Several intermediate performance objectives and corresponding criterion measures are listed for each of 25 terminal objectives presented in this guide for a basic business machine maintenance course at the secondary level. (For the intermediate course guide see CE 010 948.) The materials were developed for a two-semester (2 hour daily) course designed to provide training in the overall operations of business machines (function and repair of parts). Areas covered include understanding of theory, movement, standard adjustments, alignment, type soldering, oiling procedures, and troubleshooting for electrical and mechanical machines. Titles of the 25 terminal objective sections are Orientation, Shop Layout and Tools, Basic Information, Pitch Information, Type Bar Soldering, Typewriter Carriage, Escapement, Segment Assembly, Ribbon Mechanisms, Tabulation Unit--Underwood Typewriter, Use and Features, Power Transmission, Power Shaft and Cams, Type Action Mechanism, Ribbon Lift and Feed Mechanism, Segment Shift Mechanism, Impression Control Mechanism, Backspace Mechanism, Input Control, Space Bar Mechanism, Carriage Tabulation Mechanism, Electric Margin, Carriage Return Mechanism, Half Spacing, and Troubleshooting. (This manual and 54 others were developed for various secondary level vocational courses using the System Approach for Education (SAFE) guidelines.) (HD)
Business Machine Maintenance

PERFORMANCE OBJECTIVES

BASIC COURSE
J.:::

Mr. William L. Cullen, Chairman
Mr. Randy W. Fitts, Jr., Vice-Chairman
Mr. Joseph Cullen
R. James S. Heggan
R. William S. Mattes, Jr.
Mrs. Jene E. Miller
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Superintendent of Industrial Education

Frunald County Public Schools
Revised: December, 1974

3
The following educators who have contributed to the preparation of this manual:

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The following educator participated as the writer of this manual:

Mr. Robert McMinn, Instructor

Cover design and printing by Mr. Chester Seibert

Editor: Linda Creech
This course provides training in the overall operations ofbusiness machines; course includes function of parts andrepair of same. It also covers understanding of theorymovement, standard adjustments, alignment, type soldering.oiling procedures, and trouble shooting for electrical andmechanical machines.
without further aim and performance objectives

1. Curricular Objective
2. Orientation
3. Shop Layout, Tools
4. Basic Information
5. Pitch Information
6. Eye-bar Soldering
7. Operator's Controls
8. Unit
9. Support Assembly
10. Ribbon Mechanism
11. Tabulation Unit – Underwood Typewriter
12. Use and Features
13. Power Transmission
14. Press Shaft & Cams
15. Type Action Mechanism
16. Ribbon Lift & Feed Mechanism
17. Segment Shift Mechanism
18. Impression Control Mechanism
19. Workspace Mechanism
20. Input Control
21. Space Bar Mechanism
22. Carriage Tabulation Mechanism
23. Electric Margin
24. Margin Return Mechanism
25. Half Spacing
26. Trouble Shooting
Upon completion of the unit on orientation, the student will pass a teacher made test with 75% proficiency on school rules, shop safety and shop rules. Successful completion of each L.P.R. criterion measure will denote success of this L.P.R.

Mark True or False

1. Shirts must be worn with trousers or shorts.
2. Hats, caps, etc. will not be permitted to be worn inside the building.
3. Shoes or sandals must be worn at all times.
4. Swim wear or physical education shorts shall not be worn into class rooms.

Mark True or False

1. Safety glasses must be worn when using the electric grinder.
2. It is permissible to dry your hands by using the pressure air hose.
3. Do not turn on the exhaust fan while washing a machine.
4. You do not have to wear safety glasses while washing a machine in the cleaning tank.

Mark True or False

1. Throwing of metal objects will result in you receiving a referral to the dean.
2. Horseplay or skylarking with the trouble lamps will not be tolerated.
1. If you report to class tardy three times within a grading period you will receive a referral.

2. Only one person at a time will be allowed to use the pressure air hose to "blow" out a machine.
Upon completion of unit of instruction concerned with shop layout, history and equipment, the student will attain 75% average on each I.P. criterion measure.

