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7. AUTHOR(S)

Clarence Nevis

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Department of Public Works
Division of Highways
Traffic Department

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16. ABSTRACT

The California Photolog System is a sequential file of 35mm color pictures showing the highway from the driver's vantage point. Across the top of each picture is a 15-digit binary coded decimal number which indicates the date photographed and the location within the highway system.

Longitudinal and transverse measurements may be obtained directly from the film viewer.

Film viewers and libraries are located throughout California at the 11 District offices and the Headquarters office in Sacramento.

Duplicate film strips, slides, and black and white or color prints are easily obtained.

Ninety percent of photolog users are from the Traffic, Planning and Design Departments. Other users include Administration, Claims, Operations and Right of Way.

Typical uses include gathering of accident information of inventory data for updating computer files, determining scenic highways and roadside rest areas, court cases, determining sign messages and reviewing accident locations.

17. KEYWORDS

Photolog, microlog, visual inventory, highway record system, sequential photos, accident surveillance

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CALIFORNIA PHOTOLOGGING SYSTEM

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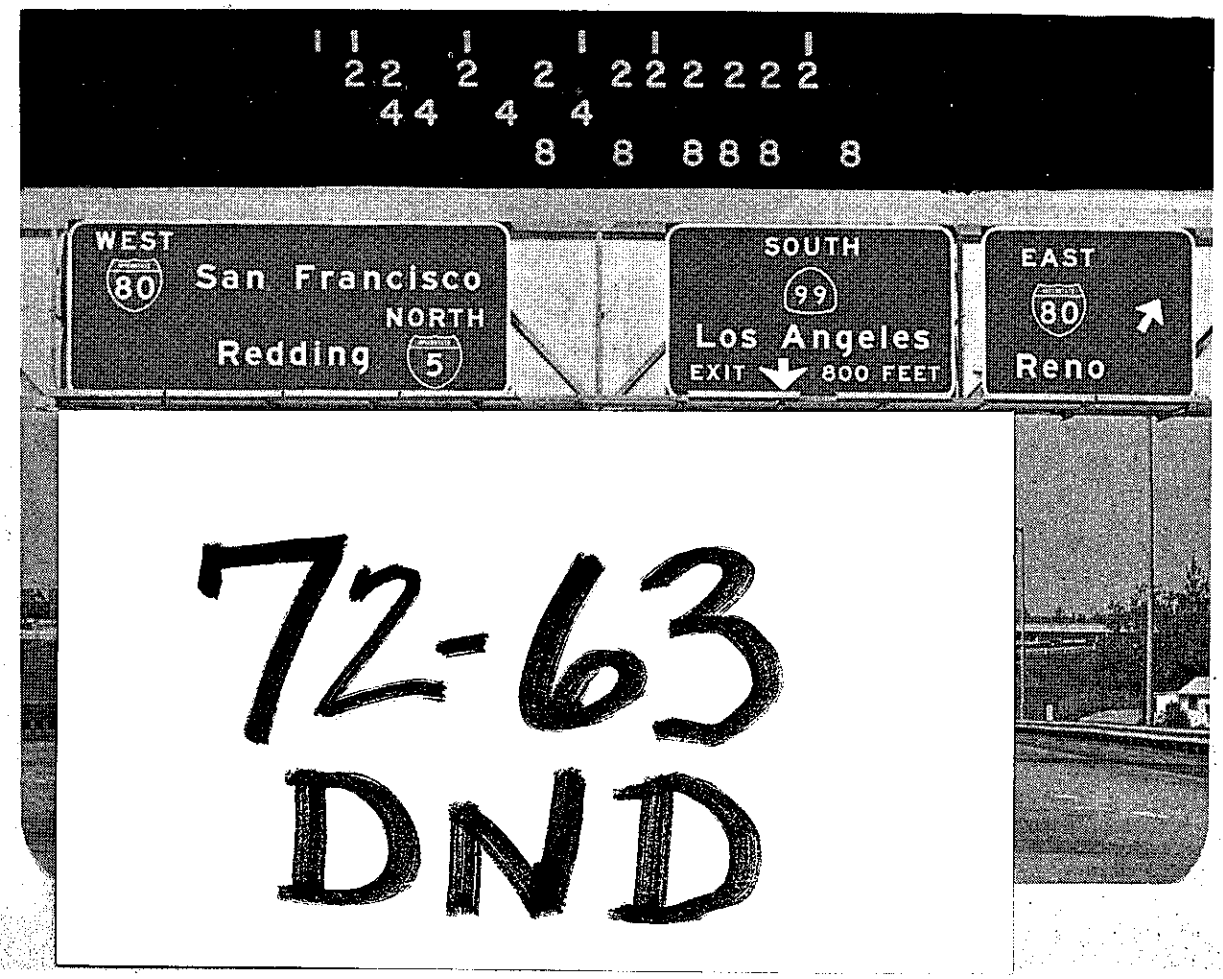

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TRAFFIC DEPARTMENT

JULY, 1972

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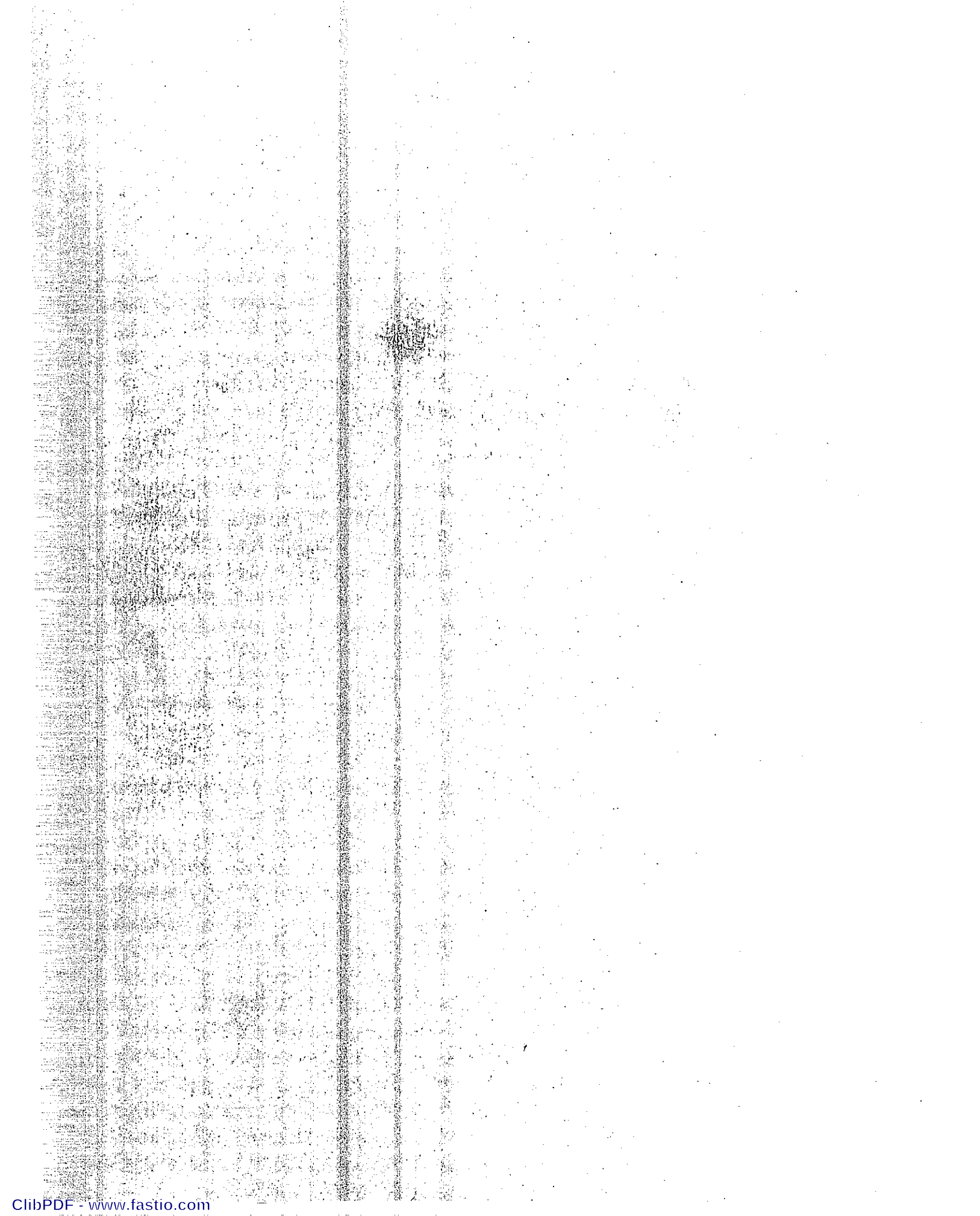

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DIVISION OF HIGHWAYS
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July 1972

Mr. R. J. Datel
State Highway Engineer
Sacramento, CA

Dear Mr. Datel:

Submitted herewith is a report on "California Photologging System".

Study supervised by----------Alvord C. Estep
State Traffic Engineer

Principal Investigators----------William R. Chaney
Supervisor of Photography
Photography & Equipment Selection

Clarence Nevis
Assistant Traffic Engineer
Editing and Libraries

Report by----------Clarence Nevis

Sincerely,

A. C. Estep

A. C. ESTEP
Traffic Engineer

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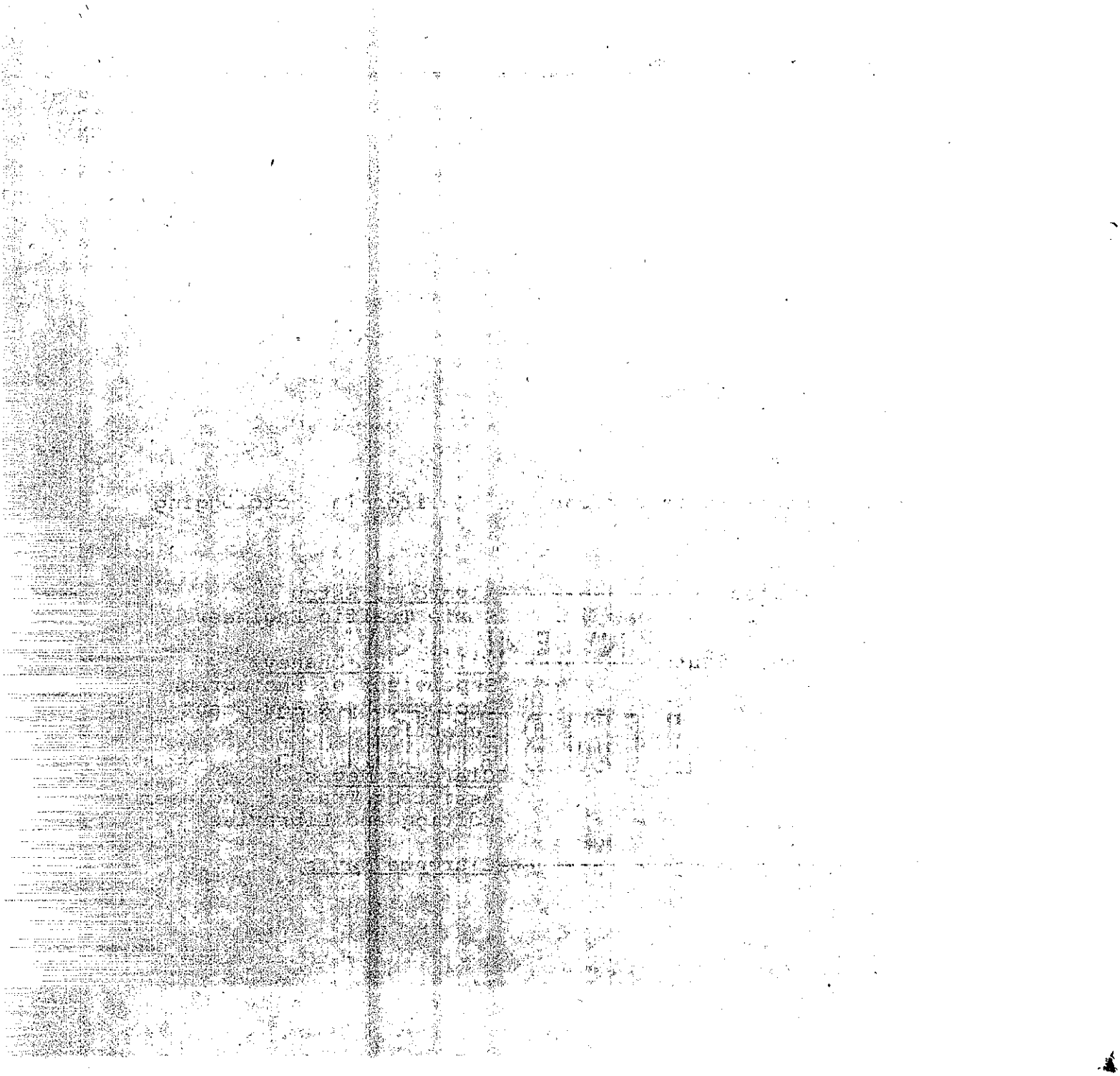

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TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
TRAFFIC DEPARTMENT

CALIFORNIA PHOTOLOGGING SYSTEM

This project is a part of the California Traffic Safety Program and was made possible through the support of the Office of Traffic Safety, State of California and the National Highway Traffic Safety Administration.

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July 1972

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the National Highway Traffic Safety Administration. This report does not constitute a standard, specification or regulation.

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COVER PHOTO:

Westbound State Route 50 at the three-level interchange with Routes 99 and 80 in Sacramento. The Department of Motor Vehicles building is in the background.

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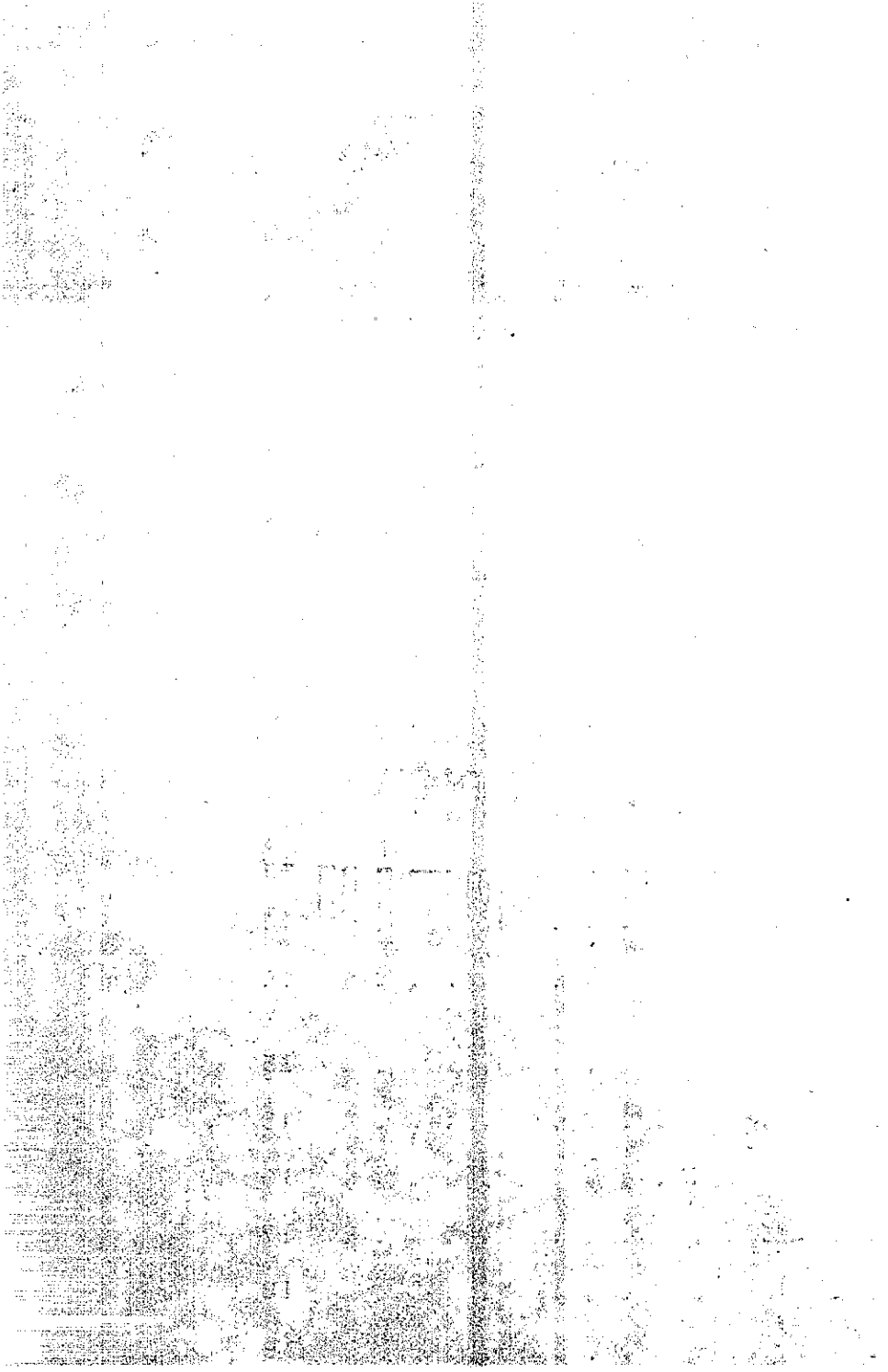

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Appendix A Photos

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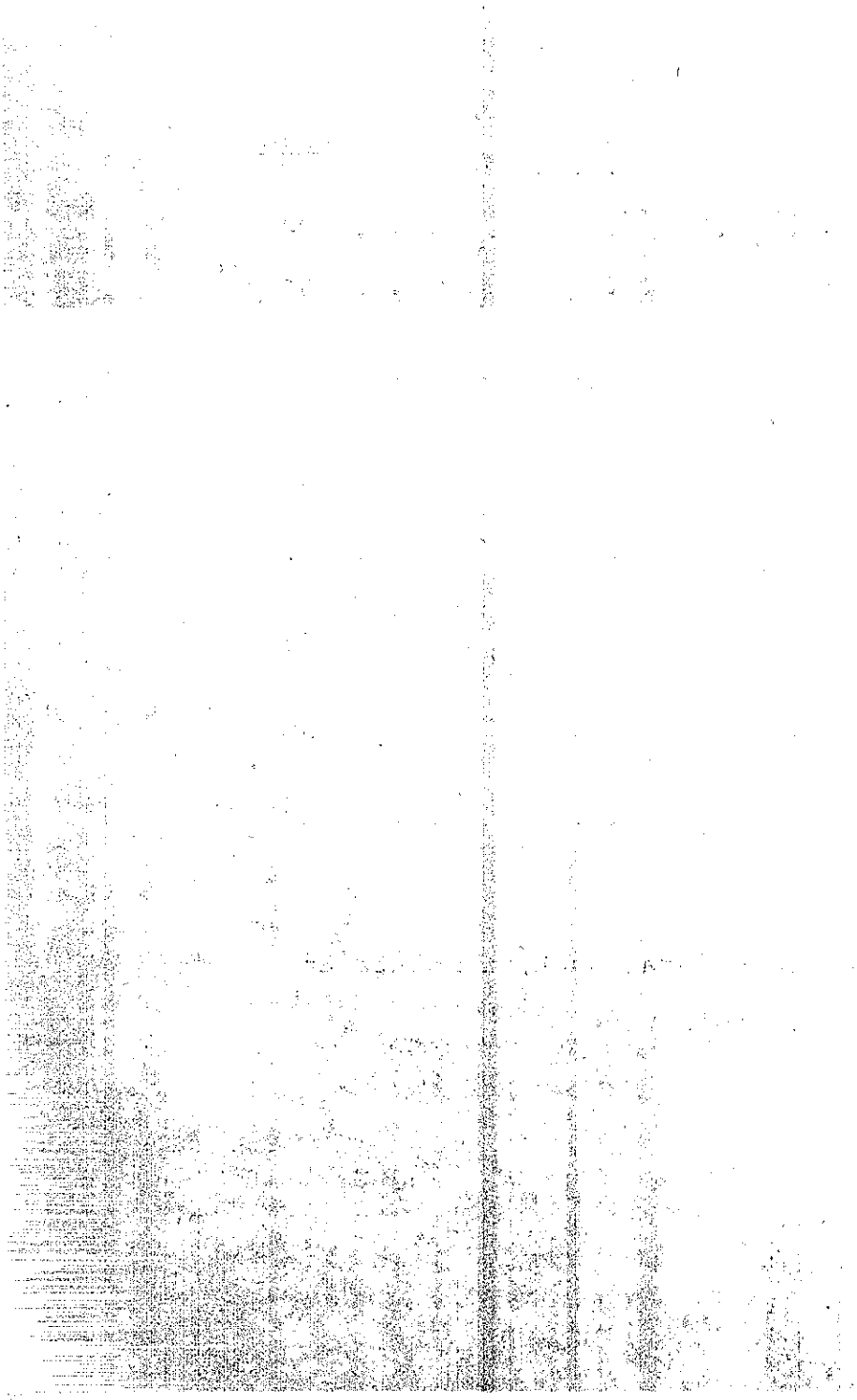

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SYNOPSIS:

The California Photolog System is a sequential file of 35mm color pictures showing the highway from the driver's vantage point.

