Illustrator Draftsman
Volume 1—Equipment

NAVEDTRA 14332

Sailor's Creed

"I am a United States Sailor.

I will support and defend the Constitution of the United States of America and I will obey the orders of those appointed over me.

I represent the fighting spirit of the Navy and those who have gone before me to defend freedom and democracy around the world.

I proudly serve my country's Navy combat team with honor, courage and commitment.

I am committed to excellence and the fair treatment of all."

PREFACE

By enrolling in this self-study course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program.

COURSE OVERVIEW: In completing this nonresident training course, you will demonstrate a knowledge of the subject matter by correctly answering questions on the following subjects: general shop administration and supervision, commonly available equipment, frequently required operator adjustments and general equipment maintenance.

THE COURSE: This self-study course is organized into subject matter areas, each containing learning objectives to help you determine what you should learn along with text and illustrations to help you understand the information. The subject matter reflects day-to-day requirements and experiences of personnel in the rating or skill area. It also reflects guidance provided by Enlisted Community Managers (ECMs) and other senior personnel, technical references, instructions, etc., and the occupational standards, which are listed in the *Manual of Navy Enlisted Manpower Personnel Classifications and Occupational Standards*, NAVPERS 18068, found on line at https://buperscd.technology.navy.mil/ bup_updt/upd_CD/BUPERS/enlistedManOpen.htm.

THE QUESTIONS: The questions that appear in this course are designed to help you understand the material in the text.

VALUE: In completing this course, you will improve your military and professional knowledge. Importantly, it can also help you study for the Navy-wide advancement in rate examination. If you are studying and discover a reference in the text to another publication for further information, look it up.

CONTENTS

ILLUSTRATOR DRAFTSMAN (DM) TRAINING SERIES

The following volumes in the DM Training Series are available:

DM, Vol. 1, NAVEDTRA 14332
Equipment. This is an overview of general shop administration, available equipment, required operator adjustments, and equipment maintenance. Knowing the capabilities and limitations of the equipment before creating artwork is essential.

DM, Vol. 2, NAVEDTRA 14065
Standard Drafting Practices And Theory. Industry standards for technical drawing, geometric construction, general drafting practices, parallel projections, perspective, and composition are foundational material on which all executionable practices rely.

DM, Vol. 3, NAVEDTRA 14333
Executionable Practices. These chapters cover the theory of color, photography, computer-generated art, figure drawing, cartooning, animation, mediums, lettering, and airbrush. These are the practices a successful DM must master.

DM, Vol. 4, NAVEDTRA 14334
Presentations Graphics. Pre-press copy preparation, television graphics, displays, exhibits, and audiovisual presentations are end products and will influence the how and why DMs do business.

NOTE
For additional information on Professional Development you may go to the following web site: https://www.cnet.navy.mil.

For information and enrollment in NRTCs and to view the Catalog of Nonresident Training Courses, NAVEDTRA 12061, go to the following web site: https//www.advancement.cnet.navy.mil.

INSTRUCTIONS FOR TAKING THE COURSE

ASSIGNMENTS

The text pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions. Pay close attention to tables and illustrations and read the learning objectives. The learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

SELECTING YOUR ANSWERS

Read each question carefully, then select the BEST answer. You may refer freely to the text. The answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the course.

SUBMITTING YOUR ASSIGNMENTS

To have your assignments graded, you must be enrolled in the course with the Nonresident Training Course Administration Branch at the Naval Education and Training Professional Development and Technology Center (NETPDTC). Following enrollment, there are two ways of having your assignments graded: (1) use the Internet to submit your assignments as you complete them, or (2) send all the assignments at one time by mail to NETPDTC.

Grading on the Internet: Advantages to Internet grading are:

- you may submit your answers as soon as you complete an assignment, and
- you get your results faster; usually by the next working day (approximately 24 hours).

In addition to receiving grade results for each assignment, you will receive course completion confirmation once you have completed all the assignments. To submit your assignment answers via the Internet, go to:

https://courses.cnet.navy.mil

Grading by Mail: When you submit answer sheets by mail, send all of your assignments at one time. Do NOT submit individual answer sheets for grading. Mail all of your assignments in an envelope, which you either provide yourself or obtain from your nearest Educational Services Officer (ESO). Submit answer sheets to:

> COMMANDING OFFICER
> NETPDTC N331
> 6490 SAUFLEY FIELD ROAD
> PENSACOLA FL 32559-5000

Answer Sheets: All courses include one "scannable" answer sheet for each assignment. These answer sheets are preprinted with your SSN, name, assignment number, and course number. Explanations for completing the answer sheets are on the answer sheet.

Do not use answer sheet reproductions: Use only the original answer sheets that we provide—reproductions will not work with our scanning equipment and cannot be processed.

Follow the instructions for marking your answers on the answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

COMPLETION TIME

Courses must be completed within 12 months from the date of enrollment. This includes time required to resubmit failed assignments.

PASS/FAIL ASSIGNMENT PROCEDURES

If your overall course score is 3.2 or higher, you will pass the course and will not be required to resubmit assignments. Once your assignments have been graded you will receive course completion confirmation.

If you receive less than a 3.2 on any assignment and your overall course score is below 3.2, you will be given the opportunity to resubmit failed assignments. **You may resubmit failed assignments only once.** Internet students will receive notification when they have failed an assignment--they may then resubmit failed assignments on the web site. Internet students may view and print results for failed assignments from the web site. Students who submit by mail will receive a failing result letter and a new answer sheet for resubmission of each failed assignment.

COMPLETION CONFIRMATION

After successfully completing this course, you will receive a letter of completion.

ERRATA

Errata are used to correct minor errors or delete obsolete information in a course. Errata may also be used to provide instructions to the student. If a course has an errata, it will be included as the first page(s) after the front cover. Errata for all courses can be accessed and viewed/downloaded at:

https://www.advancement.cnet.navy.mil

STUDENT FEEDBACK QUESTIONS

We value your suggestions, questions, and criticisms on our courses. If you would like to communicate with us regarding this course, we encourage you, if possible, to use e-mail. If you write or fax, please use a copy of the Student Comment form that follows this page.

For subject matter questions:

E-mail: n313.products@cnet.navy.mil
Phone: Comm: (850) 452-1001, Ext. 2167
          DSN: 922-1001, Ext. 2167
          FAX: (850) 452-1370
          (Do not fax answer sheets.)
Address: COMMANDING OFFICER
          NETPDTC N313
          6490 SAUFLEY FIELD ROAD
          PENSACOLA FL 32509-5237

For enrollment, shipping, grading, or completion letter questions

E-mail: fleetservices@cnet.navy.mil
Phone: Toll Free: 877-264-8583
          Comm: (850) 452-1511/1181/1859
          DSN: 922-1511/1181/1859
          FAX: (850) 452-1370
          (Do not fax answer sheets.)
Address: COMMANDING OFFICER
          NETPDTC N331
          6490 SAUFLEY FIELD ROAD
          PENSACOLA FL 32559-5000

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you may earn retirement points for successfully completing this course, if authorized under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 8 points. (Refer to *Administrative Procedures for Naval Reservists on Inactive Duty,* BUPERSINST 1001.39, for more information about retirement points.)

CHAPTER 1

SHOP ORGANIZATION AND ADMINISTRATION

Overview

Introduction   As an Illustrator Draftsman, your responsibilities do not begin and end with the start and completion of a drawing assignment. You may, regardless of pay grade, have administrative and organizational responsibilities integral to the efficient management of your shop. This chapter provides a basic background to help you understand your administrative obligations.

Objectives   The material in this chapter enables you to do the following:

- Identify command limitations on copy reproduction and the importance of a production log.

- Understand the significance of accurately completing Joint Committee of Printing (JCP) inventories.

- Recognize copyrighted material and avoid copyright infringement.

- Compile information required to submit an audiovisual report.

- Identify the procedures for releasing, handling, and protecting classified material.

- Recognize material suitable for inclusion in a picture morgue and procedures for classifying additions and deletions.

Overview, Continued

Acronyms   The following table contains a list of acronyms you must know to understand the material in this chapter:

Acronym	Meaning
AV	Audiovisual
BIB	Bibliography
DD	Department of Defense Form
FSC	Federal Supply Class
GSA	Government Supply Agency
ISA	Interservice Support Agreement
JCP	Joint Committee of Printing
JIRSG	Joint Interservice Regional Support Group
MLSR	Missing, Lost, Stolen, or Recovered
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSDS	Material Safety Data Sheets
NAVSUP	Navy Supply Form
OF	Optional Form
OPTAR	Operational Target
PAR	Personnel Advancement Requirements
PMRP	Precious Metal Recovery Program
SF	Standard Form
SSIC	Standard Subject Identification Code
VI	Visual Information

Overview, Continued

In this chapter   This chapter covers the following topics:

Topic	See Page
Shop Layout	1-4
Regulations	1-6
Forms	1-32
Files	1-35
Supply	1-39
Supervision	143
Job Orders	1-50
Customer Service	1-53
Quality Control	1-54

Shop Layout

Introduction

DMs fill billets in drafting or graphic shops on ships and shore locations. The mission of the command and the shop varies from billet to billet. Some shops stand alone and produce products from beginning to end. Other shops interface with a Photo Lab or Printshop to complete the products. It is important for you to understand the commitments and agreements of the shop to administer, manage, and supervise the shop efficiently.

Local commitments

Local commitments are interfaces with other shops, such as a Photo Lab or a Printshop. Maintain a good rapport with these support shops. Provide them with creditable service and your shop will receive the same.

External commitments

In addition to and external to the command, Navy drafting shops have obligations and responsibilities defined by instruction and practice. Know the commitments of the shop to provide support to units external to your command. These commitments exist in the form of Interservice Support Agreements (ISA), Joint Interservice Regional Support Group (JIRSG), Memorandums of Understanding (MOU), and Memorandums of Agreement (MOA). Agreements between units typically define reoccurring services and the basis for financial reimbursement. Although you need not know the intricacies involved in establishing agreements between units, you must know if your shop has such commitments, the extent of the obligation, and the format for finding. These factors can determine how your shop orders supplies and schedules work loads.

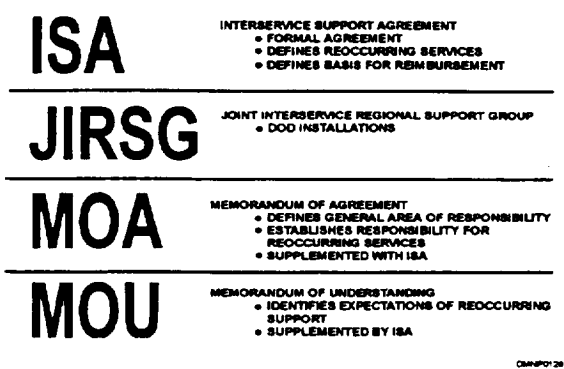Figure 1-1 shows external agreements and their purposes.

Figure 1-1. —External Agreements.

Shop Layout, Continued

Physical environment

Ideally, drafting shops are divided into the following three distinct areas:

• a reproduction area,
• a storage area, and
• a work area.

The chances are that your shop was set up before you arrived. Review your shop spaces with an eye for an improved work environment.

ANALYZE: Analyze your shop spaces periodically to determine if you are using space and equipment efficiently. Make a scale drawing of your shop spaces and cutouts of the equipment to arrange and rearrange for maximum productivity.

SPACE: Remove unwanted, obsolete, or defective equipment from the shop and dispose of it properly to free up every inch of space. Locate the reproduction and storage areas away from the work area to eliminate distractions. Workers should not have to walk around each other to reach supplies and reproduction machinery.

NOISE: Minimize the noise in the work area.

TEMPERATURE: Keep the temperatures in all areas comfortable– not too hot and not too cold. Temperatures in the storage area may sour supplies if overly warm and humid.

LIGHT: Lighting of the proper intensity is critical. All workers should have a sufficient amount of direct light or they will require additional lighting. Direct sunlight is rarely available as a steady light source.

COMFORT: Consider every factor that will impact the comfort of the worker and the security of the equipment and supplies, including the effects of the pitch and roll of the ship.

CLEANLINESS: Keep everything clean and in a maximum state of readiness. Clean spaces regularly; clean equipment often. Dirty spaces and equipment produce dirty work.

SAFETY: Plan for a safe environment.

Regulations

Introduction
Regulations govern every facet of military life, including the jobs we do and how we do them. They provide guidance and direction. They ensure uniformity and discipline. However, the word *regulations* seems always to have a derogatory connotation, but regulations actually work for you. When you know and operate within the guidelines of published regulations, you, your shop, and the people that work for you are well taken care of.

Local policy
Local commands may have an established policy regarding the function and use of the Graphics shop. Some do not. If a guidance policy does not exist for your shop, it would be wise for you to create one. If one exists, review it annually and update it as necessary.

A command policy or instruction minimizes the opportunity to abuse shop personnel, equipment, and supplies. It establishes procedures, establishes a chain of command for requesting services, and sets criteria for priority work.

When you have to create a command policy or instruction, use existing guidance already promulgated in Navy and Department of Defense instructions.

Governing directives
Although the instructions in this section were current at the time of this writing, they are subject to periodic review. Gather these instructions as reference material and be sure to collect the most recent edition. This training manual will not cover them in detail.

Regulations, Continued

**Governing
directives
(Continued)** The following table contains a list of instructions you must know well to manage a Navy Graphics shop effectively:

Instruction	Name
BUPERSINST 1610.10	Navy Performance Evaluation (EVAL) and Counseling System
DODINST 4000.19	Interservice, Interdepartmental, and Interagency support
JCP No. 26	Government Printing and Binding Regulations
NAVPUBINST 5600.44	Reprographics Management Program
NAVPUBINST 5600.42 NAVSO P-35	Department of the Navy, Publications and Printing Regulations
NAVPUBINST 5603.10	Preparation and Submission of JCP Forms 1, 5, and 6; Procedures for
NAVPUBINST P-2002	Navy Stocklist of Publications and Forms
NAVSEAINST 4570.3	Precious Metal Recovery Program (PMRP)
OPNAVNOTE 5290	Alteration of Official DOD Imagery
OPNAVINST 5290.1	Naval Imaging program (NAVIMP) Policy and Responsibilities
OPNAVINST 5510.1	Department of the Navy, Information and Personnel Security Program Regulation
SECNAVINST 5213.10	Department of the Navy, Forms Management program

Regulations, Continued

Governing directives (Continued)

Instruction	Name
SECNAVINST 5215.1	Department of the Navy, Directives Issuance System
SECNAVINST 5216.5	Navy Correspondence Manual
SECNAVINST 5210.11	Department of the Navy, Standard Subject Identification Codes
SECNAVINST 5500.4	Department of the Navy, Reporting of Missing, Lost, Stolen, or Recovered Government Property
SECNAVINST 5870.6	Copyright in Works of Authorship Prepared by Department of the Navy Personnel
SECNAVINST 5870.5	Permission to Copy Materials Subject to Copyright
SECNAVINST 5600.20	Graphic Design Standards
SECNAVINST 5603.2	Printed Matter for Official Ceremonies
SECNAVINST 5290.1	Naval Imaging Program

BUPERSINST 1610.10, Navy Performance Evaluation (EVAL) and Counseling System

The *Navy Performance Evaluation (EVAL) and Counseling System* provides guidance for writing performance evaluations and counseling personnel. It identifies line items and appropriate entries for every category of an evaluation. This is an invaluable reference for writing your input to your evaluation or those of subordinates under your jurisdiction.

Regulations, Continued

DODINST 4000.19, Interservice, Interdepartmental, and Interagency Support	This instruction specifically defines the support provided throughout the Department of Defense complex between services, agencies, and commands. It also outlines reimbursable services and formalizes agreements by Memorandums of Agreement (MOA), Memorandums of Understanding (MOU), and Interservice Support Agreements (ISA).
JCP No. 26, Government Printing and Binding Regulations, S. Pub. 101-9	This publication outlines shop entitlement, funding and allowance lists, biannual inspections, annual reporting obligations, and the consequences of inaccurate reporting or the failure to report. It contains definitions, equipment condition codes, and a list of JCP forms.
NAVPUBINST 5600.44, Reprographics Management Program	The NAVPUBINST 5600.44, Reprographics Management Program, is a fleet-wide standard. It defines procedures and terminology, delineates copy procedures, duplicating, and reprographic functions and entitlement. It specifically addresses both sea and shore command limitations. The primary concern of this instruction is the economical use of copying and reprographic facilities.

Regulations, Continued

NAVPUBINST 5600.44, Reprographics Management Program (Continued)

The Copier Production Log is generally used for copying items in small quantity. Keep this log near the copy machine and complete it every time a copy is made. It gives an accurate account of the amount of paper used and who is using it. It also highlights abuses in copier use. This is a valuable tool for justifying expenditures in stock and toner.

Figure 1-2 shows a Copier Production Log and appropriate log entries.

Figure 1-2. -Copier Production Log.

Regulations, Continued

NAVPUBINST 5600.44, Reprographics Management Program (Continued)

The Economical Copying Limit displays the copier limitations and refers the customers to another machine if their job exceeds the copier capabilities. Display this sign along with the Copier Production Log prominently near the copier.

Figure 1-3 shows the Economical Copying Limit, which is protection for the copier from excessive wear due to exceeding the manufacturer rated capacity.

NAVPUB 5600/29

ECONOMICAL COPYING LIMIT

_____COPIES PER ORIGINAL
_____TOTAL COPIES PER JOB

☆ For larger requirements, use copier or facility in Bldg. _____, Room ____

Please limit quantities to absolute minimum

DMNP0130

Figure 1-3.—Economical Copying Limit.

Regulations, Continued

NAVPUBINST 5600.44, Reprographics Management Program (Continued)

Figure 1-4 shows an example of a Duplicating Production Log.

DMNP0131

Figure 1-4. —Duplicating Production Log.

Regulations, Continued

NAVPUBINST 5600.44, Reprographics Management Program (Continued)

The Reproduction Production Log specifies job number, ordering activity, size, number of originals, copies each, total copies, and adjusted totals. This information is a valuable source in figuring overall costs in man-hours and supplies.

Figure 1-5 depicts the Reproduction Production Log, which is an enclosure to the instruction.

DMNP0132

Figure 1-5. —Reproduction Production Log.

Regulations, Continued

NAVPUBINST 5600.42 NAVSO P-35 Department of the Navy, Publications and Printing Regulations

This regulation provides detailed guidance to all ships and stations that produce a newspaper or a newsletter for the crew. It reiterates policy found in the Reprographics Management Program and the Joint Committee on Printing (JCP), No. 26. There is a list of references and authorized Navy printing plants in the back of the regulation.

NAVPUBINST 5603.10, Preparation and Submission of JCP Forms 1, 5, and 6: Procedures for

This is an instruction on completing the JCP Forms 1, 5, and 6. These are annual reporting requirements that, if inaccurate or incorrectly filled in, may cost your shop in terms of billets and funding.

Figure 1-6 shows Forms 1, 2, 5, and 6. Forms 1 and 5 are the most important forms for your shop if the shop does any reproduction.

Figure 1-6. —JCP forms.

Regulations, Continued

NAVPUBINST P-2002, Navy Stocklist of Publications and Forms

The Navy Stocklist of Publications and Forms lists standard Navy forms, signs, and labels available through the government supply system. It provides ordering information such as the stock number, unit of issue, and a brief description. Use this publication to order standard stock items instead of producing them in your shop. If an originator requests standard stock items or items with a stock number, refer them to supply with the appropriate information for ordering the item through supply. It is against Navy regulations to create or print, in quantity, items available through the system.

NAVSEAINST 4570.3, Precious Metals Recovery Program (PMRP)

This instruction introduces a precious metal/metal recovery program that is becoming increasingly important in the work space. Some of the products we use as DMs contain particles of precious metals or substances that are recoverable. Photographic films, pastes, and paints are but a few of the products that contain or produce effluent, containing recoverable particulate which could represent a savings or credit to the Navy.

OPNAVNOTE 5290, Alteration of Official DOD Imagery

This Department of Defense Directive provides guidance and establishes policy and responsibility on the alteration of DoD imagery. It defines acceptable alterations using photographic techniques, video imagery, cropping, editting, enlarging, animation, digital simulation, graphics, special effects, digital conversion or compression, and post-production enhancement.

Regulations, Continued

OPNAVINST 5290.1, Naval Imaging Program (NAVIMP) Policy and Responsibilities

The purpose of the OPNAVINST 5290.1, Naval Imaging program (NAVIMP) Policy and Responsibilities, is to establish a centralized visual imagery activity to supply the regional fleet with audiovisual products. This centralized shop would function more economically than a cluster of independent shops and assume accountability and responsibility for all audiovisual and visual information products.

Approved VI activities have a five-digit authorization number for finding and billeting. This number, called a DVIAN number, identifies major commands and individual activities of the VI community.

This instruction requires each shop to submit a visual information report annually. The visual information (VI) report accounts and justifies funding and billet assignments.

Study this instruction in its entirety. Definitions of production guidelines and report requirements must be thoroughly understood before you submit the myriad of forms associated with it.

Regulations, Continued

OPNAVINST 5290.1, Naval Imaging Program (NAVIMP) Policy and Responsibilities (Continued)

Figure 1-7 shows a customer request to initial production for an audiovisual product.

VISUAL INFORMATION PRODUCTION REQUEST, EVALUATION AND APPROVAL

REPORT CONTROL SYMBOL DD-PA(AR)1381

SECTION A. ORIGINAL CUSTOMER REQUEST FOR VISUAL INFORMATION (VI)

1. DATE OF REQUEST (YY/MM/DD)   2. DATE REQUIRED (YY/MM/DD)

3. TYPE OF REQUEST (Xa, b, or c, and complete as applicable)
   a. NEW OR REVISED PRODUCTION
   (1) Script Attached (X one) (2) Suggested Location (3) Revision of PIN/PAN
   YES   NO   (a) Script   (b) Photography
   b. ADOPTION OF GOVERNMENT PRODUCTION
   (1) Source (Name, Address, & Phone Number) (2) Location of Master Materials (3) PIN/PAN or Other Product Number
   c. COMMERCIAL ACQUISITION (Existing off the shelf productions only)
   (1) Vendor's Mailing Address & Phone Number (2) Sole Source Justification Attached (X one) YES NO (3) Copyright Release Attached (X one) YES NO
   (4) Estimated Cost Per Copy $ (5) Commercial Identification Number

4. TITLE

5. SERIES TITLE AND PART IDENTIFICATION

6. PROPOSED SECURITY CLASSIFICATION (X one) a. Unclassified b. Confidential c. Secret d. Top Secret

7. PRODUCTION OBJECTIVE (X one)
   a. Education and Training b. Internal Information c. Public Information d. Recruiting e. Research Development, Test and Evaluation f. Intelligence, Reconnaissance, Criminal Investigative and Communications Security g. Combat Readiness h. Installation Support i. Medical and Dental

8. OBJECTIVE AND KEY POINTS

9. JUSTIFICATION

10. TARGET AUDIENCE

11. DISTRIBUTION PLAN

12. FUNDING a. Unfunded b. Funded; amount available $ 13. ESTIMATED YEAR OF OBSOLESCENCE
    c. Program Element(s) (List)   14. ESTIMATED RUNNING TIME

15. REQUESTER
    a. TYPED NAME (Last, First, MI) b. RANK/GRADE c. ORG. NAME OR SYMBOL
    d. TITLE   e. PHONE NUMBERS (Autovon & Commercial)

DD Form 1995-1, AUG 87   Previous editions are obsolete   Page 1 of 2 Pages

DMNP0135

Figure 1-7. —VI Production Request.

Regulations, Continued

OPNAVINST 5290.1, Naval Imaging Program (NAVIMP) Policy and Responsibilities (Continued)

Figure 1-8 shows the extensive amount of research and consideration given to a customer request for a visual information product before approval or disapproval.

SECTION B. VALIDATION BY FUNCTIONAL MANAGEMENT

DD Form 1995-1, AUG 87 — Page 2 of 2 Pages

DMNP0136

Figure 1-8. —Validation.

Regulations, Continued

OPNAVINST 5510.1, Department of the Navy, Information and Personnel Security Program Regulation

The OPNAVINST 5510.1 is the Navy security manual. What you need to know about protecting sensitive information is in this instruction. It establishes security measures for handling and marking, as well as protection and safeguards in transmitting and storing classified information. Standardized fleet-wide procedures ensure optimum continued and consistent protection of information vital to national security.

The following table contains a list of the most important chapters that you, as a DM, must know:

Chapter	Title
Chapter 8	Declassification, Downgrading, and Upgrading
Chapter 9	Marking
Chapter 10	Accounting and Controls
Chapter 11	Printing, Reproduction, and Photographing
Chapter 13	Safeguarding
Chapter 14	Storage
Chapter 16	Hand Carrying
Chapter 17	Destruction

Regulations, Continued

SECNAVINST 5213.10, Department of the Navy, Forms Management Program

The Forms Management Program encourages interagency, interservice, and interdepartmental use of forms. Its intent is to reduce duplication of forms and to minimize the creation of new forms.

SECNAVINST 5215.1, Department of the Navy, Directives Issuance System

Besides standardizing and economizing form use, the Directives Issuance System, SECNAVINST 5215.1, ensures the currency of local forms by requiring periodic reviews. A command review procedure reduces form duplication and obsolescence. Procedures for preparing and maintaining local forms are specific. Before reproducing a local form, check to make sure the local coordinator, usually located in the administrative offices, approves the form for continued reproduction. The originators of the reproduction request are responsible for making sure local forms have approval, but not many do. The designation for approved local forms or instructions is in the lower left-hand comer of the page.

SECNAVINST 5216.5, Navy Correspon-dence Manual

The *Navy Correspondence Manual* defines the standard format for internal memos and memorandums and letters that will leave the command. It dissects a letter explaining the purpose and impact of each section. Communicating intelligently in writing is a prerequisite to any successful career. An excellent correspondence course is available through the Educational Services Office.

Regulations, Continued

SECNAVINST 5210.11, Department of the Navy, Standard Subject Identification Codes (SSIC)

The SSIC is a standardized filing procedure that creates a filing system where files are easily expandable and retrievable. All administrative correspondence is based on this system, which consists of five sections and thirteen major subject groups. Primarily numeric, further cross-referencing and subdivision yield a highly flexible filing system. When you withdraw a file from the system, use a Chargeout Record to indicate where a file belongs. Chargeout Records information is covered in the "Forms" segment of this chapter.

Figure 1-9 shows the five sections and thirteen major subject codes of the

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                    ┌─ SECTION 1:  FILING PROCEDURES

                    ─ SECTION 2:  CONSTRUCTION OF STANDARD SUBJECT IDENTIFICATION
                                  CODES (SSIC)

                    ─ SECTION 3:  LIST OF SSIC CODES

                              ┌─ 1000 - 1999    MILITARY PERSONNEL
                              │  2000 - 2999    TELECOMMUNICATIONS
                              │  3000 - 3999    OPERATIONS AND READINESS
                              │  4000 - 4999    LOGISTICS
                              │  5000 - 5999    GENERAL ADMINISTRATION AND
        5             13      │                 MANAGEMENT
      SECTIONS       MAJOR    │  6000 - 6999    MEDICINE AND DENTISTRY
                     GROUPS   │  7000 - 7999    FINANCIAL MANAGEMENT
                              │  8000 - 8999    ORDNANCE MATERIAL
                              │  9000 - 9999    SHIPS DESIGN AND MATERIALS
                              │  10000 - 10999  GENERAL MATERIAL
                              │  11000 - 11999  FACILITIES AND ACTIVITIES ASHORE
                              │  12000 - 12999  CIVILIAN PERSONNEL
                              └─ 13000 - 13999  AERONAUTICAL AND
                                                ASTRONAUTICAL MATERIALS

                    ─ SECTION 4:  ALPHABETICAL GUIDE TO SSIC

                    └─ SECTION 5:  GUIDELINES FOR REQUESTING CHANGES
                                                                DMNP0142
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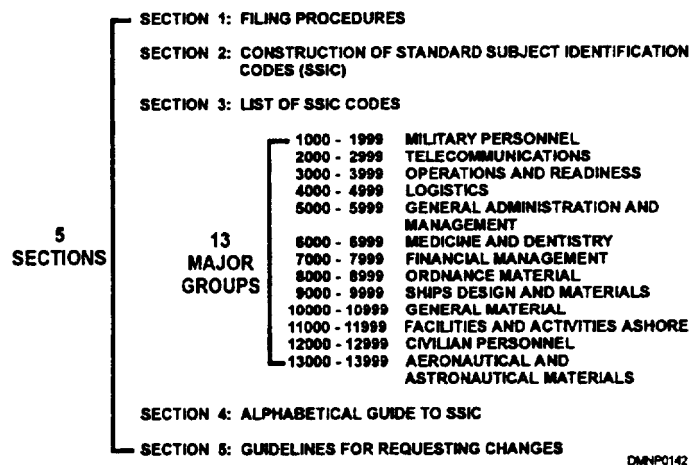
Figure 1-9.—SSIC.

SECNAVINST 5500.4, Department of the Navy, Reporting of Missing, Lost, Stolen, or Recovered (MLSR) Government Property

This instruction prescribes policy and procedures for reporting controlled or pilferable equipment, precious metals/metal recovery, and gear on minor plant property cards that is missing, lost, stolen, or recovered. Annual sight inventories of custody card items will highlight discrepancies in shop equipment. An enclosure lists MLSR definitions and terminology. Larger shops or shops highly trafficked may hold a custody card inventory more often than once a year.

Regulations, Continued

SECNAVINST 5500.4, Department of the Navy, Reporting of Missing, Lost, Stolen, or Recovered (MLSR) Government Property (Continued)

Figure 1-10 is an example of the front side of a DD Form 200. Report inventory discrepancies immediately on a Financial Liability Investigation of Property Loss, DD Form 200, NSN 0102-LF-011-9100.

Figure 1-10. —DD Form 200.

Regulations, Continued

SECNAVINST 5500.4, Department of the Navy, Reporting of Missing, Lost, Stolen, or Recovered (MLSR) Government Property (Continued)

Figure 1-11 is an example of the back side of the form. Maintain submitted forms in the shop file until the missing equipment is removed from inventory.

Figure 1-11. —DD Form 200 (back).

Regulations, Continued

SECNAVINST 5870.6, Copyright in Works of Authorship Prepared by Department of the Navy Personnel

Copyright in Works of Authorship Prepared by Department of the Navy Personnel, SECNAVINST 5870.6, clearly states that work prepared by an officer or employee of the United States Government while in an official capacity is not eligible for copyright. The definition of official capacity or official duties is defined by this instruction as are some exceptions which would allow a copyright.

SECNAVINST 5870.5, Permission to Copy Materials Subject to Copyright

The purpose of SECNAVINST 5870.5, Permission to Copy Material Subject to Copyright, is to prescribe the procedures for obtaining permission from copyright owners to use their copyrighted material. The instruction describes copyright infringement, copyright markings, and details the guidelines one should follow to request permission to use information free of charge or at cost. It also ascribes responsibilities for infringement to the user activity and lists a point of contact for clarification and administrative claims.

Figure 1-12 illustrates common copyright markings.

MARK	YEAR OF FIRST PUBLICATION (MAY NOT BE PRESENT)	OWNER IDENTIFICATION
© ℗ (SOUND RECORDINGS) COPYRIGHT COPR.	YEAR DATE	NAME INITIALS ORGANIZATION

DMNP0134

Figure 1-12. —Copyright markings.

Regulations, Continued

SECNAVINST 5600.20, Graphic Design Standards

The purpose of SECNAVINST 5600.20, Graphic Design Standards, is to standardize formats, typography, and emblem identifiers throughout the Navy in the interest of economy. Identifiers are symbols that represent the department and activity seals, the Navy emblem, and the logotype.

Figure 1-13 illustrates acceptable identifiers.

DEPARTMENT SEAL   NAVY EMBLEM   NAVY LOGOTYPE   ACTIVITY SEAL

DMNP012_

Figure 1-13. —Identifiers.

This instruction also specifies the allowable typography and leading between words and lines. Although generally uniform, regardless of whether the finished product is an envelope, a letterhead, or a certificate, it does vary. This instruction offers a selection of standardized sizes and formats for certificates and addresses the issue of color ink and color ink selection.

Figure 1-14 shows standard vertical formats. The asymmetric format is using a full-color department seal. This seal is also available in a horizontal format through the supply system.

SYMMETRIC   ASYMMETRIC

DMNP0127
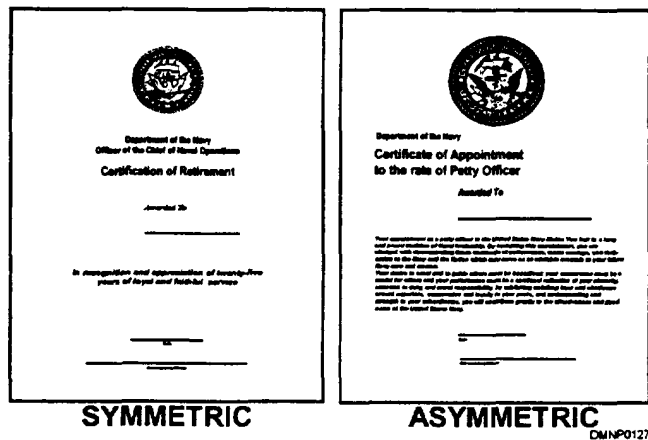
Figure 1-14. —Vertical formats.

Regulations, Continued

SECNAVINST 5600.20, Graphic Design Standards (Continued)

Figure 1-15 shows standard horizontal formats.
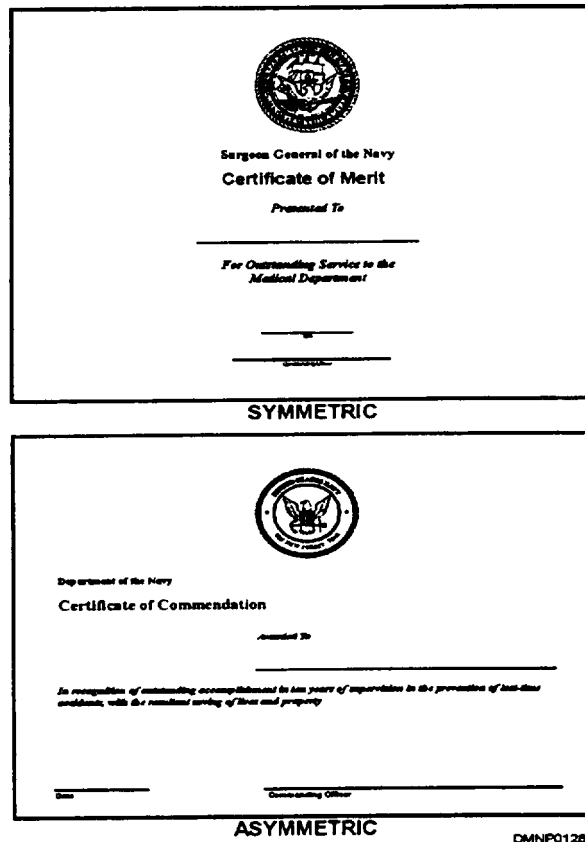
Figure 1-15. —Horizontal formats.

SECNAVINST 5603.2, Printed Matter for Official Ceremonies

Printed Matter for Official Ceremonies is a valuable reference instruction that defines ceremonial printed material at public expense approved as official and necessary. Ceremonial material is invitations for retirement ceremonies, luncheons, dinners, receptions, and Dining-In ceremonies.

SECNAVINST 5290.1, Naval Imaging Program

The SECNAV instruction is almost identical to the OPNAV instruction. The major difference between these two instructions is the detailed explanation of the procedures for filling out the reports.

Regulations, Continued

Figure 1-16 illustrates the front of a three-page form used to track the visual information product throughout its creation.

Figure 1-16. —DD Form 1995-2, page 1 of 3.

Regulations, Continued

Figure 1-17 shows the second page which identifies target audiences, milestone dates, and primary contacts.

VISUAL INFORMATION (VI) PRODUCTION REPORT *(CONTINUED)*

*8. COMMUNICATION OBJECTIVES

(Maximum 50 words)

*9. TARGET AUDIENCE

(Maximum 50 words)

10. MILESTONE DATES *(YY/MM/DD)*

*a. PRODUCTION APPROVAL DATE	b. DATE DAVIS UPDATE	
c. DATE PRODUCT PURCHASED	*(1) DAVIS User Name	
d. PRODUCTION PHASE DATES		
(1) Script Initiation Date	e. CATALOG ENTRY DATE	
(2) Script Approval Date	f. REVALIDATION DATE	
(3) Production Initiation Date	G. PRODUCTION STATUS (X one)	
(4) Production Completion Date	*(1) Proposed	
(5) Reproduction Completion Date	*(2) Completed	
(6) Distribution Date	*(3) Cancelled	

11. ACQUISITION SOURCE *(X one)*

a. GO/CO CONTRACT PRODUCED	b. GO/CO CONTRACT PRODUCED	
c. GOVERNMENT PRODUCED	d. GOVERNMENT OR DOD ADOPTED	
e. COMMERCIAL OFF-THE-SHELF PURCHASE	f. COMMERCIALLY ADOPTED	

12. PRIMARY CONTRACTS

*a. ASSIGNED PRODUCTION APPROVAL DATE	
(1) Organization and Office Symbol	
(2) Telephone Numbers *(Autovon)*	*(Commercial)*
(3) DVIAN	
*b. CONTRACTING OFFICE	
(1) Organization and Office Symbol	
(2) Telephone Numbers *(Autovon)*	*(Commercial)*
*c. COMMERCIAL SOURCE	
(1) Vendor's Name	
(2) Vendor's Mailing Address	
(3) Vendor's Telephone Number ( )	

DD Form 1995-2, AUG 87 — Page 2 of 3 Pages

DMNP0138

Figure 1-17. —Page 2.

Regulations, Continued

SECNAVINST 5290.1, Naval Imaging Program (Continued)

Figure 1-18 shows the location of the master material and the overall cost of production on the last of the three-part form.

Figure 1-18. —DD Form 1995/2.

Regulations, Continued

SECNAVINST 5290.1, Naval Imaging Program (Continued)

Figure 1-19 shows the front of DD Form 2054/1, the Visual Information (VT) report. The figures reported on this form come directly from the shop job log. The importance of a detailed and accurate log is evident. Category definitions, especially in Section III, are subject to change. Verify the reporting criteria with your type commander before submission. An incorrect report or your failure to report can be costly in terms of funding and personnel during the next fiscal review.

Figure 1-19. —VI Annual Report.

Regulations, Continued

SECNAVINST 5290.1, Naval Imaging Program (Continued)

Figure 1-20 shows an example of DD Form 2054/2, the Audiovisual (AV) Annual Production and Library Report.

Figure 1-20. —DD Form 2054/2.

Hazardous Material

In the present climate and in the future, hazardous material presents handling, storage, and disposal problems. Guidelines change daily out of necessity. So stay abreast of new developments and regulations in this area. Furthermore, collect Material Safety Data Sheets (MSDS) and keep them available in your work space.

MSDS sheets outline procedures to minimize damage to the workers and the environment should mishandling result in a spill or exposure. They are printed for every product manufactured in the United States. Track them down and maintain a file of MSDS sheets for all products in the shop. Make them available for all hands to review. It is your right and duty to be aware of hazards in the work center. If a manufacturer does not or will not provide a MSDS sheet for their product, switch to another manufacturer.

Forms

Introduction   Standard forms exist within the supply system that are sufficiently generic to use Navy-wide. Using these preexisting forms eliminates duplication at the local level. Use standard forms whenever possible. It saves manpower, supplies, and time. Newly created forms should comply with Forms Analysis and Design, 058-LP-502-0000. Obtain a copy of the Navy Stocklist of Publications and Forms, NAVSUP P-2002, to locate current form numbers and revisions.

Standard forms   The following table provides a partial list of standardized forms used throughout the Navy that you will use frequently:

Form	Purpose	Source
DD Form 1149	Requisitioning and Invoice/Shipping Document	0102-LF-007-2300
DD Form 1348	Requisition System Document (Manual) ordering supplies	0102-LF-001-3491
NAVSUP 1250/1	Supply Requisition	
NAVSUP 1250/2	Supply Requisition	
DD Form 200	Financial Liability Investigation of Property Loss	0102-LF-011-9100
OF Form 23	Chargeout Record checking files in/out, long form	7540-00-823-8130
OF Form 24	Chargeout Record checking files in/out	7540-00-823-8131
OF Form 25	Chargeout Record checking files in/out	7540-00-823-8132

Forms, Continued

Standard forms (Continued)

Form	Purpose	Source
OPNAV 5213/18	Forms Register	0107-LF-052-1390
OPNAV 5213/19	Request for New or Revised Forms	0107-LF-052-1397
NAVPUB 5600/26	Copier Production Log	Appendix NAVPUBINST 5600.44
NAVPUB 5600/29	Economical Copying Limit	Appendix NAVPUBINST 5600.44
NAVPUB 5600/27	Duplicating Production Log	Appendix NAVPUBINST 5600.44
NAVPUB 5600/28	Reproduction Production Log	Appendix NAVPUBINST 5600.44
DD Form 844	Requisition for Local Duplicating Service	0102-LF-010-2700
JCP No. 1	Semi-amual Printing Plant Inventory	Local or regional Defense Printing Service
JCP No. 5	Annual Plant Inventory	Local or regional Defense Printing Service
JCP No. 6	Annual Inventory of Stored Equipment	Local or regional Defense Printing Service

Forms, Continued

Standard forms (Continued)

Form	Purpose	Source
DD 2054/1	Visual Information (VI) Annual Activity Report	CNO (OP-09BG)
DD 2054/2	Audiovisual (AV) Production and Library Report	CNO (OP-09BG)
OPNAV 5290/1	Request for Audiovisual Services	0107-LF-031-5081
OPNAV 5290/3	Navy Visual Information Activity Authorization/Request	CNO (OP-09BG)
DD 1995-1	Visual Information Production Request, Evacuation and Approval	0102-LF-019-9511
DD 1995-2	Visual Information (VI) Production Report	0102-LF-019-9506
OPNAV 3150/16	Audiovisual Activity Job Order	0107-LF-031-5080

Files

Introduction

The way a shop files data, correspondence, original drawings, tracings, negatives, and large- or roll-size drawings is unique to each shop. Often it is dictated by the available storage containers and space. The effectiveness of a filing system is simply material retrievability.

Responsibility

The leading petty officer in the shop should designate one person to be responsible for maintaining the files. This person is to check material in and out, trace outstanding files, and replace returned files. All workers in the shop, however, should familiarize themselves with the system and be able to maintain it.

Containers

Navy shops have the following similar filing containers:

- file drawers for data and correspondence,
- flat files for original drawings, tracings, and negatives, and
- container files for large- or roll-size drawings.

These filing containers may or may not have safeguards for protecting classified material.

Files, Continued

Filing systems   The following table represents the two basic filing systems found in most shops and their advantages/disadvantages:

System	Advantages	Disadvantages
Standard Subject Identification Codes (SSIC) numbers	• broad coverage • Navy-wide use • easily expandable • easily retrievable • number identifies subject	• initial setup takes time • more complicated
Sequential serial numbers	• eliminates shifting files • easily expandable	• numbers do not identify subject • requires extensive cross-referencing

Picture morgue   Every shop has a picture morgue. Your shop may call it a clip art file, or scrap file. This is reference material and picture ideas collected for use in whole or in part for future illustrations and layout formats.