<table>
<thead>
<tr>
<th>CRITERION: MEASURES</th>
<th>CRITERION: MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1. Upon completion of unit of instruction dealing with history of the typewriter, the student will achieve 75% average on a teacher-made test.</td>
<td></td>
</tr>
<tr>
<td>2.1. What is meant by &quot;blind writers&quot;?</td>
<td></td>
</tr>
<tr>
<td>2.2. In what year was the first commercial typewriter manufactured?</td>
<td></td>
</tr>
<tr>
<td>A. 1893</td>
<td></td>
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<tr>
<td>B. 1873</td>
<td></td>
</tr>
<tr>
<td>C. 1878</td>
<td></td>
</tr>
<tr>
<td>2.3. What company manufactured the first commercial typewriter?</td>
<td></td>
</tr>
<tr>
<td>A. L.C. Smith</td>
<td></td>
</tr>
<tr>
<td>B. Remington</td>
<td></td>
</tr>
<tr>
<td>C. Underwood</td>
<td></td>
</tr>
<tr>
<td>2.4. Who is known as the &quot;father&quot; of the first commercial typewriter?</td>
<td></td>
</tr>
<tr>
<td>A. L.C. Smith</td>
<td></td>
</tr>
<tr>
<td>B. Remington</td>
<td></td>
</tr>
<tr>
<td>C. C.L. Sholes</td>
<td></td>
</tr>
<tr>
<td>2.5. Identify the equipment on the attached chart.</td>
<td></td>
</tr>
<tr>
<td>2.5. Put a check by the ones that you feel should be included in a starter tool set.</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Question</td>
</tr>
<tr>
<td>----</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>2.3</td>
<td>Identify at least 10 out of 12 on a list furnished by the teacher.</td>
</tr>
<tr>
<td>2.4</td>
<td>Upon completion of unit of instruction dealing with setting up a shop, the student will attain 75% proficiency on a teacher-made test.</td>
</tr>
<tr>
<td>2.5</td>
<td>What should you put a plastic bag on machines that will not be returned immediately?</td>
</tr>
<tr>
<td>2.6</td>
<td>When setting up a shop, the repair departments should be:</td>
</tr>
<tr>
<td></td>
<td>A. Separate from the cleaning room.</td>
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<tr>
<td></td>
<td>B. Together with the cleaning room.</td>
</tr>
<tr>
<td></td>
<td>C. All one part of the cleaning room.</td>
</tr>
<tr>
<td>3.2</td>
<td>A &quot;model&quot; shop should consist of:</td>
</tr>
<tr>
<td></td>
<td>A. Two rooms</td>
</tr>
<tr>
<td></td>
<td>B. Three rooms</td>
</tr>
<tr>
<td></td>
<td>C. Four rooms</td>
</tr>
</tbody>
</table>
EQUIPMENT
used in servicing machines
Upon completion of the unit of instruction covering steps to clean, oil, and adjust a typewriter, refinishing the case, refinishing scales, the student will achieve 75% proficiency on each L.P.O. criterion measure.

5.1 Upon completion of unit of instruction covering clean, oil and adjust, the student will list nine out of ten steps to a complete clean, oil and adjust.

5.2 Upon completion of unit of instruction covering refinishing of case, the student will attain 75% proficiency on a teacher made test.

5.1 1. Name, in order, the 10 steps in the C.O.A. sequence.
    1. ___________
    2. ___________
    3. ___________
    4. ___________
    5. ___________
    6. ___________
    7. ___________
    8. ___________
    9. ___________
   10. ___________

5.2 1. The first step in refinishing a typewriter is to:
    A. Sand the rough areas.
    B. Clean, oil and adjust.
    C. Spray a cover coat over the machine.

2. When spraying with a spray can, hold the can:
   A. 6 to 10 inches from the object.
   B. 2 feet from the object.
   C. 12 to 18 inches from the object.

3. When using an oven to wrinkle finish a machine, have the oven preheated to:
   A. 250 degrees.
   B. 175 degrees.
   C. 250 degrees.

4. The length of time that a piece of metal should be heated in order for the
Upon completion of unit of instruction covering refinishing scales, the student will attain 75% proficiency on a teacher made test.

<table>
<thead>
<tr>
<th>No.</th>
<th>Performance Objectives</th>
<th>Criterion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>Finish to wrinkle depends upon:</td>
<td>A. The thickness of the metal.</td>
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<td></td>
<td></td>
<td>B. The amount of paint that is applied.</td>
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<tr>
<td></td>
<td></td>
<td>C. The temperature of the oven.</td>
</tr>
</tbody>
</table>

Mark True or False

1. Do not touch the numbers with your fingers until they have dried at least 24 hours.
2. If the scale needs repainting, first remove about 1/2 of the old paint.
3. You can brighten the numbers on a scale with:
   A. Lacquer paint.
   B. Lacquer stick.
   C. Sand paper.
4. You should paint the scales with:
   A. Enamel paint.
   B. Oil paint.
   C. Lacquer paint.
Upon completion of the unit of instruction covering the pitch of a typewriter, ribbons, ribbon spools, platens and feed rolls, the student will achieve 75% proficiency on each I.P.O. criterion measure.

