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ABSTRACT       This guide is intended for use in a course to train
students to repair computer equipment and perform related
administrative and customer service tasks. Addressed in the
individual units are the following topics (with selected subtopics in
brackets): performing administrative functions (preparing service
bills, maintaining accounts and labor records, training new
employees, maintaining inventories, and calculating costs);
maintaining customer service (answering and troubleshooting customer
questions and demonstrating computer hardware and software);
installing computer equipment (determining customer requirements,
designing system layouts, transporting equipment, testing
installations, and demonstrating systems on site); evaluating
diagnostics (conducting various board, card, and line tests and
interpreting diagnostic flowcharts); maintaining computer equipment
(cleaning, lubricating, adjusting, and setting various components);
and servicing computer equipment (interpreting various charts and
schematics, installing and repairing various hardware, performing
operator duties, and making adjustments). Each unit contains some or
all of the following: a guide sheet consisting of a duty statement,
personal aerobic fitness and health, personal aspects of physical
fitness, and a list of resources, teaching activities, criterion-referenced measures, and performance guides;
visual aids; student worksheets and answers; and checklists.
Appendixes include a cross-referenced list of tasks and job titles,
definitions, a list of necessary tools and equipment, and a 53-item
bibliography. (MN)
Computer Equipment Repair

Curriculum Guide

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The Computer Equipment Repair Guide was developed with the help of computer equipment repairers and educators in Illinois.

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INTRODUCTION

Simply, V-TECS guides are extensions of the V-TECS catalog. While the V-TECS catalogs compile duties, task performance objectives, and performance guides, the catalogs emphasize the psychomotor aspect of an occupation. In addition, V-TECS catalogs establish blueprints of the occupations, while V-TECS guides consider background information surrounding the tasks as well as the process of making inferences, generalizations, and decisions. V-TECS guides take these aspects of the learning process into consideration, and go a step further by including job seeking skills, work attitudes, energy conservation practices, and safety.

Experience has shown that the art of learning can also be taught while teaching subject matter. Studies indicate that people need to learn how to learn. V-TECS guides are written to deal with this learning process as an efficient means of assisting instructors in the task of teaching.

V-TECS guides are centered around all three domains of learning: psychomotor, cognitive, and affective. The following is a brief explanation of each of these learning domains.

PSYCHOMOTOR

V-TECS guides are developed around the psychomotor tasks that are considered worker oriented. Psychomotor or manipulative skills such as tightening a nut, replacing a hubcap, or machining a key slot in a steel shaft, are
identified in the V-TECS catalog, but the suggestions on how to learn to do these tasks are addressed in the V-TECS guides.

COGNITIVE

To perform psychomotor tasks, students must think. To tighten a nut they must know which way to turn it and when to stop turning it so that they won't strip the threads. If replacing a hubcap, there is a certain technique that may vary from one car to another. For example, start the hubcap by placing the cap in a tilted position and tapping it all the way around until it is seated. On a different model, it may be necessary to position the hubcap and snap it all at once. At any rate, students must think about what is being done. This is cognition or a mental activity. Cognition defined, what goes on in the mind about any job being done. V-TECS guide provide both the collateral knowledge and the impetus to apply cognition to psychomotor tasks.

Students gain cognition through both real and vicarious experiences. They may read, view tapes, memorize or practice a process or procedure until they are certain of it. To test their knowledge, students may be required to decide the procedure, method, or sequence for performance. This is decision making or cognitive activity in its highest form.

Cognition is that process by which information is stored and used. The voice that warns one of potential dangers, is cognition. It is cognition that tells one to lock and tag out the power supply to an electrical apparatus before
starting to repair it. However, cognition does not apply only to safety. Good cognition, or thinking, can help employees do a job better and quicker. V-TECS guides provide for the cognitive aspects of learning.

AFFECTIVE

Curriculum writers, supervisors, and instructors often fail to assist students in acquiring a positive attitude toward themselves, their job, school or fellow students. V-TECS guides seek to provide assistance to the instructor in achieving positive attitudes. It is difficult for the instructor to identify little bits and pieces of desirable behavior for every unit and often harder yet to teach them. In this area, students might be judged on how well they clean up their work area, whether they showed up to do the job in time, or whether they must be told several times to do something. Potential employers are interested in student attitudes because attitudes directly reflect upon work habits.

A student's ability to succeed on the job depends largely on attitude. If, for example, students have the attitude: "Let someone else do it," they could be in trouble. Realizing this, V-TECS guides include activities designed to help the student get along with others.
USE OF V-TECS GUIDE

The guides are designed to provide job-relevant tasks, performance objectives, performance guides, resources, learning activities, evaluation standards and achievement testing in selected occupations.

A V-TECS guide is designed to be used with any teaching methods. If a lecture/demonstration method is best for you, you will find sufficient help to meet your needs. If, however, you prefer to use discussions or other methods that require student participation, the V-TECS guides can save preparation time and offer innovative methods and procedures. Further, this work takes into consideration students' attitudes, thinking skills, and mathematical reading skills.

The use of small groups in teaching can be helpful in a number of ways: (1) many students may feel inadequate due to their lack of background information in mechanical areas; (2) some may feel that they are physically incompetent or lack the necessary background experiences. A successful program can provide students with a sense of security by reinforcing positive attitudes while improving their skills and knowledge. The task/learner-centered approach can be achieved by allowing students to interact on a personal level. Confidence increases when students discover that they are an essential part of a team engaged in the learning-teaching process. Students learning to work without direct supervision, permits the instructor to vary instructional routines away from the lecture or other full-class methods.
The V-TECS guides provide suggestions for specific classroom activities. These activities are not meant to be restrictive but a suggested variety of learning activities for each task statement. Students may complete any or all parts of the activities.
CURRICULUM GUIDES
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #1

TASK: Prepare service bill.

STANDARD OF PERFORMANCE OF TASK:

Service bill will include a purchase order number, account number, date, customer name and address, dollar amounts, catalog equipment, unit cost, quantity, method of payment, service/product, vendor/payee information, preparer signature, and customer signature on original and duplicate copies.

SOURCE OF STANDARDS:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Billing receipt book
Pen/Pencil
Customer information
Parts price lists

ENABLING OBJECTIVES:

1. Identify the parts of a service bill.
2. Fill out a complete service bill.

RESOURCES:

RESOURCES: (cont.)

5. Visual Aid - Service bill.
6. Worksheet - Service bill parts and function.
7. Worksheet - Blank service bill.
8. Mock information sheet.

TEACHING ACTIVITIES:

1. Present lecture on parts of a service bill and their functions. (*1 & 3)
2. Instruct students to write two questions they would like answered concerning a service bill.
3. Conduct a class discussion to answer student questions about a service bill.
4. Instruct students to service bill parts and functions worksheet. (*6)
5. Demonstrate how to fill out a service bill using textbook examples as well as actual service bills. (*1, 2, 3, 4, & 5)
6. Instruct student to fill out a service bill using the service bill worksheet & mock information sheet provided by the instructor. (*7, 8 & 9)

CRITERION-REFERENCED MEASURE:

Given a blank service bill worksheet and a mock information sheet, the student will fill out the service bill including a purchase order number, account number, date, customer name and address, dollar amount, catalog/equipment number, unit cost, quantity purchased, service/product description, method of payment, vendor payee information, preparer signature, and customer signature.

PERFORMANCE GUIDE:

1. Fill in purchase order number and account number.
2. Fill in current date.
3. Record name of person, company, and address.
4. Record quantity purchased, catalog/equipment number and description, including merchandise, parts, labor, travel, and miscellaneous expenses.
5. Write dollar amount of bill to include unit cost, amount, sub total, tax, and total cost.
6. Record the purpose and method of the payment.
7. Proofread the bill.
8. Sign or initial the bill.
10. Give original copy to customer and retain duplicate copy for records.
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<thead>
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</tr>
</tbody>
</table>

- Cash  | Charge  | Other

Sub Total

% Discount

Total

% Tax

Total Cost

Make Checks Payable To:

Buyer Certification (sign in ink only)

Seller Certification (sign in ink only)
Student Name __________________________

Title: Service Bill Parts And Function Worksheet

Directions: Match the service bill part with its function.

<table>
<thead>
<tr>
<th>Service Bill Part</th>
<th>Part Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Purchase Order/Invoice Number</td>
<td>A. Labor record information.</td>
</tr>
<tr>
<td>2. Account Number</td>
<td>B. Payment/Payee information.</td>
</tr>
<tr>
<td>3. Date</td>
<td>C. Purchaser identification.</td>
</tr>
<tr>
<td>4. Customer Name and Address</td>
<td>D. Sales Person identification.</td>
</tr>
<tr>
<td>5. Dollar Amount</td>
<td>E. Account receivable/paid information.</td>
</tr>
<tr>
<td>6. Equipment/Catalog Number</td>
<td>F. Inventory update information.</td>
</tr>
<tr>
<td>8. Preparers Signature</td>
<td>H. Total billing charge information.</td>
</tr>
<tr>
<td>11. Description</td>
<td>K. Purchaser's billing identification.</td>
</tr>
<tr>
<td>12. Unit Cost</td>
<td>L. Order identification information.</td>
</tr>
<tr>
<td></td>
<td>M. Number purchased or serviced.</td>
</tr>
<tr>
<td></td>
<td>N. Item/service cost.</td>
</tr>
</tbody>
</table>
STUDENT WORKSHEET ANSWERS

1. - L
2. - K
3. - J
4. - I
5. - H
6. - F
7. - E
8. - D
9. - B
10. - A
11. - G
12. - N
On 8/17/85 John Henry, Electronic Sales and Service Technician for the XYZ Company, Inc., 6666 Nowhere Ave., Anywhere, IL 00000 completed a memory board upgrade on a disk drive unit belonging to the ABC Company, 606 Main Blvd., Everywhere, IL 00000. Jane Doe, an employee of ABC Company arrived at XYZ to pick up the disk drive and purchase 100 floppy disks, catalog #D761146, at a cost of $1.24 per disk. Jane indicates that the floppy disk purchase and the upgrade cost was to be charged to account number C-764 and reminds John that their organization is eligible for a 10% discount and 6% sales tax. John explains to Jane that the upgrade required two hours of labor (#UL 1541) at $50.00 per hour and a new memory board (#MB 179) which costs $179.66. John's previous service bill was P.O. #776. Use the information above to complete the blank service bill.
# Service Bill Worksheet

**Student Name:**

**Title:** Service Bill Worksheet

**Directions:** Using the mock information sheet provided fill out the service bill.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Equipment/Catalog Number</th>
<th>Description</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cash</th>
<th>Charge</th>
<th>Other</th>
<th>Sub Total</th>
</tr>
</thead>
</table>

% Discount

Total

% Tax

Total Cost

Make Checks Payable To:

**Buyer Certification** (sign in ink only)

**Seller Certification** (sign in ink only)
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Equipment/Catalog Number</th>
<th>Description</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>D 761146</td>
<td>Floppy Disk</td>
<td>1.24 ea.</td>
<td>124.00</td>
</tr>
<tr>
<td>2 hrs.</td>
<td>UL 1541</td>
<td>Upgrade Labor</td>
<td>50.00/hr</td>
<td>100.00</td>
</tr>
<tr>
<td>1</td>
<td>MB 179</td>
<td>Memory Board</td>
<td>179.00</td>
<td>179.00</td>
</tr>
</tbody>
</table>

Cash X Charge ___ Other

Sub Total | 403.00
% Discount | 40.30
Total | 362.70
% Tax | 21.76
Total Cost | 384.46

Make Checks Payable To: XYZ Company, Inc.

Jane Doe
Buyer Certification
(sign in ink only)

John Henry
Seller Certification
(sign in ink only)
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Prepare service bill.

ENABLER  Fill out a complete service bill.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ____________________ COURSE ________

TIME:  STARTED ______ COMPLETED ________________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate service bill worksheet.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified the P.O. number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified the account number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Marked the date.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified the customer's name and address.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated the dollar amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Indicated the dollar amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified the catalog/equipment number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Indicated the method of payment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained the buyer's signature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Secured the seller's signature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Made sure the signatures were in ink.</td>
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</tr>
<tr>
<td>- Identified the vendor/payee information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Proofread the bill before signing it.</td>
<td></td>
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</tr>
</tbody>
</table>
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #2

TASK: Maintain accounts receivable/paid records.

STANDARD OF PERFORMANCE OF TASK:

Account receivable/paid records will include customer name, account number, money owed, money paid, and current account balance.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Accounts receivable information
Accounts receivable/paid forms
Pen/pencil
Labels
File folders
File cabinet
Disks

ENABLING OBJECTIVES:

1. Complete a sales journal.
2. Complete a cash receipts journal.
3. Complete an accounts receivable ledger.

RESOURCES:

RESOURCES: (cont.)

5. Visual Aids - Sales journal, cash receipts journal, and accounts receivable ledger.
6. Worksheet - Sales journal, cash receipts journal, and accounts receivable ledger.
7. Mock information sheet.
8. Checklist - Complete a sales journal, cash receipts journal and accounts receivable ledger.

TEACHING ACTIVITIES:

1. Present lecture on keeping accounts receivable records, (sales journal, cash receipts journal, and accounts receivable ledger). (*1 & 3)
2. Conduct class discussion on keeping accounts receivable records.
3. Demonstrate how to fill out a sales journal. (*2, 4, & 5)
4. Demonstrate how to fill out a cash receipts journal. (*2, 4, & 5)
5. Demonstrate how to fill out an accounts receivable ledger. (*2, 4, & 5)
6. Instruct students to complete a sales journal, cash receipts journal, and accounts receivable ledger using the mock information sheet provided by the instructor. (*6 & 7)

CRITERION-REFERENCED MEASURE:

Given blank sales journal, cash receipts journal, and accounts receivable ledger worksheets and a mock information sheet, the student will complete a sales journal, cash receipts journal, and accounts receivable ledger including a date, customer name and address, invoice #, charge description, accounts receivable, sales discount, total amount, item, post, ref., debit, credit and balance.

PERFORMANCE GUIDE:

1. Assemble needed materials.
2. Determine customer's name and account number.
3. Find customer's file
4. Record amount owed for each job performed.
5. Record amount paid on account.
6. Determine remaining account balance.
7. Determine when next payment is due.
8. Store updated file in a dry, dust free place.
<table>
<thead>
<tr>
<th>DATE</th>
<th>CUSTOMER NAME</th>
<th>INVOICE NUMBER</th>
<th>POSTED REFERENCE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tbody>
</table>
# Cash Receipts Journal

<table>
<thead>
<tr>
<th>DATE</th>
<th>RECEIVED FROM</th>
<th>FOR</th>
<th>POSTED REFERENCE</th>
<th>ACCOUNTS RECEIVABLE</th>
<th>SALES DISCOUNT</th>
<th>CASH</th>
<th>BANK DEPOSITS</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
Use the sales journal and cash receipts journal to record the following transactions. After you have recorded all the transactions, immediately post each customer's account to an accounts receivable page. Number the sales journal page 63 and the cash receipts journal page 96. Terms for all transactions are a 2% discount on any invoice total paid within 10 days (2/10) and the total balance of any invoice due within 30 days of purchase (n/30).

**July 2**
Memory board upgrade and diskettes sold to ABC Company, Inc. for $385.10 (invoice 777).

**July 2**
Received check #114 for $200.00 from ABC Company, Inc. to be applied on account.

**July 3**
Sold memoryboard and software to James & Sons, Inc. for $250.00.

**July 4**
Sold a 64 K computer system to Lighthouse, Inc. for $952.56.

**July 10**
Received check #1118 from James & Sons, Inc. for full payment on invoice dated 7/3/85.

**July 10**
Deposited cash received from July 1 to date.

**July 19**
Sold spread sheet software to Lighthouse, Inc. for $215.00.

**July 22**
Received check #0041 for $500.00 from Lighthouse, Inc. to be applied on account.

**July 22**
Troubleshoot CPU and replace integrated circuit chip #L651Z for James & Sons, Inc. for $93.98.

**July 22**
Deposited the cash received from 7/10 to date.

**July 25**
Realigned disk drive for James & Sons, Inc. for $70.75.

**July 26**
Received check #00123 from Lighthouse, Inc. for $500.00 to be applied on account.

**July 28**
Constructed a printer interface cable for AEC Company for $36.00.

**July 30**
Received check #00211 for $167.58 from Lighthouse, Inc. for balance on account.
MOCK INFORMATION SHEET:  (cont.)

July 31  Received check #2006 for $100.00 from James & Sons, Inc. to be applied on account.

July 31  Received check #286 for $200.00 from ABC Company, Inc. to be applied on account.

July 31  Deposited cash received from 7/22 to date.
Student Name: 

Title: Sales Journal Worksheet

Directions: Using the mock information sheet provided fill out the sales journal.

<table>
<thead>
<tr>
<th>DATE</th>
<th>CUSTOMER NAME</th>
<th>INVOICE NUMBER</th>
<th>POSTED REFERENCE</th>
<th>AMOUNT</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
</tbody>
</table>
**STUDENT WORKSHEET**

**Student Name**

**Title:** Cash Receipts Journal Worksheet

**Directions:** Using the mock information sheet provided fill out the cash receipts journal.

<table>
<thead>
<tr>
<th>DATE</th>
<th>RECEIVED FROM</th>
<th>FOR</th>
<th>POSTED REFERENCE</th>
<th>ACCOUNTS Receivable</th>
<th>SALES DISCOUNT</th>
<th>CASH</th>
<th>BANK DEPOSITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
</tbody>
</table>
Title: Accounts Receivable Ledger Worksheet

Directions: Using the mock information sheet provided fill out the accounts receivable ledger.

<table>
<thead>
<tr>
<th>NAME</th>
<th>TERMS</th>
<th>ADDRESS</th>
<th>DATE</th>
<th>ITEM</th>
<th>POSTED REFERENCE</th>
<th>DEBIT</th>
<th>CREDIT</th>
<th>BALANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>1</td>
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<tr>
<td>DATE</td>
<td>CUSTOMER NAME</td>
<td>INVOICE NUMBER</td>
<td>POSTED REFERENCE</td>
<td>AMOUNT</td>
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<td></td>
</tr>
<tr>
<td>JULY 2</td>
<td>ABC Company, Inc.</td>
<td>777</td>
<td>X</td>
<td>385.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 3</td>
<td>James + Sons, Inc.</td>
<td>778</td>
<td>X</td>
<td>250.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 4</td>
<td>Lighthouse, Inc.</td>
<td>779</td>
<td>X</td>
<td>952.56</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 19</td>
<td>Lighthouse, Inc.</td>
<td>780</td>
<td>X</td>
<td>215.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 22</td>
<td>James + Sons, Inc.</td>
<td>781</td>
<td>X</td>
<td>93.98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 25</td>
<td>James + Sons, Inc.</td>
<td>782</td>
<td>X</td>
<td>70.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 28</td>
<td>ABC Company, Inc.</td>
<td>783</td>
<td>X</td>
<td>36.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JULY 31</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>2003.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

STUDENT WORKSHEET ANSWERS
<table>
<thead>
<tr>
<th>DATE</th>
<th>RECEIVED FROM</th>
<th>FOR</th>
<th>POSTED REFERENCE</th>
<th>ACCOUNTS RECEIVABLE</th>
<th>SALES DISCOUNT</th>
<th>CASH</th>
<th>BANK DEPOSITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>JULY 2</td>
<td>ABC Comp.</td>
<td>On Acct</td>
<td>X</td>
<td>200.00</td>
<td></td>
<td>200.00</td>
<td></td>
</tr>
<tr>
<td>JULY 10</td>
<td>James + Sons.</td>
<td>Inv. 7/3</td>
<td>X</td>
<td>250.00</td>
<td>5.00</td>
<td>245.00</td>
<td>445.00</td>
</tr>
<tr>
<td>JULY 22</td>
<td>Lighthouse</td>
<td>On Acct</td>
<td>X</td>
<td>500.00</td>
<td></td>
<td>500.00</td>
<td>500.00</td>
</tr>
<tr>
<td>JULY 26</td>
<td>Lighthouse</td>
<td>On Acct</td>
<td>X</td>
<td>500.00</td>
<td></td>
<td>500.00</td>
<td></td>
</tr>
<tr>
<td>JULY 30</td>
<td>Lighthouse</td>
<td>On Acct</td>
<td>X</td>
<td>167.56</td>
<td></td>
<td>167.56</td>
<td></td>
</tr>
<tr>
<td>JULY 31</td>
<td>James + Sons.</td>
<td>On Acct</td>
<td>X</td>
<td>100.00</td>
<td></td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>JULY 31</td>
<td>ABC Comp.</td>
<td>On Acct</td>
<td>X</td>
<td>200.00</td>
<td></td>
<td>200.00</td>
<td>967.56</td>
</tr>
<tr>
<td>JULY 31</td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>1917.56</td>
<td>5.00</td>
<td>1912.56</td>
<td>1912.56</td>
</tr>
<tr>
<td>DATE</td>
<td>ITEM</td>
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<td>DEBIT</td>
<td>CREDIT</td>
<td>BALANCE</td>
<td></td>
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<tr>
<td>------</td>
<td>------</td>
<td>------------------</td>
<td>----------</td>
<td>-----------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 1</td>
<td>Inv. 777</td>
<td>S63</td>
<td>385.10</td>
<td>385.10</td>
<td>385.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 2</td>
<td>Check 114</td>
<td>CR96</td>
<td>200.00</td>
<td></td>
<td>185.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 3</td>
<td>Inv. 783</td>
<td>S63</td>
<td>36.00</td>
<td></td>
<td>221.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 4</td>
<td>Check 28f</td>
<td>CR96</td>
<td>200.00</td>
<td></td>
<td>21.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
<th>ITEM</th>
<th>POSTED REFERENCE</th>
<th>DEBIT</th>
<th>CREDIT</th>
<th>BALANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1</td>
<td>Inv. 779</td>
<td>S63</td>
<td>952.56</td>
<td></td>
<td>952.56</td>
</tr>
<tr>
<td>July 2</td>
<td>Inv. 780</td>
<td>S63</td>
<td>215.00</td>
<td></td>
<td>1167.56</td>
</tr>
<tr>
<td>July 3</td>
<td>Check 0041</td>
<td>CR96</td>
<td>500.00</td>
<td></td>
<td>667.56</td>
</tr>
<tr>
<td>July 4</td>
<td>Check 00123</td>
<td>CR96</td>
<td>500.00</td>
<td></td>
<td>167.56</td>
</tr>
<tr>
<td>July 5</td>
<td>Check 00211</td>
<td>CR96</td>
<td>167.56</td>
<td></td>
<td>_______</td>
</tr>
</tbody>
</table>
STUDENT WORKSHEET ANSWERS (cont.)

ACCOUNTS RECEIVABLE LEDGER PAGE 13

NAME James Sons, Inc. TERMS 2/10, n/30

ADDRESS 53511 Double Rd., Nowhere, Il 00000

<table>
<thead>
<tr>
<th>DATE</th>
<th>ITEM</th>
<th>POSTED REFERENCE</th>
<th>DEBIT</th>
<th>CREDIT</th>
<th>BALANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>3</td>
<td>Inv. 778</td>
<td>S63</td>
<td>250.00</td>
<td>250.00</td>
</tr>
<tr>
<td>July</td>
<td>10</td>
<td>Check 1118</td>
<td>CR96</td>
<td></td>
<td>250.00</td>
</tr>
<tr>
<td>July</td>
<td>22</td>
<td>Inv. 781</td>
<td>S63</td>
<td>93.98</td>
<td>93.98</td>
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<tr>
<td>July</td>
<td>25</td>
<td>Inv. 782</td>
<td>S63</td>
<td>70.75</td>
<td>164.73</td>
</tr>
<tr>
<td>July</td>
<td>31</td>
<td>Check 20006</td>
<td>CR96</td>
<td>100.00</td>
<td>64.73</td>
</tr>
</tbody>
</table>
DUTY  Performing Administrative Functions

TASK  Maintaining accounts receivable/paid records.

ENABLER  Complete a sales journal.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME _________________________ COURSE ________

TIME:  STARTED _______ COMPLETED ______________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the sales journal worksheet.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Identified sales journal page numbers. [___] [___]

- Recorded all dates of sales transactions. [___] [___]

- Recorded customer's name for all sales transactions. [___] [___]

- Recorded invoice numbers for each sales transaction. [___] [___]

- Marked post reference for each sales transaction. [___] [___]

- Recorded amounts of each sales transaction. [___] [___]

- Correctly totaled sales amount at the end of the month. [___] [___]
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Maintaining accounts receivable/paid records.

ENABLER  Complete a cash receipts journal.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME:  STARTED ________ COMPLETED ____________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the cash receipts journal worksheet.

PERFORMANCE DETERMINANTS

<table>
<thead>
<tr>
<th>Performance Determinants</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified cash receipts journal page numbers.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Recorded dates of all the cash transactions.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Recorded purpose of each cash transaction.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Recorded accounts receivable amount for each cash transaction.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Marked post reference for each cash transaction.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Calculated and recorded sales discounts.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Recorded cash amounts of all transactions.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Recorded bank deposits.</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>- Correctly totaled accounts receivable, sales discounts, cash, and bank deposits at the end of the month.</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Maintaining accounts receivable/paid records.

ENABLER  Complete an accounts receivable ledger.

STUDENT'S NAME ___________________ DATE ______

EVALUATOR'S NAME ___________________ COURSE ______

TIME:  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the accounts receivable ledger worksheet.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Completed separate ledger sheets for each account.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded company name and address on each ledger.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded terms of payment for each account.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded each transaction date.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded purpose/item for each transaction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded post reference with the corresponding sales or cash journal page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entered debits and credits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated account balance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded amount due at the end of the month.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated correctly.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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54
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #3

TASK: Perform public relations activities.

STANDARD OF PERFORMANCE OF TASK:

Customer satisfaction will be maintained by keeping them informed about specials, new products, existing product updates, price changes, maintenance tips, general information and by standing behind the product.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Specials' bulletins Newsletter
Display materials Informational brochures
Mailing lists Central processing unit
Typewriter Disk drive
Pen/Pencil Monitor
File folders Printer
File cabinet Disks
Labels Disk cabinet

ENABLING OBJECTIVES:

1. Identify different methods of promoting public relations.
2. Maintain a mailing list.

*RESOURCES:

1. Guest speaker from a computer equipment repair business.
2. Examples of public relations materials. (Obtain from local computer equipment repair business.)
3. Public relations materials worksheet.
4. Checklist - Public relations activities.

TEACHING ACTIVITIES:

1. Lecture/discussion on methods, purposes, and effectiveness of public relation activities. (*1)
TEACHING ACTIVITIES: (cont.)

2. Present actual public relations materials for student inspection. (*2)
3. Discuss how a mailing list could be developed and maintained. (*1 & 2)
4. Instruct student to complete public relations material worksheet. (*3)
5. Instruct students to maintain a mock mailing list. (*2)
6. Instruct students to create a mock sales bulletin. (*2)
7. Assign students role playing parts to set up mock sales displays, and practice answering questions. (*1 & 2)

CRITERION-REFERENCED MEASURE:

Student will understand and identify the different types of public relation materials and their functions.

PERFORMANCE GUIDE:

1. Maintain up-to-date customer mailing list.
2. Maintain up-to-date prospective customer mailing list.
3. Prepare comprehensive list of services and prices.
4. Prepare specials' bulletins, informational brochures, and newsletters for distribution.
5. Make periodic mailings of sales bulletins, informational brochures and newsletters to above mailing lists.
6. Prepare informational displays in store and at shows.
7. Send a maintenance newsletter at least twice a year to the two mailing lists offering preventive maintenance techniques, tips and answers to questions commonly asked.
8. Answer customer questions in person or on the phone.
## Public Relations Materials Worksheet

**Title:** Public Relations Materials Worksheet

**Directions:** Match the public relations material with its function.

<table>
<thead>
<tr>
<th>Public Relation Material</th>
<th>Material Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Promotional Give-a-way</td>
<td>A. Keeps customer up-to-date on product/service cost.</td>
</tr>
<tr>
<td>2. New Product Flyers</td>
<td>B. Keeps customer up-to-date on any changes being made on existing products.</td>
</tr>
<tr>
<td>3. Existing Product Updates</td>
<td>C. Provides customer with a local place to obtain parts, repairs, and products.</td>
</tr>
<tr>
<td></td>
<td>Allows dealers to stand behind their product or service.</td>
</tr>
<tr>
<td>4. Price Change List</td>
<td>D. Provides customer with tips, techniques, and answers to questions commonly asked.</td>
</tr>
<tr>
<td>5. Product Catalogs</td>
<td>E. Provides a means of providing public relations materials to possible future customers.</td>
</tr>
<tr>
<td>6. Specials Bulletins/Coupons</td>
<td>F. Introduces products/services to customers by providing free samples.</td>
</tr>
<tr>
<td>7. Maintenance Newsletter</td>
<td>G. Keeps customer up-to-date on current product/service line.</td>
</tr>
<tr>
<td>8. Informational Displays &amp; Brochures</td>
<td>H. Provides a means of getting public relations materials to current customers.</td>
</tr>
<tr>
<td>9. Customer Mailing List</td>
<td>I. Provides customer with hands-on trial of products and take home information.</td>
</tr>
</tbody>
</table>
10. Prospective Customer Mailing List

11. Product Sales and Service Program

J. Offers the customer savings on certain products or services.

K. Informs customer of new products and services that are available.
STUDENT WORKSHEET ANSWERS

1. - F
2. - K
3. - B
4. - A
5. - G
6. - J
7. - D
8. - I
9. - H
10. - E
11. - C
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #4

TASK: Maintain labor records

STANDARD OF PERFORMANCE OF TASK:

Labor records will include service person's name, type of work performed, date work performed, equipment serial #, time spent on job, miscellaneous expenses incurred, and person or company to be charged information.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Service call forms Central processing unit
Labor record forms Disk drive
Pen/Pencil Monitor
Labels Disk storage cabinet

ENABLING OBJECTIVES:

1. Maintain individual daily labor record.
2. Maintain weekly labor record.

RESOURCES:

4. Visual aids - Time sheets (daily labor records, weekly labor records).
5. Mock information sheet.
TEACHING ACTIVITIES:

1. Present lecture on the purpose and importance of good labor records. (*1, 2, & 3)
2. Conduct class discussion on importance of accurate labor records. (*1, 2, & 3)
3. Present lecture on the types of time sheets necessary to keep labor records. (*1, 2, & 3)
4. Demonstrate how to fill out a daily labor record. (*1, 2, 3, & 4)
5. Demonstrate how to fill out a weekly labor record. (1, 2, 3, & 4)
6. Instruct student to fill out a daily labor record and a weekly labor record using the mock information sheet provided by instructor. (5, 6, & 7)

CRITERION-REFERENCED MEASURE:

Given a mock information sheet, the student will fill out a daily labor record and a weekly labor record, including service person's name, work performed, date, hours worked, rate of pay, total earnings, social security number, overtime pay, total wages, equipment serial number, miscellaneous expenses, and company to be charged for labor.

PERFORMANCE GUIDE:

1. Compile daily service call forms.
2. Enter information for each service call in file:
   A. Date work performed.
   B. Type of work performed:
      1. Preventive maintenance.
      2. Equipment repair.
      3. Software troubleshooting.
      4. Operational troubleshooting.
      5. Field upgrade.
   C. Time spent on job:
      1. Traveling time.
      2. Labor time.
      3. Other.
   D. Miscellaneous expenses:
      1. Mileage.
      2. Parts.
      3. Parking/tolls.
      4. Per diem (meals).
      5. Other.
   E. Person/company to be charged:
      1. Name.
      2. Address.
      3. Phone number.
      4. Contact person.
3. Save and store file in a dry, dust free place.

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<table>
<thead>
<tr>
<th>Service/Work Performed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Serial/Identification Number</td>
<td></td>
</tr>
<tr>
<td>Time In</td>
<td>Time Out</td>
</tr>
<tr>
<td>Miscellaneous Charges:</td>
<td>Item</td>
</tr>
<tr>
<td>Parts</td>
<td></td>
</tr>
<tr>
<td>Mileage</td>
<td></td>
</tr>
<tr>
<td>Parking/Toll</td>
<td></td>
</tr>
<tr>
<td>Per De:m</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Person's Signature</th>
<th>Customer's Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>In</td>
</tr>
<tr>
<td>---------</td>
<td>----</td>
</tr>
<tr>
<td>Monday</td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Days Worked</th>
<th>Total Hours</th>
<th>Pay Rate</th>
<th>Total Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overtime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>Gross Pay</td>
</tr>
</tbody>
</table>
MOCK INFORMATION FOR STUDENT WORKSHEET

John Henry, SSN 000-000-0001, is an electronic field engineer for the XYZ Company. Below is a listing of the labor performed by John for the week ending June 13, 19___. John has a paid lunch hour and receives overtime pay for any time over eight hours per day. John's regular rate of pay is $10.50 per hour and overtime rate is $12.25 per hour. Fill in the blank daily and weekly labor records.

DAILY RECORD INFORMATION

Monday, June 26 - Replaced drive belt, cleaned drive head, aligned drive head, replaced drive air filter. New drive belt costs $9.96; new air filter costs $3.45; time in 9:00 a.m., time out 12:00 p.m.; parking three hours cost $3.00. Disk drive serial number #4441241 belonging to Bill Will, Lighthouse, Inc., 1661 Northwest Dr., Anywhere, IL 00001.

Replaced printer ribbon, removed, cleaned, and lubricated print head assembly, lubricated head assembly guide rods and adjusted guide wire tension. New ribbon--$13.95; time in 1:00 p.m., time out 4:00 p.m. Printer serial number 61341 belonging to Jane Doe, ABC Company, Inc., 606 Main Blvd., Everywhere, IL 00000.

WEEKLY RECORD INFORMATION

<table>
<thead>
<tr>
<th></th>
<th>Time In</th>
<th>Time Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 26</td>
<td>9:00</td>
<td>4:00</td>
</tr>
<tr>
<td>June 27</td>
<td>8:00</td>
<td>6:00</td>
</tr>
<tr>
<td>June 28</td>
<td>8:30</td>
<td>4:30</td>
</tr>
<tr>
<td>June 29</td>
<td>8:00</td>
<td>5:30</td>
</tr>
<tr>
<td>June 30</td>
<td>9:30</td>
<td>5:30</td>
</tr>
</tbody>
</table>
STUDENT WORKSHEET

Student Name_____________________________

Title: Daily Labor Record Worksheet

Directions: Using the mock information sheet provided fill out the daily labor records.

DAILY LABOR RECORD

Date_____________ 19__

Customer Name + Address____________________________________________________

____________________________________________________

Service/Work Performed__________________________________________________________

____________________________________________________

Equipment Serial/Identification Number__________________________________________

Time In ____________ Time Out ____________ Total: Time ____________

Miscellaneous Charges: 

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts</td>
<td></td>
</tr>
<tr>
<td>Mileage</td>
<td></td>
</tr>
<tr>
<td>Parking/Toll</td>
<td></td>
</tr>
<tr>
<td>Per Dime</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Service Person's Signature __________________________ Customer's Signature __________________________
STUDENT WORKSHEET

Student Name

Title: Weekly Labor Record Worksheet

Directions: Using the mock information sheet provided fill out the weekly labor record.

WEEKLY LABOR RECORD

Week Ending 19

Social Security Number

Employee Name

<table>
<thead>
<tr>
<th>Day</th>
<th>Regular Worked</th>
<th>Overtime Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Monday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td></td>
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<tr>
<td>Wednesday</td>
<td></td>
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<tr>
<td>Thursday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Days Worked: Regular, Overtime, Total

Total Hours: Pay Rate: Total Earnings

Gross Pay
## Daily Labor Record

### Date
June 26, 1986

### Customer Name + Address
Lighthouse, Inc.
1661 Northwest Drive
Anywhere, IL 00001

### Service/Work Performed
Replaced drive belt + air filter + aligned drive head.

### Equipment Serial/Identification Number
4441241

### Time In
9:00

### Time Out
12:00

### Total Time
2.0

### Miscellaneous Charges:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive belt + filter</td>
<td>3.41</td>
</tr>
<tr>
<td>Mileage</td>
<td></td>
</tr>
<tr>
<td>Parking/Toll</td>
<td>3.00</td>
</tr>
<tr>
<td>Per Diem</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

### John Henry
Service Person's Signature

### Bill Will:
Customer's Signature
**DAILY LABOR RECORD**

<table>
<thead>
<tr>
<th>Date</th>
<th>June 26, 1986</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Name + Address</td>
<td>ABC Company, Inc.</td>
</tr>
<tr>
<td></td>
<td>606 Main Blvd.</td>
</tr>
<tr>
<td></td>
<td>Everywhere, IL 00000</td>
</tr>
<tr>
<td>Service/Work Performed</td>
<td>Replaced printer ribbon, removed, cleaned, and lubricated print head assembly, lubricated head assembly guide rods, adjusted guide wire tension.</td>
</tr>
<tr>
<td>Equipment Serial/Identification Number</td>
<td>61341</td>
</tr>
<tr>
<td>Time In</td>
<td>1:00</td>
</tr>
<tr>
<td>Time Out</td>
<td>4:00</td>
</tr>
<tr>
<td>Total Time</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**Miscellaneous Charges:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>New ribbon</td>
<td>13.95</td>
</tr>
<tr>
<td>3 hrs.</td>
<td>3.00</td>
</tr>
</tbody>
</table>

**Service Person’s Signature**

<table>
<thead>
<tr>
<th>John Henry</th>
</tr>
</thead>
</table>

**Customer’s Signature**

<table>
<thead>
<tr>
<th>Jane Doe</th>
</tr>
</thead>
</table>
### Weekly Labor Record

#### Week Ending June 30, 1986

**Social Security Number:** 000-00-0001  
**Employee Name:** John Henry

<table>
<thead>
<tr>
<th>Day</th>
<th>In</th>
<th>Regular Out</th>
<th>Total</th>
<th>In</th>
<th>Overtime Out</th>
<th>Total</th>
<th>Daily Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>9:00</td>
<td>4:00</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Tuesday</td>
<td>8:00</td>
<td>4:00</td>
<td>8</td>
<td>4:00</td>
<td>6:00</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Wednesday</td>
<td>8:30</td>
<td>4:30</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Thursday</td>
<td>8:00</td>
<td>4:00</td>
<td>8</td>
<td>4:00</td>
<td>5:30</td>
<td>1.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Friday</td>
<td>9:30</td>
<td>5:30</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Days Worked</th>
<th>Total Hours</th>
<th>Pay Rate</th>
<th>Total Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>39</td>
<td>10.50</td>
<td>409.50</td>
</tr>
<tr>
<td>Overtime</td>
<td>3.5</td>
<td>12.25</td>
<td>42.87</td>
</tr>
<tr>
<td>Total</td>
<td>42.5</td>
<td>Gross Pay</td>
<td>452.37</td>
</tr>
</tbody>
</table>
CHECKLIST

DUTY Performing Administrative Functions

TASK Maintain labor records.

ENABLER Fill out daily labor record.

STUDENT'S NAME _________________________ DATE ______

EVALUATOR'S NAME _________________________ COURSE ______

TIME: STARTED _______ COMPLETED _____________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the daily labor record worksheet.

PERFORMANCE DETERMINANTS YES NO

The preparer:
- Recorded the date. ______  ______
- Recorded the customer's name and address. ______  ______
- Recorded Service/work performed. ______  ______
- Recorded equipment serial/identification number. ______  ______
- Recorded time in and time out. ______  ______
- Recorded total time on the job. ______  ______
- Recorded miscellaneous charges and their costs. ______  ______
- Recorded daily labor record signed by both the service person and the customer. ______  ______
- Recorded daily record made for each customer served. ______  ______
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Maintain labor records.

ENABLER  Fill out weekly labor record.

STUDENT'S NAME _______________________________ DATE __________

EVALUATOR'S NAME _______________________________ COURSE _______

TIME:  STARTED _______ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the weekly labor record worksheet.

PERFORMANCE DETERMINANTS  YES  NO

The preparer:

- Recorded the week ending date.  _____  _____

- Recorded the employees' names and social security numbers.  _____  _____

- Recorded regular time in and time out and totaled for each day.  _____  _____

- Recorded and totaled overtime in and out for each day.  _____  _____

- Recorded a daily total for each day.  _____  _____

- Recorded total regular time hours & payrates.  _____  _____

- Recorded total overtime hours and payrates.  _____  _____

- Recorded the total earnings for regular and overtime hours calculated.  _____  _____

- Recorded gross earnings calculated.  _____  _____

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GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #5

TASK: Train new service technicians.

STANDARD OF PERFORMANCE OF TASK:

Familiarize new service technician trainee with co-workers, work area, company policies, job duties, responsibilities, routines and procedures necessary to function efficiently on the job.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Service technician trainee
Training manuals
Company policies book
Duty and responsibility list

ENABLING OBJECTIVES:

1. Explain the procedure for familiarizing new service trainees with co-workers, work area, and company policies.

RESOURCES:

2. Company service technician training manual.
3. Guest speaker.
4. Examples of different policy and training manuals.
5. Checklist - Training service technicians.

TEACHING ACTIVITIES:

1. Presentation of service training procedures/techniques by guest speaker. (*3)
2. Conduct class discussion on training procedures/techniques. (*1, 2, 3 & 4)
3. Conduct class discussion on attitudes of responsibilities of a service technician. (*1, 2, 3 & 4)
TEACHING ACTIVITIES: (cont.)

4. Instruct class to write five training techniques/procedures that they feel would be most helpful to them when they are trained on the job.

5. Conduct role playing activities where students take turns being new technicians (trainee) and experienced technicians trainer.

CRITERION-REFERENCED MEASURE:

Student will be able to identify the attitudes and responsibilities expected of a service technician.

PERFORMANCE GUIDE:

1. Introduce trainee to co-workers.
2. Familiarize trainee with work routine, shop facilities, policies, and procedures.
3. Explain job duties and responsibilities.
4. Provide trainee with company policies book and training manuals.
5. Demonstrate unfamiliar service procedures.
6. Provide supervisory period.
7. Accompany trainee on service calls until he/she is familiar with procedures.
8. Answer questions asked by trainee.
DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #6

TASK: Maintain receiving records.

STANDARD OF PERFORMANCE OF TASK:

Receiving record will show purchase order number, date received, items received, items damaged or backordered, freight charges, cost, and seller's name.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Shipping invoice Central processing unit
Purchase order copy Disk drive
Pen/Pencil Monitor
File folders Printer
File cabinet Disks
Labels Disk storage cabinet
Receiving record form

ENABLING OBJECTIVES:

1. Verify shipping invoice with a purchase order copy.
2. Prepare a receiving report.

*RESOURCES:

5. Mock information sheet.
7. Checklist - Receiving records maintenance.
TEACHING ACTIVITIES:

1. **Present lecture on receiving reports.** (*1 & 2)
2. **Conduct class discussion on the importance of verifying invoices and keeping receiving reports.** (*1 & 2)
3. **Instruct students to list in writing the components/parts they believe are important to maintain good receiving records.**
4. **Demonstrate how to verify an invoice.** (Performance Guide #1)
5. **Demonstrate how to complete a receiving report.** (*1, 2, 3 & 4)
6. **Instruct student to complete a blank receiving report using a mock information sheet provided by the instructor.** (*5 & 6)

CRITERION-REFERENCED MEASURE:

Given a mock information sheet, the student will complete a receiving report worksheet including invoice/purchase order #, date received, vendor, invoice date, amount debit, balance and irregularities.

PERFORMANCE GUIDE:

1. **Receive and inspect a shipment:**
   A. Compare shipping invoice with purchase order copy.
   B. Mark items on invoice as they are unpacked.
   C. Make note of damaged, shortage/extra or incorrect goods to carrier.
   D. Make note of backordered goods.
   E. Sign freight bill and obtain copy.

2. **Record shipment received information on receiving form:**
   A. Date shipment received.
   B. Seller's name.
   C. Purchase order/inventory number.
   D. Freight costs.
   E. Total cost.
   F. Shipment inconsistencies.
   G. Make note of shipment storage location.

3. **Save and store file in a dry, dust free place.**
<table>
<thead>
<tr>
<th>Date</th>
<th>Vendor</th>
<th>Invoice Number</th>
<th>Invoice Date</th>
<th>Received By</th>
<th>Total Cost</th>
<th>Debit</th>
<th>Credit</th>
<th>Balance</th>
<th>Inconsistencies</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

XYZ Company, Inc.
6666 Nowhere Ave.
Anywhere, IL 00000
On May 10, 19__, the XYZ Company, Inc. received the following shipments. Using the information below, complete the receiving report worksheet provided by the instructor.

Shipment #1 - Invoice #764, dated April 16, 19__ from Parts Unlimited. John Henry received and inspected the shipment. John's purchase order showed they had ordered 6 disk drive belts at a cost of $22.00 each, but the shipment included only 5 disk drive belts.

Shipment #2 - Invoice #811, dated May 1, 19__, from Software, Inc. John Henry received and inspected the shipment. John's purchase order identified an order of 10 boxes of DSDD diskettes at a cost of $25.00 per box. All ten boxes were enclosed in the shipment.
STUDENT WORKSHEET

Student Name________________________

Receiving Report Worksheet

Instructions: Using the mock information sheet provided fill out the receiving report.

XYZ Company, Inc.
6666 Nowhere Ave.
Anywhere, IL 00000

Receiving Report

<table>
<thead>
<tr>
<th>Vendor Number</th>
<th>Invoice Number</th>
<th>Invoice Date</th>
<th>Received By</th>
<th>Total Cost</th>
<th>Debit</th>
<th>Credit</th>
<th>Balance</th>
<th>Inconsistencies</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

86

87
<table>
<thead>
<tr>
<th>Date</th>
<th>Vendor</th>
<th>Invoice Number</th>
<th>Invoice Date</th>
<th>Received By</th>
<th>Total Cost</th>
<th>Debit</th>
<th>Credit</th>
<th>Balance</th>
<th>Inconsistencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/10</td>
<td>Parts Un.</td>
<td>764</td>
<td>4/16</td>
<td>JH</td>
<td>132.00</td>
<td>110.00</td>
<td>22.00</td>
<td>110.00</td>
<td>-1 belt</td>
</tr>
<tr>
<td>5/10</td>
<td>Soft. Inc.</td>
<td>811</td>
<td>5/1</td>
<td>JH</td>
<td>250.00</td>
<td>250.00</td>
<td>------</td>
<td>250.00</td>
<td>none</td>
</tr>
</tbody>
</table>
CHECKLIST

DUTY: Performing Administrative Functions

TASK: Maintain receiving records.

ENABLER: Prepare a receiving report.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE _________

TIME: STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the receiving report worksheet.

PERFORMANCE DETERMINANTS

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

The preparer:
- Recorded the date received.
- Recorded vendor's name.
- Recorded invoice #.
- Recorded invoice date.
- Recorded employee who receiving shipment.
- Recorded invoice amount.
- Appropriately mark debit column.
- Recorded balance.
- Noted inconsistencies.
- Recorded freight costs.
- Recorded storage location.
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #7

TASK: Establish customer files.

STANDARD OF PERFORMANCE OF TASK:

Customer file will include customer name, account number, address, phone number, contact, and equipment/services received.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Customer information
Pen/Pencil
Typewriter
File folders
File cabinet
Labels
Receiving record form
Central processing unit
Disk drive
Monitor
Printer
Disks
Disk storage cabinet

ENABLING OBJECTIVES:

1. Set up a customer information file.

RESOURCES:

5. Worksheet - Customer information file.
7. Checklist - Establish customer files.

TEACHING ACTIVITIES:

1. Present lecture on different types of files.
(*1, 2, & 3)
TEACHING ACTIVITIES: (cont.)

2. Conduct class discussion on types of files.
3. Demonstrate how to establish and update a customer information file. (*4)
4. Instruct students to set up a customer information file using the mock information sheet provided by the instructor. (*5 & 6)

CRITERION-REFERENCED MEASURE:

Given a mock information sheet, the student will set up and update a customer information file including customer name, address, phone #, account #, contact person, type of equipment/services received, date equipment/services received, credit terms and specific problems encountered.

PERFORMANCE GUIDE:

1. Set up customer information file.
2. Record customer information:
   A. Account number.
   B. Name and address.
   C. Phone number.
   D. Name of person to contact.
   E. Type of equipment or service received.
   F. Date equipment or services received.
   G. Specific problems encountered.
   H. Credit terms:
      1. Cash.
      2. Charge.
      3. Warranty.
      4. Update.
      5. Maintenance contract.
3. Update files.
4. Save and store files in a dry, dust free place.
<table>
<thead>
<tr>
<th>Type Of Equipment</th>
<th>Serial / I.D. Number</th>
<th>Date Bought</th>
<th>Date Warranty Expires</th>
<th>Service Performed</th>
</tr>
</thead>
</table>

Name: ____________________  
Address: ____________________  
Contact Person: ____________________  
Account Number: ____________________  
Account Type: ____________________  
Phone Number: ____________________  
Credit Terms: ____________________  

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Customer Information:

Jane Doe

ABC Company, Inc.
606 Main Blvd.
Everywhere, IL 00000

999-999-9999

Acct.# C-7664

2% discount on invoices paid in full within 10 days of purchase. Balance of any purchase due in full after 30 days after purchase date.

On 9/11/84, Purchase Disk Drive #611794 with a 90 day warranty. Had head cleaned and aligned on 12/85.

On 10/1/84, Purchased Daisywheel Printer #49314 with a 90 day warranty. Had planten adjusted on 1/5/85. Had ribbon replaced and adjusted printhead height on 4/27/85.

On 12/2/85, Purchased 64K Central Processing Unit #92143 with a 180 day warranty.
STUDENT WORKSHEET

Student Name________________________

Title: Customer Information File

Directions: Complete the following worksheet using the mock information provided.

Name: ____________________________
Address: ___________________________
Contact Person: ____________________ Phone Number: ________________
Account Number: ________________ Credit Terms: ____________________
Account Type: ______________________

<table>
<thead>
<tr>
<th>Type Of Equipment</th>
<th>Serial / I.D. Number</th>
<th>Date Bought</th>
<th>Date Warranty Expires</th>
<th>Service Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Type Of Equipment</td>
<td>Serial / I.D. Number</td>
<td>Date Bought</td>
<td>Date Warranty Expires</td>
<td>Service Performed</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------</td>
<td>-------------</td>
<td>-----------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Disk Drive</td>
<td>611794</td>
<td>9/11/84</td>
<td>12/11/84</td>
<td>6/12/84-Clean + align head.</td>
</tr>
<tr>
<td>Daisy Wheel Printer</td>
<td>49314</td>
<td>10/1/84</td>
<td>1/1/85</td>
<td>1/5/85-Adjust planen.</td>
</tr>
<tr>
<td>64k C.P.U.</td>
<td>92143</td>
<td>12/2/85</td>
<td>6/2/86</td>
<td>4/27/85-Replace ribbon + adjust printer head height.</td>
</tr>
</tbody>
</table>
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Establish Customer Files.

ENABLER  Set up a customer information file.

STUDENT'S NAME ___________________ DATE ______

EVALUATOR'S NAME ___________________ COURSE ______

TIME:  STARTED _______ COMPLETED _________ TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the customer information worksheet.

PERFORMANCE DETERMINANTS       YES       NO

The preparer

- Recorded customers names and addresses. ______ ______

- Identified contact person and phone number. ______ ______

- Recorded the account type and number. ______ ______

- Recorded credit terms. ______ ______

- Recorded type of equipment. ______ ______

- Recorded the equipment serial and identification number. ______ ______

- Recorded the date the equipment was bought. ______ ______

- Recorded the warranty expiration date. ______ ______

- Recorded service performed. ______ ______

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GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #8

TASK: Maintain in-stock parts list.

STANDARD OF PERFORMANCE OF TASK:
In-stock parts list will reflect current changes in part names, numbers, code, description and total count.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Inventory sheets
Pen/Pencil
Inventory diskette
Central processing unit
Disk drive
Printer

ENABLING OBJECTIVES:

1. Complete in-stock parts list inventory sheet.

RESOURCES:

5. Worksheet - Inventory.
6. Checklist - Inventory.

TEACHING ACTIVITIES:

1. Present lecture on maintaining in-stock parts inventory. (*1 & 2)
2. Instruct student to write down at least four reasons why maintaining an in-stock parts inventory is important.
TEACHING ACTIVITIES: (cont.)

3. Conduct a class discussion on the importance of keeping inventory.
4. Demonstrate how to complete an inventory sheet. (*3)
5. Instruct student to complete an in-stock parts list inventory worksheet. (*4, 5 & 6)

CRITERION-REFERENCED MEASURE:

Given a mock information sheet, the student will complete an in-stock parts inventory sheet including company name, counted by, computed by, recorded by, date, sheet no., stock #, description, unit of count, quantity in stock, maximum, minimum, unit cost, unit price, total value, and reorder decision.

PERFORMANCE GUIDE:

1. List parts on inventory sheet:
   A. Name.
   B. Part number.
   C. Code.
   D. Description.
   E. Minimum and maximum numbers needed.
   F. Value:
      1. Wholesale.
      2. Retail.
2. Count total for part.
3. Record totals on inventory sheet.
4. Obtain in-stock parts list form.
5. Enter total on in-stock parts list form.
6. Determine minimum and maximum number of part to be stocked.
7. Copy in-stock parts list form.
8. Reorder parts, if required.
9. Record parts reordered and date reordered.
10. Store inventory file in dry, dust free place.
# Parts Inventory Sheet

**Company Information:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock Number</th>
<th>Unit Count</th>
<th>Quantity in Stock</th>
<th>Unit Cost</th>
<th>Unit Price</th>
<th>Total Value</th>
<th>Reorder Year No</th>
</tr>
</thead>
</table>

**Date:** __________, 19__

**Sheet Number:** ________

**Counted By:**

**Computed By:**

**Recorded By:**
In-Stock Parts
Inventory Information:

On June 30, 19__, John Henry of the XYZ Co., Inc.,
6666 Nowhere Ave, Anywhere, Il. 00000, counted,
computed, and recorded the following items on
inventory sheet #4.

Use this information to complete the inventory worksheet.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit of</th>
<th>Stock #</th>
<th>Unit Cost</th>
<th>Max.</th>
<th>Min.</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer Ribbon</td>
<td>10</td>
<td>ea.</td>
<td>133</td>
<td>10.50</td>
<td>24</td>
<td>6</td>
<td>13.25</td>
</tr>
<tr>
<td>I.C. Chip</td>
<td>2</td>
<td>ea.</td>
<td>134</td>
<td>16.00</td>
<td>12</td>
<td>6</td>
<td>26.50</td>
</tr>
<tr>
<td>Disk Drive Drive belt</td>
<td>3</td>
<td>ea.</td>
<td>135</td>
<td>22.00</td>
<td>6</td>
<td>4</td>
<td>25.00</td>
</tr>
<tr>
<td>Case Retaining Screws</td>
<td>2</td>
<td>Box</td>
<td>136</td>
<td>36.00</td>
<td>3</td>
<td>1</td>
<td>50.00</td>
</tr>
</tbody>
</table>
Student Name

Title: Parts Inventory Sheet

Directions: Complete the following worksheet using the mock information provided.

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock Number</th>
<th>Unit of Count</th>
<th>Quantity in Stock</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Unit Cost</th>
<th>Unit Price</th>
<th>Total Value</th>
<th>Reorder Yes No</th>
</tr>
</thead>
<tbody>
<tr>
<td>lock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>umbrella</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Company Information:

Date: __________________, 19__. Sheet Number: ________

Counted By: __________________ Computed By: __________________ Recorded By: __________________
**Parts Inventory Sheet**

**Company Information:** XYZ Company, Inc.  
6666 Nowhere Ave.  
Anywhere, IL 00000

**Date:** June 30, 1986

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock Number</th>
<th>Unit of Count</th>
<th>Quantity in Stock</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Unit Cost</th>
<th>Unit Price</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer Ribbon</td>
<td>133</td>
<td>each</td>
<td>10</td>
<td>24</td>
<td>6</td>
<td>10.50</td>
<td>13.25</td>
<td>132.50</td>
</tr>
<tr>
<td>I.C. Chip</td>
<td>134</td>
<td>each</td>
<td>2</td>
<td>12</td>
<td>6</td>
<td>18.00</td>
<td>26.50</td>
<td>43.00</td>
</tr>
<tr>
<td>Disk Drive Belt</td>
<td>135</td>
<td>each</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>22.00</td>
<td>25.00</td>
<td>75.00</td>
</tr>
<tr>
<td>Case Retaining Screws</td>
<td>136</td>
<td>box</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>36.00</td>
<td>50.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>
**CHECKLIST**

DUTY  Performing Administrative Functions

TASK  Maintain in-stock parts list.

ENABLER  Complete in-stock parts list inventory sheet.

STUDENT'S NAME ______________________   DATE ______

EVALUATOR'S NAME ____________________   COURSE ______

TIME:  STARTED ______   COMPLETED ____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the in-stock parts inventory worksheet.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed company information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded inventory date.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Marked inventory sheet number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entered name of the person who counted, computed and recorded the inventory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Provided part description.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded part stock number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded unit count for each part.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded quantity in stock.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Stocked maximum listed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Stocked minimum listed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded unit cost.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded unit price.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated total in-stock value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Made reorder decision.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

72  110
DUTY: "Performing Administrative Functions"

PERFORMANCE OBJECTIVE #9

TASK: Order parts.

STANDARD OF PERFORMANCE OF TASK:
Order parts as minimum supply numbers are reached.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:
Vendor list
Parts catalog/price list
Parts inventory printout
Purchase order forms
Pen/pencil

ENABLING OBJECTIVES:
1. Identify items to reorder.
2. Fill out a purchase requisition form.

RESOURCES:
5. Worksheet - Purchase requisition.
6. Checklist - Purchase requisition.

TEACHING ACTIVITIES:
1. Present lecture on ordering parts, materials and equipment. (*1 & 2)
2. Present lecture on completing a purchase requisition. (*1 & 2)
3. Conduct class discussion on the parts and function of a purchase requisition.
TEACHING ACTIVITIES: (cont.)

4. Demonstrate how to fill out a purchase requisition. (*3)

5. Instruct students to fill out a purchase requisition worksheet using the mock information provided by the instructor. (*5 & 6)

CRITERION-REFERENCED MEASURE:

Using a mock information sheet, the student will complete a parts order form by filling out a purchase requisition form including account number, date, vendor, item number, quantity in stock, unit of count, description, unit price, total amount, subtotal, sales tax, shipping/handling, total cost and buyer signature.

PERFORMANCE GUIDE:

1. Review parts inventory printout/list to identify items at or below reorder point.

2. Locate part information from catalogs and lists:
   A. Part name, and reorder number.
   B. Price.
   C. Possible vendor.

3. Determine quantity of part to be ordered.

4. Complete purchase requisition form:
   A. Name/address of vendor.
   B. Name/address of buyer.
   C. Date of order.
   D. Purchase order number.
   E. Part name, reorder number, and description.
   F. Terms for payment.
   G. Expediting charges.

5. Proofread purchase order.

6. Obtain authorization and place order.

7. Record order information in inventory file.
Title: Purchase Requisition

XYZ Company, Inc.
6666 Nowhere Ave.
Anywhere, Il 00000

<table>
<thead>
<tr>
<th>Account Title</th>
<th>Account Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor</td>
<td>Purchase Order Number</td>
</tr>
<tr>
<td></td>
<td>Date</td>
</tr>
<tr>
<td></td>
<td>Credit Terms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Quantity Ordered</th>
<th>Unit Of Count</th>
<th>Description</th>
<th>Unit Price</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sub Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Tax</td>
</tr>
<tr>
<td>Shipping/Handling</td>
</tr>
<tr>
<td>Total Cost</td>
</tr>
</tbody>
</table>

Date Buyer Certification
Use the information below to complete the purchase requisition worksheet.

On September 11, 19__, John Henry placed a purchase order #123, with Parts Unlimited, 6681 Westlane, Vertex, IL 00003 for six disk drive belts at a cost of $22.00 each, two boxes of floppy diskettes at $26.00 per box, and 1 dozen of X-33 printer ribbons at $60.00 per dozen. John used the account titled "Parts Supplies", number C7776. Parts Unlimited charges $5.00 for shipping/handling of all orders, 6% IL state tax, and credit terms are included in total balance due 30 days after purchase date (n/30).
Title: Purchase Requisition Worksheet

Directions: Using the mock information sheet provided fill out the purchase requisition.

