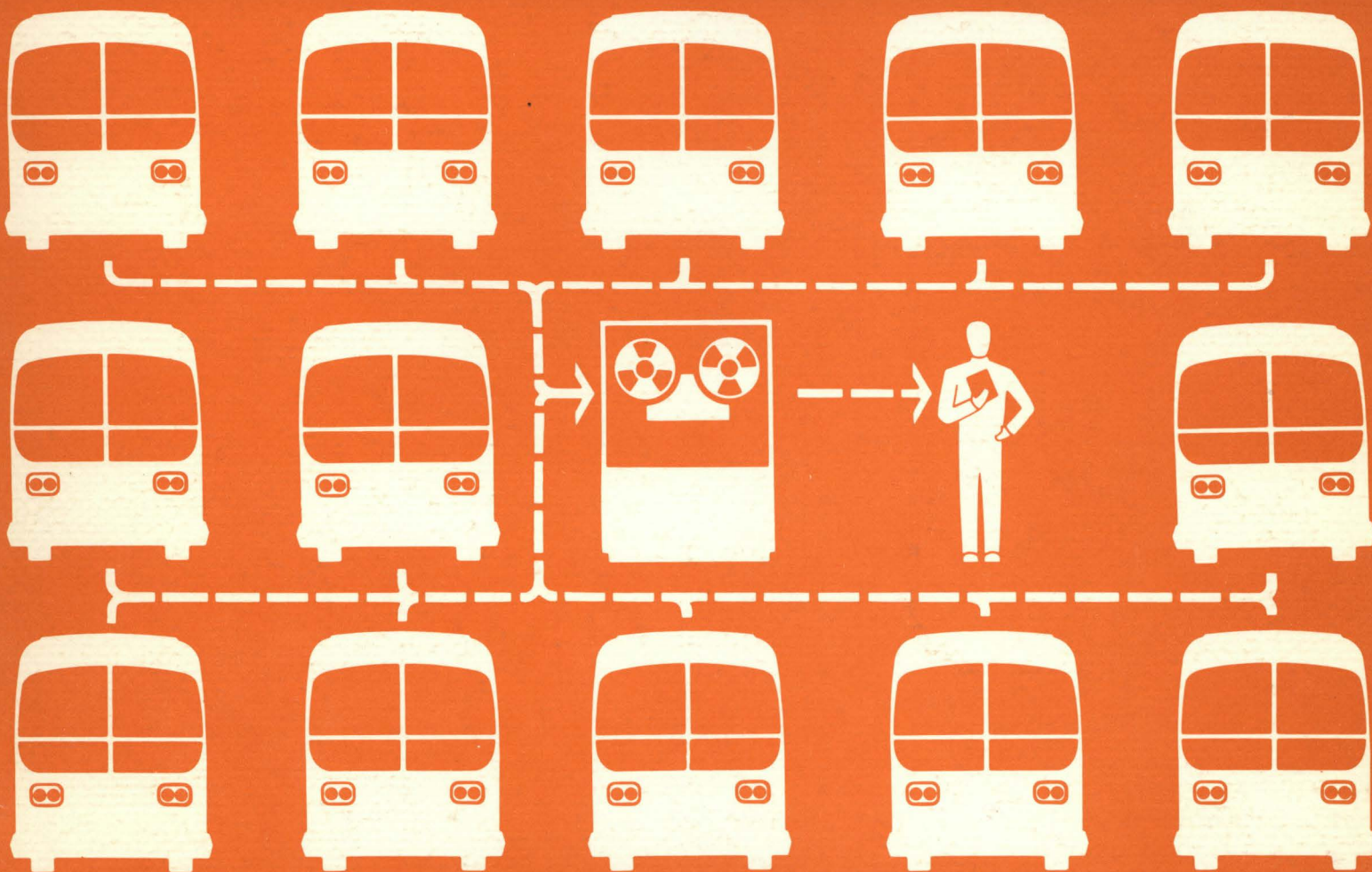# The Sims Demonstration Project at the Dallas Transit System

Volume 1
The Sims Project

DTS
DALLAS TRANSIT SYSTEM

Prepared by
S & A Systems

In Cooperation with the Urban Mass Transportation Administration

S & A Systems, Inc.

Twin Towers Bldg -:- 8585 N. Stemmons Fwy.
Dallas, Texas 75247

Telephone:
214 - 630-2287

March 31, 1974

Mr. E. H. Watkins
General Manager
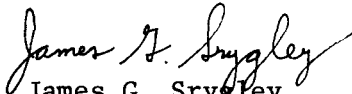Dallas Transit System
101 North Peak Street
Dallas, Texas 75226

Dear Mr. Watkins:

We are pleased to submit our report on the SIMS demonstration project at
the Dallas Transit System in accordance with our agreement of December 15,
1972, as amended in Mitre Change Order No. 6, December 15, 1973. Volume I
provides a statement of the project objectives and a description of SIMS,
as installed at Dallas Transit. Volume II contains our technical evalua-
tion, cost analyses, and recommendations.

We wish to acknowledge our appreciation for the assistance of your staff
throughout the project. The cooperation of Mr. Roy Allen's personnel at
the Data Services Department, Mr. Virgil Thurlow's group at the Mitre
Corporation, and Mr. A. B. Hallman at the Urban Mass Transportation Admini-
stration, U. S. Department of Transportation was invaluable.

We feel that the initial goals and objectives of the project have been met
and are confident that Dallas Transit will benefit from the use of this
modern management information system.

Respectfully submitted,

James G. Srygley
President

JGS:jf
Attachments

THE SIMS DEMONSTRATION PROJECT

AT THE

DALLAS TRANSIT SYSTEM

VOLUME I

THE SIMS PROJECT

Prepared for

Dallas Transit System

City of Dallas, Texas

In cooperation with

U.S. Department of Transportation

Urban Mass Transportation Administration

(TEX-MTD-3)

by

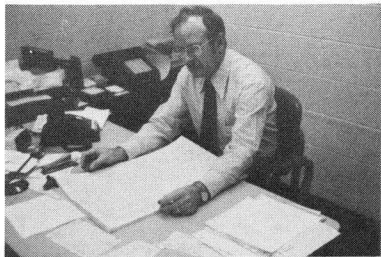S & A Systems, Inc.
March 31, 1974

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SUMMARY REPORTS FOR THE GENERAL MANAGER.

ACCOUNTING REPORTS FOR THE COMP-TROLLER.

MAINTENANCE TIME, COST, AND PERFOR-MANCE REPORTS FOR THE MAINTENANCE SUPERINTENDENT.

INVENTORY REPORTS FOR THE STOREKEEPER.

INSPECTION SCHEDULING REPORTS FOR THE FOREMAN.

REPORTS FOR PERMANENT HISTORY FILES.

1.0 PROJECT OBJECTIVES

The goals and objectives of the Dallas Transit System in participating in the development of a modern computerized management information system were to demonstrate the SIMS system by providing their service in the development and their operation in the test of a computerized system of records and reports specifically designed for urban transit operations. The system was planned as a tool for better record keeping to benefit all of urban transit as well as Dallas, in providing current information in fairly common transit terminology in order that decisions could be readily made to reduce operating costs. The SIMS programs were written by The MITRE Corporation in an UMTA funded project.

Transit companies, like Dallas Transit, that operate with sound, modern business techniques can make use of the SIMS system to provide 1) computerized record keeping systems and management reports to reduce the cost of operating and maintaining a transit system, 2) information to assist transit management in obtaining maximum income from their system whatever the source of income, and 3) a fairly standard data base through which transit systems can share meaningful information on operating economics.
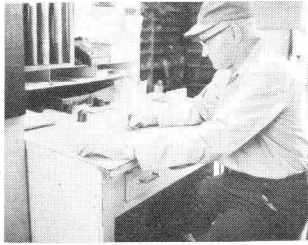
Cost reductions will be possible through use of management reports for closer control of labor and material costs. Also, use of the computerized record keeping and data processing systems should provide an increase in data recorded and reports for management with a reduction in the number of people required for these tasks.

In the maintenance area, increased utilization of personnel will be possible through:

- Reduced number of personnel required for record keeping through use of automated systems for mileage records, inspection scheduling, coach history, inventory reorder reports, inventory usage reports, current inventory status reports, and maintenance cost reports.

- Improved scheduling of maintenance functions allowing higher utilization of personnel in the Inspection Garages and the Overhaul Shop.

- Improved record keeping for better diagnosis of equipment problems and failures.

- Better maintenance cost records for budget and control.

Improved material cost control is possible through closer control of high-cost items. The spare parts inventory value can be reduced if smaller quantities can be kept due to improved inventory record keeping and control. Maintenance cost reports will provide cost information on major tasks, enabling better budgeting and cost control. Management reports produced from an expanded record keeping system will provide better information for decisions concerning replacement of older vehicles. Better information will also be available on the economic benefits of different models of bus sub-systems and vehicle commonality.