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
</table>
| 4.1 | Upon completion of the unit of instruction covering ribbons and ribbon spools, the student will achieve 75% proficiency on a teacher made test. | 1. The standard length of the cotton ribbon is:  
   A. 18 yards.  
   B. 12 yards.  
   C. 10 yards.  
   2. Most of the ribbons on current model machines are reversed by a tripping mechanism activated by:  
      A. A full spool.  
      B. An eyelet in the ribbon.  
      C. A empty spool.  
   3. When installing a two-color ribbon (black and red) always:  
      A. Put the red portion at the top.  
      B. Put the black portion at the top.  
      C. Either way is alright.  
   4. A good check to determine the condition of a ribbon, good or bad, is to:  
      A. Pull it through your fingers.  
      B. Type on it.  
      C. Simply look at the ribbon. |
| 4.2 | Upon completion of the unit of instruction dealing with platens and feed rolls, the student will achieve at least 75% proficiency on a teacher made test. | 1. What chemical restores new life to a platen?  
   2. Two important qualities of a platen are:  
      A. Softness and color.  
      B. Hardness and resilience.  
      C. Length and hardness. |
Upon completion of the unit of instruction concerned with the pitch of a typewriter, the student will achieve '5' proficiency on a teacher made test.

3. There are various grades of plates. Code "M" is used for:
   A. 4 to 8 copies.
   B. 8 to 12 copies.
   C. 1 to 6 copies.

4. When sending in platen for resurfacing, always:
   A. Leave the platen knobs on.
   B. Remove the platen knobs.
   C. Remove the left platen knob only.

1. The pitch of a typewriter refers to:
   A. The number of teeth on the starwheel.
   B. The number of spaces per inch.
   C. The length of the carriage.

2. The most common pitches of typewriters are:
   A. 10-12.
   B. 10-14.
   C. 12-14.

3. The pica refers to:
   A. 10 pitch.
   B. 12 pitch.
   C. 14 pitch.

4. Unless it is stamped in such a way as to indicate another pitch, a part is normally a:
   A. 10 pitch.
   B. 12 pitch.
   C. 14 pitch.
Upon completion of unit of instruction concerned with binds, type bars and links, type alinging and type soldering, the student will achieve 75% proficiency on each I.P.O. criterion measure.

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
</table>
| 5.1 | Upon completion of a unit of instruction covering binds, the student will achieve 75% proficiency on a teacher made test. | 5.1 | 1. The preferred way to eliminate a bind is to:  
A. Oil it.  
B. Bend it.  
C. Replace it with a new part.  
2. List three things that can cause a bind in a typewriter.  
   1.  
   2.  
   3.  
3. Binds cause about % of the trouble typewriter mechanics have when working on a machine.  
4. True or False  
   Proper spring tension can be helpful in dealing with a bind. |
| 5.2 | Upon completion of unit of instruction covering type bars and links, the student will achieve 75% proficiency on a teacher made test. | 5.2 | True or False  
1. The Underwood links are interchangeable.  
2. If a link breaks, a temporary emergency measure is to use a paper clip (small piece) as a link.  
3. On the later model typewriters, the number of type bars is:  
   A. 34.  
   B. 44.  
   C. 54. |
### Type Bar Soldering Information

<table>
<thead>
<tr>
<th>No.</th>
<th>Intermediate Performance Objectives</th>
<th>No.</th>
<th>Criterion Measures</th>
</tr>
</thead>
</table>
| 5.1 | Upon completion of unit of instruction concerned with type alignment, the student will achieve 75% proficiency on a teacher made test. | 5.2 | 4. The center point of all the type bars is between the:  
   A. Y and H keys.  
   B. H and A keys.  
   C. Y and K keys.  |
| 5.3 | Upon completion of unit of instruction dealing with type soldering, the student will achieve 100% proficiency on a teacher made test. | 5.3 | Name and explain below the two types of soldering gauges:  
   A. Universal  
   B. Ideal |
The student will disassemble, identify and reassemble the carriage assembly with 75% accuracy as judged by rating scale.

Selection of tools 40%
Accuracy 40%
Speed 10%
Neatness 10%

<table>
<thead>
<tr>
<th>No.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td>Disassemble, identify parts and reassemble carriage assembly on Underwood V typewriter.</td>
</tr>
<tr>
<td>6.1</td>
<td>Given a pictorial chart of the cover assembly, the student will correctly identify 8 of the 10 parts.</td>
<td>Identify the 10 parts of the cover assembly on the attached chart.</td>
</tr>
<tr>
<td>6.2</td>
<td>Given an Underwood V, standard typewriter, the student will remove and reinstall the carriage with 80% accuracy.</td>
<td>Remove and reinstall the carriage on an Underwood V, standard typewriter. You will be graded on the following scale: Selection of tools 40% Accuracy 40% Speed 10% Neatness 10%</td>
</tr>
</tbody>
</table>
The student will disassemble, identify and reassemble the escapement assembly with 80% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>No.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0</td>
<td>Disassemble, identify parts and reassemble escapement assembly on an Underwood V typewriter.</td>
</tr>
<tr>
<td>7.1</td>
<td>Identify the 30 parts of the escapement assembly on the attached chart.</td>
</tr>
<tr>
<td>7.2</td>
<td>Disassemble and reassemble the escapement assembly assigned you. You will be graded on the following scale: Selection of tools 40% Accuracy 40% Speed 10% Neatness 10%</td>
</tr>
</tbody>
</table>

Given a pictorial graph of the escapement assembly, the student will correctly identify 22 of 30 parts.