<table>
<thead>
<tr>
<th>Account Title</th>
<th>Account Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor</td>
<td>Purchase Order Number</td>
</tr>
<tr>
<td></td>
<td>Date</td>
</tr>
<tr>
<td></td>
<td>Credit Terms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Quantity Ordered</th>
<th>Unit Of Count</th>
<th>Description</th>
<th>Unit Price</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                      |                  | Sub Total     |
|                      |                  | Sales Tax     |
|                      |                  | Shipping/Handling |
|                      |                  | Total Cost    |

Date       Buyer Certification
Table: Part Supplies

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Quantity Ordered</th>
<th>Unit Of Count</th>
<th>Description</th>
<th>Unit Price</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>each</td>
<td>Disk Drive Belt</td>
<td>22.00</td>
<td>132.00</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>box</td>
<td>Floppy Diskettes</td>
<td>26.00</td>
<td>52.00</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>dozen</td>
<td>X-33 Printer Ribbons</td>
<td>60.00</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Sub Total 244.00
Sales Tax 14.64
Shipping/Handling 5.00
Total Cost 263.64

9/11/86 John Henry

Date Buyer Certification
CHECKLIST

DUTY Performing Administrative Functions

TASK Order Parts.

ENABLER Fill out a purchase order form for parts to be ordered.

STUDENT'S NAME __________________________ DATE ____________

EVALUATOR'S NAME ________________________ COURSE __________

TIME : STARTED __________ COMPLETED __________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the parts order information.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the account title and number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the P. O. number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the date entered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Provided vendor information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed the item number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entered quantity order.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Provided unit of count.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Provided a part description.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated total amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated subtotal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated sales tax.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entered shipping/handling cost.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Computed total cost.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded buyer signature.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #10

TASK: Maintain computer equipment inventory.

STANDARD OF PERFORMANCE OF TASK:

Computer equipment inventory will reflect levels of stock equipment on hand and a description of the equipment including equipment name, payment codes, cost, and reorder number.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Pen/pencil
Disk drive
File cabinet
Printer
File folders
Monitor
Equipment inventory forms
Central processing unit
Equipment inventory information
Equipment catalogs and price list

ENABLING OBJECTIVES:

1. Complete computer equipment inventory sheet.

RESOURCES:

5. Worksheet - Inventory.
6. Checklist - Inventory.

TEACHING ACTIVITIES:

1. Present lecture on maintaining a computer equipment inventory. (*1 & 2)
TEACHING ACTIVITIES: (cont.)

2. Instruct student to write down at least four reasons why maintaining an computer equipment inventory is important.
3. Conduct a class discussion on the importance of keeping an inventory.
4. Demonstrate how to complete an inventory sheet. (*3)
5. Instruct student to complete a computer equipment inventory worksheet. (*4, 5 & 6)

CRITERION-REFERENCED MEASURE:

Given a mock information sheet the student will complete an computer equipment inventory sheet including company name, counted by, computed by, recorded by date, sheet no., stock no., description, unit of count, quantity in stock, minimum, unit cost, unit price, total value, and reorder decision.

PERFORMANCE GUIDE:

1. Compile data describing item in stock:
   A. Name.
   B. Equipment serial# or vendor code.
   C. Payment codes.
   D. Cost.
   E. Reorder number.
   F. Current count.
2. Obtain purchase invoice or sales invoice and determine changes to inventory on hand.
3. Enter equipment inventory information into file.
4. Print equipment inventory.
5. Process reorder when established reorder point is reached.
6. Save and store file in a dry, dust free place.
<table>
<thead>
<tr>
<th>Description</th>
<th>Stock Number</th>
<th>Unit of Count</th>
<th>Quantity in Stock</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Unit Cost</th>
<th>Unit Price</th>
<th>Total Value</th>
<th>Reorder</th>
<th>Yes/No</th>
</tr>
</thead>
</table>

**Computer Equipment Inventory Sheet**

Company Information: ________________________________

__________________________

__________________________

Date: __________, 19__

Sheet Number: _________

Counted By: ________________________________

Computed By: ________________________________

Recorded By: ________________________________

__________________________

__________________________

__________________________
Inventory Information:

On July 1, 19__, John Henry of the XYZ Co., Inc., 6666 Nowhere Ave, Anywhere, Ill. 00000, counted, computed, and recorded the following items on inventory sheet #14.

Use this information to complete the inventory worksheet.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit of Count</th>
<th>Stock #</th>
<th>Unit Cost</th>
<th>Max.</th>
<th>Min.</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>-X-10 Printer</td>
<td>2</td>
<td>ea.</td>
<td>010</td>
<td>525.00</td>
<td>6</td>
<td>2</td>
<td>645.00</td>
</tr>
<tr>
<td>-Demon 64K</td>
<td>4</td>
<td>ea.</td>
<td>011</td>
<td>300.00</td>
<td>10</td>
<td>3</td>
<td>500.00</td>
</tr>
<tr>
<td>-Demon Data</td>
<td>5</td>
<td>ea.</td>
<td>012</td>
<td>70.00</td>
<td>8</td>
<td>4</td>
<td>86.75</td>
</tr>
<tr>
<td>Recorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-E.Z. Color</td>
<td>6</td>
<td>ea.</td>
<td>013</td>
<td>165.00</td>
<td>10</td>
<td>5</td>
<td>225.00</td>
</tr>
<tr>
<td>Monitor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-N.G.-80</td>
<td>3</td>
<td>ea.</td>
<td>014</td>
<td>200.00</td>
<td>6</td>
<td>1</td>
<td>335.25</td>
</tr>
<tr>
<td>Disk Drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STUDENT WORKSHEET

Student Name__________________________

Title: Computer Equipment Inventory Worksheet

Directions: Complete the following worksheet using the mock information provided.

**Computer Equipment Inventory Sheet**

Company Information: ________________________________


Date: __________, 19___

Counted By: ____________________________
Computed By: ____________________________
Recorded By: ____________________________

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock Number</th>
<th>Unit of Count</th>
<th>Quantity In Stock</th>
<th>Maximum Unit Cost</th>
<th>Minimum Unit Cost</th>
<th>Unit Price</th>
<th>Total Value</th>
<th>Reorder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sheet Number: ______

126

127
## Computer Equipment Inventory Sheet

**Company Information:** XYZ Company, Inc.  
6666 Nowhere, Ave.  
Anywhere, Il 00000

**Date:** July 1, 1986  
**Sheet Number:** 14

<table>
<thead>
<tr>
<th>Description</th>
<th>Stock Number</th>
<th>Unit of Count</th>
<th>Quantity in Stock</th>
<th>Max</th>
<th>Min</th>
<th>Unit Cost</th>
<th>Unit Price</th>
<th>Total Value</th>
<th>Reorder Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-10 Printer</td>
<td>010</td>
<td>each</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>525.00</td>
<td>645.00</td>
<td>1290.00</td>
<td>X</td>
</tr>
<tr>
<td>Demon 64k Computer</td>
<td>011</td>
<td>each</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>300.00</td>
<td>500.00</td>
<td>2000.00</td>
<td>X</td>
</tr>
<tr>
<td>Demon Date Recorder</td>
<td>012</td>
<td>each</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>70.00</td>
<td>86.75</td>
<td>433.75</td>
<td>X</td>
</tr>
<tr>
<td>E.Z. Color Monitor</td>
<td>013</td>
<td>each</td>
<td>6</td>
<td>10</td>
<td>5</td>
<td>165.00</td>
<td>225.00</td>
<td>1350.00</td>
<td>X</td>
</tr>
<tr>
<td>N.G.-80 Disk Drive</td>
<td>014</td>
<td>each</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>200.00</td>
<td>335.25</td>
<td>1005.75</td>
<td>X</td>
</tr>
</tbody>
</table>
DUTY  Performing Administrative Functions

TASK  Maintain computer equipment inventory.

ENABLER  Fill out a computer equipment inventory sheet.

STUDENT'S NAME ___________________ DATE __________

EVALUATOR'S NAME ___________________ COURSE ________

TIME:  STARTED __________ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate the computer equipment inventory worksheet.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed company information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded inventory date.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Marked inventory sheet number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Entered name of the person's who counted, computed, and recorded the inventory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Provided part descriptions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded part stock numbers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gave unit count for each part.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded in stock quantity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed stock maximum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed stock minimum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded unit cost.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded unit price.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated total in-stock value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Made reorder decision.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #11

TASK: Maintain records of service tools and equipment.

STANDARD OF PERFORMANCE OF TASK:

Records of purchases and repairs of equipment and tools used in conducting business will include date, cost, identification number and expected life.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

File folders
File cabinet
Pen/Pencil
Disk drive
Monitor
Printer
Disks
Disk storage cabinet
Service tool list
Central processing unit
Listing of service equipment
Inventory information sheets

ENABLING OBJECTIVES:

1. Update service tools and equipment records.

RESOURCES:

3. Service tools & equipment record sheets.
4. Checklist - Update service tools & equipment records.

TEACHING ACTIVITIES:

1. Present lecture on procedures for maintaining records of service tools and equipment. (1 & 2)
TEACHING ACTIVITIES: (cont.)

2. Present lecture on the parts of an invoice voucher and their location. (*1 & 2)
3. Discuss the importance of the date of purchase, cost, identification number, expected life, and rate of depreciation of service tools.
4. Demonstrate to students how to identify and record service tools and equipment purchase information.
5. Demonstrate to students how to identify and record service tools and equipment.
6. Instruct students to update service tools and equipment records.

CRITERION-REFERENCED MEASURE:

Students will maintain service tools and equipment purchase and repair records including, date, cost, identification #, rate and method of depreciation and expected life.

PERFORMANCE GUIDE:

1. Obtain purchase invoices and record purchase of all tools and equipment:
   A. Date of purchase.
   B. Cost.
   C. Identification number.
   D. Expected life.
   E. Rate and method of depreciation.
2. Obtain repair invoices and record all repairs:
   A. Date of repair.
   B. Cost.
   C. Identification numbers
3. Record discontinuance of tools and equipment including any value at the time of disposal and any value received.
DUTY  Performing Administrative Functions

TASK  Maintain records of service tools and equipment.

ENABLER  Update service tools and equipment records.

STUDENT'S NAME __________________________ DATE ____________

EVALUATOR'S NAME ________________________ COURSE _________

TIME:  STARTED _______  COMPLETED __________________

TOTAL ___________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while updating service tools and equipment records.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained all service tools and equipment purchase and repair invoices.  __ ___

- Recorded the date of purchase.  __ ___

- Recorded the identification number.  __ ___

- Recorded the cost.  __ ___

- Determined and recorded the rate and method of depreciation.  __ ___

- Recorded the discontinuance of service tools and equipment.  __ ___

- Recorded the value at the time of disposal and any value received for disposed tools and equipment.  __ ___
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #12

TASK: Maintain shipping records.

STANDARD OF PERFORMANCE OF TASK:

Shipping records will show what items were shipped, how they were shipped, estimated time of arrival and what the freight charges were.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

| Pen/pencil | Freight billing forms |
| File folders | Central processing unit |
| File cabinet | Disk drive |
| Monitor | Printer |
| Disks | Disk file cabinet |
| Customer information |

ENABLING OBJECTIVES:

1. Complete shipping records.

RESOURCES:

5. Checklist - Complete shipping list.

TEACHING ACTIVITIES:

1. Present lecture on maintaining shipping records. (*1,2,3 & 4)
TEACHING ACTIVITIES: (cont.)

2. Conduct discussion on information included in shipping records.
3. Present lecture on interpreting a freight billing form. (*1 & 3)
4. Demonstrate how to locate shipping record information on freight billing form.
5. Demonstrate how to complete shipping records.
6. Instruct student to interpret a freight billing form and complete a shipping record.

CRITERION-REFERENCED MEASURE:

Student will maintain shipping records to include items shipped, date shipped, how shipped, estimated time of arrival, and amount of freight charges.

PERFORMANCE GUIDE:

1. Obtain freight billing form.
2. Enter information into file:
   A. Customer's name, address, phone#, and contact person.
   B. Account number.
   C. Items shipped and serial#'s
   D. Method of shipment.
   E. Date of shipment.
   F. Freight charges.
   G. Estimated time of arrival.
3. Store shipping record file in a dry, dust free place.
CHECKLIST

DUTY: Performing Administrative Functions

TASK: Maintain shipping records.

ENABLER: Complete shipping records.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ____________________ COURSE ________

TIME : STARTED ________ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while maintaining shipping records.

PERFORMANCE DETERMINANTS

YES  NO

The preparer

- Obtained freight billing form. ______ ______

- Recorded customer name, address, phone number and contact person. ______ ______

- Recorded the account title. ______ ______

- Recorded items shipped and their serial numbers. ______ ______

- Recorded method and date of shipment. ______ ______

- Recorded the amount of freight charges. ______ ______

- Recorded estimated time of arrival. ______ ______

- Stored shipping record in a dry, dust free place. ______ ______
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #13

TASK: Prepare items for shipping.

STANDARD OF PERFORMANCE OF TASK:

Package and label items to be shipped, complete freight billing forms and contact necessary delivery company for pick up; package must meet delivery company standards.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Pen/pencil  Freight billing forms
File folders  Central processing unit
File cabinet  Disk drive
Monitor  Printer
Disks  Disk file cabinet
Customer information

ENABLING OBJECTIVES:

1. Package and label merchandise for shipping.
2. Complete freight billing forms.
3. Determine method of shipping and choose appropriate delivery company.

RESOURCES:

2. List of delivery companies and services offered.
3. Postal regulations booklet.
4. Freight billing forms.
5. Checklist - Package and label merchandise for shipping.

TEACHING ACTIVITIES:

1. Present lecture on methods and procedure for preparing merchandise for shipping.
2. Discuss types of packages, packing materials, fasteners and labeling.
TEACHING ACTIVITIES: (cont.)

3. Demonstrate how different merchandise requires different packing.
4. Instruct students to determine appropriate packaging for different types of merchandise.
5. Demonstrate how to fill out a shipping label and shipping invoice.
6. Instruct student to complete a shipping label and invoice from shipping information provided.
7. Discuss types of delivery companies and the services offered by each.
8. Discuss return merchandise authorization number (RMAN).
9. Present lecture on filling out a freight billing form.
10. Discuss the location and purpose of each part of the freight billing form.
11. Demonstrate how to complete a freight billing form.
12. Instruct student to complete a freight billing form based on shipping information provided.

CRITERION-REFERENCED MEASURE:

The student will assemble merchandise to be shipped, determine appropriate packaging and package items, prepare shipping label, invoice, and freight billing form and contact delivery company for pick up of package to be shipped.

PERFORMANCE GUIDE:

1. Assemble items to be shipped.
2. Prepare items for shipping:
   A. Package items in boxes or cartons using sufficient packing materials to avoid shipping damage.
   B. Record on a shipping invoice the kind and amount of items placed in the box and enclose packing slip with shipment.
   C. Fasten the box using tape, string, glue, etc.
3. Label all boxes, cartons, packages, etc.:
   A. Customer's name and address.
   B. Dealership's name and address.
   C. Return merchandise authorization number.
4. Fill out a freight billing form in triplicate:
   A. Dealership's name and address.
   B. Customer's name, address, and account number.
   C. Number of boxes, cartons, packages, etc.
   D. Description of items to shipped.
   E. Weight of each package.
   F. Method freight charges will be paid.
   G. Date of shipment.
5. Review available shipping methods and select most efficient means:
   A. Delivery rates.
   B. Time turnover for delivery.
   C. Delivery routes.
   D. Insurance availability.
   E. Guarantee of delivery.

6. Contact shipping company to pick up packages:
   A. United Parcel Service.
   B. Overnight Delivery.
   C. Parcel Post.
   D. Bus Line.

7. File one copy of freight billing form for your record, second copy goes to shipping company and original copy goes to company.

8. Verify contact with receiving company for rush or special delivery.
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Prepare items for shipping.

ENABLER  Package and label merchandise for shipping.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME: STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while packaging and labeling merchandise for shipping.

PERFORMANCE DETERMINANTS                    YES NO

The preparer

- Assembled merchandise to be shipped. ______  ______

- Protected the merchandise with package and packing materials. ______  ______

- Completed shipping invoice and placed in the package. ______  ______

- Securely fasten package shut. ______  ______

- Completed and attached shipping label to the package. ______  ______

- Shipping label included the customer's name/address and the dealership's name/address. ______  ______

- Completed freight billing form. ______  ______

- Selected the most efficient shipping method. ______  ______

- Contacted and selected delivery company. ______  ______

- Kept a copy of the freight billing form for company records. ______  ______

- Made verification contact with receiving company for rush or special deliveries. ______  ______
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #14

TASK: Update Service Manuals

STANDARD OF PERFORMANCE OF TASK:

Replace out-of-date pages with current page, so manual contains most recent information.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Update instructions
Update pages
Service manuals

ENABLING OBJECTIVES:

1. Remove and replace out-of-date pages.

RESOURCES:

1. Service manuals.
2. Sample of update pages.
3. Sample of update instructions.

TEACHING ACTIVITIES:

1. Present lecture on importance of updating the service manual.
2. Discuss different types of updates.
3. Show students sample update pages.
4. Present lecture on the procedure for updating service manuals.
5. Discuss interpreting update instructions and replacing out-of-date pages.
6. Discuss the disposal or storage of out-of-date pages.
7. Demonstrate interpreting update instructions and replacing out-of-date pages.
8. Instruct student to update a service manual according to provided instructions and update materials.
CRITERION-REFERENCED MEASURE:

Student will interpret update instructions by removing and filing or disposing of out-of-date pages, and insert up-to-date pages in a service manual.

PERFORMANCE GUIDE:

1. Read update instructions information, and additions to logic/reliability reports.
2. Remove and discard outdated pages.
3. Replace with up-to-date pages.
**CHECKLIST**

**DUTY**  Performing Administrative Functions

**TASK**  Update service manuals.

**ENABLER**  Remove and replace out of date pages.

**STUDENT'S NAME**  

**DATE**  

**EVALUATOR'S NAME**  

**COURSE**  

**TIME**:  

**STARTED**  

**COMPLETED**  

**TOTAL**  

**DIRECTIONS TO THE EVALUATOR:**

Use the following checklist to evaluate student performance while removing and replacing out of date pages.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Updated the service manual.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained update information packet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Read the update instructions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed all out-of-date pages from the service manual.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Filed away or disposed all out-of-date pages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced all up-to-date pages in the correct order and position in the service manual.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Returned the service manual to its correct storage position.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GUIDE SHEET

DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #15

TASK: Maintain call report record.

STANDARD OF PERFORMANCE OF TASK:

Service call record will include problem, action taken, length of service call, parts needed, customer to be charged, mileage, travel time, and auto expenses.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Call record  
Pen/pencil  
File folders  
File cabinet

ENABLING OBJECTIVES:

1. Record service calls in call report order.

RESOURCES:

2. Service call sheet.  
3. Call report record.  

TEACHING ACTIVITIES:

1. Present lecture on information included in call report records.  
2. Discuss customer information.  
3. Discuss types of service calls.  
4. Discuss service work information.  
5. Demonstrate the procedure for completing a service call report record.  
6. Instruct student to complete a service call report record.
CRITERION-REFERENCED MEASURE:

The student will obtain the service call information and complete a service call report record including problem, action taken, length of call, parts needed, customer information and travel expenses.

PERFORMANCE GUIDE:

1. Complete service call.
2. Complete call record form:
   A. Customer's name.
   B. Customer's problem.
   C. Type of call:
      1. Warranty call.
      3. Service call.
   D. Parts replaced or adjustments made.
   E. Date call completed.
   F. Total time spent on the job.
   G. Sign or initial form.
CHECKLIST

DUTY Performing Administrative Functions

TASK Maintain call report record.

ENABLER Record service calls in call report record.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ____________________ COURSE ________

TIME: STARTED ______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while recording service calls in call report record.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained service call information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded customer's information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded customer's problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the type of call identified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the action taken.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the total time spent on the job.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded all parts needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the date of the call.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded the travel information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Signed or initialized the call report information.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #16

TASK: Conduct representative meetings.

STANDARD OF PERFORMANCE OF TASK:

Conduct meeting with other technicians to exchange ideas, discuss problems, updates and new products; keep abreast of what is going on in your service area and field of employment.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Agenda
Meeting place
Fellow service technicians

ENABLING OBJECTIVES:

1. Prepare and conduct a meeting.

RESOURCES:

3. Sample agendas.
4. Sample meeting room arrangements.
5. Checklist - Prepare and conduct a meeting.

TEACHING ACTIVITIES:

1. Present lecture on preparing for a meeting. (*2)
2. Discuss agenda and how to plan one.
3. Discuss ways of notifying technicians of the meeting.
4. Discuss meeting room arrangements.
5. Present a lecture on conducting a meeting. (*1 & 2)
6. Discuss presiding officer, minutes of the meeting, planned agenda, old business, new business, entertainment and refreshments.
TEACHING ACTIVITIES: (cont.)

7. Demonstrate how to plan and conduct a meeting.
8. Instruct students to plan and conduct a representative meeting. (**5)

CRITERION-REFERENCED MEASURE:

Student will prepare an agenda, make the meeting room arrangements, determine a method of contacting other technicians, determine meeting time and date and act as presiding officer at meeting. The meeting must start on time and follow the planned agenda.

PERFORMANCE GUIDE:

1. Prepare agenda.
2. Arrange meeting time and place.
3. Contact people who are to attend meeting.
4. Hold meeting promptly at scheduled time and place.
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Conduct representative meetings.

ENABLER  Prepare and conduct a meeting.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ______________________ COURSE ________

TIME:  STARTED _______ COMPLETED ________________

TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while preparing and conducting a meeting.

**PERFORMANCE DETERMINANTS**

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Planned an agenda.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Arranged meeting time and place.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined a method for contacting technicians.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Contacted all technicians who were to attend.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and followed a meeting room arrangements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Acted as presiding officer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Started and ended the meeting on time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed the agenda.</td>
<td></td>
<td></td>
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<tr>
<td>- Assigned someone to keep the minutes of the meeting.</td>
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<td></td>
</tr>
</tbody>
</table>

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DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #17

TASK: Establish customer and equipment history files.

STANDARD OF PERFORMANCE OF TASK:

Customer and equipment history records will include customer name, phone number, contact person, date, equipment style/serial number, type of equipment, and maintenance history.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

- Customer information
- Pen/Pencil
- Typewriter
- File folders
- Labels
- Filing cabinet
- Information form
- Central processing unit
- Monitor
- Disk drive
- Diskettes
- Printer

ENABLING OBJECTIVES:

1. Record information in customer and equipment history files.

RESOURCES:

3. Purchase invoice information.
4. Customer and equipment history files.
5. Checklist—Record information in customer and equipment history file.

TEACHING ACTIVITIES:

1. Present lecture on recording customer information in file. (1 & 2)
TEACHING ACTIVITIES: (cont.)

2. Discuss sources and methods of obtaining and filing customer name, address, phone number and contact person.
3. Obtain customer information and how to enter it into the file.
4. Present lecture on recording equipment information in file. (*1 & 2)
5. Discuss sources and methods for obtaining and filing model/style #, serial#, installation date, making status, service, maintenance agreement and engineering updates.
6. Demonstrate different methods for obtaining and filing equipment information.
7. Conduct a class discussion on the importance of having customer and equipment history files.
8. Instruct student to establish a customer and equipment history file. (*5)

CRITERION-REFERENCED MEASURE:

The student will obtain customer and equipment information and establish a customer and equipment history file including customer name, address, phone number, contact person, date purchased, equipment style/serial #, type of equipment and maintenance history.

PERFORMANCE GUIDE:

1. Set up information file for each customer:
   A. Record customer information:
      1. Name.
      2. Address.
      3. Phone #
      4. Contact person.
   B. Record equipment information:
      1. Model/style number.
      2. Serial number.
      3. Installation date.
      5. Service/maintenance agreement.
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Establish customer and equipment history files.

ENABLER  Update history files.

STUDENT'S NAME _________________________ DATE ______

EVALUATOR'S NAME _________________________ COURSE ______

TIME:  STARTED ______  COMPLETED ____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while establishing customer and equipment history files.

PERFORMANCE DETERMINANTS    YES    NO

The preparer

- Identified a source for customer and equipment information.  ______  ______

- Obtained customer and equipment information.  ______  ______

- Set up an information file for each customer.  ______  ______

- Recorded and filed the customer's name, address, phone number and contact person.  ______  ______

- Recorded and filed equipment model/style number, serial number, installation date, machine status, service/maintenance agreement and engineering updates.  ______  ______

- Stored file in a safe place.  ______  ______
DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #18

TASK: Calculate equipment repair costs.

STANDARD OF PERFORMANCE OF TASK:

Total repair cost will include labor cost, parts cost, travel cost, and taxes.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

List of customer problems
Hourly labor charge list
Parts price list
Pen/Pencil
Paper
Calculator

ENABLING OBJECTIVES:

1. Determine total repair cost.
2. Fill out repair bill.

RESOURCES:

1. List of repair charges.
2. Parts price list.
3. Sample repair bills.
4. Pen, paper and calculator.
5. Checklist - Determine total repair cost.

TEACHING ACTIVITIES:

1. Present lecture on calculating equipment repair cost procedures.
2. Discuss calculating labor costs.
3. Discuss calculating parts costs.
4. Discuss calculating travel costs.
5. Demonstrate to student how to calculate equipment repair costs.
6. Discuss different types of service calls.
7. Demonstrate to student how to fill-out a repair bill.
TEACHING ACTIVITIES: (cont.)

8. Conduct a question and answer session on calculating equipment repair costs.
9. Instruct student to calculate total equipment repair cost and fill out a repair bill.

CRITERION-REFERENCED MEASURE:

The student will calculate the total equipment repair cost, determine type of service call, and fill out a repair bill including labor cost, parts cost, travel cost, and taxes.

PERFORMANCE GUIDE:

1. Calculate labor cost:
   A. Total time spent on job.
   B. Multiply hours by hourly rate.
   C. Use minimum labor charge when necessary.

2. Calculate parts cost:
   A. List parts used.
   B. Look up part number and price.
   C. Total parts cost.
   D. Total taxable costs and calculate tax cost.

3. Calculate travel costs:
   A. Total mileage for job.
   B. Multiply mileage by charge per mile.

4. Total all costs.
   NOTE: When there is no charge, indicate why (warranty repair, recall, update, etc.).
CHECKLIST

DUTY Performing Administrative Functions

TASK Calculate equipment repair costs.

ENABLER Determine total repair cost.

STUDENT'S NAME ____________________ DATE ______

EVALUATOR'S NAME ____________________ COURSE ______

TIME: STARTED _______ COMPLETED __________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while determining total repair cost.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained all repair information. __________
- Calculated labor costs. __________
- Calculated parts costs. __________
- Calculated travel costs. __________
- Determined type of service call. __________
- Filled out a repair bill. __________
- Correctly calculated and totaled all costs. __________
DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #19

TASK: Calculate systems installation costs.

STANDARD OF PERFORMANCE OF TASK:

Total installation cost will include equipment needed, prices, taxes, rebates, handling costs, and maintenance contract cost.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Customer requirements
System layout
Equipment price list
Pen/Pencil
Estimate forms
Calculator

ENABLING OBJECTIVES:

1. Determine system installation cost.
2. Review customer requirements and system layout.

*RESOURCES:

1. Equipment price list.
2. List of installation costs.
3. Sample installation bills.
4. Pen, paper and calculator.
5. Checklist - Determining system installation cost.

TEACHING ACTIVITIES:

1. Present lecture on determining customers requirements.
2. Discuss different types of customers needs.
3. Discuss reviewing system layout to determine equipment needs.
4. Present lecture on calculating system installation cost and completing an estimate form.
TEACHING ACTIVITIES: (cont.)

5. Discuss calculating retail price of equipment.
6. Discuss calculating sales tax and shipping/handling costs.
7. Discuss calculating rebates and discounts.
8. Discuss types of maintenance contracts and costs.
9. Discuss operator training costs.
10. Demonstrate how to calculate system installation costs and fill-in a system installation estimate form.
11. Instruct student to calculate system installation cost and fill-in an estimate form.

CRITERION-REFERENCED MEASURE:

The student will review system layout and customer requirements, calculate system installation costs and complete an estimate form.

PERFORMANCE GUIDE:

1. Review customer requirements
2. Review system layout.
3. List equipment needed to meet requirements.
4. Calculate retail price for each piece of equipment.
5. Calculate sales tax.
6. Calculate rebates or discounts.
7. Calculate shipping and handling costs.
8. Calculate maintenance contract cost (if desired).
9. Calculate operator training cost.
10. Total all costs.
11. Fill in company name/individual's name and equipment costs on estimate forms.
12. Sign and date estimate form; give time limit on estimate expiration.
13. Give original estimate to customer and keep duplicate for files.
DUTY  Performing Administrative Functions

TASK  Calculate systems installation costs.

ENABLER  Determine installation costs.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ______________________ COURSE ________

TIME:  STARTED _______ COMPLETED _________________

TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while determining installation costs.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reviewed customer requirements and system layout.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined equipment needed and retail price.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated sales tax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined rebates and discounts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated shipping and handling costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined type and cost of maintenance contract.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculated operator training cost.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Totaled all installation costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Completed an estimate form.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Signed and dated estimate form.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed an estimate expiration date.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY: Performing Administrative Functions

PERFORMANCE OBJECTIVE #20

TASK: Update on-site maintenance log.

STANDARD OF PERFORMANCE OF TASK:

On-site maintenance log must indicate the style and serial number of machine, system or manufacturing update, service performed, date and service person's signature or initials.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

On-site maintenance log sheet
Service performed information
Pen/pencil

ENABLING OBJECTIVES:

1. Determine and maintenance performed on equipment.
2. Maintain on-site maintenance log.

RESOURCES:

1. On-site maintenance log.
2. Equipment Service record.
5. Worksheet - Maintenance log.
6. Checklist - Determine and record maintenance performed on equipment.

TEACHING ACTIVITIES:

1. Present lecture on procedures for maintaining a on-site maintenance log.
2. Discuss equipment identification by style and serial number.
3. Discuss different types of service (preventive maintenance, service repairs, manufacturing, system update/upgrade, repeating problem.)
4. Discuss completing on-site maintenance log.
5. Demonstrate procedure for completing on-site maintenance log.
6. Conduct a question and answer session on maintaining and on-site maintenance log.
7. Instruct student to complete an on-site maintenance log.

CRITERION-REFERENCED MEASURE:

The student will complete a on-site maintenance log including equipment style and serial number, type of service performed, date of service and service person's signature or initials.

PERFORMANCE GUIDE:

1. Obtain on-site maintenance log.
2. Record style and serial number of machine serviced.
3. Record what service was performed.
   A. Preventive maintenance.
   B. Service repairs
   C. Manufacturing/system update.
   D. Repeating problems.
4. Record date of service and sign or initial log.
5. Return on-site maintenance log to proper on-site storage place.
## Maintenance / Repair Log

<table>
<thead>
<tr>
<th>Technician’s Name and I.D. Number</th>
<th>Date</th>
<th>Time On</th>
<th>Time Off</th>
<th>Complaint</th>
<th>Work Performed</th>
<th>Replacement Parts Used</th>
<th>Notes</th>
</tr>
</thead>
</table>

- **Site Name:**
- **Equipment Type:**
- **Equipment Serial Number:**
On 8/23/86, John Henry, technician #04 of the XYZ company received a service call from the ABC company concerning a printer which was skipping letters. John arrived on the site at 1:10 pm and was taken to a daisy wheel printer, serial #641221. Upon inspection of the printer, John found that several of the print arms on the daisy wheel were damaged. John replaced the daisy wheel, part #62129, and performed an operational check. The operational check showed that M's and W's were not fully printed. John adjusted the platen to correct the print problems. John performed a second operational check and found everything in order. John noted that the printer was due for a scheduled maintenance lubrication on 9/24/86 and left the ABC site at 2:45pm.
### MAINTENANCE / REPAIR LOG

<table>
<thead>
<tr>
<th>Site Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Type:</td>
</tr>
<tr>
<td>Equipment Serial Number:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technician's Name and I.D. Number</th>
<th>Date</th>
<th>Time On</th>
<th>Time Off</th>
<th>Complaint</th>
<th>Work Performed</th>
<th>Replacement Parts Used</th>
<th>Notes</th>
</tr>
</thead>
</table>


## MAINTENANCE / REPAIR LOG

**Site Name:** ABC Company  
**Equipment Type:** Daisywheel Printer  
**Equipment Serial Number:** 641221

<table>
<thead>
<tr>
<th>Technician's Name and L.D. Number</th>
<th>Date</th>
<th>Time On</th>
<th>Time Off</th>
<th>Complaint</th>
<th>Work Performed</th>
<th>Replacement Parts Used</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Henry-04</td>
<td>8/23/86</td>
<td>1:10pm</td>
<td>2:45pm</td>
<td>Printer 641221 skipping letters</td>
<td>Replaced daisy wheel, aligned platen</td>
<td>Daisywheel 62129</td>
<td>Scheduled maintenance lubrication on 9/24/86</td>
</tr>
</tbody>
</table>
CHECKLIST

DUTY  Performing Administrative Functions

TASK  Update on-site maintenance log.

ENABLER  Determine and record maintenance performed on equipment.

STUDENT'S NAME ___________________________ DATE ______

EVALUATOR'S NAME ___________________________ COURSE ______

TIME:  STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while determining and recording maintenance performed on equipment.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained the on-site maintenance log.  __________  __________

- Recorded equipment style and serial number.  __________  __________

- Identified type of service performed.  __________  __________

- Recorded type of service.  __________  __________

- Recorded the date the service.  __________  __________

- Signed the maintenance log.  __________  __________

- Return on-site maintenance log to its proper storage place.  __________  __________
GUIDE SHEET

DUTY: Maintaining Customer Service

PERFORMANCE OBJECTIVE #21

TASK: Answer customer questions

STANDARD OF PERFORMANCE OF TASK:

Maintain customer satisfaction by answering customer questions as they arise.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Service knowledge
Courteous mannerisms

ENABLING OBJECTIVES:

1. Maintain public relations by answering customer's questions.

RESOURCES:

2. ACE. Communications Handbook, Interstate Printers, Inc., Danville, IL.

TEACHING ACTIVITIES:

1. Present a lecture on mannerisms and techniques for dealing with the public. (*2)
2. Discuss greeting customers.
3. Discuss dealing with irate customers.
4. Discuss phone conversations vs. person to person conversations.
5. Demonstrate to students proper techniques for dealing with the public.
6. Conduct a question and answer session on situations and ways of dealing with them.
7. Instruct students to take turns at role playing different customer related problems.
CRITERION-REFERENCED MEASURE:

Student will maintain public relations by answering customer questions and dealing with customer related problems as they arise.

PERFORMANCE GUIDE:

1. Greet customer.
2. Listen to customer question.
3. Consult service manuals, knowledge and other personnel for assistance.
4. Provide customer with answer promptly.
5. Thank customer and invite them back if they have any other questions.
CHECKLIST

DUTY       Maintaining Customer Service

TASK       Answer customer questions.

ENABLER    Maintain public relations by answering customer questions.

STUDENT'S NAME __________________ DATE ______

EVALUATOR'S NAME __________________ COURSE ______

TIME: STARTED ______ COMPLETED _____________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while answering customer questions.

PERFORMANCE DETERMINANTS      YES      NO

The preparer

- Greeted the customer.  ____  ____

- Listened to customer question.  ____  ____

- Consulted service manuals, knowledge and other personnel for the answer to the question.  ____  ____

- Provided the customer with an answer immediately.  ____  ____

- Followed-up with the customer answer when it was not immediately available.  ____  ____

- Thanked the customer for their patronage and invited back.  ____  ____

- Serviced the customer promptly and courteously at all times.  ____  ____
DUTY: Maintaining Customer Service

PERFORMANCE OBJECTIVE #22

TASK: Troubleshoot customer problems.

STANDARD OF PERFORMANCE OF TASK:

Probable cause/problem must be determined and a course of action taken.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Customer problem
Service manuals
Trouble shooting charts
Schematics
Diagnostic routines

ENABLING OBJECTIVES:

1. Determine problem and course of action.

RESOURCES:

4. Manufacturer's operator manual
5. Manufacturer's service manual
6. Manufacturer's technical reference manual
7. Troubleshooting charts
8. Manufacturer's schematics
10. Diagnostic equipment & routines
TEACHING ACTIVITIES:

1. Present a lecture on troubleshooting procedures and techniques. (*1, 2, 3, 5 & 9)
2. Discuss manufacturers operator, service and technical manuals.
3. Discuss troubleshooting charts.
4. Discuss schematics.
5. Discuss diagnostic equipment & routines.
6. Demonstrate the different methods and procedures for troubleshooting computer equipment.
7. Assign the student a piece of computer equipment with a known problem and have the student troubleshoot it.
8. Conduct a question and answer session on the methods, procedures, and techniques for troubleshooting computer equipment.
9. Instruct the student to troubleshoot a piece of computer equipment based on the customer's complaint, troubleshooting charts, schematics, technical manuals and diagnostic equipment and routines. (*11)

CRITERION-REFERENCED MEASURE:

The student will identify the customer complaint and determine the probable cause and course of action to be taken, using troubleshooting charts, schematics, technical manuals and diagnostic equipment and routines.

PERFORMANCE GUIDE:

1. Listen to symptom/problem, as related by the operator.
2. Consult knowledge, manuals, charts, etc., for probable cause.
3. Diagnose problem for machine malfunction or operator error.
4. Suggest to operator a course of action for solving operator error.
5. Perform necessary repairs for machine malfunction.
DUTY Maintaining Customer Service

TASK Troubleshooting customer problems.

ENABLER Determine problem and course of action.

STUDENT'S NAME ___________________________ DATE _________

EVALUATOR'S NAME ___________________________ COURSE _______

TIME: STARTED _______ COMPLETED ____________ TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while troubleshooting customer problems.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Identified the customer problem. ______ ______

- Consulted knowledge, technical manuals, troubleshooting charts, schematics and diagnostic equipment/routines for a probable. ______ ______

- Diagnosed the problem as either a machine malfunction or an operator error. ______ ______

- Identified a course of action to solve the problem. ______ ______

- Followed the course of action. ______ ______

- Course of action solved the problem. ______ ______
GUIDE SHEET

DUTY: Maintaining Customer Service

PERFORMANCE OBJECTIVE #23

TASK: Determine repair method.

STANDARD OF PERFORMANCE OF TASK:

Repair method will provide most efficient, thorough repair of customer equipment.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Customer equipment
Service manuals
Customer complaint/problem
Service knowledge

ENABLING OBJECTIVES:

1. Identify most efficient repair method.

RESOURCES:

7. Manufacturer's DOS manual.
8. Manufacturer's technical reference.
10. Checklist - Identify most efficient repair method.

TEACHING ACTIVITIES:

1. Present lecture on determining most efficient repair method. (1, 2, & 3)
TEACHING ACTIVITIES: (cont.)

2. Discuss resources for identifying probable repair methods.
3. Discuss procedures for determining most efficient repair method.
4. Compare several repair method and demonstrate how to determine the most efficient repair methods.
5. Conduct a question and answer session on components of efficient repair methods vs. inefficient methods.
6. Instruct student to compare several repair methods and determine which is most efficient. (*10)

CRITERION-REFERENCE MEASURE:

The student will identify possible repair methods, determine the most efficient repair method and take action based on that method.

PERFORMANCE GUIDE:

1. Obtain customer equipment.
2. Determine customer complaint/problem.
3. Determine most efficient repair method.
4. Take action on repair method decided on.
CHECKLIST

DUTY  Maintaining Customer Service

TASK  Determine repair method.

ENABLER  Identify most efficient repair method.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ____________________ COURSE ________

TIME: STARTED _______ COMPLETED ___________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while identifying the most efficient repair method.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Identified the customer complaint/problem.  ____  ____

- Determined the probable problem.  ____  ____

- Determined all possible repair methods.  ____  ____

- Determined the repair methods.  ____  ____

- Determined the most efficient repair method.  ____  ____

- Took action based on the most efficient repair method.  ____  ____
GUIDE SHEET

DUTY: Maintaining Customer Service

PERFORMANCE OBJECTIVE #24

TASK: Demonstrate computer equipment functions at store.

STANDARD OF PERFORMANCE OF TASK:

Participants will be shown how computer equipment functions, and be allowed to operate equipment themselves.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be demonstrated
Operation/reference manuals
Place for demonstration
Software

ENABLING OBJECTIVES:

1. Conduct a demonstration of computer equipment, software functions.
2. Assemble equipment, materials & supplies.

RESOURCES:

1. Manufacturer's operator's manual.
5. Supporting software.
6. Equipment/software catalogs and informational pamphlets.
7. Checklist - Conduct a demonstration of computer equipment/software function.

TEACHING ACTIVITIES:

1. Present lecture on organizing a computer equipment/software demonstration.
2. Discuss determining customer's requirements.
TEACHING ACTIVITIES: (cont.)

3. Discuss assembling needed equipment, materials and supplies.
4. Discuss test running equipment and reviewing operating manuals.
5. Discuss arranging a time and place and notifying the participants.
6. Present a lecture on presenting an in store demonstration.
7. Discuss equipment/software functions.
8. Discuss operating procedures.
9. Discuss how the computer/software can meet the customer needs.
10. Show the customer how the equipment/software operates and meet their needs.
11. Demonstrate to the student how to present an in store demonstration.
12. Conduct a question and answer session concerning setting up and presenting an in store demonstration.
13. Instruct the student to set up and present an in store computer equipment software demonstration.

CRITERION REFERENCE - MEASURED:

The student will arrange a demonstration time and place, assemble the necessary computer equipment/software and present an in store, hands on demonstration of computer equipment based on the customers needs.

PERFORMANCE GUIDE:

1. Assemble required equipment, materials, and supplies.
2. Test run equipment.
3. Set time and place for demonstration.
4. Notify participants.
5. Review manuals.
6. Determine customer needs/requirements.
7. Identify parts of equipment for participants.
8. Demonstrate how the equipment could be used.
9. Discuss optional uses of equipment.
10. Discuss precautions pertaining to normal operating procedures.
11. Demonstrate complete sequence of steps in performance of typical operations.
12. Explain use of operation manual for unusual procedures or trouble shooting strategies.
13. Answer any questions and allow participants to operate equipment under direct supervision.
14. Obtain contact name for future contact by phone.
CHECKLIST

DUTY Maintaining Customer Service

TASK Demonstrate computer equipment functions at store.

ENABLER Conduct a demonstration of computer equipment/software functions.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME: STARTED ________ COMPLETED ________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while conducting a demonstration of computer equipment/software functions.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Determine the customer's needs/requirements. ______ ______

- Assembled all required materials, supplies, and equipment/software. ______ ______

- Demonstrated the equipment test. ______ ______

- Reviewed the operator's manuals. ______ ______

- Identified a time and place for the demonstration. ______ ______

- Notified all participants well in advance of the demonstration. ______ ______

- Demonstrated the possible customer uses. ______ ______

- Allowed the participants hands on experience with the computer equipment software. ______ ______

- Answered all participants questions promptly and courteously. ______ ______

- Provided participants with informational pamphlets and catalogs. ______ ______
GUIDE SHEET

DUTY: Maintaining Customer Service

PERFORMANCE OBJECTIVE #25

TASK: Demonstrate software functions.

STANDARD OF PERFORMANCE OF TASK:

Demonstration will show how the software works and meets customer needs.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Software
Software documentation
Central processing unit
Disk drive
Printer
Monitor
Customer needs information

ENABLING OBJECTIVES:

1. Identify customer needs.
2. Determine software to be demonstrated.
3. Present software functions demonstration.

RESOURCES:

1. Manufacturer's operator's manual.
4. Software catalogs and informational pamphlets.

TEACHING ACTIVITIES:

1. Present lecture on presenting a demonstration. (*1, 2, 3 & 4)
2. Discuss determining customer's requirements.
3. Discuss assembling needed software and equipment.
4. Discuss test running software and reviewing operators manual.
5. Discuss arranging a time and place for the demonstration and notify the participants.
TEACHING ACTIVITIES: (cont.)

6. Discuss and demonstrate how to present a software demonstration.
7. Instruct student to demonstrate software functions.

CRITERION-REFERENCED MEASURE:

The student will arrange a demonstration, time and place, assemble the necessary computer equipment, computer software and demonstrate software functions.

PERFORMANCE GUIDE:

1. Determine customer software needs.
2. Select software which meets needs of customer.
3. Operate software for customer so they can see how software works and how it can meet their needs.
4. Operate software following instruction.
CHECKLIST

DUTY  Maintaining Customer Service

TASK  Demonstrate software functions.

ENABLER  Present software functions demonstration.

STUDENT'S NAME  _______________  DATE  __________

EVALUATOR'S NAME  _______________  COURSE  __________

TIME:  STARTED  __________  COMPLETED  __________

TOTAL  __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate software functions demonstration.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Arranged a time and place for the demonstration.  ____  ____

- Determined customer software needed.  ____  ____

- Selected software which meets customer needs.  ____  ____

- Assembled necessary software and equipment.  ____  ____

- Demonstrated software functions.  ____  ____

- Instructed customer in operating software.  ____  ____
GUIDE SHEET

DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #26

TASK: Determine customer requirements.

STANDARD OF PERFORMANCE OF TASK:

Customer requirements will include equipment, software, service contracts, and warranties based on customer needs.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Customer needs information
System layout plan

ENABLING OBJECTIVES:

1. Identify customer requirements.

RESOURCES:

2. Software information.
4. Equipment warrant information.

TEACHING ACTIVITIES:

1. Present lecture on types of customer requirements.
2. Discuss and demonstrate computer equipment and software needs.
3. Discuss service contracts and warranty information.
4. Discuss communication skills needed to interpret and answer customer question.
5. Instruct student to practice determining customers requirements.
6. Assign student to practice determining customer requirements by role playing.
7. Instruct student to determine customer requirements.
CRITERION-REFERENCED MEASURE:

The student will determine customer requirements including equipment, software, service contracts and warranties.

PERFORMANCE GUIDE:

1. Determine customer needs.
2. Determine equipment, software, service contracts, warranties, etc. needed to meet customer needs.
3. Suggest requirements to customer.
DUTY  Maintaining Customer Service

TASK  Determine customer requirements.

ENABLER  Identify customer needs.

STUDENT'S NAME ____________________  DATE ______

EVALUATOR'S NAME ____________________  COURSE ______

TIME  STARTED ______  COMPLETED ____________

TOTAL ____________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate determining customer requirements.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified customer's needs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined equipment needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined software needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and explained applicable warranties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Determined type of service contract needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Suggested requirements based on customer needs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE 27

TASK: Design system layout.

STANDARD OF PERFORMANCE OF TASK:

System layout must provide for working space, maximum utilization of space with minimum congestion, and comply with safety regulations.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Pen/pencil
Graph paper
Ruler
Scissors
Office requirements information

ENABLING OBJECTIVES:

1. Identify customer's needs.
2. Determine needed work space, safety regulations and utilization of space.

*RESOURCES:

1. Office requirements information.
2. Office space diagram.
3. Computer equipment list.
5. Checklist - System layout design.

TEACHING ACTIVITIES:

1. Present lecture on designing a system layout plan. (*1, 2, 3 & 4)
2. Discuss and demonstrate how to make a scale diagram of the office space.
3. Discuss and demonstrate reviewing work flow, traffic patterns, electrical and phone requirements and environmental needs.
TEACHING ACTIVITIES: (cont.)

4. Discuss and demonstrate "cutout" method of determining best equipment location.
5. Discuss and demonstrate drawing final system layout design.
6. Assign student a list of office requirement computer equipment list and equipment specification sheets.
7. Instruct student to design a system layout plan.

CRITERION-REFERENCED MEASURE:

The student will design a system layout plan. The layout plan must provide maximum utilization of work space, comply with safety regulations and meet equipment requirements.

PERFORMANCE GUIDE:

1. Diagram office space to scale.
2. Review work flow characteristics, traffic patterns, electrical and telephone needs, and environmental requirements.
3. Identify kinds of equipment and furniture needed.
4. Prepare cardboard cutouts of office equipment and furniture to scale.
5. Arrange cutouts on the scale diagram.
6. Indicate traffic patterns, work areas, electrical, telephone, and future expansion needs, and environmental controls on diagram.
CHECKLIST

DUTY  Installing computer equipment

TASK  Design system layout.

ENABLER  Determine needed work space, safety regulations and utilization of space.

STUDENT'S NAME ______________________ DATE ____________

EVALUATOR'S NAME _____________________ COURSE _________

TIME: STARTED _______ COMPLETED ____________
        TOTAL ____________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate system lay-out design.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained office requirement information sheets.  ____  ____

- Diagramed office space to scale.  ____  ____

- Identified work flow characteristics, traffic patterns, electrical and environmental needs.  ____  ____

- Identified types of equipment and furniture needed.  ____  ____

- Arranged equipment and furniture figures on scale diagram. (could be cut out or on computer.  ____  ____

- Identified best office arrangement.  ____  ____

- Summitted proposal to customer for approval.  ____  ____
DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #28

TASK: Transport equipment.

STANDARD OF PERFORMANCE OF TASK:

Equipment will be packaged, loaded, transported from store to customer site and unloaded for installation.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be transported
Packing materials
Truck or van
Customer address

ENABLING OBJECTIVES:

1. Package computer equipment for transporting to customer site.
2. Load and transport computer equipment to customer site.
3. Unload computer equipment at customer site.

RESOURCES:

1. Equipment packing requirement information.
2. Packing materials usage instructions.

TEACHING ACTIVITIES:

1. Present lecture on types of transportation preparation.
2. Discuss and demonstrate computer equipment internal preparation including securing read/write/verify head, securing carriage assembly, disconnecting peripheral cables and removing language and peripheral cards from slots.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate computer equipment external preparation including anti-static bags, styrofoam support blocks, impact absorbent packing materials, and shipping crates and boxes.

4. Present lecture on loading and transporting computer equipment.

5. Discuss safety considerations for loading and transporting computer equipment.

6. Discuss and demonstrate computer equipment loading and transporting procedures.

7. Instruct student to practice packing, loading and transporting computer equipment.

8. Assign student computer equipment, packing materials and transportation.

9. Instruct student to transport equipment to customer site.

CRITERION-REFERENCED MEASURE:

The student will package, load and transport the computer equipment from the store location to the customer site. Transportation of equipment must be completed without damage to any computer equipment components.

PERFORMANCE GUIDE:

1. Prepare equipment for transportation:
   A. Internal preparation.
   B. External preparation.

2. Gather equipment to be transported.

3. Package equipment to avoid damage.
   CAUTION: Follow manufacturers safety precautions for transporting equipment.

4. Load equipment into truck or van.

5. Transfer equipment to site.

6. Unload equipment at site.
CHECKLIST

DUTY Installing Computer Equipment

TASK Transport equipment.

ENABLER Equipment will be packaged, loaded transported from stored to customer site and unloaded for installation.

STUDENT'S NAME ______________________ DATE ______

EVALUATOR'S NAME ______________________ COURSE ______

TIME: STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while transporting equipment.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Prepared equipment for transportation. ___ ___
- Gathered equipment to be transported. ___ ___
- Packaged equipment to avoid damage. ___ ___
- Loaded equipment into truck or van. ___ ___
- Transferred equipment to site. ___ ___
- Unloaded equipment at site. ___ ___
GUIDE SHEET

DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #29

TASK: Set up equipment.

STANDARD OF PERFORMANCE OF TASK:

Set up equipment at customer site according to specifications in system layout plan

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be set up
System layout and plan
Tool kit
Truck or van

ENABLING OBJECTIVES:

1. Interpret system layout plan.
2. Install computer equipment on site.

RESOURCES:

1. Manufacturer's operator's manual.
5. Manufacturer's installation manual.

TEACHING ACTIVITIES:

1. Present lecture on setting up equipment on site. (*1, 2, 3, & 4)
2. Discuss and demonstrate unpacking procedures.
3. Discuss and demonstrate determining equipment location using system layout plan.
4. Discuss and demonstrate safety precautions and considerations for setting up equipment.
5. Discuss and demonstrate checking electrical requirements before installing equipment.
TEACHING ACTIVITIES: (cont.)

6. Discuss and demonstrate equipment set up procedures.
7. Demonstrate procedure for double checking equipment location and requirements to system layout and manufacturers specifications.
8. Instruct student to practice equipment set up procedures.
9. Assign student computer equipment to be set up, a system layout and manufacturers specifications.
10. Instruct student to set up the computer equipment.

CRITERION-REFERENCED MEASURE:

The student will set up the computer equipment on site according to system layout plan and manufacturers specifications.

PERFORMANCE GUIDE:

1. Unpack equipment at site.
2. Check system layout plan for equipment specifications and location.
   CAUTION: Check electrical requirements according to manufacturers specifications.
3. Assemble equipment.
4. Double check equipment set up with system layout plan for errors.
CHECKLIST

DUTY Installing Computer Equipment

TASK Set up equipment.

ENABLER Set up equipment at customer site according to specifications in system layout plan.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ___________________ COURSE ______

TIME : STARTED _______ COMPLETED ________________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while setting up equipment.

RECORD THIS INFORMATION:

MANUFACTURER: ____________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Unpacked equipment at site. ________
- Checked system layout plan for equipment specifications and locations. ________
- Checked electrical requirements. ________
- Assembled equipment. ________
- Double checked equipment set up with system layout plan for errors. ________
GUIDE SHEET

DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #30

TASK: Perform installation tests

STANDARD OF PERFORMANCE OF TASK:

Newly installed equipment must insure that central processing unit, peripherals, and software are functioning

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Diagnostic disk
C.P. U. layout
Monitor
Disk drive
Printer
Newly installed equipment

ENABLING OBJECTIVES:

1. Test newly installed equipment to insure that central processing unit, peripherals and software are functioning correctly.

RESOURCES:

1. Manufacturer's operator's manual.
5. Manufacturer's installation manual.
6. Checklist - Installation tests.

TEACHING ACTIVITIES:

1. Present lecture on installation testing procedures. (*1, 2, 3, 4 & 5)
2. Discuss and demonstrate testing procedures for the central processing unit, peripherals and software.
3. Discuss and demonstrate test run installation testing.
TEACHING ACTIVITIES: (cont.)

4. Discuss and demonstrate diagnostic disk installation testing.
5. Instruct student to practice installation testing procedures.
6. Assign student to practice installation testing procedures.
7. Instruct student to perform installation tests.

CRITERION-REFERENCED MEASURE:

The student will perform installation test in newly installed computer equipment. All equipment must operate without error.

PERFORMANCE GUIDE:

1. Check all connections.
2. Power up system.
3. Test run central processing unit, peripherals and software.
4. Run diagnostic program when a problem is encountered.
5. Power down system.
CHECKLIST

DUTY Installing Computer Equipment.

TASK Perform installation tests.

ENABLER Newly installed equipment must insure that central processing unit peripherals, and software are functioning.

STUDENT'S NAME ______________ DATE ______

EVALUATOR'S NAME ______________ COURSE ______

TIME: STARTED ______ COMPLETED ______________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while performing installation tests.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: __________

SERIAL #: ______

PERFORMANCE DETERMINANTS YES NO

The preparer
- Checked all connections. ______ ______
- Powered up system. ______ ______
- Ran tests on central processing unit. ______ ______
- Ran tests on peripheral and software. ______ ______
- Ran diagnostic program when a problem is encountered. ______ ______
- Powered down system. ______ ______
GUIDE SHEET

DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #31

TASK: Demonstrate usage of system on site.

STANDARD OF PERFORMANCE OF TASK:

Operator will be shown the usage of newly installed system including powering up system, loading and running software, safety features, general care and maintenance, and how to use operator manuals.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

On-site equipment
Necessary software
Working knowledge of system
Operator manuals
Personnel to be operating the system

ENABLING OBJECTIVES:

1. Determine computer system to be identified.
2. Identify and review equipment and software to be used.
3. Present a operational demonstration of the systems functions on site.

RESOURCES:

1. Manufacturer's operator's manual.
6. Demonstrator's notes on key functions, features and procedures.
7. Checklist - On site system usage demonstration.

TEACHING ACTIVITIES:

1. Present lecture on conducting an on site system usage demonstration. (*1,2,3,4,5 & 6)
TEACHING ACTIVITIES: (cont.)

2. Discuss methods for scheduling demonstration and contacting participants.
3. Discuss acceptable behavior and etiquette when visiting a on site location.
4. Discuss and demonstrate procedure for presenting a system operational demonstration including powering up the system, key features of the system and software functions.
5. Discuss how to conduct a participant question and answer session.
6. Discuss and demonstrate methods for conducting a hands on demonstration.
7. Assign a role playing activity were students take turns being the participant and the demonstrator.
8. Conduct a question and answer session allowing students to interact and offer each other suggestions based on the role playing assignment.
9. Instruct student to present a on site system usage demonstration.

CRITERION-REFERENCED MEASURE:

The student will schedule a on site demonstration, contact the demonstration participants, demonstrate key features, functions and procedures including, powering up system, loading and running software, safety features, general care and maintenance and use of the operator manual.

PERFORMANCE GUIDE:

1. Gather key personnel and operators together for demonstration.
2. Name specific key equipment, documentation, parts, and their functions.
3. Power up system and demonstrate operational procedures, key features and software functions.
4. Ask for and answer any questions.
5. Have operators try using system.
6. Run through the procedures with operator performing the physical tasks.
7. Ask for and answer questions.
8. Leave a business card or phone number to call in case of problems.
9. Obtain name of key person to contact.
10. Return periodically to check system operation and operators' progress.
CHECKLIST

DUTY  Installing computer equipment

TASK  Demonstrate usage of system on site.

ENABLER  Present operational demonstration of the system functions on site.

STUDENT'S NAME ________________________ DATE _________

EVALUATOR'S NAME ________________________ COURSE _________

TIME:  STARTED _______ COMPLETED ______________

TOTAL: __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate system usage demonstration.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Scheduled a on site demonstration. ______  ______

- Contacted the demonstration participants. ______  ______

- Identified key equipment, documentation parts and their functions. ______  ______

- Powered up the system and demonstrated operational procedures, key features and software functions. ______  ______

- Conducted a question and answer session. ______  ______

- Instructed operators to try using the system. ______  ______

- Aided the operator with physical task. ______  ______

- Conducted a final question and answer session. ______  ______

- Provided a business card or contact number in case of problems. ______  ______

- Obtained name of contact person. ______  ______
GUIDE SHEET

DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #32

TASK: Complete warranty cards.

STANDARD OF PERFORMANCE OF TASK:

Warranty card information must include type of machine, date purchased, copy of sales receipt, length of warranty, serial number, owner, and dealer.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Pen/Pencil
Typewriter
Equipment information
Warranty cards

ENABLING OBJECTIVES:

1. Obtain warranty information.
2. Fill out warranty card.

RESOURCES:

1. Manufacturer's operator's manual.
3. Warranty card instruction sheet.
5. Checklist - Warranty card completion.

TEACHING ACTIVITIES:

1. Present lecture on sources for obtaining warranty card information.
2. Discuss obtaining information from operator manual, sales receipt, equipment I.D. tags/plates, customer and manufacturer.
3. Present lecture on the procedure for completing a warranty card. (*1,2,3 & 4)
4. Discuss and demonstrate procedure for filling in warranty information.
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate process for summiting warranty to the manufacturer.
6. Instruct student to practice completing a warranty card.
7. Assign the student warranty information and a blank warranty card.
8. Instruct student to complete the warranty card.

CRITERION-REFERENCED MEASURE:

The student will obtain warranty information and warranty card including type of machine, date purchased, copy of sales receipt, type and length of warranty, equipment model/serial number and the owners and dealers names and addresses.

PERFORMANCE GUIDE:

1. Obtain warranty cards for new equipment installed.
2. Fill in warranty information:
   A. Type of equipment.
   B. Model number/make and serial number.
   C. Purchase date.
   D. Warranty type and length.
   E. Name and address of owner.
   F. Name and address of dealer.
   G. Extra extended warranty or service contracts.
3. Return warranty card to manufacturer.
CHECKLIST

DUTY Installing computer equipment

TASK Complete warranty card.

ENABLER Fill out warranty card.

STUDENT'S NAME ____________________ DATE __________

EVALUATOR'S NAME ____________________ COURSE _________

TIME: STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate filling out warranty cards.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained warranty information. _____ _____

- Recorded type of equipment. _____ _____

- Recorded model/serial number. _____ _____

- Recorded purchase date. _____ _____

- Recorded warranty type and length. _____ _____

- Recorded name and address of owner. _____ _____

- Recorded name and address of dealer. _____ _____

- Recorded extended warranties or service contacts. _____ _____

- Returned warranty card to manufacturer. _____ _____
GUIDE SHEET

DUTY: Installing Computer Equipment

PERFORMANCE OBJECTIVE #33

TASK: Construct cables.