LEADMAN FILLS OUT
JOB CARD FROM
DRIVER'S DEFECT
CARD.

DRIVER DROPS DEFECT
CARD INTO COLLECTION
BOX AFTER EACH RUN.

BUS IS SERVICED AT
NIGHT WITH FUEL, OIL,
AND COOLANT AUTO-
MATICALLY RECORDED
ON PAPER TAPE.
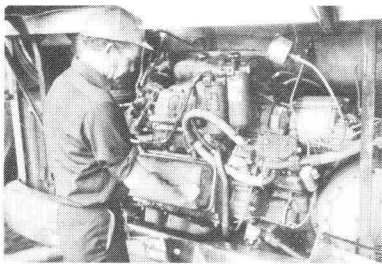
MECHANIC RECEIVES JOB
CARD FROM LEADMAN,
PERFORMS NECESSARY
REPAIRS, AND FILLS IN
TIME AND WORK CODES ON
TIME TICKET.
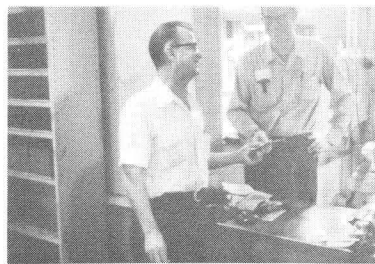
MECHANIC OR LEADMAN
FILLS OUT REQUISITION
ON STOREKEEPER AND
GETS PARTS FOR REPAIRS
FROM STOREROOM.

SERVICE PAPER TAPES
ARE TRANSPOSED TO
MAGNETIC TAPE.
INVENTORY, UNIT
CHANGES, INSPECTION,
AND MILES RECORDS
ARE KEYTAPED ONTO
MAGNETIC TAPES.

EMPLOYEE TIME
TICKETS ARE
KEYPUNCHED.

REPORTS FOR
MANAGEMENT
ARE PRODUCED.

MAGNETIC TAPES AND
PUNCHED TIME
TICKETS ARE PRO-
CESSED WITH SIMS
PROGRAMS AT DATA
SERVICES.

2.0 OPERATION OF THE SIMS SYSTEM

The SIMS system installed at the Dallas Transit System provides management reports on maintenance and inventory control. Future expansion into accounting, scheduling, and other areas is currently under consideration.

The current system consists of data collectors, multiplexers, paper tape punches, keytape, and tape reader to convert the punched paper tape to magnetic tape records. The magnetic tape records, generated daily, fo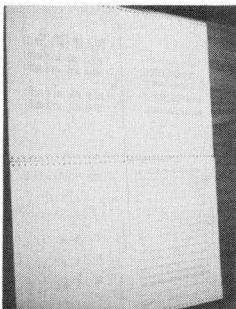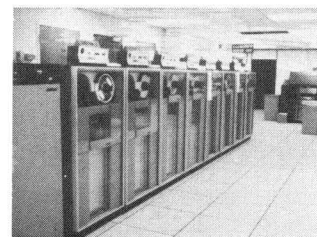rm the basic input for the SIMS computer software and provide a daily set of management and operating reports. The daily operation of the SIMS demonstration project data is as follows:

- Drivers fill out Vehicle Defect Cards for each run. (See Page 2-4.) When the driver returns the bus to its operating base, either East Dallas or Oak Cliff, he drops his completed defect card into a collection box beside the driveway. The completed card lists all the symptomatic problems noticed by the driver. After depositing his Defect Card, the driver parks his bus. (See Defect Card, Figure 2-1.)

- The Vehicle Defect Cards are removed from the collection box periodically by inspection garage personnel. The operator's reports are read by the garage leadman who translates them into tasks for the mechanics on Vehicle Job Cards. The jobs are assigned to inspection garage mechanics. (See Job Card, Figure 2-2.)

- The Vehicle Job Cards are taken by inspection garage mechanics who bring the buses into the garage and check out the reported defects. Depending on the magnitude of the mechanic's findings, the defect may be repaired then or deferred to the Overhaul Shop. The completed tasks are entered on his Time Ticket, with numerical codes, along with the time required, bus number, and account number. The Time Tickets are key punched at the City of Dallas Data Services Department and run in the biweekly payroll system. The Time Tickets are then entered with the SIMS maintenance cost program for processing. (See Time Ticket, Figure 2-3.)

- Any material requisitioned by a mechanic for a repair job is numerically coded onto a Requisition on Storekeeper Card. The Requisition on Storekeeper will have bus number, part number, units of issue, date, number of units issued, receiving mechanic, and pricing information for the Accounting Department. The Accounting Department copy is used as a source document to keytape information required for the SIMS Inventory program. These records are keytaped on magnetic tape, along with other maintenance records. (See Requisition on Storekeeper, Figure 2-4.)

- Each night, all buses run during the day are serviced and washed. When the bus is driven into the service station, the bus number is entered on the service data collector for that lane. A standard fuel nozzle is inserted into the fuel tank filler neck; as fuel is pumped into the tank, an electrical impulse counting device mounted on the fuel meter triggers the digital counters on the data collector. If oil and/or coolant are added, electronic impulse units on their meters register the amount delivered on the data collector counters. When the bus is serviced, the service station man pushes the "record" button on the data collector; the data collector record is recorded on punched paper tape.

- Each day the paper tapes are carried to the Accounting Department, fed through the paper tape reader, and transposed onto magnetic tape. (See Figure 2-5.)

- Inventory order information and inventory usage information are keytaped weekly for transmittal to data processing.

- Mechanics' Time Tickets contain information for the maintenance cost system. These time tickets are keypunched and, after processing through the City payroll system, processed through the SIMS programs.

- The magnetic tapes, containing servicing records, mileage records, inventory records, and units records, are taken to the Data Services Department computer center. The tapes are run with the SIMS programs. After processing, reports are printed for use by Dallas Transit management.
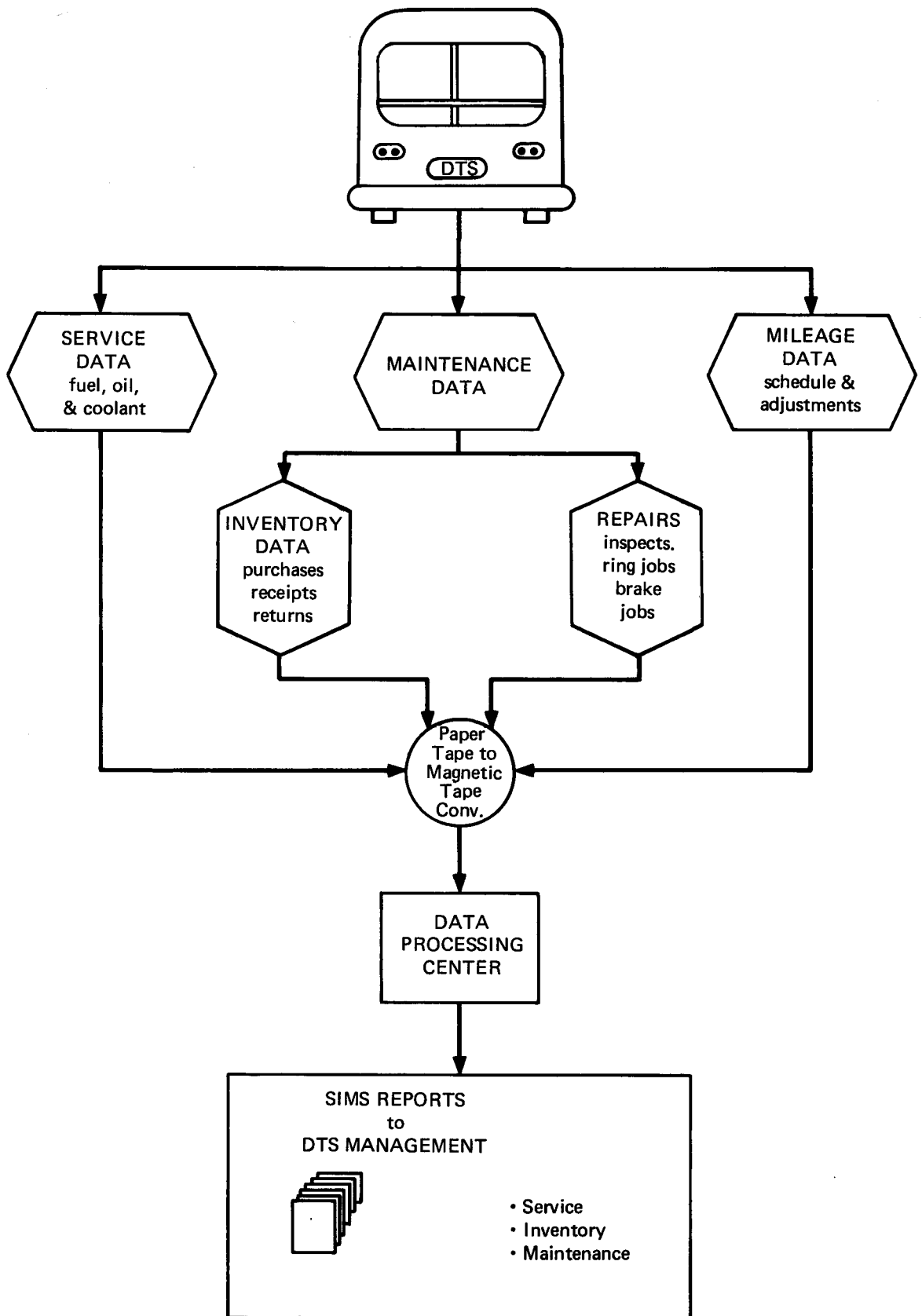
SIMS SYSTEM
Figure 2-0

form#975

DALLAS TRANSIT SYSTEM
VEHICLE DEFECT CARD

Vehicle Number	Date Mo.	Da.	Yr.

