



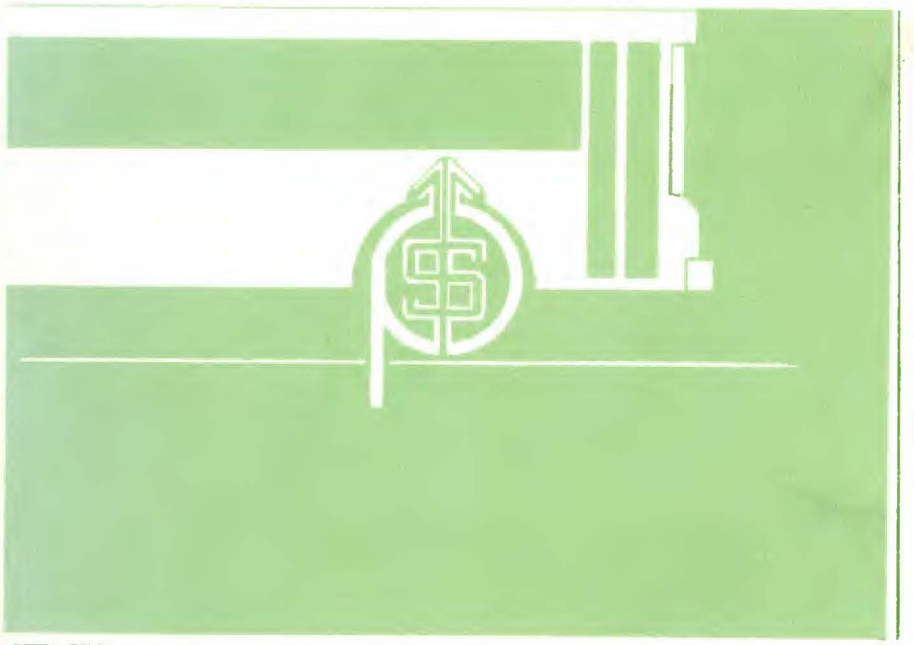
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An Approach For Microcomputer Needs Analysis:

Greater Portland Transit District

March 1984



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UMTA Technical Assistance Program

An Approach for Microcomputer Needs Analysis: Greater Portland Transit District

Technical Assistance Report
March 1984

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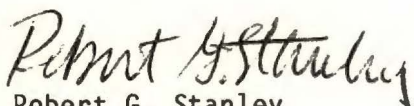
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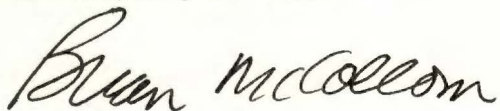
Many transit operators have begun to improve the collection, analysis, and distribution of management information. In particular, small transit systems have been attracted by the relatively low cost of microprocessors and the increasing ease in introducing their use into their organizations. APTA and UMTA have been actively seeking to assist these small transit systems in their efforts, primarily by serving as information sources on microcomputer use in the industry.

In addition, the APTA/UMTA Transit Productivity Program has been established to provide short-term technical assistance to transit operators who request assistance on a particular issue which involves system productivity. The results of the Greater Portland Transit District technical assistance effort are documented in this report. We believe the review of Portland's needs and the recommended approach will be of interest to all bus systems.

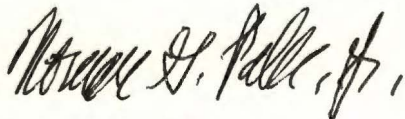
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COMPUTER SYSTEM DEVELOPMENT
AT
GREATER PORTLAND TRANSIT DISTRICT

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I. INTRODUCTION

Greater Portland Transit District, generally known locally as Portland Metro, is the public transit agency for the Portland, Maine metropolitan area. The system has a fleet of 43 vehicles, employs 73 people, and has an annual operating budget of about \$2.8 million. Metro is currently located in a leased facility which it shares with a trucking firm but is moving shortly into a newly constructed operations, maintenance, and administrative facility.

Transit properties of Portland Metro's size are now acquiring computers for various management, administrative, and planning purposes because the cost of computer hardware is becoming affordable and software is becoming more available. Package software (that is, software already programmed to perform specific functions) is not only becoming more affordable, but also is becoming available for an increasing number of functions.

Recognizing this trend, UMTA awarded Portland Metro a Section 6 Service and Methods Demonstration grant to acquire a small computer and package software. Under terms of this grant, Metro was to choose which functions were to be addressed and what software and hardware were to be implemented. The agency already had an in-house Digital Equipment Corporation (DEC) PDP-8 performing accounting functions and a standalone CPT word processing system. Several applications were developed under the Section 6 grant, as noted below, but the development was clearly on an "ad hoc" basis and not part of a coherent plan for computer system development. The objectives of this report are (a) to provide a review of the status of the work on the Section 6 project, (b) to recommend applications which might be addressed and for which commercial package software could be acquired using remaining Section 6 funds, (c) to assess the need for additional computer capability at Metro, and (d) to outline a plan for developing a comprehensive computer system at Metro, integrating package software to the extent possible.

For the Section 6 project, Metro acquired an Apple II Plus with Microsoft BASIC, VisiCalc, and DB Master software. The following applications were developed on this project:

- a cross tabulation of operator run numbers and run times to assist in preparation of operator payroll;
- labor distribution to provide an interface between payroll and general ledger;

- a route/revenue analysis;
- a route mileage calculation based on scheduled and exception mileages; and
- budget projections.

All software except budget projections were designed and programmed in Microsoft BASIC in house by a payroll clerk who taught himself both the operation of the computer and the Microsoft BASIC language.

The DEC PDP-8 is used to perform accounting and payroll functions. The existing accounting system on the PDP-8 includes general ledger, accounts payable, accounts receivable, and payroll gross-to-net processing. All software was developed for Metro (in the DIBOL programming language) under contract by a local firm which subsequently went out of business. Metro currently successfully does all processing in these areas on the PDP-8. Parts inventory control had been included, but has since been dropped because of problems with the program. The package had originally included a bus cost analysis; this has subsequently been implemented successfully on the Apple II+ computer. All programs run on a standalone basis; no applications are integrated. There is no possibility of interfaces with programs on other computers, notably Metro's Apple II+. Input to the PDP-8 programs cannot come from other sources, and output from the PDP-8 programs cannot be passed to other programs. The PDP-8 programs do perform all functions as indicated; all "bugs" have apparently been worked out. However, all processing is slow, and no modifications can be made. There is no technical documentation of these programs.

My work at Metro, funded under the UMTA/APTA Transit Productivity Program, consisted of the following tasks: (a) reviewing existing computer capabilities at Metro, (b) discussing application areas with Metro staff for potential computer system development, (c) developing a priority ranking of applications for development or conversion of software, (d) recommending package software candidates to address the applications identified, (e) developing a recommended computer system configuration for Metro, and (f) developing an outline of a plan for development of a computer system at Metro. The first three tasks were performed during two site visits to Portland. The results of the fourth and fifth tasks are based on work done on implementation projects for transit properties similar in size to Metro.

This report presents the results of the work performed on these tasks. Following this introduction chapter, the second chapter presents each application area for which use of a computer was considered for Metro. Each application is briefly discussed and ranked for priority for inclusion in the proposed system. The third chapter presents a general hardware configuration recommendation for Metro. The fourth chapter presents a

plan for development of the computer system at Metro. Two important elements in the discussion of the plan are a general recommendation of package software for the application areas at Metro and suggested phases for implementation of software at Metro. The report has two appendices which are intended to provide guidelines for further computer system development work at Metro. The first appendix is a sample set of computer specifications, adapted from specifications developed for a site similar in size to Metro. The second appendix is a sample set of functional specifications for parts inventory control on a small transit property.