Given an escapement assembly from an Underwood V, standard typewriter, the student will remove and reinstall the parts with 80% accuracy.
The student will disassemble, identify and reassemble the segment assembly with 80% accuracy as judged by rating scale.

Selecting tools 40%
Accuracy 40%
Speed 10%
Neatness 10%

<table>
<thead>
<tr>
<th>No.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>No.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0</td>
<td>Disassemble the segment assembly assigned you. Identify each part by name to the instructor. Reassemble the assembly. You will be graded as follows: Selection of tools 40% Accuracy 40% Speed 10% Neatness 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>Given a pictorial chart of the segment assembly, the student will correctly identify 20 of 27 parts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>Identify the 27 parts of the segment assembly on the attached chart.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The student will disassemble, identify and reassemble the ribbon bichrome mechanism with 80% accuracy as judged by rating scale.

Selecting tools 40%
Accuracy 40%
Speed 10%
Neatness 10%

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0</td>
<td>Disassemble, identify parts and reassemble ribbon bichrome mechanism on an Underwood V typewriter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Identify the 10 parts of the ribbon bichrome mechanism on the attached drawing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td>Remove and reinstall the ribbon bichrome mechanism on an Underwood V. You will be graded as follows:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selection of tools 40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accuracy 40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neatness 10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Upon completion of the tabulation unit of instruction, the student will answer 75% of the attached I.P.O. criterion tests correctly. In addition, the student will disassemble, identify and reassemble the tabulation mechanism with 80% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>No.</th>
<th>Performance Objectives</th>
<th>No.</th>
<th>Criterion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>Given a pictorial chart of the tabulation mechanism, the student will correctly identify 8 of 11 parts.</td>
<td>10.1</td>
<td>Identify the 11 parts of the tabulation mechanism on the diagram.</td>
</tr>
<tr>
<td>10.2</td>
<td>Given an Underwood V, standard typewriter, the student will remove and reinstall the tabulation mechanism with 80% accuracy.</td>
<td>10.2</td>
<td>Remove and reinstall the tabulation mechanism on an Underwood V. You will be graded as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Selection of tools 40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Accuracy 40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Speed 10%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Neatness 10%</td>
</tr>
</tbody>
</table>
Please place correct letter in the space provided to the left of the question. Choose the one that most closely answers the question.

(Test questions)

<table>
<thead>
<tr>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>1. How much clearance should there be between the carriage frame and the wayrod?</td>
</tr>
<tr>
<td></td>
<td>A. 0.03</td>
</tr>
<tr>
<td></td>
<td>B. 0.25</td>
</tr>
<tr>
<td></td>
<td>C. 0.10</td>
</tr>
</tbody>
</table>

|     | 2. How should the two front rollers of the carriage be adjusted? |
|     | A. The left roller should roll on the top of the rail. |
|     | B. The right roller should roll on the top of the rail. |
|     | C. The left roller should roll in the center of the rail. |

|     | 3. The (A. Left-B. Right-C. Both) rollers on the front carriage are eccentric and can be adjusted. |

|     | 4. The rack should be adjusted. |
|     | A. Deeply as possible without actual bottoming. |
|     | B. High enough to enable it to be raised. |
5. The adjustment for proper line spacing
   A. Adjusting the detent roller forward or rearward.
   B. Adjusting the line space lever.
   C. Adjusting the line space pawl up or down.

6. To increase the drawband tension:
   A. Disconnect the drawband and wind the spring drum.
   B. Loosen the pawl on the ratchet and turn the spring drum screw counter clockwise.
   C. Loosen the pawl on the ratchet and turn the spring drum screw clockwise.

7. To adjust the end play in a platen:
   A. Loosen the left platen knob and adjust the screw in the end of the knob in or out.
   B. Loosen the right platen knob and adjust the screw in the end of the knob in or out.
   C. Tighten both platen knobs.
8. Adjust the end play of the feed rollers on the shafts:
   A. By opening or closing the slots in the shaft spacers.
   B. By forming the shaft brackets.
   C. By adjusting the shaft adjusting screws.

9. The feed roller must have a good grip on:
   A. 17 sheets of paper
   B. 5 sheets of paper
   C. 1 sheet of paper.

10. The type bars should contact the universal bar:
    A. When the typehead is 7-1/8 inches from the type bar guide.
    B. When the typehead enters the type bar guide.
    C. When the typehead is 3/8 inches from the type bar guide.

11. In the space provided below, explain the procedure for adjusting the universal bar.

________________________
________________________
________________________
________________________
________________________

30
12. The clearance between the wayrod and the star-wheel should be:
   A. About .005.
   B. 1/2 inch.
   C. 5/8 inch.

13. The left to right distance between the loose dog and the rigid dog must be:
   A. Between .030 to .036.
   B. Between .010 to .015.
   C. Between .020 to .025.