Across the top of each picture is a 15-digit binary coded decimal number which indicates the date photographed and the location within the highway system.

Longitudinal and transverse measurements may be obtained directly from the film viewer.

Film viewers and libraries are located throughout California at the 11 District offices and the Headquarters office in Sacramento.

Duplicate film strips, slides, and black and white or color prints are easily obtained.

Ninety percent of photolog users are from the Traffic, Planning and Design Departments. Other users include Administration, Claims, Operations and Right of Way.

Typical uses include gathering of accident information and inventory data for updating computer files, determining scenic highways and roadside rest areas, court cases, determining sign messages and reviewing accident locations.

KEY WORDS:

Photolog, microlog, visual inventory, highway record system, sequential photos, accident surveillance.

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SUMMARY AND CONCLUSION:

In order to effectively manage a highway system, it is necessary to have a great deal of information about the system. We have to know what is out there on the ground. The information should be readily accessible and in a form which suits the many various needs. In the old days, the basic form of this information was the as-built plans. We have since found it useful to encode some of the information into computer files.

The photolog duplicates to some extent the information we have on the as-built plans and in the computer, but it also includes a great deal of additional information. More importantly, it displays this information in a way which is much more comprehensible for many users.

In summary, the photolog system is proving to be a valuable tool to aid in the overall management of the highway system, and as our experience with it continues we are finding new uses which were not contemplated when we began.

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I. INTRODUCTION:

California's photologging system was officially called the "Microlog System" in the Highway Safety Project Grant approved by the U. S. Department of Transportation.

A definition of photologging included in a questionnaire sent to us by Mr. Robert E. Bowling from the State of Georgia is as follows:

> "Photologging - is the photographing of highway or road facilities so that features such as dimensions, culture, geometrics, and structures will be available in a photographic file or library for use by operating and administrative groups of the highway department."

We would have to agree that this definition describes our "Microlog System". When our system was being developed we considered using "microfilm" readers, hence,the term "microlog". Whatever the name, the end product of micrologging or photologging looks like a real time and money saver for the State of California.

A. History:

California Division of Highways contracted with Aero Service Corporation of Philadelphia, Pennsylvania to do sample photologging in June of 1961; but real interest was not aroused until May of 1968 when we reviewed the Oregon Photolog System. About this time we also looked into a system developed by Frank Abell Photo Patrol Service, Inc., of Inglewood, California.

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In February 1969 Mr. G. L. Russell, then State Traffic Engineer, proposed the photolog project and requested financing with a Federal Highway Safety Project Grant.

In July of 1969 a test run was made with a 35mm system developed by Instrumentation Marketing Corporation of Burbank, California. The test was under the direction of William R. Chaney, supervisor of the photographic section of the Department of Public Works. Mr. Russell was assured by Mr. Chaney that this system would give us the quality of end product we wanted. The National Highway Safety Bureau approved a grant for the "Microlog System" project in September 1969.

Mr. Alvord C. Estep replaced Mr. Russell as State Traffic Engineer and assumed responsibility for the project when the first usable photographs were taken in June of 1970. The entire 15,000-mile State highway system was completed in both directions of travel by December 1971.

B. State Highway System:

The California Division of Highways maintains its Headquarters office in Sacramento. Eleven district offices are located throughout the State. They are responsible for the portion of the 15,000-mile State highway system in their respective districts. See the map in Appendix B for locations and names of District Photolog Coordinators.

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California's State highways range from narrow dirt roads to an all-paved, 17-lane, single-direction approach to the toll plaza at the San Francisco-Oakland Bay Bridge (Route 80).

State highway elevations range from 200 feet below sea level (Route 86) near the Salton Sea to 9,624 feet above sea level over Sonora Pass (Route 108). There are higher and lower roads in California, but they are not on the State highway system. Terrain ranges from barren desert to dense redwood forests.

The photolog is providing a wealth of information on all this assortment to the user in the comfort of an air-conditioned building miles away.

C. Objective:

Accident locating and analysis involve the study of the accident report in association with the highway plans and traffic data. Assigning post mile locations with just this information is oftentimes particularly difficult. On-site inspection to determine accident locations is the best method, but the cost of this makes it practical in only a few incidents. The proper locating of accidents is extremely important to the planning of safety improvements. The photolog system will supplement the accident report information insuring a more accurate post mile coding of all accidents and better accident surveillance.

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In the study of accident concentrations or hazardous locations, a pictorial reference is invaluable. Most studies require a review of the traffic data inventory and an on-site inspection of the highways. Field trips are not always possible and often are carried on by someone other than the person making the analysis. For a satisfactory analysis these two functions should be carried on simultaneously. The most practical way of doing this is to have a current file of sequential photographs taken from the driver's vantage point. This will not only show all the inventory and natural elements but will provide the additional advantage of seeing all of them in their true spacial relationship. A more rapid and better analysis will be obtained leading to early improvement or correction of any deficiencies.

D. Method of Procedure:

The photolog is a file of color transparencies providing a complete visual inventory of all highway record system information. Pictures were taken at 0.01-mile increments showing the State highway system from the driver's eye level from both directions along the highway. The format is 35mm single frame with wide field of view. Using a binary coded numbering system, data was recorded on each frame showing date, county, route and mile. Each district has its own file and reader. In addition, there is a master file and a reader in Headquarters.

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Photography was performed by State forces using a specially equipped State vehicle.

II. PHOTOLOG SYSTEM:

The system consists essentially of a 1970 Ford Econoline Van, an Automax 35mm Cine/pulse camera with an automatic exposure control, an Adtrol photo-digital recording system which places 15 rows of binary coded decimal numbers on the top of each picture, a fifth wheel for accurately measuring distance and triggering the camera, editing equipment and Vanguard Notion Analyzer projectors for viewing the final product.

Key items include:

A. 35mm color negative film is used.

B. 15 rows of binary coded decimal numbers are printed at the top of each picture.

C. A fifth wheel is used to accurately measure off 1/100 mile increments and trigger the camera.

D. Film readers are of the "action editor" type allowing a sense of motion.

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Some of the advantages of these items are as follows:

A. Film:

1. The use of 35 mm film allowed us a larger choice of proven time-lapse cameras. There are several makes of cameras with data chambers. The extra room inside the camera allowed direct internal placement of the binary digits on the film.

2. The use of negative film allows us to edit before we have positive prints made for the film readers. Incidentally, the film is large enough that a person can read the binary code without placing the film in a viewer. This is a time saver when selecting individual frames for paper prints.

B. Binary Coded Decimal System:

1. The 15 rows of binary coded decimal numbers allow us to show the following:

1.	Day, Month, Year	- 4 digits
2.	County	- 2 digits
3.	Route number	- 3 digits
4.	District	- 1 digit
5.	Odometer mile to 999.99	- 5 digits
		15 digits

See Appendix A for examples.

The digits are not limited to the above information but could easily stand for a city, street, address,

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time, altimeter or clinometer reading, elevation, percent cross slope or any other codeable item.

2. Data inserted in the console is automatically and simultaneously entered into the camera via a connecting cable.

   The console allows the operator to continuously monitor what is being imprinted on the film and he can rapidly change data as needed--say to correct for a meandering county line.

3. Data inserted across the top of each frame takes up only about 25 percent of the film area and allows the use of the full frame width for the picture.

C. Fifth Wheel Measurements:

A bicycle type wheel is trailed behind the photolog truck and triggers the camera every time it measures 1/100 mile. The wheel is capable of very good accuracy if time is taken to properly calibrate it between known mileage points. We once measured 70 miles of freeway and missed closing by only 1/100 mile or one picture. This is an accuracy of one in 7,000! We generally average less than one-half of one percent error--1/100 mile deviation every two miles. Some of our runs exceed 100 miles and a cumulative error of only one-half percent amounts to one-half mile.

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D. Action Film Viewers:

Vanguard Motion Analyzer projectors were selected because they provide "continuous" viewing at any frame rate up to 24 frames per second. A special base for projection on a standard motion picture screen is available.

The motion feature provides a great sense of feel for the road--similar to driving in a car. At the top projection speed, the apparent rate of travel is in excess of 800 miles per hour--faster than the speed of sound!

III. FIELD PROCEDURES:

A. Itineraries are planned relative to geographic area, climate and sun angle using the State Highway Log and district maps. The California State Highway Log is a continuous log of the various highway legislative routes as they existed on December 31 of each year. Computer-printed pages show route, post mile, odometer mile, length, number of lanes, construction date, bridge numbers, average daily traffic and whether freeway, expressway or conventional highway. (See Appendix B)

B. Each route is usually photographed in its entirety within a district to avoid mistakes in mileage and to reduce editing time.

C. Whenever practicable, routes are traveled westerly in the a.m. and easterly in the p.m. to take advantage of the sun angle.

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D. Restationing occurs at district boundaries, county lines and route changes.

E. A two-man crew works for one week in the field accomplishing from 600 to 1,000 linear miles (300/500 both ways), driving at highway speeds of 65-70 mph when practical.

F. Data is logged on daily work schedules, standard district maps and in the State Highway Log.

G. At the end of each week the rolls of film are sent by Greyhound bus to Cine-Chrome in Palo Alto for processing.

Photologging can be tedious, and it's not wise to work a crew more than one week at a time. We use two men in the van because the driver would be too busy with maps, highway logs, work sheets and monitoring the console to keep his undivided attention on the road. Visibility in the van is restricted due to the equipment, and the second man results in a safer operation.

In a typical operation the crew plans a 200- to 300-mile day. A photologging day extends from sunrise to sunset or as long as light permits. A typical day in mid-summer would permit about 12 hours of filming. At the beginning station the crew drops the fifth wheel and checks tire pressure, cleans the windshield, camera lens and camera. They set the shutter and adjust the exposure control. The equipment is turned on, the camera loaded, and the proper data is

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manually preset into the recording equipment. The preset button is depressed and the odometer mile is set to ascend or descend, and a few blank exposures are made. The camera is triggered by pulses sent by the fifth wheel and a switch can turn the pulses off or on. The fifth wheel switch can be thrown either from a moving start or standing start to begin a run. At the end of the run the fifth wheel switch is thrown off and more blank exposures are made, the work sheet is completed and the Highway Log is marked for a permanent record of work completed. Blank frames are made between scenes to aid the editor when splicing the film and as a precaution against possible light leaks if the magazine is removed.

A. Travel Speed:

The amount of edge movement, or blur, in an individual frame is a function of forward travel speed.

We have found that the following shutter and travel speed combinations give us acceptable photography.

1/1000 second -- up to 80 mph
1/500 " -- up to 40 mph
1/250 " -- up to 20 mph
1/125 " -- up to 10 mph

We are able to photolog at 1/1000 second shutter speed most of the time with our f2.8 lens and negative color film rated at ASA 100.

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Under very low light levels we can rate the film speed at ASA 400 and obtain special processing to compensate for the under exposure. At the higher film speed rating, some shadow detail is lost; therefore, we prefer not to do this unless absolutely necessary.

Travel speeds as slow as 10 mph were only necessary through heavily forested areas such as the coastal redwoods because of the very low light level, even at high noon.

High fog has not been a problem because the light level is usually adequate. We cannot film in a low fog due to limited sight distance.

B. Mileage Systems:

California records mileage three ways:

1. Post Mile - The official State mileage system was established from odometer measurements and as-built plans in 1964. This system uses equations for changes in length resulting from realignment projects, etc. Difficulty in locating equations in the field precluded their use in the Photolog system.

2. County Odometer Mile - The county odometer mile begins with zero at each county line or beginning of route. The mileage is recalculated when a change is made in route length in order to avoid an equation.

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This system was adopted for the Photolog project because it is free of equations, and the breaks at county lines give us a chance to correct mileage and not carry cumulative errors.

Discrepancies between photolog mileage and county odometer mileage occur at large interchanges. Federal reporting practices provide that mileage be reported from route to route along the main line. This necessitates the use of "non-add" mileage for that portion of a direct connection beyond the intersection of two routes. This area is not photographed under the photolog project because the ramp and collector road mileage system is not yet complete.

3. Route Mile - Route mile begins with zero at the beginning of a route and continues to the end of the route without changes at county lines.

The post mile system is our official log of State highways, and in case of discrepancies between photolog miles and post miles, post miles are considered accurate for reporting. This is because our computer master file ties all its data to the post mile system.

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C. Manpower:

We started the project using only one man in the photo van. We soon found that, with the amount of maps, mileage logs and charts he had to use, plus the limited visibility in the van due to the camera and other equipment, is was unsafe and inefficient.

We recommend that two men, a photographer and someone familiar with the post mile logs, travel with the photo van at all times.

We completed the project using 11 photographers and four engineering technicians on a rotating schedule to man the photo van. The men rotated weekly.

IV. EQUIPMENT:

A. Photolog Van:

A Ford Econoline Van, 302 Cid V-8 Engine, Model E-250 105 Window Van with Cruise-O-Matic transmission and roof-mounted air conditioning was selected. This van was modified with a 65-amp altenator, a special voltage regulator, an additional heavy duty battery in parallel with its existing battery and a Viking T-Bar suspension seat made by Bostrum, Cat. No. 2756lH. A narrow desk was built in behind the driver's seat and a Hadeo Model 77AGS refrigerator of six cubic feet capacity installed. Two propane tanks were installed with an automatic

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cross-feed valve for the refrigerator. The tanks hold enough gas to operate the refrigerator for about two weeks.

Approximately 60,000 miles were driven to photograph the 30,000 direction miles of highways.

The brakes were relined and the automatic transmission was rebuilt during this mileage.

A van was selected because there is no hood to block the camera view. The wide angle lens includes a view approximately 20 feet in front of the van to infinity.

B. Camera:

The camera is an Automax G-3 (115 VAC drive) pulse camera with a four-sprocket pull down. It has a variable shutter with shutter speed of 1/1000, 1/500, 1/250 and 1/125 second exposure durations. It is equipped with a 24mm f2.8 Auto Nikkor lens and an APEX-35 automatic exposure control. Six 400-foot Mitchel magazines accompany the camera. The camera is mounted with a Huber-mount, Type 195, Model D. A bracket attached to the dash supports the mount and camera. (See Appendix B)

The camera lens had to be removed in order to change the shutter speed. The camera was modified after completing the photolog to include an external shutter speed adjustment and a heavy-duty lens mount.

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C. Console:

The console was designed by Photo-Sonics in Burbank and contains the power supply, the Adtrol Unit and the control panel. The control panel has a frequency meter, a 110v Voltmeter, a 28v Voltmeter and switches for cine burst, pulse, power, Adtrol unit, camera, automatic exposure control, fifth wheel interrupter, and frame counter and reset. Incorporated in the Adtrol panel is a visual odometer mile readout, a forward and reverse odometer mile switch, a ready lamp, five preset mileage thumb-switches, ten fixed data thumbswitches, a test button and a preset button.

The data is recorded with an Adtrol Model RKBCD-15/10 Photocorder (15 rows of binary coded decimal numbers, i.e., 1, 2, 4 and 8). Data is entered into the camera via a 65-wire high voltage cable from the console.

The electronics in the console are sensitve to high heat. Sometimes when the outside air temperature exceeded 100 degrees and we were in stop-and-go traffic, the airconditioner would stop and then the console would operate erratically.

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D. Fifth Wheel:

The entire system is triggered by a fifth wheel ordered from LABECO, Mooresville, Ind. This wheel was modified by the Adtrol Co. in order to produce a properly shaped electrical pulse.

Correct mileage is very sensitive to tire pressure, and pressure is difficult to set exactly. It is especially difficult to set accurately with a hand pump and guage. You can lose up to 2 psi every time pressure is checked. This is because the volume is small in the tire and even a small loss of air results in lost pressure.

Bicycle tires are not satisfactory for use on the fifth wheel. A "sulky" tire that is used in horse racing is required. This tire has a flat tread and is of uniform diameter.

The truck cannot be reversed safely without lifting the wheel. You must get out of the truck to lift the wheel.

Tire life is approximately 10,000 miles.