II. APPLICATION AREAS

Table 1 shows the application areas which were considered for potential implementation on the proposed Metro computer system. For each of these areas, the Metro staff and I discussed current processing procedures, potential features of implementing the application area on the computer system, what software might be available to implement the application, and the resultant priority level for the application, based on Metro's current procedures and needs. The results of this analysis are shown in Table 1. Further details are included in the discussion below.

A. Financial Application Areas

Metro's top priority for implementation on a new computer system would be the financial application areas, despite the fact that a production system already exists. Metro is not satisfied with the existing package because of its lack of flexibility and inefficiency. A new package would perform more functions required and would have interfaces between application areas. Currently some input is redundant; applications cannot share data input. The existing package cannot accept input from other programs, and output cannot be passed to other programs. The current account code structure cannot accommodate an account number large enough for all of Metro's operating and grant accounts.

A new system would have a family of package software for each financial application area plus parts inventory control. Any package would need some modification (or be sufficiently flexible) to provide Section 15 reporting. Otherwise, Metro has no unusual accounting or payroll requirements which a comprehensive microcomputer accounting package could not accommodate. The general ledger package must accommodate a user specified chart of accounts, user specified financial reporting based on the account numbers, a seven digit or greater account number (and/or multiple companies), recurring journal entries, audit trail of all transactions by source, trial balances by current period and year-to-date, and reporting for multiple periods (fiscal year for operating fund and project life for each grant). Reporting must include comparison with prior year and comparison with budget (variable by month) for both month and year-to-date (or project to date). Section 15 reporting would have to be available either through a user specified report generator included with the package or by explicitly modifying general ledger programs.

TABLE 1
POTENTIAL APPLICATION AREAS FOR PORTLAND METRO

Application Area	Current Processing	Priority for Development	Software Recmndtn
FINANCIAL APPLICATIONS			
General Ledger	Existing pkg on PDP-8	1	New pkg (1)
Accounts Payable	Existing pkg on PDP-8	1	New pkg (1)
Accounts Receivable	Existing pkg on PDP-8	1	New pkg (1)
Payroll, Gross-to-net Processing	Existing pkg on PDP-8	1	New pkg (1)
Budget Development	Spreadsheet on Apple II+	7	Sprdsht
Investment Analysis	Manual	Low	Package
Fixed Asset Accountng	Manual	Low	Package
OPERATIONS APPLICATIONS			
Scheduling and Run Cutting	Manual	Low	No recom- mendation
Operator Timekeeping	Manual	2	Modify pkg or develop
INVENTORY/MAINTENANCE APPLICATIONS			
Parts Inventory Cntrl	Manual	4	Package (1)
Purchasing	Manual	Low	No rec.
Vehicle Histories and Maintenance Schdlng	Manual and Bus Cost Analysis on Apple II+	6	Modify pkg or develop
Daily Servicing Rptng	Manual and Bus Cost Analysis on Apple II+ (considering automated fueling system)	5	Add to auto- mated system
RIDERSHIP REPORTING APPLICATIONS			
Ridership Reporting	Manual and Route/Revenue Analysis on Apple II+	3	Modify pkg or develop
Ridership Survey Proc	Manual (performed by MPO)	Low	Package
PERSONNEL/ADMINISTRATION APPLICATIONS			
Operator Personnel Administration	Manual	2	Develop
Personnel Recordkpng	Manual and Sick Time Analysis on Apple II+	Low	Package
Ticket Administration	Manual	Low	Develop
Word Processing	CPT Word Processing System OK as is No rec.		

Note: General Ledger, Accounts Payable, Accounts Receivable, Payroll, and Parts Inventory Control should be modules from the same family of package software.

There are no unusual requirements for accounts payable processing. Features which will be required include provision for encumbering funds for committed purchases (i.e., use of purchase order to encumber funds), user selected payment of invoices or batch selection based on due date, distribution of invoice transaction debits to multiple general ledger accounts, and automated interface with both inventory and general ledger.

Unlike many transit properties, Metro does have a need for accounts receivable processing. In addition to outlets for tickets, Metro has receivables for performing servicing and minor maintenance work on intercity buses for Greyhound and charter operators. It must bill clients for this service and monitor receivables. There are no unusual requirements for accounts receivable processing. Features which will be required include automated generation of invoices, generation of an aged receivables report, customer analysis, and automated interface with general ledger.

Metro has no unusual requirements for payroll gross-to-net processing. All employees are paid on the same weekly cycle. Reports required include an employee master file listing, a payroll register, checks and a check register, a payroll journal, a listing for each deduction, reports on accrued and taken sick leave and vacation, and statutory Federal and state tax and unemployment reporting. Metro currently has eight non-statutory payroll deductions. There must be an automated interface with the general ledger. Eventually inputs should come from other than manual sources, notably an automated interface with operator timekeeping, so any Metro payroll software must accommodate file inputs. There should also eventually be automated input of operator sick leave earned and taken from operator personnel administration. A supplemental payroll program would calculate and report Metro pension contributions based on payroll.

Metro currently uses the Apple II+ to perform labor distribution and prepare payroll journal input to the general ledger. All data are keyed into the Apple II+ program (written in-house in Microsoft BASIC), and the information on the print-out is keyed into the PDP-8 general ledger program.

Metro currently has both the budget development program on the PDP-8 and a VisiCalc spreadsheet on the Apple II+ for use in developing operating budgets, although neither is used extensively. The PDP-8 program does have an interface with the general ledger package. Metro has use for a more full featured spreadsheet to develop operating budgets; an interface with the new general ledger package should be available.

Metro has idle cash assets which it invests to maximize revenue. It would be useful but not essential to utilize a package to perform investment analysis if a suitable inexpensive package were readily available on the new computer system.

Fixed asset accounting is another area in which Metro could use a package if a suitable inexpensive package were available on the new computer system. The ideal solution would be to implement a general ledger package which incorporates elementary fixed asset accounting features, which is all that Metro would need.

B. Operations Application Areas

Two areas of operations were discussed with Metro staff: scheduling/run cutting and operator timekeeping. The current manual scheduling and run cutting procedure is satisfactory; no need was expressed to automate this procedure. The Metro operating schedule is reasonably stable, although major changes could occur subject to political decisions, such as jurisdictions becoming members of the Transit District or withdrawing from the Transit District.

Operator timekeeping is an area which Metro would like to automate. The labor agreement is fairly complex for a small property, and the operator payroll input is time consuming and cumbersome. The process is currently facilitated somewhat by use of a program on the Apple II+ (also written in-house in Microsoft BASIC) to track scheduled run times by run numbers. An automated system would have to allow dispatchers to input a variety of payroll exceptions to scheduled pay time. A proposed program would provide automated input to the payroll gross-to-net processing program and track operator pay hours and dollars for generation of the Section 15 operator pay hours labor distribution report.

C. Inventory / Maintenance Application Areas

Metro currently does most parts inventory control and vehicle maintenance administration manually. A bus cost analysis program on the Apple II+ (also written in-house in Microsoft BASIC) generates bus cost reports with parts costs, labor costs, miles per gallon of fuel, miles per quart of oil, and cost per mile reported for month and year-to-date periods. The program accepts maintenance labor hours from time cards assigned to vehicles (weekly input), fuel amounts by vehicle (monthly input), total parts cost by vehicle (monthly input), and mileage by vehicle (monthly input). The program operates satisfactorily but has no interfaces with other programs. Priority for development of maintenance software is low because of the use of this program together with good manual maintenance recordkeeping procedures.

Metro is considering automating its daily servicing function using a local vendor who will either install a processor on site or allow a customer to use its own automated facility. (Metro would opt for the former installed in its new garage facility after the move is completed.) The output from the automated fueling system could possibly be interfaced with the existing bus cost analysis program but probably not easily. A new bus cost analysis program might be considered if the automated fueling system were to be installed.

