

REPORT DOCUMENTATION PAGE Dist: A

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank) 2. REPORT DATE 3. REPORT TYPE AND DATES COVERED
FINAL 30 Sep 93 TO 29 Sep 94

4. TITLE AND SUBTITLE
MODE OF HUMAN IMAGE REPRESENTATION AND ERROR CHECKING STRATEGIES IN COMPLEX VISUAL DISPLAYS
5. FUNDING NUMBERS
F49620-93-1 0608
62228D
4276-AS

6. AUTHOR(S)
Dr Albert B. Miller

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Dept of Psychology
Delaware State College
1200 North Dupont Highway
Dover DE 19901
8. PERFORMING ORGANIZATION REPORT NUMBER
AFOSR-TR- 95 0005

DTIC ELECTE D
S JAN 31 1995 G

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
AFOSR/NL
110 Duncan Ave Suite B115
Bolling AFB DC 20332-0001
Lt Col Collins
10. SPONSORING / MONITORING AGENCY REPORT NUMBER
19950127 194

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.
DISTRIBUTION STATEMENT A
Approved for public release; Distribution Unlimited
12b. DISTRIBUTION CODE
A

13. ABSTRACT (Maximum 200 words)
Experimental designs are currently being developed which will utilize the laboratory resources obtained under this grant for the purpose of examining error-checking strategies of human observers when monitoring complex visual displays. Some preliminary software was developed and it is hoped that this development will be able to continue with the acquisition of research support. During the period of this grant, discussions were held with staff at the National Transportation Safety Board and with staff at the Aviation Safety Reporting System Office at Battelle which provided us with data base searches of human error incidents involved in aircraft accidents. This data has been extremely useful in our preliminary development of experimental protocols which will allow us to develop Department of Defense relevant research studies.

14. SUBJECT TERMS 15. NUMBER OF PAGES
16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT (U) 18. SECURITY CLASSIFICATION OF THIS PAGE (U) 19. SECURITY CLASSIFICATION OF ABSTRACT (U) 20. LIMITATION OF ABSTRACT (U)

GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filling in each block of the form follow. It is important to *stay within the lines* to meet optical scanning requirements.

Block 1. Agency Use Only (Leave blank).

Block 2. Report Date. Full publication date including day, month, and year, if available (e.g. 1 Jan 88). Must cite at least the year.

Block 3. Type of Report and Dates Covered. State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g. 10 Jun 87 - 30 Jun 88).

Block 4. Title and Subtitle. A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

Block 5. Funding Numbers. To include contract and grant numbers; may include program element number(s), project number(s), task number(s), and work unit number(s). Use the following labels:

- | | |
|----------------------|-----------------------------|
| C - Contract | FF - Project |
| G - Grant | TZ - Task |
| PE - Program Element | WU - Work Unit Accession No |

Block 6. Author(s). Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

Block 7. Performing Organization Name(s) and Address(es). Self-explanatory.

Block 8. Performing Organization Report Number. Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es). Self-explanatory.

Block 10. Sponsoring/Monitoring Agency Report Number. (If known)

Block 11. Supplementary Notes. Enter information not included elsewhere such as: Prepared in cooperation with...; Trans. of...; To be published in... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

Block 12a. Distribution/Availability Statement. Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g. NOTORN, REL, ITAR).

DDP - See DoDD 5230.24, "Distribution Statements on Technical Documents."

DOE - See authorities.

NASA - See Handbook NHB 2200.2.

NTIS - Leave blank.

Block 12b. Distribution Code.

DDP - Leave blank.

DOE - Enter DOE distribution categories from the Standard Distribution for Unclassified Scientific and Technical Reports.

NASA - Leave blank.

NTIS - Leave blank.

Block 13. Abstract. Include a brief (*Maximum 200 words*) factual summary of the most significant information contained in the report.

Block 14. Subject Terms. Keywords or phrases identifying major subjects in the report.

Block 15. Number of Pages. Enter the total number of pages.

Block 16. Price Code. Enter appropriate price code (*NTIS only*).