E. Power Supply:

The photolog van was equipped with two, 12-volt batteries in parallel which were charged by a heavy-duty, 65-ampere rated alternator.

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The Automax G-3 Camera required 115 VAC for the main drive motor and 28 VDC for the film takeup motor.

A power supply in the console changes the output of the batteries to 28 VDC and 115 VAC. The voltage regulator in the van could not prevent voltage spikes from damaging the diodes in the power supply, so a special voltage regulator designed by Gulton Industries was installed to protect them. This solid-state regulator is mounted under the passenger seat.

V. EDITING:

A. Upon receipt of the processed negatives from the contractor, the editor cuts and splices the rolls to match the route order shown in the State Highway Log.

B. When he has enough for a complete roll (cutoff points were predetermined), he splices three feet of clear leader on each end and labels one end with the district and roll number.

C. Completed rolls of negatives are sent to the contractor for two rolls of positive transparencies.

D. Positives returned from the contractor are labeled at each end with the correct district and roll number. One roll is kept in a labeled can in Sacramento and the other is put in a labeled can, packaged and shipped to the district via United Parcel Service.

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E. A complete description of the limits of the county, route and odometer mile is logged. The film log contains corresponding odometer mileage from the status of highways and it is possible to compare the two for any deviation.

One copy of the film log is shipped with the district's film positives and one is sent to our Photo Lab with the negatives.

A. Editing Equipment:

1. Ediola, 35mm Pro-35 Action Viewer with footage counter. SOS-131-5610

2. Harwald 35mm Splicer Model C-8-1/16" splice. SOS-143-5994

3. HFC Editing table. No.2-30" H x 28" W x 60" L. SOS-150-6374

4. Two each 35mm Rewinds - Moviola Model WB-(2-35mm split reels). SOS-138-5817

5. Four each 35mm split reels-HFC Aluminum (1000 foot) Model A-135. SOS-154-6558

6. An adequate supply of 400-foot reel cans (1500) for positives. Eastman Kodak Co.

7. An adequate supply of 35mm film cores. Eastman Kodak Co.

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8. 4000 feet of clear film leader (3-foot leaders at each end).

9. 11-dry splicers. Hudson Model HD-35

10. 2 dozen pair white gloves

11. 8 ounces film cement

12. 8200 inches clear magic mend tape (double 3 inches each end for labeling).

13. 6 silver blueprint pencils (for labeling).

14. 12 one-ounce black felt tip markers (label cans).

B. Length of Film Rolls:

Our camera magazines hold 400 feet of film or 64 miles of highway. Many of our routes are short enough to fit on one roll and so we decided to edit to this size.

It now appears that the 100-foot rolls have advantages over the longer rolls. Some of the advantages include:

1. They are wound on reels instead of cores and thus do not require split reels for projection.

2. Less time is needed to find a scene within a roll because only 16 miles instead of 64 miles are on each roll.

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3. Short routes can be put on a small roll instead of being sandwiched in with several routes on a longer roll.

4. Less storage space is required. Small rolls can be placed in a drawer cabinet and the total volume will be less than that required for open shelves.

5. The 100-foot rolls will fit many of the Microfilm readers available. Black and white prints can be made on some Microfilm viewers directly from the positives.

6. Shorter rolls may be an advantage when updating. An entire roll (16 miles) could be replaced instead of splicing into larger rolls.

C. Film Numbering:

Film positives are labeled at each end with a silver blueprint marking pencil on clear mending tape. This method works better than ink or felt tip pens and appears to be more stable. A second piece of clear tape is placed over the pencil notation to prevent rubbing off.

The rolls are labeled with the district number followed by a hyphen and a two-digit roll number. Even numbered rolls are highways filmed in ascending mileage, i.e., roll 22 might show odometer mile 0.00 to 52.00. Roll

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numbers start with number 10 in each district in order to be an even number. Roll No. 23 in the above instance would contain descending odometer mile 52.00 to 0.00.

While a 400-foot roll can contain up to 64 miles of highway, most of our rolls contain about 40 miles. Some routes were too long for one roll and were cut into two or three shorter rolls.

The rolls normally contain a single highway route in one direction of travel. Several short routes would be combined into a single roll in one direction.

VI. LIBRARIES:

Each district has a Vanguard projector and a set of 50 to 80 rolls, 2,000-3,000 miles, of film for that district. District 07 in Los Angeles has two projectors and two sets of film.

A Photolog Coordinator in each district is responsible for aiding and instructing others in the use of the system. He keeps records of use and savings and handles requests for updating. The savings are usually the cost of field trips that are not required after viewing the film.

The Sacramento Headquarters Office keeps a complete set of films of the entire 30,000 miles representing every district. A complete set consists of 686 rolls with an average of about 44 miles in each roll. A duplicate set costs approximately $20,000.

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The film cans are stored on edge in racks. A rack will store 17 cans on a three-foot shelf. A total of 123-linear feet of shelf space was required for the complete set in Sacramento. Each district required space equivalent to one small bookcase.

A. Projectors:

Thirteen Vanguard projectors, Model M-35CS with projection stand Model S-13, were purchased under the Federal Grant.

One projection stand Model S-1 and a three-inch lens were also purchased for Headquarters' use so that a large wall screen can be used at conferences and public meetings. (Note: A four-inch lens would be a better choice, also a 750-watt bulb provides a brighter image.) All these units are table-top models and a stand with wheels is desirable.

Two split reels, HFC Model A-135, are needed for each projector because the film is wound on plastic cores instead of reels.

A darkened room is desirable for viewing.

1. In an attempt to find other methods of viewing the films, a roll of 35mm photolog negatives was optically printed as a 16mm positive for comparison purposes.

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The 16mm film was projected with an L&W time-lapse projector onto a beaded screen and onto ground glass by rear projection.

The resolution of the 16mm print suffered as compared to a 35mm print.

Sign messages that were readable on three to four frames of the 35mm print could only be read on one or two frames of the 16mm.

The 16mm projector was more critical in focusing, and refocusing was necessary whenever one frame was viewed for more than a few seconds.

In running mode the 16mm offered flicker-free images at any speed--a desirable feature. Other good features include smaller sized projector and film rolls with attendant smaller space requirements for equipment and film storage.

The area of a 16mm frame is approximately one-fourth that of 35mm, and 100 feet of 16mm is equal to 200 feet of 35mm film.

Examples of 16mm direct-positive film appeared much clearer than examples of 16mm negative to positive copies.

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The negative-to-positive method is desirable when multiple copies are needed and when preservation of the original is required.

2. Microfilm viewers produced by Eastman Kodak, 3M Company and others have the ability to make black and white prints from the film.

   Prints made from the negatives lacked contrast, probably due to the orange color of the negatives acting like a "safelight". Prints made from positives have much more contrast, but the printing process reverses the image into a negative.

   These viewers lack the "continuous" viewing which imparts a feeling of motion that is available on the Vanguard projectors.

3. Filmstrip projectors (half-frame 35mm) can be used but they are awkward to use with large rolls of film; and they have to be advanced manually.

   Eastman Kodak makes a $40 adapter for projecting half-frame film strips from their Carousel projectors. Our legal staff have used these to project short strips of film for the jury in a court of law.

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B. Projector Template:

We can measure distances along the centerline of travel quite easily to within a few feet by using the binary coded mileage on each frame and estimating the in-between distances.

We photographed a grid on the pavement and made a template for the film viewer. We are able to use the template to measure horizontal widths to within inches. (See appendix for sample grid)

VII. COSTS:

A Federal Highway Safety Bureau Grant provided financing with the State putting up in-kind matching funds. The in-kind funds are the costs expended by the State for doing other related traffic safety work--in this case,accident coding. In-kind funds are not part of photologging and were not included when calculating costs.

It cost nearly $9 per one-way mile of photography. This included all labor, equipment and material.

We estimate that a complete rerun of the 30,000 miles would cost about $150,000 or $5 per one-way mile because we would not have to purchase equipment again, i.e., camera, console, film readers, editing equipment, etc.

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The cost per one-way mile of photography calculates as follows:

Initial

(Includes Dev. Cost & Equip.)

$$\frac{\text{Project Cost } \$260,000}{\text{Total Miles } 30,000} = \$8.67$$

Rerun

(No new equipment)

$$\frac{\text{Est.}\$150,000}{30,000} = \$5.00^*$$

*includes negative and two positive prints

A cost breakdown is as follows:

Equipment	$110,000	
Negatives	44,000	(negative)
Prints	42,000	(two positive prints)
Staff	64,000	
	$260,000	

Cost per photo = 9 cents

400-foot roll of negative film = $85 (with processing)

400-foot roll of positive film = $40 (with processing)

Truck rental is 7.8 cents per mile and includes all maintenance and fuel. We believe the equipment (truck excluded) should be good for 25 million pictures or enough for eight complete trips through our highway system.

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Maintenance costs on photo equipment are estimated to cost $2,000 per year. Reserves for updating equipment are estimated at $4,000 per year.

A. Uses:

Some uses made of the photolog include:

1. Gathering intersection data for our computerized master file in connection with the Traffic Accident Surveillance and Analysis System (TASAS). Districts claim they can get 85 to 90 percent of the data needed by viewing the films and are saving about five hours of field work for every hour of viewing. While viewing the film they can see if the intersection has signals and lighting, channelization, medians, islands, curbs, stop signs, pavement markers, etc.

2. Our claims people are using the system to provide data for several legal cases pending against the State of California. This may result in cases being thrown out of court by the conclusive evidence in the photos.

3. Review of fatal accident scenes on the Photolog System has become standard procedure for the Traffic Engineer. The ability to make a quick appraisal of an accident site can hasten any necessary corrective action.

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4. The workload varies from district to district in our State and work is sometimes "farmed out" to other districts in order to effect manpower leveling. The photolog has been of great value here. A design group is able to communicate with another district while each is viewing identical photography.

5. Invariably during the course of project design, various items of information are desired which can be obtained by visual inspection of the site. Where the project is along existing alignment, these needs are quite often satisfied by the photolog film.

6. The system has proven quite useful in the course of replying to miscellaneous correspondence regarding roadway conditions and signing.

7. The Maintenance Department is using the system to view sites before issuing encroachment permits. They also plan to use the system to aid their superintendents in reviewing road conditions with their foremen.

8. Management is using the system to familiarize themselves with specific locations brought to their attention by district reports, private citizens and the Legislature.

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9. It is being used by our Outdoor Advertising Section to check roadside billboards for compliance with the nation's Highway Beautification Act.

10. Our Materials and Research Laboratory recently purchased a projector to use the photolog films. They will view films over a number of years to determine pavement wear rates by type and location.

11. Nearly every Department viewing the photolog has found some use that can save them time and money. New uses are being disclosed every monthly reporting period.

B. Users:

Principle users so far include the following:

	Percent of Time Used	Benefit/Cost Ratio
Administration	1	--
Claims	2	3:1
Design	10	6:1
Operations	5	9½:1
Planning	12	4½:1
Right of Way	2	1½:1
Traffic	68	4:1
	100%	

Average Ratio = 4:1

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Nonstate employees using the system include city traffic engineers, county road supervisors, outdoor advertising people, private traffic researchers and claims adjusters for insurance companies.

The photolog is considered a "writing" under the California Public Records Act; and as such, is open to inspection at all times during office hours of the State agency; and every citizen has a right to inspect it. An exception is when the photolog pertains to pending litigation to which the public agency is a party.

C. User Savings:

User savings fall into two groups--tangible and intangible.

1. Tangible savings would include the cost of field trips, car mileage, expenses saved and any other known and measurable savings.

2. Intangible savings result when the photolog was used, but a field trip would not have been made if it was not available.

   Examples might include:

   a. Management review for familiarization in reviewing project reports.

   b. Requests for viewing by the California Highway Commission.

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c. Refreshing memory for answering letters.

d. Satisfying curiosity as to type of facilities or surroundings.

Using only tangible savings due to field trips saved, car miles saved and measurable time savings, we arrived at the following user savings on a statewide basis:

1. For every man-hour of photolog system use, we are saving four man-hours and 20 car-miles of travel.

2. Estimated savings presently average about $800 per month per district or over $100,000 per year statewide. This gives a benefit/cost ratio of 1:2.6. That is, the system will pay for itself in less than three years.

VIII. PROBLEMS:

A. The late afternoon sun causes white milepost markers to reflect too much light to be readable. Green interstate milepost markers photograph much better than white markers.

B. It is impossible to exactly match photolog mileage with any of our other mileage systems because of equations, non-add mileage and errors associated with these systems. The photolog is still usable, however, because there are usually enough known landmarks in the photos to

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identify the location. A close match of the photolog mile with the post mile makes identification much faster and easier, and for this reason it is desirable to strive for accuracy in photologging.

C. Condensate from the roof-mounted airconditioner often overflowed onto the windshield when the van decelerated. This made it necessary to clean the windshield so the camera view was not distorted. Under some conditions the condensate would actually overflow into the van and wet the console. Provision should be made to drain off excess condensate so that it will not interfere with photologging operations.

D. The truck was idle for about 25% of the time due to equipment malfunctions and servicing.

Malfunctions included:

1. AC power supply - inverter, alternator, voltage regulator, relays, fuses and diodes.
2. Camera shutter - sheared pin after two million cycles.
3. Broken high voltage cable - eight feet long, 65 wires.
4. Broken fifth wheel brackets.

Service included:

1. Replacing tires on truck and fifth wheel.
2. Replacing brake linings.

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3. Rebuilding automatic transmission

4. Repairing airconditioner bracket on engine

5. Normal maintenance

E. Another problem was weather. We do not photolog in rain, low fog or snow. An early winter forced us out of the mountains last year, but we were able to continue in the southern part of the State.

F. The Vanguard Motion Analyzer projectors are high quality units, but they have given their share of problems. It was essential to obtain a good service agreement because we cannot be without a projector for even a short period of time.

G. On certain freeways in the Los Angeles area it was believed that continued high traffic volumes would make it difficult or even hazardous to photolog. A cartop-mounted sign was designed and built for use on a California Highway Patrol car which could follow the photolog van and prohibit vehicles from passing and obstructing the camera view. Approximately 200 feet of clear roadway is necessary for useful photography.

The sign was used once on the Harbor Freeway (405) in Los Angeles. The photologging was watched by District Freeway Operations people, and they felt that the sign

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would not be needed. The remainder of the Los Angeles Freeway System was photographed without the "DO NOT PASS" sign.

Photologging was confined to off-peak traffic conditions whenever practicable.

The cartop-mounted "DO NOT PASS" sign was given to the California Highway Patrol. They are considering using signs similar to this one in their "Fog Study". If feasible, they plan to build up to 100 of these signs for use on pilot cars in fogbound areas. The cartop racks, flashing lights, wire and flasher were borrowed from the California Highway Patrol originally.

IX. CHANGES:

If we were doing it again we would consider making the following changes:

A. Propane powered refrigerator is not required. An "ice chest" cooler would be adequate and it would not block the driver's view. We only carry enough film for a week, about 20 rolls.

B. Film changing box not needed. A film change bag is preferred because it can be used in the comfort of a motel room at the end of each day. It also required less room.

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C. The film splicer we used is of the "wet" type. Emulsion is scraped from the film and cement is applied for joining. A "dry" splicer makes butt joints that do not require removal of emulsion, including some binary numbers. The dry splice method appears to be a better method.

D. The fifth wheel is vulnerable to damage from other cars whenever we park. We cannot back the truck with the wheel down and this can sometimes be hazardous.

If another accurate method of determining distance can be found, we would prefer to eliminate the fifth wheel.

A front wheel takeoff and steel belted tires is one possible alternative.

X. UPDATING:

The usefulness of the system will diminish unless the photolog is kept current. It was determined by a poll of our districts that:

A. All new construction and major reconstruction should be photologged immediately after completion.

B. High-volume, two-lane roads should be photologged every two years.

C. Freeways and other roads should be photologged at least every five years.

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A continuing program of photolog updating was approved by the Federal Highway Administration.

It is planned to update photography and photolog new routes according to district needs and to include approximately 20 percent of all highways each year, so that the entire State will be rephotographed every five years.

About 5,500 photolog miles (19% of the total highway system) will be updated during 1972.