Parts inventory control records are currently manual, and there is no immediate need to automate, although there are features in an automated inventory package which Metro considers desirable. (One reason for the low priority is the labor agreement provision that requires a full time person to man the parts room.) Metro stocks about 3,000 items for its 43 vehicle fleet; it uses standard first-in, first-out (FIFO) costing for parts.

Commercial inventory packages are all designed for use with inventories for warehouses, distributors, or goods manufacturers. Most inventory packages do routinely generate most of the reports a transit property would require: reorder prompting, usage analysis, inventory valuation, and parts issue expense reports. However, a transit property would require a package which could be modified to make it suitable for use as a vehicle maintenance parts inventory package rather than its original use. At the same time, additional features which Metro wants could be added. Sales and profit data would be eliminated from reports. Metro's additional features would be a comparative vendor analysis (which is not standard and which would require regular file maintenance to keep up to date) and parts costing by vehicle.

D. Ridership Reporting Application Areas

Metro currently generates monthly ridership reports using another Apple II+ in house program written in Microsoft BASIC. The regular monthly report shows route and system revenue, ridership (total and by fare classification), vehicle hours, and vehicle miles for the month and year-to-date. Inputs are each operator's daily operator report (daily) and total vehicle miles and hours (monthly, already assigned to routes). Metro would like to convert this application to the proposed computer system, partly to increase its capability, partly to provide interfaces with other applications, but primarily to relieve the payroll clerk of tedious program input so he can be used for other data processing purposes.

Ridership surveys on Metro are all administered and processed by the Council of Governments, the local MPO. Metro has no need or desire to change this but would like the MPO to have the capability to do its survey processing on the proposed Metro computer. The priority is low because the MPO currently has other options. Metro itself could use its Apple II+ as a terminal on the University of Southern Maine's IBM 4300 computer, on which both SAS and SPSS statistical packages are available; Metro has not to date used this capability.

E. Personnel / Administration Application Areas

Metro expressed an interest in using a computer to facilitate operator personnel administration. This function would include recordkeeping and reporting for operator disciplinary actions, absences (occurrences and reasons), vacation and sick leave earned and taken, accident information, and complaint information. The complexity of the labor agreement makes both manual administration and use of an existing package difficult. (Sick pay, for example, depends on seniority and may or may not require a waiting period; disciplinary statistics must "roll over," that is, can only go back so far, etc.) Current manual processing is tedious and cumbersome, and current reporting is of limited usefulness in monitoring operator performance. Additional reporting would be useful, but the exact reports would be difficult to pre-define at this point; any program installed would have to have a flexible report generation capability.

General personnel recordkeeping does not appear to be a priority. A limited amount of personnel administration is performed by the existing payroll program, and any new payroll program would presumably do the same.

Word processing is currently performed on Metro's CPT dedicated word processing system. Although there is no possibility of interface with other programs, there is no need to consider a requirement for word processing on the proposed system. Further, any new system considered is certain to have word processing available should interfaces (and therefore a new word processing package) become necessary.

F. Application Area Summary

The discussions of application areas with Metro staff are summarized in Table 1. The accounting and payroll application areas have the highest priority for implementation for Metro because of the inefficiencies and lack of interfaces with the existing package and the inability to take any action to correct the problems, together with the fact that suitable package software exists which can be modified to meet Metro's requirements.

The second priority level for implementation includes operator timekeeping and operator personnel administration. For both of these application areas, programs would have to be developed or existing transit specific programs would have to be modified substantially. However, these areas represent areas which are most difficult for Metro to process manually and for which the greatest benefit would result. In addition to more efficient processing, computer programs in these areas could generate useful information not currently available with manual processing.

The third priority level is comprised of ridership reporting. Although the process is currently automated and the results are good, the current procedure takes a significant amount of time for data input, and the results cannot easily be used for further analysis or interface with other applications. A major objective of a new program would be a more efficient input procedure to free time for the payroll clerk, who has done all of the Apple II+ programming to date and who would logically become involved in the development and use of the new system.

The fourth priority level includes parts inventory control. Although an automated inventory system would provide features not currently available and suitable software exists which could be modified to meet Metro's needs, this is an area best left as is for now. Personnel issues are sensitive in this area, and benefits would not be realized until staff could be reassigned. Revising staff positions involves the bargaining unit and is likely to take some time. The current manual procedure is satisfactory, and no significant problems are perceived with the current system.

The fifth priority level includes daily servicing input and reporting. While this area would be helpful, its implementation should be coordinated with implementation of the automated fueling system. If the automated fueling system is implemented immediately, the priority level of this area would rise to take advantage of an automated interface and improved and more timely servicing reporting. This implementation would also free some of the payroll clerk's time.

The sixth priority level includes vehicle history record-keeping and vehicle maintenance scheduling. Manual processing is satisfactory for Metro at this point, and the cost and features of existing packages are currently such that vehicle maintenance administration might well benefit from a delay. More software should become available with a trend toward more transit specific features and lower cost.

The seventh priority level is comprised of budget development. Since this likely will involve use of a spreadsheet and interface with the general ledger, it may well be implemented on the proposed system early on simply by converting the existing VisiCalc program. The points to make here are that (a) the capability does already exist and (b) any work in this area should not preclude development in any of the other application areas.

To implement the system, the priority levels would be grouped into implementation phases. A recommended plan is to use three (or more) implementation phases as follows:

Implementation Phase I:

- general ledger;
- accounts payable;
- accounts receivable;
- payroll, gross-to-net processing;
- operator timekeeping, and
- operator personnel administration.

Implementation Phase II:

- ridership reporting and
- parts inventory control.

Future implementation phase(s):

- daily servicing input and reporting;
- vehicle history recordkeeping;
- vehicle maintenance scheduling; and
- budget development.

The phasing plan should allow orderly system development and transition both for the transit property staff and for a contractor implementing the system. This particular sequence takes maximum advantage of package software and likely developments in software available for the transit industry.

III. HARDWARE CONFIGURATION CONSIDERATIONS

It would be premature for this report to recommend specific hardware for Portland Metro. However, some general recommendations can be made based on the application areas proposed for implementation. The following considerations contribute to the determination of a hardware configuration:

- application areas initially and ultimately expected to be implemented;
- which staff positions will likely have responsibility for program input for each application and which positions will likely have use for information from each application area, either via screen display or printed output reports;
- projected volume of input for each application area;
- the expected amount of sharing of data between application areas and consequent required integration of application areas; and
- physical layout of the transit facility and environmental considerations for computer facilities.

Portland Metro is moving to a new facility in 1984, and the last consideration places little or no constraint on placement of computer facilities.

These considerations led to the specification of a number of "workstations" required for Portland Metro and the staff positions at which they would be required. A workstation provides access to a computer. It may be either a computer itself (standalone or tied to another computer) or simply a terminal connected to a computer. At a minimum, a workstation consists of a keyboard, a monitor, and some processing hardware and software to permit it to function. The number of workstations, in turn, is a primary consideration in determining the "power" and configuration of the computer (or computers) required to implement the proposed system.

Table 2 shows the recommendation for workstations for Portland Metro based on the considerations listed and discussed with Metro staff. A total of eight workstations are recommended, as shown in Table 2. Four will be required to implement Phase I application areas; four more will be required to implement Phase II application areas. Additional workstations might be needed for additional application areas, but the total number should never exceed ten for Portland Metro.