STANDARD OF PERFORMANCE OF TASK:

Constructed cable must be the correct length and have the needed gender connection.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

- Cable wire
- Ruler
- Tool kit
- Gender connection changes

ENABLING OBJECTIVES:

1. Identify type of cable needed.
2. Identify gender connection.
3. Determine wiring configuration.
4. Assemble cable.

RESOURCES:

5. Checklist - Cable construction.

TEACHING ACTIVITIES:

1. Present lecture on types of cables.
2. Discuss and demonstrate types of cable wires.
3. Discuss and demonstrate types of gender connections used on cables.
4. Discuss and demonstrate different wiring configurations.
TEACHING ACTIVITIES: (cont.)

5. Present lecture on cable construction procedures.
   (*1, 2, 3 & 4)

6. Discuss and demonstrate determining cable wire type,
   configuration and length.

7. Discuss and demonstrate cable wire cutting procedure.

8. Discuss and demonstrate selecting and fastening gender connections.

9. Instruct student to practice constructing cables.

10. Assign student a list of cable specifications
    and cable construction materials.

11. Instruct student to construct a cable to
    specifications.

CRITERION-REFERENCED MEASURE:

The student will determine cable specifications and
construct a cable to meet those specifications.
The cable must be the correct length and have the
correct wiring configuration, wire type and gender
connections.

PERFORMANCE GUIDE:

1. Determine type of cable wire needed:
   A. Cord
   B. Ribbon

2. Determine gender connection needed:
   A. Male connector
   B. Female connector
   C. Shape

3. Determine wiring configuration:
   A. Pin type
   B. Card type
   C. Jack type

4. Measure and cut needed length of cable wire.

5. Fasten gender connections to length of cable.
CHECKLIST

DUTY  Installing computer equipment

TASK  Construct cables.

ENABLER  Assemble cable.

STUDENT'S NAME  DATE

EVALUATOR'S NAME  COURSE

TIME:  STARTED  COMPLETED  TOTAL

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate constructing cables.

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Determined type of cable wire.  ____  ____
- Determined gender connection.  ____  ____
- Identified wiring configuration.  ____  ____
- Calculated cable length.  ____  ____
- Cut cable to proper length.  ____  ____
- Fastened gender connection to cable.  ____  ____
- Connected cable to equipment.  ____  ____
- Conducted an operational check.  ____  ____
GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #34

TASK: Conduct motherboard RAM (random access memory) test.

STANDARD OF PERFORMANCE OF TASK:

RAM integrated circuit on the motherboard and language card must be tested to determine and correct system operational problems; and must pass diagnostic test without errors.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Disk drive
Diagnostic disks
Monitor
Pen/pencil
Note pad
Integrated circuit chip inserter
Integrated circuit chip remover
RAM integrated circuits
Technical/service manual

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for programmer's aid test.
2. Determine if programmer's aid RAM is functioning correctly.

RESOURCES:

1. Manufacturer's operator's manual.
4. Checklist - RAM motherboard test

TEACHING ACTIVITIES:

1. Present lecture on programming aid diagnostic testing. (*1, 2 & 3)
TEACHING ACTIVITIES: (cont.)

2. Discuss location and function of programmer's aid RAM.
3. Discuss and demonstrate safety precautions and considerations when testing programmer's aid RAM.
4. Present lecture on programmer's aid RAM diagnostic testing procedure.
5. Discuss and demonstrate loading and running programmer's aid test from diagnostic disk.
6. Instruct student to practice programmer's aid test from diagnostic testing procedures.
7. Assign student a computer system with programmer's aid installed and a diagnostic disk.
8. Instruct student to conduct a programmer's aid diagnostic disk.

CRITERION-REFERENCED MEASURE:

The student will conduct a programmer's aid diagnostic test. The programmer's aid RAM must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Power up system.
2. Insert diagnostic disk into disk drive and boot.
3. Load and run motherboard RAM test program.
4. Analyze RAM test results according to manufacturer specification.
5. Replace the bad integrated circuit if any RAM fails and run test again.
6. Exit test program and remove diagnostic disk from disk drive.
7. Power down system.
CHECKLIST

DUTY Evaluating Diagnostics

TASK Conduct motherboard RAM (random access memory) test.

ENABLER RAM integrated circuit on the motherboard and language card must be tested to determine and correct system operational problems; and must pass diagnostic test without errors.

STUDENT'S NAME __________________________ DATE __________

EVALUATOR'S NAME _______________________ COURSE _________

TIME: STARTED __________ COMPLETED _____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while conducting motherboard RAM test.

RECORD THIS INFORMATION:

MANUFACTURER: ________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Powered up system. __ __
- Inserted and booted disk. __ __
- Loaded and ran motherboard RAM test program. __ __
- Analyzed RAM test results. __ __
- Replaced malfunctioning integrated circuit. __ __
- Removed disk from disk drive. __ __
- Powered down system. __ __
GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #35

TASK: Conduct motherboard ROM (read only memory) test.

STANDARD OF PERFORMANCE OF TASK:

ROM integrated circuit on the motherboard must be tested to determine and correct program operational problems and must pass diagnostic test without errors.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Disk drive
Diagnostic disks
Monitor
Pen/pencil
Note pad
Integrated circuit chip inserter
Integrated circuit chip remover
ROM integrated circuits

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for motherboard ROM test.
2. Determine if motherboard ROM is functioning correctly.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on programmer's aid diagnostic testing. (*1, 2 & 3)
2. Discuss location and function of motherboard ROM.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions and considerations when testing motherboard ROM.
4. Present lecture on motherboard ROM diagnostic testing procedure.
5. Discuss and demonstrate loading and running motherboard ROM test from diagnostic disk.
6. Instruct student to practice motherboard ROM diagnostic testing procedures.
7. Assign student a computer system with motherboard ROM installed and a diagnostic disk.
8. Instruct student to conduct a motherboard ROM diagnostic test.

CRITERION-REFERENCED MEASURE:

The student will conduct a motherboard ROM diagnostic test. The motherboard ROM must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Power up system.
2. Insert diagnostic disk into disk drive and boot.
3. Load and run motherboard ROM test program.
4. Make note of the identity of any ROM integrated circuits that fail.
5. Replace the bad integrated circuit if any RAM fails and run test again.
6. Exit test program and remove diagnostic disk from disk drive.
7. Power down system.
CHECKLIST

DUTY  Evaluating Diagnostics

TASK  Conduct motherboard ROM (read only memory) test.

ENABLER  ROM integrated circuit on the motherboard must be tested to determine and correct program operational problems and must diagnostic test without errors.

STUDENT'S NAME ___________________ DATE __________

EVALUATOR'S NAME ___________________ COURSE _______ 

TIME :  STARTED _______ COMPLETED __________________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while conducting motherboard ROM test.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS

YES  NO

The preparer

- Powered up system.  ___  ___

- Inserted and booted disk.  ___  ___

- Loaded and ran motherboard ROM test program.  ___  ___

- Identified malfunctioning ROM integrated circuits.  ___  ___

- Replaced malfunctioning ROM integrated circuits.  ___  ___

- Conducted test run.  ___  ___

- Exiting test program.  ___  ___

- Removed diagnostic disk from disk drive.  ___  ___

- Powered down system.  ___  ___
DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #36

TASK: Conduct programmers aid test

STANDARD OF PERFORMANCE OF TASK:

Programmers aid ROM must be tested to determine if it is malfunctioning and must pass diagnostic test free of errors.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Disk drive
Diagnostic disks
Monitor
Pen/pencil
Paper
Integrated circuit chip inserter
Integrated circuit chip puller

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for programmers aid test.
2. Determine if programmers aid ROM is functioning correctly.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on programmer's aid diagnostic testing. (*1, 2 & 3)
2. Discuss location and function of programmer's aid ROM.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions and considerations when testing programmer's aid ROM.
4. Present lecture on programmer's aid ROM diagnostic testing procedure.
5. Discuss and demonstrate loading and running programmer's aid test from diagnostic disk.
6. Instruct student to practice programmer's aid diagnostic testing procedures.
7. Assign student a computer system with programmer's aid ROM installed and a diagnostic disk.
8. Instruct student to conduct a programmer's aid diagnostic test.

CRITERION-REFERENCED MEASURE:

The student will conduct a programmer's aid diagnostic test. The programmer's aid ROM must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Power up system.
2. Insert diagnostic disk into disk drive.
3. Boot disk drive and load Programmers Aid Test.
4. Run programmers Aid Test.
5. Record diagnostic messages.
6. Replace ROM and run Programmer Aid Test again if it fails.
**CHECKLIST**

**DUTY**  Evaluating Diagnostics

**TASK**  Conduct programmers aid test.

**ENABLER**  Programmers aid ROM must be tested to determine if it is malfunctioning and must pass diagnostic test free of errors.

**STUDENT'S NAME**  ___________________________  **DATE**  ________

**EVALUATOR'S NAME**  ___________________________  **COURSE**  __________

**TIME**  :  **STARTED**  _________  **COMPLETED**  _________________

**TOTAL**  _________________

**DIRECTIONS TO THE EVALUATOR:**

Use the following checklist to evaluate student performance while conducting programmers aid test.

**RECORD THIS INFORMATION:**

**MANUFACTURER:**  __________  **MODEL:**  __________

**SERIAL #:**  __________

**PERFORMANCE DETERMINANTS**

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<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
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<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered up system.</td>
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<tr>
<td>- Inserted disk into disk drive.</td>
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<td>- Booted disk drive.</td>
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<tr>
<td>- Loaded Programmers Aid Test.</td>
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<td>- Ran Programmers Aid Test.</td>
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<tr>
<td>- Recorded diagnostic messages.</td>
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<tr>
<td>- Replaced ROM.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ran Programmers Aid Test.</td>
<td></td>
<td></td>
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</tbody>
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DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #37

TASK: Conduct keyboard test.

STANDARD OF PERFORMANCE OF TASK:

Keys on the keyboard, the keyboard encoder circuits and keyboard cable must be tested to determine if they are functioning and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Disk drive
Diagnostic disks
Monitor
Pen/pencil
Paper

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for conducting keyboard test.
2. Check key switches, keyboard cable and keyboard encoder circuits.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on keyboard diagnostic testing. (*1, 2 & 3)
2. Discuss keyswitch, keyboard cable and keyboard encoder circuitry test points.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions and considerations when testing a keyboard.

4. Present lecture on keyboard diagnostic testing procedures. (*1,2,3 & 4)

5. Discuss and demonstrate loading and running keyboard test program from diagnostic disk.

6. Discuss and demonstrate keyboard cable check.

7. Discuss and demonstrate keyswitch identification coding.

8. Instruct student to practice keyboard testing using a diagnostic disk.

9. Assign student a keyboard diagnostic disk.

10. Instruct student to conduct keyboard diagnostic test.

CRITERION-REFERENCED MEASURE:

The student will conduct a keyboard diagnostic test. The keyboard must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Power up system.
2. Insert diagnostic disk into disk drive
3. Boot disk drive and load Keyboard Test Program.
4. Run Keyboard Test program.
5. Record keys which fail.
   NOTE: Check keyboard connection by unplugging and replugging before replacing keys or module, replace appropriate key or module and run the test again.
6. Power down system.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Conduct keyboard test.

ENABLER  Keys on the keyboard, the keyboard encoder circuits and Keyboard cable must be tested to determine if they are functioning and must pass diagnostic test without error.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ____________________ COURSE ________

TIME :  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while conducting keyboard test.

RECORD THIS INFORMATION:

MANUFACTURER: __________________________ MODEL: __________

SERIAL #: ______________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Checked keyboard connections. ___ ___

- Powered up system. ___ ___

- Inserted diagnostic disk into disk drive. ___ ___

- Booted disk drive. ___ ___

- Loaded keyboard test program. ___ ___

- Ran keyboard test program and noted any keys which fail. ___ ___

- Powered down system. ___ ___

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DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #38

TASK: Conduct Game Paddle/Button Test

STANDARD OF PERFORMANCE OF TASK:
Game Paddles/buttons, and the circuitry on the motherboard that interfaces with the paddles/buttons must be tested and must pass diagnostic test without error.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:
Central processing unit
Disk drive
Diagnostic disks
Monitor
Game paddles/buttons

ENABLING OBJECTIVE:
1. Obtain diagnostic disk for conducting game paddle/button test.
2. Check game paddle buttons, game input/output sockets/ports and motherboard circuitry.

RESOURCES:
1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:
1. Present lecture on game paddle/button diagnostic testing. (*1, 2 & 3)
2. Discuss game paddles/buttons, game input/output sockets/ports, and motherboard interfacing circuitry location and function.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions and considerations when testing a game paddle/button.
4. Present lecture on game paddle/button diagnostic testing procedures. (*1, 2, 3 & 4)
5. Discuss and demonstrate loading and running game paddle/button test program from diagnostic disk.
6. Discuss and demonstrate connecting game paddle/button unit to game port/socket.
7. Discuss and demonstrate rotating paddle through its entire range and pressing all paddle buttons.
8. Discuss and demonstrate "new" paddle/button test.
9. Instruct student to practice game paddle/button testing using a diagnostic disk.
10. Assign student a game paddle/button and diagnostic disk.
11. Instruct student to conduct a game paddle/button diagnostic test.

CRITERION-REFERENCED MEASURE:

The student will conduct a game paddle/button diagnostic test.
The game paddle/button must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Connect game paddles to game input/output socket.
2. Power up system.
3. Insert diagnostic disk into disk drive.
4. Boot disk drive and load Game Paddle/button test.
5. Run test program.
6. Rotate paddle control through its entire range and press all paddle buttons.
   NOTE: If any part of test fails, replace paddle/button and run test again.
7. Power down system.
CHECKLIST

DUTY  Evaluating Diagnostics

TASK  Conduct paddle/button test.

ENABLER  Check game paddle/buttons, game input/output sockets/parts, and motherboard circuitry.

STUDENT'S NAME _______________ DATE _____________

EVALUATOR'S NAME _______________ COURSE __________

TIME: STARTED __________ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while conducting game/button test.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________ MODEL: ____________

SERIAL #: ______________

PERFORMANCE DETERMINANTS

The preparer

- Connected game paddles to game input/output socket.  YES  NO

- Powered up system.  YES  NO

- Inserted diagnostic disk into disk drive.  YES  NO

- Booted disk drive.  YES  NO

- Loaded Game Paddle/button test.  YES  NO

- Rotated paddle control through its entire range.  YES  NO

- Powered down system.  YES  NO

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GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #39

TASK: Conduct tape read/write/verify test.

STANDARD OF PERFORMANCE OF TASK:

Media recorder, audio cables and circuitry on the motherboard that writes to and reads from a tape recorder must be tested and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Disk drive
Diagnostic disks
Monitor
Pen/pencil
Note pad

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for conducting tape read/write/verify test.
2. Check recorder unit, audio cables and motherboard circuitry.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on tape read/write/verify diagnostic points. (=1, 2 & 3)
2. Discuss medial recorder, audio cables and motherboard tape read/write/verify circuitry location and function.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions and considerations when testing a tape read/write/verify.
4. Present lecture on tape read/write/verify diagnostic testing procedures. (*1, 2 & 3)
5. Discuss and demonstrate loading and running tape read/write/verify program from diagnostic disk.
6. Discuss and demonstrate readjusting recorder procedures.
7. Discuss and demonstrate a "new" system check.
8. Instruct student to practice tape read/write/verify testing using a diagnostic disk.
9. Assign student a tape read/write/verify and diagnostic disk.
10. Instruct student to conduct a tape read/write/verify diagnostic test.

CRITERION-REFERENCED MEASURE:

The student will conduct a tape read/write/verify diagnostic test. The media recorder must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Check the cable connections between the tape.
2. Power up system.
3. Place a scratch (expandable) tape in recorder and rewind.
4. Set the record and playback levels to mid-range.
5. Load diagnostic disk into drive and load tape read/write/verify test.
6. Run tape read/write/verify test.
7. Readjust the recorder if errors are indicated and run test again.
8. Check cables for continuity and shorts if errors still exist or try another recorder.
9. Run recorder on different system. If recorder works with new system, check motherboard on old system.
10. Exit tape read/write/verify program.
11. Remove diagnostic disk from disk drive and power down system.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct tape read/write/verify test.

ENABLER  Media recorder, audio cables and circuitry on
         the motherboard that writes to and reads from
         a tape recorder must be tested and must pass
         diagnostic test without error.

STUDENT'S NAME ___________________  DATE ______

EVALUATOR'S NAME ___________________  COURSE ______

TIME:  STARTED ______  COMPLETED ______

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student
performance when conducting tape read/write/verify test.

RECORD THIS INFORMATION:

MANUFACTURER:__________________________  MODEL:__________

SERIAL #:______________________________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Checked the cable connections between the tape.  ____  ____
- Powered up system.  ____  ____
- Replaced scratched tape and rewound.  ____  ____
- Set record and playback.  ____  ____
- Loaded diagnostic disk into disk drive.  ____  ____
- Loaded tape read/write/verify test.  ____  ____
- Readjusted the recorder if necessary.  ____  ____
- Checked cables for errors.  ____  ____
- Ran recording on different system.  ____  ____
- Removed tape read/write/verify program.  ____  ____
- Removed disk from disk drive.  ____  ____
- Powered down system.  ____  ____

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DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #40

TASK: Conduct color bar test.

STANDARD OF PERFORMANCE OF TASK:

The monitor, video cable, and the motherboard video generating circuitry must be tested to determine and correct the cause of display problem and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Disk Drive
Diagnostic disks
Monitor
Video cable
Motherboard
Pen/pencil
Note pad
Tweaking tools (non-metallic adjusting tools)

ENABLING OBJECTIVE:

1. Obtain diagnostic for conducting color bar test.
2. Match color bars to color codes.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on color bar diagnostic testing. (*1, 2 & 3)
2. Discuss monitor, video cable, and motherboard video generating circuitry location and function.
3. Discuss and demonstrate safety precautions and considerations when testing a monitor.
4. Present lecture on color bar diagnostic testing procedures. (*1, 2, 3 & 4)
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate loading and running color bar test program from diagnostic disk.
6. Discuss and demonstrate matching color bars to color codes.
7. Discuss and demonstrate adjusting color trimmer capacitor.
8. Instruct student to practice color bar testing using a diagnostic disk.
9. Assign student a color monitor and diagnostic disk.
10. Instruct student to conduct a color bar diagnostic test.

CRITERION-REFERENCED MEASURE:

The student will conduct a color bar diagnostic test.
The monitor must pass color bar test without error.

PERFORMANCE GUIDE:

1. Power up system.
2. Insert diagnostic disk into disk drive.
3. Load and run Color Bar test Program.
4. Review test usage information at the beginning of the test.
5. Match colors of color bars with corresponding color codes to verify that colors are correct.
6. Record changes made.
7. Adjust color trimmer capacitor if colors are incorrect.
8. Connect a different monitor or video cable if correct colors cannot be obtained and run test again.
9. Insert new motherboard if problem still exists and run test again.
10. Exit program and remove diagnostic disk from disk drive.
11. Power down system.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct color bar test.

ENABLER  The monitor, video cable, and the motherboard video generating circuitry must be tested to determine and correct the cause of display problem and must pass diagnostic test without error.

STUDENT’S NAME ___________________________ DATE ________

EVALUATOR’S NAME ___________________________ COURSE ________

TIME:  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting color bar test.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ___________

SERIAL #: ___________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Powered up system.  ______  ______

- Inserted disk into disk drive.  ______  ______

- Loaded and ran color bar test program.  ______  ______

- Reviewed test usage information.  ______  ______

- Matched colors for proper verification.  ______  ______

- Recorded any changes made.  ______  ______

- Adjusted color timer if necessary.  ______  ______

- Connected different monitor or video cable if necessary.  ______  ______

- Inserted new motherboard if necessary.  ______  ______

- Removed program.  ______  ______

- Removed disk from disk drive.  ______  ______

- Powered down system.  ______  ______
GUIDE

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #41

TASK: Conduct graphic tablet test

STANDARD OF PERFORMANCE OF TASK:

Operation of the graphic tablet, graphic tablet pen, graphic tablet interface card must be tested to determine and correct graphic problem must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk Drive  Central processing unit
Diagnostic disks  Monitor
Pen/pencil  Note pad
Graphic tablet  Graphic pen
Tool kit  Graphic interface card
Integrated circuit inserter
Integrated circuit puller

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for graphic tablet test.
2. Determine problem with graphic tablet or graphic tablet interface card.
3. Connect graphic tablet to graphic interface card.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on the location and function of the graphic tablet and interface card.
2. Discuss and demonstrate locating and checking graphic tablet and interface.
TEACHING ACTIVITIES: (cont.)

3. Present lecture on graphic tablet card testing procedures. (*1, 2 & 3)
4. Discuss and demonstrate loading and running graphic tablet interface card test program from the diagnostic disk.
5. Discuss and demonstrate graphic tablet interface card test procedure.
6. Instruct student to practice conducting a graphic tablet interface card test.
7. Assign student a computer system diagnostic disk, graphic tablet and graphic tablet interface card.
8. Instruct student to conduct a graphic tablet test.

CRITERION-REFERENCED MEASURE:

The student will conduct a graphic tablet test. The graphic tablet and graphic interface card must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Install the graphic interface card and connect graphic pen and tablet to it.
2. Power up system.
3. Insert diagnostic disk into disk drive.
4. Load and run graphic test program.
5. Check the ROM on the graphic interface card by running the card test.
6. Record changes made.
7. Adjust the interface card as instructed by test.
8. Check the graphic tablet by running the tablet test.
9. Replace ROM if the ROM test fails and run test again.
10. Replace the graphic pen if interface card cannot be correctly adjusted and run the test again. If the problem still exists replace the interface card and run test again.
11. Replace tablet if missing dots occur during surface test run, test again.
12. Exit program and remove diagnostic disk from disk drive.
13. Power Down system.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct graphic tablet test.

ENABLER  Operation the graphic tablet, graphic tablet pen, graphic tablet interface card must be tested to determine and correct graphic problem and must pass diagnostic test without error.

STUDENT'S NAME ___________________________ DATE ______

EVALUATOR'S NAME ___________________________ COURSE ______

TIME:  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting graphic tablet test.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Installed graphic interface card and connected graphic pen and table to it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered up system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Inserted disk into disk drive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Loaded and ran graphic test program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Checked the ROM.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recorded any changes made.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Adjusted the interface card.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Checked graphic tablet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced ROM if necessary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced graphic pen if necessary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced tablet if necessary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed disk from disk drive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered down system.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #42

TASK: Conduct basic/integer card test.

STANDARD OF PERFORMANCE OF TASK:

Each ROM in the basic or integer set on the card must be tested to determine and correct basic/integer problems and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk Drive
Diagnostic disks
Pen/pencil
Tool kit
Central processing unit
Monitor
Note pad
Basic integer ROM card
Integrated circuit inserter
Integrated circuit puller

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for testing basic/integer ROM card.
2. Determine problem with basic/integer ROM card.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on location and function of basic/integer ROM card. (*1, 2 & 3)
2. Discuss basic/integer ROM card function in relation to central processing unit.
3. Present lecture on basic/integer ROM card testing procedures. (*1, 2 & 3)
TEACHING ACTIVITIES: (cont.)

4. Discuss and demonstrate loading and running basic ROM interface card test program from the diagnostic disk.
5. Discuss and demonstrate basic/integer ROM interface card test procedure.
6. Instruct student to practice conducting a basic/integer ROM interface card test.
7. Assign student a computer system, diagnostic disk and basic/integer ROM interface card.
8. Instruct student to conduct a basic/integer ROM card test.

CRITERION-REFERENCED MEASURE:

The student will conduct a basic/integer ROM card test to determine the cause of basic/integer ROM problem. The basic/integer ROM card must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Install the basic/integer ROM card into appropriate location.
2. Power up system.
3. Insert diagnostic disk into disk drive.
4. Load and run basic/integer ROM card test program.
5. Record ROM failure.
6. Replace any ROM that fails and run test again.
7. Exit program and remove diagnostic disk from disk drive.
8. Power down system.
CHECKLIST

DUTY Evaluating Diagnostics.

TASK Conduct basic/integer card test.

ENABLER Each ROM in the basic or integer set on the card must be tested to determine and correct basic/integer problems and must pass diagnostic test without error.

STUDENT'S NAME __________________________ DATE __________

EVALUATOR'S NAME _________________________ COURSE ______

TIME: STARTED _______ COMPLETED ________________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting basic/integer card test.

RECORD THIS INFORMATION:
MANUFACTURER: _______________ MODEL: ___________
SERIAL #: ____________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Installed basic/integer ROM test card. _________
- Powered up system. _________
- Inserted disk into disk drive. _________
- Loaded and tested program. _________
- Recorded ROM failure. _________
- Replaced any malfunctioning ROM. _________
- Removed disk from disk drive. _________
- Powered down system. _________

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GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #43

TASK: Conduct language card test.

STANDARD OF PERFORMANCE OF TASK:

The RAM and autostart ROM on the language card must be tested to determine and correct program loading problems and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

- Disk Drive
- Diagnostic disks
- Central processing unit
- Monitor
- Pen/pencil
- Note pad
- Tool kit
- Language interface card
- Integrated circuit inserter
- Integrated circuit puller

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for testing language card.
2. Determine problem with language interface card.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on location and function of language card. (*1, 2 & 3)
2. Discuss language card function in relation to central processing unit.
3. Present lecture on language card testing procedures. (*1, 2 & 3)
4. Discuss and demonstrate loading and running language interface card test program from the diagnostic disk.
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate language interface card test procedure.
6. Instruct student to practice conducting a language interface card test.
7. Assign student a computer system, diagnostic disk and language interface card.
8. Instruct student to conduct a language card test.

CRITERION-REFERENCED MEASURE:

The student will conduct a language card test to determine the cause of language problem. The language card must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Install the language interface card in appropriate location and connect cable to RAM integrated circuit location on motherboard.
2. Power up system.
3. Insert diagnostic disk into disk drive and boot.
4. Load and run language card test program.
5. Record RAM test results.
6. Proceed with autostart ROM test.
7. Record language card test failure.
   NOTE: When either RAM or ROM fails, replace RAM integrated circuit or autostart ROM and run test again.
8. Replace language card if problem still exists and run test again.
9. Exit test program and remove diagnostic disk from disk drive.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct language card test.

ENABLER  The RAM and autostart ROM on the language card must be tested to determine and correct program loading problems and must pass diagnostic test without error.

STUDENT'S NAME _______________________ DATE __________

EVALUATOR'S NAME _______________________ COURSE ________

TIME : STARTED _______ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting language card test.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ____________

SERIAL #: _______________

PERFORMANCE DETERMINANTS      YES      NO

The preparer
- Installed language interface card.      ______  ______
- Powered up system.          ______  ______
- Inserted disk into disk drive and booted system. ______  ______
- Loaded and ran language card test program. ______  ______
- Recorded RAM test results. ______  ______
- Proceeded with autostart ROM test. ______  ______
- Recorded malfunctioning language card test. ______  ______
- Replaced language card. ______  ______
- Removed disk from disk drive. ______  ______

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DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #44

TASK: Conduct disk interface card test.

STANDARD OF PERFORMANCE OF TASK:

PROM on disk interface card must be tested to determine and correct the cause of disk data loading and saving problems and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

<table>
<thead>
<tr>
<th>Disk Drive</th>
<th>Central processing unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic disks</td>
<td>Monitor</td>
</tr>
<tr>
<td>Pen/pencil</td>
<td>Note pad</td>
</tr>
<tr>
<td>Service Manual</td>
<td>Disk interface card</td>
</tr>
</tbody>
</table>

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for testing disk drive card.
2. Determine problem with disk drive interface card.

RESOURCES:

1. Manufacturer's operator's manual.
5. Checklist - Disk interface card test.

TEACHING ACTIVITIES:

1. Present lecture on location and function of disk drive card. (*1, 2 & 3)
2. Discuss disk drive card function in relation to disk drive.
3. Present lecture on disk drive card testing procedures. (*1, 2 & 3)
4. Discuss and demonstrate use of diagnostic disk (disk drive interface card test program).
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate disk drive interface card test procedure.
6. Instruct student to practice conducting a disk drive interface card test.
7. Assign student a computer system, diagnostic disk and disk drive interface card.
8. Instruct student to conduct a disk drive card test.

CRITERION-REFERENCED MEASURE:

The student will conduct a disk drive card test to determine the cause of disk drive problem. The disk drive card must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Note what kind of PROM is installed on disk interface card.
2. Install disk interface card in appropriate location.
3. Power up system.
4. Insert diagnostic disk into disk drive.
5. Load and run disk interface card test program.
6. Enter location of disk interface card when prompted.
7. Record test results as program runs. NOTE: When PROM fails, replace it and run test again.
8. Exit program and remove diagnostic disk from disk drive.
9. Power down system.
CHECKLIST

DUTY Evaluating Diagnostics.

TASK Conduct disk interface card test.

ENABLER PROM on disk interface card must be tested to determine and correct the cause of disk data loading and saving problems and must pass diagnostic test without error.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME _______________ ___ COURSE ______

TIME: STARTED _______ COMPLETED __________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting disk interface card test.

RECORD THIS INFORMATION:

MANUFACTURER:_____________________________ MODEL:__________

SERIAL #:____________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Installed disk interface card. ___ ___
- Powered up system. ___ ___
- Inserted disk into disk drive. ___ ___
- Loaded and ran program. ___ ___
- Determined location of disk interface card. ___ ___
- Recorded test results. ___ ___
- Removed disk from disk drive. ___ ___
- Powered down system. ___ ___
GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #45

TASK: Conduct printer card test (parallel).

STANDARD OF PERFORMANCE OF TASK:

PROM on parallel interface card must be tested for printer operations and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk Drive
Diagnostic disks
Pen/pencil
Tool kit

Central processing unit
Monitor
Note pad
Printer interface card.

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for testing parallel printer card.
2. Determine problem with parallel printer interface card.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on location and function of parallel printer card. (*1,2,3)
2. Discuss parallel printer card function in relation to printer.
3. Present lecture on parallel printer card testing procedures. (*1,2,3)
4. Discuss and demonstrate use of diagnostic disk (printer interface card test program).
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate parallel printer interface card test procedure.
6. Instruct student to practice conducting a parallel printer interface card test.
7. Assign student a computer system, diagnostic disk and parallel printer interface card.
8. Instruct student to conduct a parallel printer card test.

CRITERION-REFERENCED MEASURE:

The student will conduct a parallel printer card test to determine printer operations. The parallel printer card must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Install parallel interface card in appropriate location
2. Power up system.
3. Insert diagnostic disk into disk drive
4. Load and run Printer Interface Card Test program.
5. When prompted, enter location of parallel interface card.
6. Record test results as program runs.
   NOTE: When PROM fails, replace interface card and run test again.
7. Exit program and remove diagnostic disk from disk drive.
8. Power down system.
CHECKLIST

DUTY Evaluating Diagnostics.

TASK Conduct printer card test.

ENABLER PROM on parallel interface card must be tested for printer operations and must pass diagnostic test without error.

STUDENT'S NAME ______________________ DATE _________

EVALUATOR'S NAME _______________________ COURSE ______

TIME : STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting printer card test.

RECORD THIS INFORMATION:

MANUFACTURER: _______________ MODEL: __________

SERIAL #: _______________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Installed parallel interface card. _____________

- Powered up system. _____________

- Inserted disk into disk drive. _____________

- Loaded and ran printer interface card test program. _____________

- Determined location of card. _____________

- Replaced PROM if necessary. _____________

- Removed disk from disk drive. _____________

- Powered down system. _____________

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DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #46

TASK: Conduct serial/communications card test.

STANDARD OF PERFORMANCE OF TASK:

Serial interface card and the communications interface card must be tested to determine serial printer or modem problems and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

- Tool Kit
  - Serial Interface card
  - Communications interface card

ENABLING OBJECTIVE:

1. Obtain diagnostic disk for testing serial/communications card.
2. Determine problem with serial or communication interface card.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on location and function of serial/communication card. (*1, 2 & 3)
2. Discuss serial/communication card function in relation to printer or modem.
3. Present lecture on serial/communication card testing procedures. (*1, 2 & 3)
4. Discuss and demonstrate use of diagnostic disk (serial/communication card test program).
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate identification of card slot and installing serial/communication card.
6. Discuss and demonstrate setting configuration switches.
7. Discuss and demonstrate serial/communication card testing procedure.
8. Assign student a computer system, serial/communication card and diagnostic test equipment.
9. Instruct student to conduct a serial/communication card test.

CRITERION-REFERENCED MEASURE:

The student will conduct a serial/communication interface card test to determine printer or modem problems. The serial/communication card must pass the diagnostic test without error.

PERFORMANCE GUIDE:

1. Power down system and install serial interface card and communications interface card into proper slots.
2. Connect a jumper cable between the serial and communication interface connectors.
3. Power up system.
4. Insert diagnostic diskette into disk drive and boot.
5. Load and run serial/communications card test program.
6. Enter slot number where the serial and communication interface cards are installed.
7. Match the DIP switch positions on serial card, then move each switch to both of its positions and check to see if the screen picture follows the switch change.
8. Type a few characters and check that the characters appear on both the SENT and RECEIVED line when communications test screen appears. (Checks communication from serial card to communication card.)
9. Reverse test and type a few characters again. (Check communication from communication card to serial card.)
10. Review status screen to determine card malfunctions. 
   NOTE: When PROM fails, replace it; if problem persists, replace card.
   NOTE: When switch setting test fails, or communication test fails, replace serial card; if it still fails, replace communication card.
11. Exit program and remove diagnostic disk from drive when system passes diagnostic test.
12. Power down system.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct serial/communications card test.

ENABLER  Serial interface card and the communications interface card must be tested to determine serial printer or modem problems and must pass diagnostic test without error.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME : STARTED _______ COMPLETED ____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting serial/communications card test.

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Powered down system.  ____  ____

- Installed serial interface card and communications interface card.  ____  ____

- Connected jumper cables.  ____  ____

- Powered up system.  ____  ____

- Inserted disk and booted system.  ____  ____

- Loaded the program.  ____  ____

- Entered slot number.  ____  ____

- Matched switch positions on serial card.  ____  ____

- Checked to insure characters appear on both the SENT and RECEIVED line.  ____  ____

- Determined card malfunctions.  ____  ____

- Removed disk from disk drive.  ____  ____

- Powered down system.  ____  ____
DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #47

TASK: Conduct monitor test.

STANDARD OF PERFORMANCE OF TASK:

Monitor must be tested to determine problems related to the composite video signal, horizontal and vertical hold, contrast or brightness. The monitor must produce a clear, bright, stable picture, and the monitor must pass the diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Monitor
Oscilloscope
Central processing unit
Tweaking tools
Wave pattern chart
Tool kit
Video cables

ENABLING OBJECTIVE:

1. Determine and correct monitor problems.
2. Check cables and cable connections.
3. Identify monitor components to be tested.

RESOURCES:

RESOURCES: (cont.)

10. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on monitor components to be tested. (*1, 2, 3, 4, 5, 6 & 7)
2. Discuss and demonstrate cables and cable connections, picture tube, potentiometers and coils.
3. Present lecture on test procedure for monitor components.
4. Discuss and demonstrate test procedures for cables and cable connections.
5. Discuss and demonstrate test procedures for adjusting picture tube yoke.
6. Discuss and demonstrate test procedures for vertical, focus, volume, contrast and color potentiometers.
7. Discuss and demonstrate test procedure for horizontal and width control coils.
8. Discuss and demonstrate an oscilloscope check of video circuits and signals.
CAUTION: High voltage of around 15,000 volts are present in parts of the monitor and extreme caution must be taken when working with the inside of a monitor.
9. Instruct student to practice monitor tests.
10. Assign student a monitor and test equipment.
11. Instruct student to conduct a monitor test.

CRITERION-REFERENCED MEASURE:

The student will conduct a monitor test. The monitor will produce a clear, bright, stable picture.

PERFORMANCE GUIDE:

1. Check video cables for breaks, loose connections, and dirty or bent connector plugs
2. Check power cable for loose or faulty connections.
3. Check on/off and volume switch for shorts.
PERFORMANCE GUIDE: (cont.)

4. Check TV/computer conversion box and cables (if TV is being used as a monitor.)

CAUTION: Some sections of TV's and monitors carry high voltage. In parts can carry 10,000 to 30,000 volts. Extreme caution, special equipment and special training is needed for work on the inside of TV's and monitors.

5. Power up system.

6. Turn horizontal hold adjustment and the vertical hold adjustment until picture remains stationary.

7. Turn contrast knob through its full range, stop where picture on screen is clearest.

8. Turn brightness knob through its full range and observe if dark and light extremes exists.

9. Check the composite video signal:
   A. Picture signal
   B. Blanking signal
   C. Horizontal sync
   D. Vertical sync
   E. Signal data

NOTE: Refer to wave pattern chart for diagram of desired wave.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct monitor test.

ENABLER  Monitor must be tested to determine problems related to the composite video signal, horizontal and vertical contrast or brightness. The monitor must produce a clear bright stable picture and the monitor must pass the diagnostic test without error.

STUDENT'S NAME ______________________ DATE __________

EVALUATOR'S NAME ____________________ COURSE ______

TIME: STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting monitor test.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: ______

SERIAL #: __________

PERFORMANCE DETERMINANTS           YES   NO

The preparer

- Checked video cables.       __   __

- Checked power cables.       __   __

- Checked on/off switch.      __   __

- Checked TV/computer conversion box and cables.    __   __

- Powered up system.          __   __

- Turned horizontal hold adjustment and vertical hold adjustment.    __   __

- Turned contrast knob.       __   __

- Turned brightness knob.     __   __

- Checked the composite video signal.     __   __
GUIDE SHEET

DUTY: Evaluating Diagnostic

PERFORMANCE OBJECTIVE #48

TASK: Conduct oscilloscope test.

STANDARD OF PERFORMANCE OF TASK:

Equipment which makes use of changing electronic signals will be tested by comparing wave patterns on the oscilloscope to wave pattern chart. Wave pattern on the oscilloscope must be the same wave pattern on the wave chart.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Tool kit
Oscilloscope
Wave pattern chart
Oscilloscope operator
Equipment to be checked
Equipment schematics

ENABLING OBJECTIVE:

1. Interpret oscilloscope wave patterns.
2. Compare wave patterns to wave pattern chart.
3. Select proper vertical and timing settings on oscilloscope.
4. Connect test probes to test points.
5. Identify proper test points.

RESOURCES:

RESOURCES: (cont.)

7. Manufacturer's operators manual.
8. Manufacturer's service manual.
9. Waveform pattern chart.

TEACHING ACTIVITIES:

1. Present lecture on types and functions of oscilloscopes. (*1, 2, 3, 4, 5 & 6)
2. Discuss and demonstrate dual trace, triggered-sweep, ordinary x-y service scope, and four channel oscilloscopes.
3. Present lecture on type of tests and testing procedures for an oscilloscope. (*1, 2, 3, 4, 5, 6, 7 & 8)
4. Discuss and demonstrate frequency divider waveforms, divide by eight circuit waveform, propagation time measurement, digital circuit time relationship, clock or pulse generation, signal checks, and circuit checks.
5. Discuss and demonstrate component test point identification.
6. Discuss and demonstrate oscilloscope test set-up procedure.
7. Instruct student to practice conducting different oscilloscope tests.
8. Assign student a oscilloscope and computer equipment.
9. Instruct student to perform a specific oscilloscope test on the computer equipment.

CRITERION-REFERENCED MEASURE:

The student will identify the component to be tested, determine proper test points, set up the oscilloscope and perform the necessary oscilloscope test.

PERFORMANCE GUIDE:

1. Power down system.
2. Set vertical and timing setting on the oscilloscope (usually 50 millivolts and 20 milliseconds).
   NOTE: Check operator manual for proper setting.
3. Connect probes for channels A and B on the two points to be tested and ground them.
PERFORMANCE GUIDE: (cont.)

4. Connect the external trigger probe to sync signal test point.
5. Power up system and oscilloscope.
6. Compare wave pattern on oscilloscope to the wave pattern diagram chart.
7. Adjust until patterns match or replace the part.
8. Power down system and oscilloscope.
9. Disconnect probes from test points.
CHECKLIST

DUTY Evaluating Diagnostics.

TASK Conduct oscilloscope test.

ENABLER Equipment which makes use of changing electronic signals will be tested by comparing wave patterns on the oscilloscope to wave pattern chart. The oscilloscope wave must be the same wave pattern as on the wave chart.

STUDENT'S NAME _________________________ DATE __________
EVALUATOR'S NAME _________________________ COURSE ________
TIME: STARTED ______ COMPLETED ________________
TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following to evaluate student performance when conducting oscilloscope test.

RECORD THIS INFORMATION:

MANUFACTURER:__________ MODEL:__________
SERIAL #:______________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Powered down system. ________
- Set vertical and timing setting. ________
- Connected probes. ________
- Connected external trigger probe. ________
- Powered up system and oscilloscope. ________
- Compared wave patterns. ________
- Adjusted patterns if necessary. ________
- Powered down system and oscilloscope. ________
- Disconnected probes. ________
DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #49

TASK: Conduct data communication line test.

STANDARD OF PERFORMANCE OF TASK:

Data communication line must be tested to determine if a signal is being transmitted into and from the modem. Signals must be transmitted to and from modem without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

System to be serviced
Voltmeter

ENABLING OBJECTIVE:

1. Connect modem to computer.
2. Determine if data communication line is functioning.

RESOURCES:

5. Checklist - Data communication line test.

TEACHING ACTIVITIES:

1. Present lecture on types of data communication lines. (*1,2,3,4)
2. Discuss types of data communication interfaces used between modem and computer.
3. Discuss setting configuration switches for proper baud rate and parity.
4. Discuss how data is transferred from computer to modem and vice-versa.
TEACHING ACTIVITIES: (cont.)

5. Present lecture on data communication line testing procedures. (*1, 2, 3, 4)
6. Demonstrate modem self-test.
7. Demonstrate interface signal check.
8. Demonstrate phone jack connector test.
9. Assign student a computer, modem, and data communication interface.
10. Instruct student to conduct a data communication line test.

CRITERION-REFERENCED MEASURE:

The student will conduct a data communication line test including modem self-test, data communication interface signal and telephone jack signal. Data communication line signal must be transmitted to and from all test points.

PERFORMANCE GUIDE:

1. Power up system.
2. Receive and transmit data to the modem.
3. Turn on voltmeter and test the modem connector then for a signal; if a signal is found at modem connector then check modem unit.
4. Test phone jack connector when no signal is found at modem.
   NOTE: Signal is found at jack connector, check peripheral cable for shorts.
5. Contact the telephone company to check the phone lines for problems when no signal is found at phone jack connector.
CHECKLIST

DUTY  Evaluating Diagnostics.

TASK  Conduct data communication line test.

ENABLER  Data communication line must be tested to determine if a signal is being transmitted into and from the modem. Signals must be transmitted to and from modem without error.

STUDENT'S NAME __________________ DATE __________

EVALUATOR'S NAME __________________ COURSE ________

TIME:  STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when conducting data communication line test.

RECORD THIS INFORMATION:

MANUFACTURER: __________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Powered up system. ________ ________
- Received and transmitted data to modem. ________ ________
- Tested modem connector with a voltmeter. ________ ________
- Tested phone jack connector. ________ ________
- Checked peripheral cables for shorts. ________ ________
- Contacted phone company for a phone line check. ________ ________
GUIDE SHEET

DUTY: Evaluating Diagnostics

PERFORMANCE OBJECTIVE #50

TASK: Interpret diagnostic flowcharts.

STANDARD OF PERFORMANCE OF TASK:

Follow diagnostic flowchart until the malfunctioning part is identified or the problem is solved.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Diagnostic flowcharts
System to be checked
Customer complaint

ENABLING OBJECTIVE:

1. Identify diagnostic flowchart symbols.
2. Understand flowchart logic.
3. Troubleshoot a computer problem using a diagnostic flowchart.

RESOURCES:

1. Manufacturer's operator's manual.
5. Checklist - Diagnostic flowchart interpretation.

TEACHING ACTIVITIES:

1. Present lecture on the purpose of a diagnostic flowchart. (*1,2,3,4)
2. Discuss troubleshooting using a diagnostic flowchart.
3. Discuss time saved by using a diagnostic flowchart.
4. Present lecture on using a diagnostic flowchart for troubleshooting.
5. Demonstrate how to interpret diagnostic flowchart.
TEACHING ACTIVITIES: (cont.)

6. Demonstrate diagnostic flow chart logic and symbols.
7. Instruct student to practice using a diagnostic flowchart.
8. Assign a computer problem to the student and a diagnostic flowchart.
9. Instruct student to troubleshoot the computer problem using the diagnostic flowchart.

CRITERION-REFERENCED MEASURE:

The step of the diagnostic flowchart must be followed in troubleshooting a computer problem.

PERFORMANCE GUIDE:

1. Determine customer complaint and select appropriate flowchart.
2. Begin troubleshooting at Box 1 of the flowchart.
3. Carry out the designated troubleshooting step.
4. Proceed with next step as indicated by symptom or outcome of prior step.
5. Continue steps until problem is identified and solved.
CHECKLIST

DUTY E evaluati ng Diagnostics.

TASK Interpret diagnostic flowcharts.

ENABLER Follow diagnostic flowchart until malfunctioning part is identified or the problem is solved.

STUDENT'S NAME __________________________ DATE __________

EVALUATOR'S NAME __________________________ COURSE _________

TIME: STARTED _______ COMPLETED ________________

TAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when interpreting diagnostic flowcharts.

RECORD THIS INFORMATION:

MANUFACTURER:_________________________ MODEL:___________

SERIAL #:________________________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Determined customer complaint. __ __
- Selected appropriate flowchart. __ __
- Began troubleshooting at box 1 of the flowchart. __ __
- Carried out designated troubleshooting steps. __ __
- Proceeded onto next step based on outcome of prior. __ __
- Identified problem. __ __
- Solved problem. __ __
DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #51

TASK: Clean metallic parts.

STANDARD OF PERFORMANCE OF TASK:

Dirt and other foreign debris must be removed from metallic mechanical parts so that part is clean and functional.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Alcohol or safe cleaning/degreasing agent
Tool kit
Brush
Clean soft cloth

ENABLING OBJECTIVE:

1. Identify metallic part to be cleaned.
2. Remove dirt and other foreign debris from metallic parts.

RESOURCES:

5. Checklist - Clean metallic parts.

TEACHING ACTIVITIES:

1. Present lecture on cleaning metallic parts. (*1, 2, 3, 4, 5)
2. Discuss problems caused by dirty metallic parts.
3. Discuss and demonstrate cleaning procedures for metallic parts.
TEACHING ACTIVITIES: (cont.)

4. Instruct student to practice cleaning procedures for metallic parts.
5. Discuss and demonstrate degreasing procedures for metallic parts.
6. Instruct student to practice degreasing procedure for metallic parts.
7. Assign student metallic parts to be cleaned and degreased and cleaning equipment.
8. Instruct student to clean and degrease the metallic parts.

CRITERION-REFERENCED MEASURE:

The student will identify the metallic parts to be cleaned and clean and degrease the metallic parts.

PERFORMANCE GUIDE:

1. Obtain equipment to be serviced.
2. Dismantle equipment until part is accessible. (If necessary remove part to be cleaned.)
3. Brush or blow away any loose dust, dirt or foreign debris from part.
4. Wipe the part until clean, using a soft clean cloth, moistened with alcohol or a safe cleaning/degreasing agent.
5. Wipe the part with another clean soft cloth moistened with alcohol if a residue or dirt still remains.
6. Dry excess cleaner from part.
7. Lubricate part when necessary or appropriate.
8. Reassemble equipment.
CHECKLIST

DUTY  Maintaining Computer Equipment

TASK  Clean metallic parts.

ENABLER  Dirt and other foreign debris must be removed from metallic mechanical parts so that part is clean and functional.

STUDENT'S NAME ______________________ DATE _______

EVALUATOR'S NAME ______________________ COURSE _______

TIME : STARTED _______ COMPLETED _____________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning metallic parts.

RECORD THIS INFORMATION:

MANUFACTURER:_________________________ MODEL:__________

SERIAL #:_______________

PERFORMANCE DETERMINANTS       YES       NO

The preparer
- Obtained faulty equipment.          __    ___
- Dismantled faulty equipment.        __    ___
- Blew loose dirt, dust and foreign debris from part. __    ___
- Cleaned part with cloth moistened in alcohol/cleaning agent. __    ___
- Dried excess cleaner from part.     __    ___
- Lubricated part if necessary.       __    ___
- Reassembled equipment. _____________

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DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #52

TASK: Clean non-metallic parts.

STANDARD OF PERFORMANCE OF TASK:

Dust, dirt and other foreign debris must be removed from non-metallic mechanical parts so part is clean and functional.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Alcohol or safe cleaning agent
Tool Kit
Fedron/rubber cleaner
Brush and soft cloth

ENABLING OBJECTIVE:

1. Identify type of material to be cleaned and a safe cleaning agent.
2. Remove dust, dirt and other foreign debris from non-metallic parts/materials.

RESOURCES:


TEACHING ACTIVITIES:

1. Present lecture on types of non-metallic material.
2. Discuss plastic, rubber and glass part/material.
TEACHING ACTIVITIES: (cont.)

3. Present lecture on cleaning non-metallic parts.
   (*1, 2, 3, 4 & 5)
4. Discuss and demonstrate safe cleaning agents for non-metallic parts.
5. Discuss and demonstrate cleaning procedure for non-metallic parts/material.
6. Instruct student to practice non-metallic cleaning procedures.
7. Assign student non-metallic parts/materials and cleaning agents.
8. Instruct student to identify the type of non-metallic material, proper cleaning agent, and to clean the non-metallic part/material.

CRITERION-REFERENCED MEASURE:

The student will identify the type of non-metallic material the part is made of, determine the proper cleaning agent and clean the non-metallic part/material.

PERFORMANCE GUIDE:

1. Obtain equipment to be serviced.
2. Dismantle equipment until part is accessible.
   (If necessary remove part to be cleaned.)
3. Brush or blow away any loose dust, dirt or foreign debris from part.
4. Wipe the part till clean using a soft clean cloth, moistened with alcohol or a safe cleaning agent.
   A. Clean plastic parts only with a low residue cleaner; do not use high residue cleaners such as soaps.
   B. Clean rubber parts with Fedron or approved rubber cleaner.
   C. Clean mechanical parts with nonresidue spray cleaners.
5. Wipe the part with another clean soft cloth moistened with alcohol or safe cleaning agent if a residue or dirt still remains.
6. Dry excess cleaner from part.
7. Lubricate part when necessary or appropriate.
8. Reassemble equipment.
CHECKLIST

DUTY Maintaining Computer Equipment

TASK Clean non-metallic parts.

ENABLER Dust, dirt and other foreign debris must be removed from non-metallic mechanical parts so part is clean and functional.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE __________

TIME: STARTED _______ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning non-metallic parts.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Obtained faulty equipment. ______ ______
- Dismantled faulty equipment. ______ ______
- Blew away dirt, dust, and foreign debris from part. ______ ______
- Identified type of non-metallic material the part is made of. ______ ______
- Identified type of cleaner for part. ______ ______
- Cleaned part with cloth moistened in alcohol/cleaning agent. ______ ______
- Dried excess cleaner from part. ______ ______
- Lubricated part if necessary. ______ ______
- Reassembled equipment. ______ ______
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #53

TASK: Clean Electrical Connections.

STANDARD OF PERFORMANCE OF TASK:

Dirt and corrosion must be removed from electrical contacts/connections so they are clean and functional.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Tool Kit
Service Manual
Cotton swabs
Burnishing fluid/contact cleaner

ENABLING OBJECTIVE:

1. Identify electrical connections to be cleaned.
2. Remove dirt and corrosion from electrical connections.
3. Determine test equipment for cleaning electrical connections.

RESOURCES:

5. Checklist - Clean electrical connections.

TEACHING ACTIVITIES:

1. Present a lecture on different types of electrical connections.
2. Discuss and ungrounded and grounded electrical connections.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions for cleaning electrical connections.
4. Present lecture on electrical connections cleaning procedures. (*1, 2, 3 & 4)
5. Demonstrate eraser cleaning procedure for electrical connections.
6. Instruct student to practice eraser cleaning procedure.
7. Discuss and demonstrate cleaning solution cleaning procedure for electrical connections.
8. Instruct student to practice cleaning solution cleaning procedures.
9. Assign student a electrical cable and cleaning equipment.
10. Instruct student to clean a electrical connection.

CRITERION-REFERENCED MEASURE:

The student will identify electrical connection, clean the electrical connection and conduct an inspection for damage to connection. Connections must be clean and snug with no bent pins or prongs.

PERFORMANCE GUIDE:

1. Obtain equipment to be serviced.
2. Dismantle equipment until part is accessible.
3. Dip cotton swab in burnishing fluid/contact cleaner and gently pull it over bottle lip to remove excess fluid.
4. Gently rub connection with moistened cotton swab until corrosion and dirt is removed.
5. Use a second cotton swab moistened with burnishing fluid/contact cleaner.
6. Rub connection gently with a dry cotton swab to remove excess fluid.
7. Reassemble equipment.
CHECKLIST

DUTY  Maintaining Computer Equipment

TASK  Clean Electrical Connections.

ENABLER  Dirt and corrosion must be removed from electrical contacts/connections so they are clean and functional.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ____________________ COURSE ________

TIME: STARTED _______ COMPLETED ____________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning electrical connections.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL:

SERIAL #: ____________

PERFORMANCE DETERMINANTS          YES   NO

The preparer
- Obtained equipment to be serviced. ____  ____
- Dismantled equipment. ____  ____
- Identified type of electrical connection. ____  ____
- Identified type of cleaner to use. ____  ____
- Moistened cotton swab with cleaning agent. ____  ____
- Cleaned part with moistened cotton swab. ____  ____
- Removed excess cleaning fluid from connection with a dry cotton swab. ____  ____
- Reassembled equipment. ____  ____
DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #54

TASK: Clean cable connections

STANDARD OF PERFORMANCE OF TASK:
Connections must be clean, snug, dirt and corrosion removed from silver-plated contacts and pins straight.

SOURCE OF STANDARD:
Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:
Cable connection to be cleaned
Pencil eraser
Tweezers

ENABLING OBJECTIVE:
1. Identify cable connections to be cleaned.
2. Remove dirt and corrosion from cable connections.
3. Determine test equipment for cleaning cable connections.

RESOURCES:

TEACHING ACTIVITIES:
1. Present a lecture on different types of cable connections. (*2)
2. Discuss card plug, pin plug, parallel plug, jack plug and prong plug connections.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate safety precautions for cleaning cable connections.
4. Present lecture on cable connection cleaning procedures. (*1, 2, 3, 4 & 5)
5. Demonstrate eraser cleaning procedure for cable connections.
6. Instruct student to practice eraser cleaning procedure.
7. Discuss and demonstrate cleaning solution cleaning procedure for cable connections.
8. Instruct student to practice cleaning solution cleaning procedures.
9. Assign student a peripheral cable and cleaning equipment.
10. Instruct student to clean a cable connection.

CRITERION-REFERENCED MEASURE:

The student will identify cable connection, clean the cable connection and conduct a inspection for damage to connection. Connections must be clean and snug with no bent pins or contacts.

PERFORMANCE GUIDE:

1. Disconnect cable to equipment.
2. Rub the silver-plated connector from the inside of the contact to the outside.
3. Repeat step 2 until all contacts are clean.
4. Blow away any rubber "crumbs".
5. Check that all pin contacts are straight.
6. Grasp contact with tweezers and gently straighten if a pin contact is bent.
7. Reconnect cable to equipment.
CLEANING CABLE CONNECTORS

**Eraser Method**

Pencil with Eraser

**Cleaning Solution Method**

Cotton Swab Moisten with Cleaning Solution

With either method, always wipe towards the edge of the card.
CHECKLIST

DU: Maintaining Computer Equipment

TASK: Clean cable connections.

ENABLER: Connections must be clean, snug, dirt and corrosion removed from silver-plated contacts and pins straight.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ______________________ COURSE ________

TIME: STARTED _______ COMPLETED ____________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning cable connections.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: __________

SERIAL #: ______________________

PERFORMANCE DETERMINANTS YES NC

The preparer

- Disconnected cable from equipment. ______ ______

- Identified the type of cleaner to use. ______ ______

- Rubbed silver-plated connector from the inside to the outside. ______ ______

- Repeated procedure until connector was clean. ______ ______

- Removed excess cleaning fluid or eraser crumbs. ______ ______

- Checked that pin contacts are straight. ______ ______

- Reconnected cable to equipment. ______ ______
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #55

TASK: Clean Printer head.

STANDARD OF PERFORMANCE OF TASK:

Dust, dirt, paper chips and accumulated ink must be removed from printer head so that it will produce clean crisp letters.

SOURCE OF STANDARD:

Writing team of incumbent worker.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer head
Alcohol
Brush
Cotton swab
Tool kit

ENABLING OBJECTIVE:

1. Remove dust, dirt, paper chips and accumulated ink from printer head.
2. Obtain access to printer head.
3. Gather print head cleaning equipment.

RESOURCES:

5. Manufacturer's service manual.
6. Checklist - Clean printer head.

TEACHING ACTIVITIES:

1. Present lecture on dust, dirt, paper chips and ink build-up on printer head. (*2)
TEACHING ACTIVITIES: (cont.)

2. Discuss problems caused by dirt, dust, paper chips and ink build-up.
3. Discuss precautions to be taken when cleaning the print head.
4. Present lecture on methods for cleaning printer heads. (x1, 2, 3, 4 & 5).
5. Demonstrate cleaning procedures for daisywheel, ball or thimble printer head.
6. Instruct student to practice cleaning a daisywheel, ball and thimble printer head.
7. Discuss and demonstrate cleaning procedures for a dot matrix printer head.
8. Instruct student to practice cleaning procedures for a dot matrix printer head.
9. Assign student a printer to be cleaned and printer head cleaning equipment.
10. Instruct student to clean the printer head.

CRITERION-REFERENCED MEASURE:

The student will determine the type of printer head, clean the printer head and perform an operational check. The printer head must produce clean, crisp, readable letters.

PERFORMANCE GUIDE:

1. Brush or blow any loose dust, dirt and paper chips from on top of the printer head.
2. Remove and clean printer head:
   A. Daisy wheel, ball or thimble head:
      1. Spray or moisten printer head in low residue cleaner such as alcohol.
      2. Gently brush letters on head to remove accumulated ink.
      3. Thoroughly rinse head.
      4. Allow head to dry completely.
   B. Dot matrix head:
      1. Using a cotton swab moistened with a safe low residue cleaner, gently wipe tip of head.
         NOTE: Be careful not to catch print wires on cotton swab.
      2. Allow head to dry completely.
3. Reinstall printer head.
CHECKLIST

DUTY  Maintaining Computer Equipment

TASK   Clean printer head.

ENABLER  Dust, dirt, paper chips and accumulated ink must be removed from printer head so that it will produce clean crisp letters.

STUDENT'S NAME ___________________ DATE ________
EVALUATOR'S NAME ___________________ COURSE ________

TIME:  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning printer head.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________ MODEL: ________________

SERIAL #: ________________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Identified the type of printer head. ______

- Brushed or blew away any loose dust or dirt. ______

- Removed the printer head from the printer. ______

- Determined cleaning procedure based on type of head. ______

- Removed all ink and dust accumulations from the print head. ______

- Removed excess cleaning fluid from print head. ______

- Inspected print head for bent or broken parts. ______

- Reinstalled printer head. ______
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #56

TASK: Clean disk drive head

STANDARD OF PERFORMANCE OF TASK:

Oxide material build-up and dust must be removed from drive head.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk drive
Isopropyl alcohol (80-90%)
Cotton swabs
Disk drive cleaning kit
Tool kit

ENDING OBJECTIVE:

1. Remove oxide build-up from disk drive head.
2. Obtain disk drive head cleaning materials.

RESOURCES:

5. Manufacturer's service manual.
6. Checklist - Clean disk drive head.
7. Visual Aid - Clean disk drive head.

TEACHING ACTIVITIES:

1. Present lecture on oxide and dust build-up on a disk drive head. (*2)
2. Discuss problems caused by oxide and dust build-up on the disk drive head.
TEACHING ACTIVITIES: (cont.)

3. Discuss safety precautions for working on disk drive head.
4. Present lecture on disk drive head cleaning methods. (*1,2,3,4 & 5)
5. Discuss and demonstrate manual disk drive head cleaning procedures.
6. Instruct student to practice the manual disk drive head cleaning.
7. Discuss and demonstrate disk drive head cleaning kit procedures.
8. Instruct student to practice disk drive head cleaning kit procedures.
9. Assign the student a disk drive to be cleaned and disk drive head cleaning materials.
10. Instruct student to clean disk drive head.