Contents   Any image on any subject is appropriate for a picture morgue. Magazines, newspapers, brochures, books, and catalogues are all excellent sources for scavenging ideas. The intent here is to use the images as a catalyst to inspire your own original ideas, not to copy another's work blatantly.

Clipping   Once you find artwork to clip for your file, identify the pictures by annotating the date, publisher, caption or description, and copyright information. Do this on the reverse of the image or on a firmly attached separate paper. Carefully pry out all the staples and remove the tape from the image area. Fold large pictures with the picture side out to minimize damage created by creasing.

Files, Continued

Filing Store clipped art in letter-sized folders. Folders with tabs are convenient for labeling. File tie folders in the shop using the established filing system or begin a system specific to the picture morgue.

Figure 1-21 shows general subject divisions for a picture morgue.

COLUMN I	COLUMN II	COLUMN III
PEOPLE	MEN	ANGLE - FULLFACE - PEOPLE - MATURE - OLD - TOUGH - EMOTION & EPRESSIONS - POSITIONS
	WOMEN	ANGLE - FULLFACE - PEOPLE - MATURE - OLD - EMOTION & EPRESSIONS - POSITIONS
	CHILDREN	BABIES - BOYS - GIRLS - TEENAGE - PLAYGROUNDS - NURSERY - FURNITURE - TOYS
	MISCELLANEOUS	EMBRACES - CROWDS - FAMOUS PEOPLE
COSTUME	AIRCRAFT	NAVY ENLISTED - ARMY ENLISTED - A.F. ENLISTED - MARINE ENLISTED - OFFICERS - COMBAT UNIFORMS
	PERIOD	ANCIENT - 15TH CENTURY & BEFORE - 16TH CENTURY - 17TH CENTURY - 18TH CENTURY - 19TH CENTURY - 20TH CENTURY
	MISCELLANEOUS	ASTRONAUT UNIFORMS - WOMEN'S FASHIONS - CHILDREN'S FASHIONS - ARMOR - ROYALTY - STAGE ACCESSORIES
TRANSPORTATION	AIRCRAFT	NAVY FIGHTER/BOMBER - A.F. FIGHTER/BOMBER - CARGO - HELICOPTERS - AIRPORTS - PARACHUTES -
	SHIPS	NAVY COMBAT - CARRIERS - DESTROYERS - SUBMARINES - MERCHANT - OCEANLINERS
	AUTOMOBILE	CURRENT - FOREIGN PERIOD - STATION WAGONS - JEEPS - MILITARY VEHICLES
	PUBLIC	TRAINS - RAILROAD STATIONS - BUSES - STREETCARS - SUBWAYS - TAXIS - LUGGAGE
	MISCELLANEOUS	TRUCKS - WAGONS - CARRIAGES - FILLING STATIONS - GARAGES - CAMPERS
HOUSING (BARRACKS)	EXTERIOR	DOORS - WINDOWS - FENCES -WALLS - STAIRS
	INTERIOR	DOORS - WINDOWS - WALLS - STAIRS - FLOORS - FIREPLACES
	FURNISHINGS	PIECES - CHAIRS - SOFAS - TABLES - DESKS - FURNISHINGS BY PERIODS
		DECOR - LAMPS - CLOCKS - MIRRORS - TABLE SERVICE
		ROOMS - LIVING ROOM - DINING ROOM - BEDROOM - BATHROOM - KITCHENS
FOREIGN	EUROPE	ENGLAND - FRANCE - AUSTRIA - GERMANY - ITALY - RUSSIA
	ASIA & AFRICA	CHINA - KOREA -VIETNAM - INDIA - EGYPT - AFRICA
	ISLANDS	BERMUDA - FORMOSA - PHILIPPINES - SOUTH SEAS - WEST INDIAS - HAWAII
	MISCELLANEOUS	ARCTIC - ANTARTIC - AUSTRALIA - CANADA - SOUTH & CENTRAL AMERICA - MEXICO
NATURE	TREES	IN BLOSSOM - WITH LEAVES - BARE BRANCHES - BARK & TRUNK - TROPICAL - UNUSUAL
	SNOW & WATER	ICE - SNOW - WATER
	FLOWERS & GARDENS	FLOWERS - PLANTS - VINES - GARDENS - GARDEN FIXTURES & TOOLS
	MISCELLANEOUS	CLOUD - LIGHTNING - RAIN - MOUNTAINS - ROCKS
ANIMAL	DOMESTIC	CATS - DOGS - HORSES - CATTLE - GOAT - SHEEP - RABBITS - RODENTS - SWINE
	WILD	BEARS - CAMELS - DEER - ELEPHANTS - FOX & WOLF - LIONS & WILD CATS - MONKEYS
	FISH/SEA LIFE	SHARKS, DOLPHINS, WHALES - FRESH WATER FISH - ALLIGATORS
	MISCELLANEOUS	BIRDS - FOWL - INSECTS - REPTILES
SPORTS	EVENTS	AUTO RACING - BASEBALL - BASKETBALL - BOXING - BULLFIGHTING - FOOTBALL - TRACK
	INDIVIDUAL	ARCHERY - BOWING - CAMPS & PICNICS - CYCLING - FISHING - GOLF - HUNTING & SHOOTING
		TENNIS - SWIMMING - SKIING - WATER SKIING - WINTER SPORTS
INDUSTRY	STORES & OFFICES	BARBER SHOP - BEAUTY SHOP - DEPARTMENT STORES - DRUG STORES - FOOD STORES - BANK
	FARMING	FARM HOUSES - BARNS - FARM EQUIPMENT - FARM SCENES
	INDUSTRY	CHEMICAL - CONSTRUCTION - DIARY - FACTORIES - MINING - OIL - STEEL - WOOD
ART & SCIENCE	ART	ART - COLOR - COMPOSITION - SCULPTURE
	SCIENCE	MEDICAL - HOSPITALS - DENTAL - LABORATORIES - ASTRONOMY
ENTERTAINMENT	MUSIC	DRUMS - STRING - WIND - SYMPHONY - SINGERS
	DANCE	BALLET - BALLROOM - STAGE
	THEATER	THEATERS - DRESSING ROOMS - HOLLYWOOD
	MISCELLANEOUS	RADIO BROADCASTS - TELEVISION - CARNIVALS - CIRCUS
MISCELLANEOUS	CHURCH & SCHOOL	CHURCH - COLLEGE - SCHOOLS - WEDDING
	DISASTER	EXPLOSIONS - FIRES - FLOODS - STORMS - PICKETING
	GOVERNMENT	POLICE - PRISIONS -POST OFFICE - U.S. GOVERNMENT
	REGIONAL AMERICA	CALIF. - FLORIDA - N.Y. - WASH., D.C. - EAST MIDDLE WEST - SOUTH - WEST
	STEET SCENES	STREET SCENES - BRIDGES - TUNNELS
	SPACE SCENES	RENDEZVOUS - SPACE SHOTS - SPACE WALKERS - RE-ENTRY SHOTS
	MISCELLANEOUS	FLAGS - FOOD - HOLIDAYS - TELEPHONES - WAR SCENES

DMNP0146

Figure 1-21. —Subject divisions.

Files, Continued

Filing (Continued)

Figure 1-22 indicates how tabbed folders are easily visible.
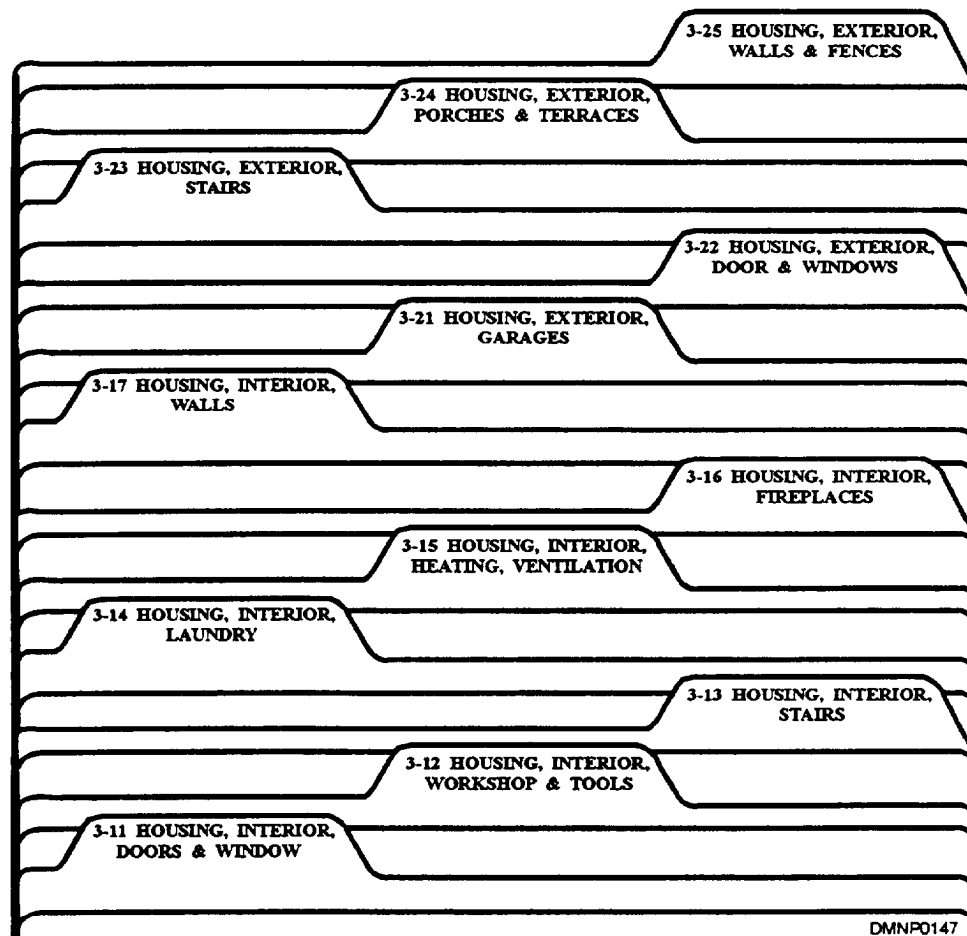
Figure 1-22. —Tabbed folders.

Supply

Introduction   At some time in your career, you will be responsible for maintaining and ordering supplies. Plentiful supplies ensure that all workers have what they need to perform a task and that your shop remains versatile and fully capable.

Waste   Monitor your shop for waste and abuses in supply use. Curb the tendency to loan or give supplies away. Correct abuses, minimize waste, and use limited shelf-life items before the expiration date. The amount of wasted supplies should not exceed 2 percent of the total supplies used on a job.

Estimating supplies   Inventory the supplies on hand regularly. Information from the job log on completed job requests, current job requests, and upcoming special projects combined with prospective deployments and exercises will show trends in quantity. Common sense gleaned from past experience will guide your decisions to order the quantities required to maintain adequate supply levels.

Purchasing new equipment   When purchasing new equipment, project the future requirements of your shop and what technology offers to fill those needs. Consider the equipment life expectancy and service contracts offered by the manufacturer. Increased quality, ease of performance, and increased production should be the effects of modernization.

Purchasing consumables   Limitations in purchasing consumables are often related to storage space. Some supplies are temperature and/or time sensitive. Use the first in/first out system of storing. Clearly mark the contents and receipt date on the package before storing it away.

Supply, Continued

Sources
There are four basic sources for supply purchases. These sources and the type of supplies you can expect from them are shown in the following table:

Source	Type	Supplies
Servmart	Local warehouse	• basic consumables • brushes • ink • pens
Government Supply Agency (GSA)	Navy Supply Group 99 (9905) Federal Supply class	• basic consumables • papers • paints • basic equipment • Office furniture
	Navy Stocklist of Publications and Forms, NAVPUBINST P-2002	• signs • forms • preprinted stationary and invitations
	GSA contracted items	• consumables • equipment • furniture • service contracts
Open purchase	any civilian business	• any product available
Imprest Funds	any civilian business	• any product available • $500 emergency • $1000 if authorized by a supply corps officer

Supply, Continued

Requisitioning   Local commands prefer specific required forms for requisitioning supplies. Ships, in particular, have unusual and complicated supply channels. Visit your local supply office and learn what form your command uses. Setup and maintain a supply requisitioning log similar to a supply Operational Target (OPTAR) to track the supplies you order.

Figure 1-23 is a standard supply NAVSUP Form 1250 and 1250-1.

Figure 1-23. —Supply requisitions.

Supply, Continued

Figure 1-24 is another standard DD Form 1348 and its color-coded receipt copies.

Figure 1-24. —DD Form 1348.

Supervision

Introduction   There are six basic steps to supervision. Some steps occur automatically and others will require conscious application. The results of a well run, effectively supervised shop are a contagious professional work ethic among crew members and a high caliber end product.

Planning   Planning is the first step in supervision. It is also a part of all other steps. Planning applies to every aspect of the shop, not just tasking. Let the crew know long- and short-range plans that concern the shop. Solicit their input for setting shop goals. Without a plan, there is nowhere to go.

Figure 1-25 demonstrates how planning affects all aspects of supervision.
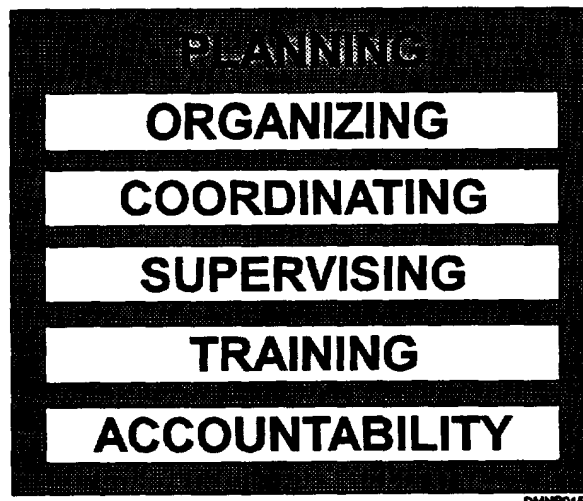
Figure 1-25. —Six basic steps in supervision.

Supervision, Continued

Planning (Continued)

Some things to consider when formulating plans to accomplish a task are shown in the following table:

Question	Considerations
What must be done?	● scope of project ● standards to meet ● deadlines
How to do it?	● personnel resources ● equipment resources ● consumables on hand ● work in progress ● future assignments
Who will do it?	● personnel and equipment capabilities ● personnel and equipment limitations
How long will it take?	● work load ● nonproductive time ● support from outside shops
Dividing and estimating?	● divide job into tasks ● estimate time for each task ● add hours together ● multiply by quantity requested ● record estimates ● obtain permission from copyright owners

Organizing   Understanding from whom one receives orders and over who one has control
is imperative to the organization and management of an efficiently run shop.
Each worker must understand the chain of command in the shop and the shop
position in the command. The chain of command must be definite, clear-cut,
and short.

Figure 1-26 illustrates a direct and uncomplicated chain of command.

CO
XO
DH
DIVO
LCPO
LPO
WORKER
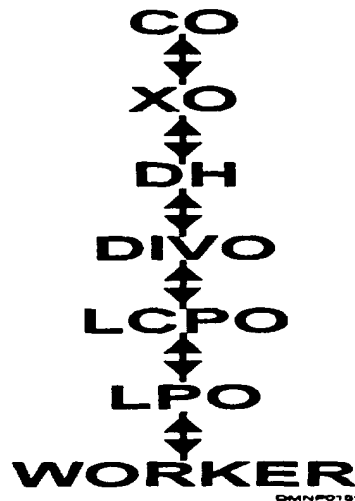
**Figure 1-26. —An
uncomplicated chain of
command.**

Organizing also involves dividing work into manageable tasks and arranging
these tasks in logical order. Workers assigned to the task must have a clear
definition of their duties and responsibilities. When assigning workers to a
job, consider how many people the job requires, worker skill levels, and the
job time line. Some jobs necessitate dividing the labor force into an
assembly line vice independent workers,

Supervision, Continued

Organizing (Continued)

Some of the advantages and disadvantages of a divided work force is shown in the following table:

Work force	Advantages	Disadvantages
Assembly line	• rapid production • developed expertise	• limited overall development • unable to see big picture • boredom
Independent worker	• pride in accomplishment • development of skills • sees big picture	• skilled workers sometimes do menial tasks • requires broader skills

Coordinating

All phases of leadership and management require coordinating. It starts at the planning stage when deciding who is the right person for the job, whether the material to do the job is onboard, and if the work environment is ready to support the job. Coordinating outside shop support, equipment readiness, and timely completion ensures that deadlines are met and no one shop is scrambling because another shop fell behind.

Supervising

Supervising is more than coordinating work flow and staying abreast of new technologies. It involves communicating both up and down the chain of command, thoughtful and timely decisions, and consistency and fairness. Be supportive without interfering or stifling creativity. Regularly monitor inexperienced personnel, but monitor experienced personnel far less. Provide feedback and motivate your crew. Fulfill administrative obligations accurately and in a timely manner.

Supervision, Continued

Supervising (Continued)

FEEDBACK: All people want feedback on job performance and for different reasons. Provide feedback in the forms of criticism or praise. Feedback in either form should be honest and constructive. There is a major difference. Praise a worker in public, criticize him in private. Feedback may be intangible as in verbal exchanges or physical gestures and touch or tangible as in counseling sheets, evaluations, and awards.

The following table lists some tangible forms of feedback:

Form	Further Information
Counseling sheets	• Local policy and instruction
Liberty	• Local policy and instruction
More challenging assignments	• Local policy and instruction
Evaluations	• Navy Performance Evaluation (EVAL) and Counseling System, BUPERSINST 1610.10
Awards	• Local policy and instructions on, • commendatory correspondence • Sailor of the Month/Quarter/Year • commendatory mast • Navy and Marine Corps Awards Manual, OPNAVINST 1650.1

MOTIVATION: Take time to know each worker and what motivates each one. Motivate people differently. Be creative in seeking ways to motivate your crew members. Foster team spirit within the shop, division, and command. Motivate positively. Negative motivation produces negative results and promotes undesirable behaviors.

Supervision, Continued

Supervising (Continued)

ACCURACY: The administrative forms you complete and submit are only as good as the accuracy of the information on them. Inaccurate figures misrepresent situations and lead to misunderstandings that may cost the shop funding and billet structure. So be accurate.

TIMELINESS: Complete tasks, both administrative and shop, on time. Submitting input late is like not submitting input at all. Seniors and subordinates appreciate and respond to timely consideration. When you are unable to complete an item quickly, conduct regular follow-ups and provide updates to individuals concerned.

Training

If you are a supervisor, you are the frost and primary link to rating knowledge. You have a responsibility to train subordinates and educate seniors about your rate. You are the most experienced person onboard at your level of expertise in your field. Make reference material available and explore new technologies and products. If you are not the supervisor, your obligation is to attend training, study all reference materials, and learn new skills actively.

The following are a few recommendations for an effective training program:

- Assemble all reference materials
  - current bibliography (BIB)
  - Personnel Advancement Requirements (PARS)
  - directives and instructions
  - rate training manual
  - manufacturer's instruction manuals
  - civilian references

- Establish a set time
  - without interruptions and as part of regular work routine
  - same day and time weekly
  - 1 hour minimum

- Review all material 3 months before exam
  - review to understand
  - quiz or test regularly

Supervision, Continued

Training (Continued)

The following are additional Navy training manuals you may want to study:

- *Blueprint Reading and Sketching,* NAVEDTRA 12014

- *Lithographer's Mate 3 & 2,* NAVEDTRA 10451

- *Photographer's Mate Basic,* NAVEDTRA 12700

- *Photographer's Mate Advanced,* NAVEDTRA 12701

- *Navy Customer Service Manual,* NAVEDTRA 12972

- *Navy Correspondence Manual,* NAVEDTRA 13091

Check with your Educational Services Office concerning the availability of the BIBs and PARs electronically.

Accountability

Regardless of your position in the chain of command, take responsibility for your actions. Take charge of your professional and personal behavior. Invest in how the shop is run. Be responsible for applying what you learn to what you do. Inform your seniors on all matters impacting the shop and seek assistance if needed. Do your job to the best of your ability.

Job Orders

Introduction	Job orders are requests for a product that requires the expenditure of funds and man-hours. Job orders accompany the job to completion. They are a record of the classification of the job, the originating department, the code or activity, the originator, and a phone number. The job order shows who did the job, how long it took, and how much supplies were used. Job orders should also indicate who picked the job up and when. Retain job orders for 1 year or until a new fiscal year begins before discarding.
Format	Your job request may be the standard Navy job request, or it maybe a local form. Local forms need to present a complete picture of information to the worker. Supervisors must make sure there is enough information on the job order for the worker to do the job without having to do additional calculations or finding more information.
Local forms	Base the information for the construction of a local job order form on the reporting criteria for the VI annual report. This will simplify report requirements by building in readily quantifiable figures. Add to this information the date when the job entered the shop and the date due. There should be a section where the shop LPO can make specific comments to the worker or assign a priority and an area for a pick-up signature and date. Specific guidance for designing job order request forms is in SECNAVINST 5290.1.
Job order log	Enter incoming job orders into a job order log book. Give them a sequential number and write down information including a brief description of the job in the log. This is an invaluable aid in tracking the progress of a job throughout the shop. Later, this information will gauge predictability in the history and trends in work load and supply use. You will have a ready reference for job status, man-hours spent on a job, and a record of who picked up the job and when. Maintain this book accurately and diligently.

Job Orders, Continued

Standard job order form

Figure 1-27 is the front of a standard job order form.

Figure 1-27. —Job order.

Job Orders, Continued

Standard job order form (Continued)

Figure 1-28 shows the amount and type of information on the job order that will also be in the job log and eventually translated to the VI report.

Figure 1-28. —Audiovisual Activity Job Order (back).

Customer Service

Introduction   The Navy Illustrator Draftsman is a customer service oriented rate. We provide a product to a customer. Your customer maybe the fleet, a coworker or peer, your seniors, and even a subordinate. The customer perceives your attitude and responsiveness as part of the product. You spoil a beautifully executed product by treating a customer poorly. Poor treatment is what a customer remembers. If you are not able to assist your customers, refer them to someone who can. Don't let a customer walk away from you dissatisfied.

Figure 1-29 shows worker responsibilities to extend professional customer service.
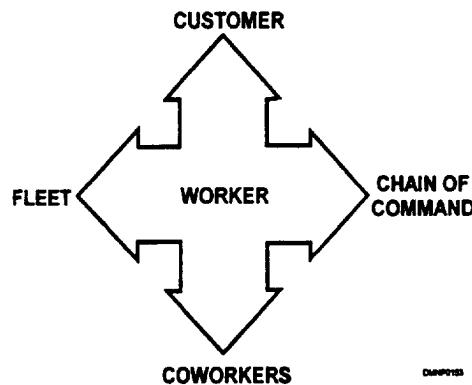
Figure 1-29. —Service obligations.

Customer treatment   Be courteous and responsive to the requests of customers. Listen carefully to what they want. If they are asking the impossible, tell them so and offer alternatives and solutions. Project a positive attitude and do not ridicule customers for their ignorance. You are the expert; guide them professionally. Most customers are not aware of the talents that a DM has or the capabilities of the shop.

Quality Control

Introduction

All work done in your shop reflects upon the shop, its workers, and its leadership; whether you or a coworker did the work is immaterial. It does not matter if you are the supervisor or the worker; the reputation of the shop is your reputation. The work produced by the shop must be professional in appearance and meet professional standards. A shop should have someone to review completed jobs to ensure that they are, in fact, completed as the customer requested and that they meet prescribed standards of execution and presentation.

Quality control inspectors

Individuals with a keen eye for detail and a thorough knowledge of drafting standards and practices should review completed jobs before the originators are called to pick them up. LPOs may assign these individuals and should rotate the assignment occasionally to cross train other workers.

What to look for

Before a product is reviewed for quality, the inspector must have a copy of the original to mark corrections on. When a copy is unavailable, then cover the original with an overlay to protect it. Do not markup an original drawing. The inspector is looking to see if the artwork satisfies the customer's request. The inspectors have a set of standards or guidelines for format, size, lettering, and standard drafting practices. If the job requires support from other shops, they check to see if those shops will have problems handling the job.

Summary

Review   This chapter briefly covered shop layout and the importance of the physical environment in the shop. There is a list of regulations and forms that have a direct influence on the operation of the shop and your professional knowledge. Files and supply are site specific. Good supervision requires constant application and refinement. Job orders, customer service, and quality control are as important to a shop as good supervision. Run your shop as if it needed to show a profit or as if it were your shop in the civilian sector. Remember, your reputation depends on a quality end product and prompt, courteous customer service.

Comments   Thoroughly understand regulations, those that apply to how a shop is run and those that apply to you and your workers as Navy personnel. A solid foundation in Graphic Design Standards, copyright regulations, and printing regulations is imperative. Stay abreast of new instructions in the field of computer generated graphics and electronic imagery manipulation, hazardous waste, and precious metals. Practice the core values of honesty, integrity, and courage in every transaction with every person. Go home at the end of the day confident that you have done your very best work and that you have treated all persons well and fairly.

CHAPTER 2

BASIC EQUIPMENT

Overview

Introduction
The environment of the Navy Drafting shop directly reflects the vitality of the shop and the abilities of the personnel assigned to it. It sets the mood for creativity and productivity. Cleanliness, availability of supplies, and equipment readiness are important to the environment of the shop and affects the way a customer perceives the professional knowledge and capabilities of personnel.

Objectives
The material in this chapter enables you to do the following:

● Identify the angles created by the use of the 30/60- and 90-degree triangles both alone and in combination.

● Differentiate between standard cased instruments and special-purpose instruments.

● Identify the steps in cleaning a technical pen with a reservoir.

● Select the appropriate lead hardness for a detailed technical drawing.

Overview, Continued

In this chapter This chapter covers the following topics:

Topic	See Page
Furniture	2 - 3
Cased Instruments	2-20
Special Cased Instruments	2-28
Pens	2-34
Drawing Aids	2-39
Scales	2-50
Brushes	2-59
Pencils	2-64
Basic Consumables	2-67

Furniture

Introduction   The name Illustrator Draftsman conjures up a visual image of a particular type of table and drawing instruments. However, a drafting table and a set of cased instruments are not all a DM has to work with. Along with the use of furniture and equipment is the responsibility of maintenance.

General care   Tables, straightedges, and other equipment that is common to drafting shops should be kept clean of debris and clutter. Periodically, clean them with mild detergent and rinse them well. Use a thinner or mineral spirits to remove adhesives and wax. Keep tables and straightedges free of nicks and lacerations. Carefully adjust tables and chairs for comfort in sitting or standing at work.

Drafting tables   Drafting tables come in a variety of shapes and sizes. Most tables have a height and a tilt adjustment. The trend is toward modular systems with an adjoining worktable. Do not cut against the drafting table. Make it a practice to cover the drafting tabletop and change the cover when it becomes soiled or unserviceable.

Figure 2-1 shows a large drafting table.
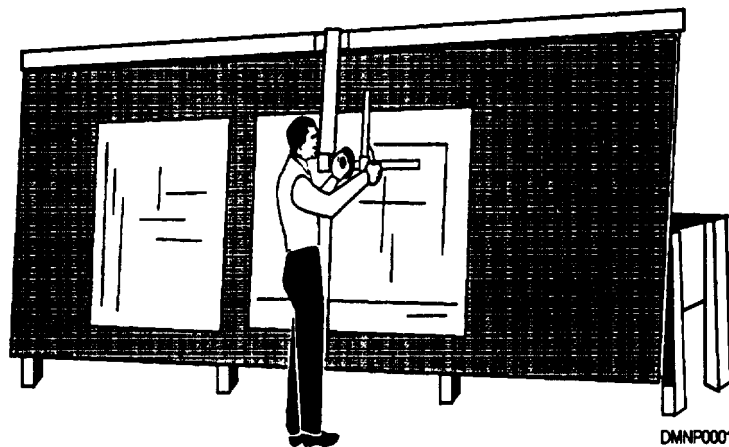
Figure 2-1. —A large drafting table with a roller-type drafting machine.

Furniture, Continued

Drafting tables (Continued)

Figure 2-2 shows many types of drafting tables.
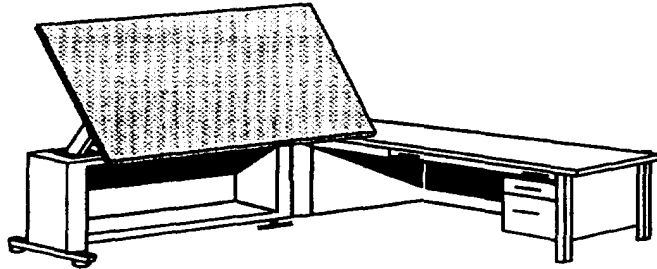
L-SHAPED DRAFTING TABLE AND REFERENCE DESK. THE DRAWING BOARD IS ADJUSTABLE TO ANY ANGLE.
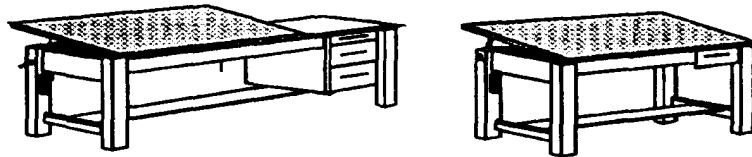
DRAFTING TABLES WITH ADJUSTABLE DRAWING BOARDS THAT MAY BE TILTED UP TO A MAXIMUM OF 45°. TABLE SHOWN ON THE LEFT ALSO HAS A FLAT SURFACE FOR TOOLS OR REFERENCE MATERIAL.
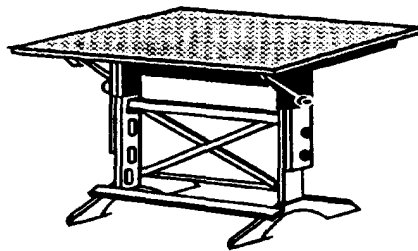
PEDESTAL DRAFTING TABLE
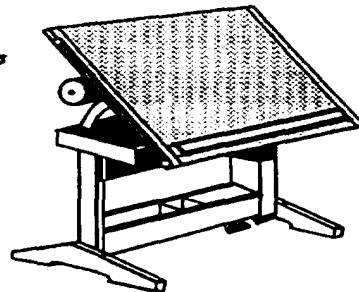
FRENCH TABLE ADJUSTABLE TO ANY ANGLE FROM HORIZONTAL TO VERTICAL.

DMNP0004

Figure 2-2. —Drafting tables.

Worktables   Worktables are large, flat tables used to spread out additional reference
                     material or equipment. Cutting may be done on this table provided you
                     cover it with cardboard or vinyl. Besides protecting the tabletop, the
                     covering prevents the blade from snapping or slipping across the table.

                     Figure 2-3 shows a typical worktable.
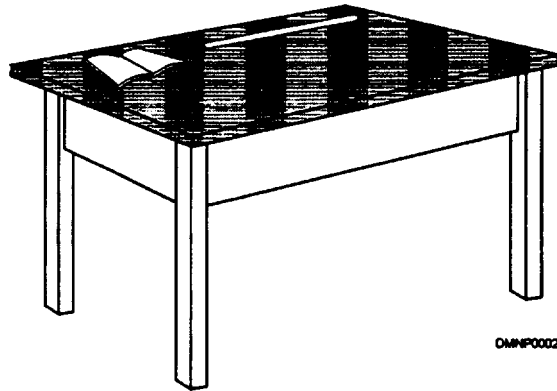
Figure 2-3. —A work table.

Light tables   Light tables may be small and portable, or as large as a drafting table.
                     Illuminated from underneath, they allow a worker to see through paper and
                     trace an image. They are invaluable for aligning transparencies or in color
                     separation work. Never cut against a light table as this will scar the glass
                     surface. Furthermore, do not lean against or on top of a glass tabletop.

                     Figure 2-4 shows a portable light table.
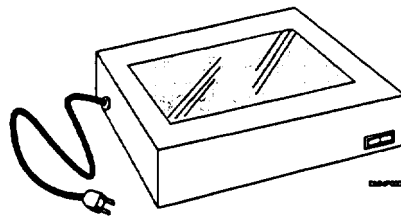
Figure 2-4. —A light table.

Tabourets   Tabourets are small, portable work stations that contain some storage in the bottom and a small drawer. They are useful when a job requires a temporary work station at a remote location away from the shop.

Figure 2-5 shows a two drawer tabouret.
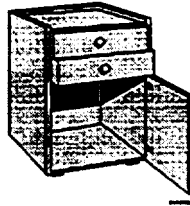
Figure 2-5.
—A tabouret.

Table coverings   A table covering protects the table from damage and wear. It smooths over existing damage to the drawing surface and changes easily when it becomes soiled or unserviceable.

The following table shows four table coverings and their advantages:

Material	Advantage
Cellulose acetate paper	• resin coated • short-term protection • maybe gridded
vinyl	• long lasting • self sealing • most popular • available as translucent for light tables
Mylar	• long lasting • dimensionally stable
Cork	• permanent • use on badly scarred tabletops

Furniture, Continued

Table coverings (Continued) Apply new table coverings periodically and according to the following procedures:

Cellulose acetate paper

Step	Action
1	Roll out and cut paper to fit table.
2	Wet paper and place on table.
3	Tape around table edges.
4	Paper will expand when wet and shrink when dry to fit tabletop.

CAUTION: This type of covering may snap smaller drafting tables or tables not reinforced with internal rods.

Vinyl and Mylar

Step	Action
1	Roll out and cut vinyl/Mylar slightly larger than tabletop.
2	Allow vinyl/Mylar to lie flat for 24 hours before applying.
3	Lay vinyl/Mylar on table and trim to size.
4	Tape to table across the top of board only.

Furniture, Continued

Cork

Step	Action
1	Roll out and cut cork slightly larger than tabletop.
2	Apply glue to tabletop and cork back.
3	Allow glue to dry.
4	Placing paper over the glued back of the cork, gently roll cork up.
5	Position cork roll carefully over one end of the table and unroll over tabletop.
6	Gradually slide paper out from under cork while applying pressure.
7	Trim to size.
8	Cover tabletop with additional cover of cellulose acetate paper, vinyl, or Mylar.

Chairs

There are many types and styles of chairs in the supply system through Government Supply Agency (GSA) contract. You will spend a great deal of time in this chair at the drafting table so make sure it is comfortable. It should be adjustable in height and tilt. Whether it has arms or rollers is a personal preference.

Lighting

Natural lighting is the best type for drawing; however, it is not always available. Overhead lighting is usually the fluorescent type and not bright enough for drafting work. You need additional lighting attached to the tabletop to alleviate shadows and glare. These desk lights are available in many styles including a ring light around a magnifier for closeup work. Attach a desk light for a right-handed draftsman to the upper left corner of the table. For a left-handed DM, attach the desk light to the upper right comer of the table. Minimize shadows cast by the hand for they distract and distort visual perception.

Waxers

Waxers are machines that heat an adhesive wax substance to a liquid form and apply it in a thin layer. The two types of waxers are hand waxers and tabletop waxers. A hand waxer waxes a 2-inch-wide strip and a tabletop waxer waxes a full sheet of paper.

To use a hand waxer, follow this table:

Step	Action
1	Look at sight glass on the side of waxer.
2	Lift top cap to replace wax brick if low on wax.
3	Plug in waxer.
4	Wait 20 minutes or until wax flows easily from the roller.

CAUTION: Never overturn waxer once the wax is heated.

Figure 2-6 shows a hand-held waxer.
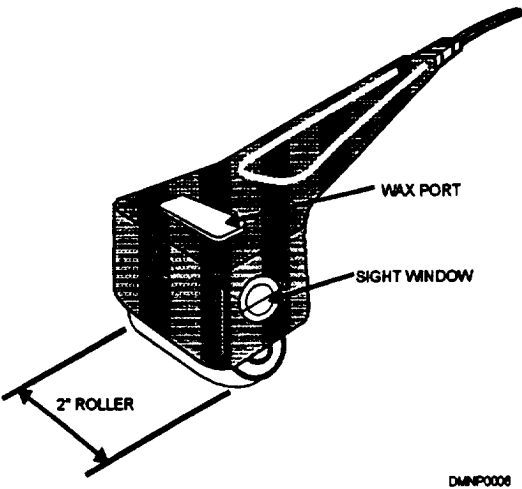
Figure 2-6. —A hand waxer.

**Waxers
(Continues)**

To use a tabletop waxer, follow this table:

Step	Action
1	Make sure the machine is a minimum of one-third capacity full of wax.
2	Turn on the machine to medium setting.
3	Allow 30 minutes to heat wax evenly.
4	Run the material through waxer.
5	Run the material through waxer a second time and at a right angle to the first pass.
6	If wax does not appear as a light frost on the back of the material, adjust temperature setting.
7	Allow 20 minutes for waxer to heat wax evenly with new temperature.
8	Waxed material is repositionable until burnished into place.

Figure 2-7 shows a tabletop waxer.
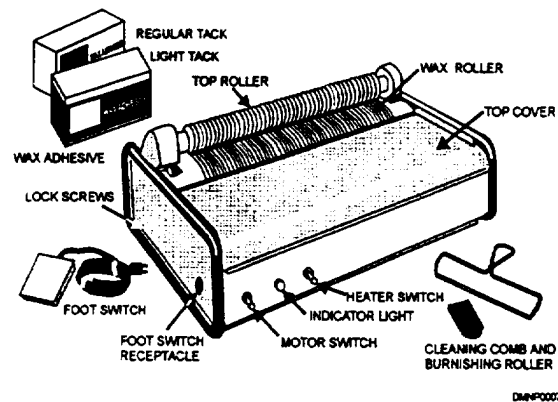
Figure 2-7. —A tabletop waxer.

Mat cutters   Another piece of equipment often found in drafting shops is a mat cutter. The two basic types of mat cutters are hand-held mat cutters and carriage units. Hand-cut mats require great skill and a steady hand. Carriage units ensure uniformity, speed, and accuracy. Carriage units cut oval, round, rectangular, square, and fancy cut mats. They may be large and mounted on a wall or they may be small tabletop units. Both types of mat cutters require a plentiful supply of fresh blades.

Figure 2-8 shows a mat being cut by hand.
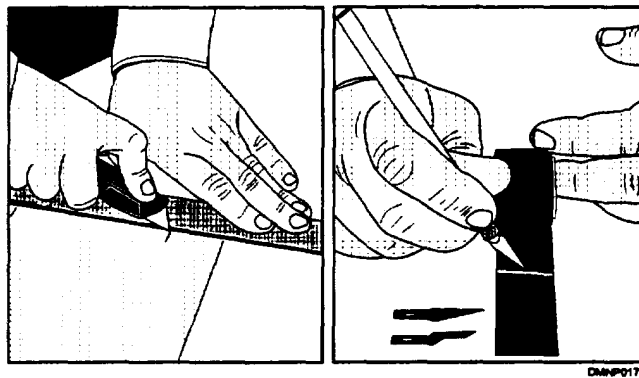
Figure 2-8. —Hand cutting a mat.

Figure 2-9 shows a tabletop carriage unit.
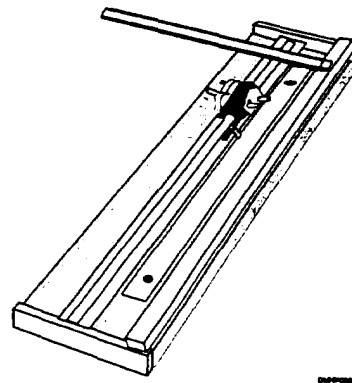
**Figure 2-9. —A carriage-
type mat cutter.**

Paper cutters   The most abused tool in the shop is the paper cutter. Because of this abuse, do not trust the scale at the top of the cutter for accuracy. When you use the cutter, do not force it to cut more material than it can easily handle. Cut only paper or light cardstock. Paper cutters come in a variety of sizes with the most common measuring 36 inches in blade length.

To use a paper cutter, follow this table:

Step	Action
1	Measure and mark the piece to be cut.
2	Raise cutter arm.
3	Hold the piece firmly against top edge of cutter.
4	Draw cutting arm swiftly and cleanly down in one stroke.
5	If item is too large for one cut: • cut through item stopping short of the end by 5 inches, • rotate and reposition item to place uncut portion at the top of the cutter, and • carefully and firmly complete cut.
6	Replace arm in DOWN position and engage safety catch; failure to engage safety catch may result in the arm springing up and damaging the mechanism at the top of the cutter.

CAUTION: Never have a coworker assist by catching paper cuttings. Even a dull blade can sever skin.

Furniture, Continued

Paper cutter (Continued)   Figure 2-10 shows the nomenclature of a paper cutter.

SPRING
CUTTING ARM
SCALE
SAFETY CATCH
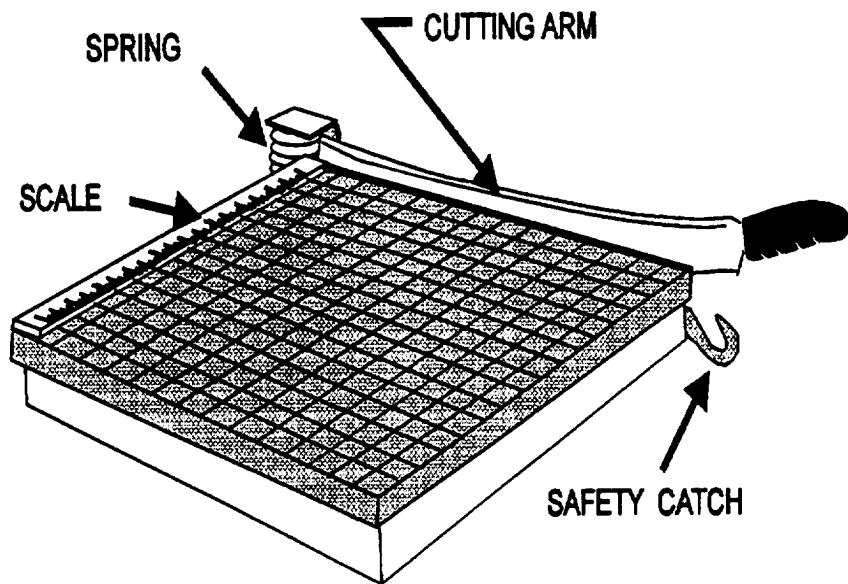
DMNP0009

Figure 2-10. —A paper cutter.

Drafting machines   A drafting machine combines the functions of a parallel ruler, a protractor, a scale, and a triangle into one piece of equipment. It is available for left-handed draftsmen. The five basic parts of a drafting machine are the protractor head, the scale mechanism, the removable scales, the linkage, and the table clamp.

Furniture, Continued

PROTRACTOR HEAD: The protractor head rotates by degrees allowing angle selection. A lock button secures the head at the selected angle. The head maintains a true angle throughout motion over the drawing surface. The protractor head houses the scale mechanism that holds the scales into place.

Figure 2-11 shows the location of the protractor head.
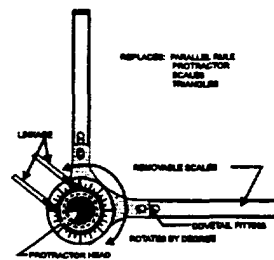
**Figure 2-11. —A
drafting machine.**

SCALE MECHANISM and REMOVABLE SCALES: There are a variety of scales available for the drafting machine. Not only do scale faces vary, but so does the composition of the scale. Scales can be made of clear plastic, wood, or metal. Two removable scales attach to the scale mechanism at right angles to each other via male and female dovetail fittings, In fitting the scales to the mechanism, you should hear an audible click. An elongated slot on the mechanism allows minor angular adjustments to the scale. Do not force a scale into the fitting.