TABLE 2
WORKSTATION REQUIREMENTS FOR PORTLAND METRO

Number of Work- stations	Staff Position for Workstation	Use of Workstation(s)
1 (Phase I)	Accounting Clerk	Input and output for general ledger, accounts payable, accounts receivable
1 (Phase I)	Payroll Clerk	Input and output for payroll, Output for ridership reporting, System administration
1 (Phase I)	Finance Director	Query and output of accounting information, Input and output for budget development
1 (Phase II)	Transportation Manager	Query of operator personnel administration information
1 (Phase I)	Dispatcher Operations Clerk	Input for operator timekeeping Input for ridership reporting
1 (Phase II)	Inventory Clerk	Input and output for parts inventory control, Input for vehicle maintenance
1 (Phase II)	Maintenance Manager	Input and output for vehicle maintenance, Query and output for parts inventory control
1 (Phase II)	General Manager	Input and output for budget development, Query of accounting, vehicle maintenance, parts inventory control, ridership reporting information
 8	TOTAL WORKSTATIONS	

This report does not recommend a specific computer system configuration for Portland Metro, but several considerations are offered. There are four alternative computer system configurations to consider, as follows:

- multiple single user computers;
- a local area network of computers;
- a distributed processing multi-user computer system;
and
- a multi-user computer.

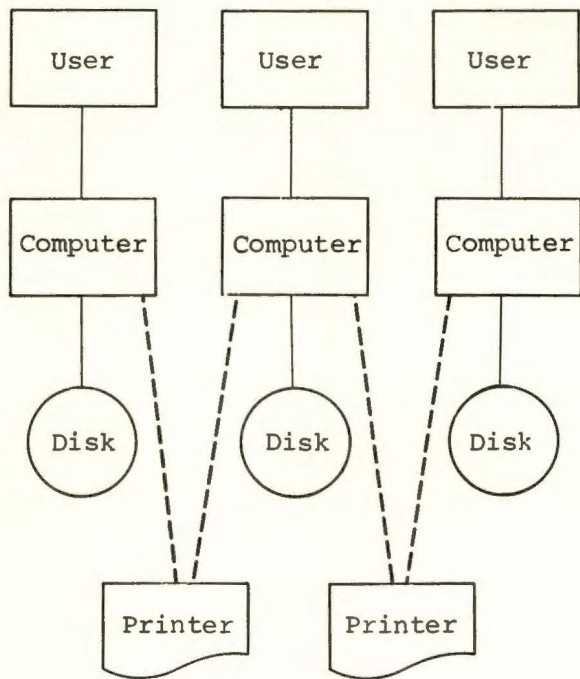
These four alternative computer system configurations are illustrated figuratively in Figure 1 and briefly described and compared in Table 3. Multiple single user microcomputers, the first alternative, would not be suitable for Portland Metro because of the number of workstations required and the amount of interfaces required between applications. This configuration would not work logistically, and the cost would be too high.

The choice between other configurations depends on the state of the art in each area at the time Metro proceeds with its implementation. If the choice were to be made at this time, the recommendation would be for a multi-user computer because the most software is available for this configuration and the configuration is the least expensive for Metro's proposed system, both initially and ultimately. The most significant disadvantage of this configuration is the poor response time when the system has several users, but this is primarily a problem only if all users are using the system heavily, and several users are performing the same application, a situation which will not occur frequently at Metro. While there is a limit on the number of users (which Metro may well exceed), expansion can be accommodated by adding a second computer and networking the two, if necessary.

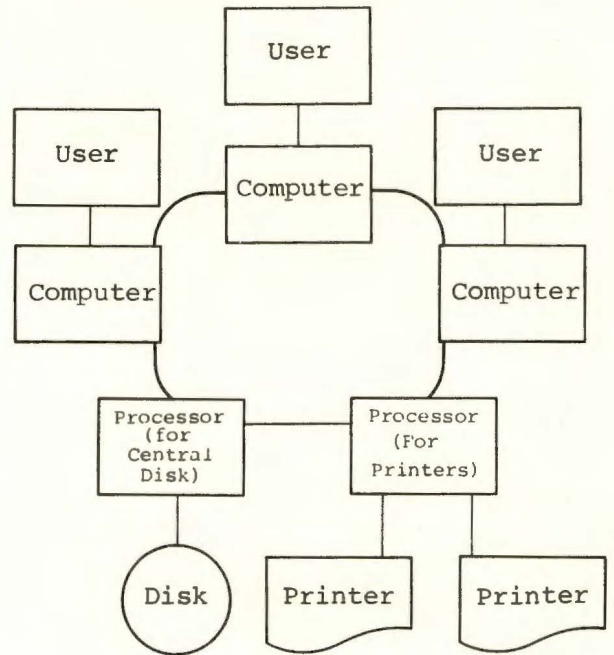
One way to make the selection is to issue specifications to which vendors representing any of the three configurations could bid and see which system comes out best. Since software availability is a major consideration for these configurations, package software must be considered if this procurement strategy is used. At the very least, package software would have to be demonstrated on each system, particular on those for which software availability is an issue.

Figure 1

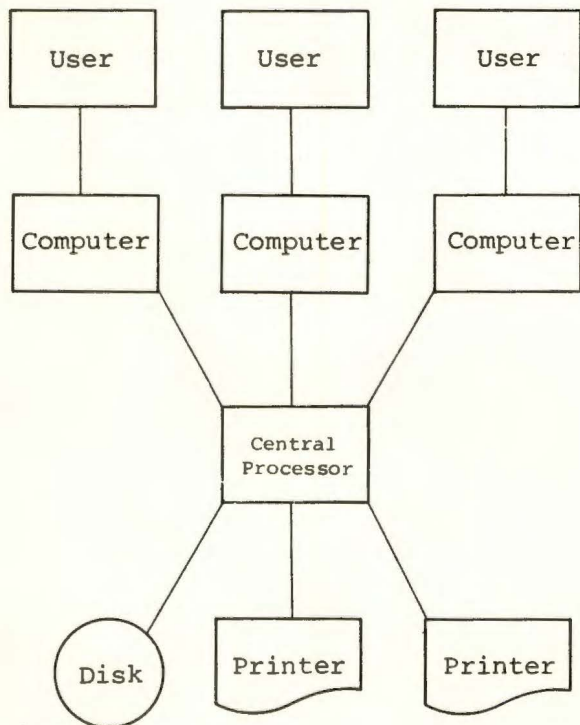
ALTERNATIVE COMPUTER SYSTEM CONFIGURATIONS



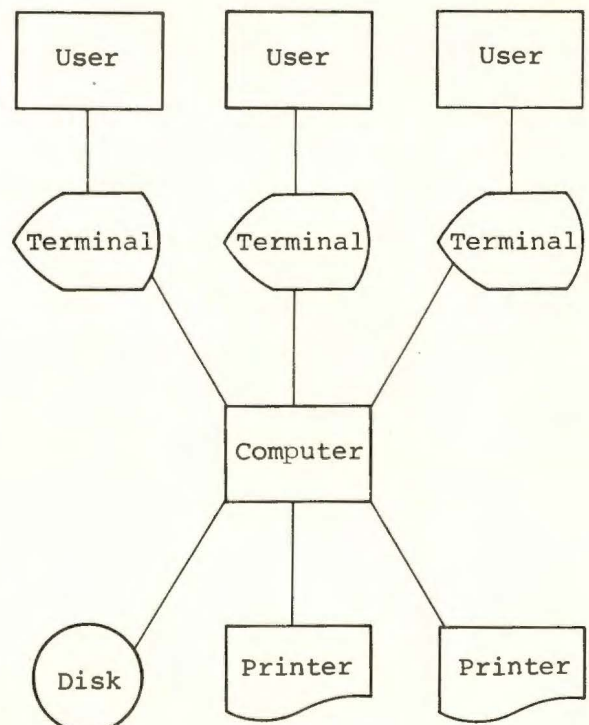
SINGLE USER COMPUTERS



LOCAL AREA NETWORK



DISTRIBUTED PROCESSING
MULTI-USER COMPUTER SYSTEM



MULTI-USER COMPUTER

TABLE 3
COMPARISON OF ALTERNATIVE COMPUTER SYSTEM CONFIGURATIONS

System	Advantages	Disadvantages	Considerations for Portland Metro	Example Systems
Single User Computers	Wealth of software available Maturity of hardware, software, operating systems	Expensive on a per user basis Difficult to integrate applications	Too expensive for number of workstations at Metro Problems of integrating applications	IBM PC TI Prof Apple HP 150 Wang PC DEC Rnbw
Local Area Network	Unlimited expansion capability Rapidly expanding use and software availability	New system, not enough experience Not much software available yet New transit specific software may not run on system	Little software available now Too new Good if ultimate expansion not yet determined Good integration between applications	PC Net with IBM PC's MagNet with Zenith Z-100's
Distributed Processing Multi-user Computer System	Less expensive per user Data on shared disk, easy to integrate applications	Limited experience May be software availability problem New transit specific software may not run on system	Cost effective Software limitation possibility Good integration between applications	Tele-video 816 Action Discovery Micro-net
Multi-user Computer	Least expensive per user if over 3 users Rapidly expanding software availability May be networked to provide expansion	Limited software availability now System slows considerably if more than 5 users New transit specific software may not run on system	Cost effective Software limitation possibility Good integration between applications	Altos 586 Onyx Wicat Dyna-byte