CRITERION-REFERENCED MEASURE:

The student will clean the disk drive head using both the manual and cleaning kit methods. The disk drive head must read, write and verify data without error.

PERFORMANCE GUIDE:

A. Manual cleaning:
   1. Power down disk drive.
   2. Remove disk drive case.
   3. Inspect drive head for brownish or yellowish build-up and check for cracks.
   4. Dip cotton swab into alcohol and wipe against the rim of the bottle.
   5. Rub swab across head.
   6. Wipe with second swab to clear away remaining oxide.
   7. Allow alcohol to evaporate.
   8. Replace drive case.

B. Disk drive cleaning kit:
   1. Remove cleaning diskette from protective sleeve.
   2. Open cleaning solution container and dispense just enough solution onto the cleaning diskette to saturate the area exposed by large cut-out in the diskette jacket.
   3. Insert cleaning diskette into drive with label side up and close drive door.
   4. Activate and exercise disk for about 30 seconds. NOTE: Disk can be activated by initializing or calling up the directory. If drive stops before 30 seconds repeat the command again.
   5. Remove cleaning diskette from drive after cleaning.
PERFORMANCE GUIDE: (cont.)

NOTE: If cleaning diskette becomes discolored with contamination, discard and use a new cleaning diskette.

CAUTION: Allow drive to sit for a few minutes before using to allow excess cleaning solution to evaporate from drive head.

CAUTION: Excessive use of abrasive cleaning kits can result in permanent damage to drive head.
CLEANING DISK DRIVE HEAD

Read/Write Head

Head Carriage

Lift Read/Write Head and clean with denatured alcohol and lint free swab.
CHECKLIST

DUTY  Maintaining Computer Equipment

TASK  Clean disk drive head.

ENABLER  Oxide material build-up and dust must be removed from drive head.

STUDENT'S NAME ________________________  DATE ________

EVALUATOR'S NAME _______________________  COURSE ________

TIME:  STARTED _______  COMPLETED ____________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning disk drive head.

RECORD THIS INFORMATION:

MANUFACTURER:__________________________  MODEL:__________

SERIAL #:____________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Powered down disk drive.

- Removed disk drive cover.

- Inspected drive head for build-up and cracks.

- Cleaned head with alcohol and cotton swab.

- Replaced drive case.

- Cleaned disk drive with cleaning kit.

- Used enough cleaning solution on cleaning diskette to saturate exposed area.

- Inserted cleaning diskette in drive, label side up, closed the door and activated the system for 30 seconds.

- Removed diskette after cleaning.
DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #57

TASK: Clean and demagnetize tape head.

STANDARD OF PERFORMANCE OF TASK:

Oxide material build-up and dust must be removed from tape head.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Tape player/recorder to be serviced
Isopropyl alcohol (80-90%)
Cotton swabs
Demagnetizing device

ENABLING OBJECTIVE:

1. Obtain access to tape head.
2. Remove oxide build-up, dust and magnetism from tape head.
3. Obtain demagnetizing device and cleaning materials.

RESOURCES:

5. Visual aid - Demagnetizing device.
6. Checklist - Clean and demagnetize tape head.

TEACHING ACTIVITIES:

1. Present lecture on oxide and magnetic build-up on tape head. (*1, 2, 3 & 4)
2. Discuss problems created by dirty tape head.
3. Discuss problem caused by magnetic build-up on a tape head.
TEACHING ACTIVITIES: (cont.)

4. Present lecture on cleaning and demagnetizing tape head. (*1,2,3 & 4)
5. Demonstrate tape head cleaning materials and procedures.
6. Instruct student to practice tape head cleaning procedures using both cotton swab/alcohol and cassette cleaning methods.
7. Demonstrate tape head demagnetizing devices and procedures. (*5)
8. Instruct student to practice tape head demagnetizing procedures.
9. Assign student a tape player and tape head cleaning and demagnetizing devices.
10. Instruct student to clean and demagnetize the tape head.

CRITERION-REFERENCED MEASURE:

The student will obtain access to tape head, remove oxide build-up and demagnetize tape head and perform an operational check. The tape head must read, write, and verify without error.

PERFORMANCE GUIDE:

1. Position head so it is accessible for cleaning by placing tape player/recorder in the RECORD mode.
2. Dip cotton swab into alcohol and wipe against rim of bottle.
3. Rub swab on heads, capstan, pinch roller, flywheel bearing and rubber drive wheels.
4. Wipe off any excess alcohol.
5. Demagnetize head with battery-powered demagnetizer or a drop-in cassette shaped demagnetizer unit.
6. Press stop button and close door on tape player.
TAPE HEAD DEMAGNETIZING UNIT

Erase Head

Read/Write Head
CHECKLIST

DUTY  Maintaining Computer Equipment

TASK  Clean and demagnetize tape head.

ENABLER  Oxide material build-up and dust must be removed from tape head.

STUDENT'S NAME __________________ DATE ______

EVALUATOR'S NAME __________________ COURSE ______

TIME: STARTED ______ COMPLETED ______

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when cleaning and demagnetizing tape head.

RECORD THIS INFORMATION:

MANUFACTURER: __________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Placed player/recorder in RECORD mode. ______ ______

- Identified type of cleaner to be used. ______ ______

- Moistened cotton swab with cleaner. ______ ______

- Rubbed swab on heads, capstan, pinch roller, flywheel, bearing and rubber drive wheels. ______ ______

- Wiped off excessive alcohol. ______ ______

- Demagnetized head with battery-powered or drop-in cassette demagnetizer unit. ______ ______

- Removed demagnetizer unit from player/ recorder. ______ ______

- Press stop button and closed door on tape player. ______ ______

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GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #56

TASK: Lubricate metallic mechanical parts.

STANDARD OF PERFORMANCE OF TASK:

Metallic mechanical parts must be lubricated to prevent sticking, jamming, and excessive wear.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
- Oil
- Grease
- Cotton swabs
- Tool kit

ENABLING OBJECTIVE:

1. Obtain access to metallic parts to be lubricated.
2. Identify metallic parts to be cleaned lubricated.
3. Determine type of lubrication to be used.

*RESOURCES:

1. Manufacturer's operator's manual.
4. Printer/Terminal, disassembly, and lubrication chart.

TEACHING ACTIVITIES:

1. Present lecture on types of metallic parts and lubricants. (*3)
TEACHING ACTIVITIES: (cont.)

2. Discuss types of metallic mechanical parts lubricated with grease, including gears, sliding parts, rotating cams and shaft sliding through brushing. (*5)

3. Discuss types of metallic mechanical parts lubricated with oil, including part rotating on a stud, bearings, shaft sliding through bushing, pulleys, cable guides and oil reservoirs.

4. Present lecture on metallic mechanical part lubrication procedures. (*1, 2, 3 & 4)

5. Discuss oil lubrication procedures.

6. Discuss and demonstrate grease lubrication procedures.

7. Instruct student to practice lubrication procedures for metallic mechanical parts.

8. Assign student a piece of computer equipment with metallic parts to be cleaned and lubricated and lubricating materials.

CRITERION-REFERENCED MEASURE:

The student will identify the metallic mechanical parts to be lubricated, determine proper type of lubricant and lubricate the part. Excess lubricant must be removed and the metallic mechanical part must operate smoothly without sticking, jamming or excessive wear.

PERFORMANCE GUIDE:

1. Dismantle equipment so part to be lubricated is accessible.

2. Determine type of part to be lubricated and type of lubricant to be used:
   A. Grease
      a. Gears
      b. Sliding parts.
      c. Rotating cams.
      d. Shaft sliding through bushing.
   B. Oil:
      a. Part rotating on a stud.
      b. Bearings.
      c. Shaft sliding through bushing.
      d. Oil reservoirs.
      e. Pulleys.
      f. Cable guides.

3. Apply a small amount of lubricant to part using a cotton swab.

4. Move part back and forth to distribute lubricant.

5. Wipe off excess lubricant.

6. Reassemble equipment.
LUBRICATION POINTS

Use Grease To Lubricate
(large spaces between parts)

Use Oil To Lubricate
(smaller/tight spaces between parts)
CHECKLIST

DUTY Maintaining Computer Equipment

TASK Lubricate metallic mechanical parts.

ENABLER Metallic mechanical parts must be lubricated to prevent sticking, jamming, and excessive wear.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME: STARTED __________ COMPLETED _________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when lubricating metallic mechanical parts.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: _________________________________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Dismantled equipment for lubrication. ______ ______
- Determined type of part to be lubricated. ______ ______
- Determined type of lubrication to be used. ______ ______
- Applied lubrication with cotton swab. ______ ______
- Distributed lubricant on parts. ______ ______
- Removed excess lubricant. ______ ______
- Reassembled equipment. ______ ______
DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #59

Task: Lubricate non-metallic parts

STANDARD OF PERFORMANCE OF TASK:

Non-metallic mechanical parts must be lubricated according to manufacturer's specification to prevent sticking, jamming and wearing of parts.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Oil
Technical manual (manufacturer's specification)
Tool kit

ENABLING OBJECTIVE:

1. Remove access covers, EMI/RFZ shields, lubricate non-metallic parts and reassemble.
2. Identify parts that are cleaned and are not lubricated.
3. Identify parts that may be surface lubricated but not soaked.
4. Locate and inspect felt oilers and parts identified as lubricated for life.

RESOURCES:

4. Printer/Terminal, disassembly, and lubrication checklist.
5. Quiz on identification and location of lubrication points.

TEACHING ACTIVITIES:

1. Read and interpret pre-operation checks.
2. Read and interpret maintenance schedule.
TEACHING ACTIVITIES: (cont.)

3. Present lecture on cleaning materials and lubricants
4. Administer cognitive test on non-metallic parts that should not be lubricated or soaked.
5. Administer cognitive test on physical location and serviceability criteria of felt washers/rings felt wicks and felt wipers.
6. Demonstrate 'Fingertip' lubrication test for bars and gears.
8. Demonstrate manual movement of assemblies to distribute oil on gears, slides, linkage and rails.
9. Demonstrate wiping of excess lubricants with lintless cloth.
10. Reassemble, and demonstrate off-line exerciser or mini-exerciser.
11. Instruct student to disassemble and lubricate the nonmetallic printer terminal.

CRITERION-REFERENCED MEASURE:

The student will disassemble and lubricate the non-metallic parts of a printer/terminal. All felt oilers will be identified and oiled, mechanical assemblies will be manually positioned to facilitate lubrication. Excess lubricants will be removed, lubricants will be properly distributed by manual movement of parts and equipment must pass off-line exercise test.

PERFORMANCE GUIDE:

1. Dismantle equipment so part to be lubricated is accessible.
2. Determine type of non-metallic part to be lubricated and type of lubricant to be used:
   A. Oil
      a. Felt wick.
      b. Felt ring.
      c. Felt wipers.
      d. Nylon gears.
   B. Self Lubricating:
      a. Delcorin plastic
3. Lubricate part according to manufacturer's specification.
4. Move parts to distribute lubrication.
5. Wipe away excess lubrication.
6. Reassemble equipment.
CHECKLIST

DUTY  Maintaining Computer Equipment.

TASK  Lubricate Non-Metallic parts.

ENABLER  Remove Access Covers, EMI/RFZ shields.
         lubricate Non-Metallic parts and Reassemble.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME :  STARTED _______ COMPLETED ____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Discuss manufacturer's warnings, then use the checklist below to evaluate the student's performance.

PERFORMANCE DETERMINANTS

<table>
<thead>
<tr>
<th>The preparer</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtained a procedure sheet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed power down procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed access cover and RFI/EMI shields correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed only those P.C. boards necessary for proper lubrication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Located and lubricated all felt rings/washers, felt wicks and felt wipers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noted location of factory deposited lubricated for life points.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used the fingertip test where specified by manufacturer's manual.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed proper 3 or 4 drop procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used manual movement of parts to distribute lubricants.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correctly installed RFI/EMI shield.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correctly replaced access cover.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtained correct off-line exercise test results.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #60

TASK: Adjust mechanical assemblies.

STANDARD OF PERFORMANCE OF TASK:

Mechanical parts must be adjusted, realigned or relocated to reduce wear and maximize performance.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain And Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Technical manual (adjustment specification)
Tool kit

ENABLING OBJECTIVE:

1. Interpret "feeler gauge" numbering and convert from Decimal System to Metric System.
2. Identify and locate the Opto-Coupler and solenoid.
3. Identify gear-cuts.
4. Identify and locate print head assembly, carriage assembly and solenoid.
5. Locate RTP and EOP Actuator Arm.
6. Identify line feed clutch, gears, & solenoid.

*RESOURCES:

5. Checklist - Adjust mechanical assemblies.

TEACHING ACTIVITIES:

1. Instruct student to do metric to decimal and decimal to metric conversions.
TEACHING ACTIVITIES: (cont.)

2. Demonstrate solenoid anvil, armature, and cam adjustment. (*1,2,3 & 4)
3. Demonstrate use of helical gear alignment tool. (*1,2,3 & 4)
4. Demonstrate different methods of drive belt adjustment. (*1,2,3 & 4)
5. Demonstrate belt tracking adjustment. (*1,2,3 & 4)
6. Demonstrate the removing, cleaning, and replacing of multi-pen cables. (*1,2,3 & 4)
7. Demonstrate release of clamp spring retainer. (*1,2,3 & 4)
8. Emphasize clamp spring cautions. (*1,2,3 & 4)
9. Demonstrate left and right opto-electronic assemblies and carriage arm adjustment. (*1,2,3 & 4)
10. Demonstrate removal of carriage solenoid cam locks. (*1,2,3 & 4)
11. Demonstrate pulley center-to-center and housing-to-bearing block alignment. (*1,2,3 & 4)
12. Demonstrate carriage drive belt and tension adjustment. (*1,2,3 & 4)
13. Demonstrate armature-to-releaser gear and armature-to-solenoid adjustment. (*1,2,3 & 4)
14. Demonstrate primary and alternate method of stopper screw adjustment. (*1,2,3 & 4)
15. Demonstrate line feed clutch gear adjustment. (*1,2,3 & 4)
16. Instruct the student to make mechanical adjustments to a computer printer/terminal including belt tension and tracking, pulley placement, gears, cams and actuator levers' tolerances as specified in Technical/Service Manual. (*5)

CRITERION-REFERENCED MEASURE:

The student will make mechanical adjustments to a computer printer/terminal, including: belt tension and tracking, pulley placement, gears, cams, and actuator levers' tolerances as specified in the technical manual.

PERFORMANCE GUIDE:

1. Dismantle equipment so mechanical assembly is accessible.
2. Determine type of mechanical assembly to be adjusted:
   A. Guide wire tension adjustment.
   B. Pulley alignment.
   C. Gear relocation.
   D. Cam adjustment.
   E. Belt tension adjustment.
   F. Drive motor adjustment.
   G. Spring tension adjustment.
3. Adjust according to manufacturer's specifications.
4. Reassemble equipment.
CHECKLIST

DUTY Maintaining Computer Equipment.

TASK Adjust mechanical assemblies.

ENABLER Make mechanical adjustments to a printer terminal.

STUDENT'S NAME ___________________________ DATE ___________

EVALUATOR'S NAME ________________________ COURSE ______

TIME: STARTED _______ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

1. Point out manufacturer's notes and cautions on guide wires and spring latches.
2. Show student simultaneous gear adjustment procedures; they may be separated by 3 or 4 pages of figures and charts.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________________________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Selected proper common tools. ___ ___
- Selected proper special tools. ___ ___
- Followed power down procedure. ___ ___
- Removed access cover properly. ___ ___
- Identified and removed EMI/RFI covers. ___ ___
- Removed and logic and control circuit boards. ___ ___
- Used the feeler-gauge for adjustments where required. ___ ___
- Checked opto-electronic switches. ___ ___
<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aligned pulley to center and pulley to bearing.</td>
<td></td>
</tr>
<tr>
<td>Followed simultaneous gear alignment procedures.</td>
<td></td>
</tr>
<tr>
<td>Followed spring tension caution and adjustment procedures.</td>
<td></td>
</tr>
<tr>
<td>Adjusted guide wire tension.</td>
<td></td>
</tr>
<tr>
<td>Adjusted clutch, solenoid and feed.</td>
<td></td>
</tr>
<tr>
<td>Properly stored internal and external lock (Jesus) washers.</td>
<td></td>
</tr>
<tr>
<td>Followed correct exerciser routine.</td>
<td></td>
</tr>
</tbody>
</table>
TEST ADMINISTRATORS INFORMATION

DUTY Maintaining Computer Equipment

TASK Adjust mechanical assemblies.

ENABLER Make mechanical adjustments to a printer terminal.

Test Environment/Station Set Up:
- Workbench with AC power
- Printer/Terminal
- Exerciser or Mini Exerciser
- Have all special tools required by technical manual
- Have common tools available.
- Use student checklist for evaluation.

Supplies, Equipment and References needed before test:
- Workbench with AC power
- Vacuum cleaner
- Printer/terminal
- Printer paper
- Exerciser/Mini-Exerciser
- Common tools
- Special tools

Time allowed to perform test:
- Manufacturer's standard rate times 150%
- Student starts time: Time spent reading procedure sheet is part of the test.
- Time spent getting tools after student starts time is part of test.

Special Instructions for Administering the test:
- Point out manufacturer's notes and cautions to student.
- You may need to develop procedure sheets for simultaneous adjustments.
- Use the student checklist to evaluate the student.
- Verify the student has read the adjustment instructions and know the exposed parts; "Call-Out" before recording the start time.
- Record total time.
- Grade exerciser routine as part of test.
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #61

TASK: Adjust and align disk drive head.

STANDARD OF PERFORMANCE OF TASK:

Disk drive head alignments will include radial head alignment, track zero sensor adjustment, carriage stop adjustment, index timing adjustment, head load adjustment and raw data adjustment.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Exerciser disk
Alignment disk
Oscilloscope
Tool kit
Central processing unit
Disk drive
Technical manual (Manufacturer's specifications)

ENABLING OBJECTIVE:

1. Operate an oscilloscope.
2. Interpret standard electronic/TTL symbols.
3. Identify test point on disk drive.
4. Read schematics of controller (interface) card.
5. Identify and adjust disk drive radial head, track zero sensor, carriage stop, index timing, head load and raw data adjustments.
6. Explain disk format.
7. Troubleshoot and align a disk drive.

RESOURCES:

RESOURCES: (cont.)

3. **TTL Databook,** (National Semiconductor, Signetics, Intel, or Motorola).
7. Manufacturer's disk drive manual.
8. **Computer Facts,** Howard W. Sams & Co., Inc., Indianapolis, IN.
9. Disk Drive Analyzer/Analysis Disk.
13. Checklist - Troubleshooting and aligning disk drive head.

TEACHING ACTIVITIES:

1. Present lecture on electronic TTL symbols. (*3)
2. Assign student to practice groups to familiarize student with TTL symbols and their purpose.
3. Present lecture on disk drive head components. (*1,4,5,7,8, & 10)
4. Conduct a hands-on demonstration of disk drive head components.
5. Conduct a discussion on analog card, disk controller/interface card and MC3470. (*2,4,7 & 8)
6. Conduct a discussion on second source drives.
7. Instruct student to complete head component identification worksheet. (*11)
8. Present lecture on disk drive test points. (*1,4,5,7,8 & 10)
9. Conduct discussion on disk drive test points. (*1,4,7,8, & 10)
10. Demonstrate how to identify disk drive test points.
11. Conduct a class discussion on drive motor, stepper motor and control circuits.
12. Present lecture on diskette structure and format. (*1,4,5,7,8 & 10)
13. Conduct class discussion on diskette structure and format.
14. Instruct student to sketch a diskette showing track and sector locations.
15. Present lecture on the operation of an oscilloscope. (*1,5,6,8, & 12)
16. Demonstrate oscilloscope operating procedures.
17. Present lecture on how to adjust and align a disk drive head. (*1,4,5,7,8,9,10 & 12)
18. Conduct demonstration on disk drive head adjustment and alignment procedures.
19. Instruct student to adjust and align a disk drive head. (*13)
CRITERION-REFERENCED MEASURE:

The student will troubleshoot and align a disk drive, including subassemblies, major assemblies, drive components, and electronic boards. After alignment, the disk drive can read/write to the disk for use on other disk drives of same format. All items on the performance checklist are adjusted to manufacturer and dash number specifications.

PERFORMANCE GUIDE:

1. Obtain disk drive to be serviced.
2. Remove disk drive cover.
3. Determine necessary adjustments and alignments:
   A. Radial head alignment
   B. Track zero sensor adjustment
   C. Carriage stop adjustment
   D. Index timing adjustment
   E. Head load adjustment
   F. Raw data adjustment
4. Make needed alignments and adjustments.
5. Replace cover.
6. Test drive to determine if it is reading, writing and verifying correctly.
Head is off track towards track 0.

Head is on track.

Head is off track towards inside track.
TITLE: Drive Head Component Identification Worksheet.

DIRECTIONS: Fill in the component name indicated by the arrow.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 
13. 
14.
1. Carriage Support Rails
2. Carriage Drive Bands
3. Drive Wheel
4. Set Screw
5. Shaft
6. Head Carriage
7. Head
8. Carriage Support Rails
9. Head Carriage
10. Head
11. Outermost Track (0)
12. Disk
13. Microswitch
CHECKLIST

DUTY Maintaining Computer Equipment

TASK Adjust and align disk drive head.

ENABLER Trouble and align a disk drive.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ______________________ COURSE ________

TIME: STARTED _______ COMPLETED __________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

1. The student must be competent on oscilloscope.
2. The student must know disk formats.

RECORD THIS INFORMATION:

MANUFACTURER: ____________________________ MODEL: __________
SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Verified operation of associated computer. __ __
- Verified I/O port or controller card. __ __
- Selected operable source disk drive for diagnostic test. __ __
- Used correct termination disk drive or terminated cable slot. __ __
- Used correct slot/drive number or default for source drive. __ __
- Designated the D.U.T drive as drive No.2. __ __
- Removed disk drive cover and base cover. __ __
- Ran diagnostics disk. __ __
- Followed monitor instructions.  
  YES  NO

- Made radial adjustment.  
  YES  NO

- Readied oscilloscope to indicate proper position of stepper motor.  
  YES  NO

- Made carriage stop adjustment to "Ballpark" track zero (0).  
  YES  NO

- Properly aligned LED/Sensor track and sector detector.  
  YES  NO

- Followed diagnostic instructions for firmware driven 0.  
  YES  NO

- Checked felt head load pad for pressure and service ability.  
  YES  NO

- Monitored raw data, interpreted oscilloscope trace, adjusted active filter/peak detector network.  
  YES  NO

- Made azimuth test, adjusted to specifications or replace head.  
  YES  NO

- Powered down disk drive.  
  YES  NO

- Replaced all covers.  
  YES  NO

- Tested drive for save/load.  
  YES  NO

- Tested portability of disk.  
  YES  NO
TEST ADMINISTRATORS INFORMATION

DUTY Maintaining Computer Equipment

TASK Adjust & align disk drive head.

ENABLER Trouble and align disk drive.

Test Environment/Station Set Up:

- Workbench with AC power
- Complete computer system
- Functional 5 1/4" disk drive.
- Misaligned 5 1/4" disk drive
- Alignment disk
- Oscilloscope with 10:1 test probe
- Common tools

Supplies, Equipment and References needed before test:

- Exercise (scratch) disk
- Diagnostic disk
- Terminating cable (If Required)
- Terminating Disk-Drive (If required)
- Oscilloscope with 10:1 test probe
- Common tool kit
- Time allowed to perform test:
- One hour maximum (For units with on-board C.P.U and On-board power supply). Student indicates starting time after checking out cables, computer, source drive and oscilloscope if pressure pad (load) is incorrect (on throw away pads) or Azimuth (read/write head) is incorrect-stop time.

Special Instructions for Administering the test:

- On some disk driver, the write protect microswitch has been replaced by a photo transistor or infra-red circuit.
- On some disk drives, the disk stop has been eliminated
- Enter manufacture and SN on checksheet.
- Use the check sheet to evaluate student.
- Record starting time and completion time.
- Discuss "Out of Sequence" adjustments.
- Record total time for task completion on checksheet.
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #62

TASK: Adjust and align tape head.

STANDARD OF PERFORMANCE OF TASK:

Tape player/recorder adjustments must include tape head adjustment, continuity in audio circuitry adjustment, and cables and connectors alignment.

CONDITIONS FOR PERFORMANCE OF TASK:

Tape player/recorder to be serviced
Tool kit
Alignment tape
Oscilloscope

ENABLING OBJECTIVE:

1. Remove tape transport cover, adjust azimuth, reassemble and test run.
2. Identify the three basic cassette interface types by name and explain their characteristics.

RESOURCES:

2. Cassette Tape, Azimuth Calibration, Cook Laboratories, Inc. CT.
3. NCR Data Communications Concepts. Technical Publications Department, Howard W. Sams & Co., Inc. Indianapolis, IN.
4. Basic Computer Language. Radio Shack, Fort Worth TX.
8. TDK Model HD-01 Electronic Head Demagnetizer, TDK.
RESOURCES (cont.)

9. Visual aids - Kansas City interface Frequencies, Tarbell Interface and Tape Head Assembly.
10. Checklist - Adjust and align tape head.

TEACHING ACTIVITIES:

1. Demonstrate the construction of Coaxial Jumper Sets: 1/4" phone plug-to-RCA; 1/4" phone plug-to-miniature phone plug; RCA-to-miniature phone plug; miniature phone plug to miniature phone plug.
2. Demonstrate battery test procedure for peeker/limiter/VU monitor. (*3 & 4)
3. Demonstrate actual sound volume for a sound level of 5 VU units. (*3 & 4)
4. Demonstrate correct Azimuth adjustment and increase in sound level. (*2)
5. Demonstrate difference in output levels of commercial cassette programs and user "saved" cassette programs.
6. Demonstrate the effect of baud rate on save amplitude.
7. Develop transparency of "Kansas City" interface frequencies. (*9)
8. Develop transparency of "Tarbell" interface.
10. Discuss Transistor Audio Amplifiers.
11. Discuss Integrated Circuit Audio Amplifiers. (*3 & 4)
12. Discuss Tone and Volume Controls. (*1, 3, 4, 5, & 7)
13. Instruct student to adjust and align tape head. (*10)

CRITERION-REFERENCED MEASURE:

The student will disassemble a cassette recorder for access to tape head. After identification of the Azimuth and Zenith hardware, Azimuth is adjusted for maximum output. The recorder is reassembled and tested in C save and or default modes. The cassette is transportable to another properly aligned recorder.

PERFORMANCE GUIDE:

1. Obtain tape player/recorder to be serviced.
2. Determine necessary adjustments and alignments:
   A. Tape head adjustments.
   B. Continuity in audio circuitry adjustments.
   C. Cables and connector alignment.
3. Adjust according to manufacturer's specifications.
CHECKLIST

DUTY  Maintaining Computer Equipment.

TASK  Adjust and align tape head.

ENABLER  Remove tape transport cover, adjust azimuth, reassemble and test run.

STUDENT'S NAME ___________________________ DATE ___________

EVALUATOR'S NAME ________________________ COURSE ___ __

TIME : STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

The student must be competent on oscilloscope and know the three basic cassette interface types by name and characteristics.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ___________

SERIAL #: ___________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Selected tools.  __________

- Disassembled unit including cassette cover.  __________

- Inserted test tape.  __________

- Connected external VU meter to "ear" or phone jack.  __________

- Adjusted azimuth for maximum output.  __________

- Turned off cassette recorder.  __________

- Reassembled unit.  __________

- Connected recorder to any computer except dataset type.  __________

- Saved program on tape.  __________

- Loaded program from tape.  __________

- Made the program transportable to another cassette recorder.  __________
DUTY Maintaining Computer Equipment.

TASK Adjust and align tape head.

ENABLER Remove tape transport cover, adjust azimuth, reassemble and test run.

Test Environment/Station Set Up:

- Workbench with AC power.
- Complete computer system.
- Limiter/VU Box.
- Oscilloscope.
- Commercial cassette recorder.

Supplies, Equipment and References needed before test:

- Common tool kit.
- Blank cassette tapes.
- Coaxial cables.
- Cassette recorder to be adjusted.
- Computer system.
- Test cassette recorder.
- Peaker/limiter/VU monitor.

Time allowed to perform test:

- 150 percent of flat rate time.
- Time stopped for cassette transport covers of non standard design.
- Time stopped if student needs to look up DINOUT of DIN plugs and color code.

Special Instructions for Administering the test:

- If you do not have a Peaker/Limited/VU monitor, you can fabricate using a LM 358 and salvaged VU meter.
- Record starting time and completion time on the checklist
- Use the checklist to evaluate the student.
- If time is stopped, note as a remark on the bottom of the checklist.
- Record total task time on checklist.
- Discuss checklist with student.
DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #63

TASK: Set disk read/write/verify speed.

STANDARD OF PERFORMANCE OF TASK:

Disk drive read/write/verify speed must be set so that drive is running at optimum speed according to strobe line pattern or screen scale pointer.

CONDITIONS FOR PERFORMANCE OF TASK:

Floppy disk drive to be serviced
Tool kit
Flourescent light
Central processing unit
Disk drive
Computer monitor

ENABLING OBJECTIVE:

1. Dissassemble a disk drive, correct speed adjustment, and reassemble.
2. Explain physical design of 50HZ/60HZ strobe decal.
3. Locate and adjust drive motor speed adjustment potentiometer.

RESOURCES:

2. Student fabricated strobe light using a NE51 lamp, 22K resistor, AC power cord, and shell from papermate pen.
3. Small single tube flourescent light unit, Department store.
4. Disk Drive Analyzer (Apple-Non Proprietary). Silic'n Express. Columbus, OH.
7. Disk Drive Alignment. CSM. Universal Software. Claremont, NH.
8. The Anatomy of The 1541. Abacus Software. Grand Rapids, MI.
10. 1541 Physical Exam. Cardinal Software. Wood Bridge, VA.
12. Checklist - Drive Motor Speed Adjustment.

TEACHING ACTIVITIES:
1. Fabricate strobe light using NE51 neon lamp and series dropping resistor. (*2,3 & 11)
2. Discuss and show a scale drawing (transparency) of 50Hz/60Hz drive motor speed decal.
3. Demonstrate 60Hz "Stopped" speed adjustment.
4. Demonstrate commercial diskette program for RPM (speed) adjustment. (*5,6,7,8,9, & 10)
5. Demonstrate correlation accuracy of strobe light motor speed adjustment, and diskette program speed adjustment. (*5,6,7,8,9, & 10)
6. Instruct student to disassemble disk drive, and adjust drive motor speed, using a strobe lightspeed adjustment, and diskette program speed adjustment. (*12)

CRITERION-REFERENCED MEASURE:

The student will remove the chassis cover and base cover from a disk drive, adjust the drive motor speed by strobe light. Adjustment is within one scale mark on commercial diskette diagnostic program. Disk drive is reassembled and tested. Disk read/write/verify is transportable to a like format disk drive unit.

PERFORMANCE GUIDE:
1. Power down system.
2. Remove drive case and place drive on its side.
3. Power up system, insert disk in drive and boot:
   A. Manual adjustment:
      1. Locate pattern of radial lines on the bottom of the drive pulley.
      2. Hold a fluorescent light above the disk drive and watch the pattern of lines.
      NOTE: If the lines seem to stand still, the speed is correct. If the lines appear to rotate one way or another, the motor speed is too fast or too slow.
      3. Locate the motor speed adjustment screw. Turn a few degrees one way and then the other and observe the effect on the strobe pattern lines.
PERFORMANCE GUIDE: (cont.)

4. Adjust the screw until the lines appear to stop turning. (No more than one full turn should be needed.)

B. Diagnostic disk adjustment:
   1. Observe pointer scale on monitor.
      NOTE: If pointer is in the center of the scale then the speed is ideal. If the pointer is to the left or right, the speed is too fast or too slow.
   2. Locate the motor speed adjustment and turn adjusting screw a few degrees one way and then the other.
   3. Adjust the screw until the pointer is in the center of the scale.
   4. Power down system and remove disk from drive.
   5. Replace disk drive cover.
MOTOR SPEED ADJUSTMENT

Strobe Disk Action

Lines moving counterclockwise - speed too fast.

Lines are still - drive speed is correct.

Lines are moving clockwise - speed too slow.

Motor Speed Adjustment Potentiometer

Potentiometer (Pot)

Adjustment Screw
CHECKLIST

DUTY Maintaining Computer Equipment.

TASK Set disk read/write/verify speed.

ENABLER Adjust drive motor speed.

STUDENT'S NAME _________________ DATE __________

EVALUATOR'S NAME _________________ COURSE ________

TIME: STARTED _______ COMPLETED ______________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Record disk drive model on the checklist if strobe decal is not labeled, the outside spoke pattern is for 60HZ power.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Observed if the system with one disk drive passed cold start diagnostics. ______ ______

- Followed power down procedure. ______ ______

- Removed chassis cover and base cover. ______ ______

- Identified 60HZ strobe pattern. ______ ______

- Properly connected DUT to system. ______ ______

- Inserted scratch disk in DUT. ______ ______

- Energized system for cold start. ______ ______

- Selected speed adjustment on diskette menu. ______ ______

- Adjusted drive motor strobe and speed. ______ ______

- Compared drive motor speed to monitor scale. ______ ______

- Powered down system. ______ ______

- Reassembled disk drive. ______ ______

- Tested read/write/verify for transport ability to another drive. ______ ______
TEST ADMINISTRATOR INFORMATION

DUTY Maintaining Computer Equipment

TASK Set disk read/write/verify speed.

ENABLER Adjust drive motor speed

Test Environment/Station Set Up:
- Workbench with AC power
- Functional computer system with disk drive
- Common tool kit
- Strobe light and fluorescent light
- Diskette Program; RPM/Diagnostics
- Disk drive to be adjusted

Supplies, Equipment and References needed before test:
- Scratch disk
- Technical Reference manual
- Operators manual
- RPM/Diagnostics disk
- Strobe light
- Screw drivers, tuning wand (Tweeker), jeweler's screwdriver
- Computer system
- Compu Trace or Manufacturer's schematics.

Time allowed to perform test:
- Maximum time 20 minutes.
- Student indicates start time.
- System power up and cold start diagnostics do not count as test time.

Special Instructions for Administering the test:
- Student should know both the strobe light and diskette method of drive motor RPM adjustment.
- Student checklist uses the diskette speed diagnostics to validate accuracy of manual adjustment.
- Use the checklist to evaluate the student.
DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #64

TASK: Set tape read/write/verify speed.

STANDARD OF PERFORMANCE OF TASK:

Tape read/write/verify speed must be set so that tape tension runs at an equilibrium between supply spindle and take up spindle.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Tape player/recorder to be serviced
Tool kit
Exercise tape

ENABLING OBJECTIVE:

1. Locate the drive motor and drive motor speed adjustment.
2. Locate the take-up spindle, spindle clutch or rider, and adjusting screw.

RESOURCES:

4. Comprehensive Cross Reference Belt Guide. Projector-Recorder Belt Corp, Whitewater, WI.
7. Checklist - Drive motor speed adjustment.

TEACHING ACTIVITIES:

1. Play contemporary music tape on recorder with a motor that is turning slow.
TEACHING ACTIVITIES: (cont.)

2. Play contemporary music tape on recorder with a motor that is turning fast.
3. Demonstrate and discuss motor "Shock Mounts". (*1,2 & 3)
4. Demonstrate and discuss motor speed adjustment. (*1,2,3 & 4)
5. Show location of spindle clutch adjustment. (*5)
6. If hardware permits show:
   A. Clutch adjustment from bottom of cassette transport with tape moving.
   B. Clutch adjustment from cassette compartment, through access hole without tape. A trial and error method.
7. Demonstrate correct tape equilibrium. (*1,2,3 & 4)
8. Instruct the student to complete tape transport parts identification worksheet. (*6)
9. Instruct the student to disassemble recorder unit and adjust motor drive speed. (*7)

CRITERION-REFERENCED MEASURE:

The student will disassemble a commercial cassette player/recorder, adjust motor drive speed, clutch drag, then reassemble and test for correct sounding speed and supply take-up equilibrium.

PERFORMANCE GUIDE:

1. Power up tape player/recorder.
2. Place tape in player/recorder and press play button.
3. Listen to the audio output; if the audio sounds sluggish, the motor is running too slow. If the audio sounds rapid, the motor is running too fast.
4. Locate motor speed adjustment in recess at one end of motor casing and turn a few degrees in one direction, then the other direction until the audio sounds best.
5. Observe take-up spindle and supply spindle and determine if they are operating at equilibrium.
6. Tighten the tension on clutch mechanism under the take-up wheel when the spindle is moving too slow (loose, excess tape inside tape case). Loosen the tension on the clutch mechanism when the supply spindle is moving too slow (tape is being stretched).
7. Power down tape player/recorder and remove tape.
TAPE TRANSPORT MECHANICAL COMPONENTS LOCATION
EXTERNAL VIEW

- Supply Spindle
- Take-up Spindle
- Read/Write Head
- Gap Area
- Erase Head
- REC (Record)
- Pinch Roller
- Capstan
- Counter
- Read/Write Head
- Power Indicator Light
- STOP/EJECT
- F. FWD (Fast Forward)
- PLAY
-REW (Rewind)
WORKSHEET

TITLE: Tape Transport Components.

DIRECTIONS: Fill in the component name indicated by the arrow.
1. Supply Spindle
2. Read/Write Head Gap Area
3. Erase Head
4. REC(Record)
5. REW(Rewind)
6. F. FWD(Fast Forward)
7. PLAY
8. STOP/EJECT
9. Read/Write Head
10. Pinch Roller
11. Capstan
12. Take-up Spindle
CHECKLIST

DUTY Maintaining Computer Equipment.

TASK Set tape read/write/verify speed.

ENABLER Adjust drive motor speed on recorder unit.

STUDENT'S NAME __________________________ DATE ________

EVALUATOR'S NAME _________________________ COURSE ________

TIME : STARTED ______ COMPLETED ________________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

1. Student may supply test tape.
2. Instruct student to set tape read/write/verify speed so that tape tension runs at an equilibrium between supply and take up spindle.

RECORD THIS INFORMATION:

MANUFACTURER: ____________________________ MODEL: ________

SERIAL #: ________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Disassembled recorder. ______ ______
- Used isolation transformer. ______ ______
- Adjusted motor speed by listening. ______ ______
- Correctly adjusted motor speed. ______ ______
- Observed the difference between the turned shock-mount screws and motor speed adjusting screw. ______ ______
- Located the take-up supply clutch. ______ ______
- Adjusted the take-up clutch for tape equilibrium. ______ ______
- Observed if the cassette recorder "C Save" and "C Load" or default saved and loaded. ______ ______
- Observed if the tape transportable to another cassette recorder. ______ ______
TEST ADMINISTRATOR'S INFORMATION

DUTY  Maintaining Computer Equipment

TASK  Set tape read/write/verify speed.

ENABLER  Adjust drive motor speed on recorder unit.

Test Environment/Station Set Up:
- Workbench with AC power.
- Computer system with good cassette recorder.
- Common tool kit.
- Test tape (Audio).
- Test tape (Computer).
- Isolation transformer.
- Cassette recorder with incorrect drive motor speed.

Supplies, Equipment and References needed before test:
- 2 Spring/belt hooks
- Common tool kit
- Isolation transformer
- Operator's and Technical manual
- Checklist
- Vita-drive (To restore feet, resilience and grip to belts)

Time allowed to perform test:
- 45 minutes
- Test time will stop and restart for belt problems.

Special Instructions for Administering the test:
- Instruct student to Set tape read/write/verify speed so that tape tension runs at an equilibrium between supply and take up spindles.
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #65

TASK: Clean or replace filters.

STANDARD OF PERFORMANCE OF TASK:

Filter must be free of dirt, dust and foreign materials.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Filters to be cleaned
Replacement filter
Cleaning solution
Tool kit

ENABLING OBJECTIVE:

1. Identify and locate RFI/EMI covers that are part of the cooling system.
2. List serviceability criteria for fan filters.
3. Identify and locate fan, finger guard (grill) retainer tabs and filter frame.

RESOURCES:

1. EG & G Rotron Specification Sheets.
2. IMC Specification Sheet.

TEACHING ACTIVITIES:

1. Demonstrate removal of protective grill (finger guard). (*3 & 4)
2. Handout of Manufacturer's RFI/EMI notes and warnings. (*1 & 2)
3. Discuss removal of finger tabs and filter frame.
TEACHING ACTIVITIES: (cont.)

4. Discuss CFM of air and filter serviceability.
5. Discuss cleaning solutions, rinse, and drying of filter elements.
6. Discuss precautions taken prior to installation.
7. Instruct the student to remove, clean, and replace a filter element. (*5)

CRITERION-REFERENCED MEASURE:

The student will remove a filter element and exercise subjective judgement on serviceability for cleaning or need for replacement. Install filter element in filter frame; mount to fan housing and install fan/filter grill. The filter element sits properly and does not obstruct fan wheel.

PERFORMANCE GUIDE:

1. Remove filter cover.
2. Remove old filter and determine if it should be cleaned or replaced:
   A. Replace filter:
      1. Place new filter in position.
      2. Replace filter cover.
   B. Clean filter:
      1. Place filter in cleaning solution.
         A. Warm water and mild detergent.
         B. Mild cleaning solution.
      2. Rinse filter thoroughly until all dust, dirt and foreign matter is removed.
      3. Shake excess solution from filter and let it dry thoroughly.
      4. Place filter in position.
      5. Replace filter cover.
CHECKLIST

DUTY  Maintaining Computer Equipment.

TASK  Clean or replace filters.

ENABLER  Remove, clean and replace a filter element.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE _________

TIME: STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

1. If filter cannot be cleaned, the student will replace it with a new filter.

PERFORMANCE DETERMINANTS

<table>
<thead>
<tr>
<th>The preparer</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Powered down system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed power plug from AC outlet.</td>
<td></td>
<td></td>
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<tr>
<td>- Removed and cleaned finger guard grill.</td>
<td></td>
<td></td>
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<tr>
<td>- Removed and inspected filter element.</td>
<td></td>
<td></td>
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<tr>
<td>- Washed filter element according to manufacturer's or OEM specifications.</td>
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<td></td>
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<tr>
<td>- Rinsed filter until there was no dust, dirt, grime, ink, or ribbon residue on it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed excess rinse.</td>
<td></td>
<td></td>
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<tr>
<td>- Dried filter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Inspected filter for dimensional stretch.</td>
<td></td>
<td></td>
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<tr>
<td>- Properly seated filter in filler frame.</td>
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<tr>
<td>- Seated filter tabs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reinstalled finger guard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered up and checked system.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY  **Maintaining Computer Equipment**

TASK  **Clean or replace filters.**

ENABLER  **Remove, clean, or replace a filter element.**

Test Environment/Station Set Up:

- Workbench station
- Tool kit
- Wash/rinse station with running water and drain
- Solution trays or shallow sink

Supplies, Equipment, and References needed before test:

- Technical reference manual
- Operator's manual
- Cleaning solutions
- Clean wiping cloth
- Tool kit
- Computer equipment with forced air cooling fan.

Time allowed to perform test:

- 30 minutes
- Filter drying time is not in test time.
- Wash/rinse station cleanup time is not in test time.

Special Instructions for Administering the test:

- If filters cannot be cleaned adequately, replace with new filters.
GUIDE SHEET

DUTY: Maintaining Computer Equipment

PERFORMANCE OBJECTIVE #66

TASK: Clean outside case/cover.

STANDARD OF PERFORMANCE OF TASK:

Outside case/cover must be free of dirt, grease, grime and dust.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Case/cover to be cleaned
Cleaning solution
Clean soft cloth

ENABLING OBJECTIVE:

1. Selection of proper cleaning material for plastic, painted metal, and glass.
2. Recognize the need for anti-static treatment of monitor CRT.

RESOURCES:

2. Operator's manuals.
3. Chemical listings of electronic parts catalogs.
7. Checklist - Cleaning case.

TEACHING ACTIVITIES:

1. Discuss mild detergents as recommended by computer operator manual. (*2 & 5)
2. Discuss isopropyl versus rubbing alcohol. (*1, 2, 3 & 5)
3. Discuss the difference between 91 percent and 98 percent isopropyl alcohol. (*1, 3 & 5)
TEACHING ACTIVITIES: (cont.)

4. Discuss percent of "Off-the-Shelf" Isopropyl alcohol. (11,3 & 5)

5. Discuss the advantages of anti-static solutions. (N1)

6. Demonstrate removal of small scratches.

7. Demonstrate cleaning of keyboards and keypads.

8. Instruct student to clean the outside case of a computer terminal including the cover, monitor safety glass, and keypads. (N7)

CRITERION-REFERENCED MEASURE:

The student will clean the outside case of a computer terminal.

The outside case is free of dirt, grease, grime and spots.

Minor scratches are removed, the CRT safety glass is coated with anti-static treatment as it is cleaned.

PERFORMANCE GUIDE:

1. Obtain case/cover to be cleaned and disconnect power.

2. Determine type of cleaning solution to be used:
   A. Warm water and mild detergent.
   B. Mild liquid cleaning solution:
      1. Alcohol.
      2. Liquid furniture cleaner.
   C. Spray cleaner.

3. Place small amount of cleaner on soft clean cloth.

4. Rub entire case/cover thoroughly until case/cover is clean.

5. Dry case/cover to dry before powering up.
CHECKLIST

DUTY  Maintaining Computer Equipment.

TASK  Clean outside case/cover.

ENABLER  Clean the outside case of a computer terminal including case/cover, monitor screen, and keypads.

STUDENT'S NAME  ___________________________  DATE  ______

EVALUATOR'S NAME  ___________________________  COURSE  ______

TIME:  STARTED  ______  COMPLETED  ____________

TOTAL  ____________

DIRECTIONS TO THE EVALUATOR:

Use the checklist to evaluate the use of cleaning agents for different types of materials.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Followed power down procedure.  __   __

- Removed cables from all peripheral equipment.  __   __

- Removed remote cables at the computer/terminal.  __   __

- Selected cleaning materials.  __   __

- Used abrasive cleaners to clean the case or cover.  __   __

- Cleaned the outside case or cover of all dirt, grease, grime and stubborn spots.  __   __

- "Rubbed out" minor scratches.  __   __

- Determined the volume of solution for the job.  __   __

- Cleaned the case by rubbing not flooding or flushing.  __   __

- Checked all connectors for cleaning solution.  __   __

- Cleaned the case/terminal using anti-static treatment as indicated by operator's manual.  __   __
DUTY:  Maintaining Computer Equipment

TASK:  Clean outside case/cover.

ENABLER:  Clean the outside case of a computer terminal including case/cover, monitor screen, and keypads.

Test Environment/Station Set Up:

- Normal workbench or desk.
- Medium bristle camel-back brush.
- Complete set of cleaning materials.
- Computer/Terminal.

Supplies, Equipment, and References needed before test:

- Operator's manual
- Medium bristle brushes
- Vacuum cleaner
- Fantastik or Formula 409 (for stubborn spots e.g. Zeron and Diablo)
- Swabs, clean wiping cloths
- Dirty computer/terminal

Time allowed to perform test:

- 30 Minutes
- Time used to remove minor scratches is not counted as test time.

Special Instructions for Administering the test:

- Abrasive powders and liquids will not be used.
- Automotive rubbing compounds will not be used for scratch removal.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #67

TASK: Interpret troubleshooting charts.

STANDARD OF PERFORMANCE OF TASK:
Probable cause and kind of test to run to check problem must be based on symptom or customer complaint.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:
Troubleshooting charts
Customer complaint/problem

ENABLING OBJECTIVE:

1. Interpret standard flowchart symbols, and the basic block diagram of the device under test.
2. Use flowchart decision blocks in conjunction with idealized voltages and waveforms explained in sectional narratives.

RESOURCES:

2. Semiconductor General Purpose Replacements, Howard W. Sams & Co. Inc., Indianapolis, IN.

TEACHING ACTIVITIES:

1. Present transparency of basic flowchart symbols. (6)
TEACHING ACTIVITIES: (cont.)

2. Discuss the importance of the decision block.
3. Instruct student to make a block diagram of a basic three chip computer.
4. Instruct student to draw a flowchart for a basic three chip computer.
5. Discuss the "Section" isolation flowchart. (*7 & 8)
6. Discuss the "CPU" isolation flowchart.
7. Test students on section isolation flowchart. (*7 & 8)
8. Test students on the CPU flowchart decision blocks.
9. Discuss signal conditioning.
10. Discuss CPU's.
11. Discuss ROM's.
12. Discuss RAM's.
13. Discuss address decoding.
14. Discuss basic keyboards.
15. Discuss video divider chain, video RAM, and video processing.
16. Discuss "SYNC" Generation.
17. Develop flowchart for computer as team project, i.e. Keyboard, Controller (Interface) Card, ROM's, RAM's, Address Decoding, Video. (1,2,3,4 &5)
18. Demonstrate actual symptoms as student flowcharts are tested.
19. Instruct students to fault isolate problems in each major area using their flowchart. (*9)

CRITERION-REFERENCED MEASURE:

The student will validate a symptom, run the indicated diagnostic test, and fault isolate to component level a problem in a malfunctioning computer. Student will use a flowchart in conjunction with idealized test voltages and wave forms.

PERFORMANCE GUIDE:

1. Obtain explanation of problem/symptom or customer complaint.
2. Locate problem/symptom/complaint on trouble shooting chart.
3. Locate probable cause on trouble shooting chart.
4. Determine diagnostic test to check problem or part to be replaced.
MICROCOMPUTER BLOCK DIAGRAM

Clock
Reset

Keyboard
Keyboard Decoder
CPU

Video Driver
Video Interface
Monitor

Video RAM

ROMs
RAMs

Disk Drive Controller

Input/Output Interface

Input/Output Interface

Disk Drive

Printer

Modem

Address Bus
Data Bus
Data Transfer

Power Supply
TYPICAL FLOWCHART SYMBOLS

Input/Output

Processing

Decision Logic

Subroutine

Connector point

Connector arrows

Terminal point

SAMPLE FLOWCHART

POWER ON
WITH DISK

BOOT OK
YES

ERROR
MESSAGE

ERROR
MESSAGE

DO
CHECKLIST
A

NO

NO

DO
CHECKLIST
B

YES

YES

NO

NO

NO

YES

YES

NO

YES

NO
DUTY  Servicing Computer Equipment

TASK  Interpret troubleshooting charts.

ENABLER  Use troubleshooting flowcharts to fault isolate problems in a computer.

STUDENT'S NAME  ___________________  DATE  __________

EVALUATOR'S NAME  ___________________  COURSE  __________

TIME : STARTED  _______  COMPLETED  ______________

TOTAL  __________

DIRECTIONS TO THE EVALUATOR:

1. The student may use idealized voltages and waveforms from technical manuals at flowchart decision block "yes" / "no" nodes.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained explanation of problem.  ______  ______

- Verified the problem.  ______  ______

- Located the suspect section on the flowchart based on symptom.  ______  ______

- Exercised Cold-Start diagnostics.  ______  ______

- Selected correct disk diagnostics for symptom and flowchart.  ______  ______

- Narrowed down probable sections to one faulty section.  ______  ______

- Located faulty component.  ______  ______

- Used a systematic procedure.  ______  ______
TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment

TASK  Interpret trouble shooting charts.

ENABLER  Use trouble shooting flowcharts to fault isolate problems in a computer.

Test Environment/Station Set Up:

- Workbench with AC power
- Grounding (static) strap
- Conducting (static) foam mat
- Oscilloscope with 10:1 test probe
- Frequency counter
- Logic probe
- Multimeter
- Malfunctioning but complete computer system.

Supplies, Equipment and References needed before test:

- Technical manual
- Section isolation troubleshooting flowchart
- Common tool kit
- Chip puller/inserter
- Three wire solder pencil and solder
- Anti static strap and foam
- Test equipment
- Procedure sheet

Time allowed to perform test:

- 120% flat rate.
- Test equipment power up 30 minutes before start test.

Special Instructions for Administering the test:

- Remind student of special handling notes and cautions.
- Critique of method and sequence of eliminating alternative faulty sections.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #68

TASK: Interpret chip swapping charts.

STANDARD OF PERFORMANCE OF TASK:

Possible locations and types of defective chips must be based on problem symptoms using chip swapping chart.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Chip swapping charts
Troubleshooting charts
Customer problem

ENABLING OBJECTIVE:

1. Using block diagram level "modes" of specific computers, i.e. basic mode, disk mode, and machine (monitor) mode, relate the modes to problems, and symptoms using a chip swapping chart.

NOTE: Chip swapping charts are normally proprietary and confidential. Use normally restricted to and authorized in franchised service centers only. Your students can develop their own chip swapping charts from these references.

RESOURCES:

1. DOS Manual.
3. Technical service manual
5. Service Data, Computer Facts (in most cases chip swapping data for RAM's, Chip select IC's and ROM, and good signal tracing waveforms). Howard W. Sams & Co. Inc., Indianapolis, IN.
RESOURCES: (cont.)

6. Chip swapping chart (if available).

TEACHING ACTIVITIES:

1. Break class into teams and develop chip swapping charts from Technical Reference handbooks and component removal. *(1, 2, 3, 4, & 5)
2. Demonstrate Tri-State devices with floating and actual output.
3. Assign student an individual assignments to validate sections of their chip swapping chart.
4. Instruct students to validate master chip swapping chart.
5. Instruct student to troubleshoot and repair a computer using a chip swapping chart. *(6 & 7)

CRITERION-REFERENCED MEASURE:

Given a faulty computer, customer problem, and chip swapping charts, the student will troubleshoot the computer by interpreting the problem, determining all symptoms, determining probable cause, and locating symptom on chip swapping chart.

PERFORMANCE GUIDE:

1. Obtain explanation of customer problem.
2. Determine probable cause of problem.
3. Determine symptoms of problems.
4. Locate symptom on chip swapping chart.
5. Identify possible locations and types of defective chips on chip swapping chart.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Interpret chip swapping charts.

ENABLER  Troubleshoot and repair a computer using a chip swapping chart.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME _________________________ COURSE ______

TIME:  STARTED _______ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Possible location and types of defective chips must be based on problem symptoms using a chip swapping chart.

Use below checklist to evaluate the use of a chip swapping chart.

PERFORMANCE DETERMINANTS    YES   NO

The preparer
- Noted complaint (problem).  ____  ____
- Validated the problem.  ____  ____
- Determined symptoms in all modes.  ____  ____
- Located symptom on chip swapping charts.  ____  ____
- Used systematic method of rejecting alternative suspect sections.  ____  ____
- Located faulty chip.  ____  ____
- Exchanged faulty chip for known good chip.  ____  ____
- Reassembled computer.  ____  ____
- Tested computer in all modes.  ____  ____
TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment

TASK  Interpret chip swapping charts.

ENABLER  Troubleshoot and repair a computer using a chip swapping chart

Test Environment/Station Set Up:

- Workbench with AC power
- Standard test equipment
- Static strap and foam
- Chip swapping charts
- Faulty computer

Supplies, Equipment and supplies needed before test:

- Standard tool kit
- Isolation transfer
- Three wire solderable wire with solder
- IC puller/insertion
- Antistatic conducting foam pad and grounding strap
- Chip swapping chart
- Checklist
- Faulty computer

Time allowed to perform test:

- 300% flat rate.
- Time will be stopped to discuss any safety and handling violations.

Special Instructions for Administering the test:

- Check serviceability of grounding strap.
- Discuss manufacturers notes and cautions.
- Possible types and locations of defective chips must be based on problem symptoms using a chip swapping chart.
GUIDE SHEET

DUTY: SERVICING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE #69

TASK: Interpret schematics.

STANDARD OF PERFORMANCE OF TASK:

Order of operation of circuits, the interrelation of parts, flow of power and logic of construction for a piece of equipment will be used in order to help troubleshoot and correct a problem.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Schematics of equipment
Understanding of schematic symbols

ENABLING OBJECTIVES:

1. Identify standard analog and digital electronic symbols.
2. Manipulate time base/synchronizing and voltage controls on a dual-trace oscilloscope.
3. Use a Frequency Counter, Digital VOM and Logic Probe to trace wave forms and voltages as interpreted on schematic.

RESOURCES:

7. Manufacturer's operator's manual.
RESOURCES: (cont.)

10. Hitachi Full Line Condensed Catalog. Semiconductor 
    and IC Sales and Service Division, 1800 Bering 
    Drive, San Jose, CA.
11. Motorola Semiconductor, Phoenix, AZ.

TEACHING ACTIVITIES:

1. Present lecture on frequency to voltage converters. 
   (*10,11,12 & 13)
2. Demonstrate usage of frequency to voltage converters.
3. Present lecture on floppy disk read amplifier IC. 
   (*10,11,12 & 13)
4. Demonstrate floppy disk read amplifier IC.
5. Present lecture on sequential and combination logic circuits. 
   (*10,11,12 & 13)
6. Demonstrate the functions of sequential and combination logic circuits.
7. Present lecture on interpreting test point waveforms, ideal frequencies, and ideal voltages 
   as indicated by a schematic. (*1,2,3,4,5,6,7,8 & 9)
8. Demonstrate how to interpret test point waveforms, ideal frequencies, and ideal voltages 
   using a schematic.
9. Instruct student to practice interpreting test point waveforms, ideal frequencies, and ideal voltages 
   using a practice schematic.
10. Present lecture on fault isolation procedures using a schematic. (*1,2,4,5,7,8,12 & 13)
11. Demonstrate how to fault isolate a faulty circuit 
    and component using a schematic.
12. Instruct student to fault isolate a piece of 
    faulty computer equipment provided using a schematic. 
    (*15)

CRITERION-REFERENCED MEASURE:

Student will use schematics and standard test equipment 
    to fault isolate and repair a piece of faulty computer/ 
    terminal equipment, following a logical based on 
    symptom(s) and schematic flow. Student will 
    systematically test interrelated circuits.

PERFORMANCE GUIDE:

1. Obtain equipment to be serviced and an explanation of customer's complaint.
PERFORMANCE GUIDE: (cont.)

2. Use schematic to locate parts or circuits that are interrelated and could affect each other's operation.

3. Monitor circuit using schematic and test equipment.

4. Isolate to faulty component.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Interpret schematics.

ENABLER  Use a Frequency Counter, Digital VOM, and Logic Probe to trace waveforms and voltages as indicated on schematic.

STUDENT'S NAME __________________________ DATE ____________

EVALUATOR'S NAME _______________________ COURSE ________

TIME:  STARTED ______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when interpreting schematics.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Noted and validated the problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Listed all symptoms contributing to the problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Selected proper technical/reference manuals or Computer Facts for the assigned computer/terminal equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calibrated test equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Used schematic to list alternate sections (circuits) that could cause or contribute to the problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Monitored circuit for ideal waveforms.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Tested circuit for ideal voltage and frequency.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Located faulty component.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced faulty component.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered up equipment and performed cold start check and/or diagnostics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Performed system check.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY  Servicing Computer Equipment

TASK  Interpret schematics.

ENABLER  Use a Frequency Counter, Digital VOM, and Logic Probe to trace waveforms and voltages as indicated on schematic.

Test Environment/Station Set Up:
- Workbench with power or 4 wheel service cart.
- Faulty computer/terminal system.
- Common tool kit.
- Oscilloscope with 10/1 probe.
- Frequency counter.
- Logic probe.
- Digital voltmeter.
- Special tools available.

Supplies, Equipment and References needed before test:
- Jumper cables (e.g. encoder/keyboard - to - motherboard, power supply to motherboard).
- Special tools (e.g. solder vac, IC puller, IC inserter, shorting strap, and conducting foam).
- Operator's manual, technical/reference/service manual and/or Computer Facts servicing data.

Special Instructions for Administering the test:
- Start with item 9 of the teaching activities.
- Use the checklist to evaluate the student.
- Student understands that problem must be 100% resolved to pass this competency.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #70

TASK: Interpret manufacturing upgrade.

STANDARD OF PERFORMANCE OF TASK:

Upgrade information must determine status of upgrade, including manufacturing change, problem in field, and safety changes.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Service manual
Manufacturing upgrade information

ENABLING OBJECTIVES:

1. Define "problem resolved" on aftermarket upgrade.
2. Answer "problem(s) not resolved" and customer upgrade questions on effect on equipment operation, application, packages, files and related peripherals.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on upgrade procedures. (*1, 2, 3, 5 & 6)
TEACHING ACTIVITIES: (cont.)