Reporter's Name	Badge or Payroll Number
1.	

Reporter's Name	Badge or Payroll Number
2.	

Reporter's Name	Badge or Payroll Number
3.	

Reporter Number	Area	DESCRIPTION OF TROUBLE

TOP VIEW
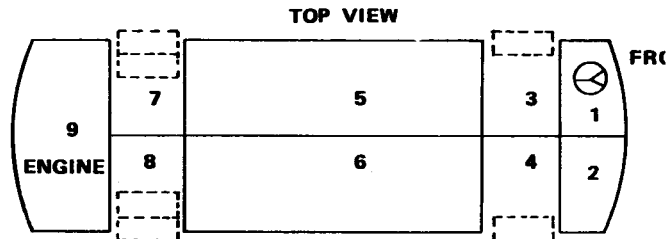
RECORD AREA NUMBER IN SPACE PROVIDED.

Additional Comments on Reverse Side

DEFECT CARD
Figure 2-1

DALLAS TRANSIT SYSTEM
Vehicle Job Card

Shop	Bus Number	Group	Unit	Date	Reported By
└─┘	└─┴─┴─┴─┘	└─┴─┘	└─┴─┘	└─┴─┴─┴─┴─┘	└─┴─┴─┘

Trouble

Brake Ft. └─┴─┘

Action To Be Taken

Authorized By _____

Corrective Action

Brake Ft. └─┴─┘

Work Type	Work Source
0 ☐ Inspection	0 ☐ Inspection
1 ☐ Repair	1 ☐ Sch. Miles
2 ☐ Rebuild	2 ☐ Oper. Report
3 ☐ Change	3 ☐ Maint. Report
4 ☐ Install	4 ☐ Road Call
5 ☐ Road Call	5 ☐ Camp./Capital
6 ☐ Found OK	6 ☐ Vandalism
7 ☐	7 ☐ Accident
8 ☐	8 ☐ Service
9 ☐	9 ☐ Other

Work Group

00 ☐ General	12 ☐ Fuel System
01 ☐ Front Axle	13 ☐ Lubrication
02 ☐ Rear Axle	14 ☐ Air System
03 ☐ Body	15 ☐ Springs
04 ☐ Brakes	16 ☐ Steering
05 ☐ Clutch	17 ☐ Transmission
06 ☐ Cooling	18 ☐ Propeller Shaft
07 ☐ Electrical	19 ☐ Wheels, Tires
08 ☐ Engine	24 ☐ Miscellaneous
11 ☐ Frame	26 ☐ Air Conditioning

This Copy to Originating Shop
After Job is Completed

Job: Start └─┴─┴─┴─┴─┘ By _____
    End └─┴─┴─┴─┴─┘ By _____

This Copy to Maintenance Office
After Job is Completed

Job: Start └─┴─┴─┴─┴─┘ By _____
    End └─┴─┴─┴─┴─┘ By _____

JOB CARD
Figure 2-2

2-5

TIME TICKET—MECHANICAL DEPARTMENT	DATE	PAYROLL NUMBER	NAME						RATE		PAY CODE	DALLAS PUBLIC TRANSIT SYSTEM
	JOB ORDER NUMBER	ACCOUNT NUMBER	COACH NUMBER	GROUP CODE	UNIT NUMBER	WORK TYPE	WORK SOURCE	LOCATION CODE	TIME WORKED REGULAR	TIME WORKED OVERTIME	AMOUNT	DETAIL OF MISCELLANEOUS WORK

THIS AREA REQUIRED ONLY FOR UPGRADING

I was assigned this date to work as (classification)_____

to fill vacancy due to absence of (list name)_____

CORRECT: _____   APPROVED: _____

DEPT.#	BADGE #	PAY RATE		J.O. NO.	ACCT. NO.	COACH	GR.	U	W	R	LOC.		REG. HRS.	OT HRS.	MO.	DAY	YR.	AMOUNT

1 2 3 4 | 5 6 7 8 9 | 10 11 12 13 14 15 | 16 17 18 19 20 21 22 23 24 25 26 27 28 29 | 30 31 32 33 | 34 35 36 37 | 38 39 40 41 | 42 43 | 44 | 45 46 | 47 48 | 49 50 51 | 52 53 54 55 56 57 | 58 59 60 61 62 63 | 64 65 66 67 68 | 69 70 | 71 72 | 73 74 | 75 76 77 78 79 80

GLOBE 309545

TIME TICKET
Figure 2-3

The programs provide a system for daily reporting of maintenance data on vehicle consumption of fuel, oil, and coolant, mileage, when inspections are due, and when inspections are performed. Reports are generated biweekly, weekly, monthly, and upon request to cover inventory status and summaries of the daily information.

The SIMS system has been sub-divided into the following categories:

- The Input System — defined as the network of data collectors and source documents used to capture the basic data on punched paper tape or magnetic tape.

- The Data Processing System — defined as the equipment and daily operation necessary to convert source documents and paper tape files into the final set of management reports.

- The Software System — defined as the set of computer programs used to store, sort, and manipulate data to produce the final set of management reports.

REQUISITION ON STOREKEEPER

DALLAS TRANSIT SYSTEM

FORM 59-R

| 01 Code | 03 Date | 09 Store | AUTHORIZING AGENT | RECEIVER'S NAME |

| 41 Quantity | 44 Unit | 46 | 48 | 51 Part Number | PART DESCRIPTION | PG | PRICE | VALUE |

41 Quantity 44 Unit 46 48 51 Part Number

41 Quantity 44 Unit 46 48 51 Part Number

41 Quantity 44 Unit 46 48 51 Part Number

| 21 | 27 | 31 | 35 | 37 | 39 | 40 |
| ACCOUNT No. | WORK ORDER No. | EQUIPMENT No. | GROUP | UNIT | WORK REASON TYPE | |

OFFICE USE ONLY

This Copy To
Storeroom
Accounting

| 21 | 27 | 31 | 35 | 37 | 39 | 40 |
| ACCOUNT No. | WORK ORDER No. | EQUIPMENT No. | GROUP | UNIT | WORK REASON TYPE | |

OFFICE USE ONLY

This Copy To
Storeroom
Inventory

| 21 | 27 | 31 | 35 | 37 | 39 | 40 |
| ACCOUNT No. | WORK ORDER No. | EQUIPMENT No. | GROUP | UNIT | WORK REASON TYPE | |