Figure 2-12 illustrates how dovetail fittings connect.
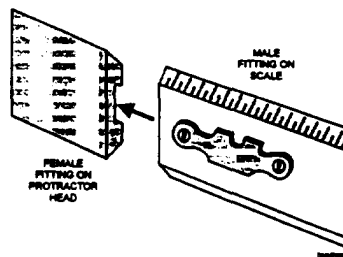
**Figure 2-12. —Dovetail
fittings.**

Furniture, Continued

Drafting machines (Continued)

LINKAGE: The three most common linkages for a drafting machine are the pin joint, the steel band, and the roller. Because of the ability to adjust tension in the bands, steel band linkage is superior to pin joint linkage. Drafting machines with a roller linkage are advantageous when you are working on a large table or in a small space.

Figure 2-13 displays linkages most commonly found on drafting machines.
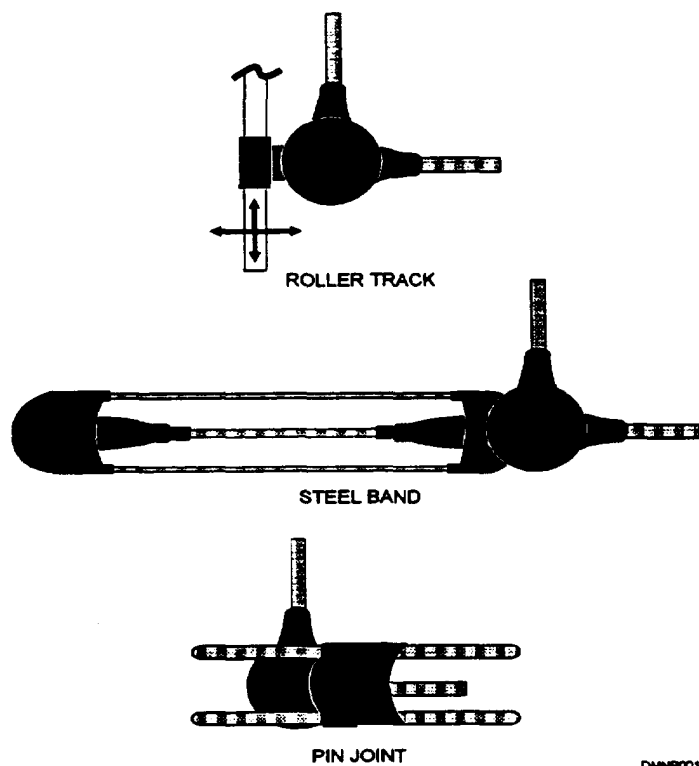
Figure 2-13. —Linkage types.

TABLE CLAMP: The table clamp attaches the drafting machine to the table. Adjustments to the clearance and the position of the protractor head are made at the clamp.

Continued on next page

2-15

Parallel straightedges	Parallel straightedges maintain parallel motion throughout their length. A system of cords and internal pulleys kept at moderate tension support the straightedge at both ends and allow travel up and down the tabletop. The cord used in a parallel straightedge may be fiber or coated wire. Straightedges are made in plastic, wood, or metal.

The major advantages of a parallel straightedge are as follows:

- it is used by both left- and right-handed DMs,
- it is easily restrung,
- it is ideal when space is tight, and
- it is simple to adjust and care for.

Keep the parallel straightedge clean, particularly underneath where it contacts with the paper surface. Periodically check the tension of the cord and adjust it as necessary. When the cord becomes frayed or kinked, restring the internal pulleys. Never cut against the edge of a straightedge.

Figure 2-14 shows a parallel straightedge with a tension adjuster.
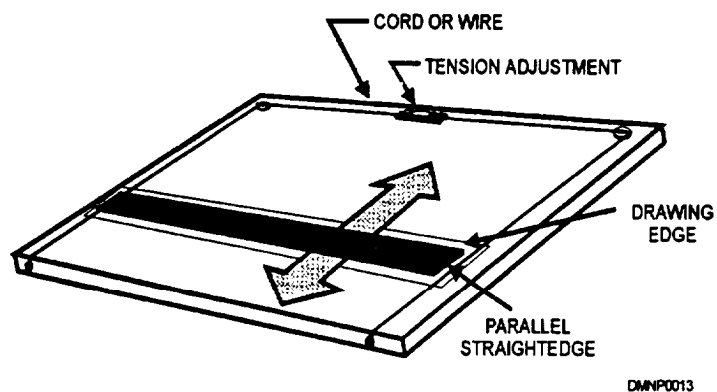
Figure 2-14. —A parallel straightedge.

Furniture, Continued

T-squares   Use a T-square to draw straight, horizontal lines and to provide support for triangles when you draw lines at an angle. The two parts of a T-square are the blade and the head. The blade comes in different lengths and has a hole in the far end for hanging the T-square up for storage. The most popular blade length is 36 inches. The head mounts under the blade at a 90-degree angle and rests against the table edge. It guides the T-square in an up-and-down movement on the drawing surface. Because a T-square allows very little adjustment when it is damaged or out of true, throw it away and get another.

Figure 2-15 shows a T-square positioned on a drawing board.
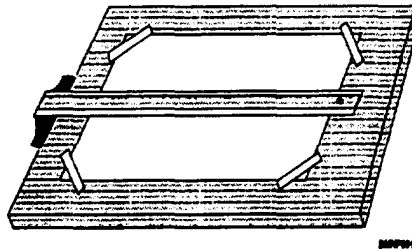
**Figure 2-15. —A t-square on a
drawing board.**

Figure 2-16 illustrates the direction for drawing horizontal lines against a T-square or straightedge.
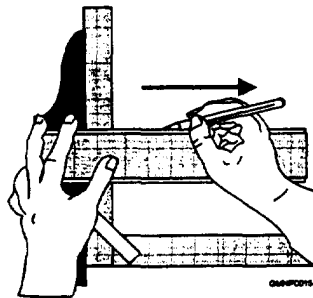
**Figure 2-16. —Drawing
horizontal lines with at-
square.**

Furniture, Continued

T-squares (Continued)

Figure 2-17 illustrates the direction in which vertical lines are drawn with a T-square or a straightedge.
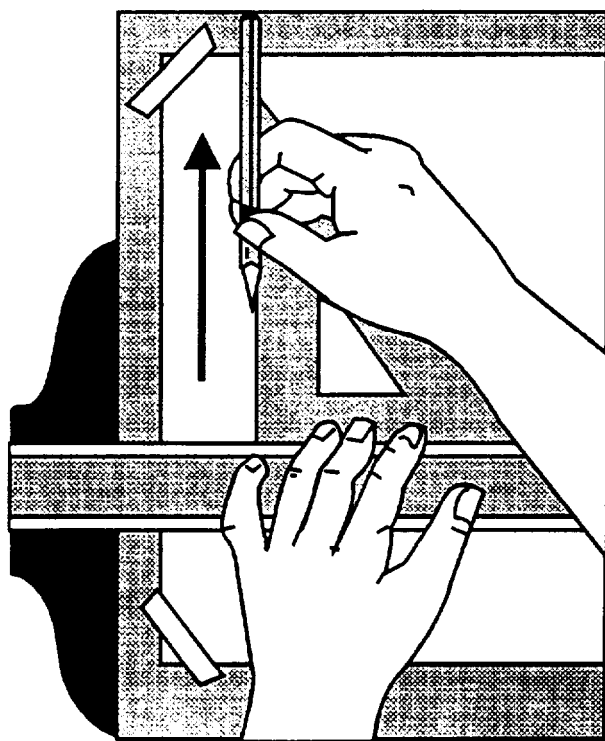
DMNP0018

Figure 2-17. —Drawing vertical lines with a t-square.

Steel straightedges

Draw or cut straight lines against a steel straightedge. Made of heavy gauge steel, they have the weight and strength needed to guide a blade under pressure. The cork on the bottom of the straightedge helps keep it in place. Some steel straightedges are beveled. Keep the straightedge clean and do not bend it out of true.

Cased Instruments

Introduction

Cased instruments allow the draftsman to make precision drawings and maintain uniformity within the drawing. Quality tools improve the work. Use these tools for their intended purpose.

Cases

Drafting instruments are delicate, precision drawing tools that require protection. Most instruments, even when purchased separately, come in their own case. This case protects the drawing tool. Many cases are impregnated with a rust or corrosive inhibitor to protect the drawing tools from the environment and atmosphere. Keep drafting instruments clean and put away when not in use.

Figure 2-18 shows a case full of clean, properly stored drafting instruments.
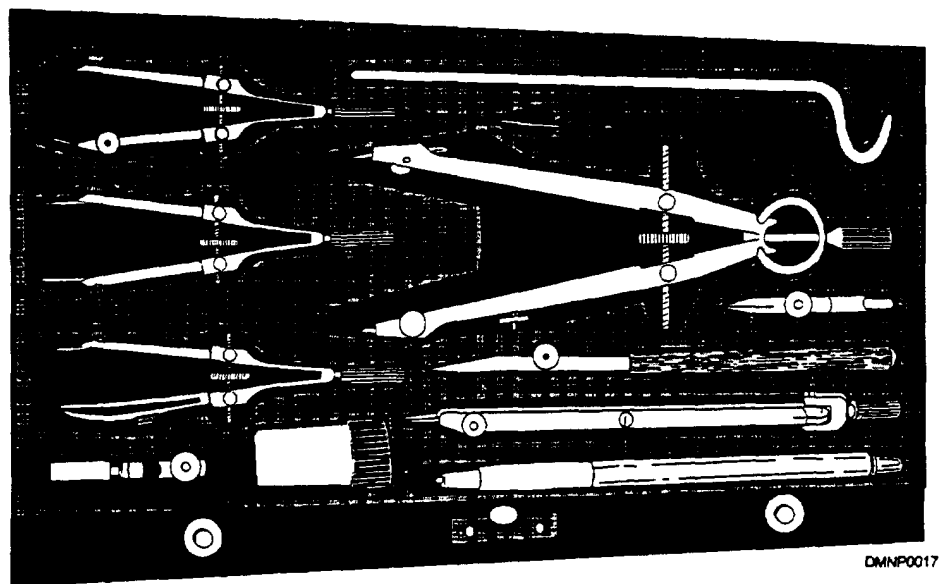
Figure 2-18. —Drawing instruments in a protective case.

Cased Instruments, Continued

Proportional dividers

Proportional dividers transfer measurements from one scale to another and divide lines and circles into equal parts. They consist of two legs of equal length joined by a moveable pivot. This pivot is a rack-and-gear movement secured by a thumb nut. There is a series of scales on the divider face ranging from 1 to 11.5. Divider points are made of hardened steel.

Protect divider points when they are not in use. Keep the dividers clean and wipe them with a light oil cloth after use, Do not oil the movement on proportional dividers.

Figure 2-19 shows a set of proportional dividers.
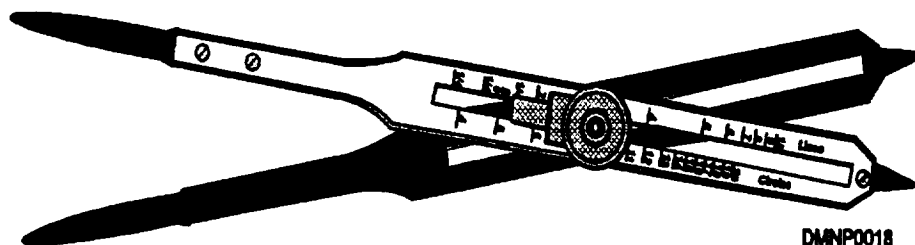
Figure 2-19. —Proportional dividers.

Dividers

Use a set of dividers to step off equal distances, to transfer measurements, or to divide a line into equal lengths. Dividers have two legs of equal length terminating in needlepoints. Above the needlepoints is a hinge to help the leg maintain perpendicularity with the drawing surface. Dividers are joined at the top.

Figure 2-20 shows a set of common dividers.
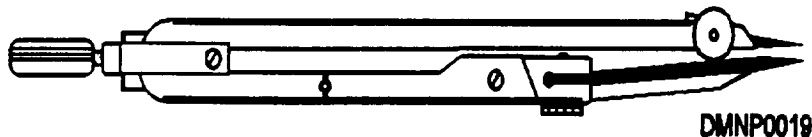
Figure 2-20. —Common dividers.

Cased Instruments, Continued

**Dividers
(Continued)**

To step off equal distances, follow this table:

Step	Action
1	Set dividers to a given distance.
2	Step off distance on drawing as many times as desired.

To transfer measurements, follow this table:

Step	Action
1	Set dividers to correct distance.
2	Transfer measurements to drawing.

To divide a line into equal lengths, follow this table:

Step	Action
1	Divide the line by the number of segments desired and approximate this distance with the dividers.
	Step off this distance on the line.
3	Continue with trial and error until the distances are equal.

Figure 2-21 illustrates how to step off a line.

**Figure 2-21.
—Dividing a line
into equal parts.**

Protect divider points with cork or eraser bits when they are not in use.
Clean dividers and wipe them with a light oil cloth before you return them to
their case. Do not oil divider joints.

Cased Instruments, Continued

Dividers (Continued)

To sharpen divider points, follow this table:

Step	Action
1	Hold dividers vertically, legs together.
2	Grind lightly back and forth against an oilstone until even in length.
3	Hold the dividers horizontally.
4	Whet the outside back and forth while rolling it side to side between fingers.
5	Inside leg should remain flat and not be ground.
6	Remove all burrs and polish with a leather cloth.

Figure 2-22 illustrates the sharpening of divider points,
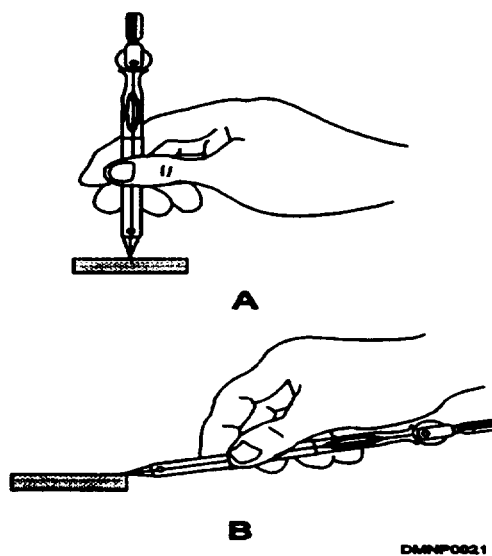
Figure 2-22. —A. Evening legs of dividers. B. Sharpening divider points.

Cased Instruments, Continued

Compasses   Use a compass to draw arcs and circles. A standard compass is 6 inches long and it has two legs. One leg holds the needlepoint and the other leg holds the nib. The nib may be a pen nib, a pencil attachment, or another needlepoint. The legs are often jointed above the nib to maintain perpendicularity to the drawing surface. The joint also reduces uneven wear and friction to the nib. To draw a circle larger than 12 inches, add an extension bar at the joint.

Figure 2-23 shows a pivot joint compass.
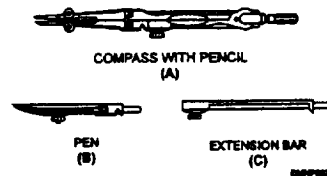
Figure 2-23. —A pivot joint compass.

The type of hinge on a standard compass indicates the quality of the instrument and its ability to hold a set. There are three types of hinges.

Figure 2-24 depicts the three types of compass hinges.
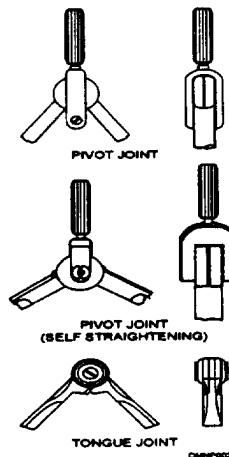
Figure 2-24. -Compass joints.

Cased Instruments, Continued

Compasses (Continued)

To use a compass, follow this table:

Step	Action
1	Make sure the needlepoint projects 1/64 inch beyond the nib.
2	Set compass legs to radius of desired circle or arc (Figure C).
3	Place needle carefully in exact center of proposed circle (Figure D).
4	Slowly lower nib to paper.
5	Rotate compass to complete circle (Figure E).
6	Check diameter of circle for accuracy (Figure F).

Figure 2-25 illustrates the steps for drawing a circle.

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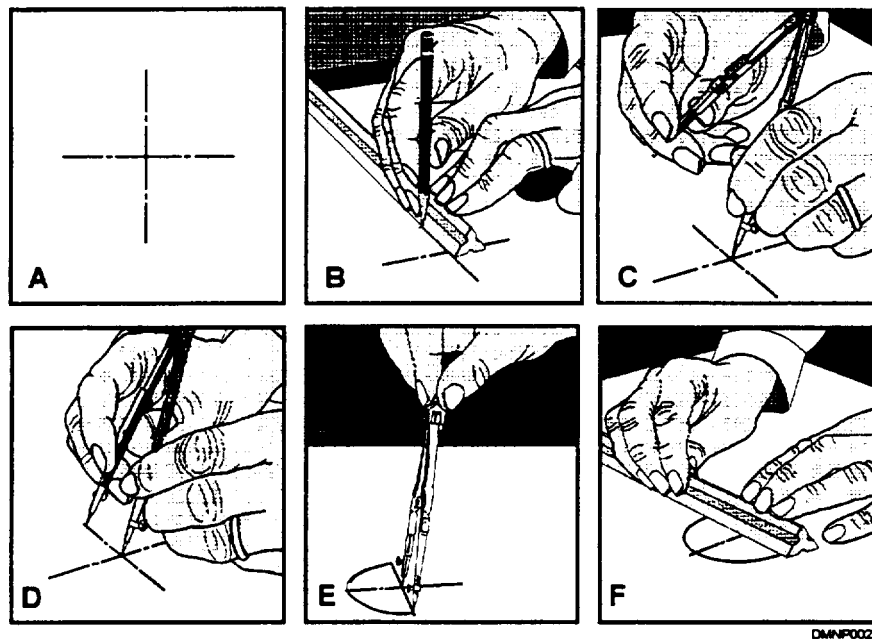
Figure 2-25. —A. Determine diameter of circle. B. Draw center lines. C, D, E, and F follow chart.

Cased Instruments, Continued

Compasses (Continued)

Protect the compass needle with cork or eraser bits. Periodically check the leg alignment. Keep the pen clean and free of ink buildup. Wipe the compass with a light oil cloth and return it to the case. Do not oil the joints.

To check compass alignment, follow this table:

Step	Action
1	Spread legs on compass.
2	Bend joints toward center.
3	Needle and nib should touch.

Figure 2-26 illustrates a test for alignment of the compass legs.

DMNO0025
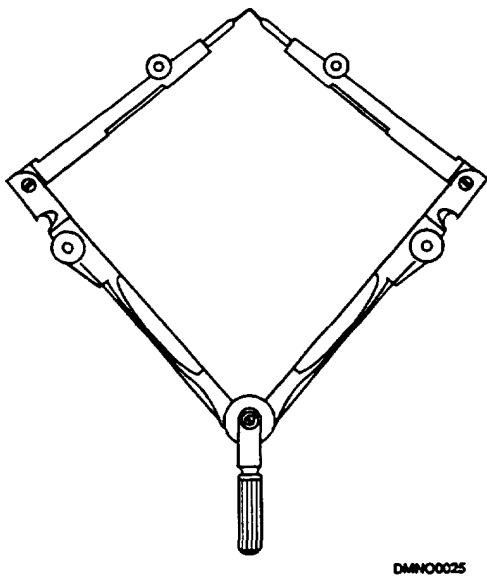
Figure 2-26. —Testing a pivot joint compass for alignment.

Cased Instruments, Continued

Extension bars   Extension bars extend the range of a compass so you can draw larger circles. Care for an extension bar as you would any other cased instrument.

Figure 2-27 shows a compass with and without an extension bar.
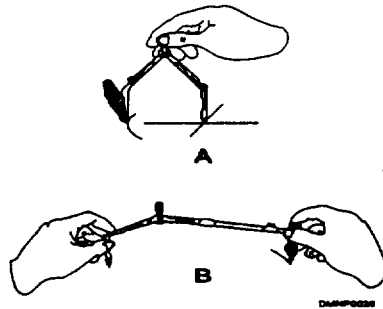
Figure 2-27. —A. A standard length compass. B. A standard compass with an extension bar.

Beam compasses   Draw an extremely large circle and arcs with a beam compass. The length of the beam that attaches the nibs and needle is the only limitation in the size of the radius of an arc or diameter of a circle. There are several styles and levels of sophistication. Care for a beam compass as you would any other cased instrument.

Figure 2-28 shows two types of beam compasses.
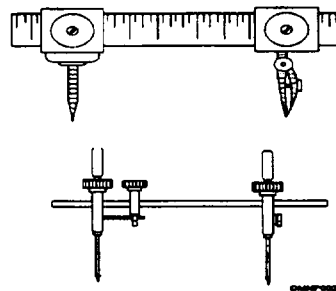
Figure 2-28. —Beam compasses.

Special Cased Instruments

Introduction   Special cased instruments are uncommon drawing tools used for distinct purposes. They are more delicate than standard cased instruments,

Bow instruments   For drawing circles and arcs that are less than 1 inch in diameter, use bow instruments. These delicate instruments have a side thumbscrew adjustment that controls the diameter of the circle. There are primarily four types of bow instruments. They are a bow pen, a bow pencil, a bow divider, and a special tool, called a drop bow pen. A drop bow pen is for drawing circles and arcs less than one fourth-inch in diameter. It has a rotating center shaft that moves up and down to minimize motion during drawing.

Figure 2-29 shows bow instruments.

BOW PEN   BOW PENCIL   BOW DIVIDER   DROP BOW PEN

DMNP0028
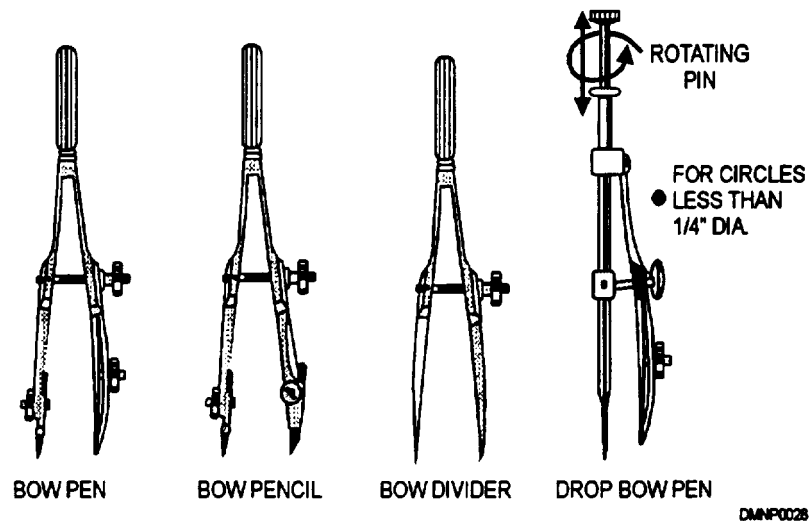
Figure 2-29. —Bow instruments.

Keep bow instruments clean and free of debris. Do not store dirty pen nibs. Wipe bow instruments with a light oil cloth and store them in the case when they are not in use.

Special Cased Instruments, Continued

Ruling pens   Ruling pens have a nib adjustment that is either the spring-type or the hinged-blade type. The three types of ruling pens you will see in Navy shops are the detail pen, the contour pen, and the railroad pen.

Figure 2-30 illustrates the differences between the two types of nibs adjustments.

SPRING TYPE   HINGED-BLADE TYPE
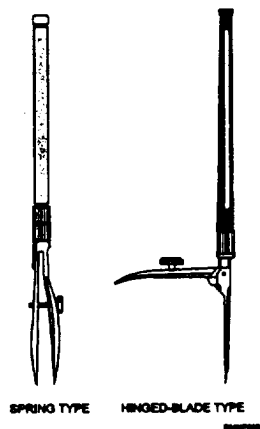
Figure 2-30. —Nib types.

DETAIL PEN: The detail pen is sometimes called the "swede" pen. It has broad nibs to handle a greater ink capacity. It can also handle a heavier bodied ink.

Figure 2-31 shows a swede pen with typically broad nibs.

DMNP0030

Figure 2-31. —Detail or swede pen.

Special Cased Instruments, Continued

**Ruling pens
(Continued)**

CONTOUR PEN: A contour pen lends itself to freehand, curvilinear lines. The pen nib swivels on a shaft inside a hollow handle. It draws sharp, precise lines and the line width is adjustable.

Figure 2-32 shows a contour pen.

Figure 2-32. —A contour pen with rotating handle.

RAILROAD PEN: Drawing parallel lines of equal or differing width is easy with a railroad pen. Both nibs have adjustable widths. The nibs may or may not rotate on a shaft inside a hollow handle.

Figure 2-33 shows a railroad pen.

Figure 2-33. —A railroad pen with rotating handle.

When you use a ruling pen, maintain perpendicularity with the drawing surface and draw the line with the pen at a 60-degree angle toward the direction the line is being drawn. Clean the pens and wipe them with a light oil cloth before you store them.

Figure 2-34 illustrates the drawing nib angle to paper.
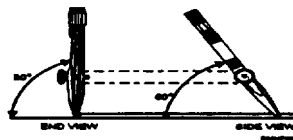
**Figure 2-34.
—Drawing lines with a
pen.**

Special Cased Instruments, Continued

Needlepoints   Needlepoints provide a stable pivot point for compasses and dividers to rotate around while you use them. Needlepoints are either tapered, shouldered, or a combination of the two.

Figure 2-35 shows the different combinations of needlepoints.
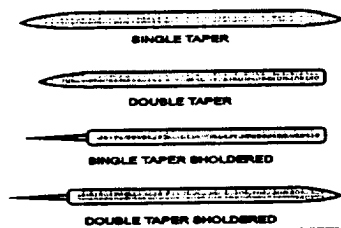
Figure 2-35. —Needle points.

Protect needlepoints when they are not in use and sharpen them when necessary.

To sharpen needlepoints, follow this table:

Step	Action
1	Wet one edge of the oilstone and place the needle shoulder against the edge.
2	Twirl between thumb and forefinger.
3	Stroke back and forth on oilstone while twirling.

Figure 2-36 illustrates the shaping of a compass needle.
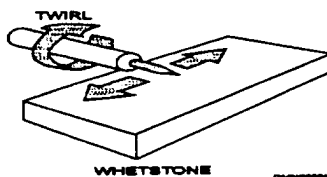
Figure 2-36. —Shaping a compass needle.

Special Cased Instruments, Continued

Center disks Center disks prevent the enlargement of a hole when concentric circles and arcs are drawn. They are usually very small with a transparent center and three needlepoint legs for holding a position on the drawing surface. Position the center disk carefully on the drawing surface, place the compass needle inside the center of the disk, and rotate the compass to draw concentric circles.

Figure 2-37 shows an enlargement of a center disk.

SMALL NEEDLEPOINT LEGS

DANP0036
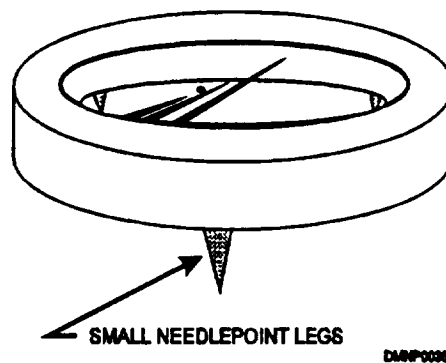
Figure 2-37. —A center disk.

Pens

Introduction

Pens and pen nibs are used throughout Navy drafting shops. The proper care and correct use can prolong the life of a pen nib. Pen nibs are made by many different manufacturers in an endless variety of styles.

Pen nibs

Pen nibs are detachable from a handle or drawing instrument. They maybe uniform in shape producing a line of equal width regardless of direction of the stroke, or they maybe irregularly shaped to produce a line of unequal width depending on the direction of the stroke. There are pen nibs used exclusively for lettering and nibs used for drawing. Before you use a pen nib, moisten it slightly to remove the manufacturer's protective oil. To fill a pen nib, supply ink by dropper or brush to extend 3/16 inch up the nib blade.

Figure 2-38 shows five different lettering nibs. Notice how changing the direction of the stroke can change the width and character of the line.
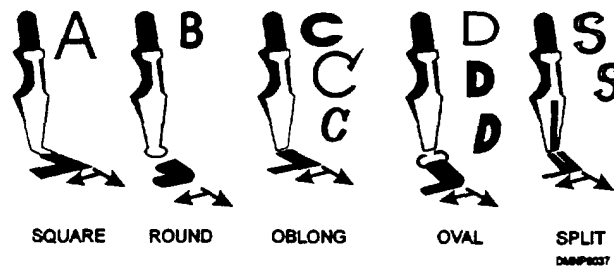
Figure 2-38. -Common nib shapes.

Figure 2-39 shows quill nibs used for drawing. They have more spring than a lettering nib. Quill pens produce an extremely fine line.
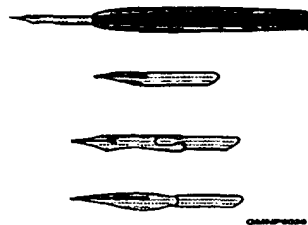
Figure 2-39. -Quill nibs.

Pens, Continued

Reservior pens   Reservoir pens, sometimes called technical pens, contain their own reservoir of ink. These pens draw lines of uniform width. They have a conical or tubular tip. Tubular tipped reservoir pens can fit into a hand lettering device to do lettering work. Inside the pen there is a weighted needle to regulate ink flow. A penis ready for use when the needle can move freely in the pen.

Figure 2-40 shows an exploded view of a reservoir pen.
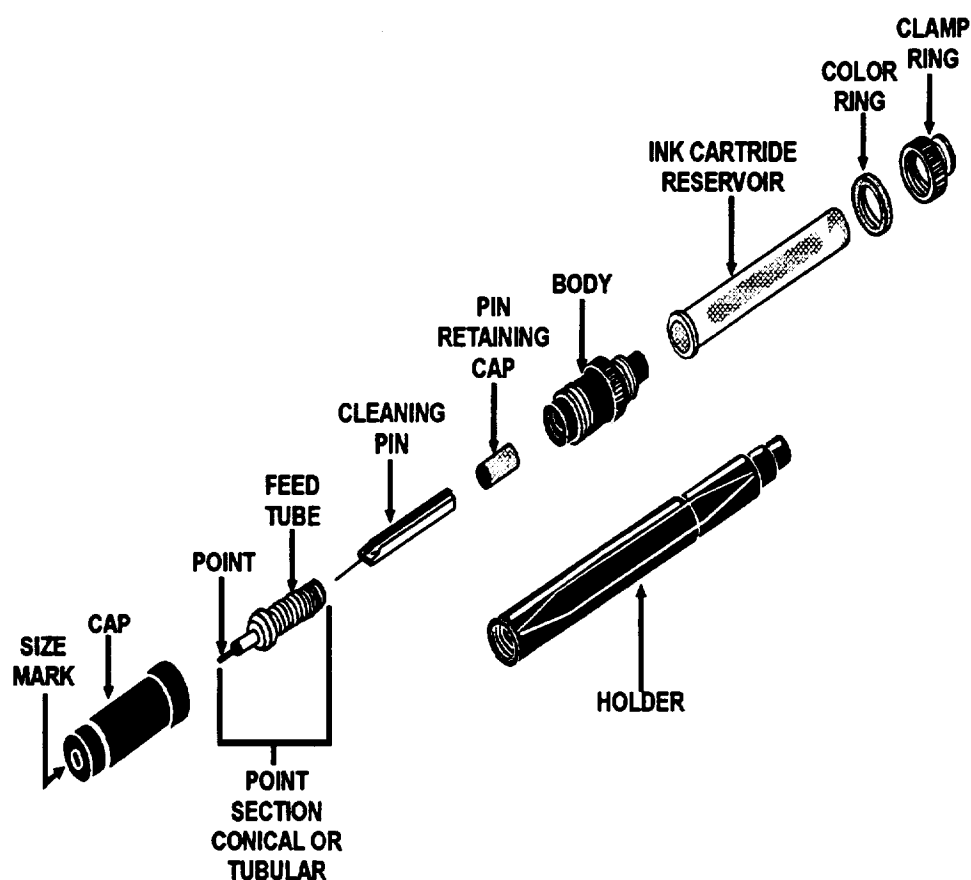
Figure 2-40. —Nomenclature of a reservoir pen.

Pens, Continued

Reservoir pens (Continued)

To use a reservoir pen, follow this table:

Step	Action
1	Remove the holder, clamp ring, and ink cartridge reservoir.
2	Fill the reservoir two-thirds full of drawing ink.
3	Holding a tissue over the pen nib, replace the reservoir, clamp ring, and holder.
4	Gently shake the pen up and down away from drawing surface allowing the weighed needle to feed ink into the feed tube.
5	Moisten a tissue and touch the pen nib to it until ink appears.
6	Hold the pen between thumb and forefinger perpendicular to drawing surface.
7	Keep tissue near to remove excess ink and paper fibers from nib as necessary.

Figure 2-41 illustrates a correctly held reservoir pen.
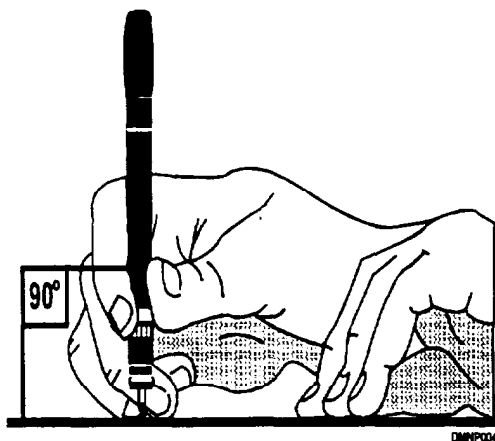
Figure 2-41. —Holding a reservoir pen.

Pens, Continued

Reservoir pens (Continued)

Figure 2-42 illustrates the consequences of improper pen handling.

INK ON OUTSIDE PEN BLADES RAN UNDER T-SQUARE

PEN BLADES NOT KEPT PARALEL TO T-SQUARE

NIB OF PEN PRESSED AGAINST T-SQUARE TOO HARD

NIB OF PEN SLOPED AWAY FROM T-SQUARE

NIB OF PEN SLOPED TOWARD T-SQUARE

T-SQUARE (OR TRIANGLE) SLIPPED INTO WET LINE

NOT ENOUGH INK TO FINISH LINE

DMNP0041
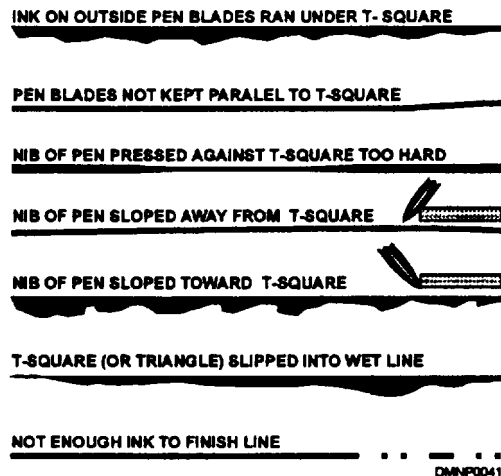
Figure 2-42. —Defective ink lines.

Pen care

Pen nibs and reservoir pens must be kept clean. Crusted ink will ruin a drawing that is in progress, rust a nib, and permanently freeze a technical pen. Pen nibs are easily cleaned in warm water with a mild detergent. Use water and ammonia to remove stubborn ink, When you are using an ultrasonic cleanser, do not leave a reservoir pen in the cleanser for a long time. Heat from the vibrating cycles will melt the retaining cap. Before you clean a reservoir pen, consider the following guidelines:

- thoroughly clean the pen before periods of nonuse,
- disassemble the pen only for thorough cleaning, and
- handle all parts carefully.

Pens, Continued

Reservoir pens (Continued)

To clean a reservoir pen, follow this table:

Step	Action
1	Remove the holder, clamp ring, and reservoir cartridge.
2	Empty cartridge, rinse, and set aside to dry.
3	Remove the cap, rinse, and set aside to dry.
4	Loosen point section before soaking: • do not force point section loose and • allow to soak and renew attempt to loosen.
5	Soak pen in water and ammonia or mild detergent.
6	Rinse well.
7	Thoroughly dry pen parts before reassembly.

When you use an ultrasonic cleanser, do not allow the pen to remain in the cleanser while the cleanser is on for a long period of time. Heat created by the vibration will melt the small plastic parts of the pen.

Drawing Aids

Introduction   Lettering aids, triangles, protractors, anything that helps the draftsman create an image, is a drawing aid. Some shops are fortunate enough to give each worker a set of drawing aids. Other shops have to share equipment among the workers. If your shop shares equipment among the workers, put the gear away clean and in good repair. Keep uncommon tools in commonly accessible places.

General care   Most drawing aids are made of plastic. Hang up drawing aids or store them flat when they are not in use. Never cut against the edges of a drawing aid or use them as a scraper. When a drawing aid is warped, nicked, out of true, or broken, throw it away and get another.

Triangles   Use triangles to draw lines at various inclines to the horizontal. Two common triangles are the 30/60- degree and the 45-degree triangle. Both of these triangles have a 90-degree base angle. A combination of a 30/60- and a 45-degree triangle creates eleven other angles. Triangles may or may not have an ink riser to prevent the flow of ink under the triangle edge. Plastic triangles are the easiest to use because you can see the work through them.

Figure 2-43 illustrates the angles created when you use combinations of a 30/60- and a 45-degree triangles.
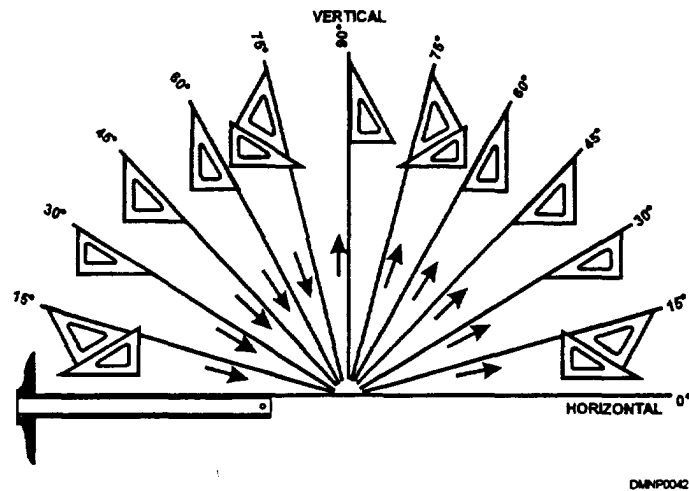
Figure 2-43. —Common angle combinations.

Drawing aids, Continued

Triangles (continued)

Figure 2-44 shows two standard triangles.

45° TRIANGLE   30°- 60° TRIANGLE
DMNP0043
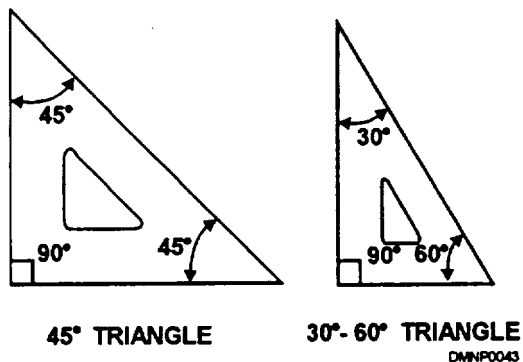
Figure 2-44. —Drafting triangles.

Adjustable triangles

Use an adjustable triangle for drawing lines inclined at irregular angles to the horizontal. This type of triangle has a set of scales for measuring off an angle and a thumbscrew for setting the angle. Care for an adjustable triangle as you would other triangles.

Figure 2-45 shows an adjustable triangle.

DMNP0044
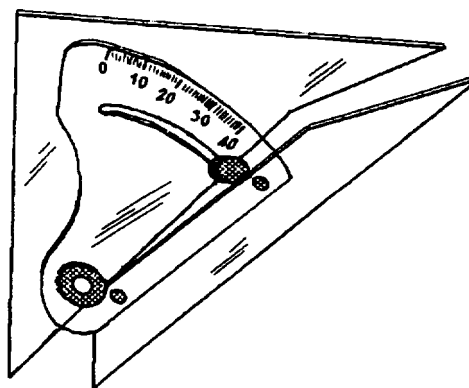
Figure 2-45. —An adjustable triangle.

Drawing Aids, Continued

Irregular curves

The two types of irregular curves common to a Navy Graphics shop are radius curves, sometimes called railroad curves, and french curves.

RADIUS CURVES: Radius curves are used for drawing large arcs. The radius of these arcs are from 1 1/2 to 1,000 inches. Some radius curves have a flat segment on one end, called a tangent.

Figure 2-46 shows radius curves.
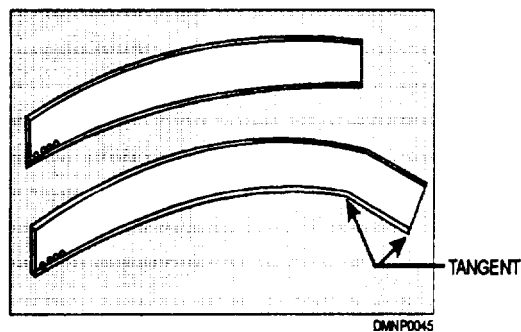
Figure 2-46. —Radius curves.

FRENCH CURVES: Use a french curve for drawing irregular or noncircular curves. Some french curves have an ink riser as part of their design. If your french curves do not have an ink riser, put one on with masking tape.

Figure 2-47 shows typical shapes for french curves.
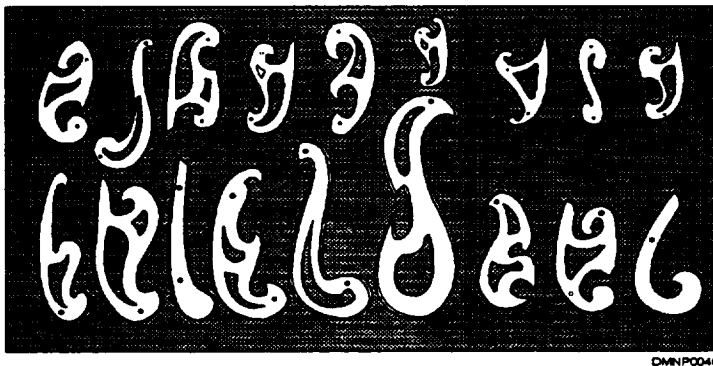
Figure 2-47. —French curves.

Drawing aids, Continued

Special irregular curves

In general, special irregular curves are curves not common to a Navy Drafting shop. These include ship's curves, mechanical engineer's curves, conic sections, and logarithmic spiral curves.

SHIP'S CURVES: These curves are peculiar to ship building. They are elongated curvilinear shapes in a variety of sizes.

Figure 2-48 shows ship's curves.

**Figure 2-48.
—Ship's curves.**

MECHANICAL ENGINEER'S CURVES: Irregular noncircular curves are drawn with mechanical engineer's curves. These curves are very similar to french curves.

CONIC SECTIONS and LOGARITHMIC SPIRAL CURVES: These curves are rarely found in a Navy Drafting shop.

Flexible curve rules

This unusual rule is used for drawing irregular curves. Completely flexible, most bend to a minimum radius of 2 inches. They have a metal or lead core which makes them bendable to any desired shape. Some have clear plastic edges graduated in increments.