2. Discuss examples of upgrade procedure to include:
   A. Problem(s) resolved.
   B. Problems not resolved (under engineering study).
   C. Parts accountability.
   D. Labor.
   E. Reports.
   F. Changes to dash-number, serial number, or model number. (*3, 4, 5 & 6)

3. Discuss related customer services, i.e. compatibility of existing archive files, working files, new commands/procedures and operation of equipment after upgrade. (*1, 2, 3, 4 & 5)

4. Demonstrate posting of service/technical manual. (*1, 2, 3, 4, 5 & 6)

5. Discuss resolving problem in field type upgrade using service/reference/technical manual, upgrade information and warranty/service responsibility. (*1, 2, 3, 4, 5 & 6)


7. Demonstrate checking of indicated (purposed) changes to equipment operation as a result of the upgrade. (*1, 4 & 10)

8. Demonstrate procedure required to update applications packages and archive files. (*1, 4 & 10)

9. Assign student a field-upgrade job order.

10. Brief students of upgrade requirements using upgrade information and student checklist. (*2 and student checklist.)

11. Instruct student to complete assigned upgrade.

CRITERION-REFERENCED MEASURE:

The student will install an upgrade to include substituting/adding parts, posting manuals, checking out upgrade and educating customer to effect of upgrade.

PERFORMANCE GUIDE:

1. Obtain equipment to upgrade.
2. Read service manual section dealing with upgrade information sent by manufacturer.
3. Determine changes in equipment and the effects the changes will have on the operation of the equipment.
4. Refer to upgrade information when trouble shooting parts interrelated to the upgraded part itself.
CHECKLIST

DUTY Servicing Computer Equipment

TASK Interpret manufacturing upgrade

ENABLER Determine status of upgrade.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ______________________ COURSE ________

TIME: STARTED ________ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate interpreting manufacturing upgrade. Time allowed is as stated in upgrade order + 50%.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Read applicable section of service/technical manual. ________ ________

- Read upgrade information. ________ ________

- Listed changes to equipment in sequential order. ________ ________

- Posted required changes to service manual. ________ ________

- Wrote required paperwork. ________ ________

- Followed upgrade installation procedures. ________ ________

- Installed upgrade resolve problems to extent specified in upgrade order. ________ ________

- Explained operational effect on equipment. ________ ________

- Explained correct tie in of upgrade technical documentation and previous technical documentation in troubleshooting upgraded section. ________ ________

- Performed cold start/diagnostic tests. ________ ________

- Upgrade accomplished without causing malfunction in related or adjacent circuits. ________ ________
TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment.

TASK  Interpret manufacturing upgrade.

ENABLER  Determine status of upgrade.

Test Environment/Station Set Up:

- Workbench with AC power.
- Common tool kit.
- Instructors written procedure sheet or students procedure sheet ok'd by instructor.
- Computer/terminal.

Supplies, Equipment and References needed before test:

- Upgrade order/authorization.
- Operators manual.
- Service/Technical/Reference manuals.
- Test equipment (testing of upgrade parts).

Time allowed to perform test:

- 150% of upgrade reimbursement/credit/installation time.
- Time spent physically inventorying parts is not part of test.
- Time spent checking serviceability of upgrade parts is not part of test.

Special Instructions for Administering the test:

- Problem resolved type upgrade (not upward compatibility) has the advantage of before installation and after installation comparisons.
- Use the checklist for student evaluation.
- Student explains the complete procedure using his /your procedure sheet prior to installing upgrade.
GUIDE SHEET

DUTY: Service Computer Equipment

PERFORMANCE OBJECTIVE #71

TASK: Remove and install cover.

STANDARD OF PERFORMANCE OF TASK:

Allow access to internal components of unit.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Troubleshooting And Repairing Personel Computers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment unit
Service manual
Tool kit

ENABLING OBJECTIVES:

1. Identify types of plugs, sockets, connectors and jacks used on computer equipment.
2. Identify the difference in socket and connector in spacing and keyway coding.
3. Follow equipment/system cable/harness running sheets.
4. Identify fasteners in button-up procedures.
5. Obtain access to internal components of computer equipment.

*RESOURCES:

5. Manufacturer's operator's manual.
RESOURCES: (cont.)


TEACHING ACTIVITIES:

1. Present lecture on cover removal and installation procedure. (*1,2,3,4,5,6 & 7)
2. Discuss and show Students edge card socket type connectors, edgecard PCB pin connectors, headers and subminiature connectors. *Physical components and current catalogs i.e. Jameco, Jade, DigiKey, VanSickle, Newark and Mouse.
3. Discuss and show students CPC-family circular connectors, din connectors, PC terminal strips, and Mate-N-Lock panel type connectors. *Physical components and catalogs i.e. Jameco, Jade, DigiKey.
4. Demonstrate use of wiring ducts, speed fasteners, SpirobondR, P-clips (burndy), and cradle clips.
5. Demonstrate removal and installation of strain relief bushings, fast-on terminals and general cable ties. (strain relief pliers, terminal pliers and tie tightening tool.)
6. Demonstrate removal of terminal cover on largest available system. (*1,2,3,4,5,6 & 7)
7. Instruct student to diagram the position of cables, connectors and their orientation. (*9)
8. Instruct student to identify EMI/RFI shields.
9. Demonstrate "button-up" procedure.
10. Demonstrate cold start (initial) tests sequence.
11. Discuss external connections for AC power, standard peripherals, modem eliminators and emulators.
12. Instruct students to remove and install the cover of a piece of computer equipment. (*9)

CRITERION-REFERENCED MEASURE:

Student will remove a terminal cover to allow access to internal components. Cables/harness must be reconnected, tied and laced in tunnels. Terminal was buttoned-up, reconnected to system and tested.

PERFORMANCE GUIDE:

1. Turn power off.
2. Disconnect power cable and other external peripheral cables.
3. Locate cover retaining screws/nuts holding cover to housing.
4. Remove retaining screws/nuts holding cover to housing.
5. Remove cover partially and disconnect wires or cables connected to both cover and housing.
6. Mark or diagram position wires or cables.
7. Reconnect wires and cables to the cover and housing.
8. Place cover back on the housing and replace retaining screws.
9. Reconnect power cable and external peripheral cables.
REMOVING CASE/COVER RETAINING SCREWS

Carefully remove all retaining screws.
REMOVING CASE/COVER
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Remove and install cover.

ENABLER  Obtain access to internal components of unit.

STUDENT'S NAME _____________________  DATE ________

EVALUATOR'S NAME ____________________  COURSE ________

TIME:  STARTED ________  COMPLETED ________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when removing and installing cover.

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Followed power down procedure.  _____  _____
- Read service/technical reference manuals and list cautions.  _____  _____
- Observe manufacturer's cautions.  _____  _____
- Drew a wiring diagram.  _____  _____
- Adequately and correctly drew wiring diagram.  _____  _____
- Made wiring diagram understandable for instructor.  _____  _____
- Followed cover removal procedure.  _____  _____
- Properly replaced, connected, routed and laced cables/harnesses.  _____  _____
- Properly replaced EMI/RFI shields.  _____  _____
- Followed button-up procedure.  _____  _____
- Properly connected peripherals.  _____  _____
- Readied system to pass cold start/diagnostics tests.  _____  _____

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TEST ADMINISTRATORS INFORMATION

DUTY Servicing Computer Equipment

TASK Remove and install cover.

ENABLER Obtain access to the internal components of the unit.

Test Environment/Station Set Up:
- Station set up varies with size and configuration of equipment.
- Workbench with AC power for desktop computer/terminal equipment.
- Four wheel two shelf cart for rack mounted and floor console equipment.
- Common tool kit.
- Cable service kit.

Supplies, Equipment and References needed before test:
- Paper and pencil
- Cable ties
- Strain relief pliers
- Felt tip color markers or wire tab identifiers
- Crimping tool set

Time allowed to perform test:
- Establish chart of acceptable time based on your equipment and your time + 50%.
- Enter time on checklist under "Directions to evaluator".

Special Instructions for Administering the test:
- Question student on release of lock mechanisms on non-friction lock connectors prior to starting test.
- Use the checklist to evaluate student
- Personally check placement and fastenings of all EMI/RFI shields.
- Personally check all added aftermarket grounding wires and external to peripheral cable grounding wires.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #72

TASK: Install keyboard.

STANDARD OF PERFORMANCE OF TASK:
Keyboard must be functional and must pass diagnostic test without error.

SOURCE OF STANDARD:
Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:
Central processing unit or
Keyboard housing if separate
Adjustable wrench
Screwdriver
Nutdrivers
Service manual

ENABLING OBJECTIVES:
1. Identification of keyboard-to-motherboard (logic) board connector and correct pin orientation.
2. Determine keyboard connector signal description and "pin-out".
3. Understand "piggy-back" encoder mounting techniques

RESOURCES:
4. MOS/LSI Databook, National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA 95051.
5. TTL Databook, National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA 95051.
RESOURCES: (cont.)

6. Motorola Microprocessors Data Manual, Motorola Inc., MOS Integrated Circuits Group, Microprocessor Division, Austin, TX

7. Component Data Catalog, Literature Department, Intel Corporation, 3085 Bowers Avenue, Santa Clara, CA 95051


11. Checklist - installing a keyboard.

TEACHING ACTIVITIES:

1. Present lecture on different types of keyboards and keyboard connections. (*1, 2, 3, 4, 5, 6, 8 & 9)

2. Discuss examples of polled keyboards. (*1, 4, 5 & 6)

3. Discuss ASC II keyboards and code assignment chart. (*4)

4. Discuss modified ASC II keyboard. (*1, 6)

5. Discuss MM5744/5745/5746. (*4)

6. Discuss KY 2002 Standard ASC II/Reverse ASC II.

7. Discuss quadrature key matrix to include shift, control, unshift and shift/control. (*1, 8 & 9)

8. Discuss MCS 8279. (*7)

9. Review NE 555/556.*

10. Present lecture on soldering and desoldering techniques. (*2, 7 & 10)

11. Demonstrate desoldering/soldering of solder/ribbon cable interconnection cables. (*1, 8 & 9)

12. Instruct student to practice soldering and desoldering techniques.

13. Demonstrate removal of standard plug type keyboard connector. (*1)

14. Present lecture on keyboard removal and replacement procedures. (*1, 2, 3, 8 & 9)

15. Demonstrate keyboard removal and replacement procedures.

16. Instruct student to write chart of selected keyboard outputs, e.g. control, reset, l.h. shift/r.h. shift, repeat, debounce mask data (and memory addresses if applicable).

17. Instruct student to remove and replace a computer system's keyboard. (*11)

CRITERION-REFERENCED MEASURE:

Student will replace a computer/terminal keyboard.
Student followed proper procedure removing old keyboard and installing replacement key board. Coldstart or diagnostics test OK.
PERFORMANCE GUIDE:

1. Disconnect power source and keyboard connector.
2. Remove cover.
3. Remove retaining screws/nuts holding keyboard to housing.
4. Lift keyboard free.
5. Place new keyboard in place.
6. Replace retaining screws/nuts.
7. Replace cover.
8. Reconnect power source and keyboard connector.
9. Run diagnostic test to check.
TYPICAL KEYBOARD ARRANGEMENT

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CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install keyboard.

ENABLER  Remove and replace keyboard.

STUDENT'S NAME  DATE

EVALUATOR'S NAME  COURSE

TIME:  STARTED  COMPLETED

TOTAL

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when installing keyboard.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Powered down system.  ____  ____

- Followed the correct procedure for removing cover/case.  ____  ____

- Removed keyboard connector.  ____  ____

- Followed correct procedure disconnecting audio, encoder, piggyback connectors or flying leads. (Strike out steps not applicable)  ____  ____

- Identified and removed keyboard mounting hardware.  ____  ____

- Installed old aluminum foil on replacement keyboards which use aluminum foil shielding.  ____  ____

- Reconnected flying leads.  ____  ____

- Corrected button-up.  ____  ____

- Readied system to pass cold start or diagnostics.  ____  ____

- Operated printer.  ____  ____

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TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment

TASK  Install keyboard.

ENABLER  Remove and replace keyboard.

Test Environment/Station Set Up:

- Workbench with AC power
- Common tool kit
- Service manual
- Vacuum cleaner/MiniVac
- Replacement keyboard

Supplies, Equipment and References needed before test:

- Double sided tape
- Aluminum foil (heavy duty)
- Replacement keyboard
- Common tool kit
- Cleaning material to include medium bristle brush.
- Computer/terminal with keyboard

Time allowed to perform test:

- 20 minutes
- Student reads Service/Reference/Technical Manual prior to starting test.

Special Instructions for administering the test:

- Discuss location of keyway or pin location on keyboard and motherboard with student prior to starting test.
- Discuss aftermarket keyboard to printer card jumper(s) if present.
- On equipment using solder on ribbon interconnection cables, traces will delaminate after a few tests. Making keyboard, motherboard/logic board useless.
- Use the checklist to evaluate student.
- If foil is used between keyboard & motherboard, stop test and check for shorts then restart test.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #73

TASK: Install motherboard.

STANDARD OF PERFORMANCE OF TASK:

Motherboard must be functional and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Integrated circuit puller
Adjustable wrench
Screwdriver
Needle nose pliers
Service manual
Nutdrivers

ENABLING OBJECTIVES:

1. Identification and location of keyboard connector, audio connectors, speaker connector, video connector, dedicated peripheral slots and general purpose connectors/slots.

RESOURCES:


TEACHING ACTIVITIES:

1. Present lecture on motherboards and connectors.
TEACHING ACTIVITIES: (cont.)

2. Discuss cartridge type slots.
3. Discuss DIN type connectors.
4. Discuss on board speaker connectors. (*1,2)
5. Discuss user I/O slots/connectors. (*1,2,3,4,5)
6. Discuss slot-cards connected to motherboard. (*2)
7. Discuss dedicated/default slot connectors. (*1,2,3,4)
8. Present lecture on installing and removing motherboard.
9. Demonstrate stand alone PCB /clip system. (*2,4,6)
10. Demonstrate installation/removal of motherboard using nylon spacer and screw/bolt hardware fasteners. (*2,4,6)
11. Demonstrate removal/installation of motherboard on computer system using through the base snap-in supports/spacers; stacking spacers and screw/nut and bolt fasteners. (*2,4,6)
12. Test student on identification, location, and purpose of slots, connectors, plugs, and flying leads.
13. Instruct students to remove and install a motherboard.

CRITERION-REFERENCED MEASURE:

Student will remove and replace a motherboard and conduct a system performance test. Motherboard must pass system performance check without error.

PERFORMANCE GUIDE:

1. Power off: disconnect power source and keyboard connector.
2. Remove cover.
   CAUTION: Static electricity can cause damage to integrated circuit chips. Be sure to discharge static from body and avoid high static areas.
3. Disconnect motherboard power supply plug.
4. Disconnect speaker connector.
5. Remove motherboard retaining screws/nuts.
6. Unhook motherboard from any support flanges.
7. Lift motherboard up and out.
8. Place new motherboard back on support flanges.
9. Replace motherboard retaining screws/nuts.
11. Plug in motherboard power supply.
12. Run diagnostic test.
13. Replace cover.
TYPICAL MOTHERBOARD ARRANGEMENT

- Interface Plug
- Transformer
- Fuse
- Switches

Integrated Resistor
Diode
Capacitor
Transistor

Circuit Chip

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**CHECKLIST**

**DUTY**  
Servicing Computer Equipment

**TASK**  
Install motherboard.

**ENABLER**  
Locate and identify computer/terminal connectors/slots.

---

**STUDENT'S NAME**  
[Blank]

**DATE**  
[Blank]

**EVALUATOR'S NAME**  
[Blank]

**COURSE**  
[Blank]

**TIME**  
STARTED _____  COMPLETED _____

**TOTAL _____

---

**DIRECTIONS TO THE EVALUATOR:**

Use checklist to evaluate student installing motherboard.

**PERFORMANCE DETERMINANTS**

<table>
<thead>
<tr>
<th>The preparer</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Followed power down procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed manual procedures for access to motherboard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrote a list identifying all motherboard connectors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed anti-static practices.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnected power supply primary harness from motherboard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed peripheral cards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed peripheral connectors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnect on-board connectors, e.g. power-on indicator lamp, printer fixes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly removed and stored motherboard fasteners - Different length screws and spacers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced motherboard according to manual procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly connected on-board connectors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connected flying leads.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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PERFORMANCE DETERMINANTS: (cont.)

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Made correct special card connections, i.e. Language card-to-motherboard RAM or RAM expansion-to-motherboard.</td>
<td></td>
</tr>
<tr>
<td>Corrected peripheral connectors.</td>
<td></td>
</tr>
<tr>
<td>Connected power supply.</td>
<td></td>
</tr>
<tr>
<td>Readied system to pass cold start/diagnostics test.</td>
<td></td>
</tr>
<tr>
<td>Replaced the cover.</td>
<td></td>
</tr>
</tbody>
</table>
DUTY  Servicing Computer Equipment

TASK  Install motherboard.

ENABLER  Locate and identify computer/terminal connectors/slots.

Test Environment/Station Set Up:
- Workbench with power
- Computer/terminal with peripherals
- Replacement motherboard
- Anti-static set
- Common tool kit
- Nutdrivers

Supplies, Equipment and References needed before test:
- Antistatic grounding strap
- Conductive foam
- IC inserter & IC extractor
- Service/Technical/Reference Manuals
- Pencil and paper
- Felt tip markers

Time allowed to perform test:
- 20 minutes for removal & installation

Special Instructions for Administering the test:
- If necessary to remove static ICs from replacement motherboard to connect user I/F cards, test student on procedure prior to starting evaluation on checklist.
- Use the checklist to evaluate the student.
- Critique student using checklist
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #74

TASK: Install power supply.

STANDARD OF PERFORMANCE OF TASK:

Machine must power up.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Troubleshooting and Repairing Personal Computers.

CONDITIONS FOR PERFORMANCE OF TASK:

Unit being serviced
Screwdrivers
Nutdrivers
Pliers
Dies
Socket set
Service manual

ENGAGING OBJECTIVES:

1. Identify different types of power supply units used in computer equipment.
2. Remove access cover and identify power supply retaining connectors.
3. Determine the location of power supply mounting, slides and fasteners.
4. Understand the purpose/function of a power supply.
5. Remove and replace a power supply.

RESOURCES:

RESOURCES: (cont.)

8. Linear Databook National Semiconductor. National Semiconductor Corporation, 2900 Semiconductor Drive, Santa Clara, CA 95051
10. Visual Aid-Block diagram of power supply.
11. Checklist-Installing power supply.

TEACHING ACTIVITIES:

1. Present lecture on computer input voltages. (*1, 2, 3, 4, 5, 6, 7, 8, & 9)
2. Discuss manufacturer's voltage cautions.
3. Discuss power plugs and pin-outs.
4. Discuss voltage select cards.
5. Show students the location of power plugs and pin-outs.
6. Present lecture on types of computer equipment power supplies and their functions. (*1, 2, 3, 4, 5 & 6)
7. Conduct class discussion on voltage conversion.
8. Demonstrate voltage conversion by drawing a block diagram of a power supply for a given piece of computer equipment. (*10)
9. Assign student a piece of computer equipment and instruct them to determine its voltage requirements and draw a block diagram of its power supply.
10. Present lecture on power supply removal procedures. (*1, 2, 3, 4, 5 & 6)
11. Demonstrate power supply removal procedure.
12. Instruct student to install a power supply unit. (*11).

CRITERION-REFERENCED MEASURE:

Student will remove and replace a power supply according to manufacturer's specifications. The machine will power-up when the power switch is turned on.

PERFORMANCE GUIDE:

1. Turn off power
2. Disconnect power cable and other external peripheral cables.
3. Remove cover.
4. Loosen retaining screws/nuts which secure power supply to housing.
   CAUTION: Do not try to remove screws.
5. Lift up edge of power supply and slide it forward until rear mounting screws clear.
6. Lift power supply out.
7. Disconnect power supply connector.
8. Clip wire tie holding cable (if there is one).
9. Place new wire tie on cable (if needed).
10. Plug in power supply cable connector.
11. Place power supply back on mountings, sliding the rear in first.
12. Tighten all screw/nuts.
   CAUTION: Do not force screws or strippage may occur.
13. Check for correct voltage.
14. Replace cover and power up.
BLOCK DIAGRAM:
TYPICAL COMPUTER POWER SUPPLY

1 Amp Fuse

Power Transformer

120 Volt ac

Rectifier and Input Filter

723 Voltage Regulator

+5 Volts at 1.35 Amps

7905
- Voltage Regulator

-5 Volts at 100 Microamps

7812
+ Voltage Regulator

+12 Volts at 400 Milliamps

7912
- Voltage Regulator

-12 Volts at 100 Milliamps
CHECKLIST

DUTY Servicing Computer Equipment

TASK Install power supply.

ENABLER Remove and replace power supply.

STUDENT'S NAME ___________________ DATE _________

EVALUATOR'S NAME ___________________ COURSE _________

TIME: STARTED _______ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while removing and replacing power supply.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed power down procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disconnected power supply cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disconnected distribution and peripheral cables.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed manual procedure for removing cover(s).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed manufacturers procedural steps for removing/loosening and mounting hardware.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed manufacturers installation procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Measured voltages where required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Properly connected cables/harnesses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Routed cables as on original equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Used new wire ties as on original equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Made sure mounting hardware/fasteners met specifications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Made sure ideal test point/plug voltages were correct.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**PERFORMANCE DETERMINANTS: (cont.)**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Powered up system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Readied system to pass diagnostics tests.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Made sure button-up procedure was correct.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY Servicing Computer Equipment

TASK Install power supply.

ENABLER Remove and replace power supply.

Test Environment/Station Set Up:
- Workbench with AC power for desktop computer/terminal equipment.
- Four wheel cart with shelves for floor unit.
- Functional replacement power supply.
- Computer/terminal equipment.
- Technical manuals.
- Digital volt/ohm meter.
- Vacuum cleaner/mini vac.

Supplies, Equipment and References needed before test:
- Cable ties
- Common tool kit
- Diagnostic disk (if DUT does not have cold start test)
- Technical/reference/service manual

Time allowed to perform test:
- 20 minutes for actual removal and installation.

Special Instructions for Administering the Test:
- Use the checklist to evaluate the student.
- If on board regulators are used, discuss check/adjustment procedure with student.
- Critique checklist with student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #75

TASK: Install analog board.

STANDARD OF PERFORMANCE OF TASK:

Analog board must be functional and must pass a diagnostic test without error

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Unit being serviced
Screwdrivers
Nutdrivers
Needle nose pliers
Service manual

ENABLING OBJECTIVES:

1. Identify analog board, motor control plug, (controller) card connector plug, and read/write connector plug.
2. Demonstrate competency in use of oscilloscope in monitoring ramped and stepped wave forms.
3. Remove and replace an analog board.

RESOURCES:

5. Motorola Linear and Interface Circuits. Motorola Semiconductor, Box 20912, Phoenix, AZ.
7. Checklist - Installing an analog board.

TEACHING ACTIVITIES:

1. Present lecture on the major components and connectors on an analog board. (*1, 2, 3, 4, 5 & 6)
TEACHING ACTIVITIES: (cont.)

2. Conduct class discussion on the function/purpose of the analog board.
3. Show the student an analog board, its location and its major components.
4. Present a lecture on the removal and installation of an analog board. (*1, 2, & 3)
5. Demonstrate removal and installation procedures for an analog board.
6. Demonstrate the use of a diagnostic disk and idealized analog board test waveforms.
7. Conduct class discussion on methods of retaining analog boards.
8. Instruct student to remove and install an analog board. (*7)

CRITERION-REFERENCED MEASURE:

The student will locate, disconnect, remove and install an analog board in a piece of computer equipment. Analog board must be functional and pass a diagnostic test free of error.

PERFORMANCE GUIDE:

1. Turn off power and remove external cables.
2. Remove cover.
3. Remove disk drive assembly shield.
4. Disconnect disk ribbon cable.
5. Disconnect read/write head cable.
6. Remove mounting screws holding analog board to housing.
7. Remove analog board from retaining hooks.
8. Disconnect motor plug.
9. Connect motor plug making sure pins align with holes.
10. Place analog board on retaining hooks.
11. Replace mounting screws.
12. Replace read/write head cable.
13. Replace disk assembly shield.
14. Replace cover.
15. Run diagnostic test to check for errors.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  install analog board.

ENABLER  Remove and replace analog board.

STUDENT'S NAME ___________________________ DATE ______

EVALUATOR'S NAME ________________________ COURSE ______

TIME:  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while removing and replacing analog board.

Note 1  At least two third party vendors fasten the analog board with cable ties--no screws are used.

Note 2  Third party vendors may use cable ties on the 20 conductor ribbon cable, and male connector at the analog board jack.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Powered down and removed external cables.  ______  ______

- Removed computer/terminal cover (if self contained).  ______  ______

- Removed shield from disk drive assembly.  ______  ______

- Removed disk ribbon cable (if self contained).  ______  ______

- Remove mounting screws holding analog board to housing(OEM) or used small diagonal pliers to cut cable tie fastener.  ______  ______

- Removed analog board from hooks.  ______  ______

- Disconnect motor control board plug.  ______  ______

- Connect plug from motor control board prior to seating analog board on hooks.  ______  ______
**PERFORMANCE DETERMINANTS:**  (cont.)

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced analog board on base hooks.</td>
<td></td>
</tr>
<tr>
<td>Replaced mounting screws or cable ties.</td>
<td></td>
</tr>
<tr>
<td>Replaced read/write head cable socket.</td>
<td></td>
</tr>
<tr>
<td>Replaced shield.</td>
<td></td>
</tr>
<tr>
<td>Replaced cover.</td>
<td></td>
</tr>
<tr>
<td>Made sure diagnostics test were ok.</td>
<td></td>
</tr>
<tr>
<td>Was critiqued on this procedure.</td>
<td></td>
</tr>
</tbody>
</table>
TEST ADMINISTRATORS INFORMATION.

DUTY Servicing Computer Equipment

TASK Install analog board.

ENABLER Remove and replace analog board.

Test Environment/Station Set Up:
- Workbench with AC power.
- Common tool kit.
- Computer system with two disk drives.
- Spare analog card.
- Diagnostics diskette.
- Oscilloscope with 10:1 probe.

Supplies, Equipment and References needed before test:
- Cable ties
- Spare(exercise) disk
- Procedure sheet
- Technical/reference/service manual

Time allowed to perform test:
- 20 minutes

Special Instructions for Administering the Test:
- Read note on checksheet to student prior to starting test.
- Use the checklist to evaluate the student
- If the student must adjust R28 and/or R33 on analog board, stop test time; restart time when adjustment is correct.
- Critique student using checksheet.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #76

TASK: Install disk drive assembly.

STANDARD OF PERFORMANCE OF TASK:

Disk drive assembly must be functional and must pass diagnostic test free of error.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Pencil
Screwdrivers
Nutdrivers
Spring clip pliers
Disk drive unit
Needle nose pliers
Service manual

ENABLING OBJECTIVES:

1. Locate and identify components of front panel assembly.
2. Locate and identify disk drive base, analog/control board and motor drive board.

RESOURCES:

7. Worksheet - Disk drive component identification.
8. Visual Aid - Typical disk drive assembly.
TEACHING ACTIVITIES:

1. Present lecture on different types of disk drives. (*1, 2, 3 & 4)
2. Conduct a class discussion on external/stand alone disk drive units.
3. Conduct a class discussion on internal/on-board drive units.
4. Show student each type of disk drive unit.
5. Present lecture on disk drive assembly components. (*1, 2, 3, 4, 5 & 6)
6. Identify and discuss disk drive components' functions.
7. Instruct student to complete disk drive component identification worksheet. (*8)

CRITERION-REFERENCED MEASURE:

Student removes and installs a disk drive assembly.
The computer/terminal passes diagnostic test without I/O error.

PERFORMANCE GUIDE:

1. Turn off power, disconnect power cord, and external cables.
2. Remove cover.
3. Remove analog card.
4. Draw pencil line on chassis along front and side of disk assembly bezel.
5. Loosen retaining screws securing disk assembly.
6. Remove disk assembly by sliding forward until it clears retaining clips.
7. Lift disk assembly from chassis.
8. Replace disk assembly, sliding assembly under retaining clip.
9. Align front of assembly with pencil line on chassis.
10. Tighten retaining screws.
11. Replace analog card.
12. Run diagnostic test to check for errors.
13. Replace cover.
DISK DRIVE ASSEMBLY

Head load pad

Head

Head carriage

Head load arm

Head stepper motor

Index sector light source

Write-protect switch

Activity indicator

Index sector pickup

Clamping hub

Spindle

Disk in position

Drive motor

Head carriage rails

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CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install disk drive assembly.

ENABLER  Remove and replace disk drive.

STUDENT'S NAME ___________________ DATE ________

EVALUATOR'S NAME ___________________ COURSE ________

TIME : STARTED _______ COMPLETED __________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while installing a disk drive assembly.

Note: On some newer disk drive assemblies, drive unit to front bezel physical location is dictated by mounting hardware. However, location of hardware/pop-rivets on write protect microswitch or optocoupler is adjustable.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Followed power down procedure. ______  ______

- Disconnect external power cord and external power/control cable(s). ______  ______

- Followed service/reference/technical manual procedures for removing access and drive assembly base covers. ______  ______

- Identified location of EMI/RFI shields. ______  ______

- Made a drawing of analog card/control card socket-to-jack connections. ______  ______

- Disconnected motor drive card, if necessary. ______  ______

- Follow procedure for removing analog/control card. ______  ______

- Located front panel bezel on drive base with pencil. ______  ______

- Followed service/technical manual procedures for removing mounting hardware. ______  ______
PERFORMANCE DETERMINANTS: (cont.)

- Followed service/technical manual procedures for installing replacement drive assembly.  YES  NO
- Aligned front panel bezel and drive unit correctly on chassis using pencil marks?  YES  NO
- Replaced and seated all cards, plugs, and jacks correctly.  YES  NO
- Replaced EMI/RFI shields.  YES  NO
- Ran cold-start diagnostics tests.  YES  NO
- Critiqued the student using this form.  YES  NO
DUTY  Servicing Computer Equipment

TASK  Install disk drive assembly.

ENABLER  Remove and replace disk drive.

Test Environment/Station Set Up:
- Workbench with AC power.
- Common tool kit.
- Computer/terminal system with disk drive.
- Replacement disk drive assembly
- Diagnostics disk for units without cold-start error checking.

Supplies, Equipment and References needed before test:
- Service/technical/hardware manual
- Pop-rivet gun with 1/8" pop-rivets
- Electric drill motor, 1/4" with 1/8" and 3/16" metal bits
- Mini vac and medium bristle brush
- Student checklist

Time allowed to perform test:
- 20 minutes (If necessary to relocate write protect sensor, stop after sensor is positioned.)
Note: If necessary to relocate write-protect sensor, stop test time; restart test time after sensor is correctly positioned.

Special Instructions for Administering the Test:
- Checklist written to accomodate shugart, ALPS, LS laboratories, MPI, TEAC and Newtronics drive assemblies.
- Use the checklist to evaluate the student.
- Critique student on sequence and procedure using checklist.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #77

TASK: Install main logic assembly.

STANDARD OF PERFORMANCE OF TASK:

Logic assembly must be functional and must pass diagnostic test.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Screwdrivers
Nutdrivers
Circuit board puller
Service manual
Socket set

ENABLING OBJECTIVES:

1. Identify and physically locate dedicated peripheral card slot locations.
2. List configurations switch positions on peripheral cards e.g., logical numbers of tape processors, disk drives terminal interface, applications processors, language and evaluator cards.
3. Understand static handling procedures.

RESOURCES:

3. Mostek 80 Microcomputer Systems. Mostek, 125 West Crosby Road, Carrollton TX, 75006.
7. Manufacturer's service manual.
TEACHING ACTIVITIES:

1. Present lecture on main logic assembly location and purpose.
2. Discuss physical appointments of computer systems. (*1, 2, 3, 4)
3. Discuss hostboard concept. (*1, 4)
4. Identify and locate dedicated peripheral slots. (*1)
5. Identify and locate main logic board for students.
6. Discuss hardware location and mounting of main logic board. (*1, 2, 4)
7. Identify and locate speaker leads, encoder board (if not pulled), keyboard cable, and any aftermarket leads.
8. Instruct students to remove main logic assembly. (*1, 2, 3, 4, 5, 6 & 7)
9. Instruct student to install main logic assembly. (*1, 2, 3, 4, 5, 6 & 7)
10. Discuss memory boards and memory maps. (*2, 5, 6 & 7)
11. Discuss memory boundaries, DIP-switches, and HEX rotary switches.
12. Discuss MSB and LSB boundary switches.
13. Demonstrate setting of 64K and 256K boundary switches.
14. Student set memory address switches on memory board.
15. Discuss peripheral cards, including switch settings and jumper options for tape storage, disk drives, printer options and video boards. (*2, 5, 6 & 7)
16. Assign student a procedure sheet for removing and installing main logic board.
17. Discuss manufacturers cautions.
18. Instruct student to mark manufacturers cautions on procedure sheets
19. Instruct student to remove and install main logic assembly.

CRITERION-REFERENCED MEASURE:

Student will remove and install a main logic board. All leads, connectors and peripheral cards must be properly located and seated.

PERFORMANCE GUIDE:

1. Turn off power and disconnect external cables.
2. Remove cover.
3. Remove peripheral cards from slots.
4. Loosen screws around edge of logic access panel.
5. Lift up logic board carefully.
6. Disconnect speaker cable, keyboard cable, and disk drive cable.
7. Mark where each plug goes.
8. Lift out logic assembly.
9. Lift up and remove the encoder board from its connector.
10. Lift memory board off the main logic board and disconnect.
11. Remove retaining screws/nuts from main logic board.
12. Ease plugs out of back and slide main logic board out peripheral connector opening.
13. Check insulating shield for position.
   Caution: Keep main logic board from shorting on access panel.
14. Replace main logic board.
15. Replace encoder board.
16. Replace memory board.
17. Plug in power supply.
18. Plug in disk cable, keyboard cable, and speaker cable.
19. Position logic assembly and tighten retaining screws/nuts on access panel.
20. Replace peripheral cables.
22. Replace cover.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install main logic assembly.

ENABLER  Location and purpose of all leads, connectors, switches and card slots.

STUDENT'S NAME ___________________  DATE ________

EVALUATOR'S NAME ___________________  COURSE ________

TIME :  STARTED ________  COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while installing main logic assembly.

NOTE: Student must demonstrate competency in static handling procedures. Student knows purpose of dedicated peripheral slots and purpose/orientation of all cables, harnesses and jumpers prior to start of test.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Followed power down procedure. __ ___

- Removed external cables. __ ___

- Followed procedure for removing equipment and chassis covers. __ ___

- Identified peripheral cards and make a drawing of peripheral card locations and switch/jumper settings. __ ___

- Loosen screws holding main logic board. __ ___

- Located and removed all cables connected to main logic board, i.e. keyboard, speaker, and interface. __ ___

- Made a accurate drawing of the cable locations and orientations. __ ___

- Prepared a non-static area to set main logic board, encoder board, and memory board. __ ___
<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removed main logic assembly following manufacturers procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed encoder board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed memory board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed mounting hardware from main logic assembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed procedure for removing main logic board from cabinet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Held insulating shield in place or correctly repositioned.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed correct procedure for replacing main logic assembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed and seated encoder board on main logic board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed and seated memory board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set memory boundaries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed all power plugs and harnesses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed keyboard and other cables.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked cable orientation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced logic assembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seated peripheral cards in slots.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced all peripheral cables.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passed diagnostic cold start test.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced equipment cover(s).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY Servicing Computer Equipment

TASK Install main logic assembly.

ENABLER Location and purpose of all leads, connectors, switches and card slots.

Test Environment/Station Set Up:
- Workbench with AC power.
- Working computer system with peripherals.
- Common tool kit.
- Circuit board puller.
- Procedure sheet or service manual.
- Socket set, 1/4 inch driver or hollow shaft nut-driver.

Supplies, Equipment and References needed before test:
- Conductive foam or mats.
- Antistatic strap.
- Brush, medium bristles.
- Memory board addresses (handout).
- Molecular model interconnect installation and user manual (16X and 32X systems).
- Diagnostic diskette (cold start).

Time allowed to perform test:
- 25 minutes

Special Instructions for Administering the Test:
- If system requires a two diskette diagnostics system and application and there is a time delay (i.e. 20 seconds) caution students and make sure application disk is at the test station.
- Use checklist to evaluate student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #78

TASK: Install integrated circuit chips.

STANDARD OF PERFORMANCE OF TASK:

Integrated circuit chips must be functional and must pass diagnostic test free of error.

SOURCE OF STANDARD:


CONDITIONS FOR PERFORMANCE OF TASK:

Heat sink
Solder sucker
Soldering tool
Integrated circuit chip
Integrated circuit puller
Integrated circuit inserter
Service manual
Solder
Solder wick
Dies
Needle nose pliers

ENABLING OBJECTIVES:

1. Pass written test on precautions and correct handling of static integrated circuit chips.
2. Pass a written/practical test using reference manuals to label pinouts of selected microprocessor, peripheral, interface, TTL, and CMOS integrated circuits.
3. Demonstrate proficiency soldering and desoldering on 1/10" centers.
4. Use lead forming dies, IC puller, and IC inserter.

RESOURCES:

1. Signetics Logic - TTL Data Manual. Signetics, P.O. Box 9052, 811 East Arques Avenue, Sunnyvale, CA.
RESOURCES: (cont.)

2. **Signetics Bipolar and MOS Memory.** Signetics, P.O. Box 9052, 811 East Arque Avenue, Sunnyvale, CA.
3. **Component Data Catalog.** Intel Corporation, 3005 Bowers Avenue, Santa Clara, CA.
4. **Motorola Linear & Interface IC's.** Motorola Semiconductor, Box 20912, Phoenix, AZ.
5. **Motorola Microprocessor Data Manual.** Motorola Semiconductor, Box 20912, Phoenix, AZ.
6. **Interface Databook.** National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA.
7. **MOS/LSI Databook.** National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA.
8. **CMOS Databook.** National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA.
9. **TTL Databook.** National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA.
10. **1982 Catalog NEC Electronics USA, Inc.** NEC Electronics, Inc., Microcomputer Division, One Natick Executive Park, Natick, MA.
11. **Hitachi Full Line Condensed Catalog.** Hitachi Semiconductor and IC Sales and Service Division, 1800 Bering Drive, San Jose, CA.
12. **Mostek Z80 Microcomputer Systems.** Mostek, 1215 West Crosby Road, Carrolton, TX.
13. **Components and Development Systems.** Zilog, 10466 Bubbroad, Cupertino, CA.
14. **Dynamic Random Access Memory.** Fujitsu America, Inc., 2945 Keifer Road, Santa Clara, CA.
18. **Visual Aids - Integrated chip identification and removal.**
19. **Checklist - Installing integrated circuit chips.**

TEACHING ACTIVITIES:

1. Present lecture on types of integrated circuit chips and their identification.
2. Discuss power down procedures.
3. Discuss 54XX/74XX integrated circuits. (*1, 7, 8 & 11)
4. Discuss 74XX/CD4XXX integrated circuits. (*2, 5, 7, 10, 11 & 14)
5. Discuss linear IC's used on disk drives, motherboards, and main logic boards. (*4 & 6)
6. Discuss 8XXX/9XXX and ZXX series of integrated circuit chips. (*3, 4, 5 & 12)
7. Discuss 65XXX/68XXX series of integrated circuit. (*5, 11 & 12)
TEACHING ACTIVITIES: (cont.)

8. Administer written test on voltage pinouts, e.g. Vcc, Gnd, Vdd, and Vss. (*all)
10. Review handling of static integrated circuits. (*2, 3, 5, 7, 8, 11, 12, 13, & 14)
11. Administer written test on handling of static integrated circuits.
13. Demonstrate grounding of chip inserter and placing of IC in the chip inserter.
15. Instruct Student to remove integrated circuit from antistatic protective cover, ground inserter, and insert IC into a DIP socket.
17. Demonstrate use of desoldering pump or desoldering bulb.
18. Instruct Student to practice using desoldering aids on surplus boards.
19. Discuss hazard of using aerosol type flux removers on boards populated with MOS/CMOS integrated circuits.
20. Instruct Student to practice installing integrated circuit chips on surplus PC boards.
21. Test student proficiency replacing socket mounted integrated circuit chips using checklist provided.
22. Test student proficiency removing and installing solder mounted integrated circuits using checklist provided.
23. Critique student using checklist. (*19)

CRITERION-REFERENCED MEASURE:

Student identifies pin no. 1 on an IC to be replaced and pin no. 1 on a new replacement IC and follows accepted practice in removing the old IC and replacing the new IC. The board was not delaminated and solder bridges were not formed.

PERFORMANCE GUIDE:

A. Non-Soldered Circuit:
1. Turn off power; disconnect external cables.
2. Remove cover.
3. Identify integrated circuit chip.
4. Note of chip orientation before removal.
5. Insert tip of integrated circuit chip puller under the ends of integrated circuit chip and gently lift straight up.
Note: Static electricity can damage integrated circuit chips. Technician should be grounded.
PERFORMANCE GUIDE: (cont.)

6. Remove integrated circuit chip from protective package.
7. Place integrated circuit chip in chip inserter.
8. Make sure pins are straight.
9. Align and insert one row of pins on integrated circuit chip into socket holes.
10. Align and insert second row of pins on integrated circuit chip into socket holes.
12. Replace cover.

B. Soldered Circuit:
1. Turn off power.
2. Remove cover.
3. Identify the integrated circuit chip.
4. Note of chip location before removal.
5. Heat the integrated circuit pin until the solder at base of pin melts.
6. Remove solder with solder sucker of solder wick.
7. Grip the integrated circuit pin with a pair of needle nose pliers and gently move it until pin breaks free.
8. Repeat Steps 5 to 9 until all pins on integrated circuit chips are free.
9. Insert tips of integrated circuit puller under the end of the integrated circuit chip and gently lift straight up.
10. Clean the back of the circuit board with flux remover.
11. Place integrated circuit chip in chip inserter.
   NOTE: Make sure pins are straight.
12. Align and insert second row of pins into integrated circuit location.
13. Align and insert second row of pins into integrated circuit location.
14. Press circuit gently into designated chip location.
15. Solder each pin individually.
17. Replace cover.

352 410
INTEGRATED CIRCUIT CHIP
INSTALLATION TOOLS

IC Extractor

IC Insertor
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install integrated circuit chips.

ENABLER  Install socket mounted DIP integrated circuit.

STUDENT'S NAME ___________________  DATE ______

EVALUATOR'S NAME ___________________  COURSE ______

TIME:  STARTED ______  COMPLETED ______

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the checklist for evaluation of removal and installation of DIP socket mounted integrated circuit.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Followed correct power down procedure. ______  ______
- Followed the service/technical manual procedure for removing cover. ______  ______
- Knew pin orientation of replacement chip. ______  ______
- Used IC puller of remove old IC. ______  ______
- Removed IC by pulling straight up. ______  ______
- Grounded IC puller. ______
- Followed procedure for removing new IC chip from antistatic tunnel or foam. ______  ______
- Seated new chip in chip inserter. ______  ______
- Grounded chip inserter. ______  ______
- Checked IC pins for straightness. ______  ______
- Aligned and inserted pins into socket one row at a time. ______  ______
- Seated IC into DIP socket. ______  ______
- Followed correct button-up procedure. ______  ______
- Checked diagnostics without error. ______  ______

354  412
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install integrated circuit chips.

ENABLER  Removal/installation of solder in IC.

STUDENT'S NAME  DATE  

EVALUATOR’S NAME  COURSE  

TIME:  STARTED  COMPLETED  TOTAL  

DIRECTIONS TO THE EVALUATOR:

Use the checklist for evaluation of removal and installation of solder in IC.

PERFORMANCE DETERMINANTS  YES  NO

The preparer:

- Followed power down procedure.
- Followed the service/technical manual procedure for removing cover.
- Identified pin orientation of replacement chip.
- Selected correct type of soldering pencil. (i.e. 2 wire or 3 wire)
- Followed procedure for removing solder from IC chip.
- Used IC puller to remove IC.
- Cleaned flux from PC board.
- Placed IC chip into chip inserter.
- Aligned and inserted the pins one pin at a time.
- Seated chip, level and flush.
- Soldered each pin without making solder bridges.
- Checked all foil traces.
- Followed correct button-up procedures.
- Checked diagnostics without error.
DUTY  Servicing Computer Equipment

TASK  Install integrated circuit chips.

ENABLER  Remove and replace an integrated circuit chip.

Test Environment/Station Set Up:
- Workbench with AC power
- Common tool kit
- Desoldering tools and aids
- Computer/terminal equipment
- Static IC set

Supplies, Equipment and References needed before test:
- Data books: TTL, CMOS, MOS, INTERFACE, and MEMORY
- Antistatic IC puller (remover) and inserter
- Flux remover
- 60/40 solder and 3-wire solder pencil

Time allowed to perform test:
- 5 minutes for socket mounted IC.
- 15 minutes for 16 pin DIP IC - will depend on total package pincount.

Special Instructions for Administering the Test:
- Review CMOS/MOS handling procedures.
- Check student's identification of pin number.
- Use both checklists to evaluate student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #79

TASK: Install power light.

STANDARD OF PERFORMANCE OF TASK:

Power light indicator lights up when power is turned on.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Handbook of Computer Maintenance and Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit
Screwdriver
Nutdriver
Replacement bulb
Socket jet
Needle nose pliers

ENABLING OBJECTIVES:

1. Identify basic indicator lamps by base style, i.e. miniature screw, candelabra screw, miniature bayonet, SC bayonet, DC bayonet, and LED.
2. Identify component parts of instrument/terminal class lamp sockets.
3. Figure bulb size based on shape column of lamp charts.

RESOURCES:

1. Signetics Logic - TTL Data Manual. Signetics, P.O. Box 9052, 811 East Arques Avenue, Sunnyvale, CA.
2. Signetics Bipolar and MOS Memory. Signetics, P.O. Box 9052, 811 East Arques Avenue, Sunnyvale, CA.
RESOURCES: (cont.)


7. Manufacturer's technical reference.

8. Manufacturer's service manual.


TEACHING ACTIVITIES:

1. Present lecture on the type of lights used in computer's and peripheral devices.

2. Discuss modular indicator light assemblies.

3. Fabricate lamp/light socket display board. (1)

4. Discuss dialight, datalamps datalamp cartridges and LED's (1 & 6)

5. Discuss popular lamp base styles. (1)

6. Discuss standard bulb styles and measurements.

7. Demonstrate use of pilot bulb remover; Type 506-0045 (T-3 1/2 and T-4 1/2) and Type 506-0073 (T-3 1/2 and S-6)


9. Student develops skill at using lamp data: Given lamp number, student determines voltage, current rating, base style, and bulb diameter.

10. Instruct Student to remove bulb from standard insulated socket.

11. Instruct Student to remove cap/shielded bulb from instrument/terminal socket.

12. Evaluate student using checklist on removing and installing a power indicator light.

13. Critique student on results of evaluation.

CRITERION-REFERENCED MEASURE:

Student will remove and install an instrument/terminal class power light or indicator light.

PERFORMANCE GUIDE:

1. Power down.

2. Remove power light cap.

3. Remove light shield. (If half shield, leave on.)

4. Lift out bulb using fingers or needle nose pliers.

5. Check socket and wires for corrosion and wear.

6. Replace bulb, making sure all wires and sockets are in place.

7. Replace light shield (if removed).

8. Replace power light cap.

9. Power up.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install power light.

ENABLER  Remove and replace power light.

STUDENT'S NAME  DATE

TIME:  STARTED    COMPLETED

TOTAL

DIRECTIONS TO THE EVALUATOR:

Use the following checklist for evaluation of removal and replacement of power light.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct power down procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed the power light cap.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed shield, if light used standard instrument/terminal class socket.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed lamp from half-shield socket without removing shield.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed lamp with fingers or needlenose pliers without breakage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified bulb using base marking data.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Selects correct replacement lamp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Checked socket contacts for serviceability.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Checked terminals and wires for serviceability.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Checked mounting hardware for tightness.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Seated replacement bulb in socket.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced shield, if present.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced socket cap.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Tested power-on light.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY  Servicing Computer Equipment

TASK  Install power light.

ENABLER  Remove and replace power light.

Test Environment/Station Set Up:

- Workbench with AC power
- Common tool kit
- Computer/terminal with power indicator light

Supplies, Equipment and References needed before test:

- Lamp chart
- Assortment of bayonet base replacement lamps
- Technical/service manual for equipment to be serviced

Time allowed to perform test:

- 5 minutes
  - Stop student test time if it is necessary to repair or replace socket or socket leads.

Special Instructions for Administering the Test:

- Critique student using checklist.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #80

TASK: Install on-off switch.

STANDARD OF PERFORMANCE OF TASK:

Off-on switch must be functional and equipment must power up.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Handbook of Computer Maintenance and Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Tool kit
New on-off switch

ENABLING OBJECTIVES:

1. Identify the location of assemblies that must be removed for access to switch.
2. Determine procedures for removing assemblies for access to switch.
3. Understand general requirements for removing and installing mechanical switches.
4. Pass cognitive test on switch symbology and designations.

RESOURCES:

2. Apple reference manual; Apple computer, Inc., 10260 Bandley Drive, Cupertino, CA, 95014
RESOURCES: (cont.)

7. Manufacturer's operator's manual.
8. Manufacturer's service manual.
10. Checklist - Removing and replacing on-off switches.

TEACHING ACTIVITIES:

1. Present lecture on type and purposes of on-off switches.
2. Physical placement of computer power switches. (*1 & 2)
3. Computer power supply modules, power supply open assemblies, power supply circuit boards, and power supplies integral to main/logic/CPU boards. (*1 & 2)
4. Physical location and functional location of computer power supply fuse(s) and switches. (1 & 2)
5. Discuss the descriptive marking (UL/CSA labeling) on switches.
6. Discuss 'Up-Side' and 'Down-Side' mounting of switches.
7. Present lecture on obtaining access to switches.
8. Demonstrate chassis removal for gaining access to power supply switches.
9. Discuss physical location and functional location of power supply indicator lamp, fuse(s) and switches.
10. Demonstrate removal of switch plate hardware and connector heads.
11. Assign student to read manufacturers data on switch.
12. Instruct student to identify and locate substitute switches in catalog.
13. Instruct student to disassemble computer/terminal to gain access to power switch.
14. Instruct student to remove power switch.
15. Instruct student to install a power switch.
16. Instruct student to connect heads to power switch.
17. Instruct student to remove and install power supply switch in a timed test.
18. Instruct student to take competency test on switches.

CRITERION-REFERENCED MEASURE:

The student will gain access to power supply switch, remove faulty switch, install replacement switch and connect leads in accordance with manufacturer's specifications.

PERFORMANCE GUIDE:

1. Power down.
2. Disconnect equipment to be serviced from power supply.
3. Remove cover and dismantle equipment so that on-off switch is accessible.
4. Remove retaining screws from switch panel.
5. Disconnect switch panel connector from CPU board.
6. Unlatch switch retaining latches and remove switch.
7. Place new switch in place and latch retaining latches.
8. Attach switch panel connector to CPU board.
9. Replace retaining screws to switch panel.
10. Reassemble equipment and replace cover.
11. Reconnect equipment to power source.
12. Power up system and check if power lamp lights up.
TYPES OF SWITCHES

Rocker Switch

Pushbutton Switch with Lamp Indicators

Toggle Switch

Microswitch - rectangular cased with Level Contactor

SPST
Single-Pole, Single-Throw

SPDT
Single-Pole, Double-Throw

DPST
Double-Pole, Single-Throw

DPDT
Double-Pole, Double-Throw
CHECKLIST

DUTY  **Servicing Computer Equipment**

TASK  **Install on-off switch.**

ENABLER  **Remove and replace on-off switch.**

STUDENT'S NAME ___________________________ DATE ______

EVALUATOR'S NAME ___________________________ COURSE ______

TIME :  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing an on-off switch.

**PERFORMANCE DETERMINANTS**  YES  NO

The preparer

- Followed power down procedure. ______  ______

- Removed the power cable from equipment. ______  ______

- Followed the correct procedure in removing access covers. ______  ______

- Followed the correct procedure in removing other assemblies for access to switch. ______  ______

- Removed mounting plate screws. ______  ______

- Removed leads and connectors. ______  ______

- Compressed switch retaining latch while removing switch. ______  ______

- Retained latch serviceable (either integral or separate compression). ______  ______

- Followed installation procedure. ______  ______

- Seated switch latches. ______  ______

- Used correct procedure in connecting switch to subassembly. ______  ______

- Checked on-off orientation. ______  ______

365  423
PERFORMANCE DETERMINANTS: (cont.)

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replaced mounting hardware.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced modules and subassemblies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Followed button-up procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connected power cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed power-up system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illuminated power indicator lamp and fuse(s) held load.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment

TASK  Install on-off switch.

ENABLER  Remove and replace on-off switch.

Test Environment/Station Set Up:
- Workbench with AC power.
- Computer/Terminal System.
- Common tool kit.
- Crimping tool-solderless connect.

Supplies, Equipment and References needed before test:
- Medium bristle brush.
- Fast-on connector assortment.

Time allowed to perform test:
- 1.5 times maximum service rate.

Special Instructions for Administering the test:
- Use the checklist to evaluate the student.
- Critique student using checklist.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #81

TASK: Install main printed circuit board.

STANDARD OF PERFORMANCE OF TASK:

Printed circuit board must be functional and system must power up.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Main printed circuit board
Tool Kit

ENABLING OBJECTIVES:

1. Identify on-board connectors and leads.

RESOURCES:

5. Manufacturer's operator's manual.
7. Manufacturer's service manual.
8. Checklist - Install main printed circuit board.

TEACHING ACTIVITIES:

1. Present lecture on purpose for installing a main printed circuit board. (*2, 3 & 4)
2. Discuss the location and purpose of all plugs and jacks. (*1, 5, 6 & 7)
TEACHING ACTIVITIES: (cont.)

3. Demonstrate the location of all plugs and jacks using dismounted main printed circuit board.
4. Instruct the student to make a line drawing of main printed circuit board labeling all plugs, jacks and connector sockets.
5. Demonstrate the removal of main printed circuit board.
6. Demonstrate the installation of main printed circuit board.
7. Instruct student to remove and install a main printed circuit board using procedures sheet.
8. Test student on removal and installation of main printed circuit board using competency checklist.

CRITERION-REFERENCED MEASURE:

The student will remove and replace a main printed circuit board within times allowable warranty service time. (approximately 20 minutes)

PERFORMANCE GUIDE:

1. Power down system.
2. Disconnect AC power cord.
3. Remove cover.
4. Note location of cable connectors before removing them.
5. Unplug ribbon cable from printed circuit board.
6. Disconnect the ground wire from main printed circuit board.
7. Release main printed circuit board retaining fasteners.
8. Unplug encoder print circuit boards from main printed circuit board.
9. Remove main printed circuit board.
10. Insert new main printed circuit board.
11. Reconnect ground wires and cable connectors.
13. Refasten main printed circuit board to base.
15. Replace cover and reconnect AC power cord.
16. Power on and check power lamp.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install main printed circuit board.

ENABLER  Remove and replace a main printed circuit board.

STUDENT'S NAME ______________________ DATE ______

EVALUATOR'S NAME ___________________ COURSE ______

TIME:  STARTED _______ COMPLETED ___________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing a main printed circuit board.

NOTE: Discuss any nonapplicable starting test.

PERFORMANCE DETERMINANTS     YES     NO

The preparer
- Followed power down procedure. ______
- Disconnected AC power cord. ______
- Followed the correct procedure in removing access covers. ______
- Located and identified socket/plug/jack number. ______
- Noted orientation on all connectors not keyed. ______
- Unplugged all connectors from main printed circuit board. ______
- Removed all piggy-back boards from the main printed circuit board. ______
- Removed ground straps. ______
- Followed manufacturers procedure for removing main printed circuit board. ______
- Dismounted printed circuit boards handled and stored. ______
- Followed the correct procedures for installing new main printed circuit board. ______
PERFORMANCE DETERMINANTS: (cont.)

- Installed ground- straps and ground connectors.

- Installed all piggy- back boards.

- Used correct procedure for installing spacers, standoffs, and mounting hardware.

- Mounted main printed circuit board securely to base.

- Secured and orientated cables secured.

- Followed correct button- up procedure.

- Connected power cord.

- Powered- up unit.
DUTY _Servicing Computer Equipment_

TASK _Install main printed circuit board._

ENABLER _Remove and replace a main printed circuit board._

Test Environment/Station Set Up:

- Workbench with AC power.
- Computer System.
- Common tool kit.
- Replacement main printed circuit board.

Supplies, Equipment and References needed before test:

- Medium bristle brush.
- Technical maintenance manual.
- Diagnostic disk.
- Checklist.

Time allowed to perform test:

- 20 minutes

Special Instructions for Administering the test:

- Line out determinants on checklist not applicable to your equipment.
- If mounting standoffs, spacers, and screws are not same length
  - caution students.
- Critique student using checklist.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #82

TASK: Install power supply printed circuit board.

STANDARD OF PERFORMANCE OF TASK:

Power supply circuit board must be functional and system must power up

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Power supply printed circuit board
Tool kit

ENABLING OBJECTIVES:

1. Determine pin-outs of power-supply connector socket.
2. Determine the location of voltage adjustment resistors, resistor identification number and order of adjustment.

RESOURCES:

5. Manufacturer's technical reference.
7. Checklist - Installing power supply printed circuit board.

TEACHING ACTIVITIES:

1. Present lecture on the purpose and location of power supply printed circuit board. (*1,2,3,4,5 & 6)
TEACHING ACTIVITIES: (cont.)

2. Discuss standard power supplies. (*1, 5 & 6)
3. Discuss computer voltages and currents. (*1, 2, 3, 4, 5 & 6)
4. Discuss switching power supplies. (*1, 2, 3, 4, 5 & 6)
5. Show students dismounted printed circuit power supply.
6. Demonstrate correct voltage adjustment procedure.
7. Check student voltage adjustments on printed circuit power supply. (*1, 2, 3, 4, 5 & 6)
8. Demonstrate procedure for remaining printed circuit power supply from computer.
9. Instruct student to remove printed circuit power supply board from computer.
10. Demonstrate installation and voltage adjustment of printed circuit power supply.
11. Discuss competency checklist.
12. Instruct student to practice timed sequence of removing, installing, and adjusting of printed circuit power supply.

CRITERION-REFERENCED MEASURE:

The student will replace a bolt-in power supply printed circuit board, connect harness and power-up system in 15 minutes. Both power supply and system must operate correctly.

PERFORMANCE GUIDE:

1. Power down system and disconnect AC power cord.
   CAUTION: Lethal voltage is present in power supply printed circuit board when the AC power cord is connected.
2. Dismantle equipment so that power supply printed circuit board is accessible:
3. Disconnect cable connectors from power supply printed circuit board.
4. Release fasteners holding board to frame.
5. Lift power supply printed circuit board from frame.
6. Insert new power supply printed circuit board on fasteners and latch them.
7. Attach cable connectors.
8. Reassemble equipment in reverse order of dismantle.
9. Reconnect AC power cord and power up system.
CHECKLIST

DUTY    Servicing Computer Equipment

TASK    Install power supply printed circuit board.

ENABLER  Remove and replace power supply printed circuit board.

STUDENT'S NAME ___________________ DATE _________

EVALUATOR'S NAME ___________________ COURSE _________

TIME:    STARTED _______ COMPLETED ____________

TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing power supply printed circuit board.

PERFORMANCE DETERMINANTS       YES     NO

The preparer

- Followed power-down procedures.      __    __

- Disconnected AC power cable.         __    __

- Disconnected interface cables.       __    __

- Gained access to power supply printed circuit board and made all connectors. __    __

- Disconnected all power supply harnesses and connectors. __    __

- Released or removed printed circuit board retaining hardware. __    __

- Installed replacement printed circuit power supply board. __    __

- Made required voltage checks and adjustments. __    __

- Followed button-up system.           __    __

- Passed diagnostics test.             __    __

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DUTY  **Servicing Computer Equipment**

TASK  **Install power supply printed circuit board.**

ENABLELER  **Remove and replace power supply printed circuit board.**

Test Environment/Station Set Up:
- Workbench with AC power.
- Computer System.
- Common tool kit.
- Replacement printed circuit power supply.
- Digital voltmeter or FET meter.

Supplies, Equipment and References needed before Test:
- Medium bristle brush.
- Technical maintenance manual.
- Reference manual.
- Computer facts.

Time allowed to perform test:
- 15 minutes

Special Instructions for Administering the test:
- Personally check manufactures notes on order of voltage adjustments and reject tolerances.
- Use checklist to evaluate student.
- Critique student on checklist results.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #83

TASK: Install drive motor.