Blocks 17. - 19. Security Classifications. Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

MODE OF HUMAN IMAGE REPRESENTATION AND ERROR CHECKING
STRATEGIES IN COMPLEX VISUAL DISPLAYS

FINAL TECHNICAL REPORT
GRANT NO. FA 9620-93-1-0608
December 9, 1994

| | |
|---------------------|-------------------------------------|
| Accession For | |
| NTIS CRA&I | <input checked="" type="checkbox"/> |
| DTIC TAB | <input type="checkbox"/> |
| Unannounced | <input type="checkbox"/> |
| Justification | |
| By | |
| Distribution / | |
| Availability Codes | |
| Dist | Avail and/or Special |
| A-1 | |

DTIC QUALITY INSPECTED 3

Dr. Albert B. Miller
Principal Investigator
Department of Psychology
Delaware State University
Dover, DE 19901

28 DEC 1994

CONTENTS

- I. Project Goals
- II. Planning And Development Effort to Create DOD Relevant Research Productive Laboratory
- III. General Configuration of the Laboratory Resulting from the Grant
- IV. Summary of Planned Research Which Will Utilize the New Laboratory Resources
- V. Itemized List Of Purchases Made Under Grant No. FA 9620-93-1-0608

I. Project Goals

The major goal of this grant was to acquire equipment to set up a laboratory capable of conducting research of interest to the Department of Defense in a manner which would make the human cognition laboratory at Delaware State University capable of competing for research funding in DOD relevant areas.

II. Planning and Development Effort to Create DOD Relevant Research Productive Laboratory

In achieving our primary goal, it was necessary to examine and make provisions for the following functions:

- a. networking of all laboratory resources
- b. data acquisition involving electrophysiological data and numerical and video image data
- c. a variety of data analysis and graphic image protocols
- d. video image creation, capture and editing

These major resources were necessary in order to design effective DOD relevant research protocols. All of the equipment acquired is designed to achieve these objectives.

III. General Configuration of the Laboratory Resulting from the Grant

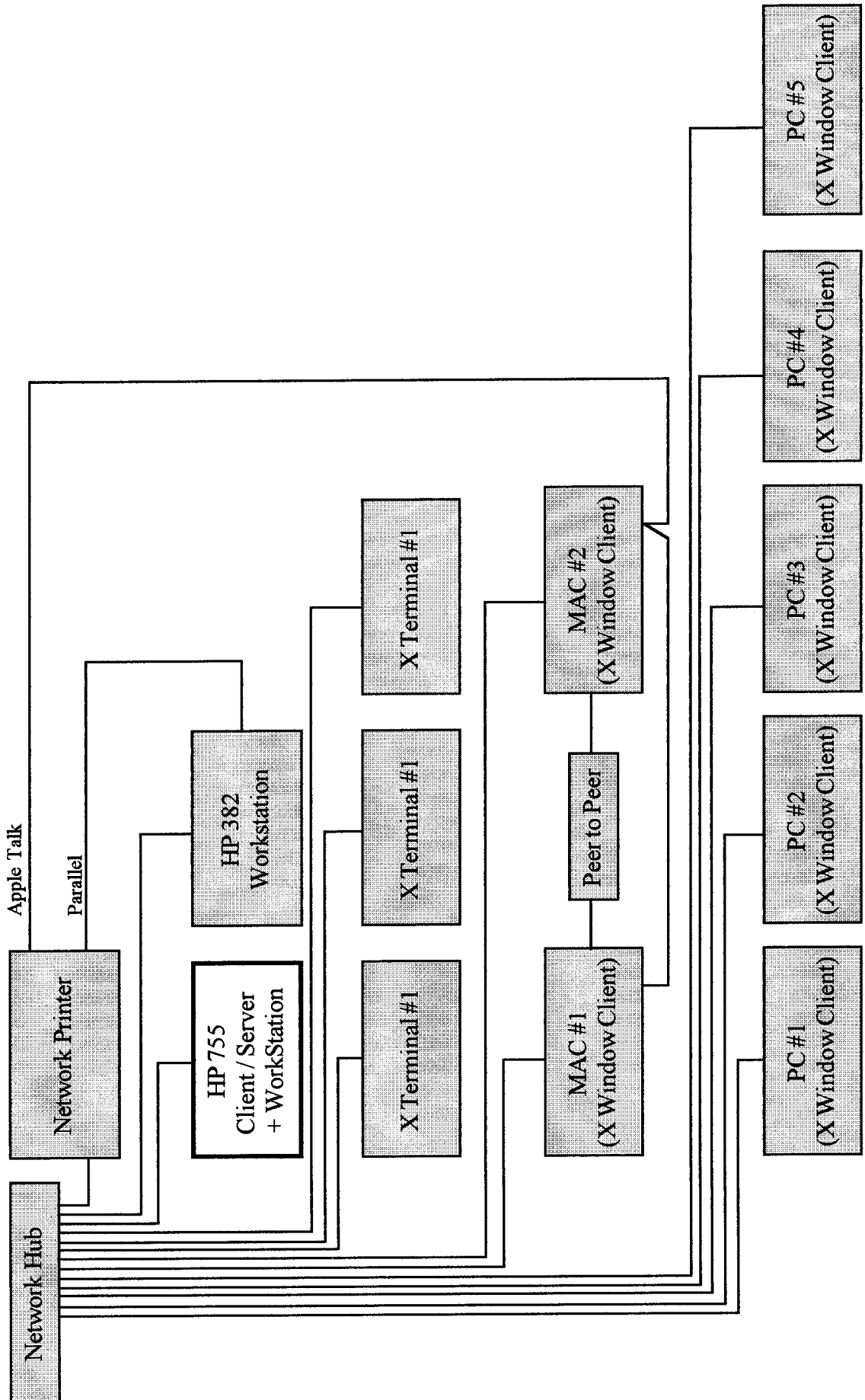
The laboratory configuration is built around an HP765 UNIX workstation which functions as the laboratory Server to remote X-Terminals and PCs which will be configured as X-WINDOWS Clients. These PCs will serve as the human subject display interface for the experimental protocols. The Server has image capture software capable of digitizing video images in formats compatible with PCs which have been configured to absorb the major image editing tasks. (All of this equipment has been purchased under the current grant.) A flow chart showing the Ethernet network configuration is presented in Figure 1.