OFFICE USE ONLY

This Copy To
Storeroom

DATA
COLLECTOR

PAPER TAPE

TAPES   TRANSFERRED

PAPER TAPE
READER

MANUAL
ENTERED
DATA

MAGNETIC TAPE
RECORDER
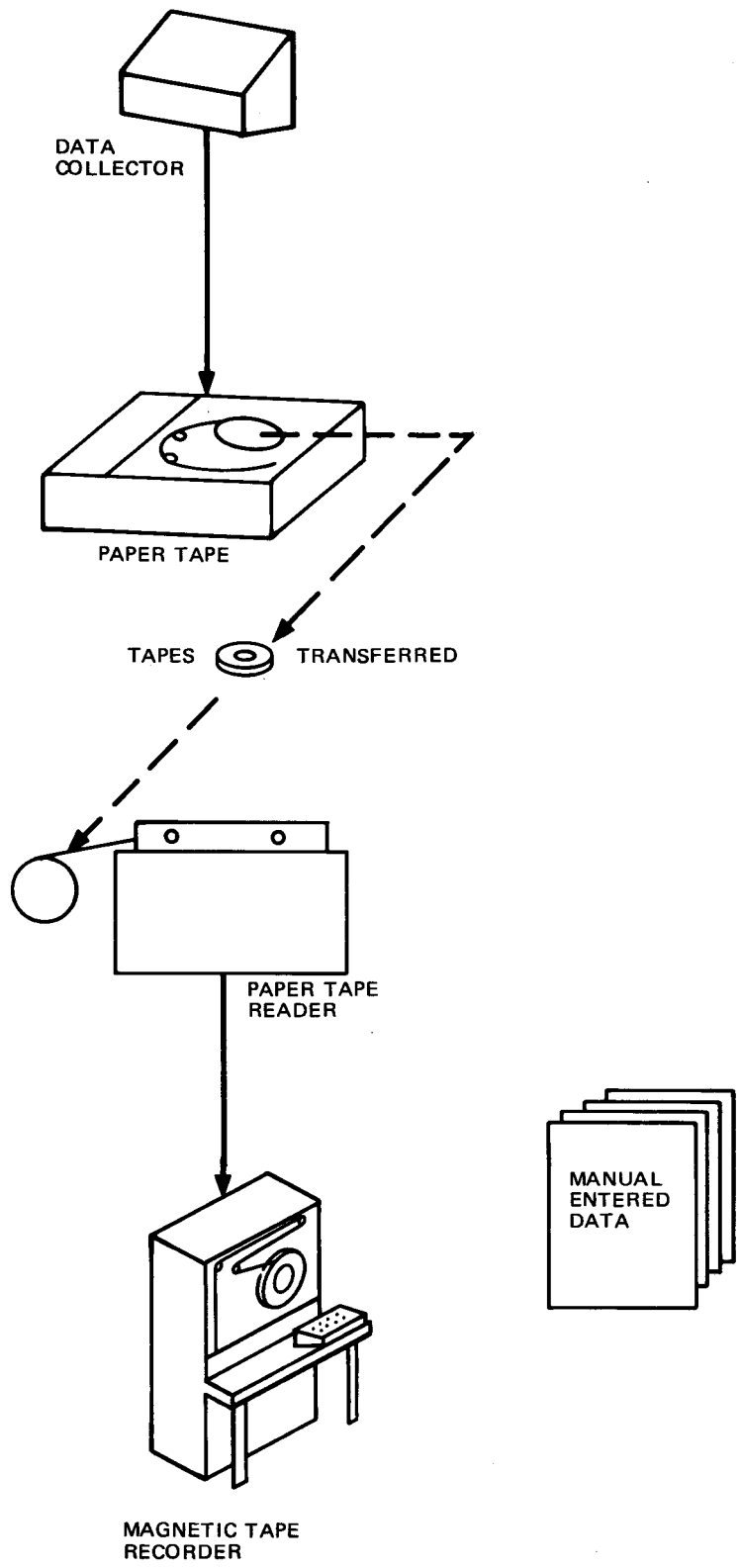
PAPER TAPE TO MAGNETIC TAPE
Figure 2-5

3.0 THE INPUT SYSTEM

The major equipment items associated with the SIMS input system are the data collectors, which are designed as input devices for service data, and other equipment such as multiplexers, paper tape punches, magnetic keytape machine, and the Data Services Department's keypunch machines. (See Figure 3-0.)

3.1 Service System Input

Input data for the service system includes the mileage operated by each bus on that day, in the form of scheduled mileage for each run made and corrections to scheduled mileage due to mechanical failures, emergency route changes, and any other deviations from the normal scheduled route. Vehicle servicing records are made for the fuel, oil, and coolant added each night as the coach is cleaned and serviced. When a bus receives a scheduled inspection, the date, bus number, inspection schedule code, and the inspection step code are recorded for updating of the "miles since last inspection" and the "inspection type/step due" on the Daily Commodity Report. Engine ring-jobs, engine overhauls, and brake-jobs are entered in a manner similar to inspections, so that the system contains the date, vehicle number, reason for repair, accumulated vehicle mileage at repair, and, in the case of brakes, the total metal removed from each brake drum and the lining type used.

3.1.1 The service data collector, shown in Figure 3-1, provides a daily servicing record for each bus cleaned and serviced that day.

Each data collector is wired to automatically record the department operating the equipment, the division in which it is located, and the lane in which it is being used.
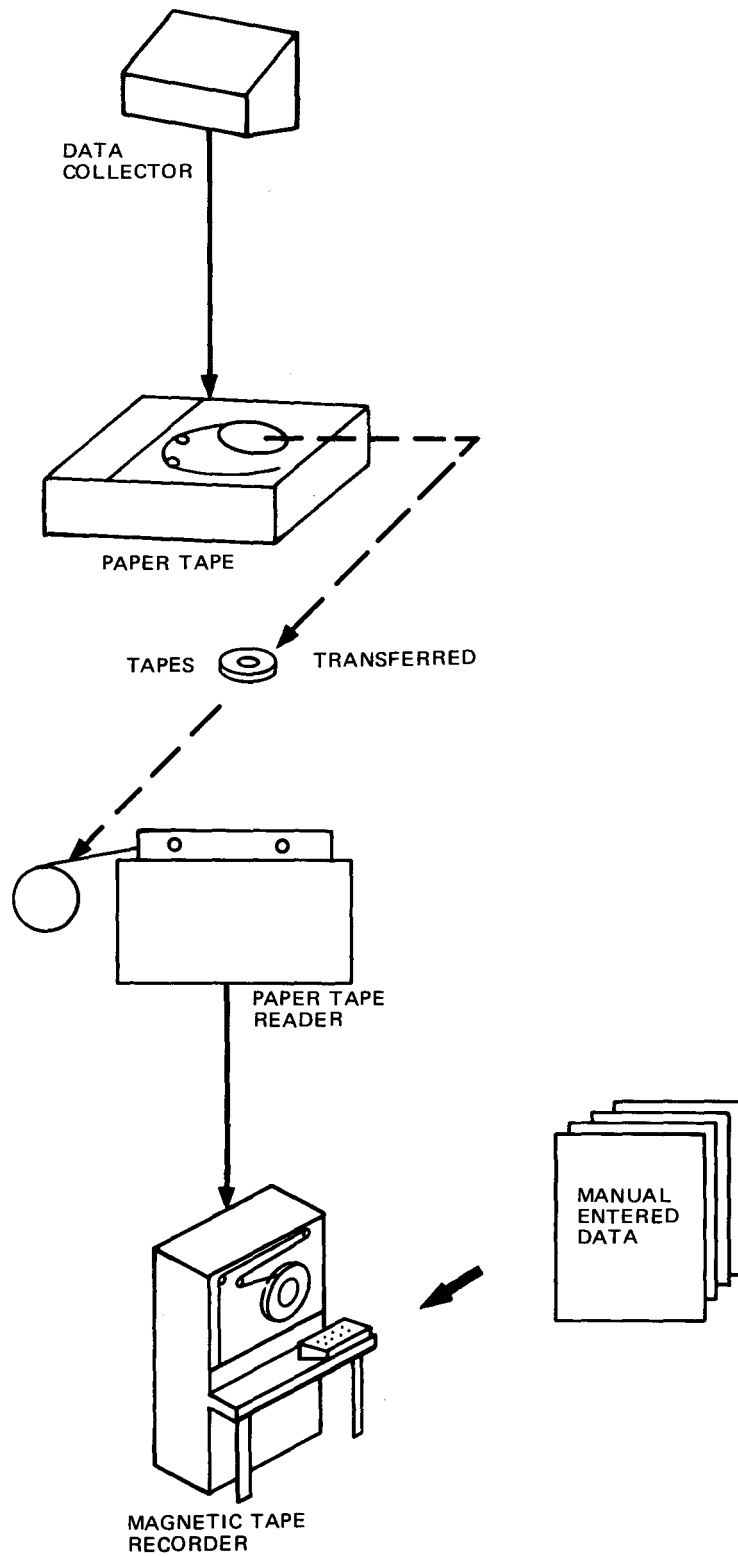
Bus numbers are entered on a keyboard arranged in three columns and ten rows of pushbuttons numbered 0 — 9. To assure that each service record has a complete bus number, the unit has a series of electrical interlocks which require that one button in each column be depressed before the "RECORD DATA" button can be energized. The individual pushbuttons illuminate when they are depressed and remain illuminated until after the "RECORD DATA" button is activated. The buttons light as they are depressed in a left to right sequence. The illuminated buttons enable the service man to easily read the bus number entered.

"FUEL", lube "OIL", and "COOLANT" register automatically on numerical readout registers on the data collectors as these fluids are added to the buses. Electric impulse units attached on the fuel and coolant meters and in the oil lines trigger the registers on the data collectors. In the event of a failure in one of the meter impulse units, the mechanically metered volume delivered may be read at the meter and entered on the data collector with pushbuttons provided for fuel, lube oil, and coolant. (See buttons marked F, O, C, and T in Figure 3-1.) TORQUE oil can be entered only by the use of the "T" button.