STANDARD OF PERFORMANCE OF TASK:

Drive motor must run when powered up.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
New drive motor
Tool kit

ENABLING OBJECTIVES:

1. Identify, remove and install all assemblies and sub-assemblies for access to drive motor.
2. Identify belt tension and tracking adjustments.

RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on purpose and location of the drive motor. (*1,2,3,4 & 5)
2. Discuss centering or location of drive belt pulley.
3. Demonstrate centering adjustment of drive belt pulley using dismount drive motor/clutch assembly.
4. Instruct student to make pulley centering adjustment on dismounted motor/clutch assembly.
TEACHING ACTIVITIES: (cont.)

5. Demonstrate procedure for disconnecting motor drive voltage.


7. Instruct student to disconnect and remove motor from dismounted motor/clutch assembly.

8. Discuss checking belt tension.

9. Discuss idler pulley adjustment.

10. Show students location of idle pulley adjusting screws.

11. Demonstrate adjustment of drive belt tension with 1kg of pressure at center of belt for 0.236- to 0.314 in deflection. (or as specified)

12. Demonstrate interdependence of tension adjusting screws on belt tracking.

13. Students adjust belt for tension and tracking.


15. Demonstrate installation and adjustments of drive motor.

16. Instruct student to remove drive motor, install drive motor and make tension/tracking adjustments.

17. Instruct students to complete a timed practical on removing and installing replacement drive motor.

18. Test student competency level using checklist.

CRITERION-REFERENCED MEASURE:

The student will remove and replace a drive motor and check drive motor belt for tension and tracking.

PERFORMANCE GUIDE:

1. Power down system and disconnect AC power source.

2. Dismantle equipment so drive motor is accessible:
   A. Cover
   B. Mechanical assembly
   C. Cables

3. Loosen drive belt adjusting nut and relieve tension from belt.

4. Remove drive belt from motor pulley.

5. Remove motor mounting screws.

6. Disconnect connectors from brush mountings on motor.

7. Lift drive motor from motor mount.

8. Place new motor on motor unit.

9. Place connectors on brush mountings and replace motor mounting screws.

10. Place drive belt on motor pulley and tighten adjusting screw to remove slack from belt.

11. Reassemble equipment, reconnect AC power cord and power up system.

12. Start drive motor running and check for slippage or binding.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install driver motor.

ENABLER  Remove and replace a driver motor.

STUDENT'S NAME ___________________ DATE _________

EVALUATOR'S NAME ___________________ COURSE _______

TIME: STARTED _______ COMPLETED ____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing a drive motor.

<table>
<thead>
<tr>
<th>Performance Determinants</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct power-down procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disconnected AC power cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disconnected interface cables.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct procedure for access to motor drive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct procedure for removing tension from drive belt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct procedure in removing drive motor from mount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct procedure for disconnecting drive motor power leads.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct procedure for installing a drive motor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Adjusted belt tension.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Adjusted belt tracking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mounted other sub-assemblies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Connected all jacks and sockets.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Connected interface cables and AC power cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Operated motor and belt.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEST ADMINISTRATORS INFORMATION

DUTY  _Servicing Computer Equipment_

TASK  _Install drive motor._

ENABLER  _Remove and replace a drive motor._

Test Environment/Station Set Up:
- Workbench with AC power.
- Computer System with printer.
- Common tool kit.
- Replacement motor.
- Replacement belt.

Supplies, Equipment and References needed before test:
- Operators technical manual or Computerfacts.
- Medium bristle brush.

Time allowed to perform test:
- 1.5 times service center time.

Special Instructions for Administering the Test:
- Use checklist to evaluate student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #84

TASK: Install print hammer.

STANDARD OF PERFORMANCE OF TASK:
Print hammer must be functional and must print clear letters.

SOURCE OF STANDARD:
Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:
Printer to be serviced
New print hammer
Tool kit
Service manual (manufacturer's specifications)

ENABLING OBJECTIVES:

1. Identify and physically locate print head, printhead fingerboard (or connector) video amplifier or logic/pulse board, carriage solenoid wires, penetration adjustments, print head ribbon guides, clamping spring and clamping spring retainer.

RESOURCES:

2. Computer Facts. Howard W. Sams and Company., Inc., Indianapolis, IN,
5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on the function and location of the print hammer. (1, 2, 3, 4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss basic block diagram of printer. (*1, 2, 3, 4 & 5)
3. Discuss control panel and demonstrate built-in test printing routine.
4. Instruct student to use built-in test printing routine.
5. Discuss print commands, paper movement and special functions.
6. Discuss and demonstrate head control and carriage activator solenoids.
7. Discuss paper motion control.
8. Instruct student to use built-in test printing routine.
9. Discuss the relationship of line buffer output; character generator, control timing and write pulses to the print head.
10. Assign student a cognitive test on line buffer, character generator and printhead.
12. Demonstrate penetration adjustment.
13. Instruct student to remove ribbon cartridge, install ribbon cartridge and make penetration adjustment.
14. Demonstrate removal of printhead. (*2 & 5)
15. Instruct student to remove ribbon cartridge, printhead, install ribbon cartridge and turn in sample print run.

CRITERION-REFERENCED MEASURE:

The student will locate print hammer, determine reason for malfunction and either repair old hammer or install a new print hammer.

PERFORMANCE GUIDE:

1. Power down printer and remove cover.
2. Remove print hammer and adjustment screws and remove nut plate and assembly.
3. Slide print hammer out of assembly. Take care to hold hammer spring in place when disconnecting.
4. Slide new hammer into place and connect spring.
5. Replace assembly and insert adjusting screws.
6. Replace nut plate and tighten screws.
7. Adjust print hammer to manufacturer's specification.
8. Replace cover and power up printer.
9. Print sample to make sure hammer is working properly.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install print hammer.

ENABLER  Remove and replace print hammer.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME: STARTED ________  COMPLETED ______________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing a print hammer.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed power-down procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed procedures to remove clear see-through cover and chassie cover.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed procedures to remove ribbon cartridge.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed technical service procedure to remove print hammer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed procedures to install print hammer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Adjusted penetration mechanism to manufactures specifications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed correct button-up procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed printer powered-up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Printed character set.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment

TASK  Install print hammer.

ENABLER  Remove and replace a print hammer.

Test Environment/Station Set Up:
- Workbench with AC power.
- Printer.
- Common tool kit.
- Working print hammer.

Supplies, Equipment and References needed before test:
- Handout on removing dried ink from hammer.
- Technical, service, and maintenance manuals.
- Sample of good character set.
- Checklist.

Time allowed to perform test:
- 20 minutes.

Special Instructions for Administering the Test:
- Test student on manufacturers cautions on removing ink/ribbon residue.
- Test student on manufacturers cautions on hammer springs and retainer springs.
- Use the checklist to evaluate student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #85

TASK: Install print mechanism.

STANDARD OF PERFORMANCE OF TASK:

Print mechanism (dot matrix head, print ball or thimble, or daisy wheel) must be changed to correct lettering problems (uneven print density, incomplete characters, missing letters), or to change the type style to be printed.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to be serviced
Print mechanism replacement
Tool kit

ENABLING OBJECTIVES:

1. Recognize print problem caused by uneven print density, deformed characters, incomplete characters and missing characters.
2. Word processor and ASCII formats.

RESOURCES:

5. Manufacturer's service manual.
6. Checklist - Installing print mechanism.
7. Visual Aid - Print mechanism.

TEACHING ACTIVITIES:

1. Present lecture on the purpose and location of the print mechanism. (*1,2,3,4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss print wheel print types, arrangement, and character totals. General office supply catalogs—e.g.—Ames, Moore, Devoe, NCR etc.

3. Assign student activity—Develop interchangeability chart for print wheels and print thimbles using 5 office machine supply catalogs.

4. Discuss print self-test procedures.

5. Instruct student to run printer self-test.

6. Discuss cleaning of print wheels. (*1,2 & 5)

7. Demonstrate cleaning of print wheels. (*2 & 5)

8. Instruct student to clean printwheels.

9. Instruct student to replace print wheels.

10. Instruct student to replace print thimble.

11. Evaluate student installing print mechanism. e.g., print ball, print wheel, print thimble and dot-matrix head using checklist.


CRITERION-REFERENCED MEASURE:

The student will identify the type of print mechanism, determine problem with print mechanism and either repair the mechanism or install a new print mechanism.

PERFORMANCE GUIDE:

1. Power down printer.

2. Disconnect print mechanism from carrier:
   A. Ball or thimble usually have a retaining latch.
   B. Dot-matrix head have retaining screws.
   C. Daisy wheels usually snap into position.

3. Check print mechanism for missing arms, chipped or broken cogs, broken or filled letters or wires.

4. Clean old print mechanism or obtain new one.

5. Replace print mechanism to carrier and reconnect it.

6. Power up printer and print test run to check quality.
TYPES OF PRINT HEAD MECHANISMS

Daisy-wheel Print Wheel

Print arm, side view:
Rigid section carries type
Flexible section
Hub

Print arm, top view:
Print hammer
Notch positions the print arm during strike

DAISY-WHEEL PRINT MECHANISM

Print mechanisms
Platen
Print wires

DOT MATRIX PRINT HEAD MECHANISM

BALL PRINT HEAD MECHANISM

THIMBLE PRINT HEAD MECHANISM
DUTY  Servicing Computer Equipment

TASK  Install print mechanism.

ENABLER  Remove and replace print mechanism.

STUDENT'S NAME  DATE

EVALUATOR'S NAME  COURSE

TIME  STARTED  COMPLETED

TOTAL

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing a print mechanism.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained sample print to evaluate.  
- Followed power-down procedures.  
- Removed interface cables.  
- Removed power cable.  
- Followed procedures for removing ribbon.  
- Centered print mechanism.  
- Followed procedures for removing print mechanism.  
- Cleaned and/or replaced print mechanism.  
- Replaced ribbon.  
- Replaced computer-to-printer cables.  
- Powered-up system.  
- Ran a print test.  
- Corrected problem.
DUTY  Servicing Computer Equipment

TASK  Install print mechanism.

ENABLER  Remove and replace print mechanism.

Test Environment/Station Set Up:
- Workbench with AC power.
- Computer system with printer.
- Common tool kit.
- Sample print sheet.

Supplies, Equipment and References needed before test:
- Cleaning material.
- Replacement print mechanism.
- Operators and technical manuals.

Time allowed to perform test:
- 10 minutes.

Special Instructions for Administering the Test:
- Manufacture's cautions on cleaning of print mechanisms should be explained to student.
- Use the checklist to evaluate student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #86

TASK: Install carriage assembly.

STANDARD OF PERFORMANCE OF TASK:

Carriage assembly exchanged must correct a problem with the ribbon motor, print wheel motor, print assembly motor or encoder printed circuit board.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to be serviced
New carriage assembly
Tool kit

ENABLING OBJECTIVES:

1. Identify hardware mounting carriage assembly to printer case.
2. List by name and function all cards, connectors, and subassemblies connected to the carriage assembly.

RESOURCES:

5. Manufacturer's service manual.
7. Visual Aid - Types of carriage assemblies.

TEACHING ACTIVITIES:

1. Present lecture on the purpose and location of carriage assembly. (*1, 2, 3, 4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Instruct student to develop block diagram discussion of initializing, data input, character printing, carriage and ribbon movement, paper motion, and power supplies.
3. Demonstrate location of printer sub assemblies.
7. Instruct student to remove subassemblies.
8. Instruct student to remove carriage assembly.
10. Demonstrate adjustments and special tools.
11. Demonstrate installation and connection of subassemblies.
12. Instruct student to remove and install carriage assembly.

CRITERION-REFERENCED MEASURE:

The student will remove and install a lightweight carriage assembly and a standard carriage assembly in 1.5 times manufacturing service center time.

PERFORMANCE GUIDE:

1. Power down system and disconnect AC power cord.
2. Remove retaining screws holding the mechanical assembly to the bottom of the case.
3. Remove ribbon, print wheel and platen.
4. Mark the position and routing of cables and remove them.
5. Unplug bottom encoder printed circuit board from main printed circuit board.
   NOTE: Encoder printed circuit board is an important part of the carriage assembly and a new one will be provided with the new carriage assembly.
6. Loosen ribbon shield retaining screws and remove shields.
7. Loosen drive belt adjusting nut to relieve belt tension and remove belt from carriage assembly.
8. Loosen rear guide shaft locking plate screws and slide rear guide shaft mounting slots and pull the carriage assembly off the grooved front bearing.
9. Slide the rear guide shaft out of the carriage assembly.
10. Disconnect harness cable from the side of the printer case.
11. Remove carriage assembly from the printer.
12. Slide rear guide shaft into new carriage assembly.
13. Place the carriage assembly into grooved front bearing.
14. Replace the rear shaft locking plates and tighten the screws.
15. Replace drive belts and tighten belt adjusting nut.
16. Replace harness cable and move carriage assembly back and forth to make sure it runs free.
17. Reconnect the encoder printed circuit board into main printed circuit board.
18. Replace the ribbon shield, cradle, platen, print wheel and ribbon.
19. Adjust drive belt tension.
20. Replace the mechanical assembly screw on the bottom of printer.
21. Power up printer and test its operation.
TYPES OF CARRIAGE ASSEMBLY

Helical Gear
A pin under the carriage fits into a slot in the helical gear
Carriage
Support Rails
Stepper Motor

HELICAL-GEAR CARRIAGE ASSEMBLY

Stepper Motor
Tab for Left Carriage-stop Sensor
Tab for Right Carriage-stop Sensor
Cable
Carriage Support Rails

CABLE CARRIAGE ASSEMBLY
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install carriage assembly.

ENABLER  Remove and replace a carriage assembly.

STUDENT'S NAME  DATE

EVALUATOR'S NAME  COURSE

TIME:  STARTED  COMPLETED

TOTAL

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing a carriage assembly.

PERFORMANCE DETERMINANTS  YES  NO

The preparer
  - Followed power down.
  - Removed AC power cord.
  - Removed interface cables.
  - Removed and stored transparent covers.
  - Removed mounting hardware.
  - Followed procedures for removing ribbon printwheel, and platen.
  - Disconnected cables and noted routing.
  - Removed P.C. boards as necessary.
  - Loosen shields as necessary.
  - Released tension on the drive motor belt.
  - Followed procedures for removing carriage from clutch/motor assembly.
  - Disconnected all harnesses.
  - Removed carriage assembly from printer cabinet.
PERFORMANCE DETERMINANTS: (cont.)

<table>
<thead>
<tr>
<th>Task Description</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mated replacement carriage correctly to motor/clutch assembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tightened motor/clutch hardware according to manufacturers specifications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted belt tension.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced all harness and connectors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked carriage travel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced support boards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced and adjusted ribbon shield, cradle and platen.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tested carriage assembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connected printer to computer system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passed print test.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment  

TASK  Install carriage assembly.  

ENABLER  Remove and replace a carriage assembly.  

Test Environment/Station Set Up:

- Workbench with AC power.
- Computer system with printer.
- Common tool kit.
- Special tools:
  a. spanner wrench.
  b. snap ring holder.
  c. spring hook.
  d. alignment tools (for clutch, motor, and drivebelt.)

Supplies, Equipment and References needed before test:

- Printer paper.
- Replacement carriage assembly.
- Operators and technical manuals, or Computerfacts.

Time allowed to perform test:

- 1.5 time standard service time for that specific model.

Special Instructions for Administering the Test:

- Review manufactures cautions with student prior to starting test.
- Use the checklist to evaluate student.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #87

TASK: Install paper feed assembly.

STANDARD OF PERFORMANCE OF TASK:

Paper feed assembly correct paper feed problems caused by tractor feed mechanism, drive rod or platen problems.

SOURCE OF STANDARD:
Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to be serviced
Drive rod
Tractor feed mechanism
Tool kit

ENABLING OBJECTIVES:

1. Identify and label gears in a line feed clutch assembly.
2. Remove and install a pinch-roller assembly.
3. Identify and label the major moving parts on a pinfeed left and right assembly.

RESOURCES:

2. Computer Facts. Howard W. Sams and Company., Inc., Indianapolis, IN,
5. Manufacturer's service manual.
7. Visual Aid - Types of carriage assemblies.

TEACHING ACTIVITIES:

1. Present lecture on purpose and location of paper feed assembly. (*1,2,3,4 & 5)

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TEACHING ACTIVITIES: (cont.)

2. Show students dismounted line feed clutch with power plug.
3. Assign students exploded drawing of line feed clutch and discuss gears, ratchet, and solenoid.
4. Instruct student to label parts of exploded drawing of line feed clutch.
5. Discuss platen assembly.
6. Discuss pinch roller assembly.
7. Assign students exploded line drawing of platten assembly. Discuss and label parts.
8. Assign student exploded line drawing of pinch roller assembly. Discuss and label all parts.
9. Instruct student to take a cognitive test on the complete feed assembly.
10. Student removes complete left and right pin feed mechanism.
11. Instruct student to install paper feed assembly.
12. Instruct student to take a timed practical test on removing platen assembly, pinch roller assembly and tractor drive assembly.
13. Instruct student to take a timed practical test on installing tractor drive assembly, pinch roller and platen assembly.

CRITERION-REFERENCED MEASURE:

The student will install a paper feed assembly after checking the drive belt, drive gear, clutch, feed rod and tractor drive pins for service ability within 1.5 times manufacturer's service center time.

PERFORMANCE GUIDE:

1. Power down printer and disconnect AC power cord.
2. Remove printer cover and drive rod retainers.
3. Remove paper feed assembly.
4. Remove tractor feed mechanisms from drive rod.
5. Remove platens and drive belt and check gears and belts for missing cogs or excessive wear.
6. Replace tractor feed mechanisms if tractor drive pins are bent or missing.
7. Replace drive rod is bent.
8. Replace platens and drive belt if cogs are missing or showing excessive wear.
9. Place paper feed assembly into place.
10. Replace drive rod retainers.
11. Replace printer cover and reconnect AC power cord.
12. Load paper into printer to check paper feed assembly.
TYPES OF PAPER FEED ASSEMBLIES

Tractor Drive Wheel
Flexible Belt with Tractor Pins
Square Drive Shaft
Tractor Drive Gear
Idler Gear
Platen Drive Gear
Platen

TRACTOR-FEED ASSEMBLY

Spring-loaded Bail Rollers
Platen
Print Area
Print Area
Spring-loaded Pressure Rollers
Drive Gear

FRICITION-FEED ASSEMBLY
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install paper feed assembly.

ENABLER  Remove and replace a paper feed assembly.

STUDENT'S NAME  DATE  

EVALUATOR'S NAME  COURSE  

TIME : STARTED  COMPLETED  

TOTAL  

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate installing a paper feed assembly.

PERFORMANCE DETERMINANTS  YES  NO

The preparer:

- Followed power down procedure.  

- Disconnected power cable interface cables.  

- Removed printer cover.  

- Removed drive rod retainers.  

- Removed paper feed assembly.  

- Disconnected drive rod from tractor feed mechanism.  

- Removed platen and drive belt.  

- Checked drive belt and drive gear for serviceability.  

- Checked drive rod for serviceability.  

- Started re-assembly in reverse order of disassembly.  

- Installed paper feed assembly.  

- Installed drive rod retainers.  

- Replaced cover and unit powered-up.  

- Loaded paper into printer.  

- Operated line feed button.  

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TEST ADMINISTRATORS INFORMATION

DUTY  Servicing Computer Equipment

TASK  Install paper feed assembly.

ENABLER  Remove and replace a paper feed assembly.

Test Environment/Station Set Up:
- Workbench with AC power.
- Computer system with printer.
- Common tool kit.
- Special tools for alignment.

Supplies, Equipment and References needed before test:
- Printer paper.
- Replacement platen, pinch assembly and tractor assembly.
- Reference and technical manuals.

Time allowed to perform test:
- 1.5 time service center time for that make and model.

Special Instructions for Administering the Test:
- Discuss manufacture's cautions with student.
- Use the checklist to evaluate student.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #88

TASK: Install drive indicator light.

STANDARD OF PERFORMANCE OF TASK:

Drive indicator light must light up when the disk drive is in operation.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Handbook of Computer Maintenance and Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk drive to be serviced
New indicator light
Tool kit

ENABLING OBJECTIVES:

1. Remove and replace defective light bulb and reassemble drive.

RESOURCES:

2. Schematic of disk drive.
3. Parts list for disk drive.
4. Parts replacement list.
5. Indicator light worksheet.

TEACHING ACTIVITIES:

1. Read and interpret disk drive operation/maintenance manual and schematic of disk drive. (*1 & 2)
2. Present lecture on types of indicator lights and how to replace them. (*2, 3, 4 & 7)
3. Present lecture on troubleshooting indicator light circuitry. (*2)
4. Read and interpret computer operation manual on boot up & power down procedures. (*1)
TEACHING ACTIVITIES: (cont.)

5. Instruct students to complete the indicator light type worksheet. (*5)
6. Demonstrate how to install drive indicator light (when possible, demonstrate installation of each type of light). (*7)
7. Instruct student to install an indicator light. (*6)

CRITERION-REFERENCED MEASURE:

The student will disassemble disk drive, remove and replace indicator light, reassemble disk drive, and conduct a test run to verify that indicator light is working properly.

PERFORMANCE GUIDE:

1. Power down disk drive and disconnect AC power cord.
2. Remove disk drive cover.
3. Locate indicator bulb and gently push in and turn bulb counterclockwise.
4. Remove indicator bulb/LED from socket connection.
5. Check socket/connection for corrosion and loose connections.
6. Insert new indicator bulb/LED into socket/connection.
7. Gently push bulb in and turn bulb clockwise.
8. Replace disk drive cover.
9. Replace AC power cord and power up disk drive.
10. Load a program and observe if drive indicator is lit during operation.
LIGHT TYPES

Screw Base
Socket Prong
LED
Bayonet Prong
Offset Prong
STUDENT WORKSHEET

Student Name ________________
Title: Light Type Identification
Directions: Identify the following lights by type.
Worksheet:

1. [Diagram of light] a. Bayonet Prong
2. [Diagram of light] b. LED
c. Screw Base
d. Off-set Prong
e. Socket Prong
f. Ground Prong
g. Round Base
STUDENT WORKSHEET ANSWERS

1. c
2. a
3. b
4. d
5. e
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install indicator light.

ENABLER  Disassemble disk drive, remove and replace defective light bulb and reassemble.

STUDENT'S NAME __________________________ DATE __________

EVALUATOR'S NAME ________________________ COURSE ________

TIME: STARTED _______ COMPLETED _______

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Check the appropriate column for each performance determinant.

RECORD THIS INFORMATION:

MANUFACTURER:_________________________ MODEL:____________

SERIAL #:________

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Followed power down procedures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Assembled all needed tools before beginning disassemble.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed disk drive cover without damage to the retainers.</td>
<td></td>
<td></td>
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<tr>
<td>- Identified the type of light needed.</td>
<td></td>
<td></td>
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<tr>
<td>- Removed and replaced lamp without damaging any other components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reassembled disk drive without damage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Test ran drive after reassembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Worked indicator light.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Used reference manuals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Completed task in the allowed time frame.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Checked for corrosion and loose socket/connections.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #89

TASK: Install peripheral connection cables.

STANDARD OF PERFORMANCE OF TASK:

Peripheral connection cables between peripheral equipment and the main central processing unit must be functional, allowing the equipment to function as one system.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Handbook of Computer Maintenance and Troubleshooting.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Peripheral equipment to be connected
Peripheral connection cables
Flatblade screwdriver

ENABLING OBJECTIVES:

1. Connect peripheral connection cables between peripheral equipment and central processing unit, allowing the equipment to function as one system.

RESOURCES:

1. Operation/maintenance manuals.
4. Visual aid - Types of peripheral connection cables.
5. Checklist - Install peripheral cables.

TEACHING ACTIVITIES:

1. Demonstrate power down procedure. (Be sure student is aware of possible shock if peripherals have power) (*1)
2. Present lecture on peripherals and cables. (*1 & 2)
TEACHING ACTIVITIES: (cont.)

3. Present lecture on proper connection procedures. (*1 & 2)
4. Present lecture on proper booting sequence and peripheral operation. (*1)
5. Conduct discussion on different types of peripheral connections. (*1, 2, 3, & 5)
6. Demonstrate how to connect different peripheral connection cables. (*5)
7. Instruct student to install peripheral connection cables. (*4)

CRITERION-REFERENCED MEASURE:

The student will install peripheral connection cables between peripheral equipment and main central processing unit, allowing the equipment to function as one system.

PERFORMANCE GUIDE:

1. Obtain equipment to be connected together and check that the power to each is disconnected.
2. Determine the type of cable connection that is needed:
   A. Pin connection.
   B. Edge-card connection.
3. Locate the proper port and gently push the cable connector in.
   NOTE: If resistance is felt, remove the connector from the port and check that the connector is right side up. Usually, the connector will have a groove or special shape which corresponds to the connection port on the equipment.
4. Gently snap the cable connector retaining latches in place.
5. Power up the system and check if installed peripherals power up and operate.
TYPES OF PERIPHERAL CONNECTION CABLES

Parallel Plug-in With Ribbon Cable

Pin Plug-in With Round Cable

Jack Plug-in With Round Cable

Card Plug-in With Ribbon Cable

Common Two Pronged Plug

Common Three Pronged Plug
JACKS AND PLUGS
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install peripheral connection cables.

ENABLER  Connect peripheral connection cables between peripheral equipment and central processing unit, allowing the equipment to function as one system.

STUDENT'S NAME _____________________ DATE ________

EVALUATOR'S NAME ___________________ COURSE ________

TIME: STARTED ________ COMPLETED ________________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while installing peripheral cables.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: ________

PERFORMANCE DETERMINANTS     YES    NO

The preparer

- Identified type of peripheral connection.   ______   ______

- Followed power down procedure.    ______   ______

- Selected correct cable.     ______   ______

- Selected proper port on CPU.   ______   ______

- Connected cable in a safe manner assuming no damage.    ______   ______

- Used proper tools.    ______   ______

- Made sure all connected peripherals functioned properly.  ______   ______

- Readied the system to function properly. ______   ______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE

TASK: Install peripheral connections.

STANDARD OF PERFORMANCE OF TASK:

Worn peripheral cable connection port must be exchanged so that peripheral cable connectors fit snug and provide a good connection with the connection port.

SOURCE OF STANDARD

Writing team of incumbent workers.
Handbook of Computer Maintenance and Troubleshooting.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Tool kit
Peripheral connection ports
Soldering tool
Solder sucker or wick
Solder

ENABLING OBJECTIVES:

1. Disassemble unit, remove and replace worn peripheral connection ports, and reassemble unit.

RESOURCES:

1. Operation/maintenance manuals for unit.
4. PACE soldering units. (any electronics book on soldering)
6. Checklist - Installing peripheral connections.
TEACHING ACTIVITIES:

1. Read and interpret unit operator's manual. (*1 & 2)
2. Present lecture on type of peripheral connectors. (*1, 2, & 6)
3. Present lecture on soldering techniques. (*3)
4. Present lecture on importance of good connections. (*1, 2 & 3)
5. Conduct class discussion on ways of replacing connections. (*1 & 2)
6. Conduct class discussion on safety in handling components. (*1 & 2)
7. Demonstrate how to replace a plug-in connection. (*1 & 2)
8. Demonstrate how to replace a soldered peripheral connection. (*1, 2 & 3)
9. Instruct student to replace a peripheral connection port. (*5)

CRITERION-REFERENCED MEASURE:

After identifying loose fitting connections, the student will remove and replace peripheral connection ports, reassemble

PERFORMANCE GUIDE:

1. Power down equipment and disconnect AC power cord and peripheral cables.
2. Remove cover.
3. Locate connection port to be replaced.
4. Determine how part is connected and disconnect it:
   A. Plug-in connection:
      1. Grasp connection port firmly on outer edges and unplug connection port.
      2. Remove connection port from the equipment.
   B. Soldered connection:
      1. Desolder the connection and remove the melted solder with a solder sucker or wick.
      2. Once all solder is removed, gently move the connector to insure it is free.
      3. Remove connection port from the equipment.
5. Replace the connection port:
   A. Plug-in connection:
      1. Insert connection port into place.
      2. Gently push connection port into socket.
   B. Soldered connection:
      1. Place connection port into position and make sure it is aligned properly.
      2. Resolder connections taking care not to get solder on other parts.
      3. Allow solder to dry and then check that soldered connections are secure.
6. Replace cover and peripheral cables.
7. Reconnect AC power cord and power up system.
8. Test run peripheral equipment to check that connection ports are functioning properly.
Peripheral Connections

Parallel Plug-in Connection

Pin Plug-in Connection

Plug-in Jack Connection

Card Plug-in Connection

Standard Two Pronged Plug Connection

Grounded Three Pronged Plug Connection
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install peripheral connections.

ENABLER  Disassemble unit, remove and replace worn peripheral connectors, reassemble unit.

STUDENT’S NAME ______________________ DATE ______

EVALUATOR’S NAME ______________________ COURSE ______

TIME:  STARTED _______ COMPLETED _______________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance when installing peripheral connections.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: ______

SERIAL #: ______

PERFORMANCE DETERMINANTS YES NO

The preparer

- Used correct procedures in power down. ______ ______

- Used correct procedure and tools to remove cover and locate connection part to be removed. ______ ______

- Properly disconnected part. ______ ______

- Used proper desoldering techniques (if necessary). ______ ______

- Gently removed connector (not forced). ______ ______

- Replaced proper connection port. ______ ______

- Used proper soldering technique. ______ ______

- Properly reconnected all parts and connections. ______ ______

- Ran successful tests on peripherals. ______ ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #91

TASK: Install circuit/language cards.

STANDARD OF PERFORMANCE OF TASK:

Circuit/language card must be exchanged to correct a programming/operation problem or to change the language.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Tool kit
Circuit/language card

ENABLING OBJECTIVES:

1. Remove and replace circuit/language card to correct a programming/operation problem or to change language to be used.

*RESOURCES:

2. Placement chart for boards.
5. Checklist - For installing circuit/language card.

TEACHING ACTIVITIES:

1. Read and interpret card replacement information. (*1 & 2)
2. Present lecture on circuit/language card functions and placement. (*1, 2 & 4)
3. Present lecture on system power down and disconnecting procedures. (*1 & 3)
TEACHING ACTIVITIES: (cont.)

4. Demonstrate power down and disconnection procedures.
5. Present lecture on handling and installation of circuit/language cards. (*1, 2 & 3)
6. Demonstrate circuit/language card handling and installation procedures. (*4)
7. Present lecture on booting system and system check. (*4)
8. Demonstrate booting system and system check procedures.
9. Instruct student to power down system, install a circuit/language card, boot system, and conduct system check. (*5)

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, replace card, reassemble unit, and perform a check to be certain installation is complete and correct.

PERFORMANCE GUIDE:

1. Power down system and disconnect peripheral cables.
2. Remove cover.
3. Mark and remove any cables connected to the card.
4. Grasp the upper edges of card gently and pull it out of its socket.
5. Insert new circuit/language card into socket.
6. Press gently on the upper outer edges of the card, push it into the socket.
7. Reconnect cables to the card.
8. Replace the cover.
9. Reconnect peripheral cables and power up system.
10. Conduct a check on the system to insure that the cards are functioning correctly.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Install circuit/language cards.

ENABLER Remove and replace language/circuit card to correct a programming/operation problem or to change the language.

STUDENT'S NAME __________ DATE __________

EVALUATOR'S NAME ________________ COURSE __________

TIME: STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing circuit language cards.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ________

SERIAL #: ________

PERFORMANCE DETERMINANTS

The preparer
- Properly shut down the system and disconnected all peripherals. ______ ______
- Removed unit cover properly. ______ ______
- Marked cables and connections to card. ______ ______
- Removed card and replaced with new card. ______ ______
- Connected all cables and connections. ______ ______
- Replaced covers and connected peripheral cables. ______ ______
- Powered system and completed performance check. ______ ______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #92

TASK: Install modem coupler.

STANDARD OF PERFORMANCE OF TASK:

Modem coupler to computer must allow information to be sent and received via a telephone line.

SOURCE OF STANDARD:

Writing team of incumbent workers. How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Modem coupler
Modem cables
Telephone/telephone jack

ENABLING OBJECTIVES:

1. Install modem coupler to computer to allow information to be sent and received via telephone hook-up.

RESOURCES:

1. Installation/maintenance manual for modem.
5. Visual aids with types of modems.

TEACHING ACTIVITIES:

1. Read and interpret installation/maintenance manual on modem. (*1)
2. Present lecture on modems internal workings. (*1, 2, 3 & 5)
3. Present lecture on testing procedures. (*1, 2 & 3)
TEACHING ACTIVITIES: (cont.)

4. Present lecture on different types of modems. (*2, 3 & 5)
5. Demonstrate different types of modems and the testing procedure for each.
6. Present lecture on proper installation of modem connectors and jacks. (*1, 2 & 3)
7. Demonstrate installation of modem connectors and jacks.
8. Instruct student to install a modem coupler to a computer, and test transfer of information. (*4)

CRITERION-REFERENCED MEASURE:

The student will install modem into system, and check system for proper system operation.

PERFORMANCE GUIDE:

1. Power down the system
2. Connect the modem connector cable into the proper connection port on the control unit (mainframe, data processor, microcomputer) and the modem.
3. Conduct modem echo test or self-test to determine if modem is transmitting and receiving correctly.
4. Connect the modem with the telephone line:
   A. Acoustic type modem:
      1. Turn on power to modem.
      2. Set operation mode on half-duplex mode if you wish only to transmit.
   B. Direct-connect modem:
      1. Connect phone jack to modem.
      2. Load and run software for control of modem.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install modem coupler.

ENABLER  Modem coupler to computer must be installed.

STUDENT'S NAME ___________________ DATE ______ 

EVALUATOR'S NAME _______________ COURSE ______ 

TIME: STARTED _______ COMPLETED ______________

TOTAL __________ 

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing modem coupler.

RECORD THIS INFORMATION:

MANUFACTURER: _______________________ MODEL: __________

SERIAL #: ______

PERFORMANCE DETERMINANTS       YES   NO

The preparer

- Followed power down procedure.  _____  _____

- Made connections between system and modem.  _____  _____

- Connected telephone line.  _____  _____

- Completed installation and readied system for check.  _____  _____

- Completed power check.  _____  _____

- Followed power down procedures.  _____  _____
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #93

TASK: Install tape transport assembly.

STANDARD OF PERFORMANCE OF TASK:

Tape transport assembly must be exchanged so that the tape can be fed through the tape player/recorder without stretching, tangling, or binding in the transport assembly.

SOURCE OF STANDARD:

Writing team of incumbent workers. How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Tape player/recorder to be serviced
Tape transport assembly
Tool kit

ENABLING OBJECTIVES:

1. Remove and replace tape transport assembly.
2. Identify internal parts of tape transport.

RESOURCES:

2. Installation operation/maintenance manual for tape transport.
5. Tape transport parts identification worksheets.

TEACHING ACTIVITIES:

1. Read and interpret manuals on tape transport system. (*2)
2. Present lecture on operation of tape transport. (*1, 2 & 3)
3. Instruct student to complete tape transport parts identification worksheets. (*5)

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TEACHING ACTIVITIES: (cont.)

4. **Present lecture on schematic of tape transport.** (*2)
5. **Demonstrate installation of tape transport.**
6. **Present lecture on testing procedure for tape transport.** (*1 & 2)
7. **Conduct class discussion on operation and testing procedures for tape transport.**
8. **Demonstrate testing procedures for tape transport.**
9. **Instruct student to install and test a tape transport system.**

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, replace tape transport system, reassemble unit, and perform operational check on system.

PERFORMANCE GUIDE:

1. **Power down system and disconnect tape player/recorder cable from control unit.**
2. **Remove cover.**
3. **Remove tape transport assembly retaining screws.**
4. **Gently lift tape transport assembly from base.**
5. **Replace tape transport assembly on base and replace retaining screws.**
6. **Replace cover.**
7. **Reconnect tape player/recorder cable to control unit and power up system.**
8. **Insert and play a tape and observe if tape transport assembly is functioning correctly.**
TAPE TRANSPORT

Supplies Spindle

Tape

Erase Head

Record/Playback Head

Capstan Flywheel

Pinch Roller

Take-up Spindle
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install tape transport assembly.

ENABLER  Remove and replace tape transport assembly.

STUDENT'S NAME  ___________________________ DATE  ______

EVALUATOR'S NAME  ___________________________ COURSE  ______

TIME:  STARTED  ______  COMPLETED  ______

TOTAL  ______

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing tape transport.

RECORD THIS INFORMATION:

MANUFACTURER:  ______________  MODEL:  __________

SERIAL #:  ______

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Followed power down procedure.  ______  ______
- Disconnected peripheral cables.  ______  ______
- Removed retaining screws without damaging unit.  ______  ______
- Removed tape transport without damaging unit.  ______  ______
- Replaced tape transport without damaging unit.  ______  ______
- Reassembled tape player/recorder properly.  ______  ______
- Reconnected all peripheral cables  ______  ______
- Tested tape transport system  ______  ______
- Prepared tape transport system to pass test.  ______  ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #94

TASK: Install read/write/verify head.

STANDARD OF PERFORMANCE OF TASK:

Read/write/verify head must be exchanged so that data may be stored, recalled, and verified.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Tape player/recorder to be serviced
Read/write/verify head
Tool kit

ENABLING OBJECTIVES:

1. Disassemble system, remove and replace read/write/verify head and reassemble system.
2. Perform check to insure read/write/verify head is operational.

RESOURCES:

1. Installation/operational maintenance manual.
5. Checklist - Read/write/verify head installation.

TEACHING ACTIVITIES:

1. Read and interpret read/write/verify head installation manual. (*1)
2. Present lecture on read/write/verify head operation. (*2 & 3)
TEACHING ACTIVITIES: (cont.)

3. Present lecture on purpose/function of read/write/verify head. (*2)
4. Conduct class discussion on purpose, operation, and safety concerning read/write/verify head. (*1 & 2)
5. Present lecture on schematic of read/write/verify head. (*1)
6. Present lecture on installation of read/write/verify head. (*1, 2 & 3)
7. Present lecture on check out procedure for the system. (*1)
8. Demonstrate how to install a read/write/verify head. (*1, 2, 3 & 4)
9. Demonstrate system check out/test procedure. (*1)
10. Instruct student to install and test a read/write/verify head. (*5)

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, remove and replace read/write/verify head, reassemble unit and then perform the proper check out procedures.

PERFORMANCE GUIDE:

1. Power down system and unplug connection cable from main power unit.
2. Remove cover.
3. Remove retaining screws and lift tape transport assembly from base.
4. Remove head retaining screws and gently lift head from assembly.
5. Mark and disconnect lead wires from head.
6. Remove head from assembly.
7. Connect lead wires to tape head.
8. Place head on tape transport assembly and replace retaining screws.
9. Place tape transport assembly back on base and replace retaining screws.
10. Replace cover.
11. Reconnect connection cable to control unit and power up.
12. Store, verify and load data to check if head is working properly.
TAPE HEAD REMOVAL/INSTALLATION

Erase Head

Read/Write Head

Erase Head Mounting Screws

Read/Write Head Mounting Screws
CHECKLIST

DUTY  Servicing computer equipment.

TASK  Install read/write/verify head.

ENABLER  Disassemble system, remove and replace read/write/verify head, reassemble system and perform check out procedure.

STUDENT'S NAME _________________________ DATE _______

EVALUATOR'S NAME _________________________ COURSE _______

TIME :  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing read/write/verify head.

RECORD THIS INFORMATION:
MANUFACTURER: ___________________________ MODEL: __________
SERIAL #: __________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Powered down system and disconnected peripheral cables. ______  ______

- Disassembled unit without damage. ______  ______

- Removed retaining screws from transport assembly without damaging unit? ______  ______

- Removed transport assembly from unit. ______  ______

- Removed retaining screws from head assembly. ______  ______

- Marked lead wires before disconnecting from head assembly. ______  ______

- Removed and replaced head assembly. ______  ______

- Reconnected lead wires to new head. ______  ______

- Replaced head assembly retaining screws. ______  ______

- Reassembled unit without damage. ______  ______

- Reconnected all peripheral cables. ______  ______

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GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #95

TASK: Install modem set switch.

STANDARD OF PERFORMANCE OF TASK:

Modem set switch installed must be exchanged to enable the half-duplex and duplex modes to be used.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITION PERFORMANCE OF TASK:

Modem to be serviced
Set switch
Tool kit

ENABLING OBJECTIVES:

1. Disassemble modem, remove and replace modem set switch, reassemble modem and conduct operational check test.

RESOURCES:

1. Installation/operational maintenance manuals.

TEACHING ACTIVITIES:

1. Read and interpret operational manual for schematics. (*1)
2. Present lecture on operation of modem set switch. (*1, 2 & 3)
TEACHING ACTIVITIES: (cont.)

3. Demonstrate the operation of modem set switch.
4. Present lecture on assembly and disassembly of modem. (*1, 2 & 3)
5. Demonstrate assembly and disassembly of a modem.
6. Conduct class discussion on modem operation in both modes (half duplex and duplex). (*1)
7. Present lecture on procedure for removing and replacing set switch.
8. Demonstrate procedure for removing and replacing a modem set switch.
9. Instruct student to remove and replace a modem set switch. (*4)

CRITERION-REFERENCED MEASURE:

The student will disassemble modem, remove and replace modem set switch, reassemble modem, and perform operational check test.

PERFORMANCE GUIDE:

1. Power down system and disconnect modem from control unit and telephone line.
2. Remove cover.
3. Mark lead wires and disconnect them from the set switch.
4. Remove the set switch retaining screws and lift switch from modem.
5. Replace the lead wires back on the switch leads.
6. Place the set switch back into place on the modem and replace retaining screws.
7. Replace cover.
8. Reconnect modem to control unit and telephone line.
9. Power up system, send and receive information in both modes to check if switch is functioning properly.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install modem set switch.

ENABLER  Disassemble modem, remove and replace modem set switch, reassemble modem, and conduct an operational check test.

STUDENT'S NAME  ___________  DATE  ___________

EVALUATOR'S NAME  ___________  COURSE  ___________

TIME:  STARTED  ___________  COMPLETED  ___________

TOTAL  ___________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing modem set switch.

RECORD THIS INFORMATION:

MANUFACTURER:  ___________  MODEL:  ___________

SERIAL #:  ___________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Followed power down procedure.  ___________  ___________

- Removed modem from control unit and telephone line.  ___________  ___________

- Disassembled modem.  ___________  ___________

- Marked leads before removing from set switch.  ___________  ___________

- Properly removed switch.  ___________  ___________

- Properly installed switch leads before reinstalling switch.  ___________  ___________

- Reassembled modem.  ___________  ___________

- Reconnected modem to central unit and telephone line.  ___________  ___________

- Powered up and performed operational check.  ___________  ___________

- Readied system to send and receive information.  ___________  ___________
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #96

TASK: Install ribbon assembly.

STANDARD OF PERFORMANCE OF TASK:

Printer ribbon assembly installed must provide a darker, clearer and more readable printed character.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to be serviced
Ribbon assembly

ENABLING OBJECTIVES:

1. Remove and replace ribbon assembly.
2. Identify parts of cartridge and ribbon holders.

RESOURCES:

1. Installation/operational maintenance manuals for printer.

TEACHING ACTIVITIES:

1. Read and interpret ribbon assembly replacement procedures. (*1)
2. Present lecture on ribbon assembly replacement procedures. (*1, 2 & 3)
3. Demonstrate procedure for installing ribbon assembly. (*1, 2 & 3)
4. Present lecture on parts of ribbon assembly. (*1, 2 & 3)
TEACHING ACTIVITIES: (cont.)

5. Demonstrate parts of ribbon assembly. (*3)
6. Instruct student to install a ribbon assembly. (*4)

CRITERION-REFERENCED MEASURE:

The student will change ribbon cartridge and check installation by performing a performance check.

PERFORMANCE GUIDE:

1. Move head adjustment gently towards the front of the printer as far as possible.
2. Tighten the ribbon using the tightening knob on assembly.
3. Push the right assembly retaining latch out and lift up the right side of the assembly.
4. Push the left retaining latch out and lift ribbon assembly up and out.
5. Tighten the ribbon of the new assembly and slide the ribbon between the print mechanism and the platen.
6. Press down on the left side of the ribbon assembly until the retaining latch clicks into place.
7. Press down on the right side of assembly while slowly turning the adjustment knob until the right side of the assembly clicks into place.
8. Tighten ribbon and set print mechanism back to original position.
TYPES OF RIBBON ASSEMBLIES

Cartridge

Spool

Cartridge

Cartridge
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Install ribbon assembly.

ENABLER Remove and replace ribbon assembly.

STUDENT'S NAME __________________________ DATE ________

EVALUATOR'S NAME ________________________ COURSE ________

TIME: STARTED ________ COMPLETED _____________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing ribbon assembly.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: ________

PERFORMANCE DETERMINANTS YES NO

- The preparer
  - Performed printer power down. ______ ______
  - Protected head while removing ribbon assembly. ______ ______
  - Removed ribbon assembly. ______ ______
  - Replaced new ribbon assembly. ______ ______
  - Tightened ribbon and set print mechanism to original position. ______ ______
  - Completed performance check. ______ ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #97

TASK: Install drive belts.

STANDARD OF PERFORMANCE OF TASK:

Drive belt installed must be free of cracks, worn, broken, or missing cogs.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Drive belts
Tool kit

ENABLING OBJECTIVES:

1. Inspect and determine type of drive belt.
2. Remove and replace a drive belt.

RESOURCES:

5. Checklist - Installing a drive belt.

TEACHING ACTIVITIES:

1. Read and interpret maintenance manual. (*1)
2. Present lecture on drive belt installation. (*1,2 & 3)
3. Demonstrate belt replacement. (*1 & 3)
4. Conduct class discussion on types of drive belt inspection techniques, and safety techniques. (*2,3 & 4)
TEACHING ACTIVITIES: (cont.)

5. Demonstrate belt inspection techniques.
6. Instruct student to inspect and install a belt. (*5)

CRITERION-REFERENCED MEASURE:

The student will inspect, remove, and replace a drive belt, and conduct a performance check test.

PERFORMANCE GUIDE:

1. Power down system and remove cover.
2. Loosen belt tension adjustment to release the tension from the belt.
3. Remove the belt from the drive pulley or gears.
4. Place new belt on drive pulley or gears and make sure that belt is properly aligned.
   A. Gear cogs and belt cogs mesh.
   B. Belt is seated in center of pulley.
5. Adjust the belt tension using the belt tension adjustment screw.
6. Turn drive and watch for belt binding or slippage.
7. Replace cover, power up, and run equipment to check for binding or slippage.
TYPES OF BELTS

ROUND BELT

FLAT BELT

V-BELT

TIMING BELT

V-RIBBED BELT
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install drive belt.

ENABLER  Inspect, remove and replace a drive belt.

STUDENT'S NAME  DATE

EVALUATOR'S NAME  COURSE

TIME  STARTED  COMPLETED

TOTAL

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing drive belt.

RECORD THIS INFORMATION:

MANUFACTURER:  MODEL:

SERIAL #:  

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Powered down system.  
- Removed tension from drive belt.  
- Removed drive belt.  
- Inspected drive belt.  
- Determined type of drive belt.  
- Replaced drive belt.  
- Aligned and seated drive belt.  
- Adjusted drive belt tension  
- Conducted an operational check test.  

443  503
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #98

TASK: Install AC input connections.

STANDARD OF PERFORMANCE OF TASK:

Worn, frayed or broken AC connection cable/cord must be replaced with a new AC connection cable/cord, so that the system will power up.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.
Handbook of Computer Maintenance and Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
AC connection cable/cord
Tool kit
Soldering tool
Solder sucker or wick
Solder

ENABLING OBJECTIVES:

1. Remove and replace AC connector.

RESOURCES:

1. Installation/maintenance/operation manual.

TEACHING ACTIVITIES:

1. Present lecture on power down procedure. (*1)
2. Present lecture on different types of AC power connectors. (*1 & 2)
3. Present types of AC power connectors. (*3)
TEACHING ACTIVITIES: (cont.)

4. Present lecture and conduct demonstration on proper soldering techniques. (*2)
5. Demonstrate soldering and desoldering techniques. (*2)
6. Present lecture on installing AC power connectors. (*1 & 2)
7. Demonstrate installation of AC power connectors.
8. Instruct student to install an AC power connector. (*4)

CRITERION-REFERENCED MEASURE:

The student will remove and replace AC connector and perform an operational check.

PERFORMANCE GUIDE:

1. Power down system and disconnect AC power cable/cord from power source.
2. Determine how AC power cable/cord is connected to equipment:
   A. Plug-in connection:
      1. Grasp cable/cord plug near socket and pull straight out. (Avoid wiggling plug if possible as it can loosen socket connection or break off pins.)
      2. Align groove on socket and plug, and gently push plug in.
   B. Wired connection:
      1. Remove equipment cover.
      2. Locate AC cable/cord lead wires.
      3. Desolder the lead connections using a solder.
      4. Remove AC cable/cord from internal connections.
      5. Resolder the lead wire connection. (Take care not to get solder on other parts.)
      6. Align cable/cord with AC cable/cord opening in the cover and replace cover.
   3. Plug AC power cable/cord into power source and power up system.
TYPES OF SLOTS AND PRONGS

120-volt 15-ampere ungrounded

120-volt grounded

120/240-volt 30-ampere

120/240-volt 50-ampere

240-volt 30-ampere grounded
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install AC input connections.

ENABLER  Remove and replace AC power connectors.

STUDENT'S NAME  DATE  

EVALUATOR'S NAME  COURSE  

TIME:  STARTED  COMPLETED  TOTAL  

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing AC input connectors.

RECORD THIS INFORMATION:

MANUFACTURER:  MODEL:  

SERIAL #:  

PERFORMANCE DETERMINANTS  YES  NO  

The preparer

- Powered down system.  
- Identified type of AC power connector.  
- Removed AC power connector.  
- Followed removal procedure.  
- Replaced AC power connector.  
- Powered up and tested system.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #99

TASK: Install fuse holders and fuses.

STANDARD OF PERFORMANCE OF TASK:

Fuse or fuse holder must be installed so equipment will not receive a power current overload and the equipment will power up.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Handbook of Computer Maintenance and Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Tool kit
Fuse holder
Fuses

ENABLING OBJECTIVES:

1. Inspect fuse or fuse holder.
2. Remove and replace fuse or fuse holder.

RESOURCES:

1. Installation/maintenance/operation manuals.
5. Checklist - Installing fuse and fuse holders.

TEACHING ACTIVITIES:

1. Present lecture on power down procedure. (*1)
2. Present lecture on different types of fuses and fuse holders. (*2 & 3)
TEACHING ACTIVITIES: (cont.)

3. Present types of fuses and fuse holders. (*4)
4. Present lecture and common fuse and fuse holder problems. (*1, 2 & 3)
5. Conduct demonstration showing problems that are common with fuses and fuse holders. (*2 & 3)
6. Present lecture on inspecting a fuse and fuse holder.
7. Demonstrate inspection of fuse S: (cont.)
8. Present lecture on installing a fuse and fuse holder.
9. Demonstrate installing a fuse and fuse holder.
10. Instruct student to install a fuse and fuse holder.

CRITERION-REFERENCED MEASURE:

The student will inspect, remove and replace a fuse and fuse holder, and conduct an operational check to verify that the problem has been corrected.

PERFORMANCE GUIDE:

1. Power down system and disconnect AC power cord.
2. Push in on fuse cap while turning counterclockwise until free.
3. Remove fuse and check for melted or broken center connector, and cracked or discolored glass.
4. Check end connection of fuse holder for corroded or loose connections.
5. If fuse holder is cracked, chipped or broken, remove equipment cover.
6. Remove retaining clip from back of fuse holder.
7. Remove fuse holder from case.
8. Insert new holder into position and replace retaining clip.
9. Replace cover.
10. Insert new fuse into holder and replace cap by pressing in turning clockwise until snug.
11. Power up system to check if fuse is making the proper connection.
TYPES OF FUSES AND FUSE HOLDERS

Fast Blow

blows instantly with surge or short

Slow Blow

withstands heavy surges

Direct Connect Fuse Wire

connected between terminals

Repairable

replacement of fuse wire

Plug-in Fuse

Snap-in Holder

Screw/Twist Top Holder
FUSE INSPECTION POINTS

- End Caps
- Glass Tube
- Center Connector

Broken Parts Of Center Connector Are Still In Place

Center Conductor Is Gone

Glass Is Clear

Stains On Inside Of Glass Case

Fuse Holder Clamps

Check For Dirt, Corrosion, And Loose Ends
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install fuse holder and fuses.

ENABLER  Remove and replace fuse and fuse holder.

STUDENT'S NAME ______________________ DATE __________

EVALUATOR'S NAME ______________________ COURSE __________

TIME: STARTED _______ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing fuses and fuse holder.

RECORD THIS INFORMATION:

MANUFACTURER:__________________________ MODEL:____________

SERIAL #:____________

PERFORMANCE DETERMINANTS

<table>
<thead>
<tr>
<th>The preparer</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Powered down system.</td>
</tr>
<tr>
<td>- Removed AC power cord.</td>
</tr>
<tr>
<td>- Located fuse holder.</td>
</tr>
<tr>
<td>- Removed fuse removed from holder.</td>
</tr>
<tr>
<td>- Inspected fuse for broken center connector, cracked or chipped glass and corroded or loose connections.</td>
</tr>
<tr>
<td>- Replaced fuse as needed.</td>
</tr>
<tr>
<td>- Replaced fuse holder as needed.</td>
</tr>
<tr>
<td>- Powered system and performed an operational check.</td>
</tr>
</tbody>
</table>
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #100

TASK: Install ejector mechanism.

STANDARD OF PERFORMANCE OF TASK:
Disk must eject when disk drive door is opened.

SOURCE OF STANDARD:
Writing team of incumbent workers.
How to Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:
Disk drive to be serviced
Ejector mechanism parts
Tool kit

ENABLING OBJECTIVES:

1. Disassemble disk drive, replace malfunctioning ejector mechanism components, and reassemble disk drive.
2. Identify internal components of a disk drive ejector mechanism.

RESOURCES:

4. Schematic of drive unit.
5. Parts replacement list.
7. Ejector mechanism component identification worksheet.
8. Disassembly/reassembly and component troubleshooting checklist.
TEACHING ACTIVITIES:

1. Read and interpret disk drive operator manual and schematics.
2. Present lecture on disk drive ejector mechanism component.
3. Instruct students to complete a disk drive mechanism component identification worksheet. (*7)
4. Assign students to write three questions they wish answered concerning the ejector mechanism of a disk drive.
5. Conduct class discussion on ejector mechanism of a disk drive.
6. Present lecture on troubleshooting and repairing a disk drive. (*1 & 2)
7. Assign students to write three questions they wish answered concerning troubleshooting and repairing a disk drive.
8. Conduct class discussion on troubleshooting and repairing disk drive.
9. Review checklist for installing ejector mechanism. (*8)
10. Instruct student to disassemble disk drive, identify and replace ejector mechanism, using the performance checklist as an evaluation guide sheet. (*5 & 8)
11. Instruct student to test run disk drive to insure that all parts are functioning.

CRITERION-REFERENCED MEASURE:

The student will disassemble and troubleshoot the disk drive ejector mechanism for possible malfunctioning components the student will reassemble the disk drive and conduct a test run to verify that the drive is functioning correctly. All items on the performance checklist must be approved by the instructor.

PERFORMANCE GUIDE:

1. Power down system; and remove AC power cord.
2. Remove disk cover.
3. Check that when disk is inserted into the drive, that the ejector block is pushed back and locks into hole in retainer spring.
4. Replace ejector block if cracked or broken pieces are found.
5. Replace retainer spring if bent or broken.
6. Check that release spring on door latch releases retainer spring when door is open.
7. Replace release spring if bent or broken.
8. Check that ejector block return spring compresses when block is pushed in and pushes forward when released.
9. Replace return spring if stretched, bent or broken.
Disk Drive Ejector Mechanism Components.

- Release Spring
- Disk in Position
- Retainer Tab
- Retainer Spring
- Guide Rod
- Ejector Block
- Return Spring
- Mounting Block
Disk Drive Ejector Mechanism Component Operation.

Door Opens, Lifts Release Spring.

Release Spring Pulls Retainer Spring Off Tab.

Return Spring Pushes Ejector Block Forward And Ejects Disk.
1. Retainer Tab
2. Retainer Spring
3. Mounting Block
4. Ejector Block
5. Return Spring
6. Guide Rod
7. Disk in Position
8. Release Spring
CHECKLIST

DJTY Servicing Computer Equipment.

TASK Install ejector mechanism.

ENABLER Disassemble disk drive, replace malfunctioning ejector mechanism components, and reassemble disk drive.

STUDENT'S NAME __________________________ DATE _______

EVALUATOR'S NAME ______________________ COURSE ______

TIME: STARTED _______ COMPLETED ____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing ejector mechanism.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________________________

PERFORMANCE DETERMINANTS

<table>
<thead>
<tr>
<th>The preparer</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Followed power down procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembled all needed tools before beginning disassembly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed disk drive cover without damage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked all ejector mechanism components for malfunctions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified all malfunctioning ejector mechanism components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaced all malfunctioning components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassembled disk drive ejector mechanism without damage to the other components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tested disk drive after reassembly.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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PERFORMANCE DETERMINANTS: (cont.)

- Checked the disk drive ejector mechanism for full operational reassembly.

- Completed the task in the allowed time frame.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #101

TASK: Install cathode ray tube.

STANDARD OF PERFORMANCE OF TASK:
Monitor must power up and display a functional screen.

SOURCE OF STANDARD:
Writing team of incumbent workers.
Troubleshooting And Repairing Personal Computers.

CONDITIONS FOR PERFORMANCE OF TASK:
Monitor to be serviced
Replacement cathode ray tube
Tool kit

ENABLING OBJECTIVES:
1. Disassemble monitor, replace C.R.T. and reassemble monitor.

RESOURCES:
1. Maintenance/operation manuals for monitor.
2. Schematic of monitor.
4. Television Servicing with Basic Electronics. No. 21859, Howard Sams and Co., Indianapolis, IN.

TEACHING ACTIVITIES:
1. Present lecture on C.R.T's. (*1, 2, 3, 4, 5 & 6)
2. Conduct class discussion on internal operation of C.R.T. (*4, 5, 6 & 7)
TEACHING ACTIVITIES: (cont.)

3. **Present lecture on power down and disassembly of monitor.** (*1)
4. **Demonstrate power down and disassembly of monitor.**
5. **Demonstrate power down and working on C.R.T.** (*3 & 4)
6. **Demonstrate safety procedures for working on C.R.T.**
7. **Present lecture on installing a C.R.T.** (*3, 4, 5 & 6)
8. **Demonstrate installation of C.R.T.**
9. **Instruct student to install a C.R.T.**

CRITERION-REFERENCED MEASURE:

The student will disassemble monitor, remove and replace C.R.T. Reassemble monitor, and conduct an operational check.

PERFORMANCE GUIDE:

1. **Power down monitor and disconnect AC power cord.**
2. **Remove the back of the monitor case.**
3. **Discharge high voltage from the flyback transformer and disconnect lead.**
   **CAUTION:** Up to 15,000 volts can be stored in the flyback transformer; the service manual should always be consulted for proper discharging method. Extreme care should be taken.
4. **Disconnect and remove video driver board.**
5. **Remove yoke clamp screw and remove yoke clamp.**
6. **Remove ring magnet and deflection yoke.**
7. **Remove cathode ray tube retaining screws and carefully remove cathode ray tube.**
8. **Place new cathode ray tube in place and replace retaining screws.**
9. **Replace ring magnet and deflection yoke.**
10. **Refasten yoke clamp.**
11. **Replace back cover.**
12. **Reconnect AC power cord and power up monitor.**
CATHODE RAY TUBE - INTERNAL FUNCTIONS

- Shadow Mask
- Three Color Phosphor Screen
- Converge At Hole On Mask
- Focus Electrodes
- Convergence Electrodes
- Red Gun
- Green Gun
- Blue Gun
- Blue Dot
- Green Dot
- Red Dot
CATHODE RAY TUBE - YOKE ASSEMBLY

Ring Magnet

Yoke Clamp Screw

Ring Magnet
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install cathode ray tube.

ENABLER  Disassemble monitor, remove and replace C.R.T. and reassemble monitor.

STUDENT'S NAME  DATE  

EVALUATOR'S NAME  COURSE  

TIME:  STARTED  COMPLETED  

TOTAL  

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing cathode ray tube.