IV. Summary of Planned Research Which Will Utilize the New Laboratory Resources

Experimental designs are currently being developed which will utilize the laboratory resources obtained under this grant for the purpose of examining error-checking strategies of human observers when monitoring complex visual displays. Some preliminary software has been developed and it is hoped that this development will be able to continue with the acquisition of research support. During the period of this grant, discussions were held with staff at the National Transportation Safety Board and with staff at the Aviation Safety Reporting System Office at Battelle (letter attached) which provided us with data base searches of human error incidents involved in aircraft accidents. This data has been extremely useful in our preliminary development of experimental protocols which will allow us to develop Department of Defense relevant research studies.

V. Itemized List of Purchases Made Under Grant No. FA 9620-93-1-0608

All equipment acquired under this grant retains all of the general functionality of the equipment originally proposed although in most cases there were changes made to minimize item cost where possible, to obtain the most current models of all equipment and to maximize in all cases the acquisition of equipment that reflected the current state of the art of the particular type of equipment obtained. Listed below are the actual items purchased.



Laboratory Network Configuration

Figure 1



ASRS Office
625 Ellis Street
Suite 305
Mountain View, California 94043
Telephone (415) 969-3969

August 29, 1994

Dr. Albert Miller
Delaware State University
Department of Psychology
Dover, DL 19901

Dear Dr. Miller:

SEARCH REQUEST NO. 3617: "HUMAN ERROR INCIDENTS"

In response to your request of NASA's Aviation Safety Reporting System, enclosed is a diskette containing 300 reports referencing alleged human error incidents. These reports have been separated into advanced cockpit flight crew errors (100), and air carrier, general aviation, corporate, and air traffic control human errors (200). An additional 90 reports referencing advanced cockpit flight crew errors are available should you require them. Attached is an explanation of the coded information contained in your diskette.

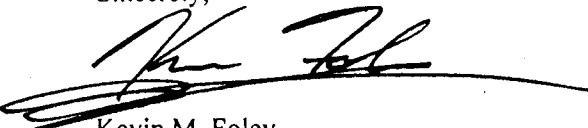
At the time of this search, the ASRS database contained 46,798 full-form records received since January 1, 1986. There were also 117,772 abbreviated-form records in the database, but since incidents involving the above-mentioned topic are not identifiable in these records, they were excluded from the search.