IV. PLAN FOR SYSTEM DEVELOPMENT

This final chapter briefly outlines a plan for development of the Portland Metro computer system. The plan lists tasks which should be performed to develop the system proposed in the previous chapters. Metro has existing or potential resources available to perform much of the plan. Various combinations of funding sources can and should be used, as available. Metro management will have to determine which plan elements are appropriate for each resource. The remainder of the Section 6 Demonstration Grant funding should be used to research, procure, and implement package software. Capital grant funding can be used to acquire hardware and system software. Section 8 technical study grants can be used to plan and develop the system.

The following tasks are proposed to design, develop, and implement the Metro system:

1. Develop functional requirements for application areas to be implemented.
2. Conduct software review and evaluation of candidate software packages.
3. Develop implementation plan.
4. Conduct computer procurement and install computer system.
5. Install Phase I package software and perform required modifications.
6. Design and develop new Phase I applications software.
7. Prepare user and system documentation for developed software.
8. Perform conversion from manual to automated procedures for Phase I applications software.
9. Conduct staff training for Phase I applications software.

Each is discussed briefly below.

A. Functional Requirements

Metro must define functional requirements for each application area to be implemented, regardless whether a package is to be implemented or software is to be developed. Functional requirements will be used to determine if candidate packages meet Metro's requirements. Functional requirements provide a design both for modifications to package software and for new software to be developed. Functional requirements generally include the following for each application area:

- identification and description of inputs;
- identification and description of data to be input from other programs;
- identification and description of outputs, including printed output reports, information displays, and output files for use in other programs;
- brief description of procedures involved in the application area; and
- notes about conditions specific to the particular transit property.

Sample functional requirements for parts inventory control (not necessarily specific to Metro) are shown in Appendix B.

B. Software Review and Evaluation

Existing software should be used to the extent possible in the Portland Metro computer system. As shown in Table 1, package software should be used for all accounting, payroll, and parts inventory control application areas and possibly operator timekeeping and vehicle maintenance application areas. The analysis of this task involves determination if any package is suitable for a given application area and, if so, evaluating candidate packages. This task must necessarily be performed for the major application areas before a computer system is selected so that suitable packages are not eliminated from consideration by selection of a restrictive computer system environment on which a suitable package would not run.

The following criteria are recommended for evaluating package software for Metro applications:

- functions and capabilities of the package vis a vis the functional requirements developed for the application area for Metro;

- computer environments in which the package will operate, with consideration of computer hardware, data storage formats, and operating system requirements; are environments likely to be those suitable for Metro's computer?
- ability of the package to be modified as required; source code availability; warranty conditions if modifications are made; availability and cost of vendor staff to make modifications as required;
- ability of the package to interface with other programs as required; i.e., operator timekeeping and payroll, gross-to-net processing;
- cost of the package, including cost to acquire the software, cost to provide ongoing support, and cost for modifications;
- support provided, including on-site staff availability for installation and training for packages not widely commercially available, telephone hotline availability, policy on package updates, policy on program bugs; and
- evaluation of documentation, including sections of documentation included (tutorial, reference sections, index, and liberal use of example screens and reports) and ease of use.

The recommended use for expending the remaining Section 6 Demonstration Grant funds is to perform this task for those application areas in Table 1 ranked for inclusion in the system (i.e., a numbered priority) for which packages should be considered, including general ledger, accounts payable, accounts receivable, payroll gross-to-net processing, budget development, operator timekeeping, parts inventory control, vehicle history recordkeeping and maintenance scheduling, and ridership reporting.

For the accounting, payroll, and inventory packages, only those packages which are complete "sets" (i.e., a comprehensive family of accounting, payroll, and inventory software) and have been used extensively should be considered. Recommended candidates include the following systems:

- Micro Level I Microcomputer Software; MCBA, Inc.;
- Real World Software; Micro Business Software, Inc. (MBSI);
- Software Fitness Program; Open Systems, Inc.; and
- Business Accounting Control Systems; American Business Systems, Inc.

Recommended candidate packages for vehicle maintenance include the following:

- Fleet Maintenance System; DDS, Inc.;
- Fleet Controller; Fleet Tech International, Inc.;
- Hercules; Computer Task Group, Inc.; and
- Computerized Fleet Maintenance; CFM, Inc.

C. Implementation Plan

An implementation plan should be prepared prior to implementation to ensure that planning and design necessary for a successful implementation have been done. It is certainly possible to "overstudy a design" such that implementation never proceeds. However, the objective here is to ensure that Portland Metro embarks on a path which leads to a computer system which benefits the property for several years. Premature implementation might lead to a fragmented system with limited benefit (as is the case with the current system) or an irreversible course toward a system which does not meet Metro's needs.

The recommended implementation plan would include the following:

- a list and description of applications software to be implemented at Portland Metro; specification of what software will be implemented with existing packages and what software will be developed;
- a plan for phased implementation of applications at Portland Metro, specifying which applications are included in each phase and why;
- the planned computer system configuration for Portland Metro based on the considerations discussed above;
- functional requirements for each application area in the initial implementation phase, including specification of modifications required for package software (if any) and design specifications for new software to be developed;
- Portland Metro staff and contractor resource requirement estimates for development, installation, system conversion, and training for each application area in the initial implementation phase;

- a training plan and schedule for development, installation, system conversion, and training for each application area in the initial implementation phase; and
- estimate of computer procurement costs, software procurement costs, and contractor costs for each implementation phase.

The implementation plan ensures that all Metro staff and contractor staff are apprised of what will be implemented and when. Note the recommendation in this report that Phase I include implementation of general ledger, accounts payable, accounts receivable, payroll gross-to-net processing, operator timekeeping, and operator personal administration application areas. Recommended Phase II application areas include rider-ship reporting and parts inventory control. Application areas for future implementation phases would include budget development, vehicle history recordkeeping, vehicle maintenance scheduling, and daily servicing reporting. Elements of the implementation plan pertaining to use of package software can be funded and developed using funds remaining in the Section 6 Demonstration Grant.

D. Computer Procurement and Installation

The computer for the Portland Metro system, associated computer hardware, system software, and package software will likely be competitively bid. Bid specifications would be prepared based on the hardware and software requirements outlined in the implementation plan. A sample draft of a the technical specifications for a computer system bid is shown in Appendix A. The sample is for a multi-user computer, which is one of the candidate computer system configurations for Portland Metro, but not necessarily the best configuration for Metro. One recommendation is to bid the three multi-user candidate configurations shown in Figure 1 and make a decision based on an evaluation of the results of the bid and demonstrations of bidder systems.

The bid should include installation and testing of all hardware and software in the procurement at the new Portland Metro facility.