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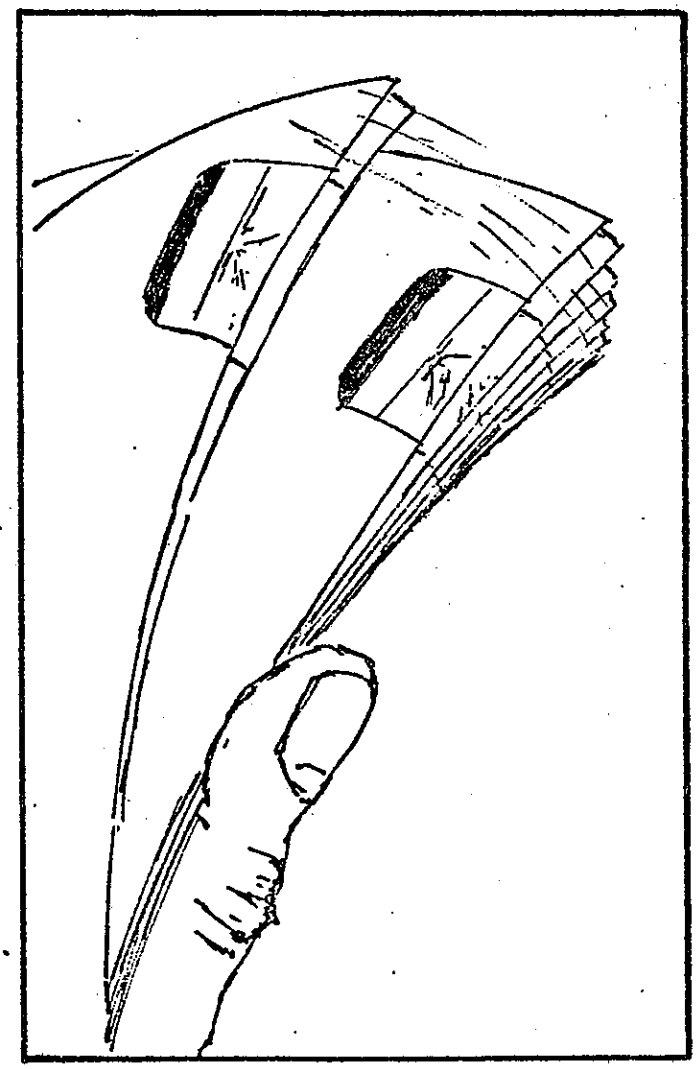
APPENDIX - A
PHOTOS



Thumb pages here to view sequential photos

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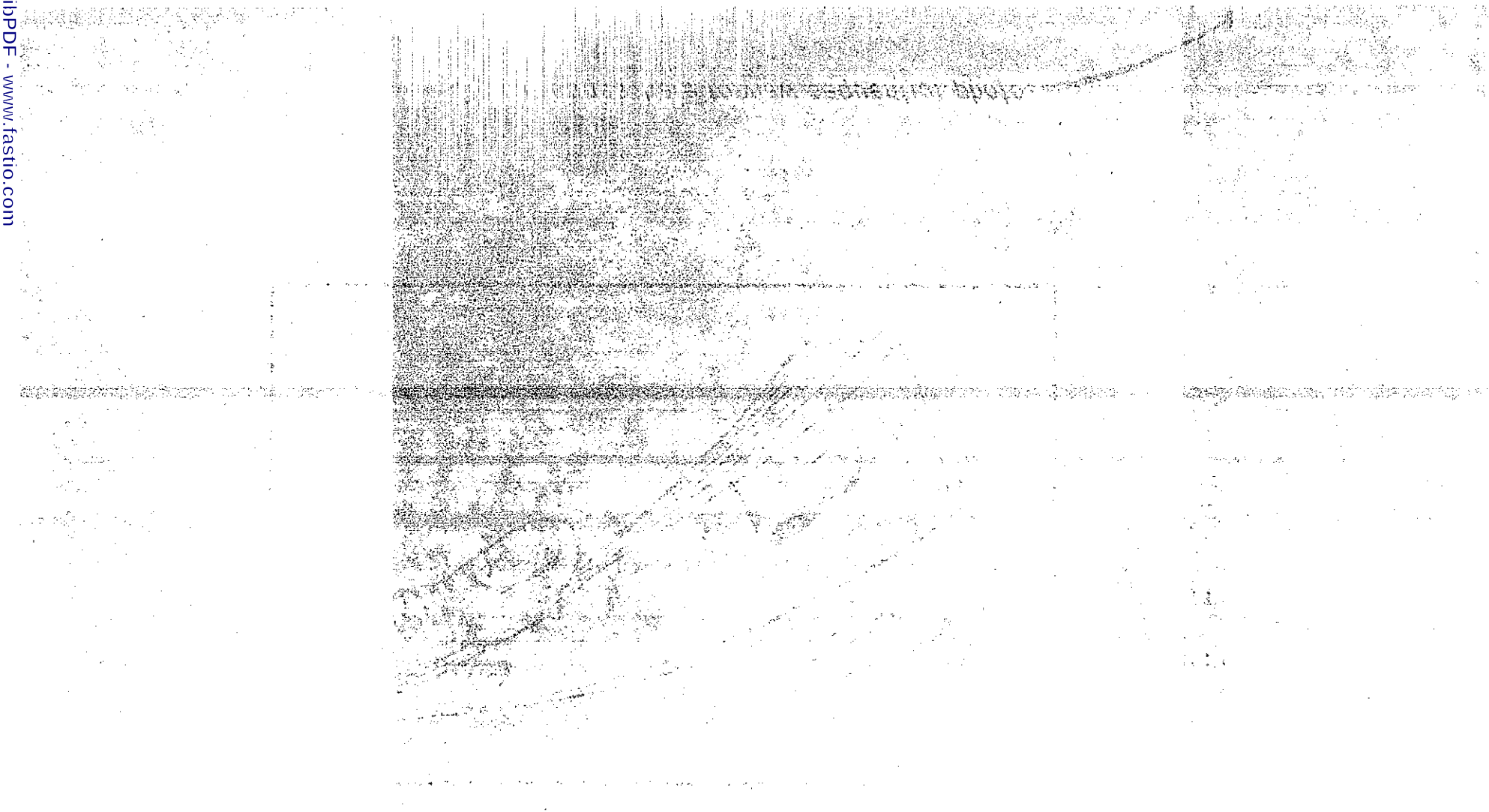

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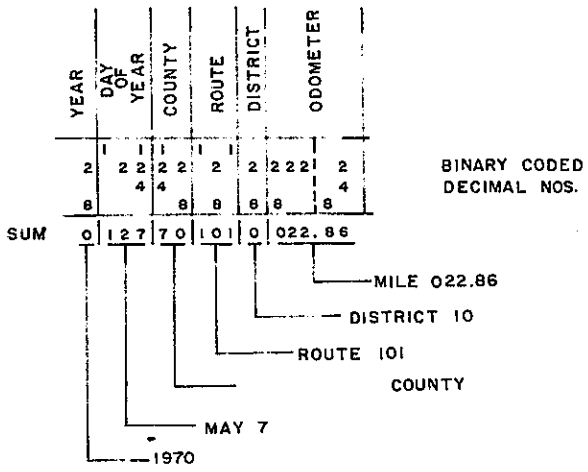
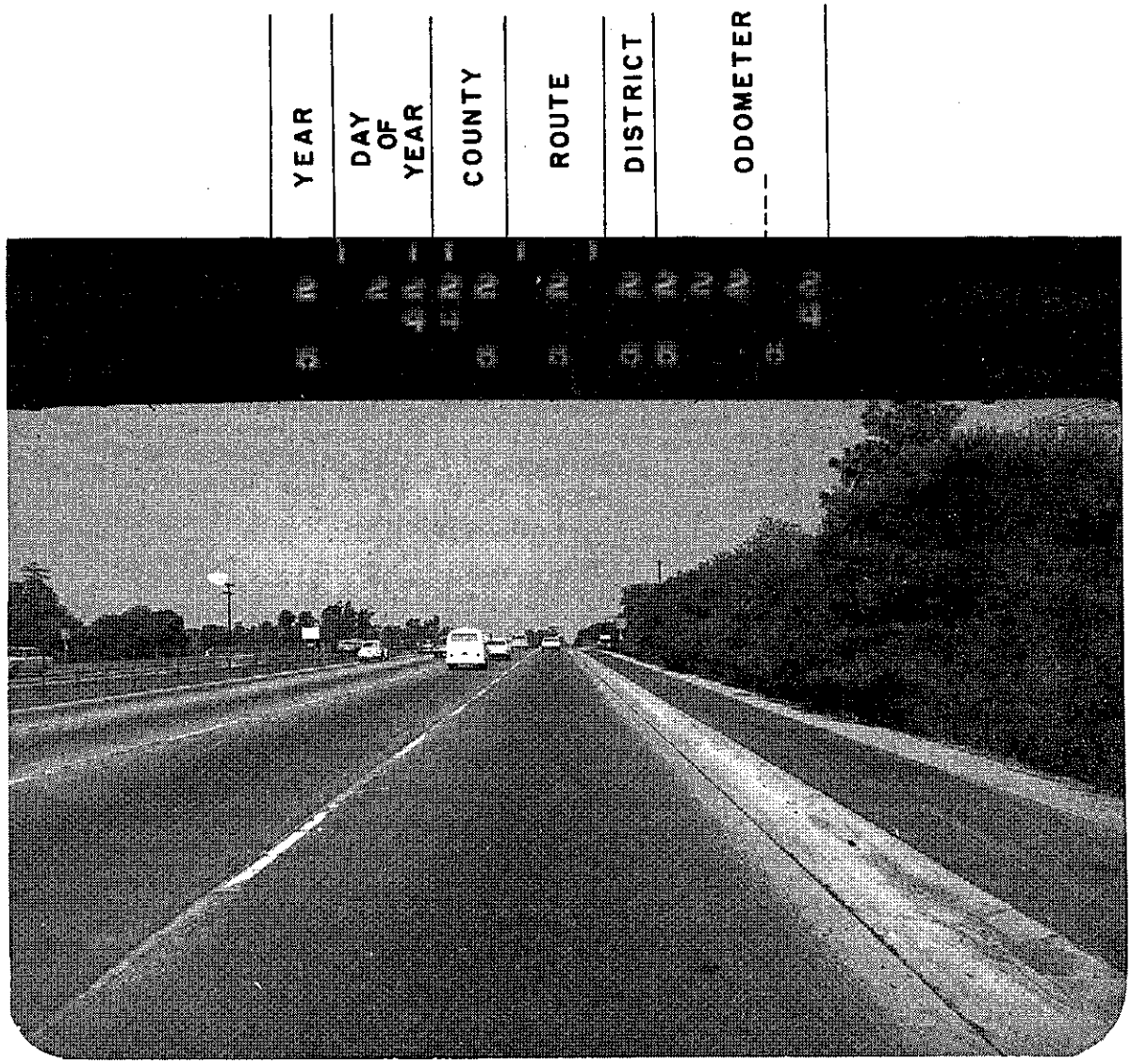
CALIFORNIA PHOTOLOGGING SYSTEM





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DAY OF YEAR

Day Mo.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1.	1	32	60	91	121	152	182	213	244	274	305	335
2.	2	33	61	92	122	153	183	214	245	275	306	336
3.	3	34	62	93	123	154	184	215	246	276	307	337
4.	4	35	63	94	124	155	185	216	247	277	308	338
5.	5	36	64	95	125	156	186	217	248	278	309	339
6.	6	37	65	96	126	157	187	218	249	279	310	340
7.	7	38	66	97	127	158	188	219	250	280	311	341
8.	8	39	67	98	128	159	189	220	251	281	312	342
9.	9	40	68	99	129	160	190	221	252	282	313	343
10.	10	41	69	100	130	·	191	222	253	283	314	344
11.	11	42	70	101	131	162	192	223	254	284	315	345
12.	12	43	71	102	132	163	193	224	255	285	316	346
13.	13	44	72	103	133	164	194	225	256	286	317	347
14.	14	45	73	104	134	165	195	226	257	287	318	348
15.	15	46	74	105	135	166	196	227	258	288	319	349
16.	16	47	75	106	136	167	197	228	259	289	320	350
17.	17	48	76	107	137	168	198	229	260	290	321	351
18.	18	49	77	108	138	169	199	230	261	291	322	352
19.	19	50	78	109	139	170	200	231	262	292	323	353
20.	20	51	79	110	140	171	201	232	263	293	324	354
21.	21	52	80	111	141	172	202	233	264	294	325	355
22.	22	53	81	112	142	173	203	234	265	295	326	356
23.	23	54	82	113	143	174	204	235	266	296	327	357
24.	24	55	83	114	144	175	205	236	267	297	328	358
25.	25	56	84	115	145	176	206	237	268	298	329	359
26.	26	57	85	116	146	177	207	238	269	299	330	360
27.	27	58	86	117	147	178	208	239	270	300	331	361
28.	28	59	87	118	148	179	209	240	271	301	332	362
29.	29	...	88	119	149	180	210	241	272	302	333	363
30.	30	...	89	120	150	181	211	242	273	303	334	364
31.	31	...	90	...	151	...	212	243	...	304	...	365

Julian calendar

COUNTY

01	ALA.	21	MRN.	41	S.M.
02	ALP.	22	MPA.	42	S.B.
03	AMA.	23	MEN.	43	SCL.
04	BUT.	24	MER.	44	SCR.
05	CAL.	25	MOD.	45	SHA.
06	COL.	26	MNO.	46	SIE.
07	C.C.	27	MON.	47	SIS.
08	D.N.	28	NAP.	48	SOL.
09	E.D.	29	NEV.	49	SON.
10	FRE.	30	ORA.	50	STA.
11	GLE.	31	PLA.	51	SUT.
12	HUM.	32	PLU.	52	TEH.
13	IMP.	33	RIV.	53	TRI.
14	INY.	34	SAC.	54	TUL.
15	KER.	35	SBT.	55	TUO.
16	KIN.	36	SBD.	56	VEN.
17	LAK.	37	S.D.	57	YOL.
18	LAS.	38	S.F.	58	YUB.
19	L.A.	39	S.J.		
20	MAD.	40	SLO.		

County Number used in Binary Code

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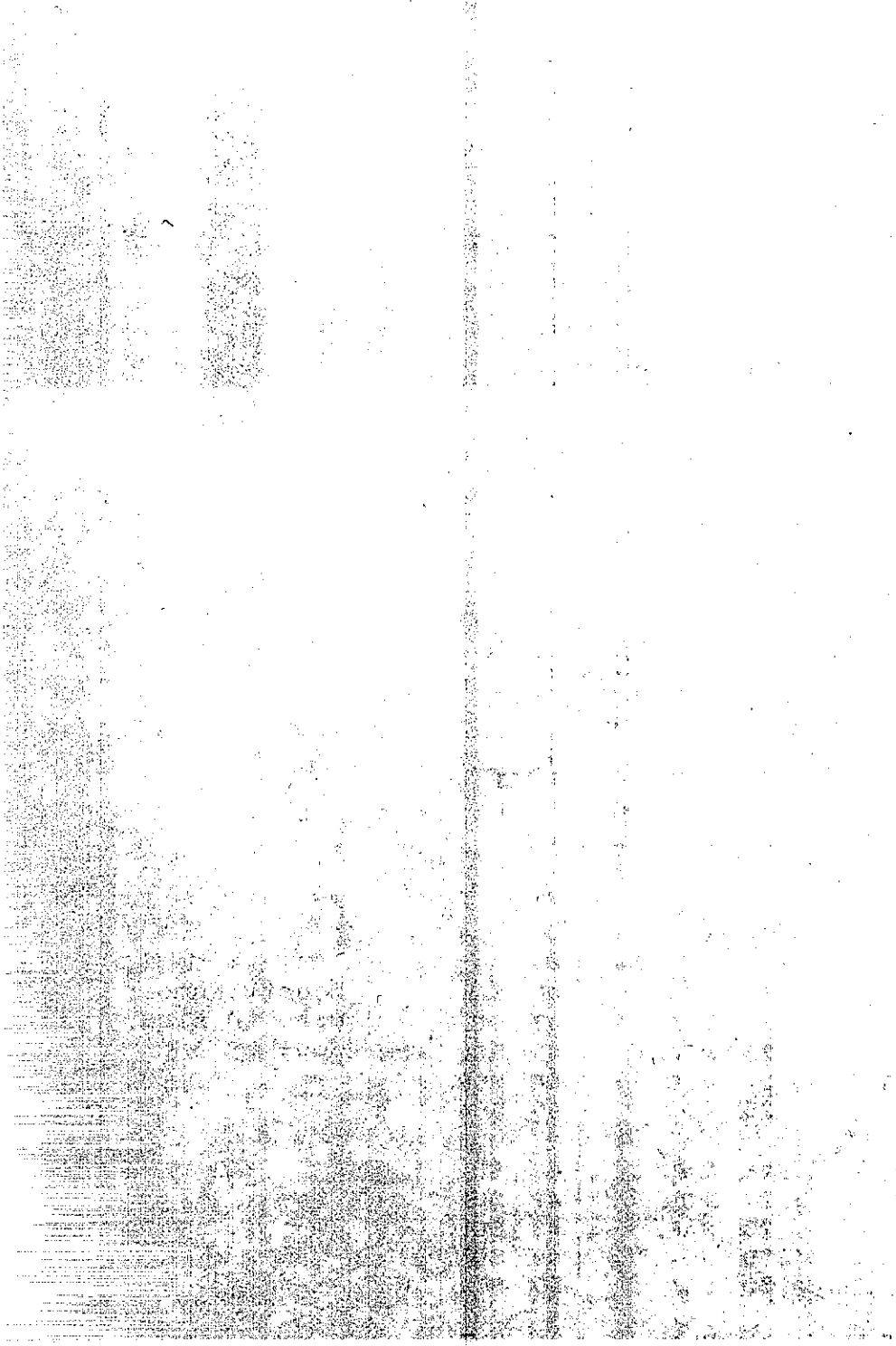

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Ford Econoline Van, 302 CiD V-8 Engine, Model E-250 105 Window Van with Cruise-O-Matic transmission and air conditioning.

Fifth wheel for measuring 0.01-mile increments to an accuracy of ±1/2%.

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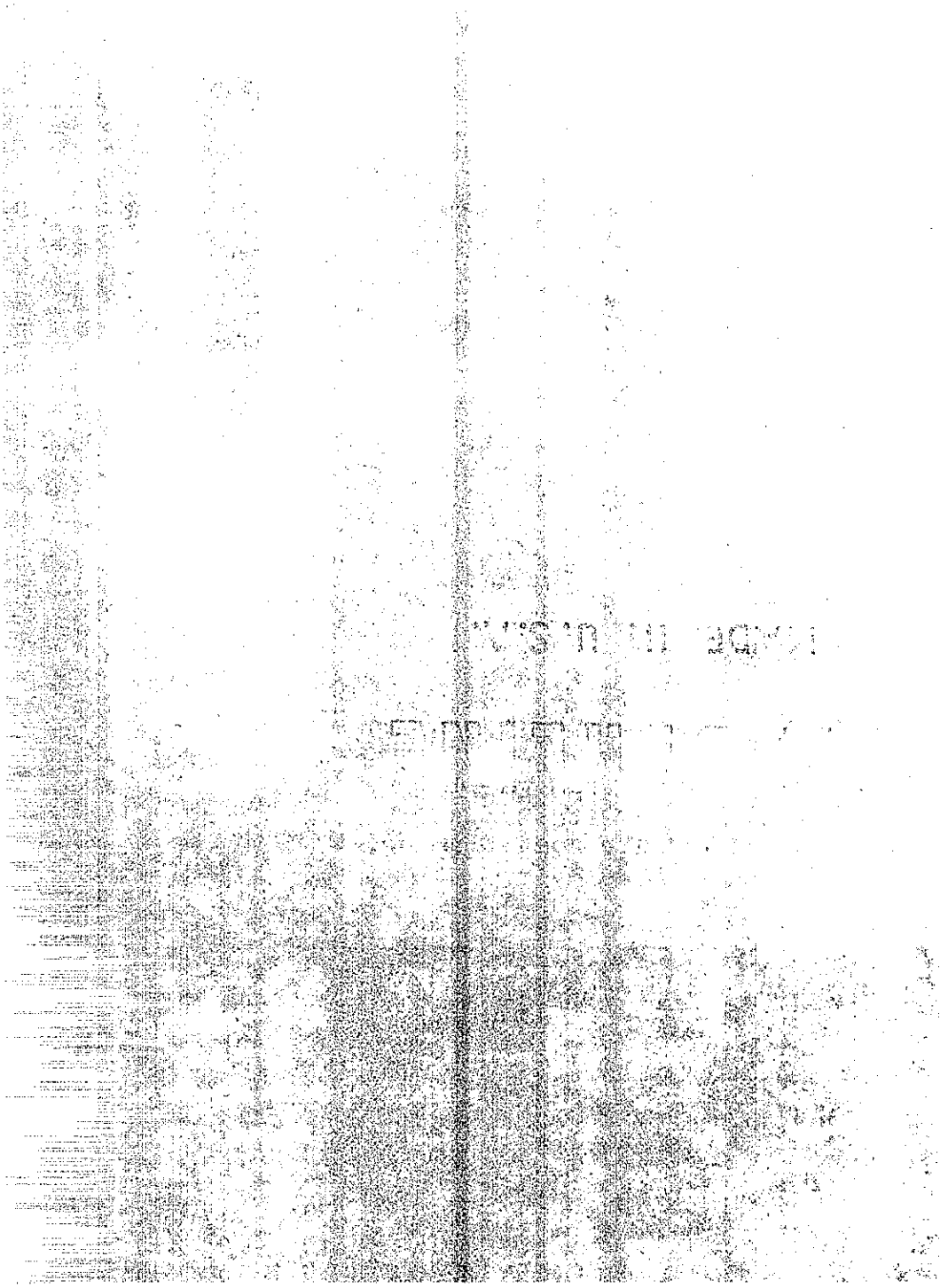