If less than one gallon of fuel is pumped into a bus, a "NO FUEL PUMPED" electronic beeper will sound when the "RECORD DATA" button is pushed. The attendant is alerted that the bus has not been refueled. If, however, the bus does not need fuel, the attendant can record the transaction by holding the "RECORD DATA" button for approximately three seconds, then the data collector will override and record the data entered.

Data collector records feed through a multiplexer to a paper tape punch machine. If the multiplexer is processing a record when the "RECORD DATA" button on a second data collector is pressed, the second record holds until the multiplexer is clear and then processes automatically. A machine status WAITING/READY light on the data collector shows whether the multiplexer is free or processing a record. (See Figure 3-2.)

When any information in the data collector is in error, a "DATA RESET" button can be pushed to clear the machine after which the correct information can be entered with the manual entry buttons. If the record is recorded on paper tape before the error is noted, a "CORRECT PREVIOUS RECORD" button

DATA
COLLECTOR

PAPER TAPE

TAPES   TRANSFERRED

PAPER TAPE
READER

MANUAL
ENTERED
DATA

MAGNETIC TAPE
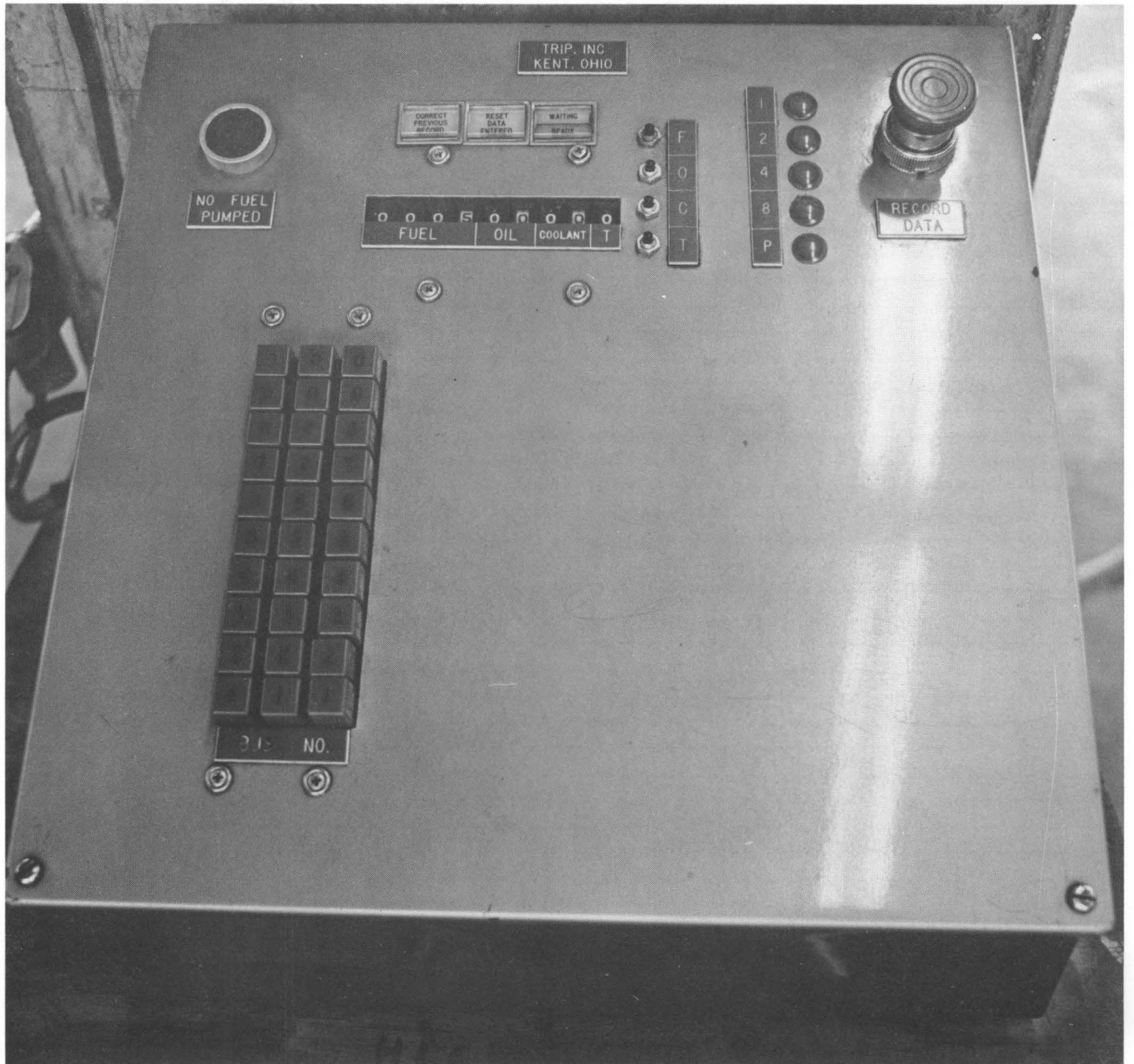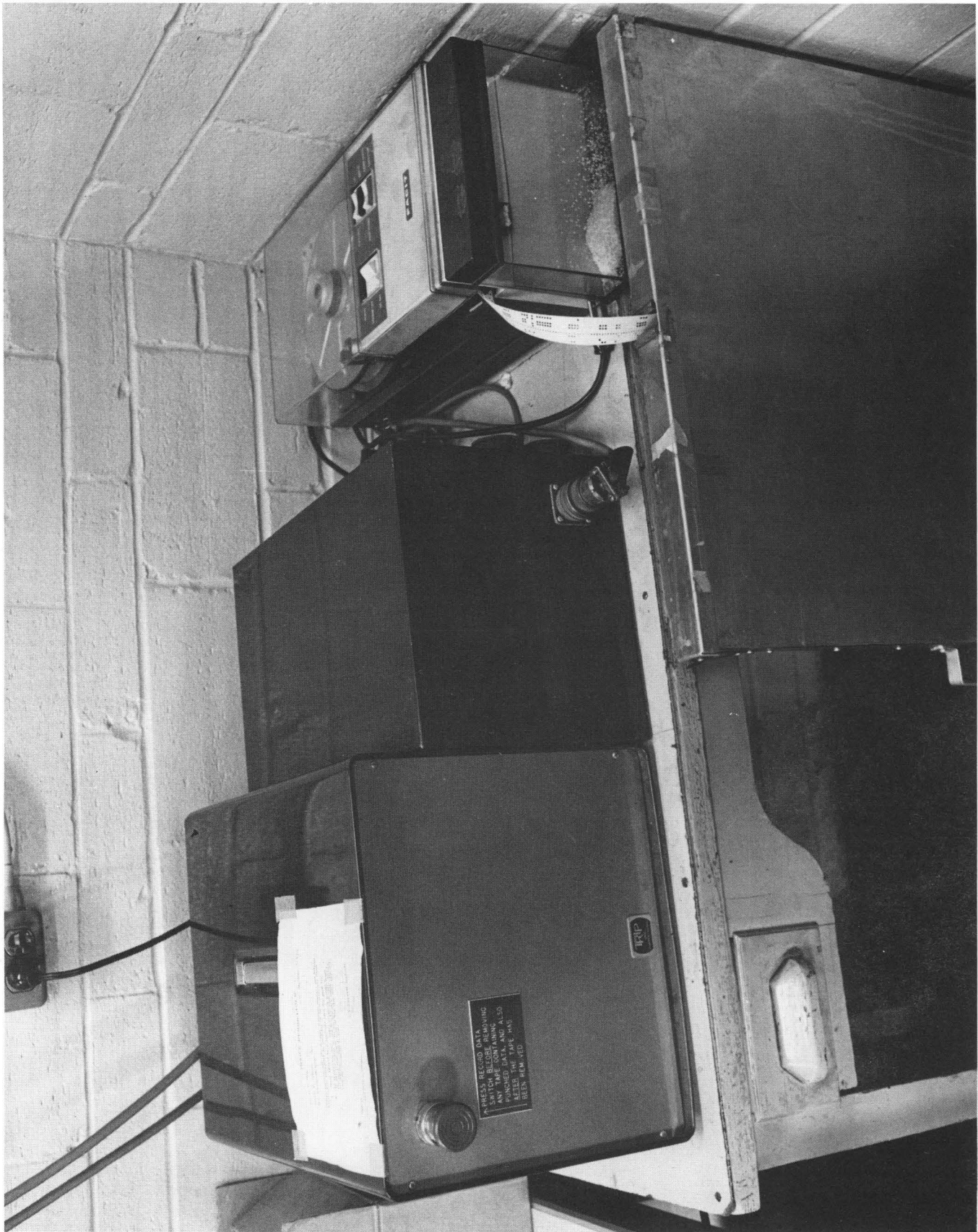RECORDER

INPUT SYSTEM
Figure 3-0

Figure 3-1

Figure 3-2

can be pushed and entered with the correct record; this will nullify the previous record from this data collector during processing.