Drawing Aids, Continued

**Using a
drawing aid**
To use an irregular curve, special irregular curve, or a flexible curve rule, follow this table:

Step	Action
1	Sketch light freehand lines of the desired curve.
2	Divide the line along its length with a series of points.
3	Select a section of curve that corresponds to at least three consecutive points.
4	Draw curve from point A to point B stopping short of point C.
5	Move curve to next segment.
6	Extend line as before continuing until the line is complete.

Figure 2-49 illustrates using a french curve.
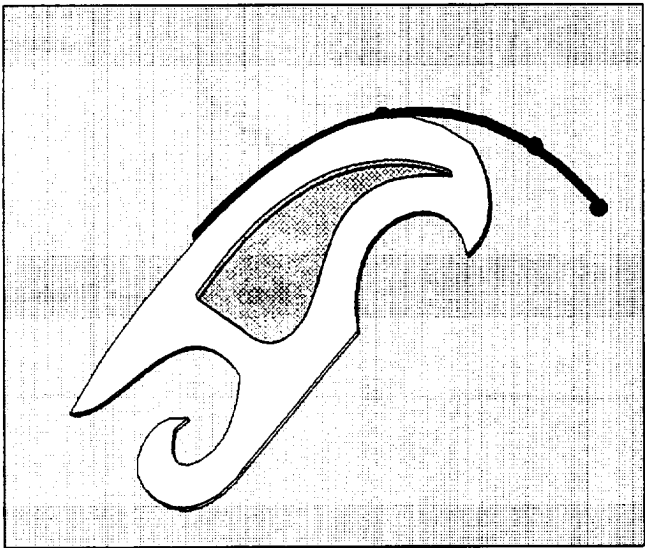
DMNP0048

**Figure 2-49. —Using a french curve to draw a
curved line through plotted points.**

Drawing Aids, Continued

Protractors   To measure and lay off angles from the horizontal without triangles, use a protractor. A protractor maybe circular or semicircular. Circular protractors are labeled in quadrants from 0 to 90 degrees or double numbered from 0 to 360 degrees. Semicircular protractors are double numbered from 0 to 180 degrees. Graduations in one-half degree increments allow accurate angle protraction.

Figure 2-50 shows a circular and semicircular protractor.

CIRCULAR   SEMI-CIRCULAR

DMNP0049
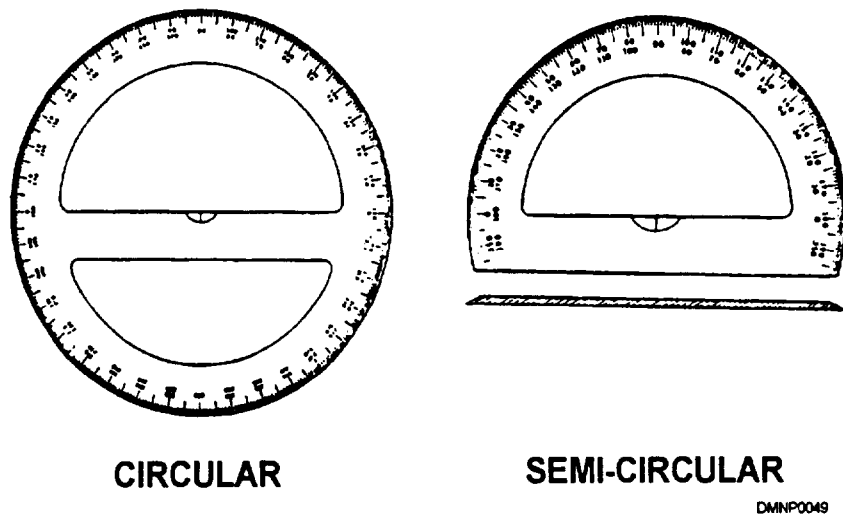
Figure 2-50. —Protractors.

Drawing Aids, Continued

**Protractors
(Continued)**

To use a protractor for laying off or measuring angles, follow this table:

Step	Action
1	Place the protractor along a straight line CA.
2	Place the O degree mark at the vertex of the desired angle.
3	Locate the desired angle (b) and its corresponding compliment (d).
4	Draw line BD.

Using four points of reference decreases the possibility of error in measurement.

Figure 2-51 illustrates the stability of a four-point reference system.
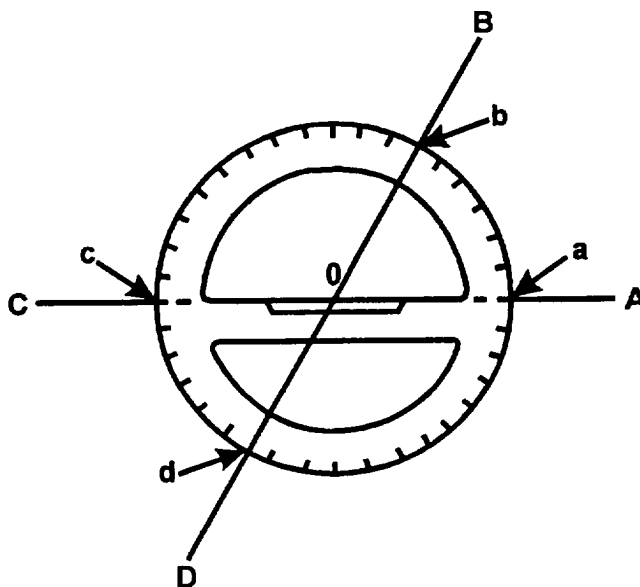
DMNP0050

**Figure 2-51. —Protracting an angle using four-
point reference.**

Drawing Aids, Continued

Templates   Frequently drawn symbols are drawn with the aid of a template. Templates are thin plastic sheets with symbols and shapes cut out. Usually transparent, they are available in a great variety. Keep templates clean and back them up with an ink riser if they do not have one.

Figure 2-52 shows a collage of templates by several manufacturers.
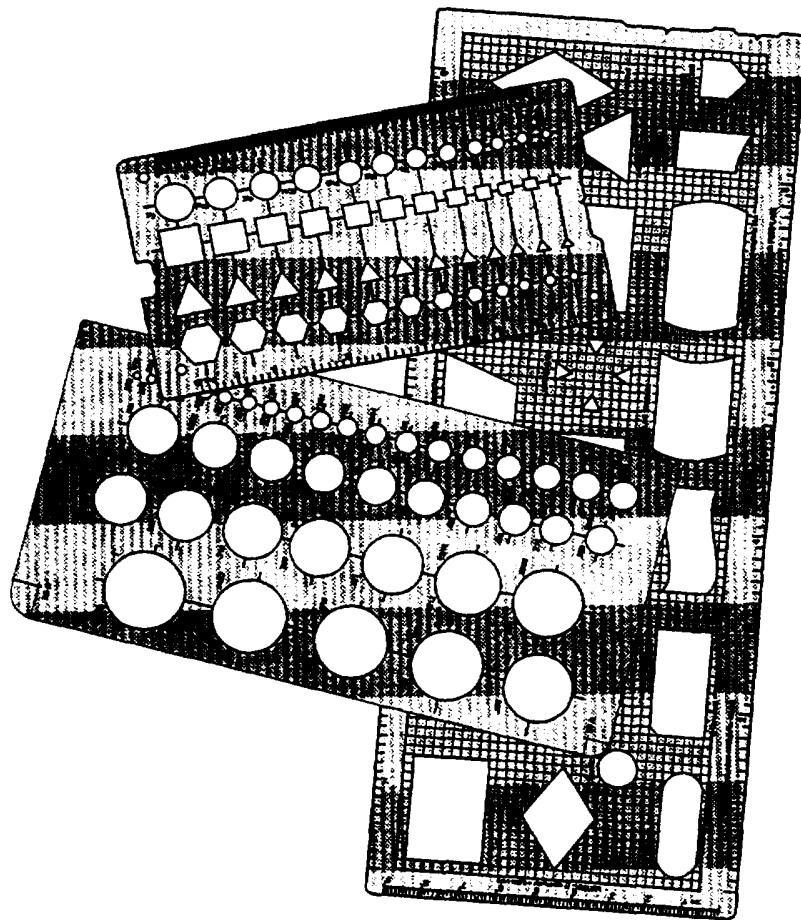
DMNP0051

Figure 2-52. —Templates.

Drawing Aids, Continued

Handmade templates

Sometimes DMs require a symbol repeatedly and there is not a template manufactured for it. In this case, a DM will have to make one. Medium to heavy acetate, sheet metal, or cardboard will suffice as template material.

To make a template, follow this table:

Step	Action
1	Draw symbol one pencil width larger than desired dimension.
2	Use a sharp blade to cut outline.
3	Clean edges with sandpaper, taking care not to enlarge symbol unnecessarily.

Figure 2-53 shows a template in the drawing stage.
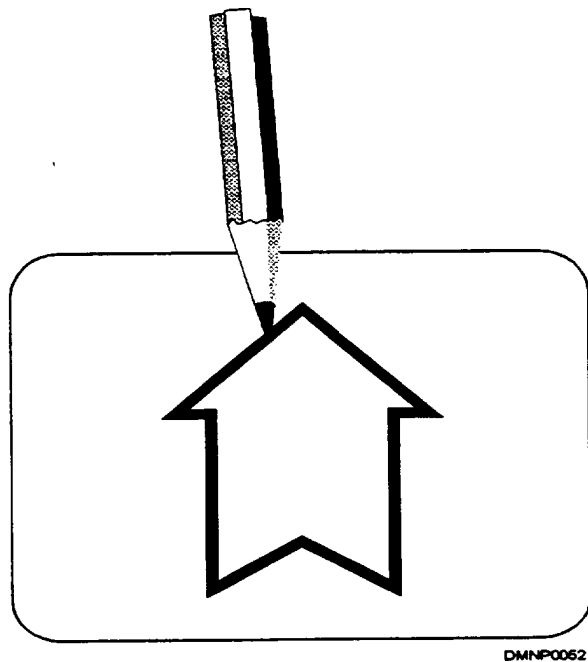
DMNP0052

Figure 2-53. —Draw symbol one pencil width larger than desired dimension.

Drawing Aids, Continued

Ink risers   The purpose of an ink riser is to raise the drawing aid slightly off the drawing surface so that ink will not bleed underneath it. If you do much ink work, put ink risers on the back of the drawing aid you use most frequently.

To make an ink riser, follow this table:

Step	Action
	Clean the back of the drawing aid.
2	Evenly cover the back with masking tape, taking care not to overlap tape.
3	Add a second layer of tape at right angles to the first layer.
4	With a fresh, sharp blade, cut openings approximately 3/32" larger than the openings of the template or the edge of the triangle or curve.
5	Remove unwanted tape.
6	Periodically clean riser and remove and replace as necessary.

Figure 2-54 shows a 30/60-degree triangle with an ink riser of masking tape.
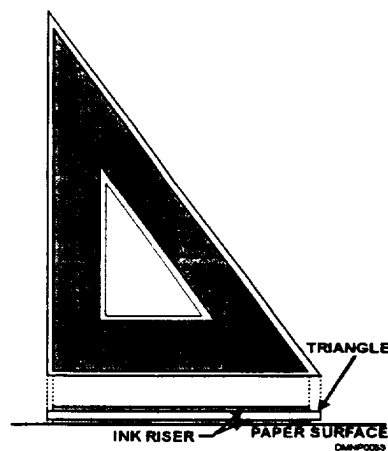
Figure 2-54. —Triangle with an ink riser.

Scales

Introduction Scales measure increments. The most common shaped scales are the triangular, two-bevel, opposite-bevel, and four-bevel. They vary not only in shape, but in style, division, and type. When properly cared for, scales will last a lifetime. Never rap a scale on a table or hard edge. Do not cut or draw lines against the machined increments of a scale face.

Figure 2-55 shows the most common scale shapes.
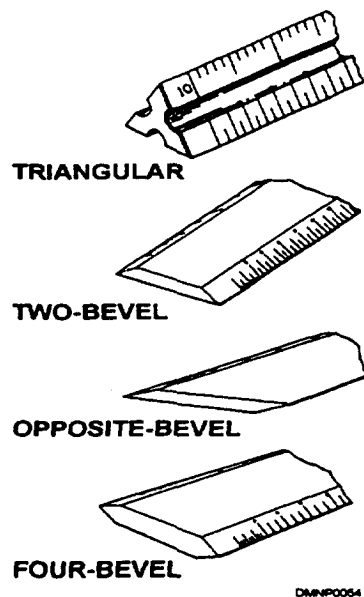
**Figure 2-55. —Common
scale shapes.**

Triangular scales Triangular scales provide six scale faces on one rule. Each scale face is double numbered except for the 16 scale which stands alone. This gives the DM eleven scales with which to measure. The triangular scale is convenient for most drawings. Some triangular scales have scale clips to identify the scale in use. Scale clips also ensure that the correct side of the scale is against the drawing surface. Large paper binder clips are a suitable substitute for scale clips.

Scales, Continued

Triangular scales (Continued)

Figure 2-56 shows six scale faces on one rule.
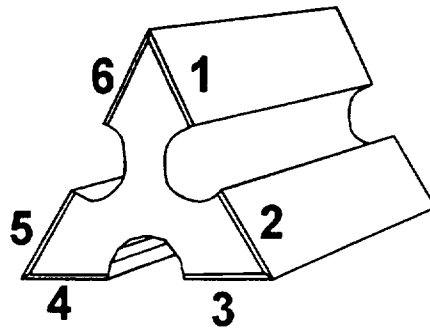
DMNP0055

Figure 2-56. —A triangular scale has six faces.

Figure 2-57 shows a scale clip.
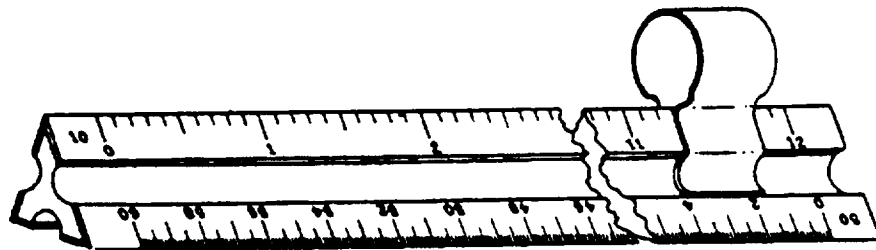
DMNP0056

Figure 2-57. —Triangular scale with a scale clip.

Scales, Continued

Two-bevel scales	Two-bevel scales tend to be wide-based. The two scale faces are always visible. Figure 2-58 shows a two-bevel scale.

Figure 2-58. —Two bevel scale.

Opposite-bevel scale	There are two scale faces on an opposite-bevel scale, but only one scale face is visible at a time. Because the sides of this scale are beveled, it is easy for you to remove it from the drawing surface. Figure 2-59 shows an opposite-bevel scale.

**Figure 2-59. —Opposite
bevel scale.**

Four-bevel scale	There are four scale faces on one rule on a four-bevel scale. Both edges on both sides are beveled. This type of scale is usually found as a small pocket scale particularly for machinists. Figure 2-60 shows a four-bevel scale.
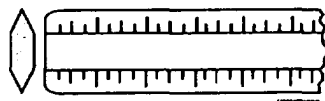
**Figure 2-60. —Four
bevel scale.**

Scales, Continued

Division
Scales are either engine divided or stenciled/painted. Engine division is highly accurate and etched into the scale face. Stenciled or painted increments are less accurate and easily worn away.

Division style
A DM must know four terms relating to the way in which increments are displayed on a scale that a DM must know. These are open divided, fully divided, double numbered, and single numbered.

OPEN DIVIDED: On an open divided scale, only the main increments are shown. There is one fully subdivided increment on the end of the scale to the left of the 0 point, Measurements of full units are read from the right of the 0, while partial increments are left of the 0.

FULLY DIVIDED: All increments on a fully divided scale are shown. This makes it easier to use, but not easier to read.

DOUBLE NUMBERED: The convenience of a double-numbered scale are that it reads from left to right and from right to left, allowing two different scales to appear on the same scale face.

SINGLE NUMBERED: This is by far the easiest scale division to read because there is only one scale per face, and it is usually fully divided.

Scales, Continued

Division style (Continued) Figure 2-61 illustrates how different 1 1/2 inches appear on differing scale faces.
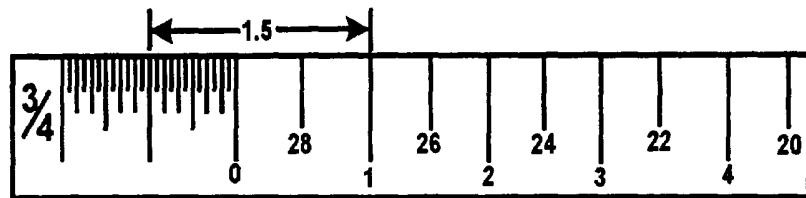
OPEN DIVIDED
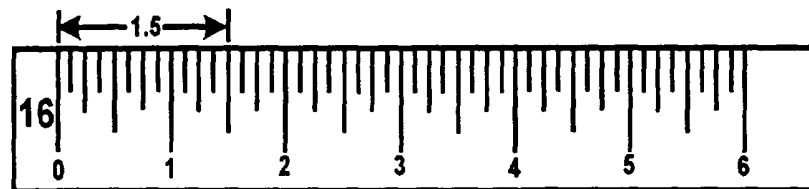
FULLY DIVIDED
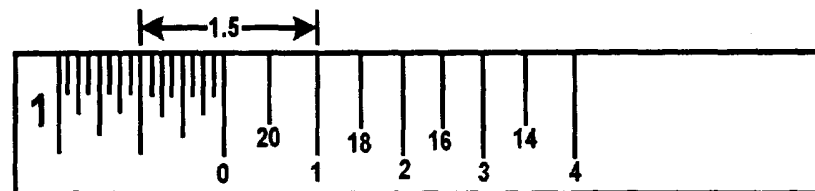
SINGLE NUMBERED
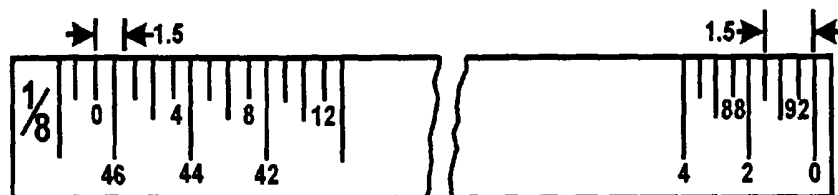
DOUBLED NUMBERED

DMNP0080

Figure 2-61. —Incremental divisions.

2-51

Scales, Continued

Types of scales   Architect scales are the most common in a Navy Drafting shop, followed by the chain or civil engineer's scale. Mechanical engineer's scales are also found in some shops.

ARCHITECT'S SCALE: This scale is the most common because it measures increments in terms of feet and inches. It has eleven scales on six scale faces. All scale faces are double numbered except for the 16 scale which stands alone. The 16 scale equates to a standard ruler. The architect's scale is open divided with the fully subdivided increment divided into 12 (inches). Lay off feet using the main scale to the right of the 0 mark. Lay off inches from the subdivided increment to the left of the 0 mark.

Figure 2-62 shows the scales on an architect's scale.

NOTE: 16 SCALE IS SUBDIVIDED INTO SIXTEENTHS.
ALL OTHERS ARE SUBDIVIDED INTO TWELFTHS.
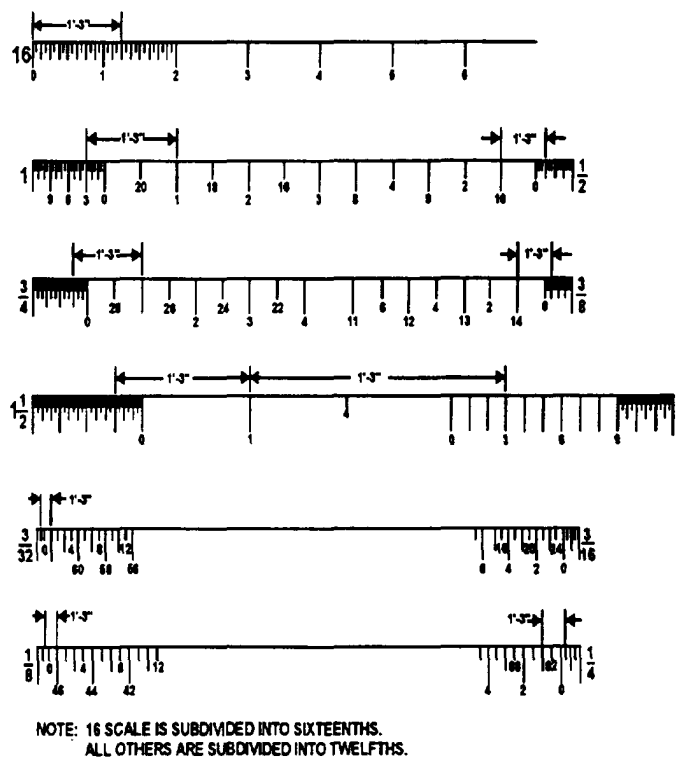
DMNP0061

Figure 2-62. —Faces on an architect's scale.

Scales, Continued

Types of scales   CHAIN or CIVIL ENGINEER'S SCALE: This scale is ideal for graphs. It may represent any measurable quantity in multiples of 10. It has six scale faces fully divided into decimal units.

Figure 2-63 shows scales from a chain or civil engineer's scale.
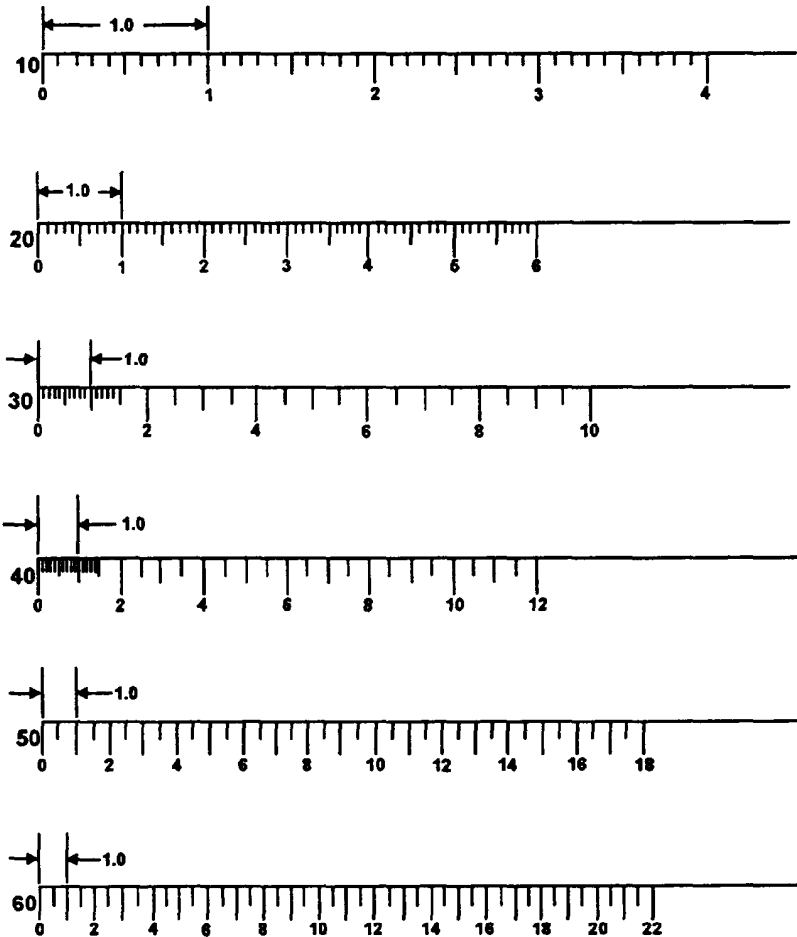
Figure 2-63. —Chain or civil engineer's scale.

Scales, Continued

Types of scales MECHANICAL ENGINEER'S SCALE: Mechanical engineer's scales are used for small machine parts not less than one-eighth scale. These scales are double-numbered.

Using the scale To use any scale, lay the scale on a surface parallel to a line. Use a sharp pencil to mark all measurements before moving the scale. Your moving the scale for each measurement increases the likelihood of a cumulative error. Indicate the measurements with a sharp pencil or pin prick. Do not draw against the machined increments of the scale or use it as a cutting edge.

Figure 2-64 illustrates the use of a pinpoint to indicate measurements.
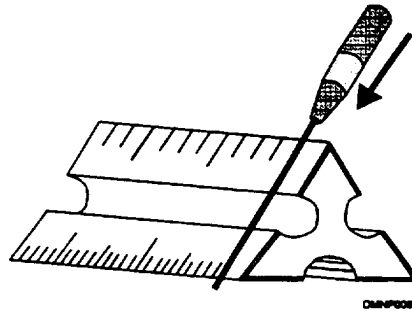
Figure 2-64. —Measuring increments on a triangular scale.

Indicating scale Indicating scale on a drawing expresses the ratio of the item to the drawing. It lends perspective to the viewer by providing a reference point. The three ways to indicate the scale on a drawing are the factional method, the equation method, and the graphic method.

FRACTIONAL METHOD: The tractional method is indicated by a fraction or ratio. The drawing unit is the numerator and the object is the denominator.

EQUATION METHOD: Scale indicated by feet and inches is the equation method of indicating scale. Feet are followed by a single apostrophe (') and inches are shown with a double apostrophe (").

Scale, Continued

Indicating scale (Continued)

GRAPHIC METHOD: An actual scale is drawn in the graphic method of showing the scale on a drawing. This is done on maps. The primary scale is to the right of the 0 and a subdivided scale is to the left of the 0.

Figure 2-65 illustrates the three ways of indicating scale on a drawing.

FRACTIONAL METHOD		EQUATION METHOD
1/1	FULL SCALE	12" = 1'-0"
2/1	ENLARGE SCALE	24" =1'-0"
1/2	REDUCED SCALE	1/2" = 1'-0"

GRAPHIC METHOD
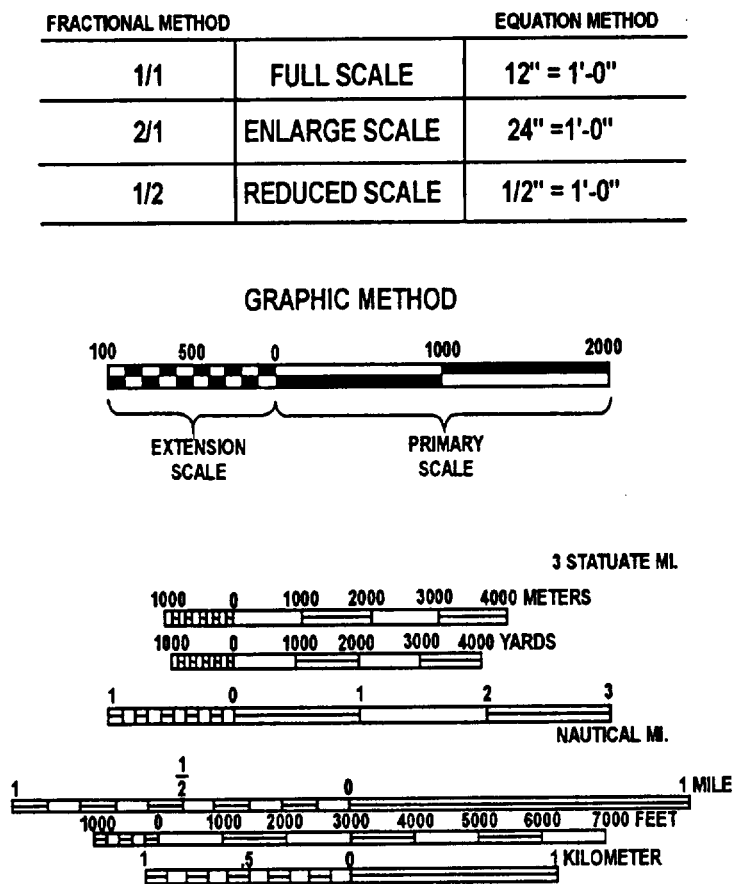
Figure 2-65. —Indicating scale.

DMNP0064

Brushes

It is important to have good quality brushes in the shop. We will cover two types of brushes which are general-purpose brushes and paint brushes.

General-purpose brushes

Keep shop brushes clean and free of abrasive particles that may scratch surfaces when you use them. Use the brush for its intended purpose. Do not whisk your drafting table with a brush just used to pickup dirt from the deck during field day.

DRAFTSMAN'S BRUSHES: Draftsman's brushes clean away dust and debris from working surfaces. They should not be overly abrasive as you will be whisking this brush over work in progress.

CAMEL HAIR BRUSHES: Camel haired brushes clean mirrored surfaces, camera lenses, and keyboards. They should be of a high quality soft bristle to prevent scratching optical surfaces.

PASTE BRUSHES: Use paste brushes to apply glues and for general-purpose work. They may be cheaper in quality, as most of these brushes are disposable.

Figure 2-66 shows the profile of common shop brushes.

DRAFTSMAN'S BRUSH

CAMEL HAIR

PASTE

DMNP0071
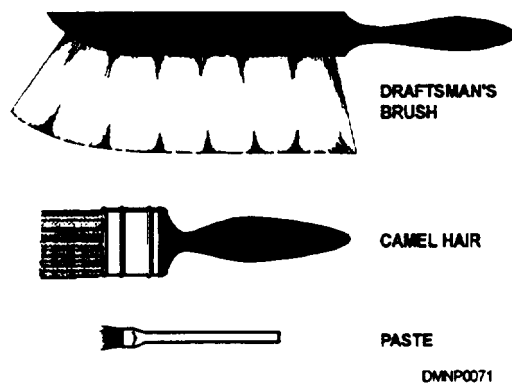
Figure 2-66. —Common shop brushes.

Brushes, Continued

Paint brushes　　Lettering, illustrations, and painting are done with paint brushes that vary in composition but have similar physical characteristics. All brushes have bristles, a ferrule or quill, and a handle. Choice of bristle depends on the intended use or desired effect. The size of the ferrule or quill dictates brush size and holds the bristles tightly in place, and the handle, usually made of hardwood, indicates the size of the brush.

Figure 2-67 shows brush nomenclature.
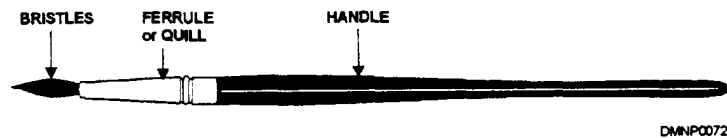
Figure 2-67. —Brush nomenclature.

Shapes of a paint brush　　There are four major shapes to paint brushes: fan, round, flat, and bright. The fan shape feathers paint over a surface and responds well to a light touch. The round shape is most commonly used for watercolor because it picks up and retains more pigment and water. Bristles on the flat and bright will differ according to the type of pigment used but tend to be a stiffer more controllable brush.

Figure 2-68 shows the shape of common paint brushes.
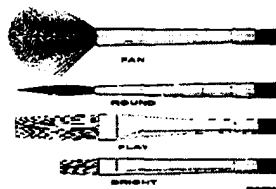
Figure 2-68. —Brush shapes.

Brushes, Continued

Storage   Store brushes in a clean condition and in the upright position. Never allow a brush to dry or set on its bristles. This permanently curls the bristles and ruins the brush for further use. Use a glass, a mug, or a brush holder to store brushes when they are not in use.

Figure 2-69 shows correctly stored brushes.
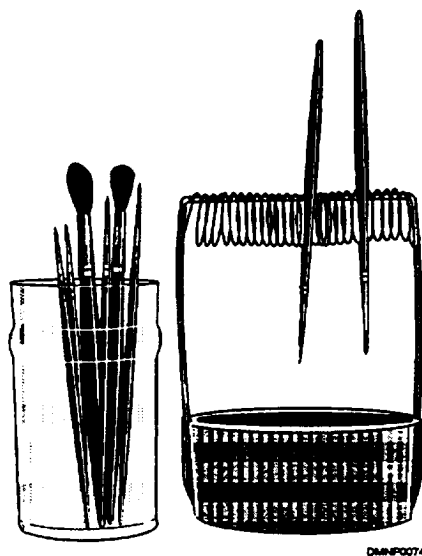
**Figure 2-69. —Store brushes.
correctly.**

Brush hair   The choice of a brush depends on the intended use, the desired effect, and the nature of the pigment. Many types of natural and synthetic bristles or hair are available in all shapes. Your creativity will dictate selection of the appropriate brush; however, the novice should follow these guidelines for red sable, camel hair, and ox hair.

RED SABLE: True red sable is the most desirable brush to use. Use it primarily for watercolor and washes. It has a great capacity for holding pigment and water while retaining a spring in the bristles. Red sable brushes are very responsive when used with water soluble pigments. They become less responsive with heavy bodied pigments, such as oil and acrylic.

Brushes, Continued

Brush hair (Continued)

CAMEL HAIR: Camel hair is a mixture of squirrel, skunk, badger, and pony hair. These brushes are extremely soft and have less spring in the bristles than red sable. Camel hair brushes with very long bristles letter well on smooth surfaces. Pin stripes are made by a camel hair dagger brush. Camel hair brights and flats are used for oil and acrylic paint.

OX HAIR: Ox hair brushes are strong bristled brushes. These coarse bristles are made into flats and brights. Use ox hair brushes to do rigid lettering and for painting with oils and acrylics.

SYNTHETIC HAIR: Synthetic fiber hair is rapidly replacing natural bristles in brush construction. Synthetics have the spring and resiliency to withstand abuse from multi-medium use and chemical cleaners. Fan-shaped brushes most often appear with synthetic bristles. Synthetic bristle brushes work well in any medium.

Oil brushes

If you use both water- and oil-based paints, dedicate a set of brushes to oil-based paints only. After cleaning the brushes and before storing them, add a drop of oil to the bristles. This keeps the bristles pliable and lessens the effect of the harsh chemicals used to clean them. Store them in an enclosed container to m We airborne contaminants. A set of brushes dedicated to oil-based paints will also eliminate the chance of your confusing them with brushes used for water-based paints. Once you use a water-based paint brush in oil-based paints, you should not use it for a water-based pigment again.

Brushes, Continued

Caring for brushes

After using a brush, clean it thoroughly and store it. A brush properly cared for will last many years. Throw away crusted and curled brushes or reuse them as disposable paste brushes.

To clean a brush, follow this table:

Step	Action
1	Remove as much color as possible: • use water for water-based paints and • use thinner or mineral spirits for oil-based paints.
2	Wet brush in lukewarm water.
3	Lather palm of hand with mild face soap.
4	Stroke brush back and forth in hand.
5	Rinse thoroughly in clean water.
6	Shake excess water from bristles.
7	Shape bristles gently into original shape.
8	Store brushes with bristles up.

Pencils

Introduction	A pencil is the most readily available tool for expressing ideas from mind to paper. Limited only by imagination, use a pencil to draw the infrastructure of a drawing or as the finish medium. Some artists specialize in the pencil and its many variations as a form of expression.
Drawing pencils	For general drawing, sketching, and layout, use a drawing pencil. Drawing pencils have a wood casing around a core of graphite or composite. The composition of the core, called a lead, and the hardness of the lead determine the grade or rating of a pencil.
General care	Take care not to drop a pencil or rap it against a surface. This will break the lead internally and drastically shorten the life of the pencil. Keep a drawing pencil sharpened by using a sandpaper sharpener, a draftsman's pencil sharpener, or a standard office sharpener.
Lead hardness	Pencil leads are available in 17 grades from 6B which is the softest to 6H, the hardest. Soft leads are 6B to 2B and have a thick-diameter core. Soft leads are best used in freehand work where smudging is a creative option. Medium-rated leads are the B to 3H pencils. These are general layout pencils sometimes used for freehand work. Technical drawing and drawing that requires a degree of precision are done by hard-leaded pencils in the 4H to 6H range. Hard-leaded pencils have a small-diameter core and tend to appear lighter in density than a soft-leaded pencil. Variations do occur among manufacturers.

Figure 2-70 shows a chart of lead hardness.

DMNP0075

Figure 2-70. —Lead hardness.

Pencils, Continued

Lead composition

Lead is made of a composition of substance and binder. The substance of a pencil lead can be graphite, carbon, charcoal, lithographic grease, colored pigment, wax, or pastel. The binder is relatively unimportant unless you are writing on a slick surface. The selection of a pencil lead is a matter of personal preference and creative intent; however, some guidelines do apply.

GRAPHITE: Graphite leads leave a dense black line with a shiny surface that can reflect light or glare when photographed for reproduction. As humidity increases, the lead softens and smears easily. In extremely dry conditions, the graphite produces a dusty residue.

CARBON: Carbon pencils produce a dense, dull-surfaced black line that is not affected by humidity to the same extent that graphite is. Carbon pencils tend to smear if they are not freed by a commercial fixative.

CHARCOAL PENCILS: Charcoal pencils are not always found in a wood casing. Charcoal is available as sticks and in powder form. Charcoal produces a dense, dull black line.

LITHOGRAPHIC PENCILS: This pencil produces a dense black line which tends to be greasy. Its primary purpose is marking lithographic plates, but it also marks well on glass and plastics.

COLOR PENCILS: In a color pencil, pigment determines the color of the line and binder determines whether it is water soluble or waterproof. Some binders have a waxy binder that makes it difficult to erase or blend them.

PASTEL PENCILS: Once available only in stick form, pastels are now in pencil form. The characteristics of the pastel pigment remain the same. In the pastel, the pigment may be dry or oil-based. They leave a dull, chalky line and come in many colors. Pastels more popular form is still in sticks and powder.

Pencils

Special-purpose pencils

Special-purpose pencils are those pencils that are nonreproducing or have waxed based cores. Use a nonreproducible blue pencil for layout work intended for black-and-white reproduction. Most black-and-white photographic films are blind to the light sky-blue color and will not record it on the negative. Nonreproducing lithographic pencils are dark violet in color. Used on a lithographic plate, this pencil will not appear in the finished product. Waxed-based leaded pencils, sometimes called china markers, come in a variety of colors and are capable of marking on glass, plastic, and metal surfaces.

Basic Consumables

Introduction   Many things a DM uses in the shop are consumable items. Erasers, pencils, and brushes are used and discarded. These items are underestimated in terms of what they do to ease the work load of the DM.

Erasers   There are electric erasers and hand erasers.

ELECTRIC ERASERS: Electric erasers are hand-held units with a power cord or rechargeable base. They provide a rapid and thorough erasure. Take care not to hold the eraser in one spot for too long as the rotation of the eraser and heat generated by it will damage the paper surface. Move the electric eraser in a circular motion over the drawing protecting those areas to remain with an erasing shield.

Figure 2-71 shows silhouettes of some popular electric erasers.

CORDLESS HAS A
SEPARATE ENERGIZER
STAND TO RECHARGE
UNIT.
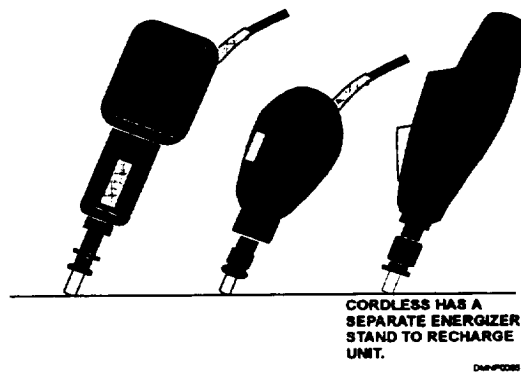
Figure 2-71. —Electric erasers.

Basic Consumables, Continued

Erasers (continued)

HAND-HELD ERASERS: Hand-held erasers are available in different grades, each with a specific purpose. Hard erasers are a white or grey color and are very abrasive. They remove stubborn marks in pencil or ink. Moderately abrasive erasers are red. Soft erasers remove only light lines, as they are the least abrasive. Soft erasers are pink in color.

Types of erasers

Erasers have specific purposes. Besides the pencil eraser, there are four other erasers the DM uses in the work center. These are plastic erasers, art gum, kneaded erasers, and pulverized eraser particles.

PLASTIC ERASERS: Plastic erasers work well removing unwanted marks from drawings on Mylar. Moisten the eraser slightly before using to increase the drag on the drawing surface. This eraser leaves no residue.

ART GUM: This eraser is excellent for removing finger marks and smudges without marring the surface of a drawing. An art gum eraser leaves much residue which should be whisked away with a draftsman's brush.

KNEADED ERASERS: Kneaded erasers bring out the highlights in a drawing and clean a drawing surface. They work by absorbing graphite particles. Absorption increases by kneading the eraser in your hand. Generally, it leaves no residue unless it is too old and/or too full of absorbed particles. If this eraser becomes overly warm, the substance may break down, leaving a stain on the drawing surface.

Basic Consumables, Continued

Types of erasers (Continued)

PULVERIZED ERASER PARTICLES: Pulverized eraser particles are available as a powder or in a soft mesh bag. They clean a drawing of surface smudges and prepare it to accept ink. Whisk away the residue of eraser particles with a draftsman' brush.

Figure 2-72 shows the types of erasers common to a work center.
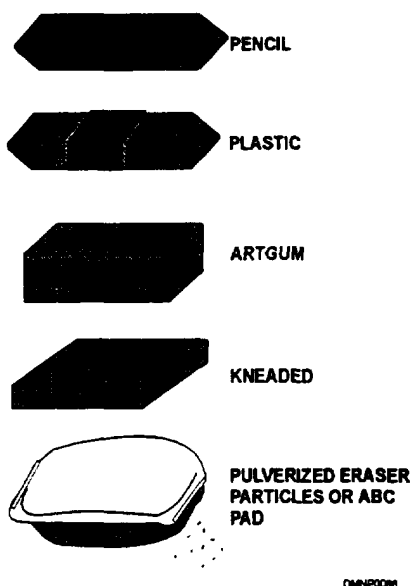
Figure 2-72. -Common erasers.

Basic Consumables, Continued

Erasing shields Erasing shields protect areas of a drawing that you do not want to erase. They are made of a light gauge, spring metal with numerous openings in variegated shapes and sizes.

Figure 2-73 shows an erasing shield.

THIN
SPRING
METAL
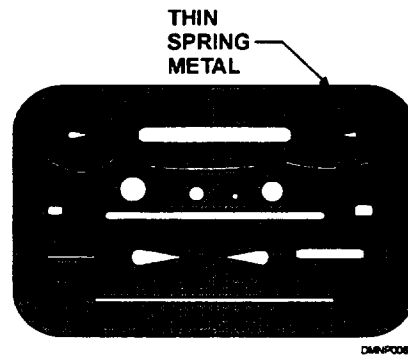
Figure 2-73. —Erasing shield.

Stumps and tortillons Stumps and tortillons blend pencil, charcoal, pastels, and crayons together in a drawing. They are made of kraft paper twisted tightly into blunt and pointed ends. When they are dirty, throw them away and get a clean one.

Figure 2-74 shows stumps and tortillons.

Figure 2-74. —Stumps and tortillons.

Cutting mats Use a cutting mat to cut out items with a blade. They are self-sealing and stabilize the blade during cutting. Keep the cutting mat clean and remove the wax or adhesive buildup often.

Basic Consumables, Continued

Blades
Knives or blades come in an assortment of shapes. Each shape has a specific purpose. Blades normally found in a shop include swivel knives, craftsman knives, and box cutters. Keep a sharp blade in the knife handle. Change blades frequently to ensure a clean cut.