RECORD THIS INFORMATION:

MANUFACTURER:  MODEL:  

SERIAL #:  

PERFORMANCE DETERMINANTS

The preparer

- Powered system down and removed AC power cord.  
- Removed back from monitor. 
- Discharged flyback transformer and disconnected lead. 
- Disconnected and removed video driver. 
- Removed yoke clamp. 
- Removed ring magnet and deflection yoke. 
- Removed cathode ray tube retaining screws. 
- Carefully removed cathode ray tube from mounts. 
- Placed new cathode ray tube on mounts and replaced retaining screws.

465  528
PERFORMANCE DETERMINANTS: (cont.)

- Reconnected ring magnet and deflection yoke.
- Reconnected yoke clamp.
- Reconnected video driver board and flyback transformer lead.
- Replaced back of monitor.
- Performed an operational check test on monitor.

YES  NO
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #102

TASK: Install configuration switches.

STANDARD OF PERFORMANCE OF TASK:

Configuration switch must enable the printer to operate according to host system specifications.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to be serviced
Configuration switch
Tool kit
Host system

ENABLELING OBJECTIVES:

1. Disassemble printer, replace malfunctioning configuration switches, reassemble printer.

RESOURCES:

1. Maintenance/operation manuals for printer.
2. Schematic of switch PC board.

TEACHING ACTIVITIES:

1. Present lecture on purpose of configuration switches. (*1,3 & 4)
2. Present demonstration on operation and function of configuration switches. (*1 & 2)
3. Present lecture on installation of configuration switches. (*1,3 & 4)
TEACHING ACTIVITIES: (cont.)

4. Demonstrate installation of configuration switches.
5. Present lecture on check out procedures. (*1, 3 & 4)
6. Demonstrate check out procedures.
7. Instruct student to install a configuration switch.

CRITERION-REFERENCED MEASURE:

The student will disassemble printer, replace malfunctioning switch, reassemble printer and perform an operational check to verify that configuration is functioning.

PERFORMANCE GUIDE:

1. Power down printer to be serviced and remove AC power cord and peripheral cables.
2. Remove printer cover.
3. Remove configuration switch retaining screws.
4. Mark any wires or cables connected to the switch and remove them.
5. Remove configuration switch from printer.
6. Place configuration switch in place.
7. Reconnect wires or cables to the switch as marked.
8. Replace configuration switch retaining screws.
9. Set configuration switch according to system specifications.
10. Reconnect AC power cord and peripheral cable.
11. Power up system and perform print test to insure that printer operates with system.
TYPICAL LOCATION OF CONFIGURATION SWITCHES

- CDCC connector
- Option Connector (for tractor unit, cut sheet feeder unit)
- DIP switch SPEC 1
- DIP switch SPEC 2
- Option connector (for keyboard)
- RS-232C connector
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install configuration switch.

ENABLER  Disassemble printer, replace malfunctioning configuration switch and reassemble printer.

STUDENT'S NAME  ___________________________  DATE  ____________

EVALUATOR'S NAME  ___________________________  COURSE  ____________

TIME :  STARTED  ____________  COMPLETED  ____________  TOTAL  ____________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing configuration switch.

RECORD THIS INFORMATION:

MANUFACTURER:  ___________________________  MODEL:  ____________

SERIAL #:  ____________

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered down printer and disconnected AC power cord.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed printer cover.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed configuration retaining screws.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Marked wires and cables connected to the configuration switch before removing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed configuration switch from mount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Position new configuration switch on mount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reconnected lead wires and cable as marked.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced retaining screws.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reconnected AC power.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered up system and performed an operational check test.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #103

TASK: Install peripheral controls.

STANDARD OF PERFORMANCE OF TASK:

Peripheral control must provide control between the central processing unit and peripheral equipment.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Peripheral control
Tool kit

ENABLING OBJECTIVES:

1. Disconnect cables from peripheral controls, replace peripheral controls, and perform check on control unit.

*RESOURCES:

1. Maintenance/operation manuals for a control unit.
4. Checklist - Installing peripheral controls.

TEACHING ACTIVITIES:

1. Present lecture on control units. (*1 & 2)
2. Present lecture on disassembly and assembly methods. (*1 & 2)
3. Demonstrate disassembly and assembly methods.
4. Conduct class discussion on cable installation/ removal with different types of connectors. (*1, 2 & 3)
5. Present lecture on proper test procedures. (*1 & 2)
TEACHING ACTIVITIES: (cont.)

6. Demonstrate operational check test procedures.
7. Instruct student to install a peripheral cable.
   (*4)

CRITERION-REFERENCED MEASURE:

The student will remove and replace peripheral control, connect control unit to CPU and peripherals, and perform an operational check test.

PERFORMANCE GUIDE:

1. Power down system.
2. Disconnect cable connector retaining latch and remove peripheral cable between control and central processing unit.
3. Remove peripheral cable between control and peripheral equipment.
4. Remove peripheral control unit.
5. Replace peripheral control unit and reconnect peripheral cable between control and peripheral equipment.
6. Replace peripheral cable between control and central processing unit.
7. Relatch the peripheral connector retaining latches.
8. Power up system and check control unit for control of peripherals.
Install peripheral control between Printer, Drive, and Computer.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install peripheral controls.

ENABLER  Disconnect cables from peripheral controls,
replace peripheral control, and perform check on control unit.

STUDENT'S NAME ______________________ DATE __________

EVALUATOR'S NAME ____________________ COURSE ________

TIME :  STARTED _______ COMPLETED ________________

TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing peripheral controls.

RECORD THIS INFORMATION:

MANUFACTURER:_________________________MODEL:__________

SERIAL #:__________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Powered down system.  ________

- disconnected cable connection retaining latches.  ________

- Removed peripheral control cable.  ________

- Replaced peripheral control.  ________

- Reconnected peripheral control.  ________

- Reconnected retaining latches to peripheral cable connector.  ________

- Powered up system and conducted an operational check test on peripheral control.  ________
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #104

TASK: Install data communication adapter.

STANDARD OF PERFORMANCE OF TASK:

Data communication adapter must enable data communication equipment to operate in conjunction with system.

SOURCE OF STANDARD:

Writing task - Incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

System to be used:
Data communication equipment
Data communication adapter
Tool kit

ENABLING OBJECTIVES:

1. Install data communication adapter and perform operational check test.

RESOURCES:

1. Manufacturer's operating manual.
3. Checklist - Installing data communication adapter.

TEACHING ACTIVITIES:

1. Present lecture on purpose and operation of data communication system.
2. Present lecture on data communication adapter installation procedures.
3. Conduct demonstration on installing data communication adapter. (*1 & 2)
4. Present lecture on operational check for a data communication adapter. (*1 & 2)
5. Demonstrate operational check for a data communication adapter.
6. Instruct student to install a data communication adapter. (*3)
CRITERION-REFERRED MEASURE:

The student will install a data communication adapter, and conduct an operational check to insure that adapter operates in conjunction with the system.

PERFORMANCE GUIDE:

1. Power down system.
2. Determine type of adapter needed to connect data communication equipment to the system:
   A. Pin adapter.
   B. Card edge adapter.
   C. Jack/plug adapter.
3. Connect adapter to system and data communication equipment.
4. Power up system and test data communication equipment to insure that it is functional.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Install data communication adapter.

ENABLER Install data communication adapter and perform operational check test.

STUDENT'S NAME ______________________ DATE _____________

EVALUATOR'S NAME ____________________ COURSE _________

TIME: STARTED _______ COMPLETED _______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:
Use checklist to evaluate student performance when installing data communication adapter.

RECORD THIS INFORMATION:
MANUFACTURER: ______________________ MODEL: __________
SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

- The preparer
  - Powered down system. _____ _____
  - Determined type of adapter needed. _____ _____
  - Connected adapter to system. _____ _____
  - Powered system up. _____ _____
  - Performed an operational check test. _____ _____
  - Prepared data communication adapter to pass operational check test. _____ _____
DUTY: Servicing Computer Equipment.

PERFORMANCE OBJECTIVE #105

TASK: Install expansion memory.

STANDARD OF PERFORMANCE OF TASK:

System memory capabilities must be expanded and must pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.
Troubleshooting and Repairing Personal Computers.

CONDITIONS FOR PERFORMANCE OF TASK:

Expansion memory
Central processing unit
Tool kit
Schematic memory map
Integrated circuit chip remover
Integrated circuit chip inserter

ENABLING OBJECTIVES:

1. Disassemble unit install expansion memory, reassemble unit, and conduct an operational check test.
2. Identify memory chip location using schematic memory map.

RESOURCES:

2. Installation/maintenance/operation manuals.
4. Schematic memory map.
7. Checklist - Installing expansion units.

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TEACHING ACTIVITIES:

1. Present lecture on ROM, RAM memory systems. (*1,3 & 5)
2. Present lecture on types of memory expansion units in memory system. (*1,2,3,5 & 6)
3. Demonstrate types of memory expansion units.
4. Read and understand logic of schematic memory map. (*1 & 4)
5. Present lecture on interpreting schematic of memory map. (*1,2,3,4 & 5)
6. Conduct class discussion on proficiency of different types of memory. (*1 & 3)
7. Demonstrate interpreting memory map schematic. (*4)
8. Present lecture on safety procedures when working on the inside of unit. (*1,2,3 & 5)
9. Present lecture on installing expansion memory. (*1,2,3,4 & 5)
10. Demonstrate installing expansion memory.
11. Instruct student to install expansion memory. (*7)

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, remove and replace, or install memory unit, reassemble unit, and perform operational check test on memory system.

PERFORMANCE GUIDE:

1. Power down system; disconnect AC power cord and remove central processing unit cover.
2. Determine type of memory expansion to be made:
   A. ROM--Read only memory.
   B. RAM--Read access memory.
3. Determine design of memory expansion the system uses:
   A. Integrated circuit chip.
   B. Memory card.
   C. Cartridge.
4. Determine location for installing expansion memory using schematic memory map.
5. Install memory expansion into central processing unit.
   NOTE: Reconfigure switches to include added memory.
6. Replace cover.
7. Power up system and check central processing unit for available memory.
Memory Expansion Board

With RAM Chips

RAM or Memory Chip
Memory Expansion Board
With RAM Chips

RAM or Memory Chip
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #106

TASK: Install main memory.

STANDARD OF PERFORMANCE OF TASK:

Central processing unit memory capabilities must be able to load, manipulate and store information, and pass diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.
Troubleshooting and Repairing Personal Computers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Central processing unit to be serviced
RAM integrated circuit chips
ROM integrated circuit chips
Integrated circuit chip inserter
Integrated circuit chip remover
Tool kit

ENABLING OBJECTIVES:

1. Disassemble unit, remove and replace or install memory integrated circuits, and reassemble unit.
2. Student will identify chips as ROM or RAM chips.

RESOURCES:

7. Checklist - Installing main memory.
TEACHING ACTIVITIES:

1. Present lecture on test procedure for motherboard RAM and ROM memory. (*1,3,4 & 5)
2. Demonstrate test procedure for motherboard RAM and ROM memory.
3. Present lecture on troubleshooting of memory integrated circuit. (*1,2,3,4 & 5)
4. Conduct hands on demonstration on removing and replacing integrated circuits in a printed circuit board. (*1,2 & 3)
5. Present lecture on interchangeability of memory integrated circuits. (*3)
6. Demonstrate interchangeability of memory integrated circuits.
7. Present lecture on installing main memory integrated circuits. (*1,3,4 & 5)
8. Demonstrate installation of main memory integrated circuits.
9. Instruct student to install main memory integrated circuits. (*7)

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, locate, remove and replace malfunctioning IC or install upgrade memory IC's and reassemble unit.

PERFORMANCE GUIDE:

1. Power down system; disconnect AC power cord and remove cover.
2. Identify malfunctioning integrated circuit chip on motherboard.
3. Remove malfunctioning integrated circuit chip.
5. Insert replacement chip on motherboard.
6. Replace cover, connect AC power cord and power up system.
7. Run motherboard RAM and ROM tests to check if memory is functional.
MOUNTING IC IN SOCKET

(A) Insert one row of pins
(B) Insert other row of pins
(C) Press IC into position
I.C. CHIP
LOCATION OF PIN 1

Looking from the top of the I.C. Chip, pin 1 is to the left of the notch or groove in the end of the chip.
CHECKLIST

DUTY Servicing Computer Equipment

TASK Install main memory

ENABLER Disassemble unit, remove, replace or install memory IC's and reassemble unit

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE __________

TIME : STARTED _______ COMPLETED _______________ TOTAL _______________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing main memory.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Powered down system. __________ __________

- Identified malfunctioning or upgraded memory IC's. __________ __________

- Replaced malfunctioning memory IC. __________ __________

- Inserted replacement or upgraded IC on motherboard. __________ __________

- Reassembled CPU and reconnected AC power cord. __________ __________

- Conducted motherboard RAM and ROM operational test checks __________ __________
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #107

TASK: Install field type product line.

STANDARD OF PERFORMANCE OF TASK:
System must be upgraded to include most current manufacturing changes.

SOURCE OF STANDARD:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:
System to be serviced
Manufacturing field upgrade information
Field upgrade parts
Tool kit

ENABLING OBJECTIVES:
1. Interpret field upgrade information.
2. Prepare unit for acceptance of product.
3. Install field upgrade and check operation of upgrade.

RESOURCES:
1. Installation/operation/maintenance manuals.
2. Sample of field upgrade information.

TEACHING ACTIVITIES:
1. Present lecture from operation or installation manual on the upgrade product line to be installed. (*1 & 2)
2. Conduct hands on demonstration on installation of a field upgrade. (*1)
3. Present lecture on how to record upgrade information in the equipment history file. (*1 & 3)
4. Instruct student to interpret field upgrade information.
5. Instruct student to install a field upgrade. (*4)
CRITERION-REFERENCED MEASURE:

The student will install upgrade product and perform operational check. Identify type of upgrade and record it in equipment history log.

PERFORMANCE GUIDE:

1. Identify system to be upgraded.
2. Review manufacturing field upgrade information.
3. Perform system upgrade.
4. Record upgrade information in equipment history file.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Install field type product line.

ENABLER  install field upgrade and check operation of upgrade.

STUDENT'S NAME ____________________ DATE _________

EVALUATOR'S NAME ____________________ COURSE _______

TIME:
STARTED _______ COMPLETED __________
TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate student performance when installing field type product line.

RECORD THIS INFORMATION:

MANUFACTURER:_______________________ MODEL:_________

SERIAL #:________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Identified system upgraded. ________
- Obtained field upgrade information. ________
- Interpreted field upgrade information. ________
- Performed field upgrade. ________
- Performed operational check on field upgrade. ________
- Recorded field upgrade information. ________
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #108

TASK: Install remote terminals.

STANDARD OF PERFORMANCE OF TASK:
Remote terminal equipment must be operational in conjunction with the main central processing unit.

STANDARD OF PERFORMANCE:
Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:
Equipment to be installed
System layout
Tool kit

ENABLING OBJECTIVE:
1. Determine remote terminal equipment and install equipment into system.

RESOURCES:
1. Manufacturer's operator's manual.
5. Computer equipment catalog.

EACHING ACTIVITIES:
1. Present lecture on remote terminal equipment. (*3, 4, & 5)
2. Conduct hands-on demonstration at a remote terminal. (*2, 3, & 4)
3. Conduct class discussion on possible equipment combinations commonly found at a remote terminal.
4. Instruct student to determine and sketch a remote terminal layout based on a list of requirement provided by instructor. (*4)
TEACHING ACTIVITIES: (cont.)

5. Present lecture on remote terminal equipment installation procedures. (*1, 2 & 4)
6. Conduct question and answer session on procedures. (*2, 3 & 4)
7. Demonstrate remote terminal system installation.
8. Instruct student to install a remote terminal system. (*7)

CRITERION-REFERENCED MEASURE:

The student will determine remote terminal equipment to be installed, install the equipment in accordance with installation guide and perform operational test on installed equipment.

PERFORMANCE GUIDE:

1. Determine equipment needed for remote terminal:
   A. Display screen/monitor.
   B. Keyboard.
   C. Storage device.
   D. Card puncher.
   E. Card reader.
   F. Data communication device.
2. Set up remote terminal equipment and interface it with the main central processing unit.
3. Power up system and test run remote terminal equipment.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install remote terminals.

ENABLER  Determine remote terminal equipment and install equipment into system.

STUDENT'S NAME ___________________  DATE ________

EVALUATOR'S NAME ___________________  COURSE ________

TIME:  STARTED ______  COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate installation of remote terminals.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Identified needed remote terminal equipment.  ______  ______

- Created remote terminal layout.  ______  ______

- Assembled needed equipment and technical manuals.  ______  ______

- Consulted technical manuals for installation procedure.  ______  ______

- Installed all remote terminal equipment and interfaced it with main central processing unit.  ______  ______

- Powered up remote terminal system and conducted an operational check.  ______  ______

- Readied remote terminal system to pass operational check.  ______  ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #109

TASK: Install electrical wiring.

STANDARD OF PERFORMANCE OF TASK:

Electrical wiring must provide the amount of current, type of outlet, and safety precautions needed to operate the system; system will power up.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How TO Maintain And Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Electrical wire
Wire strippers
Electrician pliers
Dies (wire cutters)
Tool kit

ENABLING OBJECTIVE:

1. Install proper wiring for system connections.
2. Connect system and perform power up check.

RESOURCES:

RESOURCES: (cont.)


TEACHING ACTIVITIES:

1. Present lecture on the National Electrical Codes. (*1)
2. Conduct class discussion on electrical wiring design, protection, methods and materials. (*1, 2, 3, 4, 5, 6, 7 & 8)
3. Conduct class discussion on types of electrical equipment such as cords, cables, plugs, receptacles etc. (*1, 2 & 8)
4. Perform hands-on demonstration of wiring design, protection, methods and materials.
5. Present lecture on power requirements for computer equipment. (*1, 2, 7 & 9)
6. Conduct class discussion on voltage, voltage regulation and amperage utilized by computer equipment.
7. Conduct class discussion on power surges and power surge protection.
8. Present lecture on safety precautions when working with electricity.
10. Instruct student to design an electrical wiring diagram/layout based on mock computer system information provided by instructor.
11. Instruct student to perform a dry run wiring for the wiring diagram/layout they have designed. (*10)

CRITERION-REFERENCED MEASURE:

Student will be able to determine computer equipment's power requirements, design an electrical wiring diagram/layout, install the electrical wiring for the computer system and perform a power check before computer equipment is connect to the electrical wiring.

PERFORMANCE GUIDE:

1. Determine type of system to be used.
2. Determine system's electrical requirements:
   A. Voltage needed.
   B. Type of receptacles.
   C. Type of grounding.
PERFORMANCE GUIDE: (cont.)

D. Type of fuse panel.
E. Type of circuit.
F. Gauge of wire.

3. Determine other electrical needs:
   A. Lights.
   B. Heating and cooling.
   C. Ventilation.

4. Map or diagram the electrical system.

5. Run electrical wiring as determined by system's electrical needs.

6. Conduct voltage tests at each receptacle.

7. Connect system's AC power cords and power system.
TYPES OF WIRING

- No. 6: 55 Amperes
- No. 8: 40 Amperes
- No. 10: 30 Amperes
- No. 12: 20 Amperes
- No. 14: 15 Amperes
- No. 16: 10 Amperes
- No. 18: 7 Amperes

Plastic-wrapped Ground Wire
Neutral Wire
Plastic-sheathed Cable
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Install electrical wiring.

ENABLER  Determine electrical needs and instal: electrical wiring.

STUDENT'S NAME  _______ DATE  _______

EVALUATOR'S NAME  _______ COURSE  _______

TIME:  STARTED  _______ COMPLETED  _______

TOTAL  _______

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate installation of electrical wiring.

PERFORMANCE DETERMINANTS

The preparer

- Identified the type of system to be used.  _______ _______
- Identified the system's electrical requirements.  _______ _______
- Identified other electrical requirements.  _______ _______
- Made a map or diagram of the electrical system.  _______ _______
- Ran electrical wiring as indicated on map or diagram.  _______ _______
- Conducted voltage tests at all receptacles.  _______ _______
- Connected all power cables and conducted system power check.  _______ _______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #110

TASK: Install keys on keyboard.

STANDARD OF PERFORMANCE OF TASK:

Each key switch on keyboard must transmit its designated signal to the central processing unit.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Keyboard to be serviced
Replacement keys
Soldering tool
Solder sucker
Solder
Tool kit

ENABLING OBJECTIVE:

1. Disassemble unit and remove keyboard.
2. Determine key switch(es) to be replaced.
3. Replace key switches and reassemble unit.

RESOURCES:

3. Manufacturer's operating manual.
5. Manufacturer's service manual.
6. Checklist - Key installation.

TEACHING ACTIVITIES:

1. Present lecture on types of keyboards. (*1, 2, 3, 4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss stand alone on board keyboards.
3. Conduct question and answer session on keyboard for specific systems.
4. Present lecture on methods of keyswitch fastening.
   (*1, 2 & 5)
5. Discuss screw fastened, snap-on, and sealed (unremovable) keyswitches.
6. Demonstrate procedure for removing and replacing keyswitch.
7. Conduct seminar on proper soldering techniques.
8. Demonstrate procedure for desoldering, and soldering keyswitch connector pins.
9. Instruct student to practice proper soldering and desoldering procedures.
10. Instruct student to remove and replace a keyswitch on a keyboard.

CRITERION-REFERENCED MEASURE:

The student will determine type of keyswitch fastening, type of repair needed, remove and replace malfunctioning keyswitch, and perform checkout procedures to insure repair of malfunction.

PERFORMANCE GUIDE:

1. Determine type of keyswitch on keyboard to be serviced:
   A. Screw-on
   B. Snap-on
   C. Scaled (unremovable) switch
2. Identify malfunctioning key.
3. Remove malfunctioning keyswitch assembly:
   A. Screw fasten keyswitch:
      1. Turn keyboard over and locate keyswitch to be removed.
      2. Desolder the connector pins on the back of the keyboard.
         NOTE: Do not apply the soldering tool to the back of the keyboard for more than three seconds at a time or damage to the tracers could occur.
      3. Remove keyswitch retaining screw.
      4. Turn keyboard right-side up and pull upon key cap/cover to remove assembly.
   B. Snap-on keyswitch:
      1. Turn keyboard over and locate keyswitch to be removed.
      2. Desolder the contact pins on the back of the keyboard.
      3. Turn keyboard over and remove key cap/cover.
PERFORMANCE GUIDE: (cont.)

4. Pinch the two clips on the keyswitch together and pull upon the keyswitch assembly to remove.

4. Replace keyswitch assembly:
   A. Screw-on keyswitch:
      1. Place keyswitch assembly onto keyboard with contact pins through the holes.
      2. Hold keyswitch assembly with one hand and turn keyboard over.
      3. Replace keyswitch assembly. 
      4. Resolder contact pin to pad on back of keyboard.
      5. Check soldered joint to make sure that the hole has completely filled with solder and that solder is built up around pin.
   B. Snap-on keyswitch assembly:
      1. Thread the contact pins through the holes and snap the keyswitch assembly into place on the keyboard.
      2. Replace the key cap and turn keyboard over.
      3. Resolder contact pins to the pad on the back of the keyboard.
      4. Check the soldered joint to make sure that the holes are filled with solder and that the pins are covered.
      5. Test key for designated signal.
CHECKLIST

DUTY: Servicing Computer Equipment

TASK: Install keys on keyboard.

ENABLER: Remove and replace keyswitch.

STUDENT'S NAME: __________________________ DATE: __________

EVALUATOR'S NAME: __________________________ COURSE: ________

TIME: STARTED: __________ COMPLETED: __________

TOTAL: __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate removing and replacing keyswitch.

PERFORMANCE DETERMINANTS

The preparer
- Identified type of keyswitch. __________________________
- Identified malfunctioning keyswitch. __________________________
- Made keyboard accessible. __________________________
- Desoldered keyswitch connector pins. __________________________
- Removed malfunctioning keyswitch. __________________________
- Put replacement keyswitch in place. __________________________
- Aligned and resolded keyswitch connector pins. __________________________
- Checked soldered joints to insure that the holes were filled and pins were covered. __________________________
- Checked replacement key for designated signal. __________________________
- Returned keyboard to original position. __________________________

YES NO
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #111

TASK: Repair keyboard.

STANDARD OF PERFORMANCE OF TASK:

Keyboard must transmit signals to the central processing unit.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Keyboard to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Disassemble unit, remove keyboard, remove and replace malfunctioning part, reassemble keyboard and unit.
2. Perform checklist to insure proper outputs.

RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on keyboard operations. (*1, 2, 3, 4 & 5)
2. Conduct question and answer session on keyboard operation.
TEACHING ACTIVITIES: (cont.)

3. Present lecture on keyswitch assembly.
4. Discuss the repairable parts of a keyboard.
5. Provide students with an expanded drawing of the different parts of a keyboard and a schematic of keyboard.
6. Discuss repairing procedures for keyswitch assemblies, pad tracers, message wires, decoder chips, cables and cable connectors.
7. Discuss sources for replacement parts.
8. Perform hands on demonstration for replacement of malfunctioning unit parts.
9. Present lecture on electrical connections to keyboard.
10. Assign student a malfunctioning keyboard, a keyboard schematic and a parts catalog.
11. Instruct student to identify the malfunctioning part, repair or replace malfunctioning part and test keyboard to insure repair was successful.

CRITERION-REFERENCED MEASURE:

The student will identify malfunctioning part, repair or remove and place part and perform an operational check on keyboard to insure that it functions properly. Keyboard must pass operational check without error.

PERFORMANCE GUIDE:

1. Obtain keyboard to be repaired.
2. Identify malfunctioning or broken part:
   A. Keyswitch assembly:
     1. Key cap/cover.
     2. Key contents.
     3. Key base.
     4. Key spring.
     5. Contact pins.
   B. Pad tracers.
   C. Message wires.
   D. Decoder chips.
   E. Cables and cable connectors.
3. Replace malfunctioning part with new replacement part.
4. Test keyboard for correct signal output.
Keyswitches are numbered on the back of the keyboard as shown above.

Support key top with fingers here

Pry up carefully

REMOVING KEY CAPS

Key cap

Key contacts

Key base

Cleaning key contacts

REMvING KEYSWITCH
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair keyboard.

ENABLER  Remove, repair and replace keyboard.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME:  STARTED __________  COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the checklist to evaluate student performance when removing, repairing, and replacing a keyboard.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS      YES      NO

The preparer

- Obtained malfunctioning unit.      ______  ______

- Disassembled unit so keyboard was accessible.      ______  ______

- Identified malfunctioning part.      ______  ______

- Removed the malfunctioning part.      ______  ______

- Repaired malfunctioning part if possible.      ______  ______

- Obtained replacement part if malfunctioning part was non-repairable.      ______  ______

- Installed repaired or replacement part in keyboard.      ______  ______

- Replaced the repaired keyboard in the unit and the reassembled unit.      ______  ______

- Performed operational check on the keyboard.      ______  ______

- Readied the keyboard to pass the operational check without errors.      ______  ______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #112

TASK: Repair motherboard.

STANDARD OF PERFORMANCE OF TASK:

Central processing unit must load and store data/information.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Motherboard to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify malfunctioning or broken part, disassemble unit, remove and replace malfunctioning part, and perform diagnostic check for proper function.
2. Identify internal parts of motherboard.

RESOURCES:

5. Manufacturer's service manual.
7. Block diagram of motherboard.

TEACHING ACTIVITIES:

1. Present lecture on operations and location of motherboard. (*1,2,3,4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss components of a motherboard.
3. Conduct question and answer session on motherboard.
4. Provide student with an exploded diagram and schematic of the motherboard. (§6 & 9)
5. Discuss repair procedures for motherboard.
6. Perform hands on demonstration on troubleshooting and repairing of the motherboard.
7. Present lecture on soldering and component replacement techniques. (§1, 2, 3, 4 & 5)
8. Demonstrate soldering and component replacement.
9. Present lecture on component operational checks. (§1, 3, 4, & 5)
10. Assign student a malfunctioning motherboard, schematic, and parts catalog.
11. Instruct student to troubleshoot the motherboard, isolate and repair or replace malfunctioning part and perform an operational check. (§7)

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, repair or remove and replace malfunctioning part, reassemble unit and perform operational check. The motherboard must pass operational check without error.

PERFORMANCE GUIDE:

1. Obtain motherboard to be repaired.
2. Identify malfunctioning or broken part:
   A. Resistors.
   B. Capacitors.
   C. Transistors.
   D. Integrated circuits.
   E. Diodes.
   F. Circuit boards/cards.
   G. Traces.
   H. Cables and cable connector.
   I. Rectifiers.
   J. Transformers.
   K. Switches.
3. Replace malfunctioning or broken part with a new replacement part.
4. Perform motherboard diagnostic test to check if motherboard functioning correctly.
MOTHERBOARD COMPONENT IDENTIFICATION

Card Edge Connector

Interface Plug

Transformer

Fuse

Card Edge Socket

Switches

Encoder Card Socket

Integrated Circuit Chip

Resistor

Diode

Capacitor

Transistor

Solder Trace
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Repair motherboard.

ENABLER  Troubleshoot and repair motherboard.

STUDENT'S NAME  __________________________ DATE __________

EVALUATOR'S NAME  __________________________ COURSE __________

TIME:  STARTED ________ COMPLETED ________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate troubleshooting and repairing the motherboard.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained malfunctioning unit.  __  __

- Dissassembled unit so that the motherboard was accessible.  __  __

- Identified and located malfunctioning component on the motherboard.  __  __

- Removed and repaired the malfunctioning component if possible.  __  __

- Identified replacement part if the malfunctioning part was non-repairable.  __  __

- Installed the repaired or new part on the motherboard.  __  __

- Returned the motherboard to its original position and reassembled the unit.  __  __

- Performed an operational check.  __  __

- Readied the unit to pass the operational check without error.  __  __

509577
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #113

TASK: Repair analog board.

STANDARD OF PERFORMANCE OF TASK:
Analog board must convert digital outputs into analog values.

SOURCE OF STANDARD:
Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:
Analog board to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:
1. Identify malfunctioning or broken part, disassemble unit remove and replace malfunctioning part and perform diagnostic check for proper function.
2. Identify internal parts of analog board.

RESOURCES:
5. Manufacturer's service manual.
7. Block diagram of analog board.

TEACHING ACTIVITIES:
1. Present lecture on the operation and location of analog board. (*1, 2, 3, 4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss components of an analog board.
3. Conduct question and answer session on analog board.
4. Provide student with an exploded diagram and schematic of the analog board. (*6 & 9)
5. Discuss repair procedures for analog board.
6. Perform hands on demonstration on troubleshooting and repairing of the analog board.
7. Present lecture on soldering and component replacement techniques. (*1,2,3,4 & 5)
8. Demonstrate soldering and component replacement.
9. Present lecture on component operational checks. (*1,3,4 & 5)
10. Assign student a malfunctioning analog board, schematic, and parts catalog.
11. Instruct student to troubleshoot the motherboard, isolate and repair or replace malfunctioning part and perform an operational check. (*7)

CRITERION-REFERENCED MEASURE:

The student will disassemble unit, repair or replace malfunctioning part, reassemble unit and perform an operational check. The analog board must pass operational check without error.

PERFORMANCE GUIDE:

1. Obtain analog board to be repaired.
2. Identify malfunctioning or broken part:
   A. Resistors.
   B. Capacitors.
   C. Buffers.
   D. Integrated circuits.
   E. Converters.
   F. Circuit boards/cards.
   G. Traces.
   H. Soldered connections.
   I. Cable and cable connectors.
   J. Analog multiplexers.
   K. Rf modulator.
   L. PIA (Peripheral Interface Adapter).
   M. VDG (Video Display Adapter).
3. Replace malfunctioning or broken part with a new replacement part.
4. Perform diagnostic tests to determine if the analog board is functioning.
CHECKLIST

DUTY  Servicing Computer Equipment

TASK  Repair analog board.

ENABLER  Troubleshoot and repair analog board.

STUDENT'S NAME  DATE

EVALUATOR'S NAME  COURSE

TIME :  STARTED  COMPLETED

TOTAL

DIRECTIONS TO THE EVALUATOR:

Use the checklist to evaluate troubleshooting and repairing the analog board.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained the malfunctioning unit.  

- Disassembled the unit so that the analog board was accessible.  

- Identified and located the malfunctioning component on the analog board.  

- Removed and repaired the malfunctioning component and if possible.  

- Identified replacement part if malfunctioning part was non-repairable.  

- Installed the repaired or new part on the analog board.  

- Returned analog board to its original position and reassembled unit.  

- Performed an operational check.  

- Readied the unit pass the operational check without error.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #114

TASK: Repair disk drive assembly.

STANDARD OF PERFORMANCE OF TASK:

Disk drive must be functional; drive will read, write and verify.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk drive to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Disassemble disk drive, replace malfunctioning parts, and reassemble drive.
2. Identify internal components of drive.

RESOURCES:

7. Schematic of disk drive.
8. Visual aid - Disk drive assembly, see performance objective 76.
10. Worksheet - Disk drive assembly component identification.

TEACHING ACTIVITIES:

1. Present lecture on operation of disk drive.
   (*1,2,3,4,5 & 6)
TEACHING ACTIVITIES: (cont.)

2. Present lecture on internal components of disk drive. (1,2 & 3)
3. Discuss different components making up drive unit.
4. Conduct class discussion on internal workings of disk drive.
5. Identify tools necessary to disassemble, repair and reassemble unit.
6. Present lecture on component repair procedures. (1,2,3,4 & 5)
7. Demonstrate disk drive component repair procedures.
8. Assign student a malfunctioning disk drive unit, a schematic and a parts catalog.
9. Instruct student to troubleshoot and repair the drive unit.

CRITERION-REFERENCED MEASURE:

The student will disassemble and troubleshoot disk drive, find malfunctioning part, remove and replace part, reassemble disk drive, and perform operational check. Drive unit must be able to read, write and verify disk.

PERFORMANCE GUIDE:

1. Obtain disk drive to be serviced.
2. Identify malfunctioning part:
   A. Head stepper motor.
   B. Head load arm.
   C. Head load pad.
   D. Head.
   E. Head carriage.
   F. Index sector light source.
   G. Write-protect switch.
   H. Activity indicator light.
   I. Index sector pickup.
   J. Clamping hub.
   K. Spindle.
   L. Head carriage rails.
   M. Drive motor.
   N. Disk ejector mechanism.
3. Replace malfunctioning part with a new part.
4. Test drive to insure it will read/write and verify.

515 584
TITLE: DISK DRIVE ASSEMBLY

DIRECTIONS: Fill in the component name indicated by the arrow.

13. ____________
14. ____________
12. ____________
11. ____________
1. ____________
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________
8. ____________
9. ____________
10. ____________
STUDENT WORKSHEET ANSWERS

1. Head carriage
2. Index sector light source
3. Write-protect switch
4. Activity indicator
5. Index sector pickup
6. Clamping hub
7. Spindle
8. Disk in position
9. Head carriage rails
10. Drive motor
11. Head stepper motor
12. Head load arm
13. Head load pad
14. Head
CHECKLIST

DUTY  Servicing Computer Equipment ________________________

TASK  Repair disk drive assembly. ________________________

ENABLER  Troubleshoot and repair disk drive assembly.

STUDENT'S NAME ________________________ DATE ______

EVALUATOR'S NAME ________________________ COURSE ______

TIME :  STARTED ______ COMPLETED ________________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use checklist to evaluate troubleshooting and repairing disk drive assembly.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained the faulty disk drive unit. ______ ______

- Assembled the drive unit. ______ ______

- Isolated the malfunctioning component. ______ ______

- Removed and repaired malfunctioning component if possible. ______ ______

- Identified replacement part if malfunctioning part was non-repairable. ______ ______

- Installed repaired or replacement part in the drive unit. ______ ______

- Reassembled drive unit. ______ ______

- Conducted an operational check on the disk drive unit. ______ ______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #115

TASK: Repair logic assembly.

STANDARD OF PERFORMANCE OF TASK:

Logic assembly must interpret and manipulate digital logic signals being processed by the central processing unit.

SOURCE OF STANDARD:

Writing team of incumbent workers. Troubleshooting and Repairing Personal Computers.

CONDITIONS FOR PERFORMANCE OF TASK:

Logic assembly to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

Troubleshoot logic assembly for malfunctioning parts and perform diagnostic tests for operation of logic assembly.

RESOURCES:

5. Schematic of logic assembly.
7. Checklist - Repair logic system.

TEACHING ACTIVITIES:

1. Present lecture on troubleshooting components. (*1, 2, 3 & 4)
2. Discuss the components in a logic assembly.
3. Perform hands on demonstration-troubleshooting components in logic system.
TEACHING ACTIVITIES: (cont.)

4. Present lecture or diagnostic checks. (*1,2,3,4 & 5)
5. Conduct question/answer session on troubleshooting.
6. Present lecture on current flow in logic assembly. (*5)
7. Present lecture on logic assembly repair procedures. (*1,2,3,4 & 5)
8. Demonstrate logic assembly repair procedures.
9. Instruct students to repair a logic assembly.

CRITERION-REFERENCED MEASURE:

Student will troubleshoot logic assembly, remove and replace malfunctioning part(s) and perform diagnostic test for proper operations.

PERFORMANCE GUIDE:

1. Obtain logic assembly to be serviced.
2. Identify malfunctioning or broken part:
   A. Peripheral card sockets.
   B. Peripheral equipment parts.
   C. Speaker.
   D. Cables and cable connectors.
   E. Encoder.
   F. Integrated circuit chips.
   G. Integrated circuit chip sockets.
   H. Tracers.
   I. Capacitors.
   J. Transistors.
   K. Diodes.
   L. Resistors.
3. Replace malfunctioning or broken part with a new replacement part.
4. Perform diagnostic tests to check if logic assembly is functional.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair logic assembly.

ENABLER  Logic assembly must interpret and manipulate digital logic signals being processed by the central processing unit.

STUDENT'S NAME  

DATE  

EVALUATOR'S NAME  

COURSE  

TIME:  

STARTED  

COMPLETED  

TOTAL  

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing logic assembly.

RECORD THIS INFORMATION:

MANUFACTURER:  

MODEL:  

SERIAL #:  

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained faulty logic assembly.  

- Identified malfunctioning or broken parts.  

- Removed and repaired malfunctioning parts.  

- Conducted a operational check on the logic system.  

- Performed a diagnostic test to determine if logic assembly is functional.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #116

TASK: Repair on-off switch.

STANDARD OF PERFORMANCE OF TASK:

Off-on Switch must be operational; equipment will power up when switch is turned on.

SOURCE OF STANDARD:


CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify type of switch.
2. Identify malfunctioning component(s) and repair or replace it.

RESOURCES:

5. Manufacturer's operators manual.
7. Manufacturer's service manual.
8. Visual Aid - Types of switches, see performance objective 80.
TEACHING ACTIVITIES:

1. Present a lecture on the different types of switches. (*1, 2, 3, 4 & 5)
2. Discuss the components of a switch.
3. Discuss troubleshooting procedures for a switch.
4. Demonstrate troubleshooting procedures for a switch.
5. Present a lecture on repair procedures for a switch. (*1, 2, 3, 4, 5, 6 & 7)
6. Discuss repair procedures for a switch.
7. Demonstrate repair procedures for a switch.
8. Demonstrate testing procedures for a switch.
9. Instruct student to repair a switch and perform an optional check.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot a switch, determine malfunctioning component, repair the switch and conduct an operational check. Equipment must power up when the switch is turned on.

PERFORMANCE GUIDE:

1. Obtain equipment to be serviced.
2. Identify malfunctioning part:
   A. Button switch.
   B. Lever switch.
   C. Flip switch.
   D. Contacts.
   E. Electronic connections.
3. Replace malfunctioning part with new part.
4. Test off-on switch to insure equipment will power up.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair on-off switch.

ENABLER  Off-on switch must be operational;
equipment will power up when switch is turned.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ________________________ COURSE ______

TIME : STARTED _______ COMPLETED ______________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing on-off switch.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ______

SERIAL #: _______

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained faulty equipment. ______ ______

- Identified malfunctioning parts. ______ ______

- Replaced malfunctioning part with new part. ______ ______

- Checked on-off switch to insure equipment will power up. ______ ______
DUTY:  Servicing Computer Equipment

PERFORMANCE OBJECTIVE #117

TASK:  Repair mechanical assembly.

STANDARD OF PERFORMANCE OF TASK:

Mechanical assembly must provide peripheral equipment with mechanical power/motion.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Mechanical assembly to be serviced
Service manual (manufacturers specifications)
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components of mechanical assembly.
2. Determine if mechanical assembly can be repaired.
3. Remove and replace malfunctioning component.

RESOURCES:

3. Manufacturer's operator's manual
5. Manufacturer's service manual.
7. Checklist - Repairing mechanical assembly.

TEACHING ACTIVITIES:

1. Present lecture on types and uses of mechanical assemblies. (*2)
2. Discuss components in a mechanical assembly.
TEACHING ACTIVITIES: (cont.)

3. Present a lecture on troubleshooting and repairing a mechanical assembly. (*1, 2, 3, 4, 5)
4. Discuss troubleshooting and repairing procedures for a mechanical assembly.
5. Demonstrate troubleshooting and repairing procedures for a mechanical assembly.
6. Discuss and demonstrate operational testing procedures for mechanical assemblies.
7. Instruct student to troubleshoot, repair and check a mechanical assembly.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot, repair and perform an operational check on the mechanical assembly. The mechanical assembly must provide mechanical power/motion to the equipment.

PERFORMANCE GUIDE:

1. Obtain mechanical assembly to be repaired.
2. Identify worn, bent or broken part:
   A. Gears.
   B. Cams.
   C. Sliding parts.
   D. Bearings.
   E. Bushings.
   F. Springs.
   G. Shafts.
   H. Rollers.
   I. Pulleys.
   J. Levers.
3. Replace worn, bent or broken part with a new replacement part.
4. Adjust, align, and lubricate new part according to manufacturer's specifications.
5. Test run peripheral equipment and check that all mechanical parts are aligned and functional.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Repair mechanical assembly.

ENABLER Mechanical assembly must provide peripheral equipment with mechanical power/motion.

STUDENT'S NAME __________________________ DATE ________

EVALUATOR'S NAME _______________ COURSE ________

TIME: STARTED ________ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing mechanical assembly.

RECORD THIS INFORMATION:

MANUFACTURER: ________________ MODEL: ____________

SERIAL #: __________

PERFORMANCE DETERMINANTS

The preparer

- Obtained faulty mechanical assembly. _____ _____
- Identified worn part. _____ _____
- Identified bent part. _____ _____
- Identified broken part. _____ _____
- Replaced worn part. _____ _____
- Replaced bent part. _____ _____
- Replaced broken part. _____ _____
- Adjusted, aligned and lubricated new parts. _____ _____
- Check that all mechanical parts are aligned and functional. _____ _____
- Test run peripheral equipment. _____ _____

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GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #118

TASK: Repair printed circuit board.

STANDARD OF PERFORMANCE OF TASK:

Printed circuit board must receive, interpret, and manipulate data signals sent from the central processing unit to the peripheral device.

SOURCE OF STANDARD:
Writing team of incumbent workers.
Troubleshooting and Repairing Personal Computers.

CONDITIONS FOR PERFORMANCE OF TASK:
Printed circuit board to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components on a printed circuit board.
2. Troubleshoot, repair and check a printed circuit board

RESOURCES:
RESOURCES: (cont.)

7. Manufacturer's operational manual.
10. Visual Aid - Printed circuit board.

TEACHING ACTIVITIES:

1. Present a lecture on components of a printed circuit board. (*1, 2, 7, 8 & 9)
2. Discuss identifying and troubleshooting a component on a printed circuit board.
3. Present a lecture on the functions and operation of components. (*2, 3, 4, 5 & 6)
4. Discuss different components, what their main function is and how they operate.
5. Present a lecture on repair procedures for a printed circuit board. (*1, 2, 5, 6, 7, 8 & 9)
6. Discuss how to determine if board should be repaired or replaced.
7. Discuss and demonstrate safety precautions for working on printed circuit boards.
8. Demonstrate repair procedures for a printed circuit board.
9. Discuss and demonstrate how to perform an operational check on a printed circuit board.
10. Instruct student to troubleshoot, repair and check a printed circuit board.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot, repair or replace and conduct an operational check on a printed circuit board. The circuit board must pass operational check without error.

PERFORMANCE GUIDE:

1. Obtain printed circuit board to be repaired.
2. Identify malfunctioning or broken part/component:
   A. Encoder boards/cards.
   B. Encoder sockets.
   C. Cable and cable connectors.
   D. Integrated circuit chips.
   E. Resistors.
   F. Capacitors.
   G. Diodes.
   H. Traces.
   I. Soldered electrical sockets.
   J. Card edge connectors.
3. Replace malfunctioning or broken part or component with a new replacement part or component.
4. Test run peripheral equipment to check if printed circuit board is functional.
DUTY  Servicing Computer Equipment.

TASK  Repair printed circuit board.

ENABLER  Printed circuit board must receive, interpret, and manipulate data signals sent from the central processing unit to the peripheral device.

STUDENT'S NAME  ___________________________  DATE  __________

EVALUATOR'S NAME  ___________________________  COURSE  ________

TIME :  STARTED  ________  COMPLETED  ______________

TOTAL  __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing printed circuit board.

RECORD THIS INFORMATION:

MANUFACTURER:  ___________________________  MODEL:  __________

SERIAL #:  __________

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained faulty printed circuit board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified malfunctioning component.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced malfunctioning component with new component.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Check if printed circuit board is functional.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Test run peripheral equipment.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #119

TASK: Repair drive motor.

STANDARD OF PERFORMANCE OF TASK:

Drive motor must operate without binding or overheating.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components of a drive motor.
2. Determine if motor should be repaired or replaced.

RESOURCES:

5. Manufacturer's service manual.
7. Checklist - Drive motor repair.

TEACHING ACTIVITIES:

1. Present lecture on the function and operation of a drive motor. (*2 & 3)
2. Discuss the components of a drive motor.
3. Present a lecture on the repair procedures for a drive motor. (*1,3,4 & 5)
TEACHING ACTIVITIES: (cont.)

4. Discuss and demonstrate safety procedures for working with electrical motors.
5. Discuss and demonstrate how to determine if a drive motor should be repaired or replaced.
6. Discuss and demonstrate repair procedures for a drive motor.
7. Discuss and demonstrate how to perform an operational check on a drive motor.
8. Instruct student to repair a drive motor.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot, repair or replace and conduct an operational check on a drive motor. The drive motor must run at the correct speed and operate without binding or overheating.

PERFORMANCE GUIDE:

1. Obtain equipment to be serviced.
2. Identify malfunctioning part:
   A. Motor windings/wrappings.
   B. Motor mounts.
   C. Brushes.
   D. Motor shaft.
   E. Electrical connections.
   F. Wiring.
3. Replace malfunctioning part with new part.
4. Run motor to verify that it does not bind or overheat.
DRIVE MOTOR COMPONENTS

Motor Windings

Case

Motor Shaft

Metal Plates
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Repair drive motor.

ENABLER Drive motor must operate without binding or overheating.

STUDENT'S NAME _______________________________ DATE ________

EVALUATOR'S NAME _______________________________ COURSE ________

TIME: STARTED _______ COMPLETED __________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing drive motor.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ___________

SERIAL #: ___________

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained faulty equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested motor windings/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wrappings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested motor mounts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested brushes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested motor shaft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested electrical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>connections.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested wiring.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced malfunctioning part with new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>part.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Test run motor to verify that it does</td>
<td></td>
<td></td>
</tr>
<tr>
<td>not bind or overheat.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #120

TASK: Repair carriage assembly.

STANDARD OF PERFORMANCE OF TASK:

Printer carriage must move back and forth without sticking or jamming.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Service manual (manufacturer specifications).
Printer to be serviced.
Replacement parts.
Tool kit.

ENABLING OBJECTIVE:

1. Identify the components in a carriage assembly.
2. Determine if carriage assembly should be repaired or replace.

RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on the function of a carriage assembly and how it operates. (*1,2,3,4,5)
TEACHING ACTIVITIES: (cont.)

2. Discuss and demonstrate the different components of a carriage assembly.
3. Present a lecture on repair procedures for a carriage assembly.
4. Discuss and demonstrate safety consideration when repairing a carriage assembly.
5. Discuss and demonstrate repair procedure for a carriage assembly.
6. Discuss and demonstrate performing an operational check on a carriage assembly.
7. Assign the student a carriage assembly with numbered components and instruct the student to identify the components and determine if they need repair.
8. Instruct student to repair a carriage assembly and perform an operational check.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot, repair and conduct an operational check on a carriage assembly. The carriage must operate without sticking or jamming.

PERFORMANCE GUIDE:

1. Obtain printer to be serviced.
2. Identify malfunctioning part:
   A. Carriage support rails.
   B. Carriage.
   C. Pulleys.
   D. Right and left tab carriage-stop sensor.
   E. Cables.
   F. Stepper motor.
   G. Support rails wheels.
   H. Helical gears.
3. Replace malfunctioning part and lubricate according to manufacturer specifications.
4. Move carriage back and forth to insure that it moves freely.
DUTY  Servicing Computer Equipment.

TASK  Repair carriage assembly.

ENABLE  Printer carriage must move back and forth without sticking or jamming.

STUDENT'S NAME  ___________  DATE  ________

EVALUATOR'S NAME  ________________  COURSE  ________

TIME :  STARTED  ___________  COMPLETED  ________________

TOTAL  ___________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing carriage assembly.

RECORD THIS INFORMATION:

MANUFACTURER:  ________________  MODEL:  ___________

SERIAL #:  ___________

PERFORMANCE DETERMINANTS  YES  NO

- Obtained faulty printer.  ______  ______

- Identified malfunctioning part.  ______  ______

- Replaced malfunctioning part.  ______  ______

- Lubricated part according to manufacturer specifications.  ______  ______

- Checked carriage to insure that it moves freely.  ______  ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #121

TASK: Repair paper feed assembly.

STANDARD OF PERFORMANCE OF TASK:

Printer paper assembly must be functional; paper must feed through without bending, tearing or folding.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Service manual (manufacturer specifications)
Printer to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify the components in a paper feed assembly.
2. Determine if paper feed assembly should be repaired or replaced.

*RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on the function of a paper feed assembly and how it operates. (*1, 2, 3, 4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss and demonstrate the different components of a paper feed assembly.
3. Present a lecture on repair procedures for a paper feed assembly.
4. Discuss and demonstrate safety considerations when repairing a paper feed assembly.
5. Discuss and demonstrate repair procedures for a paper feed assembly.
6. Discuss and demonstrate performing an operational check on a paper feed assembly.
7. Assign the student a paper feed assembly with numbered components and instruct the student to identify the components and determine if they need repair.
8. Instruct student to repair a paper feed assembly and perform an operational check.

CRITERION-REFERENCED MEASURE:

The student will repair a paper feed assembly and conduct an operational check. The paper feed assembly must operate without tearing, bending, or folding the paper.

PERFORMANCE GUIDE:

1. Obtain printer to be serviced.
2. Identify malfunctioning part:
   A. Tractor-feed assembly:
      1. Platen.
      2. Platen drive gear.
      3. Flexible belt with drive pins.
      4. Tractor drive wheel.
      5. Square drive shaft.
      6. Tractor drive gear.
      7. Idler gear.
   B. Friction feed assembly:
      1. Platen drive gear.
      2. Spring-loaded pressure rollers.
      3. Platen.
      4. Drive gear.
      5. Stepper motor.
3. Replace malfunctioning part with new part and adjust and lubricate according to manufacturer specifications.
4. Load paper into printer and check to make sure paper feeds through without bending, folding or tearing.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair paper feed assembly.

ENABLER  Printer paper assembly must be functional:
          paper must feed through without bending,
          tearing or folding.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME _____________________ COURSE ________

TIME:  STARTED _______ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing paper feed assembly.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: __________

SERIAL #: ________

PERFORMANCE DETERMINANTS

YES  NO

The preparer

- Obtained malfunctioning printer.  ______ ______

- Identified malfunctioning part.  ______ ______

- Replaced malfunctioning part.  ______ ______

- Adjust and lubricated according to manufacturer specifications.  ______ ______

- Passed operational check on loading paper without error.  ______ ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #122

TASK: Repair circuit/language card.

STANDARD OF PERFORMANCE OF TASK:

Circuit card must allow interfacing between central processing unit and peripheral unit. Language card must allow central processing unit to use different programming languages such as Pascal, COBOL and Fortran; passes diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Circuit/language card to be serviced Replacement parts/component Tool kit

ENABLING OBJECTIVE:

1. Identify components on a circuit/language card.
2. Determine if circuit/language card should be repaired or replaced.

*RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on components of a circuit/language card. (*1, 2, 3, 4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss identifying and troubleshooting a component on a printed circuit board.
3. Present a lecture on the functions and operations of circuit/language card components.
4. Discuss different components, what their main function is and how they operate.
5. Present a lecture on repair procedures for a circuit/language card. (*1,2,3,4 & 5)
6. Discuss how to determine if board should be repaired or replaced.
7. Discuss and demonstrate safety precautions for working on circuit/language cards.
9. Discuss and demonstrate how to perform an operational check on a circuit/language cards.
10. Instruct student to troubleshoot, repair and check a circuit/language card.

CRITERION-REFERENCED MEASURE:

The student will repair a circuit/language card. The circuit/language must pass diagnostic test without errors.

PERFORMANCE GUIDE:

1. Obtain circuit/language card to be repaired.
2. Identify malfunctioning part or component:
   A. Integrated circuit chip.
   B. Capacitor.
   C. Resistor.
   D. Diode.
   E. Tracer.
   F. Cable and cable connectors.
3. Replace malfunctioning part/component with new replacement part/component.
4. Test run peripheral equipment to determine if circuit card is functioning. Perform diagnostic test to check if language card is functioning.
## CHECKLIST

**DUTY** Servicing Computer Equipment.

**TASK** Repair circuit/language card.

**ENABLER** Circuit card must allow interfacing between central processing unit and peripheral unit. Language card must allow central processing unit to use different programming languages such as Pascal, COBOL and Fortran; passes diagnostic test without error.

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained malfunctioning circuit/language card.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified malfunctioning part/component.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced malfunctioning part/component with new part/component.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Test run peripheral equipment to determine if circuit board is functioning.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Performed diagnostic test to check if language card is functioning.</td>
<td></td>
<td></td>
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</tbody>
</table>

STUDENT'S NAME __________________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME: STARTED __________ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing circuit/language card.

RECORD THIS INFORMATION:

MANUFACTURER:_________________________ MODEL:________________________

SERIAL #:__________
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #123

TASK: Repair tape transport assembly.

STANDARD OF PERFORMANCE OF TASK:

Tape must feed through tape transport assembly without stretching, binding or tangling.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.
Handbook Of Computer Maintenance and Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Tape player/recorder
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components in a tape transport assembly.
2. Determine if tape transport assembly should be repaired or replaced.

RESOURCES:

5. Manufacturer's technical reference.
8. Worksheet - Tape transport assembly component identification.
TEACHING ACTIVITIES:

1. Present lecture on function and location of tape transport assembly. (*1,2,3,4,5 & 6)
2. Discuss and demonstrate the components in a tape transport assembly.
3. Present a lecture on how to repair a tape transport assembly. (*1,2,3,4,5 & 6)
4. Discuss and demonstrate how to determine if a tape transport system should be repaired or replaced.
5. Discuss safety precautions to observe when working on a tape transport assembly.
6. Discuss and demonstrate tape transport assembly repair procedures.
7. Assign student a tape transport assembly component worksheet.
8. Instruct student to identify tape transport assembly components on the assigned worksheet.
9. Instruct student to repair a tape transport assembly and conduct a operational check.

CRITERION-REFERENCED MEASURE:

The student will repair a tape transport assembly and perform a operational check to insure that the assembly transports tape without stretching, bending or tangling.

PERFORMANCE GUIDE:

1. Obtain tape player/recorder to be serviced.
2. Identify malfunctioning part:
   A. Supply or take up spindle.
   B. Erase head.
   C. Record/playback head.
   D. Pinch roller.
   E. Capstan flywheel.
3. Replace malfunctioning part new part.
4. Run a tape to check if tape passes through transport system without stretching, binding or tangling.
TAPE TRANSPORT MECHANICAL COMPONENTS
INTERNAL VIEW

Front View

Rewind Drive Gear
Forward Drive Gear
Stepper Motor
Take up Spindle
Counter Drive Belt
Capstan
Power Indicator Light
Read/Write Head
Pinch Roller
Supply Spindle
Erase Head

Rewind Drive Gear Pulley
Forward Drive Gear Pulley
Counter Drive Belt
Drive Belt
Stepper Motor
WORKSHEET

TITLE: Tape Transport Mechanical Components - Internal View

DIRECTIONS: Fill in the component name indicated by the arrow.

Front View

1. ______________________  16. ______________________
2. ______________________  15. ______________________
3. ______________________  14. ______________________
4. ______________________  13. ______________________
5. ______________________  12. ______________________
6. ______________________  11. ______________________
7. ______________________  10. ______________________
8. ______________________  9. ______________________

Back View
STUDENT WORKSHEET ANSWERS

1. Rewind gear
2. Supply spindle
3. Erase head
4. Read/write head
5. Rewind drive gear pulley
6. Forward drive gear pulley
7. Drive belt
8. Counter drive belt
9. Stepper motor
10. Pinch roller
11. Power indicator light
12. Capstan
13. Counter drive belt
14. Take up spindle
15. Stepper motion
16. Forward gear
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair tape transport assembly.

ENABLER  Tape must feed through tape transport assembly without stretching, binding or tangling.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME _____________________ COURSE ______

TIME : STARTED _______ COMPLETED _____________

TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing tape transport assembly.

RECORD THIS INFORMATION:

MANUFACTURER: _______________________ MODEL: _____________

SERIAL #: ______________

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obtained faulty tape player/recorder.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested supply of take up spindle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested erase head.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested record/playback head.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested pinch roller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identified and tested capstan fly-wheel.</td>
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<tr>
<td>- Replaced malfunctioning part with new part.</td>
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<tr>
<td>- Performed operational check on tape.</td>
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</table>
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #124

TASK: Repair print mechanism.

STANDARD OF PERFORMANCE OF TASK:

Printer mechanism must produce clean, clear and crisp lettering.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Service manual (manufacturer specification)
Printer to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify the type of print mechanism.
2. Identify the components of the print mechanism.
3. Determine if print mechanism should be repaired or replaced.

RESOURCES:

5. Visual Aid - Types of print mechanisms, see performance objective 85.
6. Checklist - Print mechanism repair.

TEACHING ACTIVITIES:

1. Present lecture on types of print mechanisms. (*1, 2 & 5)
2. Discuss and demonstrate dot matrix, daisy-wheel and ball or thimble print mechanism.
TEACHING ACTIVITIES: (cont.)

3. Discuss and demonstrate components of a print mechanism.
4. Present lecture on print mechanism repair procedures. (*2, 3 & 4)
5. Discuss and demonstrate how to determine if a print mechanism should be repaired or replaced.
6. Discuss and demonstrate repair procedures for dot matrix, daisy-wheel and ball thimble print mechanisms.
7. Assign student several different types of print mechanisms and instruct the student to determine if each mechanism should be replaced or repaired.
8. Instruct student to repair a print mechanism.

CRITERION-REFERENCED MEASURE:

The student will identify the type of print mechanism, determine if it should be repaired or replaced and repair the print mechanism if possible. Print mechanism must produce clean, clear and crisp lettering.

PERFORMANCE GUIDE:

1. Obtain printer mechanism to be repaired.
2. Identify malfunctioning part:
   A. Dot matrix print mechanism:
      1. Print wires.
      2. Armature.
      3. Return spring.
      4. Soleniod.
   B. Daisy-wheel print mechanism:
      1. Print head.
      2. Print arm.
3. Replace malfunctioning part with new part and adjust and lubricate according to manufacturer specifications.
4. Conduct a sample printing and check for clearness and quality.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair print mechanism.

ENABLER  Printer mechanism must produce clean, clear and crisp lettering.

STUDENT'S NAME ___________________________ DATE ________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME :  STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing print mechanism.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: ________

SERIAL #:__________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained faulty printer mechanism.   _____  _____

- Identified malfunctioning part.       _____  _____

- Replaced malfunctioning part with new part. _____  _____

- Adjusted and lubricated according to manufacturers specification. _____  _____

- Conducted a sample printing. ______  _____

- Checked for clearness and quality. _____  _____
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #125

TASK: Repair read/write/verify head.

STANDARD OF PERFORMANCE OF TASK:

Disk drive must be functional; reads/writes and verifies data without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.
How To Maintain and Service Your Small Computer.
Handbook Of Computer Maintenance And Troubleshooting.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk drive to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components of a read/write/verify head.
2. Determine if read/write/verify should be repaired or replaced.