The data collector is equipped with a set of test lights, labeled 1, 2, 4, 8, and P, to provide a troubleshooter with readings on the data recorded and translated for output.

The paper tapes are carried from the service stations to the Accounting Department daily; here the paper tapes are transposed onto magnetic tape. (See Figure 3-3.)

For replacement of data collector records edited from the input or in the event of a data collector failure, the service records can be entered with the keytape.

3.1.2 Daily mileage records are keytaped from several source documents. Each operating division has a schedule of morning bus departures and a schedule of afternoon bus departures, listed by route, with each pull-out listed in time order for its particular route; the scheduled miles of operation is listed for each of these runs. These scheduled runs, departure times, and route miles are on printed forms with a space to fill in the bus number assigned to that run. A separate form contains mileage adjustments to the schedule sheet's listing of buses, with negative mileage for buses that did not finish the total mileage of their runs and the mileage for buses which filled in or which had additional miles over the schedule. A third sheet contains bus numbers and mileage for chartered buses. (See Figure 3-4.)

Each keytaped record has a date, bus number, and mileage for computer sorting, compiling, and filing. Mileage adjustments can be made for any bus and any day within a predetermined period; Dallas has a range of 45 days in which daily adjustments can be made to the vehicle mileage.

3.1.3 Inspection records are keytaped daily. As the operating garages inspect buses which they have scheduled from the Daily Commodity Report figures on "miles since last inspection", they complete a form with the date of the inspection, bus number, the inspection type and the inspection step. From this input data, the programs zero and restart the "miles since last inspection" and cycle the "inspection due".

The inspection schedules can be set at any mileage interval and any number of steps up to 20. Each bus is assigned to a particular inspection schedule where it may remain or be changed to another mileage interval schedule as is necessary. Dallas Transit currently has two schedules, one with eight steps of 9,000 miles each, and one with twelve steps of 6,000 miles per step.

3.1.4 Units to be kept on a mileage basis are those so designated by the user. Dallas Transit keeps "Engine Overhaul", "Engine Ring-Job", and "Brake Reline" records on this system. Update information is keytaped for processing with the daily SIMS data. Update records contain the date of the work, bus number, and numeric codes to define the task. Brake-reline updates also contain the amount of metal removed from the brake drums and the type of lining used.

Procedures are available to make adjustments to any records which are entered with an error or inadvertently omitted for more than 45 days.

3.2 Inventory System Input

Regular inventory records are basically of four types: purchase order data, receipt of material data, return to vendor data, and material usage data. The SIMS inventory records are entered on a separate inventory tape for weekly processing.

Figure 3-3

Figure 3-4

PURCHASE ORDER

DALLAS TRANSIT SYSTEM

Date

Acct. Req.

Code

S01

Deliver and Charge to

Dallas Transit System
Dallas, Texas

	QUANTITY	UNIT	DESCRIPTION	

_____   _____   APPROVED:_____
DATE   DIVISION HEAD

Figure 3-5

3.2.1 Purchase order data may be entered from either the Purchase Order form (see Figure 3-5), the confirmation order, or a SIMS form for purchase order input. From the data on the source document, the following are entered into the SIMS inventory system:

1. Purchase Order number
2. Purchase Order date
3. Vendor code
4. House inventory number
5. Quantity ordered
6. Unit of measure
7. Price

Additional information on each inventory item is contained in the SIMS masterfile.

3.2.2 Receipt of materials are keytape entered from the invoice, receiving record (see Figure 3-6), or a special SIMS form for receipt of goods. The following data on receipts is used to update the Purchase Order status and the inventory stock status:

1. Purchase Order number
2. Date of receipt

RECEIVING RECORD

PURCHASE ORDER

DALLAS TRANSIT SYSTEM

Date

Acct. Req.   Code

Received From

Deliver and Charge to

SO1

Dallas Transit System
Dallas, Texas

	QUANTITY	UNIT	DESCRIPTION	

I HEREBY CERTIFY THAT THE ARTICLES AND/OR SERVICES LISTED AND DESCRIBED ABOVE HAVE BEEN RECEIVED BY ME, THAT I HAVE INSPECTED AND CHECKED THE SAME, AND HAVE FOUND THEM TO BE ACCORDING TO SPECIFICATIONS AS ORDERED BY THE PURCHASING AGENT, AND IN THE QUANTITIES AS REPORTED ABOVE BY ME.

APPROVED:_____

DATE   RECEIVING CLERK   DIVISION HEAD

Figure 3-6

3. House inventory number
4. Quantity received
5. Unit of measure

3.2.3 When merchandise is returned to the vendor, SIMS is keytape updated from a Return to Vendor Report. (See Figure 3-7.) This transaction reopens the Purchase Order, if closed, and subtracts from quantity in stores and adds this amount to the unfilled Purchase Order category. The transaction includes:

1. Purchase Order number
2. Date of return
3. House inventory number
4. Quantity returned
5. Unit of measure

3.2.4 Material usage is keytaped from the Requisition on Storekeeper. Because some information from this entry is used in the maintenance cost system, the form includes data on the bus and job. The Requisition on Storekeeper is divided into two sections by a heavy black line. (See Figure 2-4.) The data on the right side of the heavy line is for accounting use only, this information already being part of the inventory masterfile for each part. All data to the left of the heavy line is keytaped. The SIMS input data includes:

1. Date of issue
2. Point of issue

DALLAS TRANSIT SYSTEM
RETURNED GOODS REPORT

NUMBER _____

GOODS RETURNED TO: _____ DATE _____

_____ DEPARTMENT

STOCK NO.	QUANTITY	UNIT	DESCRIPTION

REASON FOR RETURNING _____
(EXPLAIN FULL)

CREDIT ACCOUNT NUMBER _____   BOUGHT ON ORDER NO._____

SIGNATURE OF PARTY MAKING RETURN: RECEIVED BY: _____

_____ DATE   _____ 19 ____

Figure 3-7

3. Account number
4. Work order number
5. Bus number
6. Repair group, unit, work reason, and work type
7. Quantity of issue
8. Unit of measure
9. House inventory number

Keytape entry methods are available to make a variety of corrections to inventory records which may have been entered in error, omitted, etc.

New house inventory items can be added to the masterfile and old ones can be deleted by providing the basic data required for the inventory masterfile. Similarly, system constants, such as reorder notice interval, taxes, number of vehicles, etc., can be keytaped for entry into the masterfile to provide changes to out-dated information.

3.3 Maintenance Cost Input

The maintenance cost programs receive their input from two sources, the Requisition on Storekeeper cards processing through the inventory system and the Mechanics' Time Tickets which are run with the SIMS programs after processing through the City payroll system.