Figure 2-75 shows examples of blades. Let personal preference dictate the blade most comfortable for you,
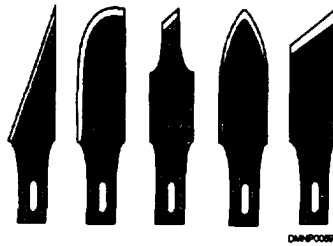
Figure 2-75. —Blade shapes.

Figure 2-76 illustrates knife styles with particular purposes.
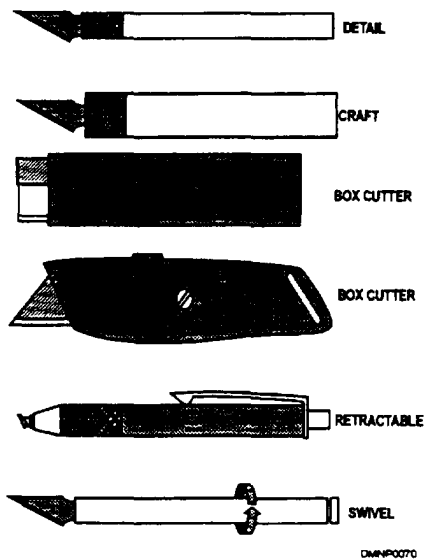
Figure 2-76. —Knife styles.

Summary

Review

This chapter covered the general types of shop furniture found in a Navy Drafting shop and how to care for it. It described cased and special cased instruments and the procedures to store and use them. Drawing aids and scales are some of the simplest and most worthwhile tools to master. Practice with them. Use the pens and pencils mentioned. Consumable supplies represent the bulk of supplies that you, as a DM, will use. Do not waste supplies needlessly.

Comments

Familiarity with any piece of equipment will enable the DM to assess the limitations and capabilities of the shop accurately. Know your equipment well. Care for the equipment in the shop as if it were your own. Maintain an open mind to new products in the market. A good, capable shop enhances the reputation of each worker in it. In a rate as small as DM, that reputation could follow you throughout your career.

CHAPTER 3

COMPUTER EQUIPMENT

Overview

Introduction   You may or may not have experience in doing your job with a computer. However, computers are rapidly supplementing traditional methods of preparing artwork and work intended for reproduction, and you will have to interface with them at some point in your career. Not only is computer literacy becoming a desirable in-service job skill, but it is an essential communications skill in the civilian arena. Learn the vocabulary and learn your way around a computer.

Objectives   The material in this chapter enables you to do the following:

- Identify the procedures to clean and inspect computer peripherals.

- Identify hardware components.

- Correctly install peripheral devices.

- Select compatible hardware and software accessories.

- Differentiate between hardware and software.

Overview, Continued

Acronyms   The following table contains a list of acronyms that you must know to understand the material in this chapter:

Acronym	Meaning
ALT	Alternate
ASCII	American Standard Code for Information Interchange
BBS	Bulletin Board Service
BIT	Binary Digit
BPS	Bits Per Second
CD ROM	Compact Disk Read-Only Memory
COMPORT	Connector Port
CPS	Characters Per Second
CPU	Central Processing Unit
CRT	Cathode-Ray Tube
CTRL	Control
DEL	Delete
DPI	Dots Per Inch
DTP	Desk Top Publishing
E-MAIL	Electronic Mail
EMR	Electro Magnetic Radiation
EO	Erasable Optical
ESC	Escape
FF	Form Feed

Overview, Continued

Acronym	Meaning
GB	Gigabyte
INS	Insert
I/O	Input/Output
KB	Kilobyte
LAN	Local Area Network
LCD	Liquid Crystal Display
LF	Line Feed
MAC	Macintosh
MB	Megabyte
MO	Magneto Optical
NIC	Network Interface Card
PC	Personal Computer
PCL	Printer Control Language
PRTSCRN	Print Screen
RAM	Random Access Memory
ROM	Read-Only Memory
SIMMS	Single Inline Memory Modules
SYSOP	System Operator
VGA	Video Graphics Array
WAN	Wide Area Network
WORM	Write Once/Read Many

Overview, Continued

In this chapter This chapter covers the following topics:

Hardware

Introduction

Computer hardware is all the equipment and devices associated with the operation of a computer system. Everything that is tangible or touchable regarding the computer is hardware, including the disks used to program the computer. Hardware is divided into input devices, edit devices, output devices, and input/output devices.

General maintenance

Practice the following general maintenance procedures to maintain your computer in peak operating efficiency:

- Keep devices clean and free of debris.

- Clean the keyboard and button selection areas with a camel hair brush.

- Clean optical surfaces with a lint-free cloth or chamois. Check the operating manual to make sure screen surfaces are not covered with a glare preventative spectral coating that spray cleaners could damage.

- Clean exterior cases, tabletops, and mouse track with a slightly dampened, lint-free cloth. Dampen the cloth; do not wet the components.

- Do not allow food or drink near the keyboard, the mouse track, or the pressure sensitive and electronic tablets.

- Inspect connector ports (COMPORTS) and pins for damage.

- Carefully align pins and never force a connection when connecting devices.

Input Devices

Introduction

Input devices are devices that allow a system operator (SYSOP) to interface with a computer. You interface with the computer by entering your commands into the computer system through a keyboard, a seamer, a mouse, a trackball or joystick, a pressure sensitive or electronic tablet, or a light pen. These are all input devices.

Keyboards

The keyboard is the primary means for inputting data into the computer. Based on a standard typewriter keyboard, computer keyboards have additional special-purpose keys, function keys, cursor movement keys, and a numeric keypad. Keystrokes input text and characters into memory or on a screen. Combinations of keystrokes prompt key functions such as holding, underlining, and italicizing. An enhanced keyboard minimizes keystrokes by using function keys like F1, F2, and so forth, to access functions or commands. The following table lists special-purpose keys and their function:

Key	Function
ALT	Alternate; modifies or accesses function
BACKSPACE	Backspace; deletes keystrokes left of the cursor
CTRL	Control; modifies or accesses function
DEL	Delete; removes unwanted keystrokes right of the cursor
ESC	Escape; exits program or situation
HOME	Home; allows rapid scrolling to top or bottom of document
INS	Insert; allows insertion of text or characters
PRTSCRN	Print Screen; sends what is on the screen to printer

Input Devices, Continued

Function keys   Function keys are special-purpose keys, numbered F1 through F10, used to communicate specific fictions to the operating system. These keys simplify tasks that might otherwise require several key strokes. These keys can also be used with other keys to increase the number of functions available. The software program in operation defines the function of these keys. Be sure to read the software owner/user manual to understand the purpose of these keys. These keys are generally located at the top of the keyboard.

Cursor movement keys   Cursor control keys move the cursor from one place to another on the display screen. The cursor is the indicator on the display screen that lets the user know where the next entry will be made. Cursor control keys have an arrowhead printed on them pointing in the direction that the key will move. Some keyboards have a separate set of keys for cursor movement; others have the cursor movement keys incorporated into the numeric keyboard. As long as the NUM LOCK key is OFF, the cursor movement keys function. Some software packages use the cursor control keys in combination with each other or with other keys to increase the number of ways and the speed with which you can move the cursor. Another cursor movement key — the SCROLL LOCK/BREAK key – controls screen scrolling. When in the BREAK mode and used in conjunction with the CTRL key, the SCROLL LOCK key will interrupt program execution.

Figure 3-1 shows cursor movement keys.
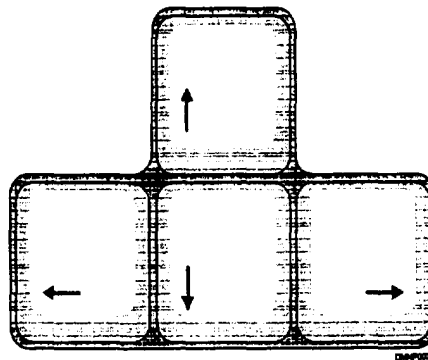
Figure 3-1. -Cursor movement keys.

Input Devices, Continued

Numeric keypad

To perform mathematical functions, use the numeric keypad as you would a calculator. To activate the numeric keypad, press the NUM LOCK key. If you do not press the NUM LOCK key, the numeric keypad will function as cursor control keys.

Figure 3-2 shows a numeric keypad. Note the location of the cursor movement keys on the numeric keypad.
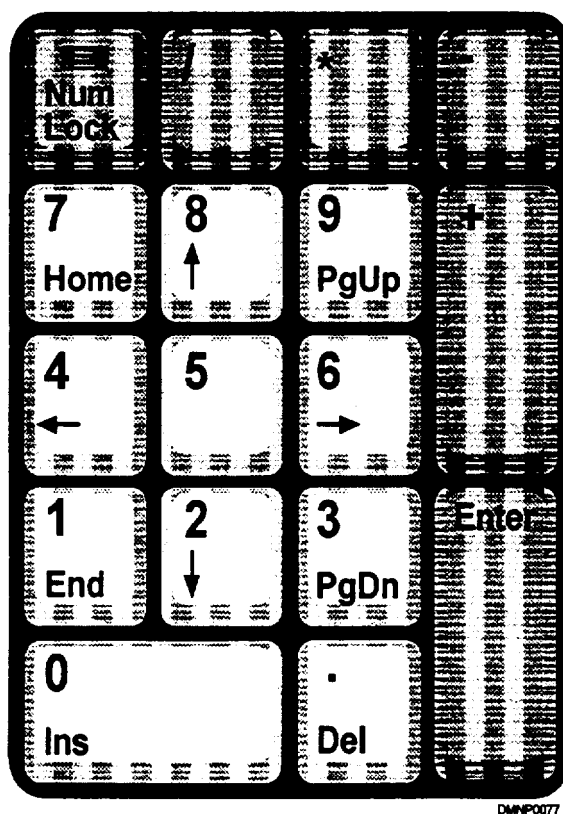
Figure 3-2. —Numeric keypad.

DMNP0077

Input Devices, Continued

Scanners
A scanner allows you to copy a photograph, a drawing, or a text page into the memory of the computer. It does this by measuring tonal or color values and converting them into a binary code that the computer can digest. You may then "clean-up" the image using the appropriate software program before printing a final copy for reproduction. Software for the scanner is as important as the scanner. The software provides for image manipulation and export format compatibility. A scanner is particularly useful for copying large amounts of text or images not previously saved on disk that now require revision. When using a scanner, be careful not to violate an existing copyright.

Grey scale scanners
Grey scale scanners read tonal values and assign density code numbers. The density code is available from 16 to 256 levels of grey. For general-purpose work, select a software program that offers a minimum of 64 levels of grey.

Color scanners
A color scanner reads color value and assigns it a binary code for export. This scanner will range from 70 to 600 dots per inch (DPI) with 24 binary digits (bits) of color. For general-purpose work, select a software program that offers a range between 300 and 600 dpi.

Scanner types
The four types of scanners are the hand scanner, the flatbed scanner, the copystand scanner, and the slide scanner.

HAND SCANNERS: Hand scanners are useful for small quantity scanning. They read portions or excerpts from a document page into the memory of the computer.

FLATBED SCANNERS: Flatbed scanners scan pages out of a book. They scan an entire one- or two-page spread in one view.

COPYSTAND SCANNERS: Copystand scanners are capable of scanning three-dimensional objects.

SLIDE SCANNERS: Slide scanners scan slides and transparencies into memory. Scanners used to scan slides and transparencies require a mirrored or reflective attachment.

Mice

A mouse is an input device that allows the SYSOP to stroke functions and commands rapidly into the computer without touching a keyboard. It also provides a synchronous movement for drawing. The two types of mice are the mechanical mouse and the optical mouse. The mechanical mouse fits in the palm of the hand and rolls around either on a small ball or on small wheels that roll around the ball. This movement moves the cursor on the screen. The optical mouse also moves the cursor, but it uses a beam of light on a reflective mouse pad. Press or click the mouse buttons to access functions or commands.

Figure 3-3 shows a mechanical mouse on a mouse pad. The mouse pad protects the ball inside the mouse from collecting dust from the tabletop.

DMNP0078
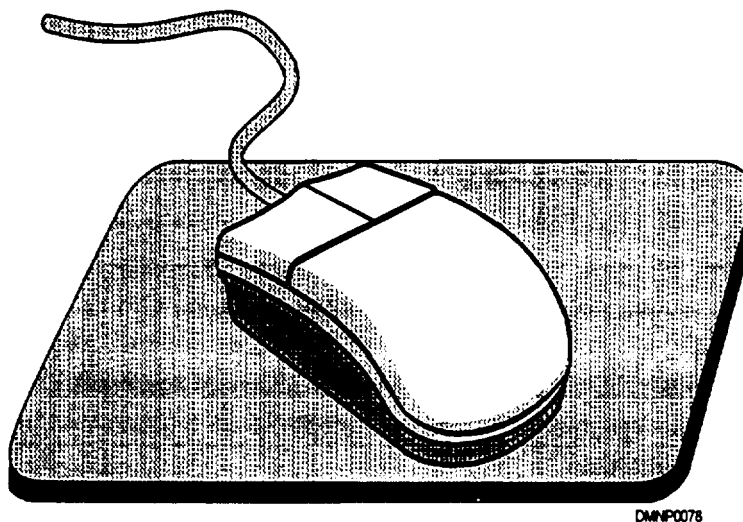
Figure 3-3. —A mechanical mouse.

Joysticks and trackballs

Joysticks and trackballs are like mice in that they allow rapid access to functions; however, they are most often used in game playing or contests of skill. They resemble cockpit wheels, triggers, and guns.

Pressure sensitive or electronic tablets

Pressure sensitive and electronic tablets are primarily freehand drawing devices. Sensitive to pressure from the hand, the tablet recreates the thick and thin strokes made on the tablet to the screen.

Figure 3-4 shows a pressure sensitive or electronic tablet.
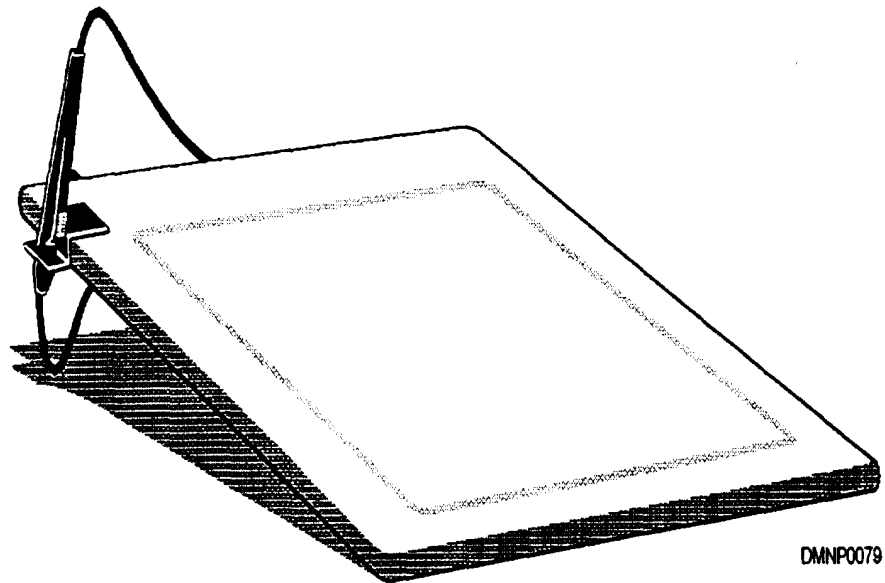
DMNP0079

Figure 3-4. —A pressure sensitive or electronic tablet.

Light pens

Light pens are similar to ball-point pens; however, the drawing surface is the screen itself. The light pen activates the photoelectric circuits of the screen to produce an image.

Microphones

Microphones prompt voice activated computers to perform specific functions. The computer recognizes a voice pattern and responds by following the command. Similarly, musical instruments can be fed through a computer to create electronically enhanced recordings.

Edit Devices

Introduction

The primary editing device of a computer is the system unit that houses the central processing unit (CPU) and the disk drive. The CPU reads software and directs the actions of the peripherals, and the disk drive electronically stores and retrieves software and information.

System unit

The large box that encloses the CPU and the disk drive is called the system unit. A horizontally oriented system unit lies flat on a desk top. A system unit that stands upright is a tower unit. The system unit houses the motherboard, the disk drives, the power supply, and the expansion ports.

Figure 3-5 shows a system unit.
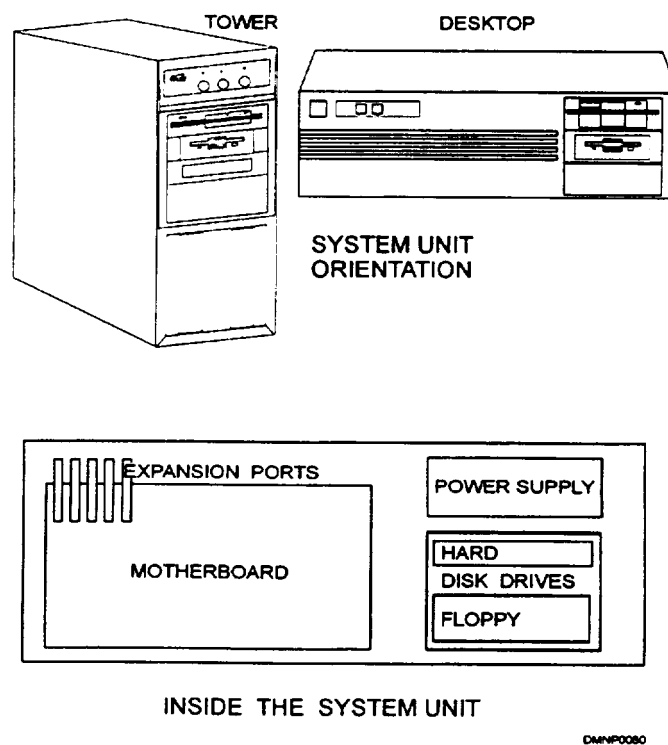
Figure 3-5. —The system unit.

Edit Devices, Continued

Motherboard

The motherboard or system board is the master printed circuit board that holds the CPU chip, the Random Access Memory (RAM) chips, the Read Only Memory (ROM) chips, a math co-processor, extra memory slots, and the computer clock.

Central Processing unit (CPU)

The CPU is a integrated circuit (IC) chip on the motherboard. It is a mass of transistors that coordinate all activities of the computer. It accepts input, interprets software, and provides output. The CPU chip also controls the speed or processing power of the computer. The two types of CPUs are PCs (personal computers that are IBM compatible or clones) and MACs (Macintosh or Apple exclusives). The main difference between the two is how the user interfaces with the system. You may find either type in your work space. Users refer to their computer by the CPU chip numerical generation, such as 386 or 486, inside the system unit.

Random Access Memory (RAM)

Random Access Memory, or RAM memory chips, randomly store and transmit information from memory or a disk. Sometimes referred to as read/write memory, RAM memory chips determine what programs your computer is capable of running and how much information you are able to store.   Ram memory is short term in nature; that is, you must save the information or it will disappear when you turn the machine off. You enlarge the memory of your computer by installing chips of a larger rated capacity. Memory chips store bytes of information in kilobyte (KB), megabyte (MB), or gigabyte (GB) increments. Word processing and graphics software require a great deal of memory so be sure to coordinate or upgrade the memory capacity of the computer when you select software packages.

Read Only Memory (ROM)

Read Only Memory (ROM) is the memory required by the computer to read a disk. ROM will remain in memory until it is removed. This memory does not allow overwriting or modification. Generally, the operating system instructions of the computer are in ROM circuitry.

Edit Devices, Continued

Math co-processor

The math co-processor assists the CPU chip in performing mathematical functions. In most computers, this is a feature that is automatically built into the motherboard circuitry.

Expansion slots

On the motherboard, there are extra connections for enlarging the capabilities of the computer. Features such as extra memory chips, called single inline memory modules (SIMMS), a video graphic array (VGA), and network interface cards (NICs), plug into these expansion ports to expand computer versatility. When you upgrade software or make additional software purchases, you may have to enlarge the memory capacity of the computer.

Clock

On the motherboard inside each computer, there is a clock. The clock coordinates and paces the functions of the computer.

Figure 3-6 shows the motherboard and the basic circuitry found on it.
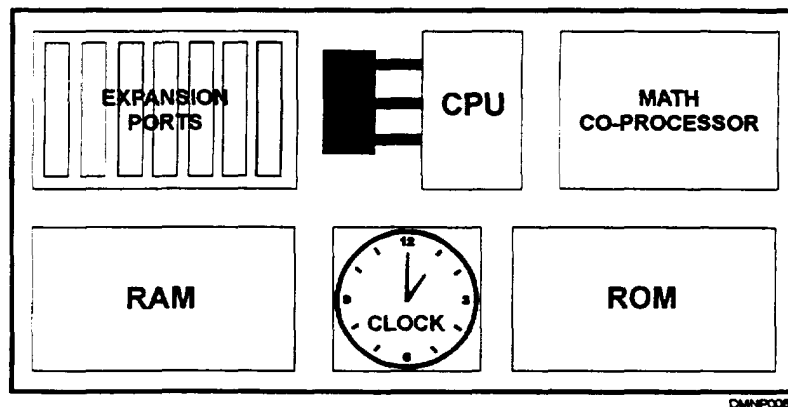
Figure 3-6. —The motherboard.

Disk drives

Also inside the system unit, there is the disk drive or a combination of disk drives. A disk drive provides direct access to data on a disk for electronic storage and retrieval. The two basic types of disk drives are the floppy disk and the hard disk drive. Hard disk drives can be removable as a precautionary measure of protection for the data stored on the drive.

Floppy disk drive

Floppy disk drives play and record on floppy diskettes. There are openings on the face of the system unit for the insertion of a floppy disk. Inside the disk drive are electronic heads that read and write. Single-sided disk drives read/write on one side of the disk. Double-sided disk drives have read/write heads on both sides. The electronic heads in each floppy disk drive read/write slower than those of a hard disk drive.

Floppy disks

Floppy disks are round, flexible platters covered with magnetic oxide and encased in a sturdier plastic envelope. The envelope is lined with a soft material that continuously cleans the disks, as it spins inside the envelope. The diskette has a hole in the middle, called a center hub. Also on the envelope, there is a recording window that allows the read/write heads access to the disk surface. Disks have a notch in the upper right-hand comer which is a write protect feature to prevent the user from accidentally recording over existing data. New disks are blank; therefore, you must initially format every disk you use in your computer. The diskettes used with a floppy disk drive come in two sizes: 5 1/4 and 3 ½ inch. The following table explains other diskette features:

Feature	Meaning
Single-sided	Records on one side only
Single density	256 byte capacity per sector
Double-sided	Records on both sides of disk
Double density	512 byte capacity per sector
Quad density	1,024 byte capacity per sector

Edit Devices, Continued

Floppy disks (Continued)

Figure 3-7 shows floppy disks and their nomenclature,

5 1/4 inch

3 1/2 inch

JACKET

WINDOW or HEAD SLOT

EXPOSED DISK

BEGIN-SECTOR HOLE (in disk)

SECTOR SIGHT HOLE (in jacket)

WRITE PROTECT NOTCH

HUB

TRACKS

DISK

SECTOR

LINING

DMNP0082
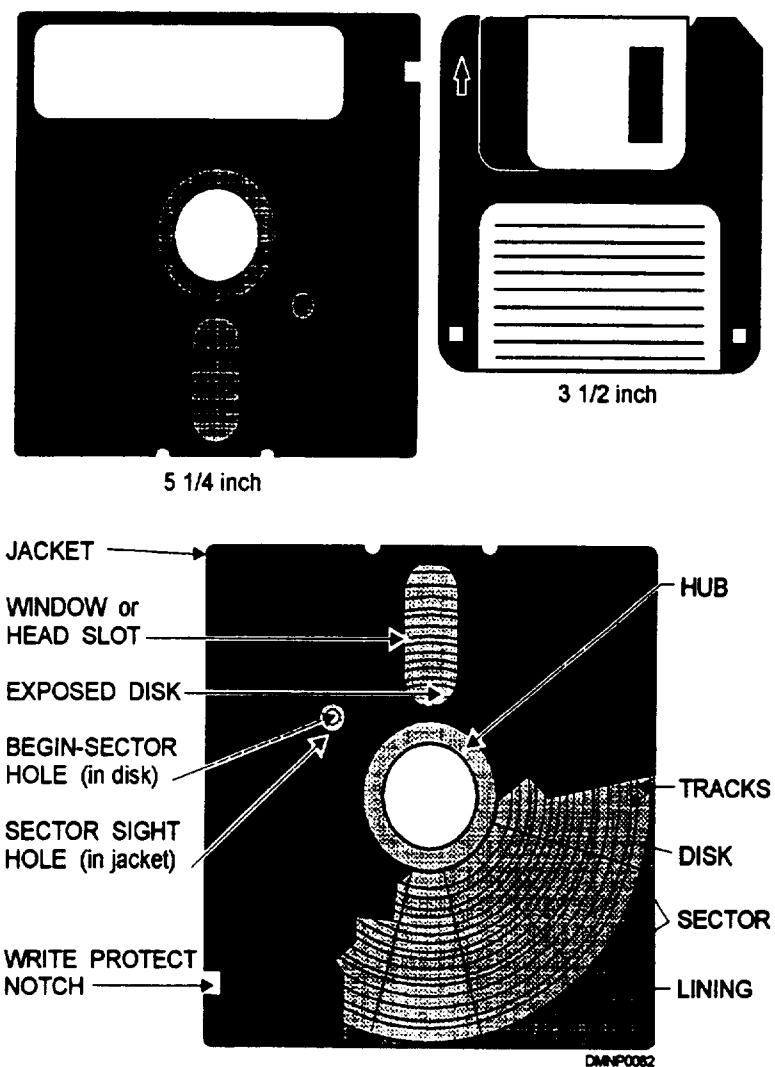
Figure 3-7. —Floppy disk nomenclature.

Hard disk drives

Hard disk drives are generally part of the system unit. These sealed units are inside the unit as stacks or tiers of rigid metal platters that are not removable. Some of the advantages of hard disk drives are their increased speed of execution and memory capacity. Hard disk storage capacities range from 50 MB to 2 GB. Also, there is no need for you to open, close, file, or find a diskette manually and no initialization or rebooting, as there is with a floppy disk.

Removable hard disk drives

Data that is sensitive information and requires protection, such as classified material or advancement examinations and results, belongs on a removable disk drive. Programs which are large and memory intensive also belong on a removable hard drive. Removable hard disk drives are just like built-in hard disk drives except for their portability. You can physically remove a removable hard disk drive from the system unit for safekeeping in a secure area, such as a safe.

Figure 3-8 shows a removable hard disk drive.
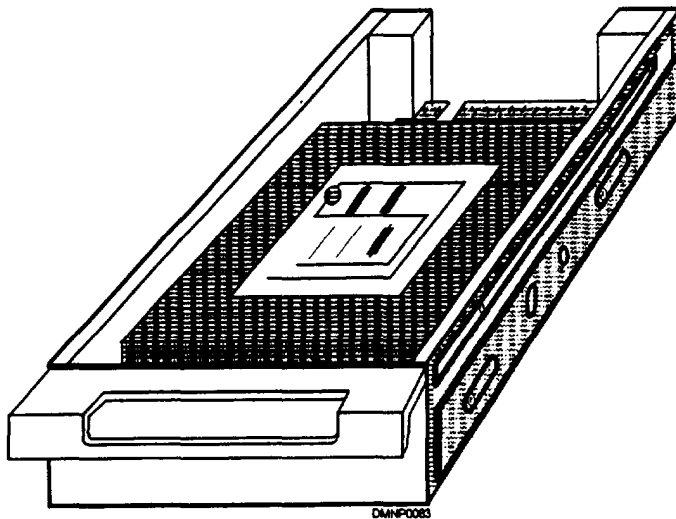
Figure 3-8. —A removable hard drive.

Edit Devices, Continued

Compact Disk Read Only Memory (CD ROM)	A compact disk read only memory (CD ROM) drive is a disk drive that reads data stored on computer disks. It can be internal or external to the system unit. CD ROM is used when many users need the same information and the nature of the information remains constant over time. The expression Write Once/Read Many (WORM) describes this type of technology. On CD ROM, information once recorded cannot be erased or changed, only read many times.
Video Graphics Array (VGA)	One piece of hardware that controls the size and resolution of what you see on the computer screen is a Video Graphics Array (VGA) or graphics card, This card, located on the motherboard, intervenes between the CPU and the monitor to control the screen display. This graphics card is extremely important to you as a DM. When you assess the capabilities of your computer, you should consider upgrading your graphics card to a Super Video Graphics Array. VGA boards are available as a grey scale display board or as a color display board. Grey scale display boards have 4 to 8 bits per pixel (picture element) and offer from 70 to 256 levels of grey. Color display boards have 8 to 24 bits per pixel and offer smooth blends and continuous color.

Output Devices

Introduction   After you enter all the data into the computer and the CPU has had time to process the information, it exits the computer through an output device. Monitors, plotters, printers, and film recorders are output devices. They provide the SYSOP with an image or hard copy data.

Monitors   Monitors provide visual feedback of work in progress. The three types of monitors are the analog monitor which is similar to a television set but provides only a video display, the digital monitor which processes data as a numeric value and provides only a textural display, and the multi synchronous monitor which provides both analog and digital information.

Multi synchro-   Multi synchronous monitors are capable of processing both analog and digital
nous monitors   information. They work on any computer system displaying text and graphics with superb resolution and can vary resolution at the SYSOP discretion. Resolution is the number of pixels per inch and is referred to as dots per inch (DPI). The dpi in height and dpi in width define the display of the monitor. A 17- or 20-inch monitor rated at 640 by 480 dpi or higher is a good monitor for general-purpose work. This is the type of monitor you will most likely be using.

Plotters   Plotters are output devices used for large linear drawings. The drawing or design is conveyed to the paper surface by plotting a series of points and connecting them with lines. Plotters are most often used for drafting or map making.

Output Devices, Continued

Printers

Printers provide a hard copy printout of data stored electronically inside the computer or from a disk. The two types of printers are impact printers and nonimpact printers.

Impact printers

Impact printers operate in the same manner as do typewriters. They are either front striking where a print hammer strikes a character against an inked ribbon and paper or hammer striking where print hammers strike a character against paper first and then an inked ribbon. Impact printers print one character at a time at speeds from 30 to 350 characters per second (CPS). Impact printers use standard single, multipart, and continuous-form paper. Dot matrix printers and daisy wheel printers are impact printers.

Dot matrix printers

A dot matrix printer creates a character with a series of tiny pins or wires that strike the ribbon or page and leave an image in dots. The resolution of the matrix is defined in terms of rows and columns of dots. A 7 by 9 matrix uses seven dots horizontally and nine dots vertically to create a character. Some dot matrix printers have a 36 by 24 matrix. The size of the matrix determines the quality of the printed character. Dot matrix printers are near letter quality, faster than daisy wheel printers, and have speeds ranging from 60 to 350 cps.

Figure 3-9 shows the letter 'L' created by a dot matrix printer,
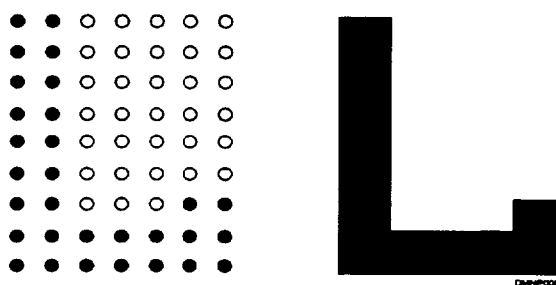
Figure 3-9. —The letter "L" on a dot matrix printer.

Output Devices, Continued

Daisy wheel printers

Daisy wheel printers are very similar to typewriters. The flat, circular printing element contains all text and numeric characters. The element spins rapidly, pausing only to allow the printing hammer time to strike the character against the ribbon or paper. Daisy wheel printers are letter quality printers but they tend to be slow.

Figure 3-10 shows a daisy wheel printer printing element.
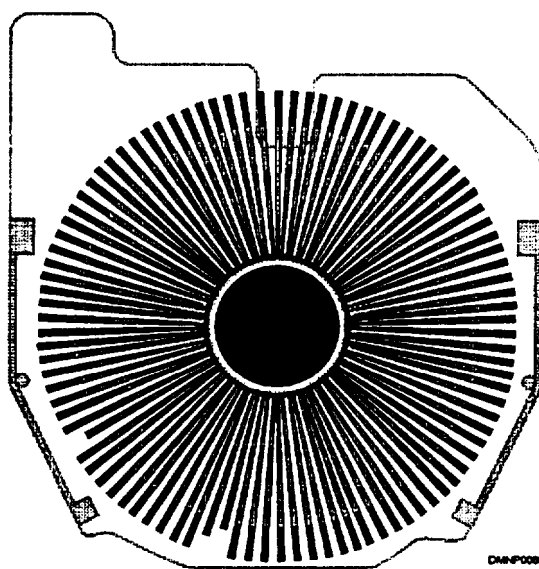
Figure 3-10. —A daisywheel printing element.

Nonimpact printers

Nonimpact printers do not make contact with paper or ribbon during printing. They use several techniques for printing, such as xerographic, electrostatic, electrosensitive, electrothermal, ink jet, and laser. Nonimpact printers are the fastest of printers with speeds approximating 20,000 lines of print per minute. They are also much quieter than impact printers. Some of the disadvantages are that they produce one copy at a time, sometimes require specially treated paper stock, and the printed output may blur.

Output Devices, Continued

Nonimpact printer types

Thermal transfer, ink jet, laser, wax, continuous tone die sublimation, and color phase change are nonimpact printers that you may find in a Navy shop.

THERMAL TRANSFER PRINTERS :   Thermal transfer printers use wax or ink dies from a heated printing element to transfer an image to a page.

INK JET PRINTERS: Ink jet printers spray electrically charged ink through tiny nozzles in the printing element. The ink passes through an electrically charged field that forms the image in matrix form. These printers offer very high-quality resolution and print up to 300 cps.

LASER PRINTERS: A laser printer directs a beam of light that electrically charges an image on a photosensitive drum. Toner attracts and adheres to the dots on the drum and a heating element fixes the image on the paper. These printers can print in excess of 20,000 lines per minute.

WAX PRINTERS: Wax printers use a ribbon of thin transparent wax. Ribbons are available in color and are useful for transparencies.

CONTINUOUS TONE DIE SUBLIMATION: Continuous tone die sublimation uses color dies on a plastic film for image transfer. This is a thermal transfer and requires specially coated papers.

COLOR PHASE CHANGE: A color phase change uses Pantone certified colors in a wax medium. Like continuous tone die sublimation, this is a thermal transfer, but it does not require specially coated paper.

Output Devices, Continued

Printer control   There are several buttons that control the functions of the printer. To setup printer functions manually, you must first put the printer in an Offline status. The following list contains some of the more common buttons:

Printer control buttons

Button	Function
COPY	Reprints data previously stored in the printer buffer.
FORM FEED (FF)	Advances the printer to the top of the form or next page.
LINE FEED (LF)	Advances the paper one line at a time.
MODE	Selects print quality; draft, high-density, or letter-quality.
ONLINE	Turns the printer on- and off-line. Offline, a printer cannot receive data. Online, the operating system software controls the printer.
PITCH	Selects the number of characters to print per inch; 10, 12, or 17 characters per inch.
RESET	Clears all data from the print buffer.
SPACING	Adjusts spacing of characters and words; normal or proportional.
TOP-OF-FORM	Advances the paper 1 1/2 inches and redefines the top of the form.
TYPESTYLE	Font selection.
UP/DOWN	Critical or fine adjustments in the paper position.

Output Devices, Continued

Printer indicator lights Indicator lights, located above the control buttons, provide printer status information and functions or features currently in effect. The following list contains the more common indicator lights:

Light	Function
ERROR	Warns of a problem that makes the printer inoperable.
ONLINE	Shows when the printer is in an online status during which time all other control buttons are inoperative.
POWER	Indicates that power is reaching the printer.
TYPESTYLE, MODE, PITCH, and SPACING	Located above each button and next to each feature, these lights indicate the current operating modes of the printer. The lights are lit next to the selected features.

Printer loading A printer receives paper by being single sheet fed or tractor fed. Single sheet fed is much like a standard copier paper tray in which paper stacks on the side of the printer and enters the printer one sheet at a time. Tractor fed paper is a long continuous sheet of paper with perforations and a series of holes on each side. These holes fit onto tractor wheels under the front cover of the printer. Location of and space between the tractor wheels is adjustable. When it is necessary for you to change the tractor wheel position, always leave the left tractor wheel in the same position and make the adjustments to the right tractor wheel. This way all documents will begin the page at the same location.

Output Devices, Continued

Printer loading (Continued) Figure 3-11 shows the difference between single sheet fed and a tractor fed paper.

SINGLE SHEET

CONTINUOUS SHEET
(TRACTOR FED)
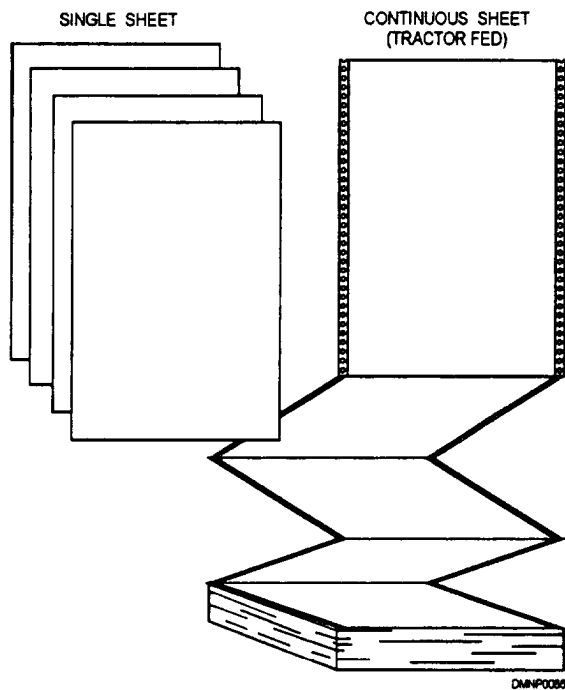
Figure 3-11. —Single fed and tractor fed paper.

To load a tractor fed printer, use the following table:

Step	Action
1	Raise the soundproof cover of the printer.
2	Move the print unit release lever toward you.
3	Swing unit toward you to expose the tractor fed wheels.
4	Open the tractor wheel lock to access the wheel spokes and load/unload paper.

Output Devices, Continued

Film recorder   A film recording device attached to a computer system provides 35mm slides
and negatives of the screen output. It is a lighttight box with a small camera
inside. The lens conventionally photographs the image from the CRT screen.
The film is conventional photographic film and processes normally.

Figure 3-12 shows a film recording device.
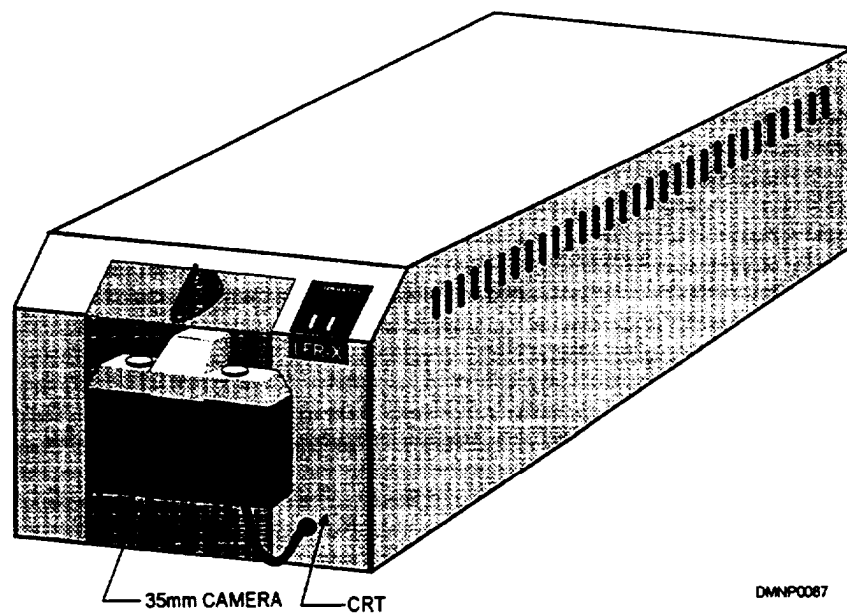
Figure 3-12. —A film recording device.

Input/Output Devices

Introduction   Devices that provide both input and output to the system unit are called input/output (I/O) devices. A modem is an I/O device as is a communications local area network (LAN) or a wide area network (WAN) NIC.

Moderns   A modem is an electronic connection, usually via telephone, between your computer and others. Modems exchange files and data with other computers via local networks or telephone connections. Fax moderns link a fax machine to a modem for the direct transfer of an image to the originator. Modems can be stand alone or board units. Stand alone units may be acoustic modems in which a cradle holds a telephone headset and you dial the phone number of the computer system to establish a link or direct-connect modems that plug directly into a phone line. Board modems are built onto plug-in boards that insert into the expansion ports inside the system unit of the computer.

Figure 3-13 shows three different types of modems.

ACOUSTIC MODEM   DIRECT-CONNECT   BOARD MODEM
                              MODEM
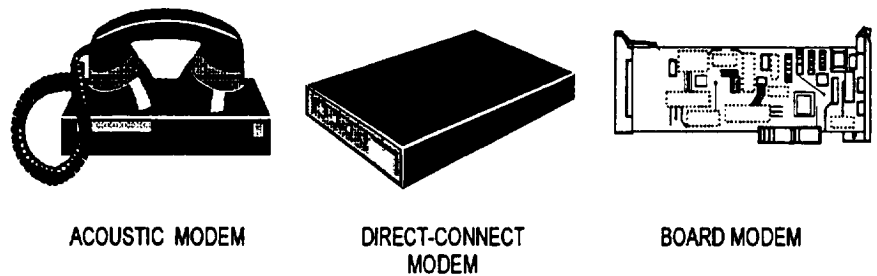
DMNP0088

Figure 3-13. —Modems.

Microcomputer Setup

Introduction   You may or may not have a computer in your work space. However, your understanding how to setup a computer system will help you initially integrate a computer system into your work space and troubleshoot simple computer problems.

Owner's manuals   Owner/user manuals explain all about the hardware and how to install and configure it. Become familiar with the documentation that comes with your computer system and the peripherals. Spend time learning all you can about the hardware and software. Start setting up the computer system by thoroughly studying the installation instructions.

Power requirements   Most microcomputers have a range of 100 to 130 volts or 200 to 230 volts alternating current. On the back panel of the system unit, there is a voltage or line select switch. Make sure your computer and all supporting devices are set to the appropriate line voltage supplied to the electrical outlets in your work space.

Surge protectors   A surge protector is a power strip that prevents abnormally high-power fluctuations from damaging the computer. A high-voltage surge can overload and burn up internal components. Most surge protectors can accommodate multiple electrical plugs. First, plug the system unit and supporting devices into the surge protector and then plug the protector into the electrical outlet. This allows you to turn all of your equipment ON or OFF with one switch. Before you make any type of connection, be sure the ON/OFF switch on the surge protector is OFF and remove the plug from the wall socket.

Figure 3-14 shows a surge protector.
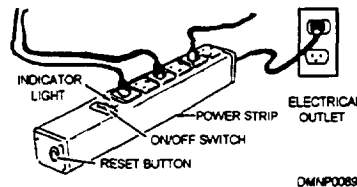
Figure 3-14. —A surge protector.