E. Package Software Installation

Package software in the initial implementation phase would be loaded and tested on the Portland Metro computer system. Modifications would be made according to specification (by Metro staff, contractor, or software vendor, as would be decided prior to procurement of each package). Each package requires some level of "installation," which includes loading the software onto the system, establishing test and production files on the system, development and input of general system parameters (such as name of agency, selection of options such as FIFO or LIFO accounting in inventory, and file sizing for the property), development of "tables" where required (such as passwords and state tax tables), and design of reports where the package allows user specification.

F. New Software Installation

For the software which must be developed, program code must be written to design specifications. Design specifications would be prepared from the functional specifications in the implementation plan. New programs would be installed and tested on the Portland Metro computer. Interfaces with other applications software programs would be tested.

G. User and System Documentation

Portland Metro will require user documentation to operate both package software and developed software. Package software always includes a user's manual (although the quality varies among packages). The contractor (or Metro staff member) who develops new software must provide a satisfactory user manual in order for the software to be used properly. User's manuals for package software should be modified accordingly if modifications are made to the software.

System documentation refers to documentation of the design and structure of the software itself. It would only be required for new software or modified package software, such that the installed software can be inspected and understood, should problems arise with production use of the software or future modifications be required. (This point should be well taken by Portland Metro, which is in the position of having existing software which cannot be modified because no system documentation exists.)

H. System Conversion

System conversion involves performing tasks required to convert from existing manual procedures to the computer system for a given application area. This involves the following steps:

- collection of data required to initialize the system (e.g., taking of physical inventory, determining end of period accounting balances);
- input of "master file" information (e.g., input of inventory item descriptions, costs, balances);
- ordering of forms required for system (e.g., new check stock); and
- parallel running of manual and computer systems for those applications which require a test period (e.g., payroll or general ledger).

I. Training

Training is that phase of a computer implementation which is frequently neglected because of time or budget constraints but which can make a project a success or a failure. An implementation is only successful if users know and understand the use of the programs. This requires both good user documentation and effective training.

A training program should include both lecture and demonstration. There should be three levels of training, as follows:

- general training about the installed software for Metro management so they understand the use of each program and can make decisions about further system development;
- training in running and maintaining the system as installed for a "systems administrator," a non data processing person on Metro staff who would be in charge of running the system. At Metro, this is likely to be the payroll clerk, who has shown both an interest and an aptitude in microcomputers; and
- training in the specific use of each program for all staff members who will be entering input, obtaining information on screen displays, and generating printed output reports.

Training should be "hands on" to the extent possible. Staff members should be using terminals and printers. Real data should be used; most programs allow users to "practice" by using real data but placing the data in test files rather than "live" production files. Training should include walk-throughs of all procedures which will be used. The evidence of a good training program is that (a) programs are used as intended and (b) people who have been trained can successfully train other staff members.

APPENDIX A

SAMPLE COMPUTER

SPECIFICATIONS

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE

A. Computer and interfaces, as follows:

1. Computer must meet specifications as follows: 1

- a. Computer's central processing unit microprocessor must be an Intel 8086 (or member of Intel 8086 family) with a minimum clock speed of 8 Mhz
- b. Computer must have internal diagnostics, including parity checking and automatic power on self-testing
- c. Computer must have an internal real time clock and calendar with battery backup
- d. Computer must have internal boards or expansion slots to accommodate controller boards for interfaces with the following (initial configuration capability):
 - three terminals,
 - one floppy disk drive,
 - one hard disk drive,
 - one letter quality printer, and
 - one dot matrix printer, and
 with capability to add the following in a future configuration:
 - three additional terminals and
 - one additional hard disk drive of same capacity as original hard disk drive
 Interface ports may be parallel or serial; serial ports must be RS 232C ports with standard serial I/O protocol and software selectable communications speeds of 110 through 9600 baud; parallel ports must be Centronics compatible
- e. Computer must have external 16 bit data bus (S-100, Multibus, or equivalent) and 16 bit internal architecture
- f. Computer must have internal random access memory (RAM) of 512 Kb or greater, with capability to upgrade to at least 1 Mb of internal memory
- g. Computer system must have an attractive enclosure or enclosures for all integrated components; each must be suitable for desktop placement or placement alongside a desk
- h. Computer must include a power supply with a rated capacity in excess of 150% of the power requirements of all components
- i. Computer must be adequately ventilated and must, if necessary, include a ventilation fan

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 2)

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE (Continued)

A. Computer and interfaces (Continued):

- | | | | |
|--|----------------------------|--|--|
| 2. Computer must have one or more controllers, as required to provide interfaces for hard disk drive and floppy disk drive (and other backup mechanism, if required); computer must have capability to add controller(s) or for initial controller to accommodate one additional hard disk drive (of same capacity as original) and one additional floppy disk drive | <u>2</u>
(1 per drive) | | |
| 3. Computer must have controllers to provide interfaces for four computer terminals with capability to add controllers for four additional terminals; each controller must be capable of generating bit mapped monochrome graphics display output | <u>4</u>
(1 per termnl) | | |
| 4. Computer must have a controller to provide an interface with an RS 232C serial and/or a Centronics compatible parallel letter quality printer | <u>1</u> | | |
| 5. Computer must have a controller to provide an interface with an RS 232C serial and/or a Centronics compatible parallel dot matrix printer | <u>1</u> | | |
| 6. Voltage regulator or uninterruptable power supply as required to provide adequate protection of computer from deviations in the ambient power supply (voltage spikes, faults, dips, surges, and line noise) | <u>1</u> | | |

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 3)

Bidder Name: _____
 Address: _____

 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE (Continued)

B. Auxiliary storage

1. Computer must have on-line hard disk auxiliary data storage available in the following capacities (unformatted) on a single disk drive: 40 megabytes (or greater, specify size) Hard disk drive must operate satisfactorily with specific controller installed in computer	1		
2. Interface adaptor and software required to operate hard disk drive with specified computer	1		
3. Cable and cable connectors as required to connect hard disk drive to controller on computer	1 set		
4. Cartridge tape backup drive must be available with capability to stream entire contents of respective hard disk onto tape	1 (opt)		
5. Blank tape cartridges for cartridge tape backup	4 (opt)		
6. Head cleaning kit for cartridge tape drive	1 (opt)		
7. Computer must have one (or more) disk drive for floppy diskettes; each floppy disk drive must meet specifications as follows: a. The floppy disk drive must be internal to the computer b. The floppy disk drive must handle 5.25 inch double sided, quad density diskettes, with a capacity of 1 megabyte of data storage (unformatted) per diskette c. The floppy disk drive must operate satisfactorily with specific controller board installed in computer	1		
8. Internal cable and cable connectors as required to connect floppy disk drives to controller on computer	1 set		
9. Diskettes for floppy disk drive specified	20 (2 bxs)		
10. Head cleaning kit for floppy disk drive	1		

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 4)

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE (Continued)

C. Computer terminals

Computer must have terminals and terminal connections which meet specifications as follows:

1. Each computer terminal must have a keyboard and display which meet specifications as follows:

- a. Each keyboard must have a minimum of ASCII 96 character set, standard typewriter layout ("QWERTY") and keys; upper and lower case characters; keyboard must have the following:
- a separate 10 key numeric keypad,
 - separate cursor control keys, (minimum of four directional arrows plus Home keys),
 - standard data terminal keys (minimum of Control, Escape, and Break keys),
 - edit keys (minimum of Insert, Delete, Next Page, Previous Page, and Caps Lock keys), and
 - programmable function keys (minimum of 10 keys);

Keyboard must be of ergonomic design with tactile touch and/or audible feedback when a key is pressed

- b. Each monitor must have capability to display a minimum of 24 rows and 80 columns plus a 25th row status line; display must measure at least 12 inches diagonally and have a non-glare screen; display must have a minimum of the following visual attributes:
- reverse video,
 - underline,
 - cursor blink, and
 - highlighting (or half intensity)
- Display must have bit mapped graphics display capability with a minimum resolution of 500 horizontal by 200 vertical pixels; display must operate satisfactorily with specific controller board installed in computer