The Requisition on Storekeeper data is an input source of maintenance cost information as well as for the inventory system. (See Figure 2-4.) Data on the bottom line of this form matches with corresponding work
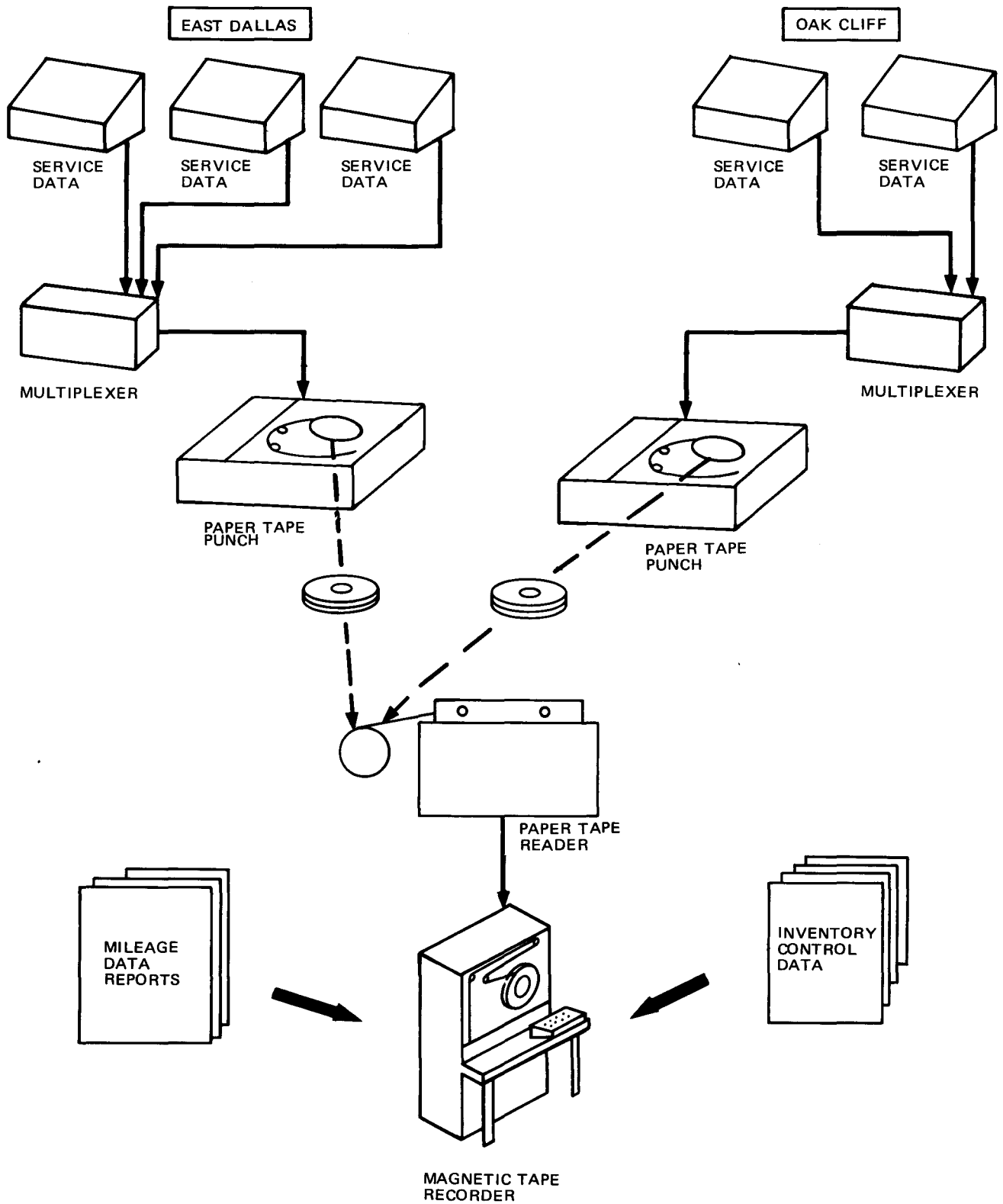
COMPLETE INPUT SYSTEM
Figure 3-8

coding from the Mechanics' Time Tickets. (See Figure 2-3.) The requisition data is priced from the inventory masterfile, matched with the time ticket job data and becomes the material cost information for the job and job classification in the maintenance cost system. The Requisition on Storekeeper information keytaped for SIMS is:

1. Date of requisition
2. Issuing store
3. Quantity issued
4. Unit
5. House part number
6. Account number
7. Work order number
8. Equipment number
9. Group code
10. Unit code
11. Work reason code
12. Work type code

The Mechanics' Time Tickets are filled out by the mechanic performing the work. The time ticket data is a combination of regular accounting data, City payroll system data, and maintenance cost system data. The time ticket is keypunched at the Data Services Department of the City of Dallas, run through the City payroll system, and then run through the SIMS maintenance cost system. Information on the City payroll system masterfile is accessed for the current pay rate and classification of each employee. If a time ticket has labor recorded on more than one task for the day, trailer cards are punched for each job to provide the labor cost for each job performed. The Mechanics' Time Ticket contains labor information on:

1. Department
2. Badge number (payroll number)
3. Job order number (when applicable)
4. Account number
5. Coach number (vehicle number)
6. Group code (i.e., electrical, brakes, engine, etc.)
7. Unit code (a subdivision of the group code)
8. Work type code (i.e., rebuild, replace, etc.)
9. Work source code (i.e., Vehicle Defect Card, found on a scheduled inspection, etc.)
10. Regular hours worked (by job)
11. Overtime hours worked (by job)
12. Date

3.4 The Complete Input System

The complete input system at Dallas Transit is shown in Figure 3-8. At the East Dallas location there are three service data collectors, one multiplexer, and one paper tape punch machine installed in the service station.

At Oak Cliff, there are two service data collectors, one multiplexer, and one paper tape punch machine installed in the service station and inspection garage.
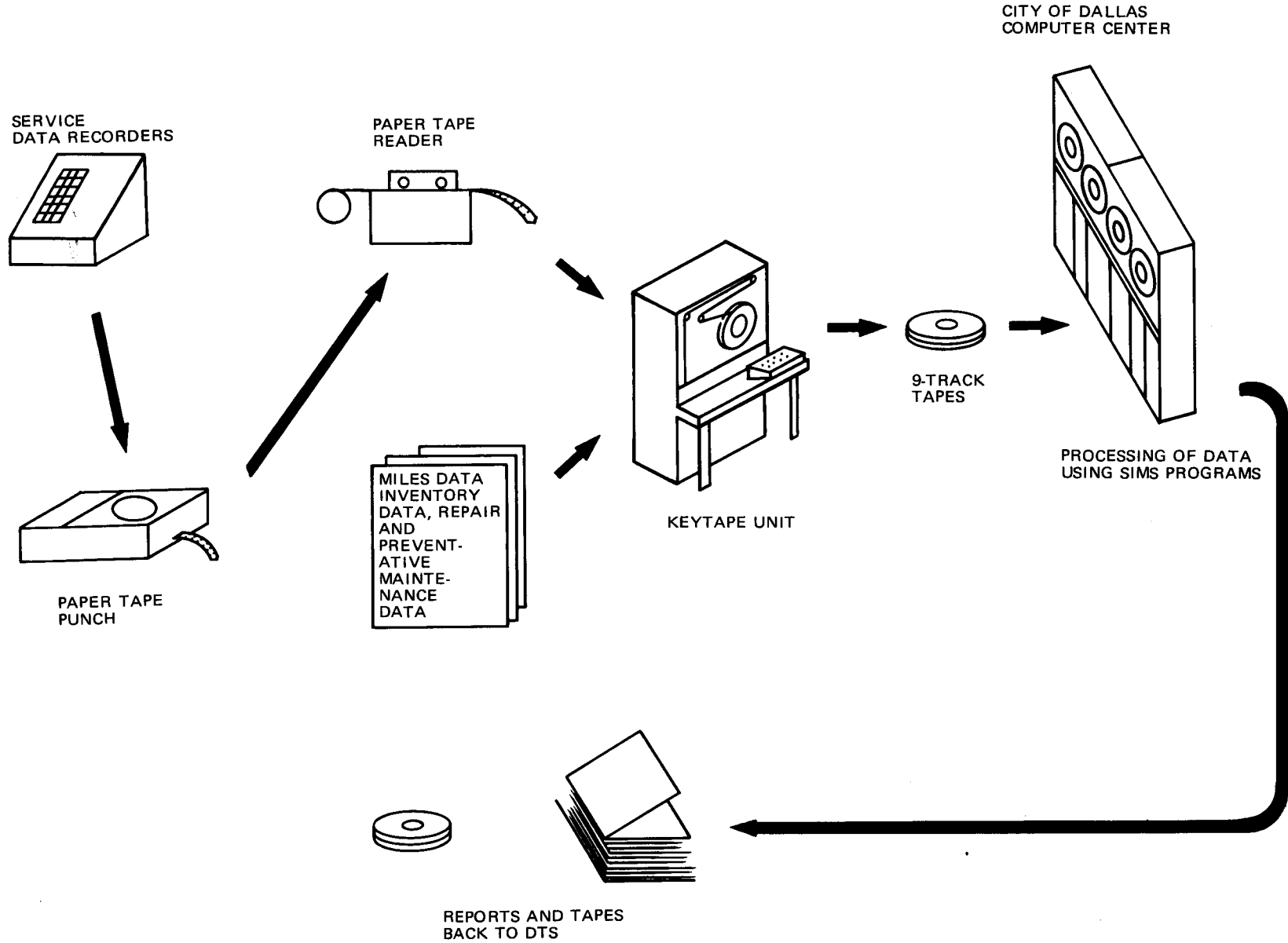
For backup and maintenance purposes, there is one spare service data collector and two spare paper tape punch machines.

4.0 THE DATA PROCESSING SYSTEM

The equipment and software programs required to convert the daily input of data, to produce the SIMS reports for the Dallas Transit System management, is defined as the data processing system. (See Figure 4-0.)

Punched paper tapes produced from the service data collectors are collected each morning; these tapes contain data from the previous day's activity. The tapes are collected from the Oak Cliff and East Dallas garages, and are then taken to the Accounting Department. At the accounting offices, the paper tapes are converted to a magnetic tape file on a Mohawk Data Sciences 6405 data recorder. The other items that are input to the system include mileage consisting of the miles traveled by each vehicle during the previous day. The daily input from the maintenance storeroom for parts charged out by mechanics, inventory items ordered or received the previous day and information on inspection and unit changes performed are also included. This data is keytaped onto the magnetic tape along with the transposed paper tape records. The Mohawk keytape unit is a 9-track, 800 bpi unit. The tapes produced at Dallas Transit are sent to the Data Services Department by messenger Monday through Friday. The tapes are processed on an IBM 370-145 with the SIMS software along with the Mechanics' Time Tickets which are keypunched by Data Services. The resulting set of printed management reports, along with the tapes and time tickets are returned to the Dallas Transit System.