14. To position the rocker at a six o'clock position:
   A. Adjust the star-wheel to the left or right.
   B. Adjust the loose dog to the left or right.
   C. Adjust the rocker to the left or right.

15. The loose dog must be positioned:
   A. Flush with the star-wheel tooth.
   B. .010 behind the front edge of the starwheel tooth.
   C. .010 in front of the starwheel tooth.

16. The escapement trip should occur when:
   A. The type bar enters the type guide.
   B. The type bar is 1/64 inch past the type guide.
   C. The type bar is 1/64 inch in front of the type guide.
### 17. The back limit adjustment should be made:
- A. After the master trip adjustment is made.
- B. Before the master trip adjustment is made.
- C. Before the front limit adjustment is made.

### 18. The correct position of the space bar is:
- A. Even with the front frame.
- B. One inch above the front frame.
- C. 3/8 inch below the bottom row of keys.

### 19. The distance between the space bar trip lever and the rocker should be:
- A. Between .003 and .006.
- B. About .010 to .030.
- C. Exactly 3/8 inch.

### 20. To remove the end play in the segment:
- A. Tighten the outer rail binding nuts.
- B. Tighten the lock nut on the segment shaft.
- C. Move the bracket wedge down.
## Test Questions

<table>
<thead>
<tr>
<th>No.</th>
<th>Performance Objective</th>
<th>No.</th>
<th>Criterion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>1. Explain how the segment is properly adjusted in the space provided below.</td>
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<tr>
<td>2. The &quot;on feet&quot; adjustment is made by using:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. The small letters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. The large letters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Either the small or the large letters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The &quot;on feet&quot; adjustment is made by:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Adjusting the segment up or down as needed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Adjusting the carriage up or down as needed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Adjusting the platen up or down as needed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The ring and cylinder adjustment is made by:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Adjusting the carriage forward or rearward.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

The ring and cylinder adjustment is made by:

A. Adjusting the carriage forward or rearward.
5. The proper adjustment for the ring and cylinder is checked by:
   A. A slight drag on two sheets of paper.
   B. A slight drag on five sheets of paper.
   C. Drag on one sheet of paper.

6. The "motion" must be made by:
   A. Before the ring and cylinder adjustment is made.
   B. After the ring and cylinder adjustment is made.
   C. Before the "on feet" adjustment is made.

7. The "motion" adjustment is made by:
   A. Aligning the small letters with the large letters.
   B. Aligning the large letters with the small letters.
   C. Aligning either large letters or small letters with each other.

8. When the ribbon is in the rest position:
   A. The top of the ribbon should be .015 to .025 above the type bar guide.
The top or the ribbon should be below the type bar guide.

C. The ribbon should move slightly when the bichrome lever is moved.

9. The bichrome universal bar should be resting on the:
   A. "H" key lever.
   B. Vibrator arm.
   C. "Period" key lever.

10. To obtain the proper throw of the ribbon:
   A. Adjust the screw on the back of the bichrome universal bar.
   B. Form the bracket on the back of the bichrome universal bar.
   C. Raise or lower the rest position.

11. The black and red Up Stop adjustments are checked by:
   A. Typing hard on the one-half key.
   B. Holding the type bar to the platen.
   C. Pulling up on the vibrator.

12. The ribbon feed is driven by:
   A. The main spring.
   B. The gear on the starwheelshaft.
   C. The ribbon drive pawl.
13. The reverse cams on the ribbon drive shaft should be positioned:
   A. One high side up and the other high side down.
   B. Both high sides up.
   C. Both high sides down.

14. The clearance between the high point of the reverse cams and the plungers should be:
   A. 1/2 inch.
   B. .003.
   C. 1/16 inch.

15. To adjust the tabulator rack in proper timing with the escapement, move the rack:
   A. Either left or right as needed.
   B. Up or down as needed.
   C. Forward or rearward as needed.

16. To adjust the tabulator rack so that the set pins may be fully set and unset, move the rack:
   A. Either left or right as needed.
   B. Up or down as needed.
   C. Forward or rearward as needed.