Please bear in mind that the ASRS reports are soft data. The reports are submitted voluntarily and are subject to self-reporting biases. Such incidents, in many cases, have not been corroborated by the FAA or NTSB.

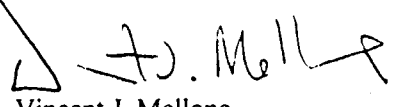
We hope you find this information useful for your purposes. Please note with care the attached caveat regarding statistical use of ASRS information and the point Mr. Reynard makes in his covering memorandum to recipients.

We would appreciate any comments you have regarding the value of this service. If you have any questions or comments, please do not hesitate to contact us at (415) 969-3969.

Sincerely,



Kevin M. Foley
ASRS Database Specialist



Vincent J. Mellone
ASRS Deputy Program Manager

KMF

Enclosures

Equipment Acquired Under
Grant No. FA9620-93-1-0608

All equipment acquired under this grant retains all of the general functionality of the equipment originally proposed although in most cases there were changes made to minimize item cost where possible, to obtain the most current models of all equipment and to maximize in all cases the acquisition of equipment that reflected the current state of the art of the particular type of equipment obtained. Listed below are the actual items purchased.

Digital Equipment Corporation

| <u>Item Description</u> | <u>Cost</u> |
|-------------------------------------|----------------------------|
| DECpc XL 566 | \$ 4,179.05 |
| 16 MB 70NS, Simm Memory | \$ 665.00 |
| DEC pc 5.25" 1.2 MB | \$ 71.25 |
| PC half card modem | \$ 189.05 |
| Viper PCI Video Adapter | \$ 379.05 |
| 19" Trinitron Hi-Res, LE (2) | \$ 3,798.10 |
| 16 MB, 70NS, Simm Memory | \$ 760.00 |
| DEC pc 5.25" 1.2 MB | \$ 71.25 |
| PC half card modem | \$ 189.05 |
| Viper PCI Video Adapter | \$ 664.05 |
| Laboratory Microprocesser | Digital Equip \$ 7,097.45 |
| FR-783AA-WN 16MB16MB | Digital Equip \$ 4,369.05 |
| FR-783AA-WJ,DECPC XL590 System (4) | Digital Equip. \$15,896.00 |
| FR-PCXAv-EA decpc monitor(4) | " \$ 3,996.00 |
| FR-PC7XR-BA DECPC Disk Drive | " 300.00 |
| FR-PCXAG-AM Viper PCI Video Adapter | " \$ 1,596.00 |

FR-DE205-AB, Etherworks 3 Turbo Plus "" \$ 692.00

Hewlett-Packard Company

| <u>Item Description</u> | <u>Cost</u> |
|---|--------------|
| MDL 755 CRX24Z STD config. | \$38,786.30 |
| 2GB Single-Ended SCSI II Option 011 | \$ 435.50 |
| 2GB Fast-Wide Option ATA | \$ 3,249.50 |
| 660MB SCSI CD ROM Option AM8 | \$ 566.15 |
| 3.5" 1.4MB SCSI Option AMB | \$ 351.75 |
| 64MB memory Option ANQ | \$ 3,430.00 |
| First Year of System Support. Option OS2 | \$ 1,293.10 |
| HP-UX WKST localization kit | \$ 70.35 |
| HP-UX release 9.0 Option APH | \$ 0.00 |
| US English localized version Option ABA | \$ 0.00 |
| HP-UX Run-Time operation systems | \$ 0.00 |
| HP-UX software Option AAB | \$ 260.00 |
| HP-UX 9.0 2-User Option APH | \$ 62.50 |
| 200MB of hard swap space Option ATC | \$ 0.00 |
| 200 Megabytes of hard swap space Option ATF | \$ 0.00 |
| License to use HP-UX 9.0 | \$ 188.50 |
| 9.0 version of software Option APH | \$ 0.00 |
| Software preloaded Option OD1 | \$ 0.00 |
| CD-ROM Certificate Option AAU | \$ 0.00 |
| US power cord Option ABA | \$ 0.00 |
| HP series 6400 Model 2000DC | \$ 2,212.50 |
| First year of system support Option OS2 | \$ 74.25 |