2. Cable and cable connectors as required to connect each computer terminal to respective controller on computer

	4		
	4 sets		

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 5)

Bidder Name: _____
 Address: _____

 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE (Continued)

D. Letter quality printer, accessories, and supplies

1. Letter quality printer must meet specifications as follows:	1		
a. Printer may operate with RS 232C serial and/or Centronics compatible parallel interface			
b. Printer must be a daisy wheel or thimble printer which produces fully formed characters, including descenders and has a minimum of ASCII 96 character set			
c. Printer must have software selectable capabilities, including 10 or 12 character per inch pitch, variable tabbing, line feed, and form feed			
d. Printer must have underline and overstrike capabilities			
e. Printer must operate at a minimum speed of 23 characters per second			
f. Printer must have optional 6 or 8 lines per inch line spacing			
g. Printer must be able to accommodate forms of up to 15 inches in width; must be able to print up to 132 characters per line			
h. Printer must have friction paper feed, accommodating continuous form or single sheet feed paper			
i. Printer must be designed to operate satisfactorily when connected to controller on computer specified			
2. Printer must have tractor feed (either with printer as specified or as option) which will accommodate up to 4 part forms	1		
3. Cable and cable connectors as required to connect printer to controller on computer	1 set		
4. Printer stand for printer specified	1 (opt)		
5. Noise reduction cover for printer specified	1 (opt)		
6. Printwheels for printer specified	12		
7. Printer ribbons for printer specified	12		

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 6)

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE (Continued)

E. Dot matrix printer, accessories, and supplies

1. Dot matrix printer must meet specifications as follows:

1	_____	_____	_____
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- a. Printer may operate with RS 232C serial and/or Centronics compatible parallel interface
- b. Printer must use a minimum of 7 X 9 matrix for character formation, must have minimum of ASCII 96 character set; characters must have true descenders
- c. Printer must have both tractor and friction paper feed, with capability to accommodate forms from 4 to 15 inches in width and up to 4 part thickness
- d. Printer must have a minimum of 15 inch carriage with ability to print up to 132 characters per line
- e. Printer must have software selectable capabilities, including 10, 12, or 16.5 characters per inch pitch, 6 or 8 lines per inch line spacing, variable tabbing, line feed, and form feed
- f. Printer must have capability for proportional spacing, bidirectional printing, underlining, overstriking, superscripting, and subscripting
- g. Printer must operate at a minimum speed of 160 characters per second
- h. Printer must have capability to print dot addressable graphics
- i. Printer must be designed to operate satisfactorily when connected to controller on computer specified

2. Cable and cable connectors as required to connect printer to controller on computer

1 set	_____	_____	_____
-------	-------	-------	-------

3. Printer stand for printer specified

1 (opt)	_____	_____	_____
---------	-------	-------	-------

4. Noise reduction cover for printer specified

1 (opt)	_____	_____	_____
---------	-------	-------	-------

5. Printer ribbons for printer specified

12	_____	_____	_____
----	-------	-------	-------

6. Printer paper, continuous fanfold, 1 part, reducing to 8 1/2 by 11 inches after removal of perforated edges

2 boxes	_____	_____	_____
---------	-------	-------	-------

7. Printer paper, continuous fanfold, 1 part, 14 7/8 by 11 inches

2 boxes	_____	_____	_____
---------	-------	-------	-------

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 7)

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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I. COMPUTER SYSTEM HARDWARE (Continued)

F. Modems and connections

1. Modem must meet specifications as follows:
 - a. Modem must operate at 1200 baud or greater
 - b. Modem must have auto answer, auto dial capability
 - c. Modem must have standard diagnostic communications test functions, including DL, AL, ST, and RDL
 - d. Modem must include modular connection for RJ45S data line phone jack
2. Cables and cable connectors as required to connect modem to controller on computer
3. Cable and cable connectors as required to connect computer terminal to modem specified above

2			
1 set			
1 set			

G. Hardware documentation; operations guides must be provided for all hardware specified above

1. Guide to operations for computer
2. Guide to operations for hard disk drive
3. Guide to operations for floppy disk drive
4. Guide to operations for computer terminals
5. Guide to operations for letter quality printer
6. Guide to operations for dot matrix printer
7. Guide to operations for modem

1			
1			
1			
4			
1			
1			
1			

II. COMPUTER SYSTEM SOFTWARE

A. Operating systems

1. XENIX operating system
 Computer must operate under the XENIX operating system from Microsoft, version 2.4C or later; operating system must be provided (XENIX development system is acceptable)
2. UCSD-p operating system
 Computer must be capable of running under UCSD-p operating system, version IV.0 from Softech Microsystems; state availability of UCSD-p operating system (provision of UCSD-p operating system is optional)

1			
1 (opt)			

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 8)

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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II. COMPUTER SYSTEM SOFTWARE (Continued)

B. Data communications software

1. Data communications software Computer and operating system must be capable of running LYNC data communications software or equivalent (provision of LYNC data communications software or equivalent is optional)	1		
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C. Languages and applications software

1. Spreadsheet software package Computer and operating system must be capable of running Multiplan spreadsheet package from Microsoft or equivalent; state availability of Multiplan or equivalent (provision of Multiplan is optional)	1		
2. Word processing software package Computer and operating system must be capable of running LEX word processing package from Softest or equivalent; state availability of LEX word processing package or equivalent; (provision of a word processing package is optional)	1		
3. BI-286D Business BASIC language interpreter Computer and operating system must be capable of running BI-286D Business BASIC language interpreter; state availability of BI-286D Business BASIC language interpreter (provision of BI-286D Business BASIC language interpreter is optional)	1		
4. Open Systems Software Fitness Program (including general ledger, accounts payable accounts receivable, payroll, and inventory) Computer and operating system must be capable of running the Open Systems Software Fitness Program package; state availability of Open Systems Software Fitness Program package; (provision of Software Fitness Program package is optional)	1		

Note: All software must be provided on floppy diskettes that may be used on the computer system specified. One master copy must be provided and either one backup copy of the capability to make a backup copy must be provided. A user manual is to be provided with each software package procured from vendor

GREATER PORTLAND TRANSIT DISTRICT
 SAMPLE COMPUTER SYSTEM SPECIFICATIONS
 Multi-user Computer System (Continued, Page 9)

Bidder Name: _____
 Address: _____
 City, St, Zip: _____

Min Qty	Item Specified	Quoted Unit Price	Extended Price
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III. SYSTEM DELIVERY AND INSTALLATION

A. Delivery and installation

1. Computer systems is to be delivered on this procurement, delivery is to Greater Portland Transit District, located in Portland, Maine	<u>1</u> deliv- eries	<u>Delivery of computer system</u>		
2. Installation of the computer is to be included in this procurement. The computer, two terminals, and printers will be located in the transit accounting office; a third terminal will be located in the Finance Director office, and a fourth terminal will be located in the transit garage dispatcher office. Installation is to include all cabling and connectors necessary to provide a hardwire connection between the all sites. Contact Mr. Leo K. Hurtubise at Greater Portland Transit District at (207) 774-3778 to inquire about the installation or to arrange a site visit.	<u>1</u> instal- lation	<u>Installation of computer system</u>		

IV. WARRANTY AND POST WARRANTY SERVICE

A. Procurement is to include a minimum 90 day warranty on all parts and labor for all computer system hardware on an on-site basis; all software provided in this procurement must be subject to exchange in the event that a defective copy or backup copy is provided. Post warranty service must be available for all computer system hardware specified in bid. Service may be offered by either the bidder or another vendor, but a service center must be available in the Greater Portland area. State terms and cost for post warranty 12 month service contracts for computer system hardware:

1. 12 month service contract for computer specified	1			
2. 12 month service contract for hard disk drive specified	1			
3. 12 month service contract for floppy disk drive specified	1			
4. 12 month service contract for computer terminal specified	4			
5. 12 month service contract for letter quality printer specified	1			
6. 12 month service contract for dot matrix printer specified	1			
7. 12 month service contract for modems specified	1			

TOTAL, EXTENDED PRICE _____

A P P E N D I X B

S A M P L E

F U N C T I O N A L R E Q U I R E M E N T S

FUNCTIONAL REQUIREMENTS

APPLICATION: Parts inventory control

TRANSIT OPERATOR: Portland Metro

I. INPUTS

Input 1: Inventory master file information

Content of input: Identification and description

information for each item in inventory, including:

part number--GMC part number (minimum of 7
digits)

part description

alternate part number

vendor

primary vendor price

alternate vendor 1

alternate vendor 1 price

alternate vendor 2

alternate vendor 2 price

bin location

category (brakes, electrical, etc.)

minimum balance for reorder prompting

maximum balance

reorder quantity

on-hand quantity

Frequency of input: Once for each item, updated as
required to reflect data changes

Form of input: Terminal,
entered from current inventory cards

Volume of input: 3,000 inventory items

Who would input data: Inventory clerk

Location: Parts room

Input 2: Inventory parts issues

Content of input: Issue of parts for use on vehicles,
including:

part number

number of items issued

Frequency of input: Daily

Form of input: Terminal,
entered from parts tickets filled out by mechanic,

Volume of input: about 20 inventory issues per day

Who would input data: Inventory clerk

Location: Parts room

Input 3: Inventory parts receipts

Content of input: Receipt of parts upon delivery
including:

part number

number of items received

FUNCTIONAL REQUIREMENTS

APPLICATION: Parts inventory control (Continued, Page 2)
TRANSIT OPERATOR: Portland Metro

Input 3: Inventory parts receipts (continued)

Frequency of input: As required to process parts receipts (about 30 per week)

Volume of input: 300 inventory items received per week

Form of input: Terminal, entered from maintenance copy of Requisition for Material, updated with correct receiving information

Who would input data: Inventory clerk

Location: Parts room

Input 4: Inventory adjustments

Content of input: Adjustments to inventory to reflect errors found or actual physical inventory, including part number and correct item count

Frequency of input: On demand, as required

Form of input: Terminal, entered from physical inventory count sheet or adjustment form

Volume of input: About 20 adjustments per month, major adjustment volume (10 % of inventory) when physical inventory taken

Who would input data: Inventory clerk

Location: Parts room

II. PROCESSING

Procedure 1: Reorder prompting:

Scan of all items, all items at or below specified reorder point flagged for listing on reorder report

Procedure 2: Processing physical inventory:

Generation of forms for recording physical inventory, procedure to input adjustment quantities to reconcile physical and book inventory amounts

Procedure 3: Reporting for vehicle histories:

Actual parts issued and parts cost for a particular vehicle automatically printed for vehicle history recordkeeping;

Procedure 4: Posting to general ledger:

Generation of report of parts cost for issues for posting to general ledger (as manual general journal entry) using first-in, first-out (FIFO) inventory costing method

FUNCTIONAL REQUIREMENTS

APPLICATION: Parts inventory control (Continued, Page 3)
TRANSIT OPERATOR: Portland Metro

III. OUTPUTS

Output 1: Reorder prompting report

Content of output: Items listed for reorder, based on scan of all items, on-hand quantity at or below specified minimum quantity, in sequence by part number or bin location; data reported include
item part number and description
unit of measure (each, package of 10, dozen, etc.)
bin location
part category
vendor for reorder and alternate vendor
on-hand amount
minimum balance
reorder quantity
date of last receipt (item received for inventory)
last unit cost
reorder cost

Frequency of output: Weekly, (display available on request as required)

Form of output: Printout, available as display on monitor

Output generated by: Inventory clerk

Location: Parts room

Used by: Inventory clerk, Maintenance Manager

Output 2: Usage analysis

Content of output: Items listed with usage of parts, specification of all parts, parts within specified categories, or parts exceeding a specified usage, usage based on issue quantities; data reported include
item part number and description
quantity issued, month to date
cost of issues, month to date
quantity issued, year to date
cost of issues, year to date
on-hand quantity
valuation of on-hand inventory

Frequency of output: Weekly

Form of output: Printout, available as display on monitor

Output generated by: Inventory clerk

Location: Parts room

Used by: Inventory clerk, Maintenance Manager

FUNCTIONAL REQUIREMENTS

APPLICATION: Parts inventory control (Continued, Page 4)
TRANSIT OPERATOR: Portland Metro

Output 3: Inventory valuation report

Content of output: All items listed with valuation of each item and total valuation for all inventory; based on first-in, first-out (FIFO) inventory costing

Frequency of output: Monthly

Form of output: Printout

Output generated by: Inventory clerk

Location: Parts room

Used by: General Manager, Maintenance Manager, Finance Director

Output 4: Form for recording physical inventory

Content of output: List of all items in bin location sequence, including

item part number and description

blank line to record physical inventory

Frequency of output: Annually

Form of output: Printout

Output generated by: Inventory clerk

Location: Parts room

Used by: Inventory clerk, Mechanics

Output 5: Inventory detail list

Content of output: Detail list of all master file information for all items in inventory

Frequency of output: On-demand, as required

Form of output: Printout

Output generated by: Inventory clerk

Location: Parts room

Used by: Maintenance Manager, Inventory clerk

Output 6: Parts issues expense report

Content of output: List of parts issued in the month and computed cost for parts issued for input to general ledger

Frequency of output: Monthly

Form of output: Printout

Output generated by: Inventory clerk

Location: Parts room

Used by: General Manager, Maintenance Manager, Finance Director

FUNCTIONAL REQUIREMENTS

APPLICATION: Parts inventory control (Continued, Page 5)
TRANSIT OPERATOR: Portland Metro

IV. OTHER FEATURES, NOTES

Note 1: Inventory valuation and costing of issues by first-in, first-out (FIFO) method

Note 2: Inventory package must have capacity for 5,000 items

Note 3: Inventory package will perform month end and year end file maintenance (zero out month-to-date and year-to-date figures)

Note 4: Printed inventory reports can be generated by item, for all items, or by category

Note 5: Inventory package programs accessible only by user password

TECHNICAL ASSISTANCE REPORT

Requestor: Greater Portland Transit District
(Portland Metro) 17 Westfield Street
Mr. Leo Hurtubise, Portland, ME 04104
General Manager
Ms. Sarah DeDoes
Finance Director

Referred by: Mr. Ron Jensen-Fisher Dates: 7/20/83-10/30/83
Urban Mass Transportation Administration

Type of TA: X Site Visit

Follow up? No

TA Provided by: Howard Ostroff Hours worked: 24

Topic: Assistance to assess potential for commercial package software and to determine general computer requirements

Notes: Portland Metro was awarded a Section 6 Demonstration Grant to demonstrate the use of a microcomputer and commercial package software on a small transit property. The objectives of this technical assistance were to review the status of work on the Section 6 project and to give Metro some direction in the development of a computer system to serve all computing needs of the property. The assistance consisted of (a) a review of the applications developed on both the microcomputer obtained with Section 6 funds and an older minicomputer at Metro and (b) consideration of potential application areas for computer system implementation at Metro. Discussions were held with the General Manager, Finance Director, and Payroll Clerk (who had done the microcomputer work and was interested in further computer system development at Metro). Potential applications in financial, operations, inventory and vehicle maintenance, ridership reporting, and personnel and general administration were covered. The results of the assistance were documented in a technical report, which has been submitted to Portland Metro, to UMTA (the referring agency), and to Crain and Associates as documentation of the work performed.

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