Microcomputer Setup, Continued

System unit   On the back of the system unit, there are connection ports (COMPORTS) and a power cord connector. The monitor, the keyboard, and the printer will connect to the system unit COMPORTS. The system unit power cord will connect to the surge protector.

Monitor   On the back of the monitor, there is a power cable and a video input cable. There also may be a voltage selection switch. The video input cable plugs into the back of the system unit where the video display board is located. The power cord plugs into the surge protector.

Keyboard   The keyboard plugs into the back of the system unit with a five-pin connector.

Printer   The printer has a power cable and a data cable. The data cable connects to the system unit. The power cable plugs into the surge protector.

Cable connection   Most cables or connectors have some sort of device to ensure a firm, tight connection between devices. This device may be a couple of screws or a cable lock. When you plug in a cable, make sure it is properly and firmly seated, then tighten down the cable connection locking device. Never force a cable connection.

Figure 3-15 shows typical cable locks.
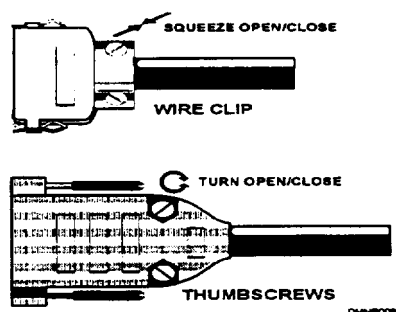
Figure 3-15. -Cable locks.

Microcomputer Setup, Continued

Connection relationships

Figure 3-16 shows the relationship of the computer system and the peripheral devices covered in this chapter.

DATA SYSOP

INPUT DEVICES
* KEYBOARD
* MOUSE
* JOYSTICK
* TRACKBALL
* LIGHT PEN
* TABLETS
* SCANNERS

EDITING DEVICES
* SYSTEM UNIT
  - MOTHERBOARD
  - CPU
  - RAM
  - ROM
* DISK DRIVES
* CD ROM

OUTPUT DEVICES
* MONITOR
* PRINTER
* PLOTTER
* FILM RECORDERS

I/O DEVICES
* MODEM
* LAN NIC
* WAN NIC

HARD COPY
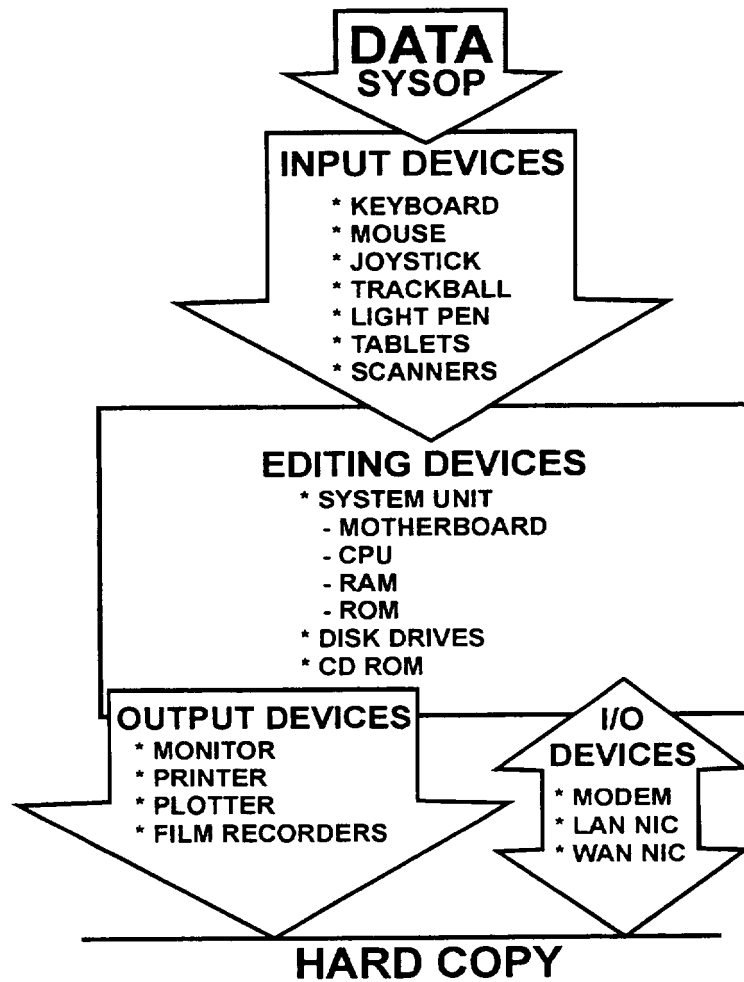
DMNP0091

Figure 3-16. —Connector relationships.

Software

Introduction	Software is the set of instructions, program parameters, or data stored on a disk. Remember, the disk itself is hardware; the data on the disk is software. The two categories of software are operating system software and applications software.

Operating system software

Operating system software manages the operation of the entire computer Its primary job is to manage the system and system resources, such as the disks, the printers, and the modems. It also helps you to communicate with the computer to use applications software. Install the operating system program into the system hard drive with the distribution disks before attempting to load any other program. Follow the owner/user manual. The owner/user manual will tell you the setup command that will lead you through the process from the display screen. Once you have the operating system installed, put the original distribution disks in a safe place.

Applications software

User or application software is program disks that help you to accomplish a specific goal, such as DOS, Windows (PC), or System 7 (MAC). Distribution disks for applications software require information about the microcomputer configuration. Software programs have differing requirements; therefore, refer to the owner/user manual for installation. Once you have installed the applications software, put the original distribution disks in a safe place.

Using software

Consciously develop a good, systematic approach in your work habits. Have your reveal codes displayed on the screen while you are working. This allows you to see any coding errors in the document. You will find it easier to make corrections to the text of a document when you eliminate coding errors. Break the habit of hitting the ENTER or RETURN key; it unnecessarily enters an undesirable hard return. Save the current document periodically. Do this more often than relying just on the timed backup feature. This will lessen data loss should the system crash or freeze. Another excellent work habit is to save all documents on working copy disks. This saves memory space, facilitates safeguarding and protection, and should the computer develop a virus or lose data during power fluctuations, the damages would be recoverable. Although initially cumbersome, these habits will prove well worth your effort to cultivate and maintain.

Text Programs

Introduction	Nearly every microcomputer in the Navy has some sort of word processing program installed on it. These programs make it easier for us to complete the myriad of administrative tasks demanded of us. To a DM, they are invaluable at composing flawless text for subsequent reproduction.

Word processing programs

Word processing programs allow you to create documents with extensive editing features that a typewriter, even a high-end electronic typewriter, does not allow. These editing features are what distinguishes one word processing program from another. Regardless of manufacturer and because there are so many word processing programs used in Navy Graphics shops, this segment covers only the features common to the majority of programs.

Word processing software features

Word processing programs simplify the creation of documents. The program features manipulate the text in every imaginable way. Read the owner/user manual for the software on the computer at your shop. Each program offers a combination of features in the following categories:

DOCUMENT FORMAT: Format a document before entering the text of the document by setting the parameters for margins, justification, centering text, aligning text with the right margin, setting headers, footers, endnotes, and pagination.

TEXT ATTRIBUTES: Text attributes include the ability of the program to change typefaces and sizes, to bold, underline, or italicize, and to display and print.

EDITING FEATURES: Editing features include text search and replace, automatic hyphenation, automatic word wrap, columnization, special character definition, mail merge, incorporation of lines, boxes, or images, delete, insert, block, move text, a thesaurus, a spell check, and grammar and style checker.

SPECIALIZED FEATURES: Some programs offer index construction, table of contents construction, line numbering, and macros which set specific repetitive steps used frequently into one keystroke for rapid recall.

Graphics Programs

Introduction   As a DM, you will be using some type of graphics software package in your shop. More shops are becoming computerized and just as the command mission varies at each duty station so does the graphics software requirements. Periodically assess the computer graphic capabilities of your shop and stay as current as you can.

Graphics software   Graphics software allows you to create artwork and images to stand alone or to insert into text. Some programs create primarily presentation graphics in the form of 35mm slides, overhead transparencies, electronic presentations, and audience handouts. Other graphics software allows you to modify or combine existing artwork, edit and enhance photographs, create line graphs, pie charts, and organizational charts. The two types of graphics software technology are bit mapping, or raster-based, and vector mapping. How easily the graphics program permits image manipulation and how sharp the resolution of that image is part of the software program. Monitor resolution, the VGA card, and the devices used to make the hard copy end product also affect resolution. Regardless of manufacturer and because there are so many graphics software programs used in Navy Graphics shops, this segment covers only those features common to the majority of programs.

Bit mapped software programs   Bit mapped images create an image using a point or hundreds of points of light in a matrix. These images are slower to manipulate and create than vector graphics but more spontaneous and easier to learn. Multi-layering bit mapped matrixes into distinct gridmapped forms is called raster-based imagery. Raster-based images create painterly effects and encourage creativity. They also require an enormous amount of power and memory which slows program execution. To modify or create in the bit mapped mode is to work at the pixel level which can be time consuming and tedious.

Graphics Programs, Continued

Vector mapped software programs

Vector mapped software is ideal for drawings, charts, graphs, and diagrams. It creates an image by defining line, position, shape, and fill pattern. You plot or vector a series of points to define a shape. This shape is calculated into a mathematical formula called an algorithm. Image manipulation and editing is automatically calculated by the computer when you change parameters, making modifications easy and fast. The use of a vector-based program requires preplanning and more computer savvy than a bit mapped program.

Graphics software features

Drafting, drawing, and painting are distinctly different functions and not all programs will be equally adept at processing all three. Base your choice of program on command requirements. Also, let your software drive your hardware. Select a software program that fulfills the needs of the command and allows for some growth. Purchase hardware based on software requirements. Invest in the very best monitor possible. All of this affects the graphics resolution, the ease of processing, and the end product. In general, graphics software programs offer the following features:

FILL: Fill is a command to fill a shape with color or pattern. Make sure the shape is completely closed or the fill will bleed into the adjacent area. Color or pattern selection is nearly limitless.

BELZIER CURVES: The axis of a Belzier curve automatically changes as you move the cursor or mouse across the screen.

GEOMETRIC SHAPES: These are closed shapes whose major and minor axis change with the movement of the cursor or mouse.

DELETE: Use a geometric shape to surround or isolate segments you want removed from the image and click into place. Then press the DELETE key to remove everything inside the geometric shape.

UNDO: UNDO is a feature that eliminates the last command given and its associated affects.

Graphics Programs, Continued

Graphics software features (Continued)

ONE- or MULTI-LAYERING: Graphics programs create artwork on one layer where everything is visible to you, or on multi-layers where different aspects of the image are on different layers. Multi-layering complicates modification because you cannot always see how under layers are affected.

SCALE: Most programs offer scale changes to both the vertical and horizontal dimensions.

BRUSH/PENCIL/PEN NIB/SPRAY: Selection between the effect of a brush stroke, the nuances of a pencil or pen nib, and the splattering of an aerosol spray are common icons that mimic traditional drawing tools.

STROKE or SPRAY WIDTH and SHAPE: A wide or narrow stroke that is either round or square are selections available that pertain to the number of pixels modified at once.

Your attitude toward graphics software

Not only do graphics programs require more memory and power and greater capacity VGA cards and monitors, but they also require more of you. The only way to become proficient in graphics software is by constant use. The computer and associated software will not supplant you. You must gain the knowledge to master the program and use this tool beneficently. Sit down, read the owner/user manual, and experiment with the computer.

Desk Top Publishing Programs

Introduction

As DMs, we are primarily concerned with the creation of artwork, but we are increasingly tasked with massive text and the preparation of it for reproduction. The distinction between Lithographer's Mates (LI), who traditionally use desk top publishing programs, and DMs is less distinct. Desk top publishing (DTP), often called electronic pre-press preparation, is gaining popularity; become familiar with it.

Desk top publishing software programs

Desk top publishing software programs electronically integrate text and graphics into newsletters, advertisements, letterheads, reports, brochures, catalogs, and books, such as this TRAMAN. These programs allow you to see the page and alter it on screen before committing it to print. The range of manipulation is extensive. So, too, are the plethora of programs offered by manufacturers. Regardless of manufacturer and because there are so many desk top publishing programs used in Navy Graphics shops, this segment covers only those features common to a majority of programs.

Desk top publishing software features

Desk top publishing software features can be broken into three basic categories. These categories — composition, layout, and graphics — combine to make a comprehensive package for designing and publishing documents.

COMPOSITION: Composition defines the sizes and styles of type, the amount of space between horizontal letters and vertical lines, and the coding of the text copy to meet standards. You can edit text directly or input text from documents created in a word processing program and imported into the DTP software.

LAYOUT: Layout involves the arrangement of text and graphics on the page. Electronic pasting moves text from one portion to another and incorporates illustrations into the text. Some features include multiple columns, column widths, and gutter space manipulation, printing vertically or horizontally on a page, automatic copyfitting, automatic page numbering, and adding headers and footers.

Desk Top Publishing Programs, Continued

Desk top publishing software features (Continued)

GRAPHICS: Desk top publishing graphics features can scan or import illustrations/graphics either from hard copy or digital data. You can add images, borders, lines, and arrows. You can alter or edit images by shrinking or expanding them and create a layered four-plate color separation for color reproduction. You can also import images from other scanners and programs.

Communications

Introduction

Computers can communicate electronically with other computers via a local area network (LAN) or a wide area network (WAN). When individual workstations interconnect and have access to each others information ardor resources, it is called a network. These networks consist of nodes, the hardware, and are interconnected by links, the communications media of twisted-pair wire, coaxial cable, or fiber-optic cable.

Local area networks (LAN)

Workstations that use a local area network (LAN) are usually in close proximity to each other, often in the same building. A LAN can transfer data, files, and programs from one PC to another or even from one LAN to another LAN.

LAN configurations

LAN configurations or topology is the physical arrangement of the LAN components. The three common configurations are the star, the bus, and the ring network. In the star configuration, each component connects directly to a central computer or network server. In the bus configuration, all workstations connect to the same cable and the far ends of the cable never meet. In a ring network, all components connect to a cable and this cable forms a ring. Each configuration offers a compromise in advantages and disadvantages. Your LAN configuration was probably already set up before you arrived or tapped into it.

LAN communication

It takes network software, communications software, and interfacing software to make a LAN network work correctly. Also, each workstation must have a network interface card (NIC).

Wide area networks (WAN)

Wide area networks cover a larger geographical area than a LAN system. Examples of a WAN would include the Internet, Bulletin Board Services (BBS), electronic mail (E-Mail), and the world wide web (WWW). You may or may not have the opportunity to access any of these networks from your workstation in the graphics shop.

Security

Introduction	DMs often work on classified or sensitive data. Graphics and text created electronically and stored on disks require protection. The procedures for protecting and marking disks, disk drives, and workstations differ slightly from what you are familiar with for hard copy data. Security procedures for electronic data is found in the *Department of the Navy ADP Security Manual,* OPNAVINST 5239.1.

Automated data processing security officer (ADPSO)	Your command will have an automated data processing security officer (ADPSO) that reports to the commanding officer concerning the protection of electronically generated data. The ADPSO is responsible for the physical security of each computer workstation. The protection of each workstation involves physical security, physical access control, data file protection, and natural disaster protection. Seek out your ADPSO and make sure your workstation complies with Navy and command regulations for the protection of classified material.

Security	The three levels of data processed electronically are Level I, Level II, and Level III. If your command processes Level I and/or Level II data, it must provide a specific degree of protection. The following table defines the three levels of data:

Level	Meaning
Level I	Classified; Confidential, Secret, and Top Secret
Level II	Unclassified; requires special protection, such as For Official Use Only and data covered by the Privacy Act of 1974
Level III	Unclassified

Security, Continued

Level I   Level I data (classified) handling requirements and procedures are similar to those for handling hard copy classified material. You are responsible for safeguarding this information at all times. Within Level I, the four modes of secure electronic processing of classified data are the system high, the dedicated, the multilevel, and the controlled mode. The following table specifically defines the four security modes:

Mode	Definition
System high	All computers on the network and connected peripherals protect data according to the requirements for the highest classification category and type of material contained in the system. This requires a security clearance but not necessarily a need-to-know for all material in the system.
Dedicated	Specific users or a group of users with a security clearance and a need-to-know for the processing of a particular type of classified material exclusively use and control all of the computers and peripherals on a system.
Multilevel	Various types and categories of classified material stored and processed concurrently in a computer system that permits selective access to material by uncleared users and users with differing security clearances and need-to-know. This is a function of the operating system and associated system software.
Controlled	A computer system in which at least some users with access to the system have neither a security clearance nor a need-to-know for all classified material in the system.

Security, Continued

Level II
Level II data is unclassified data that requires special protection. Examples are data For Official Use Only and data covered by The Privacy Act of 1974. To assure protection for processing Level II data, the Navy established the limited automated information system access security mode. A system or network operating in the limited access security mode restricts the access to data only to individuals who by their job function have a need to access the data.

Level III
Level III does not require the safeguards of Level I or Level II data. It does however, require proper handling to make sure that data is not lost or destroyed.

Electronic media
The computer system and its associated peripherals require controlling and safeguarding at all times. This includes the disks, diskettes, disk drives, monitors, printer ribbons, and generated hard copy. In general, the two types of electronic media are working copy media and finished media.

WORKING COPY MEDIA: Working copy media is temporary information. It stays within the confines and control of your activity. After creating a working copy, retain it for 180 days before destruction. Examples of working copy media are information used and updated at frequent intervals.

FINISHED MEDIA: Finished media is permanent information. It can be released to other commands and activities. Finished media contains information that does not change or is pertinent for more than 180 days.

Security controls
Date and mark classified electronic media when it is created. Control electronic media in the same manner prescribed for classified material. Protect working copy media according to the highest classification ever recorded on the media. For media classified Top Secret or Secret, maintain a master list including the overall security classification and the identification number permanently assigned to the disk.

Security, Continued

Disk security markings

To avoid confusion, set aside groups of disks for recording classified data at each security level. Mark each disk or diskette with a stick-on label with the overall security classification and a permanently assigned identification number. When you declassify and degauss the disks, remove all external labels indicating the classification unless you immediately use the disk to store information of the same classification level.

Display screen security markings

When you use the computer to create classified graphics and text, make sure to mark the computer monitor at the top above the screen with the appropriate security classification.

Hard copy security markings

Mark hard copy reports or printouts from a printer, terminal, plotter, or other computer equipment at the top-and-bottom-center of each page with the appropriate classification or the word unclassified. Number each page consecutively. In most cases, do so as you compose the artwork or text in the computer. If you are in doubt about security markings, consult OPNAVINST 5510.1.

Media disposition

Magnetic media, such as disks, eventually wear out or become damaged. If the disk contained classified material, degauss or erase it before destruction. Handle and dispose of printer ribbon and carbon paper used to print/transfer classified information according to the highest classification level of the data printed by that ribbon or carbon. Follow the requirements outlined in the OPNAVINST 5510.1.

Equipment inventory

In addition to safeguarding the information in a computer, protect the custody of the system. Do not indiscriminately move the system in and out of work spaces. If you must loan equipment, limit equipment loans and have borrowers sign for custody of the loaned gear. Keep an inventory identifying the equipment by make and model, the type of system the equipment is part of, the mode the equipment operates in, what kind of information and media the computer processes, and the level of sensitivity for the highest classification of material processed. Post the name and phone number of the physical security officer and/or ADPSO near the workstation.

Summary

Review

This chapter briefly covers a computer system, its associated peripherals, and the differences between hardware and software. Because of the plethora of applications software available in the fleet and the absence of standardized programs in graphic shops throughout the Navy, specific software packages were not covered in detail. Stringently follow security procedures and provide adequate protection for classified material in the electronic format. If you are not knowledgeable on safeguarding classified material, find the authority in the command and assess the integrity of your shop.

Comments

Computerization is the single most significant event of the twentieth century. It impacts every aspect of life. Take a serious look at how computers affect you. Even your local pizza parlor can speculate on your life by analyzing your choice of pizza ingredients and how often you order, whether you pay by check, and how much you tip the driver. You must become computer literate. Navy Graphic shops, printshops, and photo labs are all incorporating electronic imagery and digitization. Future Navy and civilian correspondence courses, such as this rate training manual, will be on CD ROM for print on demand. You don't have to like it, but you must master this medium. Do not be afraid of damaging the computer; the worst that will happen is that you lose some material you entered into it. It is here; the time is now. It is the future — the key to the twenty-first century.

CHAPTER 4

REPRODUCTION EQUIPMENT

Overview

Introduction   A Navy Graphics shop contains a wide variety of equipment. To use the
equipment effectively and safely, you must have a working knowledge of its
characteristics, limitations, and operating and maintenance procedures. This
chapter covers the more common types of graphics shop reproduction
equipment.

Objectives   The material in this chapter enables you to do the following:

- Recognize the need for periodic cleaning and inspecting of shop
  reproduction equipment.

- Select copier options and maintain toner levels.

- Describe operator checks and adjustments on diazo-type reproduction
  machines.

- Explain phototypesetter operation and maintenance.

- Identify operator adjustments on pressure process lettering machines.

- Adjust copy camera settings and explain the procedures for completing
  operator checks.

Overview, Continued

Acronyms   The following table contains a list of acronyms you must know to understand the material in this chapter.

Acronym	Meaning
CRT	Cathode-Ray Tube
DPI	Dots Per Inch
ISO	International Standards Organization
K	Kelvin
LASER	Light Amplification by Simulated Emission of Radiation
LED	Light Emitting Diode
LPI	Lines Per Inch
OCR	Optical Character Recognition
PIXEL	Picture Element
RIP	Raster Image Processor
SLR	Single Lens Reflex

Overview, Continued

In this chapter This chapter covers the following topics:

Topic	See Page
General Safety Precautions	4-4
General Maintenance	4-5
Copiers	4-6
Diazo Machines	4-10
Phototypesetters	4-17
Pressure Process Lettering Machines	4-22
Special Applications Graphic Machines	4-27
Cameras	4-31

General Safety Precautions

Introduction   Since most shop equipment is electrically driven, you must observe several precautions to avoid personal injury and injury of others and to prevent damage to the equipment.

General precautions   Inspect reproduction equipment regularly and have all repairs done by a qualified electrician.

Common electrical discrepancies are as follows:

- worn or frayed cords,
- bare wires, and
- broken/malfunctioning switches.

Avoid extensive use of extension cords. Plug units into safety approved surge protectors. Make sure power to the equipment is off before cleaning any equipment.

CAUTION: Never touch an energized electrical plug, switch, or any part of electrically operated equipment when you have wet hands, or while you are standing in water on a wet deck.

Environmental precautions   Do not expose electrically powered reproduction equipment to the elements. During field day, do not allow water to seep under the equipment near the electrical mechanisms. Allow for maximum air circulation when you select a position for placing equipment, particularly if the equipment produces fumes.

General Maintenance

Introduction   Proper maintenance extends the useful life of equipment and ensures that the equipment is in an optimum state of readiness. It is aggravating to need a piece of equipment for a rush job and discover that you have to clean it up before you can use it.

General maintenance   The cleaner you keep your equipment, the better off you are. Specific maintenance requirements for particular pieces of equipment should appear near the equipment to which they pertain. In general, keep debris away nom keyboards and keys. Clean monitors and mirrors periodically. Do not allow food and especially drink near equipment and keyboards.

Equipment movement   Do not move equipment around the shop excessively. Protect equipment from unnecessary jarring and secure for sea before getting under way.

Copiers

Introduction

DMs interface with copiers daily. Copiers offer a selection of timesaving options and provide good resolution reproductions. As copiers become more sophisticated, they assume a more versatile and valuable role in the creative process.

Copier needs

Command or shop needs determine the type of copier purchased or leased. Copiers are classified by volume range and speed. The command or shop may need a color copier or a black-and-white copier. Available options also influence the choice of a copier.

Volume range and speed

A low-volume range indicates the need for a personal copier which tends to be slow in operation. A medium-range copier is for moderate use, and a high-volume range indicates a heavy use, multifunction, high-speed copier found in reprographic departments and printshops.

Standard copiers

Standard copiers produce basic black images on either white or colored paper. These images appear through electrostatic, thermographic, or digital technology. Speed, resolution, and volume are the primary variables that influence the selection of a standard copier.

Color copiers

Color copiers make the image appear through thermal fusion or laser technology.

THERMAL: A copier scans an image at 300 dots per inch (DPI) and prints through a ribbon that converts the image into a combination of four colors. Heat transfers and fixes the image to paper.

LASER: Laser copiers use color toner instead of ribbon to create an image. The color toner is available in cyan, magenta, yellow, and black. They use digital technology to act as a laser printer, reproducing the image in very high resolution.

Options   Most copiers are user friendly. Standard symbology or icons represent options and often labels do not appear on the facia of the machine. Most copiers provide the following options.

ONE-SIDED: One side of the master copies to one side of a page.

ONE- to TWO-SIDED: A one-sided master copied to two sides of a page.

TWO-SIDED to TWO-SIDED: A two-sided master copied to two sides of a page.

COLLATE: Combines pages of different information.

SORT: Sorts pages into like information.

STAPLE: A staple placed in either the upper left-hand comer or the left side of the document.

LIGHT/DARK: An increase or decrease in the contrast of the image.

REDUCE: Reduction of the image, either in stepped increments or variable increments.

ENLARGE: Enlargement of an image, either in stepped increments or variable increments.

ELONGATE: Stretching an image to appear panoramic with some horizontal distortion.

Figure 4-1 shows typical copier option icons.

ONE SIDE   TWO SIDE   BOOK   OVERLAY   NON-SORT   SORT   STAPLE   REDUCE   ENLARGE

DMNP0092
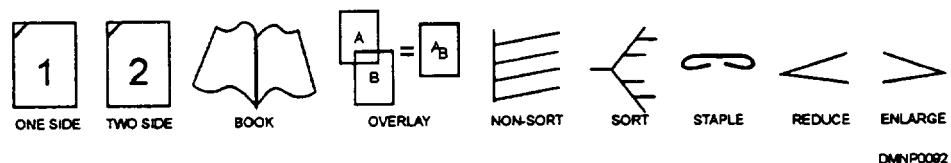
Figure 4-1. -Sample copier symbols.

Copiers, Continued

Copier use and operator checks Copiers sometimes confuse instructions programmed into them by an Should a copier jam or continually malfunction, call a "key" operator. Key operators are command designated personnel that have formal training in copier repair/adjustment.

To use a standard copier, follow this table:

Step	Action
1	Turn machine on and allow it to warm to operating temperature.
2	Inspect copier paper supply.
3	Inspect copier output tray.
4	Raise copier cover and inspect the glass for dirt, scratches, and smudges.
5	Inspect readout LEDs for copier status: • if jammed, open door, inspect, and clear paper path, • replenish toner if needed, and • retrieve jammed documents from rollers.
6	Select options.
7	Insert master into feed tray.
8	Push copy button.
9	Remove master and copy.

Copiers, Continued

Copier maintenance

When a copier needs more toner or a new ribbon, the copies will appear progressively lighter in tone. They will be uneven in resolution and color balance.

To change toner or ribbon, follow this table:

Step	Action
1	Follow instructions: • posted on the machine interior, • in the operating manual, and • call key operator.
2	Handle toner/ribbon with care.
3	Open cover door to copier.
4	Remove and discard old toner canister or ribbon cartridge.
5	Open new canister and replace.
6	Close cover door.
7	Run test copy.

Diazo Machines

Introduction   Diazo machines have been around a long time. Navy shops still have these workhorses tucked away in reproduction rooms. Although diminished in importance, these machines continue to produce good quality, cost effective, correctable reproductions on paper, Mylar, vellum, and acetate foils.

General types   Two general systems are in use in diazo process machines. The first is a continuous gravity feed ammonia system. These machines drop ammonia at the rate of 50 to 60 drops per minute into a tray where heater rods vaporize the ammonia into developing fumes. The second type of diazo system is the anhydrous ammonia system that mixes ammonia vapor with distilled water.

Figure 4-2 illustrates ammonia vapor production in a gravity feed and an anhydrous system.

GRAVITY FEED SYSTEM   ANHYDROUS SYSTEM

DMNP0093
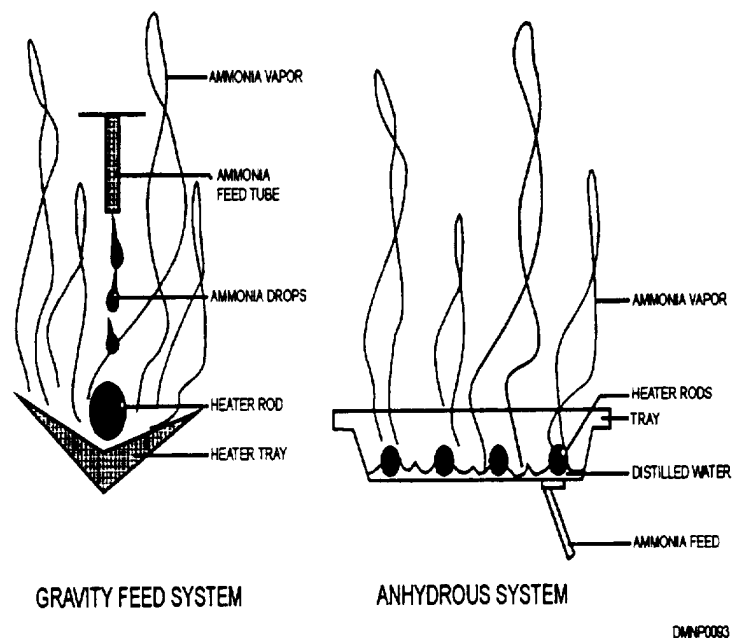
Figure 4-2. —Ammonia vapor production.

Diazo Machines, Continued

Major sections A diazo machine has four major components. These components are a printing section, a developing section, a cooling system, and an exhaust system.

PRINTING SECTION: The printing section contains a light source, the reflector assembly, a printing cylinder, and the feed belts.

Figure 4-3 shows the configuration of the printing section.

THE DEVELOPING SECTION

CYLINDER PICKOFF ASSEMBLY
AND GUIDE ROLLER

CYLINDER
REFLECTOR ASSEMBLY
MERCURY VAPOR LAMP
PRINTER FEED BELTS

DMNP0094
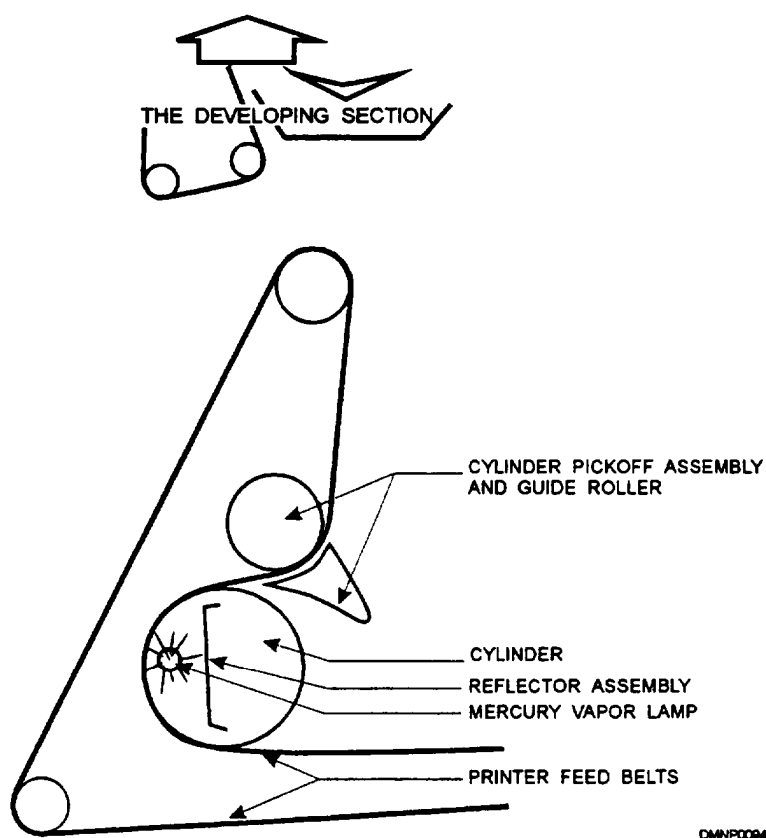
Figure 4-3. —The printing section.

Major sections (Continued)

DEVELOPING SECTION: The developing section houses the stainless steel developing tank and the heater rods.

Figure 4-4 shows the developing section.

DEVELOPING TANK

HEATER RODS

DRIP TRAY

THE PRINTING SECTION

DMNP0095
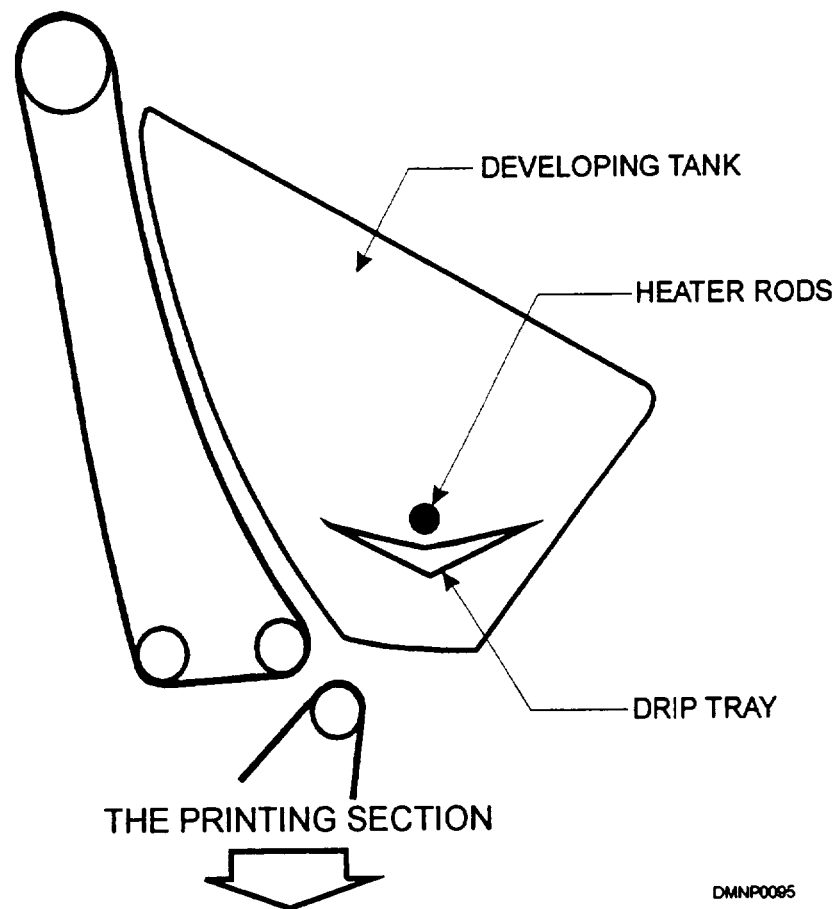
Figure 4-4. —The developing section.

Diazo Machines, Continued

Major sections (Continued)
COOLING and EXHAUST SECTIONS: The cooling section contains the blower and timer that cool the heating rods and drip trays. The exhaust section, monitored by the blower and timer, expels fumes through exterior ducts and deposits residue into the residue collection bottle in the base of the machine.

Figure 4-5 illustrates the basic ammonia flow system.
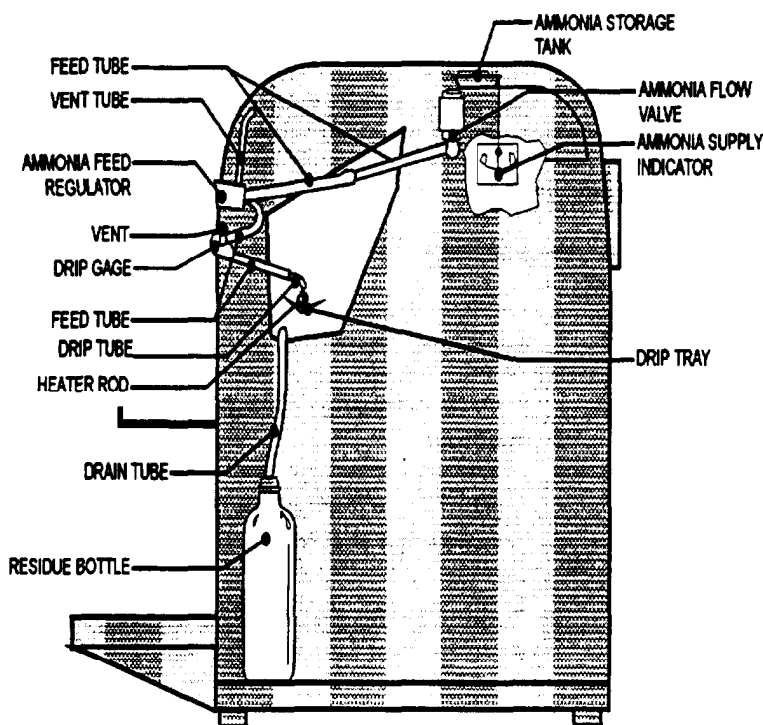
DMNP0098

Figure 4-5. —The basic ammonia flow system.

Diazo Machines, Continued

Start-up and shut-down operations

The following tables give start-up and shutdown procedures and operator checks for standard diazo-type machines:

start-up

Step	Action
1	Make sure the drain tube is inserted into residue bottle.
2	Check ammonia storage tank; refill if needed.
3	Turn machine on.
4	Adjust ammonia flow to 50/60 drops per minute.
5	Run machine 20 minutes or until machine reaches an operating temperature of 180 to 210 degrees.

Shut-down

Step	Action
1	Set blower motor to 20 minutes and turn off ammonia flow.
2	Feed a sheet of porous paper as wide as machine throat through machine.
3	Turn off machine to stop paper when wrapped around cylinder and between the sealing sleeve and developing tank: ● to prevent sleeve from sticking and ● to protect belt from residual heat.

Diazo Machines, Continued

Maintenance

Diazo machines fail to perform or become dangerous to operate without regular maintenance. Daily maintenance consists of emptying residue bottles every 8 hours, replenishing the ammonia supply, cleaning the outside of the glass cylinder, and cleaning the feedboard, receiving tray, and print tray of debris and paper scraps. Weekly maintenance is cleaning the inside of the cylinder and wiping the lamp assembly. Lubricating all bearings using a No. 10 motor oil and cleaning the suction holes is done monthly. Remove, clean, and dust all hoses annually.

Specific safety precautions

In addition to precautions ascribed to electrically powered machinery, diazo-type machines require the following specific safety precautions:

- store ammonia in shatterproof bottles,

- protect bottles in storage by securing them in place,

- handle ammonia bottles carefully to prevent:
  - blindness and bums to personnel,
  - stripping finishes off of surfaces, and
  - never turn ammonia flow completely off while machine is running.

Diazo sensitive materials

Diazo sensitive materials are papers, acetate, and lightweight cardstock coated with diazo salts and azo dyestuff emulsion. This emulsion is sensitive to light. Exposure to light through a transparent or translucent master desensitizes areas not protected by the opaque image of the master. After development in ammonia vapor, desensitized areas appear clear and protected areas appear as the image. Paper comes in different weights and as standard line, continuous tone, and sepia line stock. Drafting film comes as a blueline or sepia image stock. Foils or acetates, used for transparencies, come in normal intensity colors and pastels, black or color on color backgrounds, and in a variety of densities, weights, and sizes. Cardweight stock is available with a metallic shine. All diazo materials fade in time and exposure to daylight accelerates fading. Because developed images retain residual ammonia vapor fumes that permeate and deteriorate paper, do not store them with other file images, particularly photographs.

Diazo Machine, Continued

Diazo material storage

Diazo material is stored on a first in/first out basis. Before storing, mark the contents of the package with the date received and package contents. Diazo materials are light and temperature sensitive. Store them in a cool, dark, dry location.

Diazo masters

Master artwork for diazo reproduction are dense, opaque images on a transparent or translucent base of paper or acetate. A commercial product, called "transparentizer," lessens the opacity of lightweight translucent papers. When creating the master, use shading sheets judiciously; the heat of the mercury-vapor lamp in the diazo machine can melt the adhesive. It will also melt a master created using an image from a thermal copier. Place registration marks outside of the image area in multifoil transparencies.

Diazo exposure

To expose diazo material, place the sensitized material on the feedboard emulsion side up and place the master on the material emulsion side down. Better images result from emulsion to emulsion contact. Webb belts will slowly feed the combination through the machine. There is a slight dimensional instability in diazo material that occurs as the cylinder rotates the diazo material from the heat of exposure to the dampness of the development process. The master and the material will automatically separate before the material enters the development area.

Figure 4-6 illustrates placing a master on diazo material.
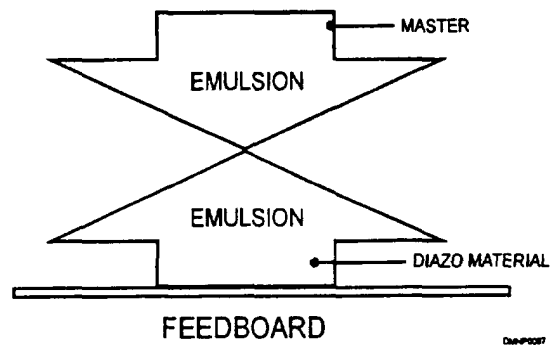
Figure 4-6. —Combining a master with diazo material to feed into the machine.

Phototypesetters

Introduction

Phototypesetting machines expose photosensitive paper or film to a light image of each character set, either electromechanically or by digitation (cathode-ray tube (CRT)). The two primary components of a phototypesetter are a keyboard and a processor. Because of rapidly changing technology, this section provides only a brief overview of phototypesetting systems.

General maintenance

Before covering phototypesetting theory and equipment, let's cover basic maintenance procedures for the equipment and the handling of the film/paper.

- Avoid excessive handling of the film/paper to minimize scraping the sensitized surface, kinking, and increasing static discharge.

- Check the internal mechanism of the processor for:
  - obstructions in the film/paper path and
  - the solution level of the processor tanks.

- Rinse the roller assembly and trays daily with warm water and loosen crystallized chemical deposits with a soft brush.

- Clean optical surfaces with a lint-free cloth or chamois and mirrored surfaces with a camel hair brush.

- Refer to the owner's manual for specific maintenance periodicities,

General adjustments

With most typesetting equipment, it is possible to adjust type size, type font, line length, letter density, word, line, and lettering spacing, type position, and leading. Some typesetters are further divided by their ability to produce display type or body type. Direct keyboard, magnetic storage on tape or disk, and a retrieval system through optical character recognition (OCR) are available on newer machines. Refer to your owner's manual for the full range of operator adjustments.

Phototypesetters, Continued

Typesetter generations

The term *generation* classifies significant advancements in phototypesetter technology. The first-generation phototypesetters closely resembled machines used to cast hot type. Second-generation phototypesetters set type by photographic projection through a font. Third-generation machines reproduce letters on the face of a cathode-ray tube (CRT) and fourth-generation equipment uses raster scan technology and fiber optics. Third-generation phototypesetters still exist in Navy Graphics shops.

Third-generation typesetters

Third-generation phototypesetters use cathode-ray tube technology. There are two basic categories of CRT typesetters. The first category, electromechanical typesetters, scans a photographic master stored on grids and strikes an image onto the face of a cathode-ray tube. This image then passes through a lens to photographic film or paper. A letter is rescanned each time it is used. This process is referred to as "on the fly. " The second category typesetter stores the font as a digital representation; a letter is scanned only once and enters the machines memory for subsequent use.