| | |
|---|-------------|
| DDS cartridge | \$ 85.00 |
| Rewriteable Optical Disk | \$ 140.00 |
| SCSI Terminator low density | \$ 40.00 |
| SCSI 2 High density | \$ 88.00 |
| Small computer system interface cable | \$ 55.00 |
| Series 700 HP-UX 9.0 Documentation | \$ 0.00 |
| Documentation on CD-ROM Option OBC | \$ 417.50 |
| B2355B manuals Option OBJ | \$ 79.00 |
| HP-UX System Administration Option OBE | \$ 342.50 |
| Hardcopy manuals Option OBF | \$ 170.00 |
| HP-UX Advanced Usage manuals Option OBG | \$ 92.00 |
| HP-UX User Environment Programming manuals Option OBL | \$ 365.00 |
| First year of system support Option OS2 | \$ 52.50 |
| Standard instrument control library | \$ 250.00 |
| Instrument control I/O library Option AAF | \$ 0.00 |
| High speed HP-IB interface | \$ 497.50 |
| T&M productivity assistance | \$ 7,650.00 |
| 5 day course at HP | \$ 1,550.00 |
| HP BASIC/UX S700 license | \$ 400.00 |
| HP BASIC/UX S700 upgrade Option OC | \$ 100.00 |
| HP 19" Color monitor | \$ 4,556.00 |
| UNIX starter kit | \$ 950.00 |
| HP BASIC/UX S700 media | \$ 0.00 |
| HP BASIC/UX S700 media on CD-ROM Option AAF | \$ 450.00 |
| HP/BASIC/UX S700 media on DDS Option AAH | \$ 450.00 |
| HP BASIC/UX S700 license-to-use. | \$ 400.00 |

| | |
|---|-------------|
| 19" 1280x1024 72Hz color monitor Option 191 | \$ 3,075.30 |
| HP-UX keyboard with HP-HIL interface | \$ 70.35 |
| HP-UX keyboard Option ABA | \$ 0.00 |
| MNL: INSTAL. PERIPHERAL | \$ 47.00 |
| 5 day course at HP\ system | \$ 1,845.00 |
| T&M response center phone support | \$ 25.00 |
| T&M response center phone support | \$ 17.00 |
| Mpower | \$ 123.75 |
| HP-UX 9.0 binaries Option APH | \$ 0.00 |
| Mpower client factory integration Option OD1 | \$ 0.00 |
| Mpower client CD-ROM certificate Option AAU | \$ 0.00 |
| Mpower | \$ 373.75 |
| HP-UX 9.0 binaries for Mpower Option APH | \$ 0.00 |
| Instant Ignition Option OD1 | \$ 0.00 |
| CD-ROM certificate Option AAU | \$ 0.00 |
| License-to-use HP-PEX | \$ 437.50 |
| Software for HP-UX release 9.0 Option APH | \$ 0.00 |
| CD-ROM certificate Option OD1 | \$ 0.00 |
| CD-ROM certificate Option AAU | \$ 0.00 |
| Group response line for HP 9000 | \$ 0.00 |
| HP Responseline support for 700(2) Option ONA | \$ 37.00 |
| Application support/software dev. Option ON1 | \$ 74.00 |
| Application caller Option OMB | \$ 0.00 |
| HP Software Update materials for Wkstns | \$ 0.00 |
| HP Support materials Option ONA | \$ 21.00 |
| Mpower | \$ 123.75 |

| | | |
|---|----|--------|
| HP-UX 9.0 binaries Option APH | \$ | 0.00 |
| Instant Ignition Option OD1 | \$ | 0.00 |
| Mpower client CD-ROM certificate Option AAU | \$ | 0.00 |
| Mpower | \$ | 373.75 |
| HP-UX 9.0 binaries for Mpower server Option APH | \$ | 0.00 |
| Mpower server factory intergration Option OD1 | \$ | 0.00 |
| Mpower server CD-ROM certificate Option AAU | \$ | 0.00 |
| License-to-use HP-PEX | \$ | 437.50 |
| Software for HP-UX release 9.0 Option APH | \$ | 0.00 |
| CD-ROM certificate Option OD1 | \$ | 0.00 |
| CD-ROM certificate Option AAU | \$ | 0.00 |
| Group response line | \$ | 0.00 |
| HP Responseline Option ONA | \$ | 37.00 |
| Application support/software dev. Option ON1 | \$ | 74.00 |
| Application caller Option OMB | \$ | 0.00 |
| HP Software Update materials for Wkstns | \$ | 0.00 |
| HP Support materials Option ONA | \$ | 21.00 |