RESOURCES:

5. Manufacturer's technical reference.
7. Worksheet - Read/write/verify head component identification, see performance objective 61.

TEACHING ACTIVITIES:

1. Present lecture on the location and function of the read/write/verify head. (*1, 2, 3, 4, 5 & 6)
TEACHING ACTIVITIES: (cont.)

2. Discuss and demonstrate the components of a read/write/verify head.
3. Instruct student to complete a read/write/verify head components identification worksheet. (*7)
4. Discuss safety considerations when working with a read/write/verify head.
5. Present lecture on repair procedures for a read/write/verify head. (*1, 2, 5 & 6)
6. Discuss and demonstrate repair procedures for carriage support rails, head, head carriage, spiral cam, stepper motor and motor base.
7. Discuss and demonstrate how to determine if read/write/verify should be repaired or replaced.
8. Discuss and demonstrate how to perform an operational check on a read/write/verify head.
9. Instruct student to repair a read/write/verify head and perform an operational check.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot the read/write/verify head, determine if it should be repaired or replaced, repair head when possible and perform an operational check. The head must read, write, and verify data without error.

PERFORMANCE GUIDE:

1. Obtain disk drive to be repaired.
2. Identify parts to be replaced:
   A. Carriage support rails.
   B. Head.
   C. Head carriage.
   D. Stepper motor.
   E. Motor base.
   F. Spiral cam.
3. Replace malfunctioning part with new part.
4. Test run drive to insure that drive head will read, write and verify without error.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair read/write/verify head.

ENABLER  Disk drive must be functional: reads/writes and verifies data without error.

STUDENT’S NAME ___________________ DATE ______

EVALUATOR’S NAME ___________________ COURSE ______

TIME: STARTED _______ COMPLETED _____________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing read/write/verify head.

RECORD THIS INFORMATION:

MANUFACTURER: _________________ MODEL: _______________

SERIAL #: _______________

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Obtained faulty disk drive. ______  ______
- Identified parts to be replaced. ______  ______
- Replaced malfunctioning part with new part. ______  ______
- Test ran disk drive to ensure drive head will read, write and verify without error. ______  ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #126

TASK: Repair ribbon assembly.

STANDARD OF PERFORMANCE OF TASK:
Ribbon must produce dark, clear, readable printed characters; ribbon should move continuously while printing is taking place.

SOURCE OF STANDARD:
Writing team of incumbent workers. How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:
Printer to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:
1. Identify components of a ribbon assembly.
2. Determine if ribbon assembly should be repaired or replaced.

RESOURCES:
5. Manufacturer's service manual.

TEACHING ACTIVITIES:
1. Present lecture on the components of a ribbon assembly. (1 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss types of ribbons, re-inking ribbons and replacing ribbons.
3. Discuss and demonstrate the mechanical components of a ribbon assembly.
4. Discuss the difference between cartridge and reel to reel ribbons.
5. Present lecture on ribbon assembly repair procedures. (*1, 2, 3, 4 & 5)
6. Discuss and demonstrate ribbon assembly repair procedures.
7. Discuss and demonstrate how to conduct a ribbon assembly operational check.
8. Instruct student to repair a ribbon assembly.

CRITERION-REFERENCED MEASURE:

The student will determine if the ribbon assembly can be repaired, repair the ribbon assembly and conduct an operational check. The ribbon must feed without kinking or binding and produce dark, clear, readable characters.

PERFORMANCE GUIDE:

1. Obtain ribbon assembly to be repaired.
2. Identify malfunctioning part:
   A. Ribbon.
      1. Fabric.
      2. Plastic or film.
   B. Drive wheel.
   C. Pressure roller.
   D. Pressure spring.
   E. Drive wheel.
   F. Ribbon guide arms.
   G. Ink cassette.
3. Replace malfunctioning part with new part.
4. Test run ribbon.
PRINTER RIBBON CARTRIDGE

Internal View

- Print Hammer
- Drive Wheel
- Pressure Wheel
- Pressure Spring
- Stored Ribbon Is Folded

External View

- Print Ribbon
- Print Hammer
- Print Ribbon Cartridge Case
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair ribbon assembly.

ENABLER  Ribbon must produce dark, clear, readable printed characters; ribbon should move continuously while printing is taking place.

STUDENT'S NAME ___________________________ DATE __________

EVALUATOR'S NAME ___________________________ COURSE ________

TIME:  STARTED _______ COMPLETED ________________

TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing ribbon assembly.

RECORD THIS INFORMATION:

MANUFACTURER:_____  MODEL:________

SERIAL #:________

PERFORMED: DETERMINANTS  YES  NO

The preparer

- Obtained faulty ribbon assembly.   ___  ___
- Identified and inspected ribbon.    ___  ___
- Identified and inspected drive wheel. ___  ___
- Identified and inspected pressure roller. ___  ___
- Identified and inspected pressure springs. ___  ___
- Identified and inspected ribbon guard arm. ___  ___
- Identified and inspected ink cassette. ___  ___
- Replaced malfunctioning part with new part. ___  ___
- Test ran ribbon. ___  ___
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #127

TASK: Repair ejector mechanism.

STANDARD OF PERFORMANCE OF TASK:

Disk will eject from disk drive opening when disk drive door is opened.

SOURCE OF STANDARD:

Writing team of incumbent workers. How To Maintain and Service Your Small Computer.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk drive to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components of a ejector mechanism.
2. Determine if ejector mechanism should be repaired or replaced.

RESOURCES:

5. Manufacturer's service manual.
6. Visual Aid - Ejector mechanism component, see performance objective 100.
7. Worksheet - Ejector mechanism component identification, see performance objective 100.
8. Checklist - Repair ejector mechanism.

TEACHING ACTIVITIES:

1. Present lecture on the function and operation of a ejector mechanism. (#1, 2 & 3)
2. Discuss the components of a ejector mechanism.

3. Present a lecture on the repair procedures for a ejector mechanism. (*1, 2, 3, 4 & 5)

4. Discuss and demonstrate safety procedures for working with ejector mechanism components.

5. Discuss and demonstrate how to determine if a ejector mechanism should be repaired or replaced.

6. Discuss and demonstrate repair procedures for a ejector mechanism.

7. Discuss and demonstrate how to perform an operational check on a ejector mechanism.

8. Instruct student to complete the ejector mechanism component identification worksheet. (*7)

9. Instruct student to repair and conduct an operational check on a ejector mechanism.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot, repair and perform an operational check on a ejector mechanism.

PERFORMANCE GUIDE:

1. Obtain disk drive to be serviced.

2. Identify malfunctioning part:
   A. Ejector block.
   B. Return spring.
   C. Retainer spring.
   D. Drive door release spring.
   E. Drive door.
   F. Retainer spring block.

3. Replace malfunctioning part with new part.

4. Insert a disk into drive and open door to check if disk ejects.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Repair ejector mechanism.

ENABLER Disk will eject from disk drive opening when disk drive door is opened.

STUDENT'S NAME __________________________ DATE __________

EVALUATOR'S NAME __________________________ COURSE ______

TIME : STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing ejector mechanism.

RECORD THIS INFORMATION:

MANUFACTURER: __________________________ MODEL: ______

SERIAL #: ____________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Obtained faulty disk drive. ______ ______
- Identified and inspected ejector block. ______ ______
- Identified and inspected return spring. ______ ______
- Identified and inspected retainer spring. ______ ______
- Identified and inspected drive door release spring. ______ ______
- Identified and inspected drive door. ______ ______
- Identified and inspected retainer spring block ______ ______
- Replaced malfunctioning part with new part. ______ ______
- Conducted operational check on disk drive. ______ ______

565 639
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #128

TASK: Repair peripheral control.

STANDARD OF PERFORMANCE OF TASK:

Peripheral controls must be functional; selector knobs, switches and lights must work and control the peripheral equipment they are connected to.

SOURCE OF STANDARD:

Writing team of incumbent workers. 
How To Maintain and Service Your Small Computer. 
Handbook Of Computer Maintenance and Troubleshooting

CONDITIONS FOR PERFORMANCE OF TASK:

Peripheral controls to be serviced 
Replacement parts 
Tool kit

ENABLING OBJECTIVE:

1. Identify type of peripheral controls.
2. Determine if peripheral control should be repaired or replace.

RESOURCES:

2. Manufacturer's operators manual.
5. Checklist - Repair peripheral control.

TEACHING ACTIVITIES:

1. Present a lecture on the different types of peripheral control. (* 1)
2. Discuss the components of a peripheral control.
3. Discuss troubleshooting procedures for a peripheral control.
TEACHING ACTIVITIES: (cont.)

4. Demonstrate troubleshooting procedures for a peripheral control.
5. Present a lecture on repair procedures for a peripheral control. (*1, 2, 3 & 4)
6. Demonstrate testing procedures for a peripheral control.
7. Instruct student to repair a peripheral control and perform an optional check.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot a peripheral control, determine malfunctioning component, repair the peripheral and conduct an operational check.

PERFORMANCE GUIDE:

1. Obtain peripheral control to be serviced.
2. Identify malfunctioning part:
   A. Knobs.
   B. Switches.
   C. Lights.
   D. Connectors.
   E. Contacts.
   F. Cables.
3. Replace malfunctioning part with new part.
4. Test control to insure that it controls the peripheral equipment.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair peripheral control.

ENABLER  Peripheral controls must be functional:
selector knobs, switches and lights must work
and control the peripheral equipment they are
connected to.

STUDENT'S NAME ___________________ DATE __________

EVALUATOR'S NAME ___________________ COURSE ________

TIME:  STARTED _______  COMPLETED _________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student
performance while repairing peripheral control.

RECORD THIS INFORMATION:

MANUFACTURER:______________________ MODEL:_________

SERIAL #:__________________________

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Obtained faulty peripheral control. __ ___
- Identified and inspected knobs. ___ ___
- Identified and inspected switches. ___ ___
- Identified and inspected lights. ___ ___
- Identified and inspected connectors. ___ ___
- Identified and inspected cables. ___ ___
- Replaced malfunctioning part. ___ ___
- Conducted operational check on test control. ___ ___

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DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #129

TASK: Repair data communication adapter.

STANDARD OF PERFORMANCE OF TASK:

Data communication adapter must be functional; adapter connector must be free of corrosion and pins straight.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Data communication adapter to be serviced Replacement parts Tool kit

ENABLING OBJECTIVE:

1. Identify the different types of data communication adapter.
2. Identify components of a data communication adapter.
3. Determine if data communication adapter should be repaired or replaced.

RESOURCES:

1. Manufacturer's operator's manual
2. Manufacturer's technical reference manual

TEACHING ACTIVITIES:

1. Present lecture on types and uses of data communication adapters. (*2)
2. Discuss components in a data communication adapter.
3. Present a lecture on troubleshooting and repairing a data communication adapter. (*1, 2, 3)
4. Discuss troubleshooting and repairing procedures for a data communication adapter.
5. Demonstrate troubleshooting and repairing procedures for a data communication adapter.
6. Discuss and demonstrate operational testing procedures for data communication adapter.
7. Instruct student to troubleshoot, repair and check a data communication adapter.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot, repair and perform an operational check on the data communication adapter.

PERFORMANCE GUIDE:

1. Obtain data communication adapter to be serviced.
2. Identify malfunctioning part:
   A. Cable connectors.
   B. Cable.
   C. Selector switch.
   D. Contacts.
3. Replace malfunctioning part with new part.
4. Check adapter to insure that connection is clean and snug.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair data communication adapter.

ENABLER  Data communication adapter must be functional:
  adapter connector must be free of corrosion
  and pins straight.

STUDENT'S NAME ___________________ DATE ________

EVALUATOR'S NAME ___________________ COURSE ________

TIME : STARTED _______ COMPLETED _____________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student
performance while repairing data communication
adapter.

RECORD THIS INFORMATION:

MANUFACTURER: ____________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained data communication adapter
to be serviced. _________

- Identified and inspected cable
  connectors. _________

- Identified and inspected cable. _________

- Identified and inspected selector
  switch. _________

- Identified and inspected contacts. _________

- Repaired malfunctioning part if
  possible. _________

- Replaced part if malfunctioning
  part was non-repairable. _________

- Conducted operational check on data
  communication adapter. _________
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #130

TASK: Repair expansion memory.

STANDARD OF PERFORMANCE OF TASK:

Central processing unit expanded memory capabilities must be able to load, manipulate and store information; passes diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Expanded motherboard
Expansion memory chips
Integrated circuit chip remover
Integrated circuit chip inserter
Tool kit

ENABLING OBJECTIVE:

1. Identify components of an expansion memory unit.
2. Determine if expansion memory unit should be repaired or replaced.

RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on different types of expansion memory. (*2)
2. Discuss and demonstrate cartridge expansion, printed circuit board expansion and I.C, chip expansion.
TEACHING ACTIVITIES: (cont.)

3. Discuss the components of a expansion memory unit.
4. Present lecture on repair procedures for expansion memory. (*1, 2, 3, 4 & 5)
5. Discuss and demonstrate safety considerations when working on expansion memory.
6. Discuss and demonstrate expansion memory component repair procedures.
7. Discuss and demonstrate operational check procedures for expansion memory.
8. Assign students a computer and instruct the student to locate and identify the type of expansion memory used.
9. Instruct student to repair expansion memory and conduct an operational check.

CRITERION-REFERENCED MEASURE:

The student will identify, locate and repair or replace the expansion memory of a computer. The expansion memory must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Obtain expanded memory board to be repaired.
2. Identify malfunctioning expanded memory chip:
   A. RAM integrated circuit chip.
   B. ROM integrated circuit chip.
3. Replace malfunctioning integrated circuit chip with new integrated circuit chip.
4. Perform diagnostic test to determine if expanded memory is functional.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair expansion memory.

ENABLER  Central processing unit expanded memory capabilities must be able to load, manipulate and store information: passes diagnostic test without error.

STUDENT'S NAME  __________________________ DATE  _________

EVALUATOR'S NAME  __________________________ COURSE  _________

TIME :  STARTED  _________ COMPLETED  _________________

TOTAL  __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing expansion memory.

RECORD THIS INFORMATION:

MANUFACTURER: __________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained faulty expanded memory board.  ______  ______

- Identified and inspected RAM integrated circuit chip.  ______  ______

- Identified and inspected ROM integrated circuit chip.  ______  ______

- Repaired malfunctioning part if possible.  ______  ______

- Replaced malfunctioning part with new part.  ______  ______

- Performed diagnostic test to insure expanded memory is functional.  ______  ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #131

TASK: Repair memory.

STANDARD OF PERFORMANCE OF TASK:

Central processing unit's main memory capabilities must be able to load, manipulate and store information; passes diagnostic test without error.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Memoryboard to be serviced
Main memory integrated circuit chips
Integrated circuit chip remover
Integrated circuit chip inserter
Tool kit

ENABLING OBJECTIVE:

1. Identify components of a memory unit.
2. Determine if memory unit should be repaired or replaced.

RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on different types of memory. (§2)
2. Discuss and demonstrate cartridge memory, printed circuit board memory and I.C, chip memory.
TEACHING ACTIVITIES: (cont.)

3. Discuss the components of memory unit.
4. Present lecture on repair procedures for memory.
   (*1, 2, 3, 4 & 5)
5. Discuss and demonstrate safety considerations when working on memory.
6. Discuss and demonstrate memory component repair procedures.
7. Discuss and demonstrate operational check procedures for memory.
8. Assign student a computer and instruct the student to locate and identify the type of memory used.
9. Instruct student to repair memory and conduct an operational check.

CRITERION-REFERENCED MEASURE:

The student will identify, locate and repair or replace the memory of a computer. The memory must pass diagnostic test without error.

PERFORMANCE GUIDE:

1. Obtain memoryboard to be repaired.
2. Identify malfunctioning memory integrated circuit chip.
3. Remove malfunctioning memory integrated circuit chip.
4. Insert replacement memory integrated circuit chip.
5. Perform diagnostic test to determine if memory is functioning.
TYPICAL RAM OR MEMORY CHIP
DUTY  Servicing Computer Equipment.

TASK  Repair memory.

ENABLER  Central processing unit's main memory capabilities must be able to load, manipulate and store information; passes diagnostic test without error.

STUDENT'S NAME ____________________________ DATE ______

EVALUATOR'S NAME ____________________________ COURSE ______

TIME:  STARTED ______ COMPLETED ______________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing memory.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________________ MODEL: __________

SERIAL #: ______

PERFORMANCE DETERMINANTS YES  NO

The preparer

- Obtained faulty memory board. ______ ______

- Identified malfunctioning circuit chip. ______ ______

- Removed malfunctioning chip. ______ ______

- Inserted replacement chip. ______ ______

- Performed diagnostic test. ______ ______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #132

TASK: Repair field type product line.

STANDARD OF PERFORMANCE OF TASK:

Field upgrade must be functional according to manufacturing changes.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's field upgrade information
Equipment history file
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Obtain and review field upgrade information.
2. Identify repairable components of the field product.
3. Determine if field product should be repaired or replaced.

RESOURCES:

1. Manufacturer's field upgrade information.
5. Checklist - Field type product line repair.

TEACHING ACTIVITIES:

1. Present lecture on the different field type product lines. (*1)
2. Discuss repairable components for the field type product line.
3. Demonstrate how to determine if the field type product line should be repaired or replaced.
4. Present lecture on repair procedure for field type product line.
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate repair procedures for field type products and upgrades.
6. Discuss and demonstrate operational check procedure for the field type product line.
7. Instruct student to repair a field type product line.

CRITERION-REFERENCED MEASURE:

The student will review manufacturer's upgrade information, troubleshoot, repair and conduct an operational check for a field type product line.

PERFORMANCE GUIDE:

1. Obtain equipment history file and determine the nature of upgrade performed on the equipment.
2. Review manufacturer's field upgrade information to determine nature and purpose of the change.
3. Identify malfunctioning part and replace it with a new replacement part.
4. Perform any adjustments or alignments as indicated by field upgrade information in equipment history file.
5. Test run equipment to check that upgrade operates according to manufacturer's intentions as specified in field upgrade information.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Repair field type product line.

ENABLER Field upgrade must be functional according to manufacturing changes.

STUDENT'S NAME ________________________ DATE ______

EVALUATOR'S NAME ____________________ COURSE ______

TIME: STARTED ______ COMPLETED ________________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing field type product line.

RECORD THIS INFORMATION:

MANUFACTURER:______________________ MODEL:___________

SERIAL #:_________

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained equipment history file. ______ ______

- Determined the nature of upgrade performed on the equipment. ______ ______

- Reviewed manufacturer's field upgrade information. ______ ______

- Identified malfunctioning part. ______ ______

- Performed adjustments or alignments as indicated by field upgrade information in equipment history file. ______ ______

- Test ran equipment. ______ ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #133

TASK: Repair remote terminals.

STANDARD OF PERFORMANCE OF TASK:

Remote terminal equipment must be operational in conjunction with the main central processing unit.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Remote terminal equipment to be serviced
Replacement parts
Tool kit

ENABLING OBJECTIVE:

1. Identify components of a remote terminal.
2. Determine if remote terminal should be repaired or replaced
3. Remove and replace remote terminal.

RESOURCES:

7. Manufacturer's technical reference.
8. Manufacturer's service manual.
TEACHING ACTIVITIES:

1. Present lecture on types of remote terminal equipment. (*1, 2, 3 & 4)
2. Discuss display monitors, keyboards, storage devices, card punchers, card readers, and data communication devices.
3. Present lecture on repair procedures for different remote terminal equipment. (*1, 2, 3, 4, 5, 6, 7 & 8)
4. Demonstrate repair procedures for remote terminal equipment.
5. Discuss and demonstrate safety precautions to be taken when repairing remote terminals.
6. Demonstrate operational check procedures for remote terminals.
7. Instruct student to troubleshoot a remote terminal and repair faulty equipment.

CRITERION-REFERENCED MEASURE:

The student will identify the remote terminal equipment, troubleshoot and repair remote terminal equipment and conduct an operational check to insure that the remote terminal is working in conjunction with the main control processing unit.

PERFORMANCE GUIDE:

1. Identify remote terminal equipment must be operational.
   A. Display screen/monitor.
   B. Keyboard.
   C. Storage device.
   D. Card puncher.
   E. Card reader.
   F. Data communication device.
2. Identify the malfunctioning or broken part/component and remove it.
3. Replace malfunctioning or broken part/component with a new replacement part/component.
4. Test run remote terminal equipment to check if it operates in conjunction with main central processing unit.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair remote terminals.

ENABLER  Remote terminal equipment must be operational in conjunction with the main central processing unit.

STUDENT'S NAME  __________________________  DATE  __________

EVALUATOR'S NAME  __________________________  COURSE  __________

TIME:  STARTED  __________  COMPLETED  __________  TOTAL  __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing remote terminals.

RECORD THIS INFORMATION:

MANUFACTURER:  __________________________  MODEL:  __________

SERIAL #:  __________

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Identified remote terminal equipment.  ____  ____
- Identified and inspected keyboard.  ____  ____
- Identified and inspected storage device.  ____  ____
- Identified and inspected card puncher.  ____  ____
- Identified and inspected card reader  ____  ____
- Identified and inspected data communication device.  ____  ____
- Removed malfunctioning/broken part.  ____  ____
- Replaced malfunctioning/broken part.  ____  ____
- Conducted test run on remote terminal equipment.  ____  ____
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #134

TASK: Identify integrated circuit chips.

STANDARD OF PERFORMANCE OF TASK:

Integrated circuit chip must be identified using an integrated circuit chip chart according to manufacturer's logo, core number and batch code found on chip.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Integrated circuit chip
Integrated circuit chip chart

ENABLING OBJECTIVE:

1. Identify different types of integrated circuit chips.
2. Understand manufacturers integrated circuit numbering system.
3. Determine the different uses of integrated chips.

RESOURCES:

5. Manufacturer's service manual.
6. Visual Aid - integrated circuit numbering system.
TEACHING ACTIVITIES:

1. Present lecture on types of integrated circuit chips. (*1, 2, 3, 4 & 5)
2. Discuss different manufacturers integrated circuit chips.
3. Discuss and demonstrate the removal procedure for a integrated circuit chip.
4. Discuss and demonstrate the insertion procedure for a integrated chip.
5. Discuss and demonstrate the use of a integrated circuit chip remover and inserter.
6. Discuss and demonstrate safety procedures for removing and replacing a integrated circuit chip.
7. Present a lecture on identifying a integrated circuit chip using the manufacturer's numbering system. (*1, 2, 3, 5 & 6)
8. Discuss and demonstrate manufacturers logo, prefix, suffix and data code.
9. Discuss and demonstrate the care number including logic family, logic subfamily and function code/number.
10. Assign student several different integrated circuit chips and have them identify them using the manufacturer's numbering system.
11. Instruct student to locate, remove, identify and replace a integrated circuit chip.

CRITERION-REFERENCED MEASURE:

The student will locate and remove a integrated circuit chip, identify the chip using the manufacturer's numbering system and insert a replacement chip according to core code number, batch code and manufacturer's logo.

PERFORMANCE GUIDE:

1. Locate integrated circuit chip that is malfunctioning.
2. Interpret core number, batch code and manufacturing logo, and compare to the integrated circuit chip chart.
   A. Core code number:
      1. Logic family.
      2. Logic subfamily.
      3. Function of integrated circuit chip.
      4. Prefix-manufacturer, integrated circuit type.
      5. Suffix-package type, temperature range.
   B. Batch code:
      1. Year of manufacture.
      2. Production batch.
   C. Manufacturer's logo.
3. Match codes and number with chart and determine replacement integrated circuit chip.
MANUFACTURING NUMBERING SYSTEM FOR INTEGRATED CIRCUIT CHIP IDENTIFICATION

Prefix Indicates Manufacturer, IC Type

Core Number: 74 LS 74

Logic Family

Logic Subfamily: Examples:
No Letter = TTL
C = CMOS
H = High Speed
L = Low Power
LS = Low Power/Schottky
S = Schottky

Suffix Indicates Package Type, Temperature Range

Year of Manufacture

Production Batch

Manufacturer's Date Logo

Date Code

SN 74LS74 N

Production Batch: 79 32

Core Number: 7932

587

661
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Identify integrated circuit chips.

ENABLER  Integrated circuit chip must be identified
          using an integrated circuit chip chart
          according to manufacturer's logo, core number
          and batch code found on chip.

STUDENT'S NAME __________________________ DATE ______

EVALUATOR'S NAME ________________________ COURSE ______

TIME :  STARTED ______  COMPLETED ______________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student
performance while identifying integrated circuit
chips.

RECORD THIS INFORMATION:

MANUFACTURER: __________________________ MODEL: ______

SERIAL #: ______

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Located malfunctioning integrated circuit chip. ______ ______

- Identified and interpreted core number. ______ ______

- Identified and interpreted batch code. ______ ______

- Identified and interpreted manufacturing number. ______ ______

- Compared each to the integrated circuit chip chart. ______ ______

- Matched codes and numbers with chart. ______ ______

- Determined replacement integrated circuit chip. ______ ______

- Obtained integrated circuit chip. ______ ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #135

TASK: Identify machine components and test points.

STANDARD OF PERFORMANCE OF TASK:

Machine component must pass the test and the test points for that component must be located.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Schematics
Test equipment
Service manuals

ENABLING OBJECTIVE:

1. Locate test points.
2. Understand the difference between hot test points and ground test points.

*RESOURCES:

5. Manufacturer's technical reference.
7. Manufacturer's schematic.
8. Visual Aid - Test equipment.

TEACHING ACTIVITIES:

1. Present lecture on determining component to be tested and proper test points. (*1, 2, 3 & 4)
2. Discuss using schematics and service manuals for identifying components and test points.

3. Present lecture on hot test points and ground test points. (*1, 2, 3, 4, 5, 6 & 7)

4. Discuss and demonstrate hot test points such as: supply outlets, test point pins, signal traces, component legs, connector pins and insulated wires.

5. Discuss and demonstrate ground points such as: metal frame or chassis, grounding traces, ground leads, grounded test pins, logic ground and signal grounds.

6. Discuss and demonstrate safety precautions to be taken when working with test points.

7. Present lecture on types of test equipment. (*8)

8. Discuss and demonstrate a volt-ohm milliometer (DVM), digital logic probe, logic pulser, oscilloscope, IC test clips, no-op tester and transistor tester. (*1, 2, 3 & 5)

9. Assign student a list of components to be tested and a schematic of the equipment.

10. Instruct student to identify and locate the correct test points for each component listed.

CRITERION-REFERENCED MEASURE:

The student will locate the component to be tested and identify the proper test points for that component. The student will also identify the test equipment needed to properly test the component.

PERFORMANCE GUIDE:

1. Using the schematic or service manual for that particular machine, determine the machine component to be tested and its location in the machine.

2. Locate the test points for that component:
   A. Hot test point--point where current or signal is carried.
      1. Power supply outlets.
      2. Labelled test point pin.
      3. Signal trace.
      4. Component leg.
      5. Connector pin.
      6. Insulated wire.
      CAUTION: Care must be taken not to touch more than one test point at a time with the test probe or a short circuit could result.
   B. Ground test point--point grounded to outside world, usually through the third prong of the AC plug.
      1. Metal frame or chassis.
      2. Grounding traces on circuit board.
      3. Ground leads on motors, solenoids and case.
      4. Grounded test pin on circuit board.
      5. Logic ground on TTL logic circuit.
      6. Signal ground on a link between two pieces of equipment.
      NOTE: Use ground closest to test point for most accurate reading.
TEST EQUIPMENT

Digital Logic Probe

A Dual-trace Oscilloscope

Volt-ohm-milliammeter

Digital Volt-ohm-milliammeter
TYPICAL TEST POINTS FOR COMPONENTS

Testing a Resistor

Testing a Capacitor

Testing Cables

Check for shorts between each adjacent pair of wires in the cable

Test Pin on Circuit Board

Test Pin on Circuit Trace

Attach test clip here

To test signal on this trace

Test readings from Circuit Trace

IC Test Clip

Testing a using an
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Identify machine components and test points.

ENABLER  Machine component to be tested and the test points for that component must be located.

STUDENT'S NAME ______________________ DATE ______

EVALUATOR'S NAME ______________________ COURSE ______

TIME: STARTED _______ COMPLETED ______________________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while identifying machine components and test points.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: __________

SERIAL #: _______

PERFORMANCE DETERMINANTS

The preparer

- Used service manual to determine the machine component to be tested and its location in the machine. ______  ______

- Located power supply outlets. ______  ______

- Located labelled test point pin. ______  ______

- Located signal trace. ______  ______

- Located component leg. ______  ______

- Located connector pin. ______  ______

- Located insulated wire. ______  ______

- Grounded test point. ______  ______
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #136

TASK: Set configuration switches.

STANDARD OF PERFORMANCE OF TASK:

Configuration switches must be set according to host system specifications; equipment will operate with system.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Operator manual
Tool kit

ENABLING OBJECTIVE:

1. Determine location of configuration switches.
2. Identify function of configuration switches.
3. Identify desired results and determine what configuration switch setting will achieve that result.
4. Understand how to read and set configuration switches.

RESOURCES:

5. Manufacturer's service manual.
6. Manufacturer's schematics.
7. Configuration switch setting chart.
8. Visual Aid - Typical configuration switch.

TEACHING ACTIVITIES:

1. Present lecture on computer equipment that use configuration switches. (*1,2,3,4 & 5)
TEACHING ACTIVITIES: (cont.)

2. Discuss and demonstrate computers, printers, disk drives and peripheral interfaces using configuration switches.
3. Present a lecture on the function and operation of configuration switches. (*1, 2, 3, 4 & 5)
4. Discuss and demonstrate different modes such as graphics, test, language, machine specification etc.
5. Present lecture on reading and setting configuration switches. (*1, 2, 3, 4, 5 & 7)
6. Discuss and demonstrate the "on" position for a configuration switch.
7. Discuss and demonstrate the "off" position of a configuration switch.
8. Discuss and demonstrate how different combinations of switches "on" and "off" can produce various results.
9. Assign student a piece of computer equipment with configuration switches and a switch setting chart. (*7)
10. Instruct student to change the configuration switch setting according to the setting chart and verify if the indicated function was achieved.

CRITERION-REFERENCED MEASURE:

The student will locate the configuration switches on a piece of computer equipment and change the switch setting to obtain the desired function. The equipment must operate and perform the desired function without error.

PERFORMANCE GUIDE:

1. Power down system and unplug AC power cord.
2. Remove cover and locate configuration switches on top of main printed circuit board.
3. Locate host system specification in operator manual.
4. Set switches to match configuration in owner's manual.
   A. 1 = On
   B. 0 = Off
   NOTE: Switches read from left to right as you look at them from the front of the printer.
5. Replace cover and power cord.
6. Power up system and test run printer to insure it operates with system.
DIP SWITCHES

OPEN

CLOSE

OPEN

1  2  3  4  5  6  7  8
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Set configuration switches.

ENABLER  Configuration switches must be set according to host system specifications; equipment will operate with system.

STUDENT'S NAME ___________________ DATE ________

EVALUATOR'S NAME ___________________ COURSE ________

TIME :  STARTED _______  COMPLETED ________________  TOTAL ________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while setting configuration switches.

RECORD THIS INFORMATION:

MANUFACTURER:______________________ MODEL: ____________

SERIAL #:________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Powered down system. ______ ______
- Unplugged AC cord. ______ ______
- Removed cover. ______ ______
- Located configuration switches on top of main printed circuit board. ______ ______
- Set switches to match configuration. ______ ______
- Replaced cover and power cord. ______ ______
- Test ran printer. ______ ______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #137

TASK: Set user switches.

STANDARD OF PERFORMANCE OF TASK:

User switch must be set according to customer needs including line feed, auto line feed, form length, and spacing.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to have switches set
User's manual
Tool kit

ENABLING OBJECTIVE:

1. Determine location of user switches.
2. Identify function of user switches.
3. Identify desired results and determine what user switch setting will achieve that result.
4. Understand how to read and set user switches.

RESOURCES:

5. Manufacturer's schematics.
6. Configuration switch setting chart.
7. Visual Aid - Typical configuration switch.
8. Checklist - Setting user switches.

TEACHING ACTIVITIES:

1. Present lecture on computer equipment that use user switches. (*1,2,3,4 & 5)
2. Discuss and demonstrate computers, printers, disk drives and peripheral interfaces using user switches.
TEACHING ACTIVITIES: (cont.)

3. Present a lecture on the function and operation of user switches. (*1, 2, 3, 4 & 5)
4. Discuss and demonstrate different modes such as line feed, carriage return, form length, character spacing and print style.
5. Present lecture on reading and setting user switches (*1, 2, 3, 4, 5 & 7)
6. Discuss and demonstrate the "on" position for a user switch.
7. Discuss and demonstrate the "off" position of a user switch.
8. Discuss and demonstrate how different combinations of switches "on" and "off" can produce various results.
9. Assign student a piece of computer equipment with user switches and a switch setting chart. (*7)
10. Instruct student to change the user switch setting according to the setting chart and verify if the indicated function was achieved.

CRITERION-REFERENCED MEASURE:

The student will locate the user switches on a piece of computer equipment and change the switch setting to obtain the desired function. The equipment must operate and perform the desired function without error.

PERFORMANCE GUIDE:

1. Power down system and unplug AC power cord.
2. Remove cover and locate configuration switches on top of main printed circuit board.
3. Locate host system specification in operator manual.
4. Set switches to match configuration in owner's manual.
   A. 1 = On
   B. 0 = Off
   NOTE: Switches read from left to right as you look at them from the front of the printer.
5. Replace cover and power cord.
6. Power up system and test run printer to insure it operates with system.

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SETTING OF DIP SWITCH

DIP Switch SPEC 1

DIP Switch SPEC 2

OPEN

CLOSE

OPEN

675
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Set user switches.

ENABLER  User switch must be set according to customer needs including line feed, auto line feed, form length, and spacing.

STUDENT'S NAME ___________________ DATE __________

EVALUATOR'S NAME _________________ COURSE ______

TIME: STARTED __________ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while setting user switches.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: _______

SERIAL #: _______

PERFORMANCE DETERMINANTS

YES  NO

The preparer

- Powered down system.
- Unplugged AC power cord.
- Located configuration switches.
- Located host system specifications.
- Set switches to match configuration.
- Replaced cover and power cord.
- Powered up system.
- Test ran printer.
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #138

TASK: Install mechanical assembly.

STANDARD OF PERFORMANCE OF TASK:

Mechanical assembly must be functional; printer will power up and operate.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Printer to be serviced
Mechanical assembly
Service manual
Tool kit

ENABLING OBJECTIVE:

1. Identify and locate mechanical assembly.
2. Remove and replace mechanical assembly.

RESOURCES:

5. Checklist - Mechanical assembly installed.

TEACHING ACTIVITIES:

1. Present a lecture on the function and location of the mechanical assembly. (*1, 2, 3 & 4)
2. Discuss and demonstrate pulleys, cams, levers, gears, belts, etc, that are involved in mechanical motion.
3. Present lecture on procedures for installing a mechanical assembly.
4. Discuss and demonstrate safety procedures and considerations when working on mechanical assemblies.
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate the procedure for removing a mechanical assembly.
6. Discuss and demonstrate the procedure for replacing a mechanical assembly.
7. Discuss and demonstrate the operational check procedure for a mechanical assembly.
8. Instruct student to identify, remove and replace a mechanical assembly.

CRITERION-REFERENCED MEASURE:

The student will identify, remove and replace a mechanical assembly must function without rubbing, binding, jamming or breaking of mechanical parts.

PERFORMANCE GUIDE:

1. Power down printer and disconnect AC power cord.
2. Remove printer case.
3. Remove central processing unit board and ground cable.
4. Remove noise filter and power switch plate.
5. Remove mechanical assembly from printer.
6. Lift mechanical assembly from printer.
7. Place mechanical assembly into printer.
8. Replace retaining screws.
9. Replace noise filter and ground cables.
10. Replace power switch cover and central processing unit board.
11. Replace printer cover and power cable.
12. Power up system and run a print sample to test printer.
DUTY  Servicing Computer Equipment.

TASK  Install mechanical assembly.

ENABLER  Mechanical assembly must be functional:
_ printer will power up and operate._

STUDENT'S NAME ______________________ DATE ______

EVALUATOR'S NAME ______________________ COURSE ______

TIME:  STARTED ______  COMPLETED ______

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student
performance while installing mechanical assembly.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: ______

SERIAL #: ______

<table>
<thead>
<tr>
<th>PERFORMANCE DETERMINANTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>The preparer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Powered down system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disconnected AC power cord.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed printer case.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed central processing unit board and ground cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed noise filter and power switch plate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removed mechanical assembly from printer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lifted mechanical assembly from printer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Placed mechanical assembly into printer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Replaced retaining screws.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PERFORMANCE DETERMINANTS: (cont.)

- Replaced noise filter and ground cable.

- Replaced power switch cover and central processing unit board.

- Replaced printer cover and power cable.

- Powered up system and ran a print sample to test printer.
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #139

TASK: Perform operator duties.

STANDARD OF PERFORMANCE OF TASK:

Operator duties must include powering up the system, loading and booting disk drive, and loading printer paper and ribbon.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

List of operator duties
Operator manual
Computer system

ENABLING OBJECTIVE:

1. Determine operator duties to be performed.
2. Identify procedures for performing operator duties.

RESOURCES:

1. Manufacturer's operator's manual.

TEACHING ACTIVITIES:

1. Present lecture on types of operator duties. (*1, 2 & 3)
2. Discuss and demonstrate system power-up procedures.
3. Discuss and demonstrate loading and booting a disk drive.
4. Discuss and demonstrate loading paper into printer.
5. Discuss and demonstrate identifying and replacing printer ribbon.
6. Instruct student to practice procedures for performing operator duties.
7. Discuss and demonstrate safety considerations when performing operator duties.
TEACHING ACTIVITIES: (cont.)

8. Assign student a list of operator duties to be performed.
9. Instruct student to perform operator duties.

CRITERION-REFERENCED MEASURE:

The student will perform operator duties including powering up the system, loading and booting disk drive, loading paper in printer and replacing printer ribbon.

PERFORMANCE GUIDE:

1. Power up system:
   A. Plug in AC power cord and turn on power strip (if on is used).
   B. Switch on printer.
   C. Switch on disk drive.
   D. Switch on monitor.
   E. Switch on computer.

2. Load and boot disk drive:
   A. Insert diskette into drive and shut drive door.
   B. Load program.
   C. Run program.

3. Load paper into printer:
   A. Insert paper from rear and turn paper feed knob clockwise until paper appears between the platen and the print head.
   NOTE: If the paper does not appear by turning the knob, push the paper gently while turning the knob.
   B. Lift up the friction bar roller bar and open the tractor covers to the side.
   C. Align the paper guide holes with the paper feed pins and close the tractor covers.
   D. Lower friction roller bar, position the friction rollers on the bar directly on top of the rubber tractor rings.

4. Load printer ribbon:
   A. Determine type of ribbon needed:
      1. Cartridge
      2. Reel to reel
      3. Fabric
      4. Film
   B. Load ribbon according to manufacturer specifications.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Perform operator duties.

ENABLER  Service technician will be able to perform operator duties including powering up the system, loading and booting disk drive, and loading printer paper and ribbon.

STUDENT'S NAME _______________ DATE __________

EVALUATOR'S NAME _______________ COURSE ________

TIME :  STARTED _______  COMPLETED __________

TOTAL ______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while performing operator duties.

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Plugged AC power cord in.  ____  ____  
- Turned on power strip.  ____  ____  
- Inserted ribbon into printer.  ____  ____  
- Loaded paper into printer.  ____  ____  
- Turned on printer.  ____  ____  
- Loaded and booted disk drive.  ____  ____  
- Turned on monitor.  ____  ____  
- Turned on computer.  ____  ____  
- Conducted systems operational check.  ____  ____  

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GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #140

TASK: Realign read/write/verify head.

STANDARD OF PERFORMANCE OF TASK:

Read/write/verify head must be positioned directly over the center of the track it is reading, writing, or verifying.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Disk drive to be serviced
Tool kit
Exerciser disk
Alignment disk
Oscilloscope

ENABLING OBJECTIVE:

1. Identify current location of the read/write/verify head over the track.
2. Reposition read/write/verify head over the center of the track.
3. Understand a disk format and location of various tracks/sectors.
4. Operate test equipment.

RESOURCES:

5. Manufacturer's DOS manual.
RESOURCES: (cont.)

7. Manufacturer's service manual.
8. Visual Aid - Test points and radial head adjustment disk format, see performance objective 61.

TEACHING ACTIVITIES:

1. Present lecture on disk format. (*2,3 & 8)
2. Discuss and demonstrate track and sector locations on a disk.
3. Discuss and demonstrate disk care and handling.
4. Present lecture on read/write/verify head alignment procedures. (*1,2,3,4,5,6 & 7)
5. Discuss and demonstrate test equipment including oscilloscope, diagnostic software and exerciser program.
6. Discuss and demonstrate test points and test point locations.
7. Instruct student to practice using test equipment.
8. Discuss and demonstrate head alignment procedures.
9. Discuss safety procedures to be followed when realigning a read/write/verify head.
10. Assign student a out of align disk drive and test equipment.
11. Instruct student to realign the read/write/verify head on a disk drive.

CRITERION-REFERENCED MEASURE:

The student will identify the current read/write/verify head position and realign the head so it is directly over the center of the track being read.

PERFORMANCE GUIDE:

1. Set up dual-trace oscilloscope.
2. Power down the system and remove the disk drive cover.
3. Connect Channel B to head test point one and to ground.
4. Connect Channel A to head test point two and ground.
5. Connect external trigger probe to the sync signal test point.
6. Insert exerciser disk into drive and boot system and load exerciser program.
7. Remove exerciser disk and insert alignment disk into drive.
8. Start head reading a track near the center of the disk.
9. Oscilloscope signals from channels A and B will be shown. When both signals are equal, the drive head is in alignment.
10. Adjust the head alignment when the two signals are unequal:
   A. Adjustment of stepper motor pulley:
      1. Loosen set screws that hold the pulley in place.
      2. Slowly turn the pulley until the two trace signals on the oscilloscope are equal.
      3. Retighten screws.
   B. Adjustment of stepper motor:
      1. Loosen stepper motor mounting screws.
      2. Slowly turn stepper motor until trace signals are equal.
      3. Retighten mounting screws.

11. Step the head in three tracks and then step it back after adjustment is complete; recheck head alignment.

12. Step head three tracks out and then step it back; recheck alignment.

NOTE: Final setting will take into account inward and outward movement of head while reading, writing and verifying.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Realign read/write/verify head.

ENABLER Read/write/verify head must be positioned directly over the center of the track it is reading, writing, or verifying.

STUDENT'S NAME ______________________ DATE ______

EVALUATOR'S NAME _____________________ COURSE ______

TIME: STARTED _______ COMPLETED ____________

TOTAL _______

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while realigning read/write/verify head.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS YES NO

The preparer
- Set up dual-trace oscilloscope. _____ _____
- Power down the system and remove the disk drive cover. _____ _____
- Connected channel B to head test point one and to ground. _____ _____
- Connected channel A to head test point two and ground. _____ _____
- Connected external trigger probe to the sync signal test point. _____ _____
- Inserted disk and boot system. _____ _____
- Removed exercise disk and insert alignment disk into drive. _____ _____
- Adjusted the head alignment. _____ _____
- Step head in three tracks. _____ _____
- Recheck head alignment. 687 687
GUIDE SHEET

DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #141

TASK: Adjust motor speed.

STANDARD OF PERFORMANCE OF TASK:

Motor speed must be adjusted to prevent slippage or binding of motor.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Equipment to be serviced
Tool kit
Motor to be adjusted

ENABLING OBJECTIVE:

1. Determine motor speed problem.
2. Identify adjustments needed to obtain correct motor speed.

RESOURCES:

5. Manufacturer's service manual.

TEACHING ACTIVITIES:

1. Present lecture on methods for changing motor speed. (*2,3,4,5)
2. Discuss and demonstrate speed adjustment screws, potentiometer adjusting screws, belt tensions adjustments and pulley/gear size adjustments.
3. Discuss motor speed adjustment chart.
4. Present lecture on motor speed adjustment procedure. (*1,2,3,4,5)
TEACHING ACTIVITIES: (cont.)

5. Discuss and demonstrate motor speed adjustment procedure.
6. Discuss and demonstrate safety consideration for working with electric motors.
7. Assign student a piece of computer equipment with incorrect motor speed.
8. Instruct student to adjust the motor speed to the proper speed.

CRITERION-REFERENCED MEASURE:

The student will determine the best method for adjusting the motor speed and adjust the motor speed so that no slippage or binding occurs.

PERFORMANCE GUIDE:

1. Power down equipment to be serviced.
2. Dismantle equipment until motor is accessible.
3. Locate motor speed adjustment screw.
4. Power up equipment.
5. When the part is binding, turn the potentiometer adjusting screw to speed up the motor.
6. When the part is slipping, turn the potentiometer adjusting screw to slow the motor down.
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Adjust motor speed.

ENABLER Motor speed must be adjusted to prevent slippage or binding of the motor.

STUDENT'S NAME __________________ DATE __________

EVALUATOR'S NAME __________________ COURSE _________

TIME: STARTED _______ COMPLETED ________________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while adjusting motor speed.

RECORD THIS INFORMATION:

MANUFACTURER: ___________________________ MODEL: __________

SERIAL #: __________

PERFORMANCE DETERMINANTS  YES  NO

The preparer
- Powered down faulty equipment. ___   ___
- Dismanteled equipment until motor is accessible ___   ___
- Located motor speed adjustment screw. ___   ___
- Powered up equipment. ___   ___
- Checked motor for binding or slippage. ___   ___
- Turned potentiometer adjusting screw to slow motor down. ___   ___
- Conducted operational check. ___   ___
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #142

TASK: Check AC power source.

STANDARD OF PERFORMANCE OF TASK:

AC power receptacle must be checked to determine if voltage is present.

SOURCE OF STANDARD:

Writing team of incumbent workers.

CONDITIONS FOR PERFORMANCE OF TASK:

Voltage tester light
Voltage meter
Screwdriver

ENABLING OBJECTIVE:

1. Identify type of AC power source and voltage requirements.
2. Verify that voltage at the outlet is correct.
3. Understand AC power source test procedures.

*RESOURCES:

RESOURCES: (cont.)

12. Visual Aid - Check AC power source.

TEACHING ACTIVITIES:

1. Present lecture on causes of AC power source interruptions.
2. Discuss power surge's, power outages, blown fuse's, tripped circuits, circuit over loads and faulty wiring.
3. Discuss and demonstrate safety precautions for working with electricity.
4. Present lecture on procedures for checking AC power source.
5. Discuss test equipment used to test a power source.
6. Discuss and demonstrate test procedures for checking a power source.
7. Assign student several power outlets and testing equipment.
8. Instruct student to check the power source for proper voltage.

CRITERION-REFERENCED MEASURE:

The student will determine required voltage and check the power source for proper voltage.

PERFORMANCE GUIDE:

1. Check outlet for power by placing the test probes/prongs directly into outlet sockets and the ground socket.
   NOTE: Test light will light up if power is present.
2. If power is not present at the receptacle, check the service panel for a blown fuse or tripped circuit breaker.
3. If service panel is not the problem, unscrew retaining screw from receptacle cover plate and remove plate.
4. Place the test probes/prongs of the voltage tester or meter on the bare ends of the black and the white wires, at the point where they are connected to the receptacle. Check both sets of wires in this manner.
   NOTE: If the tester bulb lights or volt meter arm moves, then there is power present at the receptacle.
CHECK AC POWER SOURCE

Receptacle Ground Check

Cover-plate Ground Check

Incoming Power Check
CHECKLIST

DUTY Servicing Computer Equipment.

TASK Checked AC power source.

ENABLER AC power receptacle must be checked to determine if voltage is present.

STUDENT'S NAME ______________________ DATE ________

EVALUATOR'S NAME ___________________ COURSE ________

TIME: STARTED _______ COMPLETED _________

TOTAL _________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while checking AC power source.

PERFORMANCE DETERMINANTS YES NO

The preparer

- Obtained voltage tester or meter. _______ _______

- Identified AC power outlet. _______ _______

- Placed test probes into outlet sockets. _______ _______

- Removed receptacle cover plate. _______ _______

- Placed test probes on bare ends of white and black wires. _______ _______

- Determined if power is present in wires. _______ _______

- Check service panel if power is not present. _______ _______
DUTY: Servicing Computer Equipment

PERFORMANCE OBJECTIVE #143

TASK: Repair power supply.

STANDARD OF PERFORMANCE OF TASK:
System will power up.

SOURCE OF STANDARD:
Writing team of incumbent workers. Troubleshooting and Repairing Personal Computers.

CONDITIONS FOR PERFORMANCE OF TASK:
Power supply to be serviced
Replacement parts/components
Voltmeter
Tool kit

ENABLING OBJECTIVE:
1. Identify components of a power supply.
2. Determine if power supply should be repaired or replaced.

RESOURCES:
7. Manufacturer's DOS manual.
10. Checklist - Repair power supply.
11. Visual Aid - Block diagram of power supply, see performance objective #74.
TEACHING ACTIVITIES:

1. Present lecture on the location and function of the power supply. (*1,2,3,4,5,6,7,8,9)
2. Discuss voltage requirements, power input, and voltage regulation.
3. Discuss and demonstrate safety precautions when working with power supplies.
4. Present lecture on components of a power supply. (*6,8,9)
5. Discuss and demonstrate a filter capacitor, voltage regulator, bridge diode, voltage lines, transistors, resistors, transformers, reset buttons, cables and cable connectors.
6. Present lecture on power supply repair procedures. (*1,3,5,6,7,8,9)
7. Discuss and demonstrate power supply repair procedures.
8. Assign student a piece of computer equipment with a faulty power supply and power supply test equipment.
9. Instruct student to check and repair the power supply.

CRITERION-REFERENCED MEASURE:

The student will troubleshoot and repair a power supply. System must power up.

PERFORMANCE GUIDE:

1. Obtain power supply to be serviced.
2. Identify malfunctioning part/component.
   A. Filter capacitor.
   B. Voltage regulator.
   C. Bridge diodes.
   D. Voltage lines.
   E. Transistors.
   F. Resistors.
   G. Transformer.
   H. Reset buttons.
   I. Cables and cable connectors.
3. Remove malfunctioning part/component and replace it with a new part/component.
4. Replace power supply and power up system to check if power supply is functional.
CHECKLIST

DUTY  Servicing Computer Equipment.

TASK  Repair power supply.

ENABLER  Determine if power supply should be repaired or replaced.

STUDENT'S NAME ______________________ DATE __________

EVALUATOR'S NAME ___________________ COURSE ______

TIME :  STARTED _______ COMPLETED __________

TOTAL __________

DIRECTIONS TO THE EVALUATOR:

Use the following checklist to evaluate student performance while repairing power supply.

RECORD THIS INFORMATION:

MANUFACTURER: ______________________ MODEL: ______________

SERIAL #: __________

PERFORMANCE DETERMINANTS  YES  NO

The preparer

- Obtained faulty power supply. ________

- Identified malfunctioning part/component. ________

- Removed malfunctioning part/component. ________

- Replaced malfunctioning part/component. ________

- Replaced power supply. ________

- Performed operational check to insure power supply is functional. ________
APPENDICES

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APPENDIX A

TASK LIST AND JOB TITLES

Computer Equipment Repair
OE: 15-0402

Electronic Sales and Service Technician
DOT: 828.251-010

Electronic Field Engineer
DOT: 828.261-014

DUTIES:

Tasks

A. PERFORMING ADMINISTRATIVE FUNCTIONS

Prepare service bill.
Maintain accounts receivable/paid records.
Perform public relations activities.
Maintain labor records.
Train new service technicians.
Maintain receiving records.
Establish customer files.
Maintain in-stock inventory.
Order parts.
Maintain computer equipment inventory.
Maintain records of service tools and equipment.
Maintain shipping records.
Prepare items for shipping.
Update service manuals.
Maintain call record report.
Conduct representative meetings.
Establish customer and equipment history file.
Calculate equipment repair cost.
Calculate system installation cost.
Update on-site maintenance log.

B. MAINTAINING CUSTOMER SERVICE

Answer customer questions.
Troubleshooting customer problems.
Determine repair method.
Demonstrate computer equipment functions at store.
Demonstrate software functions.

C. INSTALLING COMPUTER EQUIPMENT

Determine customer requirements.
Design system layout.
Transport equipment.
Set up equipment.
Perform installation tests.
C. INSTALLING COMPUTER EQUIPMENT (cont.)

Demonstrate usage of system on site.
Complete warranty cards.
Construct cables.

D. EVALUATING DIAGNOSTICS

Conduct motherboard RAM test.
Conduct motherboard ROM test.
Conduct programmers aid test.
Conduct keyboard test.
Conduct paddle/button test.
Conduct tape read/write/verify test.
Conduct color bar test.
Conduct graphics tablet test.
Conduct basic/integer ROM card test.
Conduct language card test.
Conduct disk interface card test.
Conduct printer card test.
Conduct serial/comm. card test.
Conduct monitor test.
Conduct oscilloscope test.
Conduct data communication line test.
Interpret diagnostic flow charts.

E. MAINTAINING COMPUTER EQUIPMENT

Clean metallic parts.
Clean non-metallic parts.
Clean electrical connections.
Clean cable connections.
Clean printer head.
Clean disk drive head.
Clean and demagnetize tape head.
Lubricate metallic mechanical parts.
Lubricate non-metallic parts.
Adjust mechanical assemblies.
Adjust and align disk drive head.
Adjust and align tape head.
Set disk read/write/verify speed.
Set tape read/write/verify speed.
Clean or replace filters.
Clean outside case/cover.

F. SERVICING COMPUTER EQUIPMENT

Interpret troubleshooting charts.
Interpret chipswapping charts.
Interpret schematics.
Interpret manufacturing upgrade.
Remove and install cover.
Install keyboard.
Install motherboard.
Install power supply.
F. SERVICING COMPUTER EQUIPMENT (cont.)

Install analog board.
Install disk drive assembly.
Install main logic assembly.
Install integrated circuit chips.
Install power light.
Install on-off switch.
Install main printed circuit board.
Install power supply printed circuit board.
Install drive motor.
Install print hammer.
Install print mechanism.
Install carriage assembly.
Install paper feed assembly.
Install drive indicator light.
Install peripheral conn. cables.
Install peripheral connections.
Install circuit/language cards.
Install modem coupler.
Install tape transport assembly.
Install read/write/verify head.
Install modem set switch.
Install ribbon assembly.
Install drive belts.
Install AC input connections.
Install fuse holders and fuses.
Install ejector mechanism.
Install cathode ray tube.
Install configuration switches.
Install peripheral controls.
Install data communications adapter.
Install expansion memory.
Install main memory.
Install field type product line.
Install remote terminals.
Install electrical wiring.
Install keys on keyboard.
Repair keyboard.
Repair motherboard.
Repair analog board.
Repair disk drive assembly.
Repair logic assembly.
Repair on-off switch.
Repair mechanical assembly.
Repair printed circuit board.
Repair drive motor.
Repair carriage assembly.
Repair paper feed assembly.
Repair circuit/language card.
Repair tape transport assembly.
Repair print mechanism.
Repair read/write/verify head.
Repair ribbon assembly.
Repair ejector mechanism.
Repair peripheral control.
Repair data communication adapter.
F. SERVICING COMPUTER EQUIPMENT (cont.)

- Repair expansion memory.
- Repair memory.
- Repair field type product line.
- Repair remote terminals.
- Identify integrated circuit chips.
- Identify machine components and test points.
- Set configuration switches.
- Set user switches.
- Install mechanical assembly.
- Perform operator duties.
- Realign read/write/verify head.
- Adjust motor speed.
- Check AC power source.
- Repair power supply.
APPENDIX B

DEFINITION OF TERMS

A number of terms frequently used in this manual may be unfamiliar to the reader; others may be familiar but in the context of this manual have been assigned special meanings. To assist the catalog user, the following definitions are provided.

1. **Affective.** Skills which emphasize an attitude, feeling, emotion, or degree of acceptance and rejection.

2. **Checkpoint.** A point in the development of the curriculum guide when materials must be sent to V-TECS control office for quality review.

3. **Cognitive.** Skills which emphasize the recall of knowledge and development of intellectual abilities.

4. **Competency.** The ability (including knowledge, skills, and/or attitudes) to perform a specific task or duty successfully.

5. **Competency-based vocational education.** A methodology of instruction that (a) identifies the competencies needed for on-the-job performance; (b) informs students and teachers of the precise and detailed learning objectives required to achieve these competencies; (c) emphasizes high performance standards in testing, course requirements, and/or graduation; and (d) facilitate learning by letting each student master the tasks prior to advancing to another.

6. **Criterion-referenced measures.** An evaluative procedure used to determine if a student has mastered a performance objective.

7. **Domain.** A group of related jobs within an occupational area.

8. **Duty.** One of the distinct, major work activities in an occupational area. A duty is made of numerous tasks. A duty lends itself to the design of units of instruction.

9. **Enabling objectives.** Objectives identifying support knowledge, and subskills, that are prerequisites to the mastery of a task.

10. **Occupational inventory.** An instrument used to obtain responses from workers on what duties and tasks are actually performed in an occupational area.
11. *Performance checklist*. A list of performance steps derived from the performance guide to record acceptable or unacceptable performance of each step of a task.


   a. **Conditions**: "Given what?"
      Describes the situation, including tools and equipment to be used, and limits under which the tasks will be performed.
   b. **Task**: "Does what?"
      States the observable activity the learner will perform.
   c. **Standard**: "How well?"
      Indicates performance required of a successful incumbent worker in an actual job environment.


15. *Quality review*. A review of content by V-TECS director or designated representative to examine quality of content format, and style of curriculum guide.

16. *Resources*. Materials which are used to develop instruction and/or learn specific objectives.

17. *State-of-the-art reference*. Current materials from which information or resources can be found to facilitate instruction.

18. *Task*. A unit of work with a beginning and an ending which is measurable and observable.

19. *Task list*. A list of individual tasks which correspond to a specific job title(s) derived from V-TECS catalogs.

20. *Teaching activities*. Methods and/or procedures for delivering instructional contents to students.
APPENDIX C

TOOL AND EQUIPMENT LIST

Tool/Equipment

Flashlight
Alcohol
Dental mirror
Needles/pins, package of assorted sizes
Adjustable wrench
Digital logic probe
Digital voltmeter
Nonresidue spray cleaner
Circuit-board puller
Parts manual
Combination wrench set
Disks, blank
Voltmeter
Wire strippers
Clean dry cloth
Socket set, standard
Technical manual
Drill bit set
Lubricating grease
Oscilloscope
Chip (integrated circuit) inserter
Feeler gauge
Electrician pliers
Ruler, 25 ft. retractable tape
Adjustable pliers
Soldering tool
Wire, assorted gauges (sizes)
Tweaking tools (non-metal adjusting tools)
Modum
Tweezers
Bristol wrench
Nut driver set
Wired alligator clips
Logic pulser
Socket set, metric
Disks, diagnostic
Electronic/computer books & magazines
Open end wrench set
Solder
Allen wrench set
Electronic tape
Grip tip pliers
Fedron (rubber cleaner)
Tools / Equipment

Lubricating oil
Spring hook
Cotton swab
Printer
Brush, fine bristle
Cleaning solution
Combination gauge
No-op tester
Phillip screwdriver, assorted sizes
Magnet
Burnishing fluid (corrosion remover)
Specialized test equipment
Vise grip pliers
Central processing unit
Dies (wire cutters)
Disk file cabinet
Drill
Spring clip pliers
Frequency counter
Screwdriver gripping tip
Sponge
Brush, stiff bristle
Heat sink
Schematics
Hammer
Hand cleaner
Heat gun
Small 1 lb. weight
Surgical pliers
Thread-lock compound
Disk drive
Channel lock pliers
Flute spline wrench set
Box wrench set
Microfiche reader
Circuit-board vise
Spring scale or postage scale
Solder sucker
Monitor (computer)
Metal hand file set
Microfiche
Ruler, 12 inch
Exacto razor knife
Flat tip screwdriver, assorted sizes
Chip (integrated circuit) remover
Wire wrap extractor
Wire wrap tool
Transistor tester
Flux
Wire gauge
Integrated circuit test clip
Needle nose pliers
Screw starter
Solder wick
Tools / Equipment

Breakout box
Micrometer
Snap ring pliers
Dust-off spray
Automotive ignition wrench set
Connector-gender changers
Pocket knife (2 or 3 blades)
Video patch cord
APPENDIX D

BIBLIOGRAPHY


BIBLIOGRAPHY (cont.)


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