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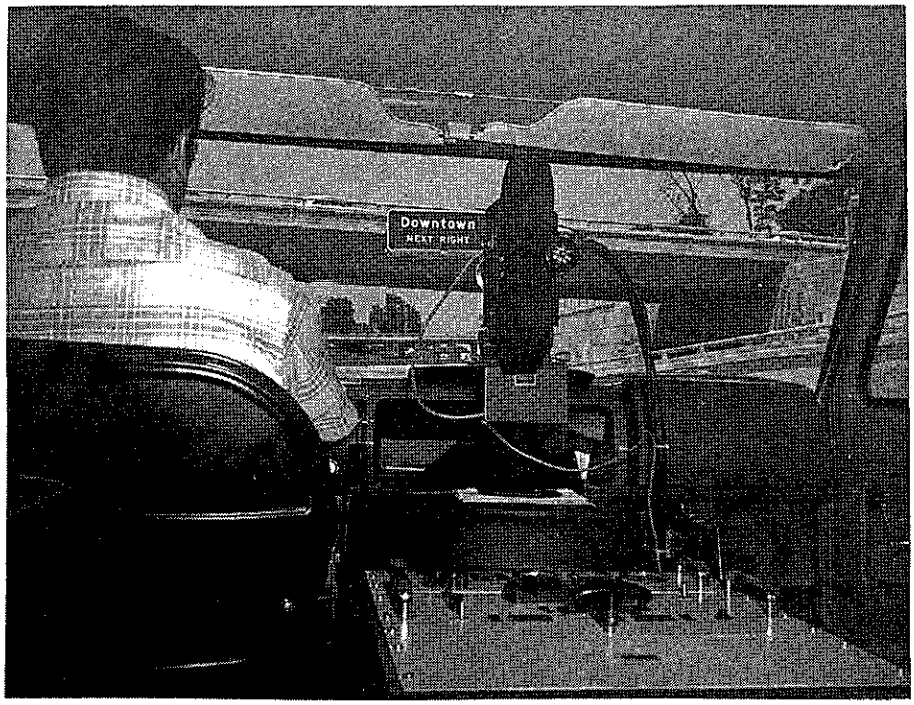
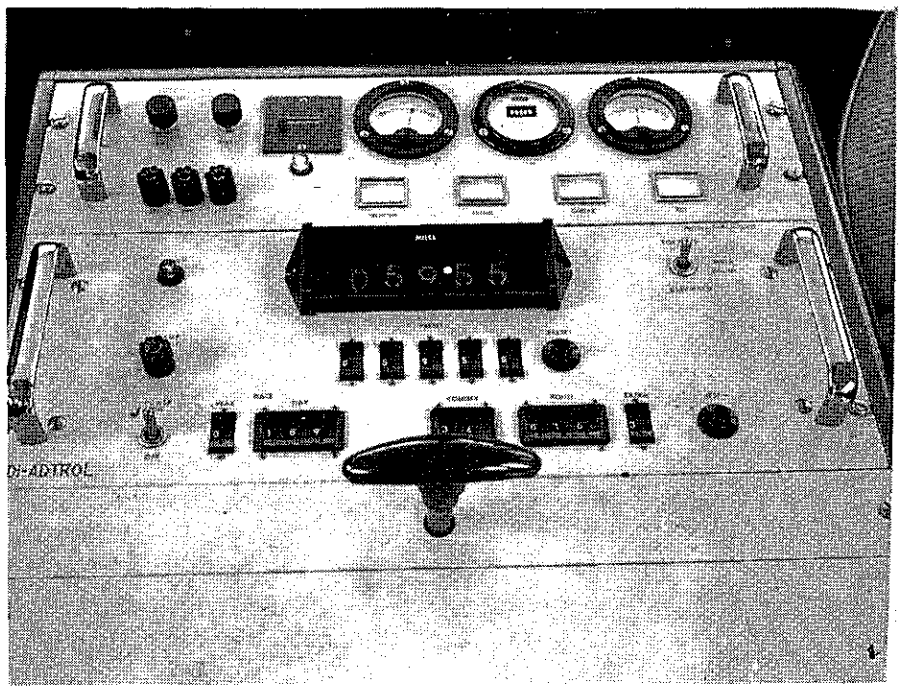


35 mm Automax G-3 Cine-Pulse camera is mounted at windshield. Console is in foreground.



Data is recorded with an Adtrol Model RKBCD-15/10 Photocorder. Mileage is displayed continuously (center).

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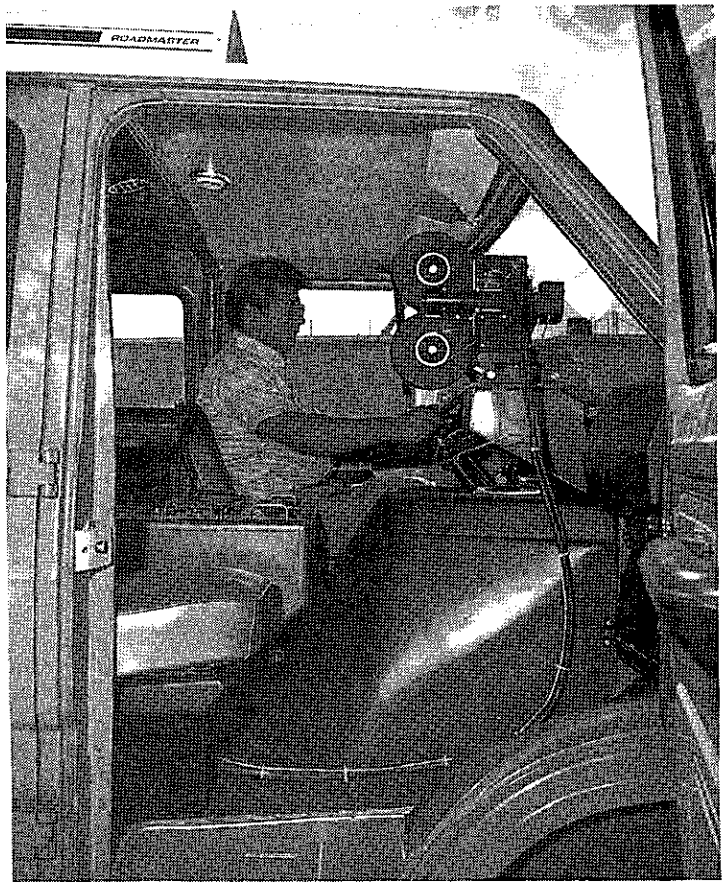
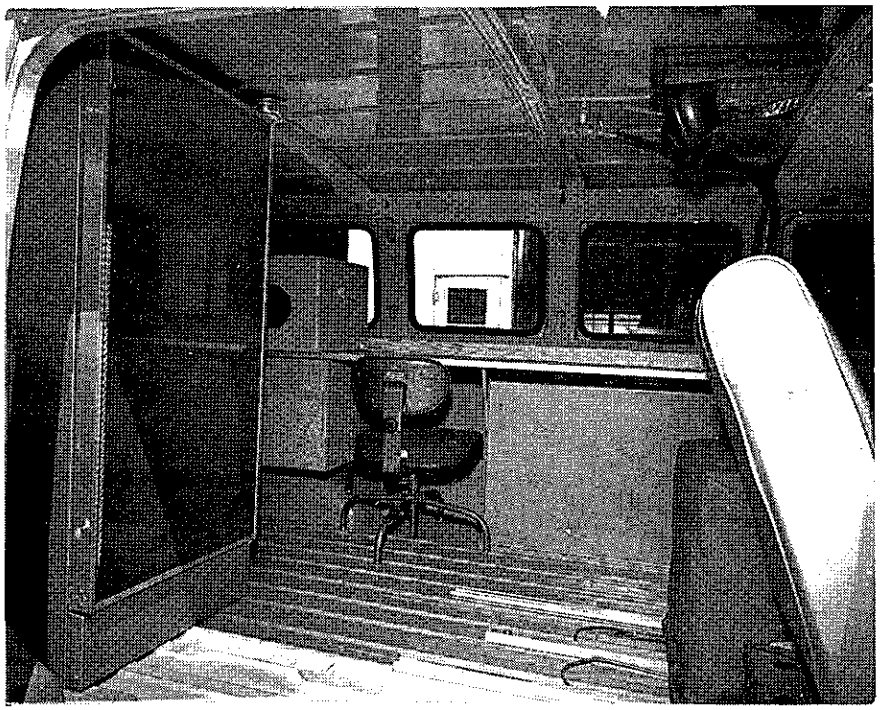


Console, camera and mount assembly.



Refrigerator (left) was used to store film.

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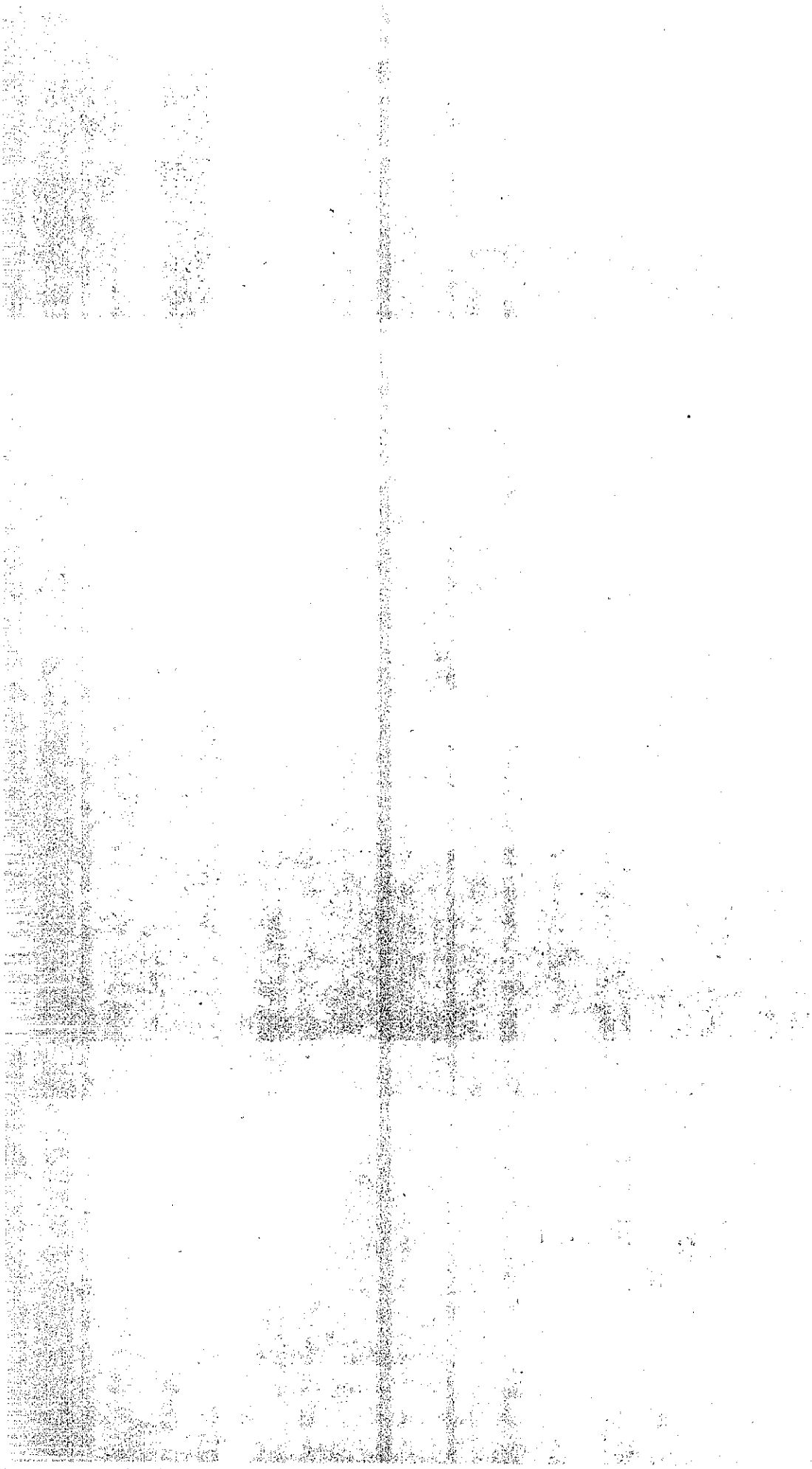

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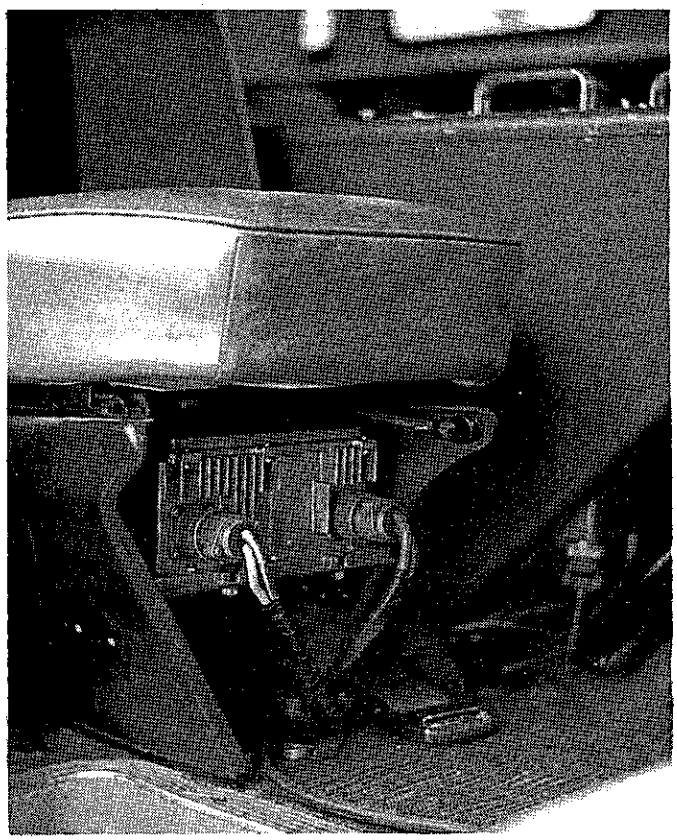
Propane tanks for gas refrigerator.



Special voltage regulator mounted under seat.

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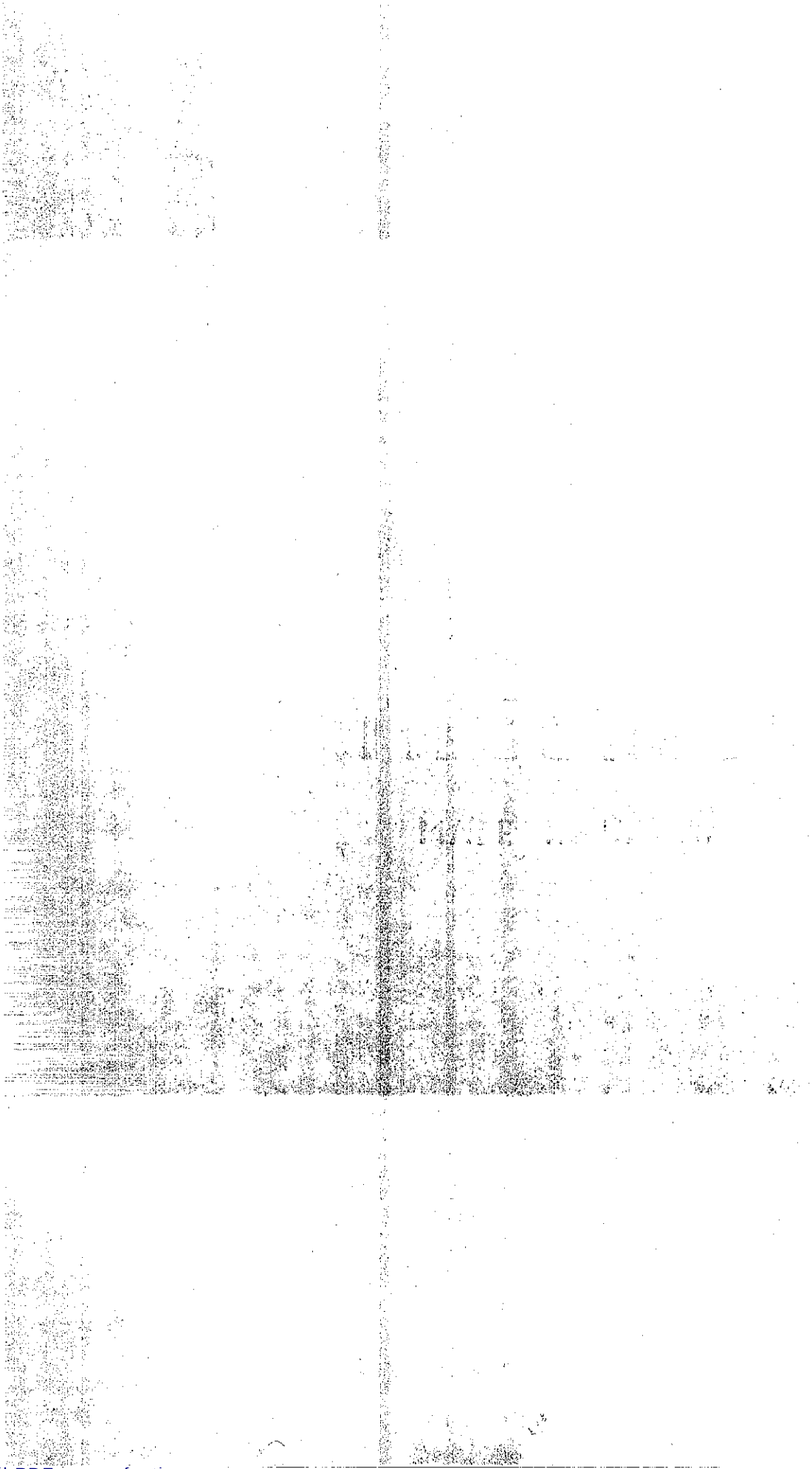