Tektronix, Inc.

| <u>Item Description</u> | <u>Cost</u> |
|---|--------------|
| XP358 COLOR XTERMINAL TEK | \$ 7,300.00 |
| B9 SW LICENSE "" | \$ 60.00 |
| 25 ADD 8MB SIMM, 2 4MB SIMMS "" | \$ 1,200.00 |
| 3L MOTIF LOCAL, WINDOW MANAGER "" | \$ 70.00 |
| AV AVXPRESS "" | \$ 490.00 |

| | | |
|---|-------------------------|-------------|
| SO INSTALLATION | "" | \$ 318.00 |
| E3 XPRESS EXCHANGE | "" | \$ 538.00 |
| XPFYN IBM101 KEYBOARD | "" | \$ 69.60 |
| XPCD06 HP CD ROM | "" | \$ 635.10 |
| XP300n Color Xterminal | "" | \$ 9,362.94 |
| XPFYN IBM 101 Keyboard | "" | \$ 69.60 |
| XPCD HP CD ROM | "" | \$ 304.50 |
| Light Pen System | FTG Data Systems | \$ 1,387.80 |
| COVID Video Media System | Covid, Inc. | \$ 4,549.00 |
| | Global Computer Supply | |
| KT Labs Pocket Hard Drive | "" | \$ 699.95 |
| Ergo Flex Workstation | "" | \$ 1,480.00 |
| Coactive Connector Starter Kit | | \$ 399.90 |
| View Sonic Color Monitor | "" | \$ 899.95 |
| Lab Workstations(4) | "" | \$ 2,399.00 |
| Lab Rennovations,Including: Power Dist\Network Connection\ Inst. Interfacing\Electronic Supplies\ Cables, connectors, etc. | Intelligent Appl. Corp. | \$22,400.00 |
| Litepro 550/Proj. System | Future Enterprises | \$ 6,961.00 |
| HT Basic HP WKSTA | Transera, Inc. | \$ 2,295.00 |
| HT Basic Hp 700 Media & Mauals | "" | \$ 250.00 |
| HT Basic HP 700 Wksta Ver. CSUB Kit | "" | \$ 495.00 |
| HT Basic HP 700 Wksta Ver. Math Lib | "" | \$ 495.00 |
| HT Basic HP 700 Wksta DDS | "" | \$ 50.00 |
| HP540/560 Print System | Hewlett-Packard | \$ 2,866.00 |
| Image Editing System | SONY | \$ 4,049.00 |
| Network Analysis Microprocessor | IBM | \$ 6,966.00 |

| | | |
|---|-----------------------|-------------|
| HON 514C 089192 HON 510 Series Files 08693 | GA Blanco & Sons | \$ 654.00 |
| HON F-26 UPC00082 Lock 510 Series | "" | \$ 74.80 |
| Capacitive Touch Screen Solution For Tektronix X Terminal | Trident Systems, Inc. | \$ 1,700.00 |
| VISCA Package including CVD-100 V Box Computer Interface, EZV2 Edit Software, Control Cable 9 pin | B & H Photos | \$ 1,995.00 |
| Digital Camera | Cole Palmer Co. | \$ 768.00 |
| VGA to TV Converter | "" | \$ 199.95 |
| Parallel and Serial Autoswitches | "" | \$ 160.00 |
| Parallel and Serial Autoswitches | "" | \$ 182.00 |
| Automatic A-B Switch | "" | \$ 55.00 |
| Automatic A-B Switch | "" | \$ 55.00 |
| Automatic Cablemaker | "" | \$ 169.95 |
| Interface Converter (2) | "" | \$ 209.00 |
| X-STAT | "" | \$ 595.00 |
| Projector | Kuntz Inc. | \$ 479.63 |
| Projection Table | "" | \$ 51.74 |
| Apple Quick Take 100-M1644KK/B | Apple Comp. Inc. | \$ 653.00 |
| Apple Design Powered Speakers II M326111/A | "" | \$ 288.00 |
| Adams Essentials - TCH 0502 | "" | \$ 249.00 |
| Apple ADJ Keyboard M12411/A | "" | \$ 200.00 |
| S-PC PRO 3.1 TCH 0188 | "" | \$ 179.00 |
| S-WIN-TCH 0190 | "" | \$ 229.00 |
| 270 MB Syquest Drive APP 0022 | "" | \$ 529.95 |
| 270 MB CART.APP 0014 | "" | \$ 218.85 |
| 105MB Cart.APP 0016 | "" | \$ 203.85 |