17. With the carriage in the banked or returned position, there should be:
   A. 1/2 inch between the
<table>
<thead>
<tr>
<th>No.</th>
<th>Performance Objectives</th>
<th>Criterion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>With the carriage pushed completely to the right, the lock slide should:</td>
<td>leaf margin stop and the margin stop slide.</td>
</tr>
<tr>
<td></td>
<td>A. Engage as deeply as possible into the pinion.</td>
<td>B. No clearance between the left margin stop and the margin stop slide.</td>
</tr>
<tr>
<td></td>
<td>B. Engage one-third into the pinion.</td>
<td>C. .003 clearance between the left margin stop and the margin stop slide.</td>
</tr>
<tr>
<td>19.</td>
<td>The bell should ring:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A. One space after the line lock engages.</td>
<td>18. With the carriage pushed completely to the right, the lock slide should:</td>
</tr>
<tr>
<td></td>
<td>B. Seven or eight spaces before the line lock engages.</td>
<td>A. Engage as deeply as possible into the pinion.</td>
</tr>
<tr>
<td></td>
<td>C. Three or four spaces before the line lock engages.</td>
<td>B. Engage one-third into the pinion.</td>
</tr>
<tr>
<td>20.</td>
<td>When the back space key is restored to normal, the back space pawl should:</td>
<td>C. Clear the pinion by about .003.</td>
</tr>
<tr>
<td></td>
<td>A. Engage one-third with the pinion.</td>
<td>19. The bell should ring:</td>
</tr>
<tr>
<td></td>
<td>B. Engage fully with the pinion.</td>
<td>A. One space after the line lock engages.</td>
</tr>
<tr>
<td></td>
<td>C. Not contact the pinion.</td>
<td>B. Seven or eight spaces before the line lock engages.</td>
</tr>
</tbody>
</table>

37
The student will disassemble, identify and reassemble the case on an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

**Selection of tools** 25%
**Accuracy** 50%
**Speed** 10%
**Neatness** 15%

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.0</td>
<td>Disassemble, identify parts and reassemble the case on an Olivetti electric typewriter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.1</td>
<td>Identify the 23 parts on the attached chart.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2</td>
<td>Remove and reinstall the case covers on an Olivetti electric typewriter. You will be graded on the following scale: Selection of tools 25% Accuracy 50% Speed 10% Neatness 15%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**OBJECTIVE NO. 12.0**

**Power Transmission**

The student will disassemble, identify and reassemble the power transmission assembly of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>Selection of tools</th>
<th>Accuracy</th>
<th>Speed</th>
<th>Neatness</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>50%</td>
<td>10%</td>
<td>15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0</td>
<td>Disassemble, identify parts and reassemble the power transmission assembly on an Olivetti electric typewriter.</td>
<td></td>
</tr>
<tr>
<td>12.1</td>
<td>Identify the 9 parts on the attached chart.</td>
<td></td>
</tr>
<tr>
<td>12.2</td>
<td>Remove and reinstall the power transmission on an Olivetti electric typewriter. You will be graded on the following scale:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selection of tools 25%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accuracy 50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed 10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neatness 15%</td>
<td></td>
</tr>
</tbody>
</table>
The student will disassemble, identify and reassemble the power shaft and cams of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

Selecting tools 25%
Accuracy 50%
Speed 10%
Neatness 15%

13.1 Given a pictorial chart of the power shaft and cams assembly, the student will correctly identify 9 of 12 parts.

13.2 Given an Olivetti electric typewriter, the student will remove and reinstall the power shaft and cams with 75% accuracy.

13.0 Disassemble, identify parts and reassemble the power shaft and cams on an Olivetti electric typewriter.

13.1 Identify the 12 parts shown on the attached sheet.

13.2 Remove and reinstall the power shaft and cams on an Olivetti electric typewriter. You will be graded on the following scale:
Selection of tools 25%
Accuracy 50%
Speed 10%
Neatness 15%
Objective No. 14.0 Type Action Mechanism

The student will disassemble, identify and reassemble the type action mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>Selection of tools</th>
<th>Accuracy</th>
<th>Speed</th>
<th>Neatness</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>50%</td>
<td>10%</td>
<td>15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>INTERMEDIATE PERFORMANCE OBJECTIVES</th>
<th>No.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.0</td>
<td>Disassemble, identify parts and reassemble the type action mechanism on an Olivetti electric typewriter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.1</td>
<td>Identify the 26 parts on the attached sheet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.2</td>
<td>Remove and reinstall the type action mechanism on an Olivetti electric typewriter. You will be graded on the following scale: Selection of tools 25% Accuracy 50% Speed 10% Neatness 15%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Given a pictorial chart of the type action mechanism assembly, the student will correctly identify 16 of 26 parts.

Given an Olivetti electric typewriter, the student will remove and reinstall the type action mechanism with 75% accuracy.
### TERMINAL PERFORMANCE

**OBJECTIVE NO.** 15.0  
**Ribbon Lift & Feed Mechanism**

The student will disassemble, identify and reassemble the ribbon lift and feed mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

- **Selecting tools** 25%
- **Accuracy** 50%
- **Speed** 10%
- **Neatness** 15%

<table>
<thead>
<tr>
<th>INTERMEDIATE PERFORMANCE OBJECTIVES</th>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.1 Given a pictorial chart of the ribbon lift assembly, the student will correctly identify 9 of 11 parts.</td>
<td>15.1</td>
<td>Identify 11 parts on the attached chart.</td>
</tr>
</tbody>
</table>
| 15.2 Given an Olivetti electric typewriter, the student will remove and reinstall the ribbon lift and feed mechanism with 75% accuracy. | 15.2 | Remove and reinstall the ribbon lift and feed mechanism on an Olivetti electric typewriter. You will be graded on the following scale:  
Selection of tools 25%  
Accuracy 50%  
Speed 10%  
Neatness 15% |
TERMINAL PERFORMANCE