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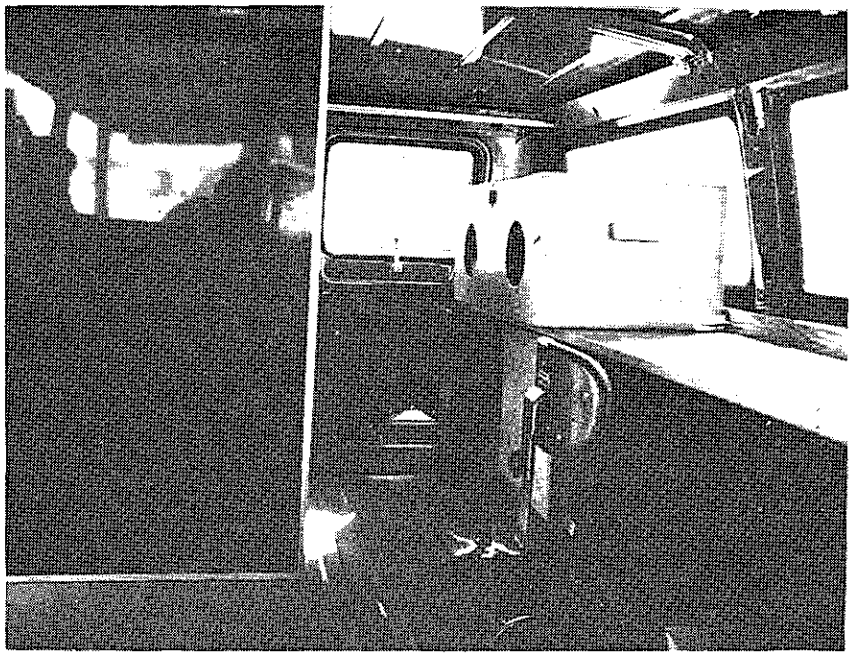
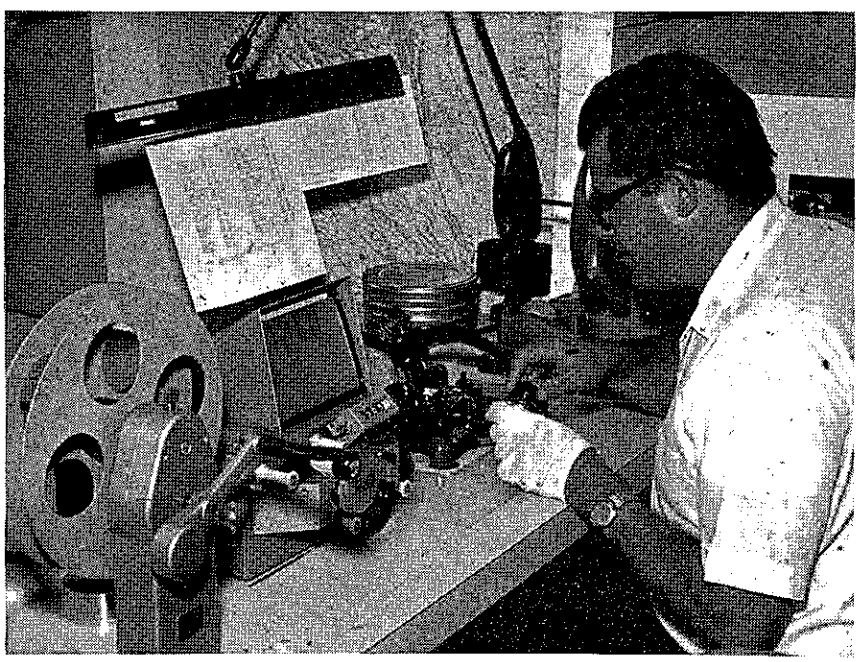


Refrigerator and film change box obstruct view to rear.



Editing color negatives.

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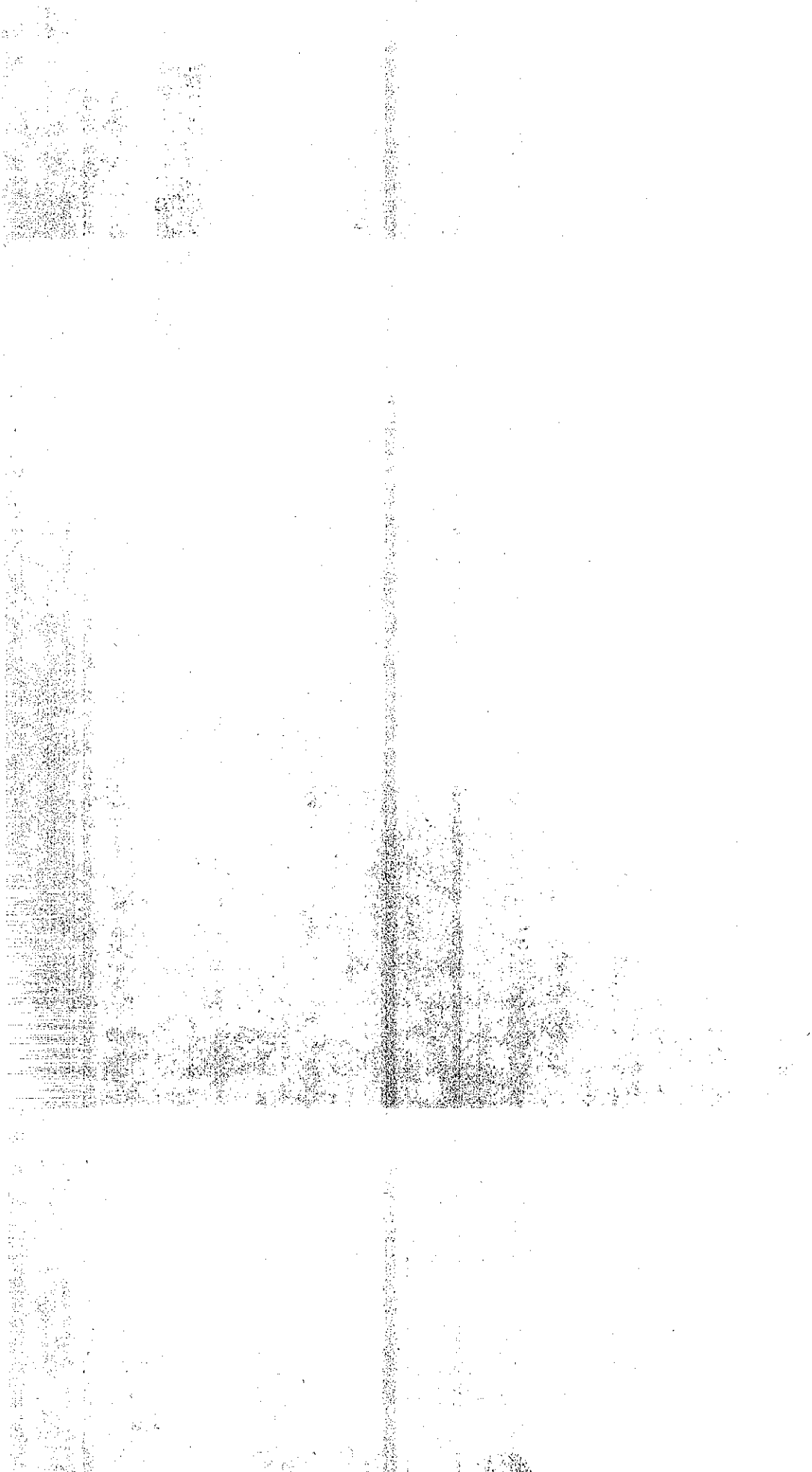

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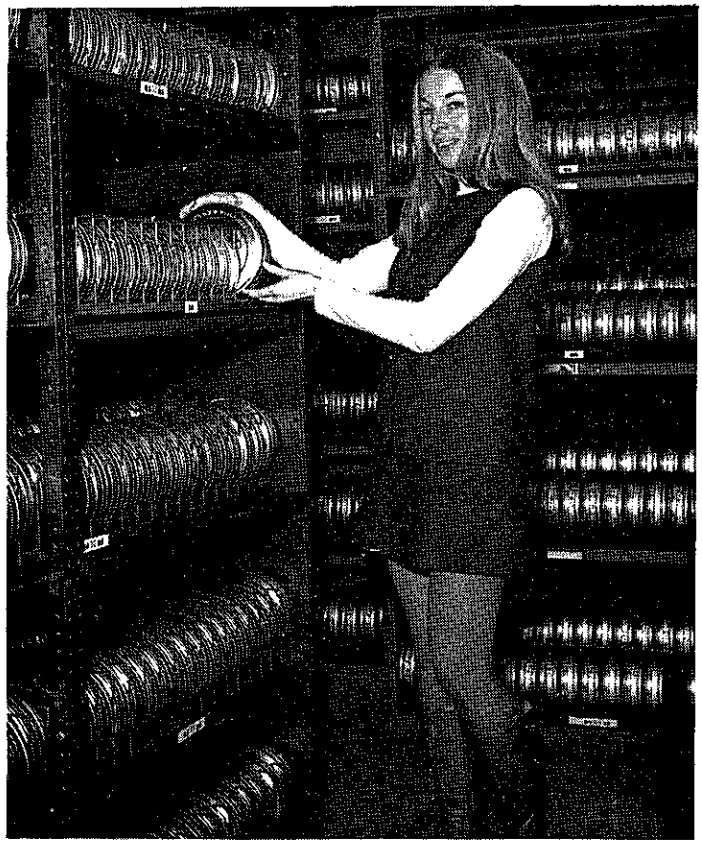
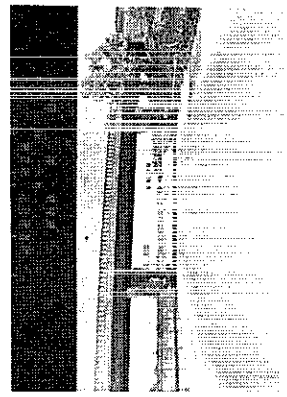
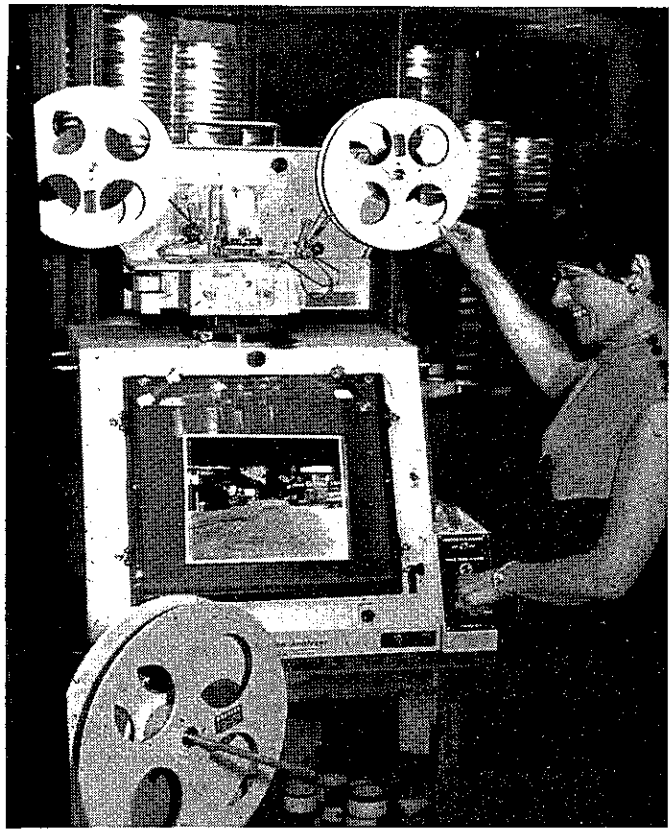




Positive film storage. 400-foot rolls in cans hold up to 64 photolog miles.



Vanguard projector (simulated picture).

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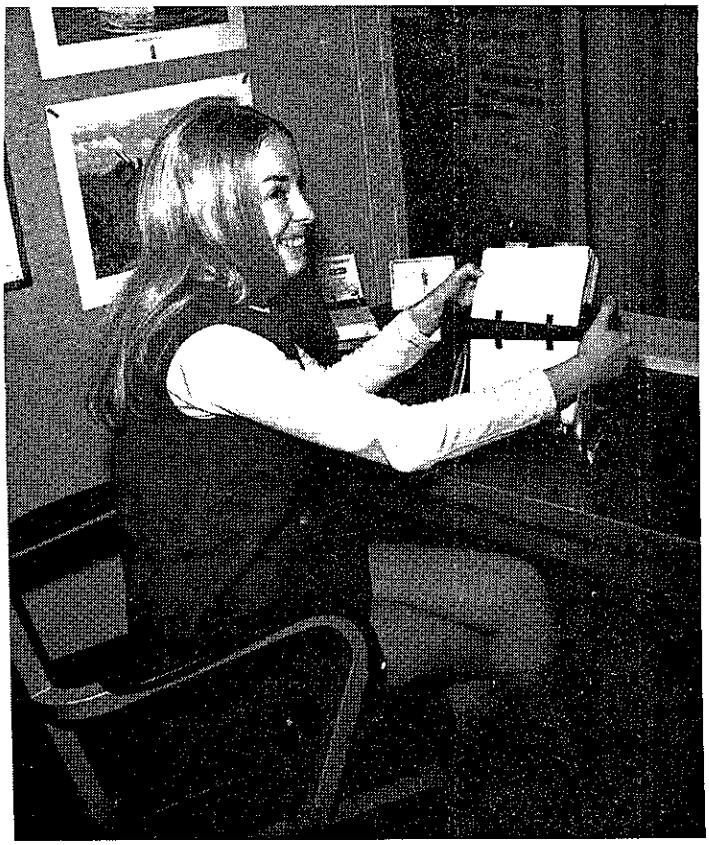

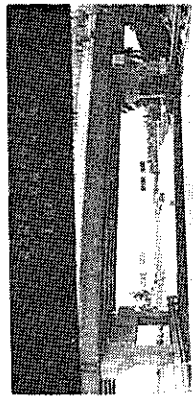

Photolog card file.

CALIFORNIA HIGHWAY MICROLOG STATUS CARD

DIST – CO – RTE	ROLL NO.	STATUS LOG MILEAGE
07-LA-10	30-31	0.00 - 46.77

ORIGINAL DATE FILMED	MICRO LOG MILEAGE
Oct. 14, 1970	0.00 - 46.98 46.98 - 999.98

DATE FILMED UPDATED – LIMITS	EQUATIONS
2-29-71 15.62 - 18.33	realignment
1-15-72 5.25 - 23.50	Sign upgrading

CONTINUE ON REVERSE SIDE

HT-105-71

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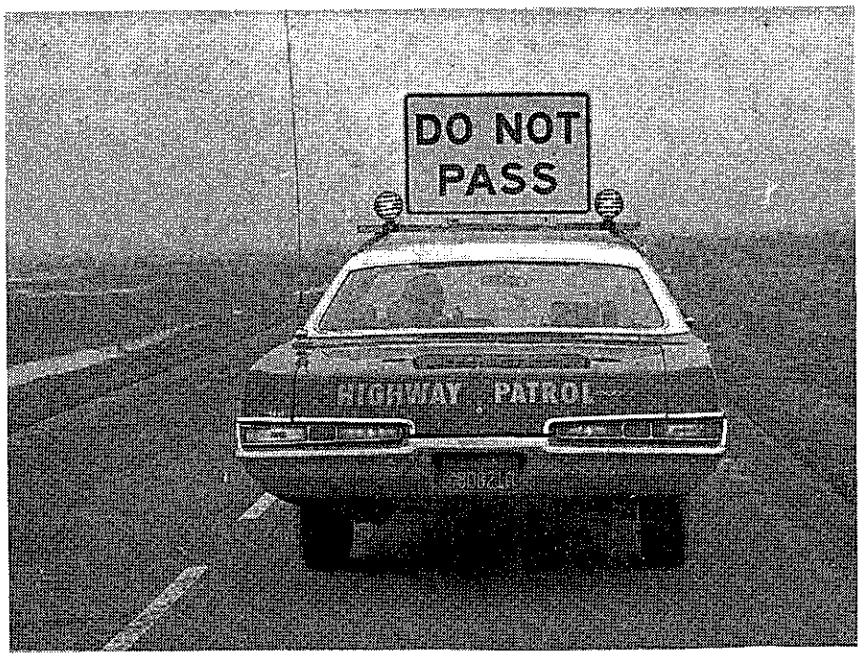

Fold-down cartop sign was not needed for project.