Electromechanical typesetters

Electromechanical typesetters may produce display or body type. They are hand-operated by direct keystrokes. Newer machines may have magnetic disk or tape memory and/or OCR scanning capabilities. Different type styles and sizes are available for enlargement, reduction, or same-size reproduction. The typesetter scans a photographic master each time a letter is used and transfers the image on the fly to the face of a CRT screen or photosensitive film/paper.

Phototypesetters, Continued

Digitized typesetters

Digitized typesetters set type with greater speed and detail than electromechanical machines. An electronic beam draws on the face of the CRT tube in random fashion. Image refresh is greater than 30 times per second at 2,600 lines per inch (LPI).

Figure 4-7 shows character imagery in digital phototypesetting.

CHARACTERS EXIST IN
OUTLINE WITHIN
MAGNETIC MEMORY

CRT "PAINTS"
CHARACTER
WITHIN OUTLINE

FINAL CHARACTER
APPEARS
SHARP AND SOLID

DMNP0096
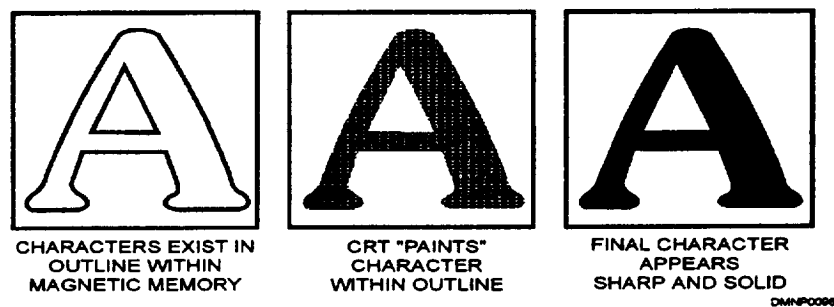
Figure 4-7. —Digitized phototypesetting.

LASER

Light amplification by simulated emission of radiation (LASER) phototypesetters raster scan an image in a very tight pattern with a narrow beam of light or energy. This allows for precise control of the image area. Characters, art, and halftones are generated picture element (PIXEL) by pixel at 700 to 1,500 LPI. Point size ranges from 5 to 246 points. Note that a point size and a pixel are not the same. Notice also that a halftone and a pixel are not the same. A halftone is comprised of pixels and how many depends on the resolution of the screen and the percentage of the halftone pattern desired. This type of typesetter and processor is also known as a raster image processor (RIP).

Phototypesetters, Continued

Phototypesetter processors The developing unit of a typesetter develops the image after transfer to photosensitive film or paper. The machine is self-developing. The two types of development processes are the stabilization process and the photographic process.

STABILIZATION PROCESS: The stabilization process is a nonpermanent process that uses an activating solution to develop the image and a chemical stabilizer to halt the development.

PHOTOGRAPHIC PROCESS: The photographic process is a permanent process much like standard photographic processing. It uses a chemical developer to mature the image, a fixer to stop development of the image, and a water wash to remove chemical residue from the developed image.

Figure 4-8 illustrates the two types of phototypesetting processor systems.

DMNP0099
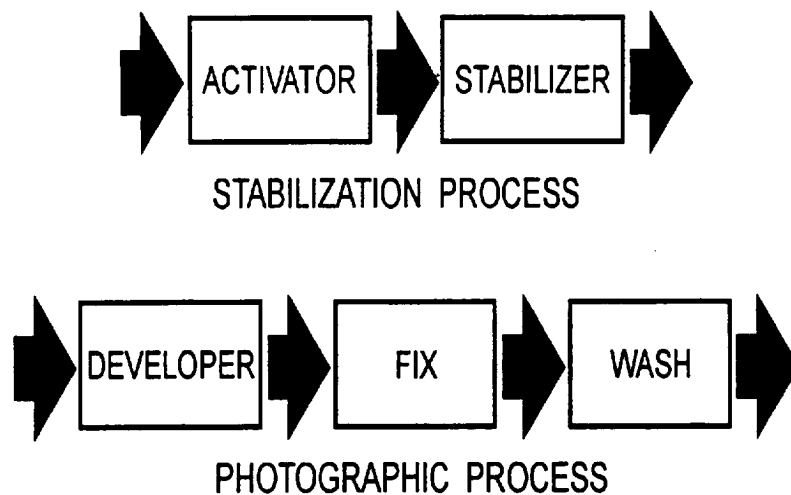
Figure 4-8. —Two basic types of phototypesetting processes.

Phototypesetters, Continued

Chemistry exhaustion

Change the chemistry in the processor often to keep developed images crisp and dense. As the chemistry oxidizes or expires, images become weak, thin, and grey. Streaked images also indicate a need to replenish the processor with fresh chemistry.

Typical work flow

Your initial interface with the typesetter is at the keyboard where all parameters are coded into the machine and the stroking of the image begins. This keyboard connects to the processor, sometimes through a memory storage system, and the processor develops the image. Carefully proofread all data. Assemble the text with the artwork and conduct a final proofreading.

Figure 4-9 shows a typical work flow pattern for a job that requires typesetting.
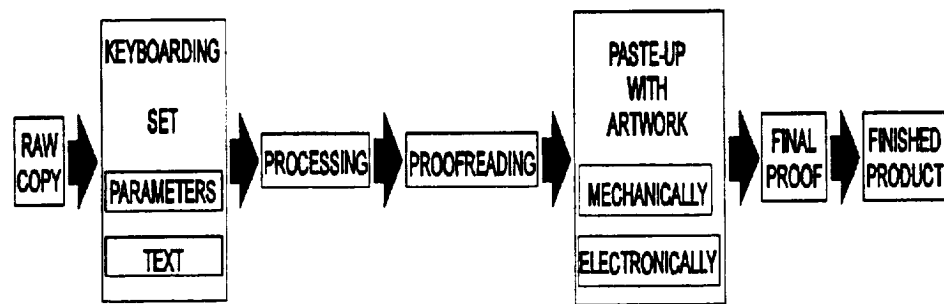
DMNP0100

Figure 4-9. —The phototypesetting process.

Pressure Process Lettering Machines

Introduction
A pressure process lettering device impresses letter fonts against a tape of paper or acetate film transferring a carbon image of a letter or symbol and with some machines, actually cutting the letter or symbol into the tape. This paper or acetate film is stripped into place on artwork or a paste-up. A number of manufacturers produce them with options that include keyboards, memory storage, letter distortion, and color.

Manual machines - carbon image
Manual pressure process lettering machines are simple in theory and use. They consist of a basic machine with a print button, cutter lever, and letter disks or fonts.

To use a manual machine, follow this table:

Step	Action
1	Plug the machine into power source and turn machine on.
2	Select a disk or font of desired style.
3	Adjust machine with parameters indicated on disk or font.
4	Insert disk or font into machine.
5	Rotate disk until the desired letter appears in the print window.
6	Press PRINT button.
7	Continue process until word or phrase is complete.
8	Advance leader and draw cutter lever up sharply to cut tape.
9	Turn off machine; return disk or font to storage.

Pressure Process Lettering Machines, Continued

Automatic machines - carbon image

Automatic pressure process lettering machines approach the sophistication of phototypesetters, but they are less complicated to use. These machines have a keyboard, limited memory storage, and a monitor screen to view the work in progress.

To use an automatic machine, follow this table:

Step	Action
1	Plug into power source and turn machine on.
2	Select desired font and insert into font port.
3	Adjust spacing and height for selected font.
4	Keystroke text into memory and proofread from screen.
5	Press PRINT button.
6	Press ADVANCE button to advance tape and clear cutter.
7	Press CUT button to cut tape.
8	Press CLEAR to erase image from screen and memory.
9	Turn off machine and restore fonts.

Pressure Process Lettering Machines, Continued

Manual machines - cutout image

Some pressure process lettering machines cut letters or symbols from paper and vinyl tape. Each letter/symbol is an individual font template. The template is inserted into a channel with the cutting edge facing the tape. A rotating drum applies sufficient amount of pressure to cut through the paper or vinyl as the tape and template press together. A manual machine has a hand-operated crank, letterspacing adjustment, letter height adjustment, pressure adjustment, tape holder, and font templates.

To use a manual machine, follow this table:

Step	Action
1	Insert tape onto tape roll holder in back of machine.
2	Select font plates.
3	Set letterspacing as indicated on font plate.
4	Set letter height adjustment as indicated on font plate.
5	Set pressure adjustment as indicated on font plate.
6	Insert font plate of desired letter into channel at the top of the machine.
7	Make certain the ridges on the font plate face the back toward tape.
8	Rotate hand crank one complete revolution.
9	Remove font plate from machine and replace in order in carrier.
10	Continue process until word or phrase is complete.

Pressure Process Lettering Machines, Continued

Automatic machines - cutout image

Automatic machines for cutout letters/symbols are exactly like their manual counterpart except for the cutter at the back of the machine. On a manual machine, the tape is tom by hand across a serrated edge. On an automatic machine, the tape is cut by pushing a button that activates a guillotine-type cutter near the tape holder. Directions for use of an automatic machine are identical to those for a manual machine.

Tapes - carbon

Carbon image tapes are available in combinations of paper or vinyl, opaque or transparent, adhesive or nonadhesive backed, white background, colored background, white letters, and colored letters. Carbon image tape has a soft surface that scratches easily. The surface of some carbon image tapes has a low tack surface that requires sealing with a fixative. When you use a carbon image, adhesive-backed tape in artwork that requires exposure to a heat-producing process, check the tape periodically during that process for adhesive seeping. Seepage gums up a diazo drum or copyboard and ruins the artwork. If a tape has lost adhesiveness, it will jar out of position on the artwork and misalign.

Tapes - cutout

Paper and vinyl tape, used in pressure cutout systems, are available in eight colors and are adhesive-backed. Several layers make up the tape, and these layers facilitate an easy application of the cutout letter to the artwork. Peel a comer of the carrier acetate away from the color tape. Turn the tape, adhesive side up, and place it on a work surface. At a low angle to the tape, peel the backing wax paper and the excess color tape away from the carrier tape carefully. Watch the cutout letters/symbols to make sure they remain on the carrier acetate. Throw away the wax paper and excess tape. Place the carrier tape, which now supports only the desired tape letters, over the artwork and press gently over the letters/symbols. Peel away the carrier tape slowly and at a low angle. The letters/symbols will remain. Throw away the carrier acetate.

Pressure Process Lettering Machines, Continued

Tapes - cutout (Continued)

Figure 4-10 shows the different tape layers and a low angle of peel.

CARRIER ACETATE

LOW TACK ADHESIVE

COLOR TAPE

HIGH TACK ADHESIVE

WAX PAPER BACK

WAX BACK AND EXCESS COLOR TAPE

LOW ANGLE OF PEEL

CLEAR CARRIER ACETATE AND DESIRED LETTER

DMNP0101
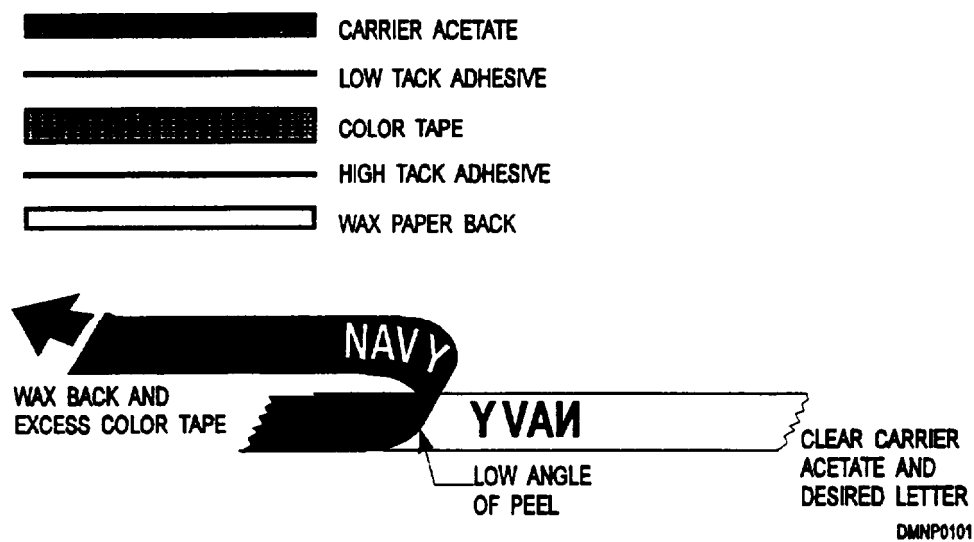
Figure 4-10. —Tape layers.

Special Applications Graphics Machines

Introduction   There are a number of graphics machines that have special purposes. Two machines that you may encounter in the fleet are the engraver and a computerized graphics machine.

Engravers   An engraver routes letters and images below the surface of metals and plastics. Personnel name tags, doorplates, desk plates, and shipboard signage are all examples of engraved products. Engraving is also done on plaques and trophies and shadow boxes. Engravers work on the same principle as a pantograph; that is, a parallelogram with repositionable tracer and drawing points.

Figure 4-11 shows the similarities between a pantograph and an engraving rig .

PARALLELOGRAM

STATION POINT   TRACE POINT   DRAWING POINT

PANTOGRAPH

STATION POINT

TRACER POINT   ENGRAVING POINT
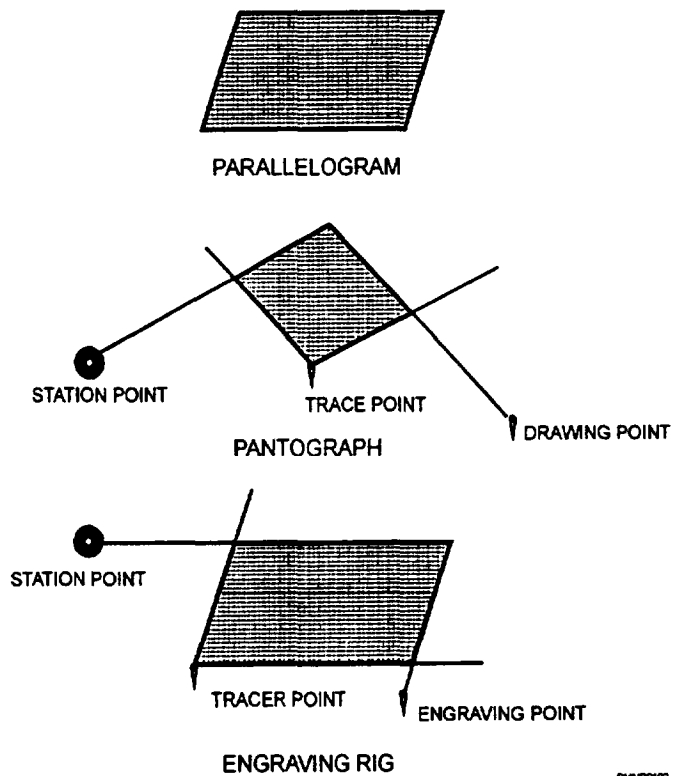
ENGRAVING RIG   DMNP0102

Figure 4-11.—Similarities in operation.

Special Applications Graphics Machines, Continued

Engraver features

Manual engravers may be hand-driven or motorized. Newer, automated engravers have keyboards, a memory system, and an editing screen. Engravers enlarge, reduce, or create the same-size letters by tracing fonts secured in a galley and redrawing that image into plastic or metal. Engravers have a motor, pulleys, a galley tray, a tracing point, tracing arms, and jigs to hold round or flat objects. Templates are slid into a galley tray and secured by thumbscrews. Templates are available in many styles and are made of brass. The engraver cuts the letter/symbol outline into plastic or metal, using a cutter. Cutters are carbide steel for cutting plastic and diamond-tipped for engraving metal. Use the motor with the carbide cutters. The diamond-tipped cutters require only hand pressure to cut metal.

Figure 4-12 shows different cutter points.

CARBIDE STEEL

DIAMOND TIP

DMNP0103
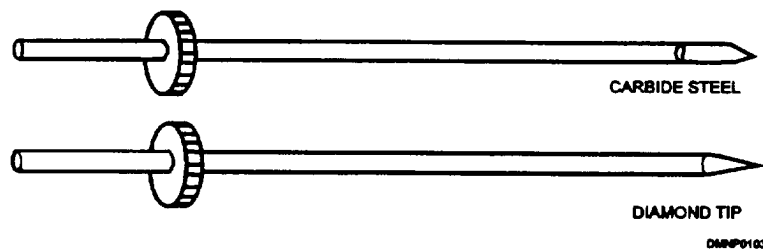
Figure 4-12. —Cutter profiles.

General care

Inspect the engraving machine before using it. Like other electrically powered tools, inspect the cords and wiring for wear. Examine the pulleys and belts for dryness and stretching. Use sharp cutters of the correct depth in the machine.

General maintenance

Clean debris from all surfaces. Remove the jigs to brush away debris under the galley. Remove the thumbscrews and brush debris from the galley trays. Brush away debris from under the jigs and surrounding areas. Engraving residue is similar to sawdust; it gets everywhere. Maintain sharp cutter points and clean, sharp templates. Do not over tighten thumbscrew settings.

Special Applications Graphics Machines, Continued

Use   Select a cutter for engraving based on the material being engraved and the desired effect. Diamond-tipped metal cutters do not require the use of a motor. They cut a fine line into a metal surface. A wider line is possible with a carbide cutter, but that requires the motor to rotate the cutter head. Plastic is cut using the carbide steel cutter points and motor only. Carbide cutters offer differing widths.

To use an engraver, follow this table:

Step	Action
1	Inspect the condition of the machine.
2	Select cutter and insert into the machine.
3	Set correct depth for the cutter and tighten setscrew.
4	Select template style.
5	Insert template pieces into galley.
6	Center word or phrases in galley and finger-tighten thumbscrews.
7	Adjust letter height and letter slant.
8	Center item for engraving into holding jigs and tighten jigs.
9	Place tracer point into groove on template.
10	Turn motor on.
11	Apply pressure with the left hand to the tracer point.
12	Simultaneously apply pressure with the right hand to the cutter.
13	Trace letter until engraved image is distinct and uniform in width.
14	Continue until word or phrase is complete.
15	Turn motor off; replace templates into storage unit.
16	Remove item from jigs; clean area of debris.

Special Applications Graphics Machines, Continued

Computerized graphic machines

There are computerized graphic machines that draw, pounce, and cut letters and graphics with the latest advances in digital typesetting. These systems use paper, vellum, vinyl, rubylith masking film, and application tape. The tools of these machines change from ball-point pens, to pounce wheels, and to knife blades. Some of these machines are self-contained units and others hook up to computer systems. Many commercial sign shops use this type of graphics device to reduce production time and enhance quality. Few of these machines are in Navy shops, but you should know of their existence.

Cameras

Introduction

Cameras, in one form or another, have always been one of a DM's tools. A DM either uses a photographic process in the creation of artwork or prepares artwork for photographic reproduction. Knowledge of camera types and the basic functions of camera parts are essential.

General maintenance

Cameras may be process cameras found in large studio settings or hand-held 35mm cameras and copy cameras.   Maintenance is similar for all the various types of cameras.

PROCESS CAMERAS: Process cameras usually have an electrical power source to drive timers, settings, and lights.

- Inspect electrical cords for fraying or bare wire.
- Clean optical surfaces with a lint-free cloth or chamois.
- Clean mirrored surfaces with a camel hair brush.
- Keep bellows, copyboard, and film plane free of debris and lint.
- Lightly oil rotating handwheels, cranks, and worm gears.

35MM and COPY CAMERAS: Small cameras like 35mm and copy cameras rely on a battery for power.

- Check the battery compartment for battery status:
    - is the battery present,
    - is the battery fresh, and
    - is the battery swollen or leaking.
- Clean optical surfaces with a lint-free cloth or chamois.
- Clean mirrored surfaces with a camel hair brush.
- Wipe down camera body with a lint-free cloth or chamois.
- Dust inside film back with a camera hair brush.

Cameras, Continued

Process cameras

Process cameras are large studio-type cameras. They may be horizontal or vertical in construction. Horizontal process cameras divide into darkroom cameras and gallery cameras. Darkroom cameras have the back or the film plane built into a wall. On the other side of the wall is the darkroom. Gallery cameras are free standing units. Vertical process cameras take up less space. Both horizontal and vertical process cameras have fully automated exposure control.

Figure 4-13 shows various types of process cameras.
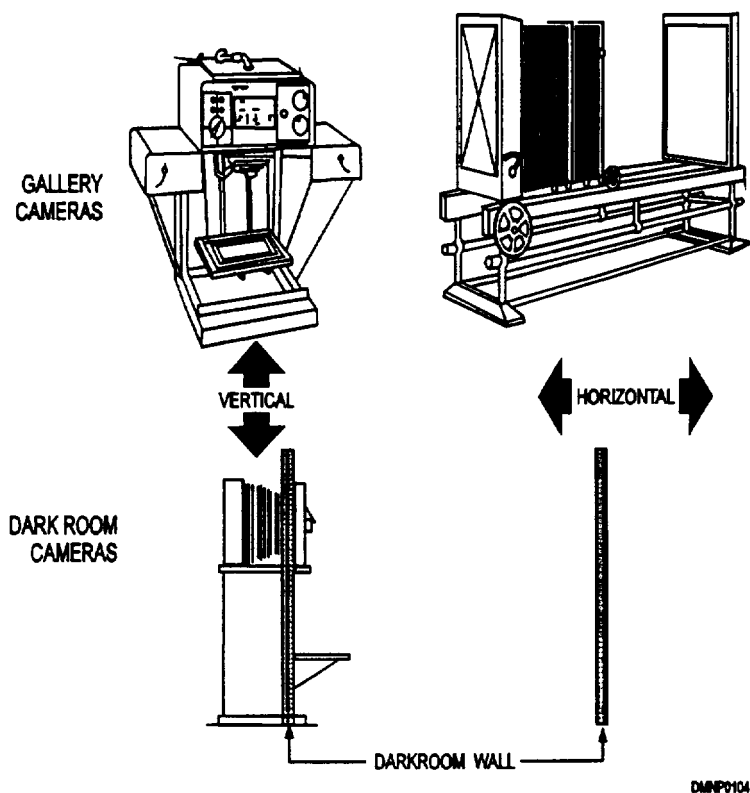
Figure 4-13. —Format types of process cameras.

Camera components

Cameras consist of seven basic components on three parallel planes. Misadjustment of any component part of a process camera affects the reproduced image in size, clarity, or density. The three parallel planes of a copy camera are the copy plane, the lens plane, and the focal plane. Consult the manufacturer's operating instructions for precise operator adjustments.

COPY PLANE: The copy plane is a glass copyboard that holds the original copy in place. The most common size is 18 by 24 inches with gridded reference lines to help align the original copy. Vacuum pressure creates suction to flatten the copy during a shoot. The copy plane may move on a track for proportional reductions or enlargements.

LENS PLANE: The lens plane holds the lens in position. Some lens planes have interchangeable lenses. The lens plane moves along a track for proportional reductions or enlargements.

FILM or FOCAL PLANE: The film plane holds the film in place in the back of the camera. The film plane may also have a filter attachment for halftone or color separation work. Without film, the ground glass of the focal plane allows for fine focusing an image.

SCALES: Most cameras reduce to 50 percent and enlarge to 300 percent or a range in between.

FOCUSING CONTROL: Handwheels or cranks rotate to focus an image. Newer machines have automated push-button focusing.

BELLOWS: Bellows are the accordion folded segment between the lens and the film plane. Bellows maintain lighttight integrity during enlargements and reductions.

EXPOSURE CONTROL: Once the copy plane, lens plane, and focal plane are positioned correctly, the camera scales recommend settings for the f/stops and/or the shutter speed. Some cameras are set manually and other cameras are automated. Automated cameras are aperture priority cameras where the operator sets the shutter speed and the camera sets the aperture opening. Shutter priority is when the operator sets the shutter speed and the camera selects the aperture. Little figuring is done by the operator in either case.

4-33

Cameras, Continued

Camera components (Continued)

Figure 4-14 shows a basic process camera with the primary components identified.
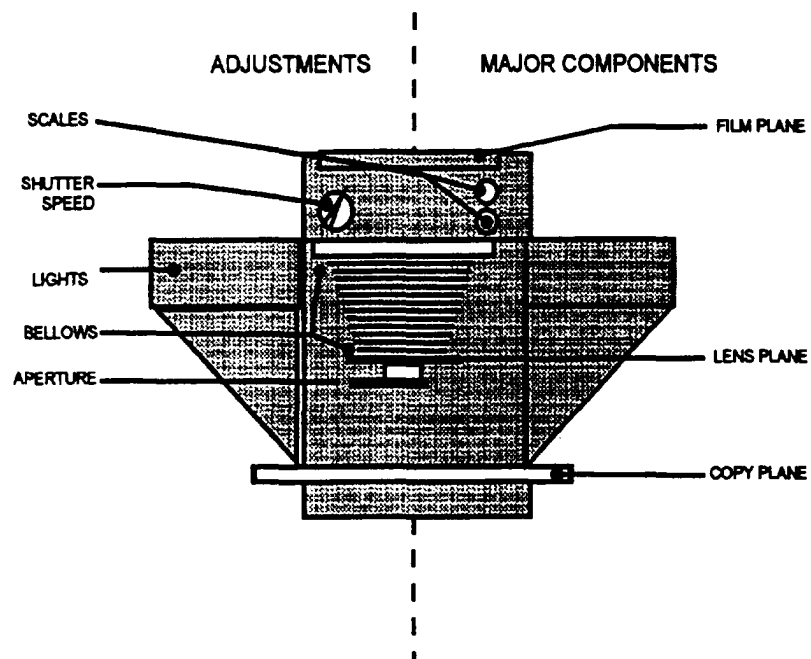
Figure 4-14. —Process camera nomenclature.

Cameras, Continued

Lighting   You can use almost any type of light for copy work, provided the intensity of the light is sufficient to prevent excessively long exposures. Another principal requirement of the light source is that it produces a light with a color temperature suitable for the type of film used. Use normal room light to focus the image on the focal plane. Use copy lights on high to expose the film.

Types of lights   Lights maybe part of the camera, as are lamp housing units and lights in the copyboard, or they may be separate units. Lighted copyboards illuminate copy from underneath. This allows greater control of negative density. It is also superior for backlighting film positives and transparencies.

Figure 4-15 shows different light configurations.
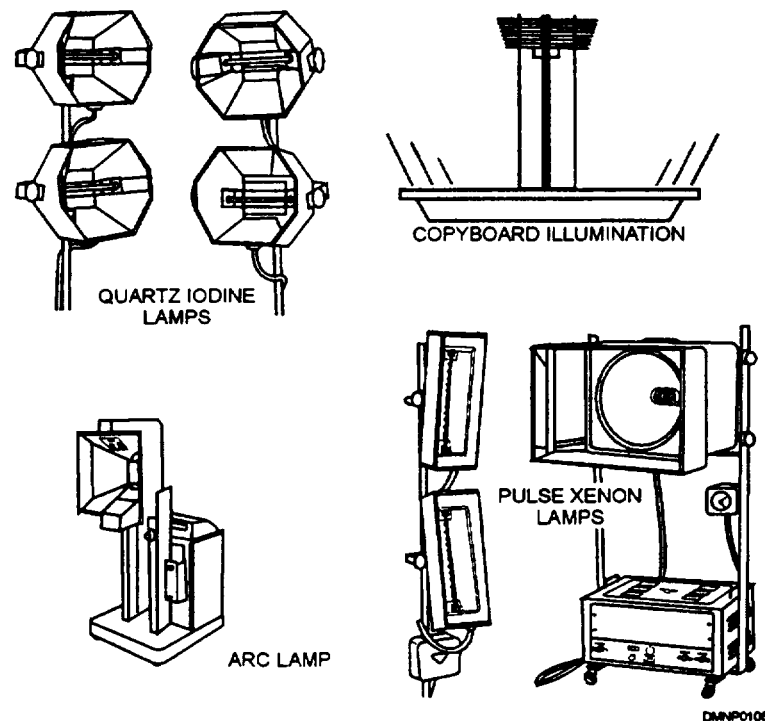
Figure 4-15. —Light configurations.

Cameras, Continued

Light temperature

Light temperature becomes critical when reproducing color images and an imbalance light source will skew tonal values in black-and-white reproduction. The most common lamps in Navy Graphics shops are the tungsten lamp, fluorescent lamp, and quartz iodine lamp variations.

TUNGSTEN LAMPS: Tungsten lamps are excellent for use in black-and-white reproduction. Tungsten lamps are available as 3200 degrees Kelvin (K) and 3400 degrees Kelvin. Lamps rated 3400 degrees K are used less because they have a short life of 4 to 6 hours.

FLUORESCENT LAMPS: Use fluorescent lamps when the original has a textured or uneven surface and little reduction or enlargement. Even illumination of a smooth-surfaced original is difficult to obtain. When you use fluorescent lamps, arrange the tubes in a square pattern parallel to the edges of the copyboard.

QUARTZ IODINE LAMPS: Quartz iodine lamps produce a very intense light particularly suited to general copy work. They maintain a fairly constant color temperature throughout their life.

Reflectors

Reflectors evenly distribute light over the surface of an original, eliminating hot spots. Reflectors also funnel more light toward the original that shortens exposure times. Certain types of lights have built-in reflectors. When you use a lamp with a built-in reflector, also use a lens hood to shade the lens from glare and stray light.

Lamp replacement

Keep all lamps clean and free of dust and finger smudges. Handle lamps carefully. Replace all lamps in the system simultaneously. As lamps age, temperature variations occur. Failure to replace all lamps creates an imbalance in temperature and intensity of illumination.

Cameras, Continued

35mm cameras   The two types of 35mm cameras are the rangefinder camera and the single lens reflex (SLR) camera. This classification indicates the way the image projects on the film plane for focusing. The film size for these cameras is 35mm film, hence the name.

RANGEFINDER CAMERAS: Focus an image on the film or focal plane of a rangefinder camera by aligning one image over another until they coincide. The image enters the lens and diverts to the focal plane from a mirrored surface. The distance between the viewing lens and the lens through which the exposure is made is called parallax. Parallax is automatically corrected in a rangefinder camera.

Figure 4-16 shows how an image passes through a rangefinder.

DMNP0107
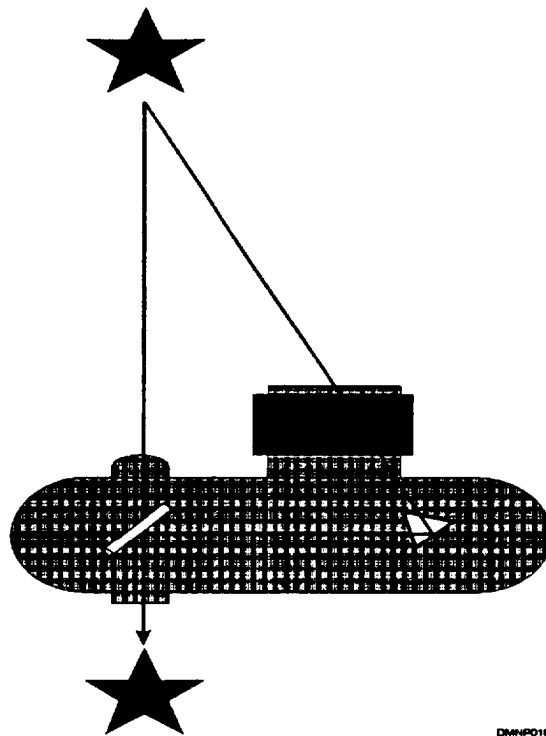
Figure 4-16. —View through a rangefinder.

35mm cameras (Continued)
In a single lens reflex (SLR) camera, the image enters the lens and strikes a mirror. This mirror deflects the image onto a ground glass for focusing. The mirror flips out of the way during exposure; therefore, the viewing lens is the same lens that records the image.

Figure 4-17 shows how an image passes through an SLR.
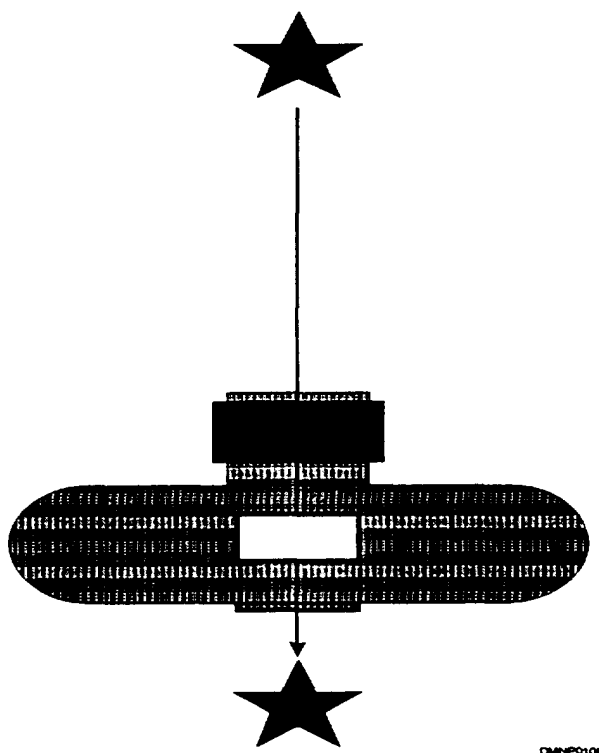
Figure 4-17. —View through a SLR.

Camera components
Camera components are similar to those of a process camera. There is a film or focal plane, a lens, and the object or a copyboard. Shutter speed settings and apertures or f/stops are adjustable. There is also a setting to indicate the film speed to the automatic sensors in the camera. Lenses are interchangeable on 35mm cameras.

Cameras, Continued

Lenses

Camera lenses have different ranges that make some lenses more suited to copy work than others. Range refers to focal length or the distance between the lens plane and the focal plane. Lens range may be long, short, standard, variable, or macro. The speed of a lens increases as focal length decreases.

LONG RANGE: Long-range lenses are telephoto lenses. Use these lenses to draw an image closer. Ideal for action or sports photography, they require more light and faster film than standard lenses.

SHORT RANGE: Short-range lenses are fast lenses with a wide angle of view. They are excellent for photographing large expanses in limited space and panoramic views.

STANDARD RANGE: Standard-range lenses most closely record the image as seen by the human eye. Distortion is relatively negligible.

VARIABLE RANGE: Variable-range lenses are zoom lenses or lenses in which the focal length changes at the option of the photographer.

MACRO RANGE: Macro-range lenses are ideal for copy work, particularly if the item being copied is small. This lens is slower in speed than standard lenses. Available as 50mm and 100mm macros, they also perform well as a general-purpose lens in routine shoots.

Figure 4-18 shows differences between lens ranges.
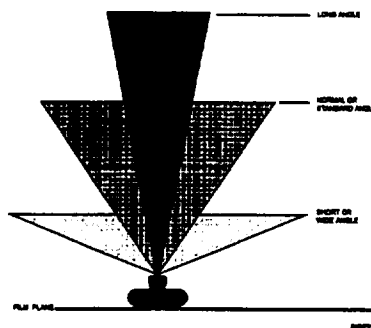
Figure 4-18. —Lens ranges.

Cameras, Continued

Aperture An aperture is an opening in a lens through which light can pass. Apertures are set at standardized intervals, referred to as f/stops. F/stops help control image sharpness by partially correcting for lens aberrations and defining depth of field. Changing aperture settings changes the amount of light allowed to strike the film. The greater the numerical value of the f/stop, the less light enters the lens. Each increment divides the light by half. If your camera or hand-held meter is not working or you find yourself in a situation where you haven't the time to calculate an f/stop, use the f/16 rule; that is, set the f/stop to f/16 and the shutter speed to the film speed, or as close to the ISO that the shutter speed adjustment will allow.

Figure 4-19 shows standard f/stop increments.

f/2   f/2.8   f/4   f/5.6   f/8   f/11   f/16   f/22

DMNP0110
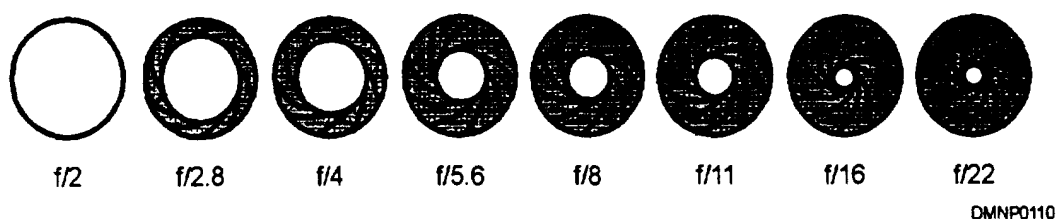
Figure 4-19. —Standard f/stop increments.

Cameras, Continued

Shutter speed

Shutter speed is the length of time light can expose the film. A camera may have a leaf-type shutter or a focal-plane shutter. The shutter speed is set in standardized increments. Increasing the shutter speed incrementally lessens exposure time by half. At the "T" setting, the shutter opens the frost time you press the shutter release button and closes the second time you press the release button. At the "B" setting, the shutter remains open as long as you depress the shutter release button.

Figure 4-20 shows standard shutter speed ratios,

B 1/1 1/2 1/4 1/8 1/15 1/30 1/60 1/125 1/250 1/500 1/1000 1/2000
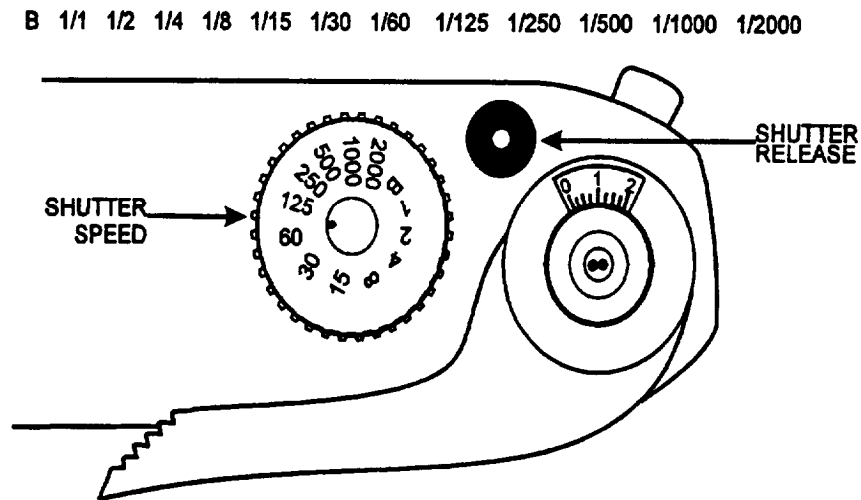
Figure 4-20. -Shutter speed increments.

Cameras, Continued

Film speed

Film speed appears on every roll of film and is an industry-rated standard. The standard is set by the International Standards Organization (ISO). Film speed, sometimes referred to as film sensitivity, indicates the sensitivity of the film emulsion to record latent images of light. Film speed may be fast or slow. Selection of a film speed requires a knowledge of film characteristics, lighting situations, and potential compromises.

FAST FILM: Film considered "fast" is film that requires less light for exposure.   These are the low-light film speeds of ISO 400 and higher. Image resolution is good in small prints; however, pronounced graininess appears in enlargements. Some of the very fast films, ISO 1000 and faster, need very little light and an extremely short exposure time, making them more desirable for dimly lit auditoriums and difficult to handle in daylight situations.

SLOW FILM: Slow film requires more light or longer exposure times to record an image. Slow films, such as ISO 25, have very fine grain that remains fine even in enlargements. These films are ideal for a controlled studio atmosphere.

Slide duplicators

Sometimes a photo lab is not available to produce duplicates of slides or transparencies. The DM is able to duplicate slides using a slide duplicator that attaches to the front of a camera body much as a lens does. The duplication process allows the DM an opportunity to correct minor exposure errors and perform limited cropping of the original slide. The light meter in the camera can meter exposure. Transparencies, placed on a light table or the illuminated copyboard of a process camera, can be re-photographed with a 35mm camera and slide film.

Summary

Review

This chapter covers general safety precautions for and maintenance procedures of the basic equipment used to produce a first-generation copy from an original. Equipment and procedures are intentionally generic for copiers, diazo machines, phototypesetters, lettering machines, and cameras since different equipment is in every Navy shop. Familiarize yourself with the equipment in your shop. It is not important that you learn brand name equipment, only that you understand the theory behind the process on which your equipment operates.

Comment

I have always found that a solid foundation in basic photographic theory, camera operation, and film characteristics is a valuable asset as a DM. This information applies to many aspects of our job and is a natural extension of our creativity and visual literacy. Understanding tonal representation in photography also helps to understand tone as it applies to the printing process and CRT transmission. Study the Photographer's Mate (Basic) manual. It is well written and easily understood.

As with all processes, understanding how and why a process works unravels the mystery of operator adjustments. Machines are logical and predictable. Mastering reproduction equipment is essential. Knowing the processes required to achieve an end product makes the creation of the product easier.

CHAPTER 5

AUDIOVISUAL EQUIPMENT

Overview

Introduction Every command in the Navy has a different requirement for audiovisual presentations.   Some commands have elaborate briefing theaters with closed circuit television or computer-assisted telecommunications and Internet, while other commands have only an occasional overhead projector. You need a working knowledge of the operation and basic maintenance of the common types of audiovisual equipment.

Objectives The material in this chapter enables you to do the following:

- Clean and inspect visual presentation equipment.

- Identify operator adjustments on visual presentation equipment.

- Select audiovisual equipment appropriate to a presentation.

- Set up and maintain a presentation theater.

Overview, Continued

Acronyms   The following table contains a list of acronyms you must know to understand the material in this chapter:

Acronym	Meaning
CBI	Computer Based Instruction
LSP	Long Standard Speed
SP	Standard Speed
VCR	Video Cassette Recorder

In this chapter   This chapter covers the following topics:

Topic	See Page
Projection Devices	5-3
Audio Devices	5-19
Multimedia	5-20
Lecture Aids	5-21
Screens	5-24
Briefing Theater	5-29

Projection Devices

Introduction   The most common types of still picture projectors are the opaque, the overhead, and the 35mm slide projector. You need a working knowledge of the operation and the basic maintenance of the common types of projectors.

General maintenance   For general maintenance purposes, inspect the projection device well before presentation day to allow time for the repair of any discrepancies. Likewise, pay attention to the following details:

- Check the cleanliness of the lenses and projection stages:
  - clean optical surfaces with a lint-free cloth, a damp chamois, or a lens tissue;
  - clean exterior surfaces with a clean, damp cloth; and
  - clean mirrored or reflective condensers with a camel hair brush.

- Check the device for worn or frayed electrical cords.

- Test device operation by running the projector for 5 minutes before actual use to make sure it is working properly.

- Check the projector to screen distance.

- Keep a spare bulb available next to the projector.

Projection Devices, Continued

Projector support

Make sure the projector is securely supported so that it will not fall or jiggle during the presentation. The projector should project the image over the heads of the audience without partially projecting it onto the ceiling or floor. Position the projector close enough to the screen to permit even illumination. Make sure the lens projects the image at a 90-degree angle to the projection surface to prevent keystoning, covered later in this chapter.

Figure 5-1 shows the correct positioning of a projector to prevent keystoning.