OBJECTIVE NO. 16.0

Segment Shift Mechanism

The student will disassemble, identify and reassemble the segment shift mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

Selection of tools 25%
Accuracy 50%
Speed 10%
Neatness 15%

<table>
<thead>
<tr>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.0</td>
<td>Disassemble, identify parts and reassemble the segment shift mechanism on an Olivetti electric typewriter.</td>
</tr>
</tbody>
</table>

16.1 Given a pictorial chart of the segment shift assembly, the student will correctly identify 12 of 15 parts.

16.2 Given an Olivetti electric typewriter, the student will remove and reinstall the segment shift shaft with 75% accuracy.

Remove and reinstall the segment shift shaft on an Olivetti electric typewriter. You will be graded on the following scale:

Selection of tools 25%
Accuracy 50%
Speed 10%
Neatness 15%
The student will disassemble, identify and reassemble the impression control mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

Selecting tools 25%
Accuracy 50%
Speed 10%
Neatness 15%

17.1 Given a pictorial chart of the impression control assembly, the student will correctly identify 9 of 11 parts.

17.2 Given an Olivetti electric typewriter, the student will remove and reinstall the impression control mechanism with 75% accuracy.

Disassemble, identify parts and reassemble the impression control mechanism on an Olivetti electric typewriter. You will be graded on the following scale:
Selection of tools 25%
Accuracy 50%
Speed 10%
Neatness 15%
The student will disassemble, identify and reassemble the backspace mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>No.</th>
<th>Performance Objective</th>
<th>No.</th>
<th>Criterion Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.0</td>
<td>Disassemble, identify parts and reassemble the backspace mechanism of an Olivetti electric typewriter.</td>
<td>18.1</td>
<td>Identify the 13 parts on the attached chart.</td>
</tr>
<tr>
<td>18.1</td>
<td>Given a pictorial chart of the backspace assembly, the student will correctly identify 8 or 13 parts.</td>
<td>18.2</td>
<td>Remove and reinstall the backspace mechanism on an Olivetti electric typewriter. You will be graded on the following scale:</td>
</tr>
<tr>
<td>18.2</td>
<td>Given an Olivetti electric typewriter, the student will remove and reinstall the backspace mechanism with 75% accuracy.</td>
<td></td>
<td>Selection of tools 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Accuracy 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Speed 10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Neatness 15%</td>
</tr>
</tbody>
</table>
The student will disassemble, identify and reassemble the input control of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0</td>
<td>Disassemble, identify parts and reassemble the input control of an Olivetti electric typewriter.</td>
<td></td>
</tr>
<tr>
<td>19.1</td>
<td>Identify the 10 parts on the attached chart.</td>
<td></td>
</tr>
<tr>
<td>19.2</td>
<td>Remove and reinstall the input control mechanism on an Olivetti electric typewriter. You will be graded on the following scale. Selection of tools 25% Accuracy 50% Speed 10% Neatness 15%</td>
<td></td>
</tr>
</tbody>
</table>

Disassemble, identify parts and reassemble the input control of an Olivetti electric typewriter. You will be graded on the following scale. Selection of tools 25% Accuracy 50% Speed 10% Neatness 15%
TECHNICAL PERFORMANCE

OBJECTIVE NO. 20.0  

Space Bar Mechanism

The student will disassemble, identify and reassemble the space bar mechanism of an Olivetti electric typewriter. The student will remove and reinstall the space mechanism with 75% accuracy as judged by rating scale.

Selecting tools 25%
Accuracy 50%
Speed 10%
Neatness 15%

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.0</td>
<td>Disassemble, identify parts and reassemble the space bar mechanism of an Olivetti electric typewriter.</td>
<td></td>
</tr>
<tr>
<td>20.1</td>
<td>Given a pictorial chart of the space bar assembly, the student will correctly identify 8 of 12 parts.</td>
<td></td>
</tr>
<tr>
<td>20.2</td>
<td>Given an Olivetti electric typewriter, the student will remove and reinstall the space bar mechanism with 75% accuracy.</td>
<td></td>
</tr>
</tbody>
</table>

Remove and reinstall the space bar mechanism on an Olivetti electric typewriter. You will be graded on the following scale:

- Selection of tools 25%
- Accuracy 50%
- Speed 10%
- Neatness 15%
Carriage Tabulation Mechanism

The student will disassemble, identify and reassemble the carriage tabulation mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

Selecting tools 25%
Accuracy 50%
Speed 10%
Neatness 15%

<table>
<thead>
<tr>
<th>NO.</th>
<th>PERFORMANCE OBJECTIVES</th>
<th>NO.</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.0</td>
<td>Disassemble, identify parts and reassemble the carriage tabulation mechanism of an Olivetti electric typewriter.</td>
<td>21.0</td>
<td></td>
</tr>
<tr>
<td>21.1</td>
<td>Given a pictorial chart of the tabulation assembly, the student will correctly identify 15 of 19 parts.</td>
<td>21.1</td>
<td></td>
</tr>
<tr>
<td>21.2</td>
<td>Given an Olivetti electric typewriter, the student will remove and reinstall the tabulation mechanism with 75% accuracy.</td>
<td>21.2</td>
<td></td>
</tr>
</tbody>
</table>

Remove and reinstall the tabulation mechanism on an Olivetti electric typewriter. You will be graded on the following scale.