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APPENDIX B

PHOTOLOG COORDINATORS

PROJECTOR TEMPLATE

CHECK LISTS

WORK SHEETS

CAMERA MOUNT

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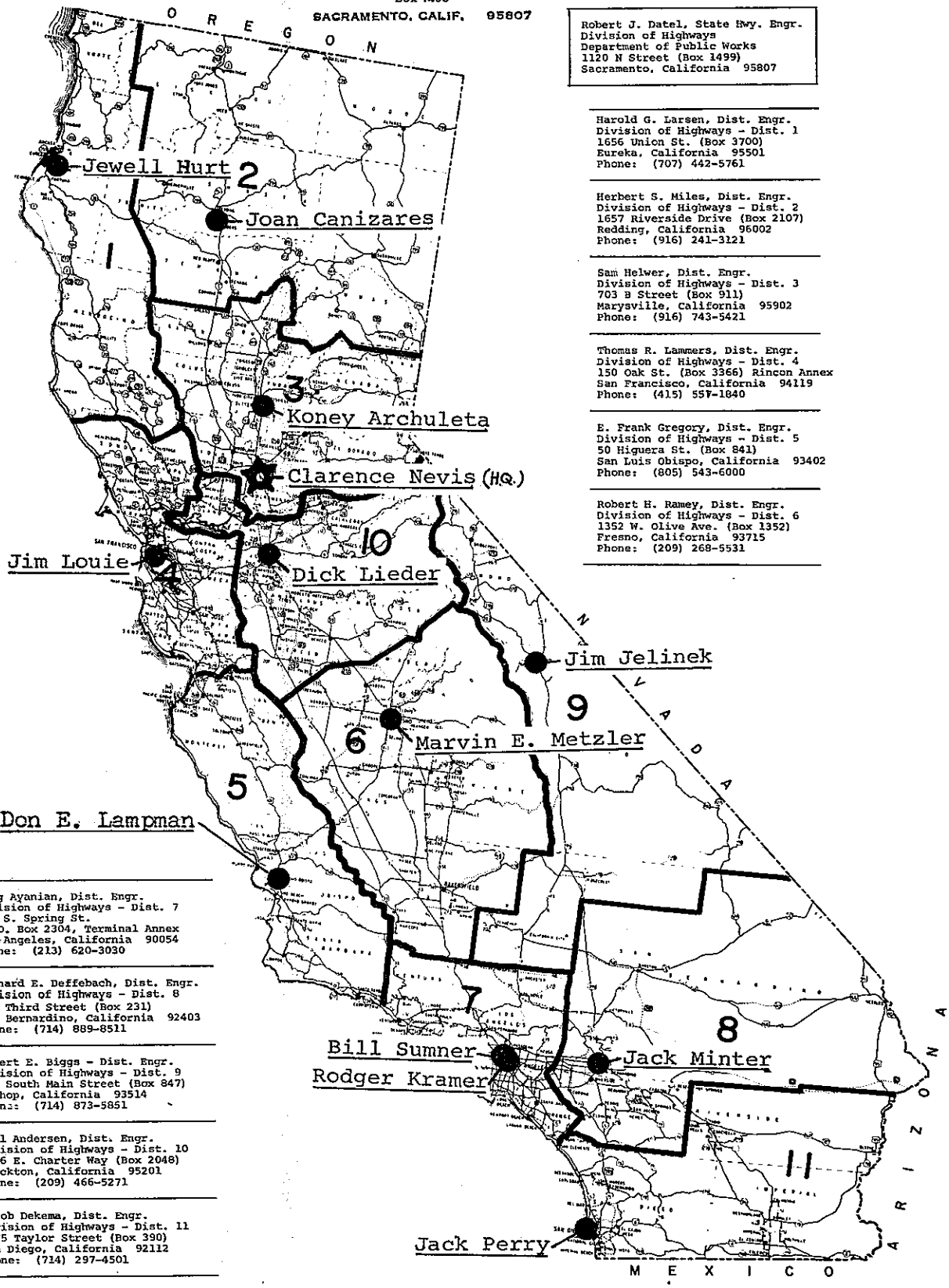
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
Box 1499
SACRAMENTO, CALIF. 95807



HEADQUARTERS

Robert J. Datel, State Hwy. Engr.
Division of Highways
Department of Public Works
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Sacramento, California 95807

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Los Angeles, California 90054
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Division of Highways - Dist. 11
4075 Taylor Street (Box 390)
San Diego, California 92112
Phone: (714) 297-4501

PHOTOLOG COORDINATORS

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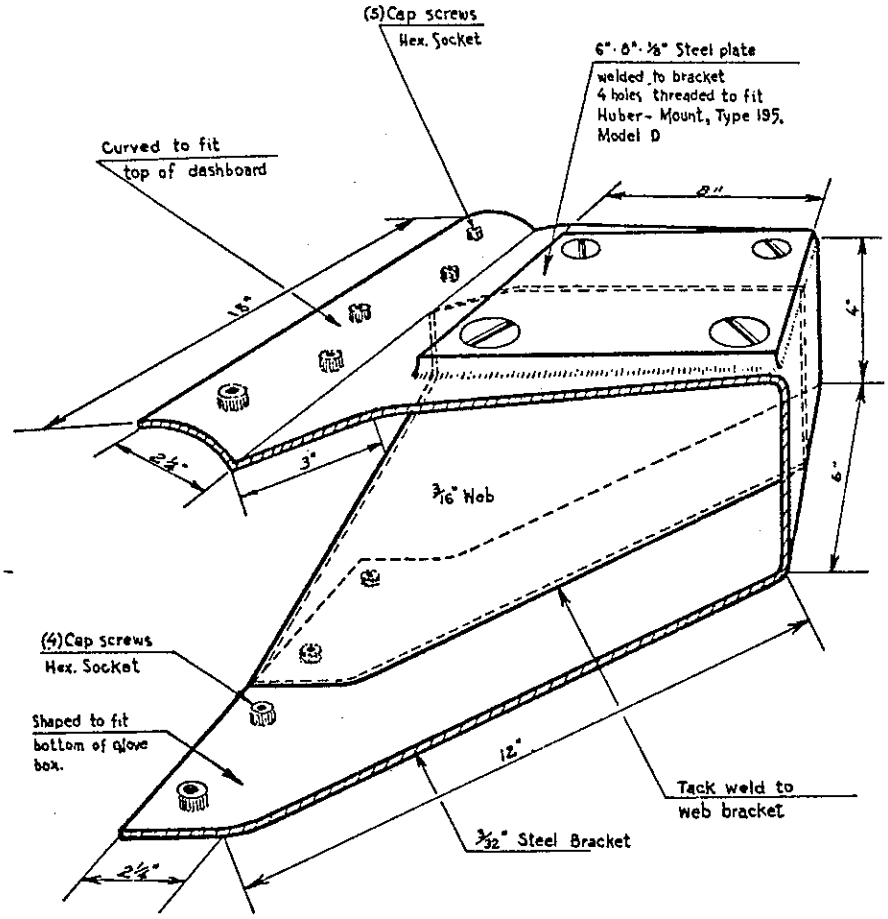
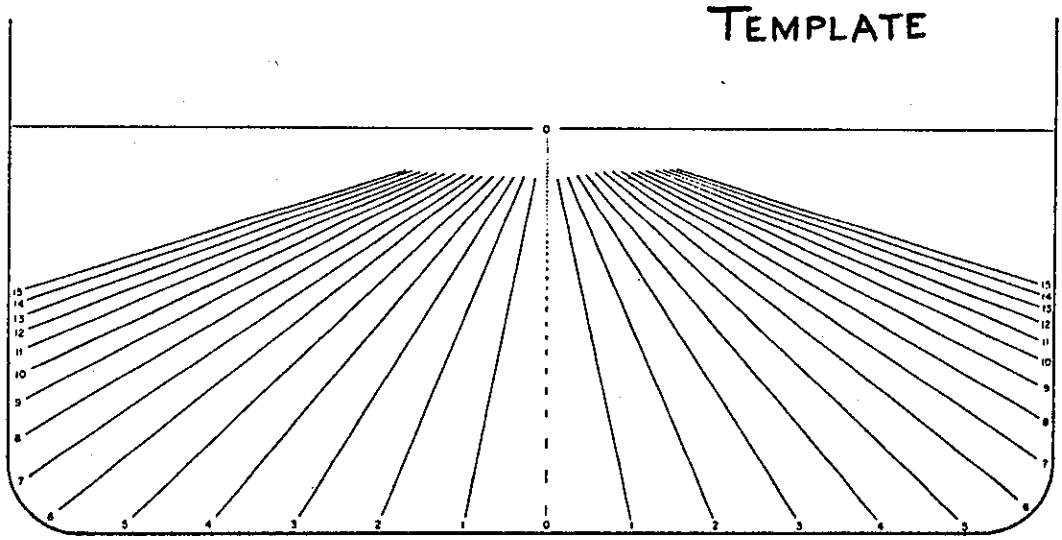
PHOTOLOG
CAMERA MOUNT



Camera mount attached to dash of van

PROJECTOR TEMPLATE



Transparent template placed on viewer face to measure width of pavement or shoulder.

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CALIFORNIA PHOTOLOG SYSTEM

Truck Check Lists and Supplies

PHOTOLOG SUPPLY LIST (IN TRUCK)

1. 20 rolls film.
2. 6 magazines.
3. Photolog work sheets.
4. Processing orders(cine-chrome)
5. Mailing labels.
6. Diary.
7. District maps.
8. Status of Highways.
9. Felt pens, pens, pencils.
10. Masking tape.
11. Nylon tape.
12. Window Cleaner.
13. Window cleaning towels.
14. Spare camera springs.
15. Scissors.
16. Tool kit.
17. Tire pump.
18. Tire guage.
19. Changing bag.
20. Dark cloth.
21. Tooth brush.
22. Schematic of equipment.
23. Slow-blow fuses.

TRUCK MAINTENANCE CHECK (FRIDAY)

1. Check diary for discrepancies.
2. Make list for maintenance.
3. Check tires.
4. Lube 5th wheel.
5. Battery water level.
6. Transmission fluid.
7. Check ammeter.
8. Check all lights.
9. Check wipers.
10. Horn.

STARTING CHECK (MONDAY)

1. Check general supply list.
2. Check itinery. (week)
3. Auto maintenance complete.
4. Daily check list.

STARTING CHECK (DAILY)

1. Check day's itinary.
2. Check 5th wheel pressure.
3. Reefer operating.
4. All magazines loaded.
5. Windshield clean.
6. Dark cloth in place.
7. Lens cap off.
8. Clean gate.
9. Clean lens.
10. Distance on infinity.
11. AEC set.
12. Shutter set.
13. Test Adtrol.
14. Pre-set starting data.

ENDING CHECK (DAILY)

1. Lens cap in place.
2. Dark cloth over camera.
3. Cover on Adtrol.
4. Complete daily log.
5. Diary.
6. Unload magazines.
7. Reload magazines.
8. Ship film.
9. Figure tomorrow's itinery.
10. Gas truck.
11. Call Sacramento on Wednesday.

ENDING CHECK (FRIDAY)

1. Daily ending check.
2. Check supply, note needs.
3. Clean truck.
4. Car maintenance, note needs.
5. 5th wheel tire wear.
6. Butane tanks full.
7. New weekly itinery.
8. Fill out Photolog Schedule.

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WORKSHEETS

EXAMPLE

A. California State Highway Log - County odometer mile is the same as the photolog mile. Notice the difference in mileage caused by the equation in the post mile at Odometer Mile 4.790.

B. District Route Map - Portion of District 05 map. Routes are colored when photologged. Post miles are shown on map, not odometer miles.

C. Micro Log Work Sheet - Shows last digit of year, Julian calendar date, number of county, district, start and end of photolog mileage, highway log mileage, and remarks.

D. Shipping Forms (Negatives) - Top, gummed mailing label is affixed to outside of negative box. Bottom, form placed inside negative box. "No. ML" is the Julian date shipped and should agree with the "Date", i.e., No. ML 200 is the same as July 19, This was arbitrarily selected for identification only.

E. Editing Cutoff List - Sample sheet showing limits of mileage in Rolls 46 through 55 in District 07. Center column shows highway log odometer miles. Ascending and descending photolog mileage is shown on each side of center column. Brackets show the limits within each film roll.

F. Shipping Form (Positives) - Order form for obtaining two positives of edited negative rolls.

G. Check List - Record of film rolls sent and returned from processing. Shows limits and roll number. This information is transferred to Exhibit 9 when positives are returned.

H. Invoice of Contents - Shipping order for sending positives to districts. Each district's form was preprinted and only the roll numbers and shipping date are needed. Shipping is via United Parcel Service.

I. Film Log - Shows contents of all film rolls in library. Each district maintains these sheets near the projector. These sheets must be used to find the proper roll number after the county, route, and odometer mile are known.

J. Status Cards - These cards fit a Rolodex card holder. Updating information will be stored on the cards.

K. Photolog Use Sheet - This sheet provides information on the use and user of the system. Man-hours saved is our prime method for making cost effectiveness studies. Each district sends completed sheets to a Headquarters coordinator for

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EXAMPLE

review. Districts are informed of any new uses found on the reporting forms.

L. Photolog Status - Monthly progress report of photologging.

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CALIFORNIA STATE HIGHWAY LOG

FORMERLY STATUS OF HIGHWAYS

DISTRICT 2

Edition
DECEMBER 31
1970

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

Compiled by

TRAFFIC DEPARTMENT

J. A. LEGARRA
State Highway Engineer

EXAMPLE - A

1/2

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
Box 1499
SACRAMENTO, CALIF. 95807

CALIFORNIA STATE HIGHWAY LOG

DEC. 31, 1970

PAGE 1

DISTRICT 2 ROUTE 3

(Photolog Mile)

ROAD SYSTEM	FA CODE	CO	CITY	DESCRIPTION		POST MILE	LENGTH (MILES)	COUNTY ODOM	ADT	NO LN	R T	CLN	SIG	DATE	PLN	LEFT S	LEFT W	RIGHT S	RIGHT W
		TRI		BEG FH-5 ON RTE ADOPT	L	0.000		0.000											
		TRI		OF BRAMLOT RD AT JCT ST	L	0.000		0.000											
G81S	1390	TRI		36 FAS 503-COLD CR RD	L	0.000	3.840	0.000	140	02	C	201		*08-21-70		OE	024		
G81S	1390	TRI		SALT CR BR 5-61	L	3.840	.010	3.840	140	02	C	201		*08-21-70		BR	031		
G81S	1390	TRI		END BR 5-61	L	3.850	.940	3.850	140	02	C	201		*08-21-70		OE	024		
G81S	1390	TRI			L	4.790	.000	4.790	140	02	C	201		*08-21-70		OE	024		
		TRI		PEANUT		0.000		4.790											
G81S	1340	TRI		TRAFFIC PROFILE POINT		0.000E	.497	4.790	190	02	C	201		01-01-64		MB	024		
G81S	1340	TRI				0.497	.041	5.287	234	02	C	201		01-01-64		MB	028		
G81S	1340	TRI		DOBBINS GULCH 5 42		0.538	.006	5.328	237	02	C	201		01-01-64		BR	030		
G81S	1340	TRI				0.544	.042	5.334	237	02	C	201		01-01-64		MB	028		
G81S	1340	TRI				0.586	5.368	5.376	241	02	C	201		01-01-64		MB	024		
G81S	1340	TRI				5.954	.038	10.744	716	02	C	201		01-01-64		MB	018		
G81S	1340	TRI				5.992	.228	10.782	719	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		TRAFFIC PROFILE POINT		6.220	.000	11.010	740	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		MORGAN HILL RD		6.220	.303	11.010	1,000	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		HAYFORK CREEK 5 20		6.523	.043	11.313	1,278	02	C	201		01-01-64		BR	023		
G81S	1340	TRI				6.566	.634	11.356	1,317	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		TRAFFIC PROFILE POINT		7.200	.000	11.990	1,900	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		HAYFORK		7.200	.660	11.990	1,900	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		TRAFFIC PROFILE POINT		7.860	.000	12.650	1,900	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		FOREST RD		7.860	1.382	12.650	1,600	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		BIG CREEK 5 22		9.242	.010	14.032	952	02	C	201		01-01-64		BR	023		
G81S	1340	TRI				9.252	.038	14.042	948	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		TRAFFIC PROFILE POINT		9.290	.000	14.080	930	02	C	201		01-01-64		HB	026		
G81S	1340	TRI		BIG CREEK RD		9.290	4.597	14.080	930	02	C	201		01-01-64		HB	026		
G81S	1340	TRI				13.887	.072	18.677	902	02	C	201		01-01-64		HB	024		
G81S	1340	TRI		CARR CR BR 5-35		13.959	.015	18.749	901	02	C	201		01-01-64		BR	032		
G81S	1340	TRI		END BR 5-35		13.974	.067	18.764	901	02	C	201		01-01-64		HB	024		
G81S	1340	TRI				14.041	.161	18.831	901	02	C	201		01-01-64		HB	026		
G81S	1340	TRI				14.202	1.679	18.992	900	02	C	201		01-01-64		HB	022		
G81S	1340	TRI		BEG TRANS TO TRUCK LN R		15.881	.038	20.671	890	02	C	201		01-01-64		HB	022		
G81S	1340	TRI		BEG TRUCK PASSING LN RT		15.919	.336	20.709	890	02	C	3P2		11-20-68	201	HB	034		
G81S	1340	TRI		END TRUCK PASSING LN RT		16.255	.078	21.045	888	02	C	201		01-01-64		HB	022		
G81S	1340	TRI		END TRANS FROM PASS LN		16.333	1.260	21.123	887	02	C	201		01-01-64		HB	022		
G81S	1340	TRI		BEG TRANS TO TRUCK LN R		17.593	.030	22.383	879	02	C	201		01-01-64		HB	022		
G81S	1340	TRI		BEG TRUCK PASSING LN RT		17.623	.270	22.413	879	02	C	3P2		11-20-68	201	HB	034		
G81S	1340	TRI		END TRUCK PASSING LN RT		17.893	.076	22.683	878	02	C	201		01-01-64		HB	022		

NOTE----- SEE FRONT SHEETS FOR CODING EXPLANATION

EXAMPLE-A

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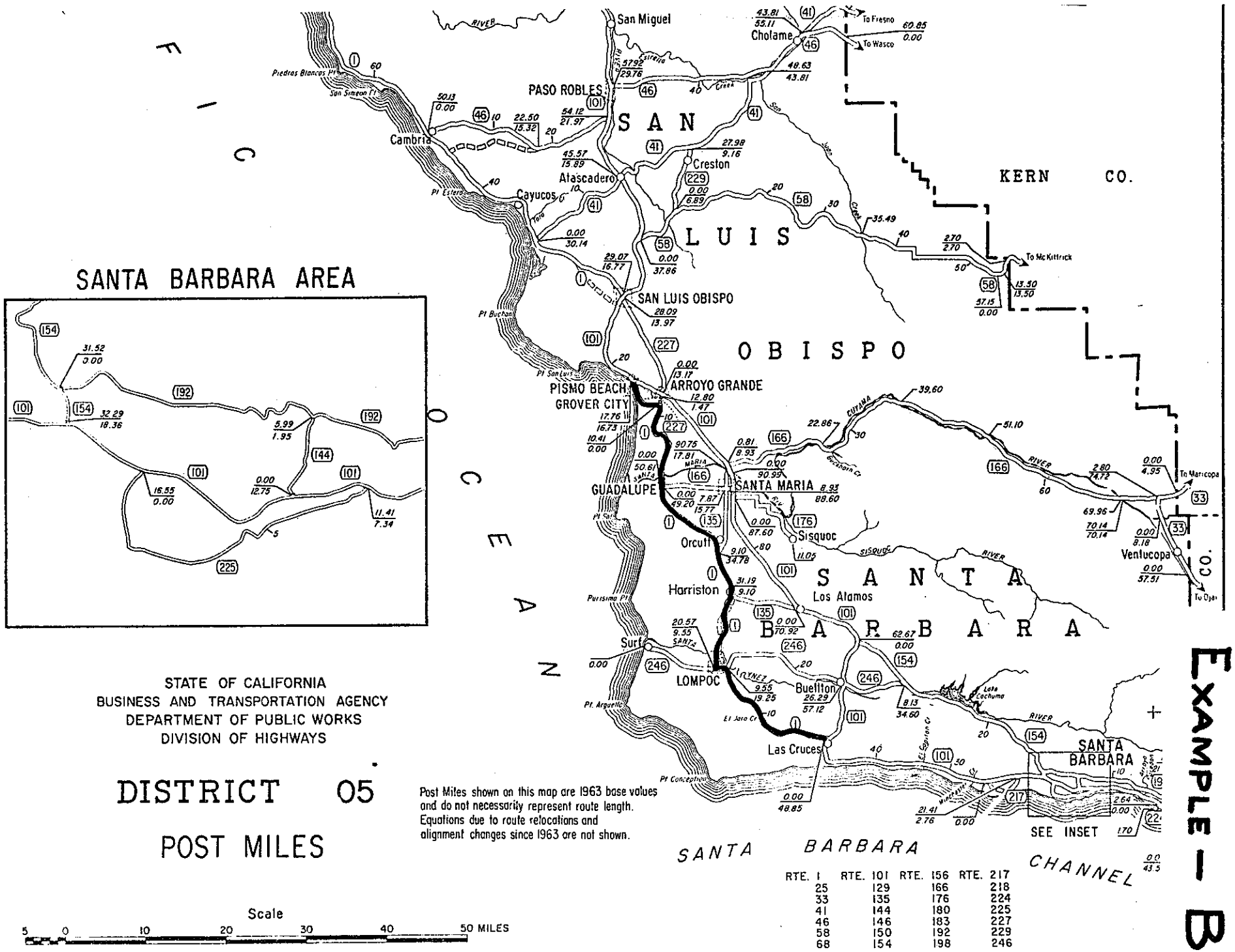

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

DISTRICT 05

POST MILES

Post Miles shown on this map are 1963 base values and do not necessarily represent route length. Equations due to route relocations and alignment changes since 1963 are not shown.