| | | |
|---|-----------------------|-------------|
| Printer Select 360 B1333LL/A | "" | \$ 1,344.00 |
| Cartridge M1960G/A | "" | \$ 154.00 |
| Data Switch | Micro Warehouse | \$ 64.00 |
| 8 Port Video Splitter | "" | \$ 499.00 |
| 8-1 Auto Switch-Parallel | "" | \$ 119.00 |
| 50ft Extension Cable | "" | \$ 18.00 |
| NEC # JC1731 VMAA-3 17" Monitor | Info sys | \$ 1,986.24 |
| Smart UPS #AP1250 Power Back Up | "" | \$ 1,127.32 |
| #KVH100 Cobra Projector System | Paper Direct | \$ 1,079.60 |
| #KVH102 Marker/Templates | "" | \$ 70.80 |
| Meridian Personal Scribe 1000 Alchemy Bundle P/No512262013 | I-Net | \$ 6,124.00 |
| Software and Computer Supplies | DSR Inc. | \$ 1,450.00 |
| MCA 5100 Workstations | Berger Bros. | \$ 876.00 |
| MCA 5200 Workstations | "" | \$ 338.00 |
| Media Magic Multi Media Solution | Media Magic, Inc. | \$ 4,415.00 |
| FR-PCXAG-AM-Viper PCI Vid. Adapt | "" | \$ 379.05 |
| FR_PCXAV_HA 21" monitor | "" | \$ 1,899.00 |
| FO-4800 G3 Com. System | Sharp Electronics | \$ 2,195.00 |
| Synergy and Keyboard Storage Drawer | Corporate Express | \$ 187.33 |
| SLV 770 Video Deck | Sony | \$ 1,493.91 |
| MDP 600 LAsEr Disk | "" | \$ 699.00 |
| LAB Furniture Lab Rennovations Supplies | White & Leonard, Inc. | \$ 4,164.00 |
| HP 4SI Printer | PC Age | \$ 2,600.00 |
| HP MX Printer | "" | \$ 3,850.00 |
| 8 MByte Simm Memory Boards | "" | \$ 1,625.00 |

| | | |
|--|------------------------|---------------------|
| Apple Ext Keyboard | Apple Comp. Inc. | \$ 320.00 |
| Power MAC 8100 | "" | \$ 4,930.00 |
| Apple Multi Scan Display | "" | \$ 1,872.00 |
| Quadra | "" | \$ 4,518.00 |
| Audio Vision 14" | "" | \$ 629.00 |
| Mac 16 Color Display | "" | \$ 904.00 |
| Apple Design Speakers | "" | \$ 138.00 |
| Geoport Adapter | "" | \$ 105.00 |
| Apple Ethernet | "" | \$ 76.00 |
| 8 Meg Simms | "" | \$ 1,632.00 |
| HP 1200/520 Printer | Hewlett Packard | \$ 2,609.00 |
| HP II CX Scanner | "" | \$ 896.00 |
| Ink Cartridges (4) | "" | \$ 193.00 |
| 32 Meg Simm Memory | "" | \$ 975.00 |
| Instrumentation Installation Setup/checkout | Intelligent Appl. Corp | \$12,210.00 |
| Shipping Charges | | \$ 1,035.00 |
| TOTAL | | <u>\$284,245.61</u> |