Selection of tools 25%
Accuracy 50%
Speed 10%
Neatness 15%
### Terminal Performance

**Objective No. 22.0**

The student will disassemble, identify and reassemble the electric margin of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

- **Selecting tools**: 25%
- **Accuracy**: 50%
- **Speed**: 10%
- **Neatness**: 15%

<table>
<thead>
<tr>
<th>No.</th>
<th>Intermediate Performance Objectives</th>
<th>No.</th>
<th>Criterion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.1</td>
<td>Given a pictorial chart of the electric margin assembly, the student will correctly identify 8 of 12 parts.</td>
<td>22.0</td>
<td>Disassemble, identify parts and reassemble the electric margin of an Olivetti electric typewriter.</td>
</tr>
<tr>
<td>22.2</td>
<td>Given an Olivetti electric typewriter, the student will remove and reinstall the electric margin with 75% accuracy.</td>
<td>22.1</td>
<td>Identify the 12 parts on the attached chart.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.2</td>
<td>Remove and reinstall the electric margin on an Olivetti electric typewriter. You will be graded on the following scale.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Selection of tools 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Accuracy 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Speed 10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Neatness 15%</td>
</tr>
</tbody>
</table>
**INTERMEDIATE PERFORMANCE OBJECTIVES**

<table>
<thead>
<tr>
<th>No.</th>
<th>PERFORMANCE OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.0</td>
<td>Disassemble, identify parts and reassemble the carriage return mechanism on an Olivetti electric typewriter.</td>
</tr>
<tr>
<td>23.1</td>
<td>Identify the 30 parts on the attached chart.</td>
</tr>
</tbody>
</table>
| 23.2 | Remove and reinstall the carriage return mechanism on an Olivetti electric typewriter. You will be graded on the following scale.  
Selection of tools 25%  
Accuracy 50%  
Speed 10%  
Neatness 15% |
Upon completion of the half-spacing unit of instruction, the student will answer 75% of the attached I.P.O. criterion tests correctly. In addition, the student will disassemble, identify and reassemble the half-space mechanism of an Olivetti electric typewriter with 75% accuracy as judged by rating scale.

<table>
<thead>
<tr>
<th>No.</th>
<th>CRITERION ILLUSTRATIONS</th>
<th>CRITERION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.1</td>
<td>Identify the 7 parts on the attached chart.</td>
<td>Identify the 7 parts on the attached chart.</td>
</tr>
<tr>
<td>24.2</td>
<td>Remove and reinstall the half space mechanism on an Olivetti electric typewriter. You will be graded on the following scale.</td>
<td>Remove and reinstall the half space mechanism on an Olivetti electric typewriter. You will be graded on the following scale.</td>
</tr>
</tbody>
</table>

- Selection of tools 25%
- Accuracy 50%
- Speed 10%
- Neatness 15%
## Troubleshooting

Given an Olivetti electric typewriter, the student will diagnose, troubleshoot, and restore to proper operating condition 15 designated malfunctions within 75% accuracy as judged by rating scale. The criterion measure of the I.P.O. is contained in the I.P.O. measures.

### Selecting tools
- **Accuracy**: 25%
- **Speed**: 10%
- **Neatness**: 15%

### Performance Objectives

<table>
<thead>
<tr>
<th>No.</th>
<th>Performance Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.9</td>
<td>On each of the I.P.O.'s below:</td>
</tr>
<tr>
<td></td>
<td>Given an Olivetti electric typewriter with a specified malfunction, the student will troubleshoot, repair, adjust and/or replace parts within 75% accuracy as judged by rating scale.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Criterion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0</td>
<td>On the Olivetti electric typewriter assigned you, troubleshoot and repair as needed each of the specified malfunctions below to bring the machine back to operating condition.</td>
</tr>
</tbody>
</table>

- Correct "failure to print".
- Correct "motor will not run".
- Correct "repeating keys".
- Correct "space bar repeat".
- Correct "skipping".
- Correct "motion".
- Correct "type off feet".
- Correct "ring and platen".
- Correct "space bar repeat".
- Correct "backspace".
- Correct "banking".
- Correct "Carriage return".

### Selection of tools
- **Accuracy**: 25%
- **Speed**: 10%
- **Neatness**: 15%