Scale
5 0 10 20 30 40 50 MILES

RTE. 1	RTE. 101	RTE. 156	RTE. 217
25	129	166	218
33	135	176	224
41	144	180	225
46	146	183	227
58	150	192	229
68	154	198	246

EXAMPLE - B

JULY

MICRO LOG WORK SHEET EXAMPLE - C

ROLL	YR	DAY	CO.	RTE.	DIST	S.O.M.	E.O.M.	B.E.O.M.	REMARKS
1	0	222	51	70	3	0.00	8.30	8.30	
1	0	222	58	70	3	0.00	13.10	13.09	Junc. Rte 20
1	0	222	58	70	3	13.10	24.17	24.20	Co. BDY Line
1	0	223	04	70	3	0.00	7.41	7.38	end roll
2	0	223	04	70	3	7.41	35.41	35.34	end DIST
2	0	223	04	70	2	35.41	48.15	48.07	Co. line
2	0	223	32	70	2	0.00	22.93	22.93	end roll
3	0	223	32	70	2	22.93	33.05	33.03	June 89
3	0	223	32	89	2	8.71	42.18	42.33	June 36
3	0	223	32	89	2	42.18	29.57	29.59	June 147
3	0	223	32	147	2	0.00	6.00	6.00	end roll
4	0	223	32	147	2	6.00	9.89	9.86	Co. line
4	0	223	18	147	2	0.00	1.77	1.79	June. 36
4	0	223	18	147	2	1.77	0.00	0.00	Co line
4	0	223	32	147	2	9.89	0.00	0.00	June 89
4	0	223	32	89	2	29.57	8.71	8.71	June 70
4	0	223	32	70	2	33.05	57.43		end roll
5	0	223	32	70	2	57.43	95.60	95.53	Co. line
5	0	223	18	70	2	0.00	3.85	3.87	Co. line
5	0	223	18	395	2	4.61	0.00	0.00	Co line
5	0	223	46	395	2	3.18	0.00	0.00	NEV. ST. line

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
Box 1499
SACRAMENTO, CALIF. 95807

SOM – Starting Odometer Mile
AEOM – Actual Ending Odometer Mile
BEOM – Book Ending Odometer Mile

8/10/70
8/11/70
RJR

278.12

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EXAMPLE – D

FROM:
DIVISION OF ADMINISTRATIVE SERVICES
1120 N STREET
SACRAMENTO, CALIF. 95814

TO:
CINE CHROME LABORATORIES, INC.
4075 TRANSPORT STREET
PALO ALTO, CALIF. 94303

PHONE: 321-5678

No. ML 200

Date July 19, 1971

TO: *CINE CHROME LABORATORIES*
4075 Transport St.
Palo Alto, Calif. 94303

1. This package contains:

10 rolls, a total of 4,000 feet of 35mm film

type 5254 (no.), Eastman Color Neg. (name).

EXPOSED FILM TO BE PROCESSED

2. DO NOT PRINT.

3. Photo order No. ML 200 must appear on the packing memo.

4. This work to be charged against contract No. 13824 .

5. Ship this material via UPS TO

TO: *DIVISION OF HIGHWAYS*
1415 – 11th Street
Sacramento, Calif. 95814

Atten: W. R. Chaney

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAY
Box 1499
SACRAMENTO, CALIF. 95[illegible]

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BOX 1499
SACRAMENTO, CALIF. 95807

DISTRICT-07 EXAMPLE - E

County	Route	Ascending Mileage Micro-Log O.D.M	Hwy-Log O.D.M.	Descending Mileage Micro-Log O.D.M	~~Hwy-Log O.D.M.~~
LA	47	0.00 - 2.02	0.00 - ~~2.27~~ 2.01	2.02 - 0.02	47 ✓ P
P	✓46				
LA	48	0.00 - 34.08	0.00 - 34.03	34.08 - 999.99	
Ora	55	0.00 - 17.86	0.00 - 17.81	17.86 - 999.93	
Ora	57	15.60 - 19.93	15.60 - 19.87	19.93 - 15.65	
P	✓48	22.40 - 28.23	22.40 - 28.23	28.23 - 22.44	49 ✓ P
LA	57	0.00 - 4.39	0.00 - 4.63	4.39 - 999.98	
LA	60	0.00 - 30.83	0.00 - 32.33	30.43 - 999.45	
P	✓50				51 ✓ P
LA	66	0.00 - 5.39	0.00 - 5.34	5.39 - 0.01	
LA	71	0.00 - 4.93	0.00 - 4.79	4.93 - 0.00	
Ora	72	0.00 - 12.09	0.00 - 11.92	12.01 - 0.04	
LA P	✓72 52	0.00 - 13.52	0.00 - 13.44	13.54 - 0.02	53 ✓ P
Ora	73	0.00 - 5.82	0.00 - 5.98	5.82 - 0.00	
Ora	74	0.00 - 16.74	0.00 - 16.60	16.74 - 0.00	
LA	90	1.72 - 3.72	1.71 - 3.28	3.22 - 1.72	
Ora B P	90 ✓54	0.50 - 13.04	0.50 - 13.04	13.04 - 0.50	55 B ✓ F

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EXAMPLE – F

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
Box 1499
SACRAMENTO, CALIF. 95807

No. PML 322

Date Nov. 18 1971

TO: *CINE CHROME LABORATORIES*
4075 Transport St.
Palo Alto, Calif. 94303

1. This package contains:

20 rolls, a total of 5,000 feet of 35mm film

of *PROCESSED* Eastman Color Negative.

2. Please make *TWO* prints per contract instructions.

3. Order No. PML 322 must appear on the packing memo.

4. This work is to be charged against contract No. 13824 .

5. Ship the original and prints via UPS

TO: *DIVISION OF HIGHWAYS*
1415 – 11th Street
Sacramento, Calif. 95814

Atten: W. R. Chaney

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PML 322 EXAMPLE – G

20 rolls

Roll	Co. Rte	Mile	Date Shipped to District
01-48 X	Men -261	0.00 - 15.12	12-1-71
	Men -271	0.16 - 10.83	
	Hum -271	0.00 - 0.32	
02-62 X	Teh - 172	0.01 - 6.93	12-2-71
	Sis - 263	0.00 - 8.32	
	Sha - 273	0.00 - 15.91	
03-10 X	Sac -5	23.25 - 34.69	12-2-71
	Yol -5	0.00 - 27.53	
03-45 X	But -70	35.34 - 0.00	12-2-71
	Yub - 70	24.16 - 999.98	
	Sut -70	8.49 - 0.05	
03-49 X	Pla -80	58.69 - 0.07	12-2-71
04-13 X	S.F -1	7.08 - 999.99	12-2-71
	SM -1	48.11 - 999.99	
05-42 X	Mon -156	0.00 - 5.17	12-2-71
	SBt -156	0.03 - 18.44	
	SB -176	0.00 - 10.94	
	SBt -180	0.00 - 20.63	
05-43 X	SBt -180	20.55 - 0.05	12-2-71
	SB -176	10.94 - 0.00	
	SBt -156	18.43 - 0.03	
	Mon -156	5.18 - 0.00	

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BOX 1499
SACRAMENTO, CALIF. 95807

EXAMPLE - H

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

INVOICE OF CONTENTS

TO
Mr. H. Ayanian - 07

Attention Mr. Bill Sumner
Microlog Coordinator

FILE NO.

REQUEST DATED

FROM Clarence Nevis
Headquarters--Traffic

CONTENT: Microlog Project

Description	Quantity
Roll Nos.	
07-15	7 Rolls
07-20	
07-21	
07-28	
07-29	
07-30	
07-31	

SOURCE DIST.	SOURCE UNIT	CHARGE DIST.	CHARGE UNIT	EXPENDITURE AUTHORIZATION (GEN LED. / SUB-ACCT / MAINT W O / ROUTE NO / WORK ORDER NO.)	SPECIAL DESIGNATION (USE WHEN APPLICABLE) PREFIX / BRIDGE NUMBERS / PARCEL OR CONTR NO / DMG RPTS LABR / CDS ENCR PMTS / SUB-JOB NOS / LOCATIONS	OBJECT
13	351			904501		627

ADDRESS ALL QUESTIONS TO

HOW SENT
U.P.S.

DATE SHIPPED March 23, 1971

SHIPPED BY (Signature and Title or Position)
Clarence Nevis
Assoc. Hwy. Engr.

Clarence Nevis

Δ OSP

FORM HSS-110

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STATE OF CALIFORNIA
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CALIFORNIA HIGHWAY MICROLOG

EXAMPLE - I

DISTRICT 05

Roll No.	Co./Rte.	Microlog Mileage	Status Log Mileage	
10	S.B-1	0.00 - 48.04	0.00 - 48.58	
11	S.B-1	48.44 - 0.04	48.58 - 0.00	11-11-71
12	SLO-1	0.00 - 37.00	0.00 - 37.00	7-13-71
13	SLO-1	37.00 - 0.00	37.00 - 0.00	11-11-71
14	SLO-1	37.01 - 74.58	37.01 - 74.22	7-13-71
15	SLO-1	74.22 - 37.01	74.22 - 37.01	11-11-71
16	Mon-1	0.00 - 50.00	0.00 - 50.00	7-13-71
17	Mon-1	50.00 - 0.08	50.00 - 0.00	11-11-71
18	Mon-1	50.01 - 101.71	50.01 - 101.62	7-13-71
19	Mon-1	101.71 - 50.01	101.62 - 50.01	11-11-71
20	Mon-25	0.03 - 11.74	0.00 - 11.75	11-11-71
	SBt-25	0.09 - 39.51	0.00 - 39.53	
21	SBt-25	39.53 - 0.09	39.53 - 0.00	11-11-71
	Mon-25	11.75 - 0.03	11.75 - 0.00	

HT-106 71

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EXAMPLE – J

CALIFORNIA HIGHWAY MICROLOG STATUS CARD

DIST – CO – RTE	ROLL NO	STATUS LOG MILEAGE
07-Ora-605	82-83	2.67 – 5.07 5.07 – 2.67
ORIGINAL DATE FILMED		MICRO LOG MILEAGE 2.68 – 5.14 5.20 – 2.73

DATE FILMED UPDATED – LIMITS	EQUATIONS

CONTINUE ON REVERSE SIDE

HT-105-71

(Back of Card)

DATE FILMED UPDATED – LIMITS	EQUATIONS

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District 10

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SACRAMENTO, CALIF. 95807

Microlog Coordinator Lieder/Curry

EXAMPLE - K

Name	DATE	DEPARTMENT	ROLL NUMBER	MAN-HRS. USED	MAN-HRS. SAVED	
Lieder	10-8-71	Traffic	10-52	1½	4	Log Co Rds
Eggman	10-13-71	Planning	10-81	¾	4	Check for possible pass. Lane
T Kads	10-19-71	Traffic	✓	4	16	✓ ✓ ✓ ✓ ✓
Jacobi	10-20-71	Planning	9-1	½	1	Check double stripe area
Lane	10-30-71	Design	✓	1½	2	Check curb Locations
[illegible]	10-21-71	Traffic	10-66	½	3½	Fatality check
Lane	10-22-71	Design	✓	1½	2	General Knowledge
Frisk/Eggman	11-10-71	Plann	10-81	9	32	Check Pass. Lanes
Harrison	11-17-71	Traffic	10-32	½	4	Fatality Check
Fairs	11-19-71	✓ ✓	10-?	5	16	TASAS Sta-108
Plinski	11-23-71	Planning	10-50	1	6	Ck For Acc Rate
Harrison	11-23-71	Traffic	10-40	½	4	
Fairs	11-23-71	✓ ✓	10-74	4	12	TASAS Sta-132
✓	✓	✓ ✓	10-58	1	5	✓ Sta-99
✓	11-24-71	✓ ✓	✓	2	8	✓ ✓ ✓
✓	11-30-71	✓ ✓	✓	1	8	✓ ✓ ✓
✓	✓	✓ ✓	10-32	1 3/4	8	✓ Sta 33
Lieder	11-30-71	✓ ✓	10-50 10-52	3hrs	8	✓ Ama-88
Reber	12-3-71	Planning	10-56	1	4	Mar-99
Young Engineer	12-7-71	✓ ✓	10-81	1	8	Check Pass. Lane Limits
Jacobi	12-6-71	✓ ✓	8-1	1	8	Check Drainage Lights
Young Engineer	✓	✓ ✓	10-80	3	8	Check Locs of exist turn outs & Loc passing Lanes
L. Mar	12-8-71	Traffic	10-78	¾	3	Traffic Accident Locs
✓	✓	✓ ✓	10-79	¼		✓ ✓ ✓
J. Fairs	12-9-71	Traffic-Plann	10-79	1	6	Traffic Patterns & Land Use
E. Reber	12-15-71	Planning	10-51	¾	2	Shldr repair project
V. Curry	12-20-71	Traffic	10-72	1	—	TASAS - Two-120
D. Lieder	12-21-71	✓ ✓	10-76	½	2	✓ ✓ Two-Mpa .132
V. Curry	12-24-71	✓ ✓	10-72	3	16	✓ ✓ ✓ ✓ -120
Totals	Oct. Nov. & Dec. 1971			52 ¼	200½	

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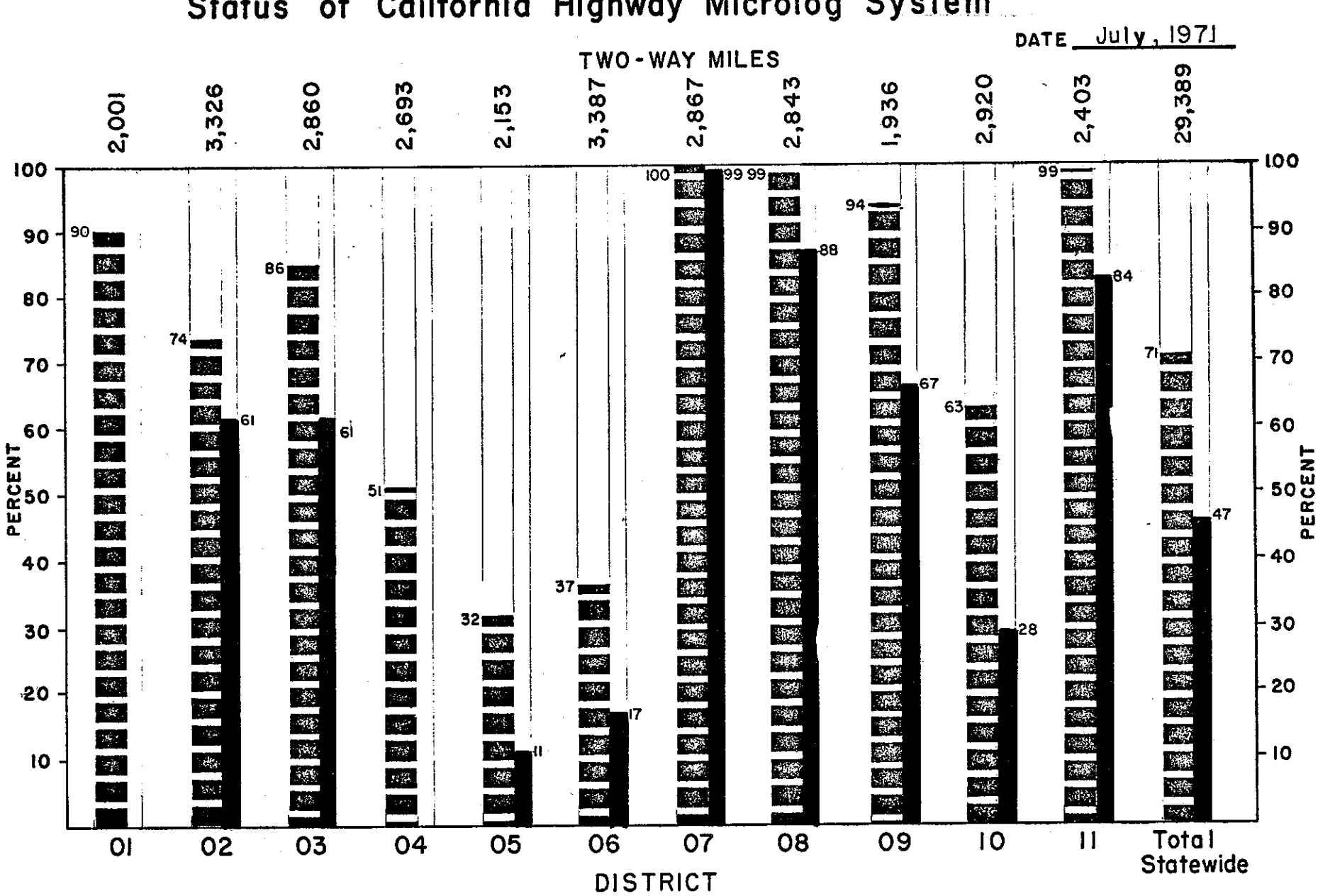
Status of California Highway Microlog System

DATE July, 1971



EXAMPLE - L

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Box 1499
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HDQ TRAFFIC

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