THE DATA PROCESSING CYCLE
Figure 4-0

SERVICE
DATA RECORDERS

PAPER TAPE
READER

CITY OF DALLAS
COMPUTER CENTER

PAPER TAPE
PUNCH

MILES DATA
INVENTORY
DATA, REPAIR
AND
PREVENT-
ATIVE
MAINTE-
NANCE
DATA

KEYTAPE UNIT

9-TRACK
TAPES

PROCESSING OF DATA
USING SIMS PROGRAMS

REPORTS AND TAPES
BACK TO DTS

5.0 PROGRAMS AND REPORTS

The SIMS programs and reports have been documented by The MITRE Corporation; the analyses and uses of these reports are discussed in Volume II. This section will summarize these reports and their functions at the Dallas Transit System.

5.1 Service System Programs and Reports

The Service System reports are produced daily, weekly, monthly, and on demand. These reports are the product of the service/unit change module of programs. The input and output of this portion of SIMS is basically in terms of miles run, service fluids used, inspections performed, and units changed.

To thwart excessive input errors and to provide more complete information, SIMS has a number of values which are initialized as constants for future comparisons and calculations. These constants may remain in the programs with their original values or they may be changed anytime necessary by the user. Examples of constants would include each bus's fuel capacity and the current price of fuel.

5.1.1 Daily service system reports include the following group of reports to provide edit listings of invalid records and update transaction listings of records which were accepted:

1) Rejected Service Data Collector Records for Processing Date M-D-Y
2) Service Transaction Edit List for Processing Date M-D-Y
3) Unresolved Codes and Edit List for Processing Date M-D-Y
4) Service Data Collector Record Summary for Processing Date M-D-Y
5) SIMS S/U Coach Transactions Processed M-D-Y
    a) Inspection Performed Notice
    b) Units Changed/Rering/Overhaul
    c) Brake Job Done
    d) Buses Added/Deleted/Updated
6) Constants File Updates for Processing Date M-D-Y
7) Summary of Service System Transactions for Processing Date M-D-Y

These reports provide the record keeping personnel at Dallas Transit with listings of invalid records which they correct and re-enter into the system and valid records which are checked against source documents for control purposes.

5.1.2 The primary report produced by the Service System is the "Commodity Report for Day M-D-Y". This report lists the following data on each bus daily:

    a) Bus number
    b) Total accumulated miles
    c) Miles since last inspection
    d) Inspection type and step due
    e) Miles travelled on the report date
    f) Fuel, oil, and coolant delivered for the report date

A secondary report processed weekly is the "Commodity Usage for Week Ending M-D-Y" report, which is a tabulation of the daily and weekly service fluids delivered to each bus during the previous four weeks.

5.1.3 A series of "Maintenance Work Performed Reports" list the inspections, brake jobs, and ring jobs performed for the month:

    a) Inspections Done for M-Y
    b) Rering/Overhaul Jobs for M-Y
    c) Brake Jobs Done for M-Y

These reports provide a check against shop records to assure complete updating for the SIMS reports.

5.1.4 Other monthly reports are provided which have a statistical analysis of the mileage, service commodities dispensed, and unit life.

Three monthly reports on mileage and service commodity usage are produced to provide the proper amount of information at different levels of management. These reports, which provide analysis at the division, fleet, and bus levels are:

a) Bus Analysis Division/System Summary for Month Ending M-D-Y
b) Bus Analysis Summary for Month — Ending M-D-Y
c) Bus Analysis for Month Ending M-D-Y

These reports show mileage, fuel consumption, oil consumption, and combined service commodities cost for the month.

A Brake Status report is produced which shows the current drum size, lining type, and miles of service for the brake-system on each bus. This report is used to analyze lining types and to make long range forecasts on brake jobs.

The user may call for a listing of the entire service system file on a bus or group of buses in the form of the "Vehicle Master File Listing". This report is produced on request rather than on a set schedule.

A monthly Tire Mileage report lists, by bus and by day, the mileage travelled during the month.

5.2 Inventory System Programs and Reports

The Inventory System Reports are produced weekly, monthly, and on demand. These reports are produced by the inventory module of programs. The input to the system is basically in terms of material ordered, material received, material returned, and material used. These basic transactions are recorded in terms of transaction date, part number(s) involved, number of units involved, units of measure, purchase order number, vendor number, and price.

A master file is kept which contains data on each part number and each vendor number. The information in the master file, both constants and variables, are accessed for comparison during purchase transactions. Verification of data such as units of measure in the purchase order entry, and in future transactions with that purchase order, prevents erroneous stock levels and stock prices.

Prices are an average cost of units in stores. The average cost is determined from the quantity and unit prices of purchases, and the number of units remaining in the bins based on a first-in, first-out flow.

5.2.1 Several of the inventory reports are produced to provide direct support to the purchasing function. Weekly "Reorder Notification as of M-D-Y" and "Follow-up Reorder Notification as of M-D-Y" reports are produced to supply the storekeeper with information necessary for drafting a Requisition on Purchasing. For follow-up on purchase orders, the "Vendor Performance, Month Ending M-D-Y" and the "Unfilled Purchase Orders Report as of M-D-Y" reports are produced to supply the storekeeper with information on the quality of service on outstanding orders.

5.2.2 Other reports supply the storekeeper with information on his inventory for planning and checking. The "Stock Status Report for M-D-Y" provides a view of the current status of the file on each part number as well as the number of units issued during the current quarter and each of the past four quarters.

The "Low Usage Materials Items as of M-D-Y" report provides the storekeeper with information on stock items which have been inactive for a given period of time; Dallas Transit currently sets the inactive period at 365 days.

5.2.3 The financial reports available to the storekeeper and the comptroller are the "Inventory Activity Report for the Month of M-Y" and the "Inventory Activity Abstract for the Month of M-Y" reports. The

activity report is a balance sheet of total receipts, issues, and adjustments for the month, combined with the inventory/issues ratios for the last three periods. The abstract supplies the end-of-month stock value, value/bus, monthly issues, and the inventory/issues ratio for each of the past 13 months.

5.2.4 Other reports which support the inventory system are:

a) "Receiving Report" for information and updating of the outstanding orders
b) "Amendment to Receiving Report" which reflects changes in the "Receiving Report"
c) "Materials Transaction History for Processing Date M-D-Y" which provides the storekeeper with a listing of all the previous week's transactions and the resulting inventory status for all parts affected.
d) Various edit listings which provide information on transactions which must be corrected and re-entered.

5.3 The Maintenance Cost Programs and Reports

The maintenance cost reports are the product of the repair cost group of programs. This group of programs draws its data from four sources:

(a) The mechanics' time cards, with their information on labor time, vehicles repaired, and work performed.
(b) The inventory transaction history file, with its information on material requisitioned from the storekeeper.
(c) The vehicle master file, part of the service system, provides the necessary vehicle mileage data.
(d) The mechanics' pay rates are taken from the City of Dallas employee master file, payroll.

The mechanics' time tickets are filled out with information concerning jobs performed and labor time. These cards are keypunched by the Data Services Department and run with the City payroll programs. After the payroll system has run and the paychecks are produced bi-weekly, the time cards are entered into the SIMS repair cost programs. These SIMS programs utilize all four of the data sources discussed to produce the SIMS reports on maintenance costs.

The reports printed from the bi-weekly runs are edit listings on the card input. After entering corrections for the program edits, the reports on maintenance cost are normally called for on a monthly or quarterly basis.

5.3.1 The repair cost programs perform a series of edits on input data. Each edit program produces an edit listing which in some way shows the record entered and the part of the record which was not acceptable.

The edit reports are:

a) Data Acceptance List for Processing Date M-D-Y
b) Labor Transaction Edit List for Processing Date M-D-Y
c) List of Accounting Classification Exceptions
d) Employee Card Edit List for Processing Date M-D-Y
e) Employee Statistics, which is a statistical summary of the input edits

These reports are used to correct and re-enter unacceptable records.

5.3.2 The reports on maintenance cost produced for use in management planning analyze the cost of repairs for each of the major subassemblies. Eight reports are printed to show costs in several ways.

The three "Bus Repair Cost by Subassembly" reports are based on labor costs, parts costs, and labor and parts costs. These reports separate costs by bus and by subassembly.

The three "Subassembly Repair Cost — Division Summary" reports are based on labor costs, parts costs, and labor and parts costs, separated by subassembly and by division.

The "Hourly Maintenance Labor Utilization" report and the "Maintenance Labor Costs" report are in the same format, listing data by division and by labor category. The former report's data is in hours while the latter report's data is in dollar cost.