SIDE VIEW

PROJECTOR

90°

SCREEN   SUPPORT

TOP VIEW

90°

PROJECTOR

SCREEN

DMNP0112
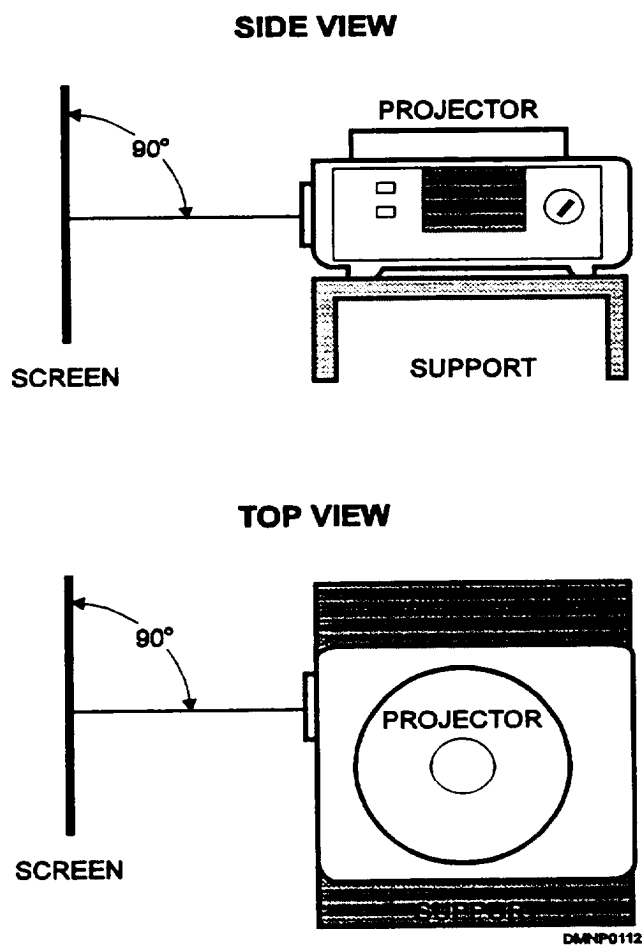
Figure 5-1. —Correct projector angles.

Projection Devices, Continued

Opaque projectors

An opaque projector reflects light from the surface of an opaque object. Magazines, books, photographs, full-color pictures, charts, and diagrams project onto a screen without additional preparation. An opaque projector will also project any relatively flat object, such as small machine parts, cams, gears, and coins. This projector is often used for teaching, briefing, and as an aid to draftsmen enlarging an image to redraw. Some of the limitations in the use of an opaque projector are its cumbersome size and weight, and it does not illuminate the screen brightly, requiring the elimination of room lights.

Figure 5-2 shows a basic opaque projector.
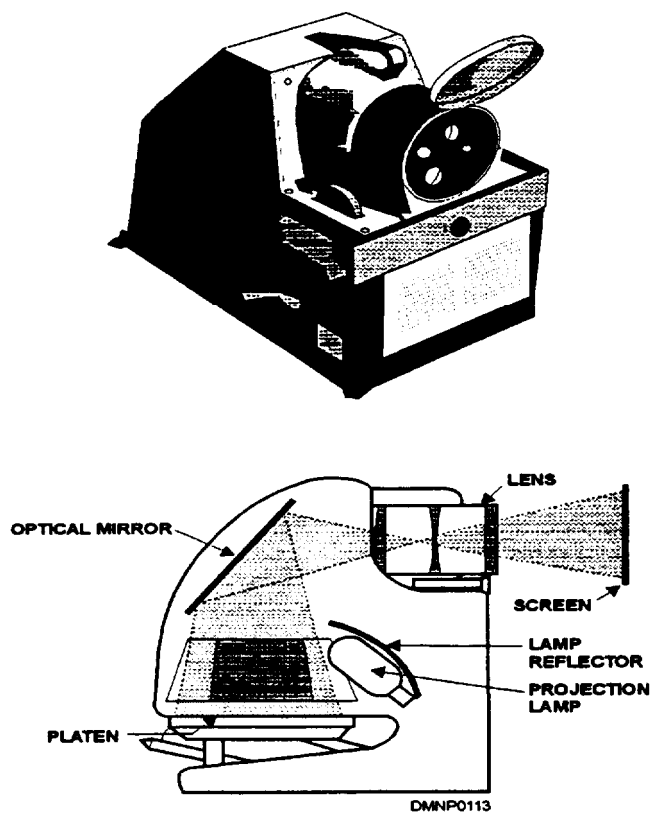
Figure 5-2. —The opaque projector.

Projection Devices, Continued

Nomenclature   An opaque projector is an indirect projection system that uses a composite of highly polished mirrored surfaces to reflect light from an object through a lens onto a screen. Other parts of the opaque projector include an on/off switch, a high intensity 1,000 watt bulb, an optical pointer, a focusing knob, a roll feed assembly, a platen assembly, and a fuse holder. Most parts and their functions are self-explanatory except for the roll feed assembly and the platen assembly.

ROLL FEED ASSEMBLY: The roll feed assembly works like a conveyor belt to slide objects into the projection platform. Located on the platen assembly, it permits movement from left to right when you turn a hand crank on the side of the machine.

PLATEN ASSEMBLY: The platen assembly raises and lowers the projection platform. By raising and lowering the platform, you can project objects up to 1 ½ inches thick. The lock on the platen assembly is spring-loaded; therefore, carefully lock and unlock the platen to prevent the projection platform from snapping up.

Projection Devices, Continued

Nomenclature (Continued)

Figure 5-3 shows the key elements of an opaque projector.
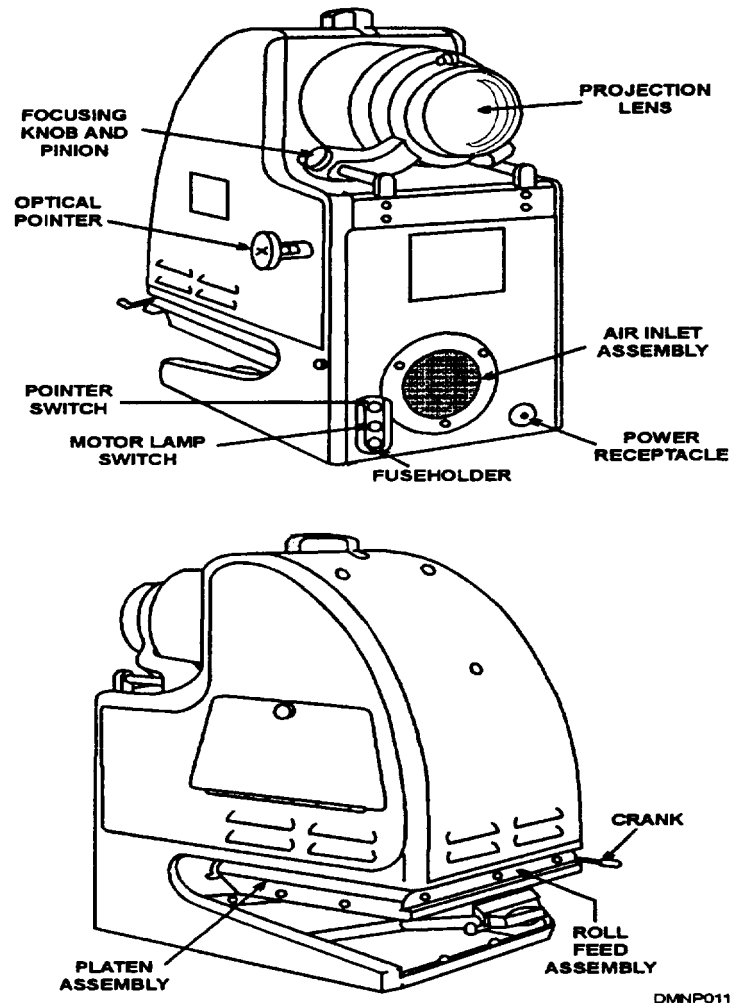
Figure 5-3. —Nomenclature of the opaque projector.

Projector Devices, Continued

Use

To project flat objects and objects up to 1½ inches thick with the opaque projector, use the following tables:

Flat objects

Step	Action
1	Use the roll feed assembly.
2	Stand behind the projector.
3	Hold crank in right hand.
4	Hold copy in left hand, bottom edge toward the screen.
5	Feed material into left side of projector while rotating the crank clockwise.

Objects up to 1 ½ inch thick

Step	Action
1	Lower platen assembly to the locked position.
2	Remove the roll feed assembly by lifting it off the platen assembly.
3	Apply continuous pressure to the platen assembly to prevent the projection stage from snapping back into place.
4	Place the object on the platen assembly and slowly raise it into place.

Projection Devices, Continued

Replacing a bulb

To remove and replace a bulb in an opaque projector, use the following tables:

To remove bulb

Step	Action
1	Turn off power to device.
2	Allow the lamp to cool down.
3	Press down gently on the bulb.
4	Turn counterclockwise until socket releases bulb.
5	Discard spent bulb.

To replace bulb

Step	Action
1	Align lamp ears with matching socket receptacle.
2	Press down gently on the bulb.
3	Turn clockwise until bulb stops.
4	Clean bulb of all fingerprints before turning on projector.

Overhead projectors

Overhead projectors project light through a transparent visual onto a mirror that reflects that image to a screen. Use an overhead projector for teaching, briefing, and as a draftsman's aid in enlarging or transferring an image to another surface. Major advantages of the overhead projector are portability, being able to write directly on the visuals during projection, and using the projector in dim classrooms. Limitations include a distracting blower motor noise, the visuals must be transparent to project, and the projector requires close placement to the screen.

Projection Devices, Continued

Nomenclature   The overhead projector is a simple device. It consists of a three-position on/off switch, a lamp, a fresnel lens, mirrors, a projection stage, a focusing knob, a blower, and a condenser. The fresnel lens is the key component of an overhead projector. This prismatic lens is a series of concentric circular scribes calculated to concentrate and intensify the light, as it passes through the visual onto a mirror.

Figure 5-4 shows the elements of an overhead projector.
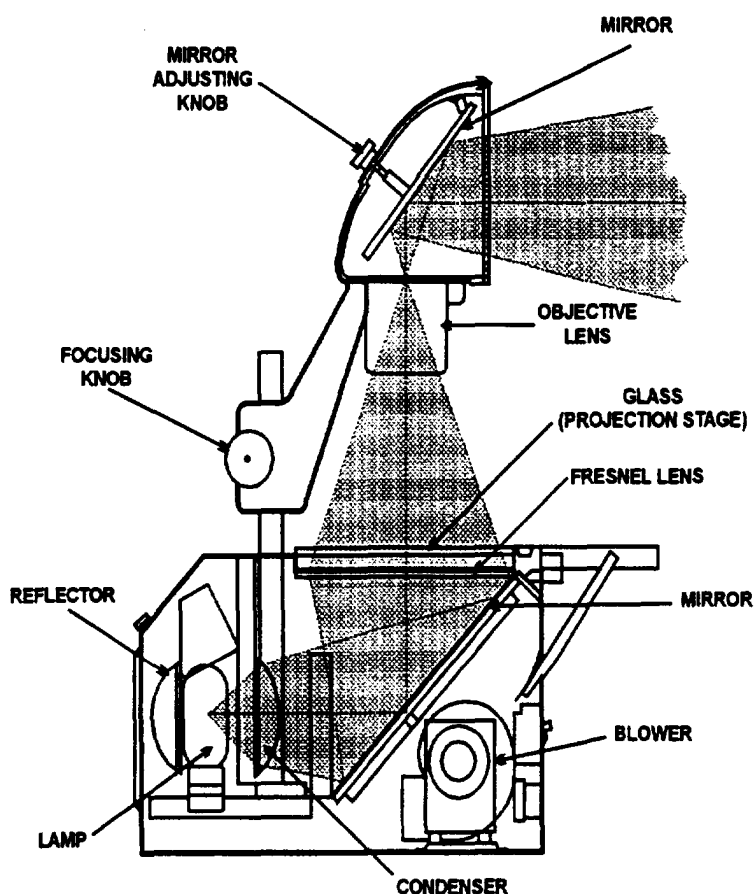
DMNP0115

Figure 5-4. —Overhead projector nomenclature.

Projection Devices, Continued

Use

To use an overhead projector for front screen projection, place the projectural on the projection stage with the bottom of the projectural facing the screen. The projectural will be legible to the operator. For rear screen projection, place the projectural on the projection stage with the bottom of the projectural facing the screen, but facedown so that the projectural is illegible to the operator. When using an overhead projector, always allow the blower motor to cool the bulb before removing power from the unit.

Replacing a bulb

Use the following tables to remove and replace a bulb in overhead and portable overhead projectors:

To remove bulb

Step	Action
1	Turn off power.
2	Allow lamp to cool.
3	Raise projection stage to gain access to lamp assembly.
4	Release bulb by raising spring clip.
5	Remove bulb and discard.

To replace bulb

Step	Action
1	Wipe new bulb with lint-free cloth to remove all hand oils and perspiration.
2	Protect bulb with cloth or wear a lint-free glove when handling.
3	Align socket and insert bulb.
4	Replace spring clip.
5	Close cover.

**Portable
overhead
projectors**

Portable overhead projectors are similar to overhead projectors. Portable projectors fold into a self-protecting carrying case. The on/off switch has a third position which allows the blower to remain on after the projector bulb is turned off. Also, the bulb is more intense and has a shorter life. The use and care of a portable overhead projector is the same as for a regular overhead projector.

Figure 5-5 shows a few of the many types of portable overhead projectors available.
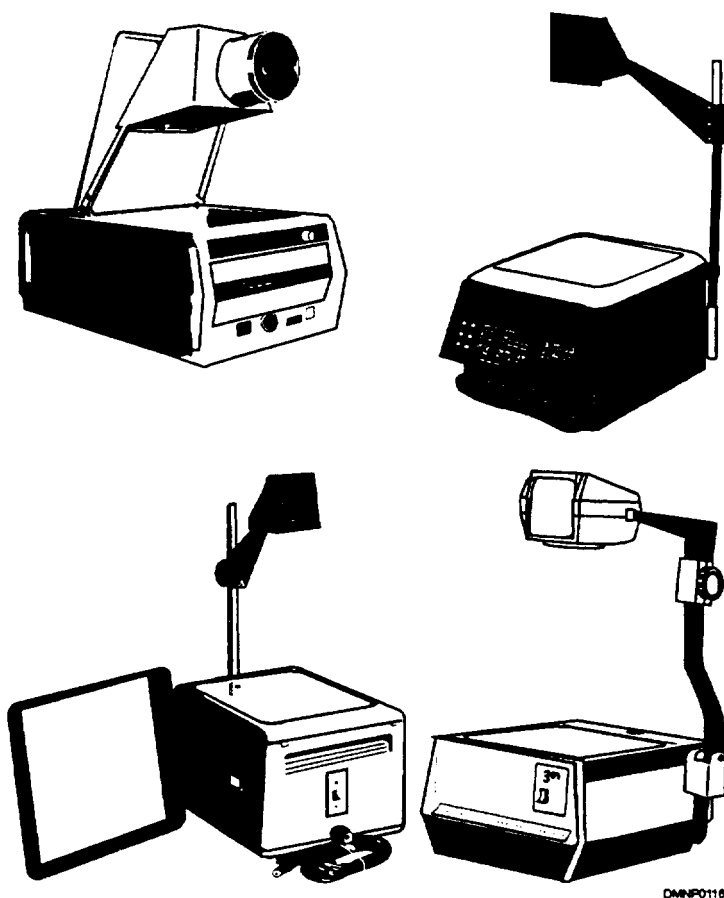
Figure 5-5. —Portable overhead projectors.

Projection Devices, Continued

Slide projectors Slide projectors are the most common still picture projectors found in military commands. The operation of slide projectors is simple and universal. These projectors project an image from 35mm or 126mm, slide film in a 2- by-2-inch slide mount. Some projectors can project super slide film in the 127mm format. Slide projectors are used in teaching, briefing, and as a draftsman's aid in enlarging images. The limitations of a slide projector are that the feed mechanism easily jams, and the bulb is very sensitive to rapid temperature fluctuations and perspiration from your hand during handling.

Nomenclature Although the slide projector looks difficult to adjust, its many parts have obvious functions. A slide projector consists of a slide holder, lens, focusing knob, forward/reverse button, on/off button, select button, remote receptacle, dissolve receptacle, timer, and a bulb. Some of these features require further explanation:

SLIDE HOLDER: The holder for slides fed into the slide projector is available as a tray that holds from 60 to 180 slides or a stack loader that feeds a stack of slides one at a time into the projector.

SELECT BUTTON: Use the select button to select a specific slide in the slide tray. Depress SELECT and spin the tray to align the slide sequence number with the gate. When you release the SELECT button, the desired slide will advance into the gate for projection.

TIMER: Use the timer button to select the manual or automatic mode. In manual, the operator has control of the amount of time the slide is on the screen. In automatic, the operator selects the time interval and the projector automatically changes the slide. The timer activates to prompt the projector to change slides and refocus. The choices are in 5-, 10-, and 15-second increments.

BULB: The bulb in a slide projector has two levels of illumination. Low illumination is 425 watts. Using the projector bulb at low watt illumination prolongs the life of the bulb. High illumination is 500 watts.

Projection Devices, Continued

Figure 5-6 shows key points of adjustment on a slide projector.

1. SLIDE TRAY	5. FORWARD BUTTON	9. DISSOLVE CONTROL RECEPTACLE
2. ELEVATING WHEEL	6. REVERSE BUTTON	10. SELECTOR SWITCH
3. LENS	7. SELECT BUTTON	11. AUTOMATIC TIMER
4. FOCUS KNOB	8. REMOTE CONTROL RECEPTACLE	12. ILLUMINATED CONTROL PANEL
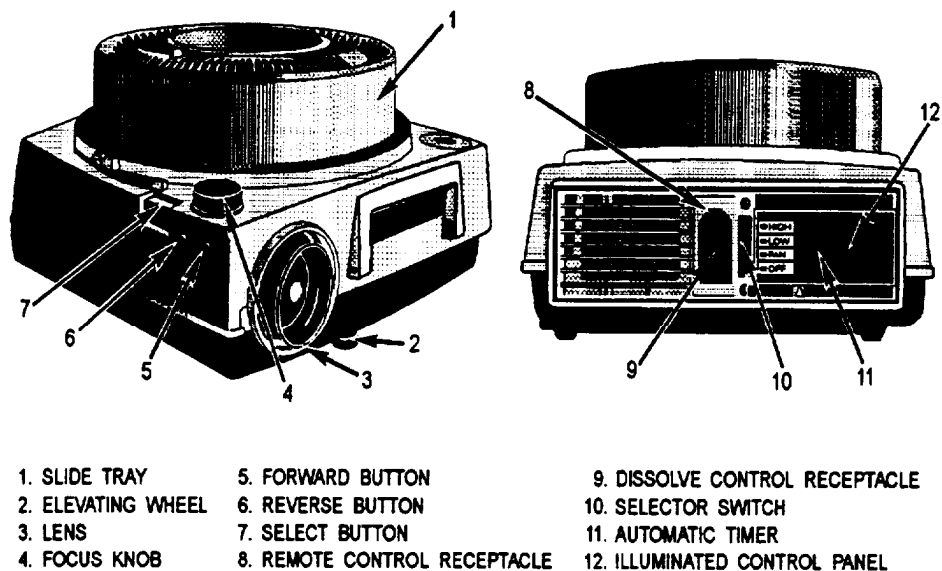
DMNP0117

Figure 5-6. —Slide projector nomenclature.

Care

Make sure the slide tray or stack loader is firmly seated on the projector. If a slide jams, remove the tray or loader to retrieve it. Before unplugging a slide projector, allow time for the blower to cool the bulb and the motor.

To remove the tray, follow this table:

Step	Action
1	Depress SELECT button and rotate tray to align notched edge.
2	Gently raise tray; do not force tray off.
3	If the tray is difficult to remove, use a coin to turn the slotted screw in the center of the projector.

Projection Devices, Continued

Replacing a bulb

To replace a bulb or secure the projector, allow the blower motor to cool the bulb before you remove the unit from the power source. To remove and replace a projector bulb, use the following tables:

To remove bulb

Step	Action
1	Allow bulb to cool.
2	Turn off power.
3	Open small door to lamp housing.
4	Raise spring clip.
5	Remove bulb and discard.

To replace bulb

Step	Action
1	Make sure new bulb is free of hand oils, perspiration, and dirt by wiping with a soft lint-free cloth.
2	Handle bulb carefully, making sure not to touch it with your bare hands.
3	Place bulb in bulb socket.
4	Replace spring clip.
5	Close lamp assembly cover.
6	Run projector with lamp on low setting for 5 minutes before reusing projector.

Projection Devices, Continued

Slide projector accessories

Slide projectors have many accessories to create a custom system that works for your needs. Slide trays hold slides in sequence, locked into place, in increments from 60 to 180 slides. Stack loaders allow the rapid loading and the easy rearrangement of slides. Remote control cords with connections of varying lengths allow the operator mobility during presentation. These remotes signal the projector to go forward, in reverse, and to power focus. Variable focus lenses are available in long and short ranges to minimize distortion in unusual presentation situations.

Dissolve units

One accessory that contributes to a professional presentation is a dissolve unit. Most dissolve units are multi-functioning; that is, they fade an image into black or into another image, or have flashing or overlay capabilities. One or more projectors change an otherwise static presentation into a dynamic display.

Programmers

Programmers offer the operator an opportunity to code a series of functions or special effects into their slide presentation. Common special effects programmers include the following:

AUDIBLE TONE CONTROLLER: An audible tone controller activates the projector by impulsing a tone. This coded tone signals the projector to do what the operator pre-programs into the device.

PUNCH TAPE: Punch tape uses programming logic or electronic circuitry to pierce a paper tape with a code. The code punched onto this tape cues the projector for multiple functions.

ELECTRONIC MICROPROCESSORS: Electronic microprocessors digitize information. This "bit" information triggers the programmer's multiple functions automatically.

Projection Devices, Continued

Projector racks
Make sure slide projectors and programmers or dissolve units are securely mounted to a stable projector rack. Keep all electrical and connector cords from being pinched between devices. Position the projector rack so that the projectors are at a 90-degree angle to the screen and deck to prevent keystoning. Also consider ventilation, cooling, and access to the projection devices when you position the projector rack.

Video cassette recorders players (VCR)
Video cassette recorders/players (VCR) combine a synchronized audio and video presentation. The operation of a VCR is easy, as many individuals are already familiar with the operation of their home VCR. VCR presentations are excellent for small audiences. When you give a presentation to a large group, hook up several monitors and strategically place them throughout the briefing theater. VCRs require the addition of a television monitor and occasional jams will badly damage a tape.

Nomenclature
Most adjustment points of a VCR are self-explanatory. There is a cassette port, an on/off switch, a forward/fast forward button, a rewind/reverse button, a record button, a playback button, a pause button, a stop/eject button, a speed control switch, and a tracking dial. The two adjustments you may not be familiar with are the speed control switch and the tracking dial.

SPEED CONTROL SWITCH: This switch allows the operator to switch from standard tape advance speed (SP) to long standard advance speed (LSP). Switching from SP to LSP increases the amount of recording time on a tape.

TRACK DIAL: An incorrectly tracking tape will chatter, appear out of synchronization, or show distinct horizontal frame lines on the monitor. Adjust the track of the tape by moving the dial until the projected image is steady.

Use
When you use a VCR, make sure the tape is correctly inserted into the cassette port. Take care not to re-record inadvertently over a recorded tape. To make sure a tape is not able to record, break the small plastic tab on the tape cartridge and discard the tab. Occasionally, clean the tape heads with a tape head cleaning tape.

Projection Devices, Continued

Video projectors	Video projectors are very similar to VCR units. The major difference is that the video projector projects the image onto a screen. The video projector is primarily a teaching device meant for small audiences. One of the drawbacks in using this projector is how easily it slips out of adjustment.
Nomenclature	Video projectors have the same buttons and switches as a VCR with only a few differences. These differences are a projection lens, a focusing ring, and input/output ports to the video cassette player.
Use	Position a video projector so that it is not in a traffic area as this projector easily jars out of alignment. Use a special projection cart, or ideally, mount the projector to the ceiling in a projector rack. The projector has sensitive adjustment dials. A misadjusted projector will project an image that appears to have a ghost or has incorrect coloration. Adjust this projector before actual use by aligning the three primary color dots on the screen until only white light is seen.
Monitors	Monitors are television screens connected to computers or video cassette recorders/players to playback audiovisual tapes. Monitors have the same adjustment features as a television. Use as large a monitor as practicable in the classroom or theater.
Nomenclature	Monitors have an input port, an output port, an on/off switch, a screen face, a color balance control, and a vertical/horizontal hold adjustment dial.
Use	Never force a plug into an input/output port. Monitors are hardy devices that require little care beyond general maintenance and commonsense treatment.

Audio Devices

Introduction Audio devices provide sound to a presentation. It maybe a narration, sound effects, or music. A presentation is ineffective if an audience cannot hear it.

Cassette decks Cassette decks provide the dimension of sound to a visual presentation. This music or narration promotes the understanding of the presented material. Cassette tapes are available in 30-, 60-, 90-, and 120-minute increments. You can record information on a cassette tape or use pre-recorded tapes. Some cassette decks require an additional device, called an amplifier, which increases the sound volume before it reaches a set of speakers.

Nomenclature Cassette decks have an on/off power switch, a play button, a record button, a forward/fast forward button, a rewind/reverse button, a pause button, a stop/eject button, and a tape counter. The tape counter is useful when you are cuing sound at a specific time or interval and monitoring the amount of tape expended.

Use To record, most cassette players require you to depress the record button simultaneously with the play button. Take care not to re-record over pre-recorded information. To prevent this, break off the small plastic tab on the side of the cassette cartridge. Clean the tape heads with a head cleaning tape or an alcohol solution and cotton swab after 8 hours of play.

Speakers Speakers transmit sound so that everyone can hear. They use a ground wire and an input wire for connection to a player or amplifier.

Use Place speakers far enough from the amplifier to prevent feedback or squeal. The speakers should remain in front of and facing the audience. Place them out of the way, preferably mounted on the ceiling.

Care Keep the front grill of the speaker box. Replace speakers that have been tom or crushed. Damaged speakers distort sound or buzz and are distracting to the audience. Occasionally, disconnect the speaker and expose fresh wire to reconnect to the terminals. Oxidation of the copper core of the wire will cause the speaker to cut in and out.

Multimedia

Introduction

Sometimes one projector is not enough. When a speaker combines different devices or methods of presentation, it becomes a multimedia event.

Multimedia presentations

Multimedia describes presentations that use several different devices or presentation methods to convey information. Another name for multimedia is media integration. This type of presentation combines information presented in a lecture with slide, films, video, transparencies, or other lecture aids. It may be reactive for which the audience sits and listens, or it may be interactive, whereby the audience is participating as well as listening. The point is to use as many of the human senses as possible to increase audience understanding of the material presented.

Computer interactivity

Computers can coordinate the functions of slide projectors, video projectors, and overhead projectors. They cue each device in sequence and provide special effects that create dynamic and professional presentations. Computers can also present information as a projection device by projecting an image onto an overhead screen or for direct viewing from the computer monitor. Software or programs are available that allow you to create a graphics presentation with sound and project or display that presentation in a classroom or briefing environment. Through international electronic hookups, briefings can link commands all over the world for direct and live transmissions.

Computer Based Instruction (CBI)

Future developments to exploit the training and briefing capabilities of computers include computer based instruction (CBI). Command ESOs will receive Navy training material on disks for rapid distribution to the fleet. You will be able to complete training courses at your computer station in the work space. This interactive learning process will have the twofold benefit of improving your computer skills as well as providing immediate feedback on how well you assimilate the lessons taught in the training program.

Lecture Aids

Introduction	In short, any additional paraphernalia that a speaker uses in the presentation of a program is a lecture aid.
Lectern or podium	A lectern, or podium, focuses the audiences attention on the person delivering the presentation. It also serves to support the speaker's notes for teaching or briefing.
Types	A lectern maybe static, merely a platform the speaker stands behind or near. Lecterns may also be electrified. Lecterns with power options provide the speaker with control over room lights, projection devices, and microphone operation and volume. Some podiums have signal indicators or idiot lights to alert the speaker that the behind-the-scenes crew is experiencing trouble with the presentation.
Care	Keep a lectern clean and in good repair. Do not allow food or drink near the podium, particularly if it is electrified. Place a command logo or Navy emblem on the front of the podium. This may be the first and only impression your command makes on a visiting dignitary or new personnel.
Flannel/felt boards	Flannel/felt boards are large boards covered with felt or flannel material. Lightweight letters and pictures with a slightly abrasive backing stick to the board surface. Use flannel/felt boards for static displays, storytelling, and teaching. Figure 5-7 shows the abrasive backing on an object used on a flannel board.
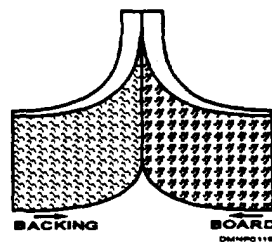
**Figure 5-7.
—Flannel/felt board
and backing.**

Lecture Aids, Continued

Hook and loop boards

Hook and loop boards are similar to flannel/felt boards. The material used to cover the board is a nylon loop material. The material used to cover the back of the objects to stick to the board is a nylon hook material. Objects used on a hook and loop board may be larger, heavier, or have dimension to them because of the strength in the grip of the hook and loop material. This board is used for displays, storytelling, and teaching.

Figure 5-8 shows an enlargement of hook and loop material.

BACKING   BOARD
DMNP0118
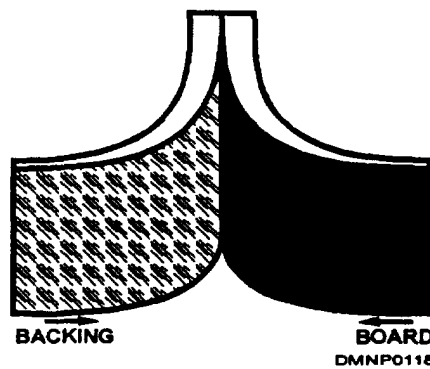
Figure 5-8. —Hook-and-loop board and backing.

Marker board/ multipurpose board

Marker boards are slick surfaced boards that are usually white. Use an erasable marker to write or draw on the surface of these boards. Make sure you use the correct type of marker on this board, as common markers will ruin it. Some marker boards will accept magnets which make them more versatile than flannel boards or hook and loop boards. Marker boards are gaining popularity as status boards, in displays, for teaching, and as a spontaneous briefing tool.

Chalkboards

Chalkboards are becoming rare with the advent of the marker board, but they are still found in classrooms and briefing theaters for storytelling, teaching, and briefing. Only chalk will mark the slightly abrasive surface of a chalkboard. Chalk is available in many colors, and chalkboards are available in green, grey, or black.

Lecture Aids, Continued

Easels   Use an easel when a lecture or brief is short or requires audience participation. Lecture paper pads fit into the top of an easel and are easily tom off and discarded when you complete the brief. When writing on a lecture pad or drawing a chart or diagram, place an extra sheet of paper between the top paper sheet and the next sheet to prevent the marker ink from bleeding through. Write large and legibly on the lecture pad. Make sure the markers are fresh and full of ink before you address the audience.

Figure 5-9 shows an easel with a lecture pad attached to it.

DMNP0120
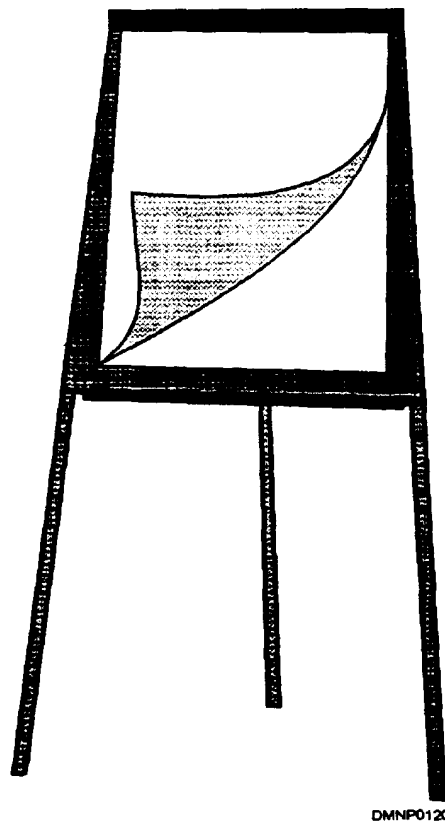
Figure 5-9. —An easel with lecture pad paper.

Screens

Introduction The success of a presentation is greatly dependent on your use of the correct screen in a serviceable condition. In extreme circumstances, however, a light color wall may have to suffice.

Purpose A screen enlarges the image of a slide or transparency projected on it so that it is legible to an audience. The two types of projection screens are the rear projection, and the front projection screens. Rear projection screens are translucent: therefore, the projector is invisible to the audience as it projects an image through the screen. Front projection screens are reflective and reflect the light image off the screen to the audience.

General care Keep a screen clean and free of tears. Protect a screen from abuse and stray chalk or pencil marks. Unless it is permanently freed, roll the screen up and store it properly between use.

Rear projection screens Screens used in rear projection are found most often in permanent theater setups. Many flag staffs have such facilities. Rear screen projection allows the production personnel behind the scenes mobility. It also decreases audience distraction created by the whirling of a projector motor. Most rear projection screens have a matte surface. The image is projected directly on the screen or reflected from large mirrors located behind and at a 45-degree angle to the screen.

Front projection screens Most front projection screens are the reflective type. The four types of screens used for front projection are the lenticular screen, the high gain aluminum screen, the beaded screen, and the matte screen. Select the type of screen most appropriate to the room dimensions and desired angle of projection. They may be portable units that roll or fold up for storage or permanently freed to a ceiling or wall.

Lenticular screens Lenticular screens reflect light evenly including all room light and glare. They appear to have a striped, ribbed, rectangular, or diamond pattern, and they have a coating that gives them an enameled, pearlescent, granular, or smooth surface. Lenticular screens have a 70-degree width by 20-degree height angle of projection and are brighter than beaded and matte screens.

Screens, Continued

High gain aluminum screens	The high gain aluminum screen is a fill-contrast screen that is six times brighter than any other screen. This is a noncollapsible, slightly concave screen with a grained or patterned aluminum foil laminate. It rejects room light and glare. Use a high gain aluminum screen in a normally lighted room. The angle of projection is 60-degree width by 30-degree height.
Beaded screens	Beaded screens have a very bright image. The image is reflected from a white surface covered with embedded or attached clear glass beads. A beaded screen will reflect all light including stray light and glare. Its 22-degree angle of projection make it useful in long, narrow rooms.
Matte screens	Matte screens appear equally bright from all angles because they diffuse light evenly in all directions. Their dull, matte surface may be dark grey to white in color. They have a 30-degree angle of projection useful in wide, shallow rooms.
Selecting a screen	Before selecting a screen, consider the factors associated with the room you will be using the screen in. Consider the width and length of the room and the size of the audience, and the angle of projection of the screen.

Screen, Continued

Selecting a screen (Continued)

Figure 5-10 illustrates the differing angles of projection for each type of screen.
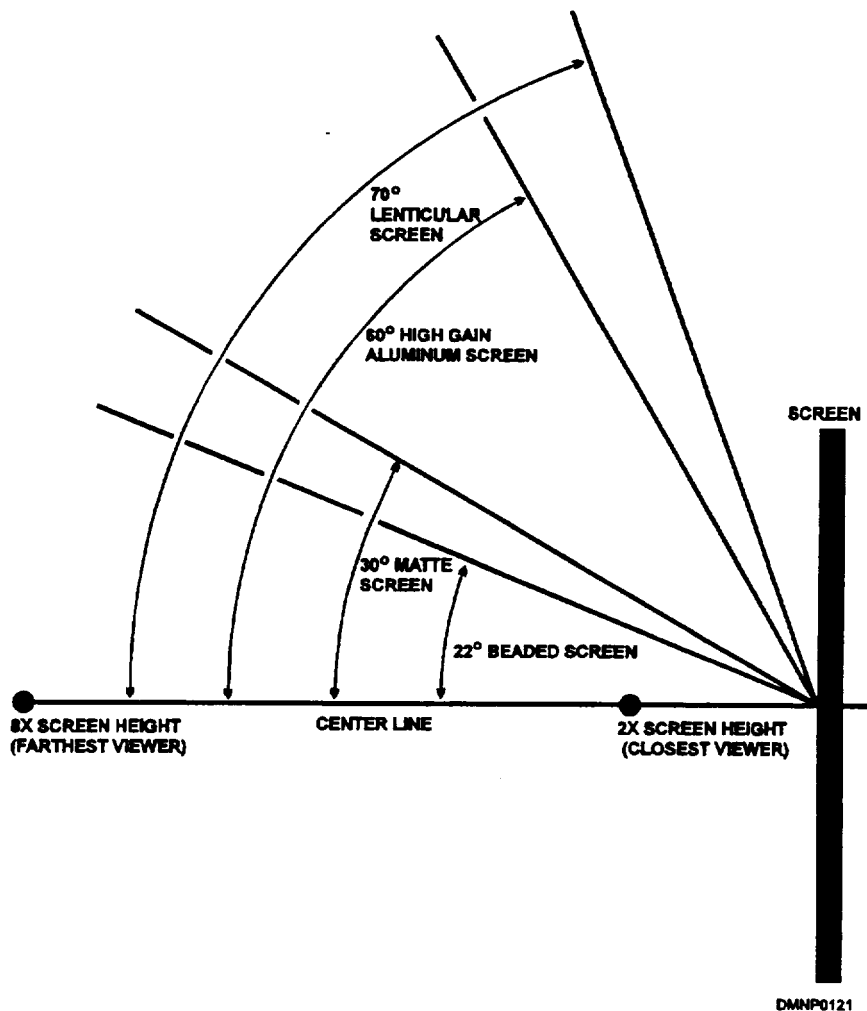
Figure 5-10. —Angle of projection.

Screen, Continued

Screen placement

Consider the room size, the size of the audience, and the location of the windows, the doors, and the speakers before selecting a screen location. Seat the audience no closer than two screen heights from the screen, and no farther than eight screen heights back away from the screen. Position all projectors to project an image over the heads of the audience. To prevent keystoning, tilt the screen until the distortion disappears.

Figure 5-11 shows the position of the audience and projectors in relation to the screen.
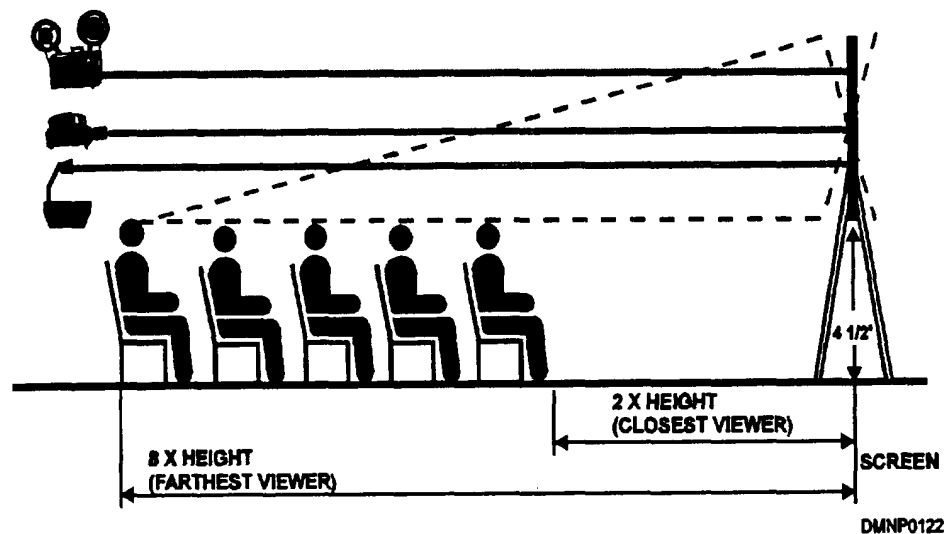
Figure 5-11. —Screen position.

Screen, Continued

Keystoning Keystoning appears when the projector lens is not perpendicular to the screen or deck. The distorted image appears as a wedge shape. To correct the keystone effect, tilt the screen toward the projector on the end displaying the smallest part of the wedge.

Figure 5-12 shows the keystone effect.

KEYSTONING   CORRECT

DMNP0123
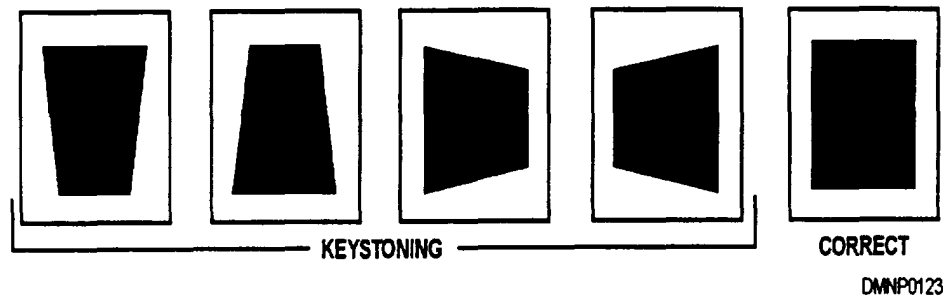
Figure 5-12. —The keystone effect.

Briefing Theater

Introduction
Nothing is more impressive to an individual than walking into a new command for a presentation and seeing a state-of-the-art presentation theater. It is especially awesome to have the presentation flawlessly executed.

Purpose
Few commands are fortunate enough to have a room specifically designated as a briefing theater. Many commands have conference rooms and classrooms. In each instance, this is a space set aside for the specific purpose of teaching, briefing, meeting, or holding mast. This room warrants special consideration for cleanliness and material condition, as it is sometimes the frost and only contact someone may have with a command.

Theater environment
A briefing theater, or any room used as a classroom or conference room, should be quiet both inside and outside. Sound-absorbing material inside the room lessens equipment noise and voices speaking at enhanced volumes. Upholstered furniture, drapes, and carpeting all absorb sound to varying degrees. Prohibit loitering outside the theater and post passageway signs requesting silence. Noise from outside is distracting to those inside the theater trying to concentrate on a speaker.

Temperature
The temperature in the briefing theater should be controllable. Keep the room cool without coldness. Overly warm temperatures lull the audience into slumber. Air should circulate regularly and often, particularly if the theater is full.

Lighting
Use lighting dramatically in the theater. Light the theater in three distinct stages: before the presentation, during the presentation, and after the presentation. Locate lights above the speaker, in front of the screen, over the audience, and in the back of the room. Locate light switches near exits, on the podium, and in the projection booth. Light switches maybe on/off switches or dimmer switches.

BEFORE THE PRESENTATION: Before the presentation begins, turn the lights on over the audience. Once the audience is seated, the lights over them go out and the lights behind them, in front of the screen, and over the speaker go on.

**Lighting
(Continued)**

DURING THE PRESENTATION: After the welcoming of the audience and the introduction of the speaker, the lights in front of the screen are turned off to prevent glare on the screen and interference with the contrast of the projected image. The light on the speaker remains on as does the light in back of the audience. This remaining light slightly lessens the contrast of the projected image reducing eyestrain, providing light for note taking, and creating a social ambience within the theater.

AFTER THE PRESENTATION: After the presentation, the lights behind the audience are turned off, the lights above the audience are turned on, the light on the speaker remains on, and the light over the screen remains off.

Figure 5-13 shows the position of lights in the briefing theater.
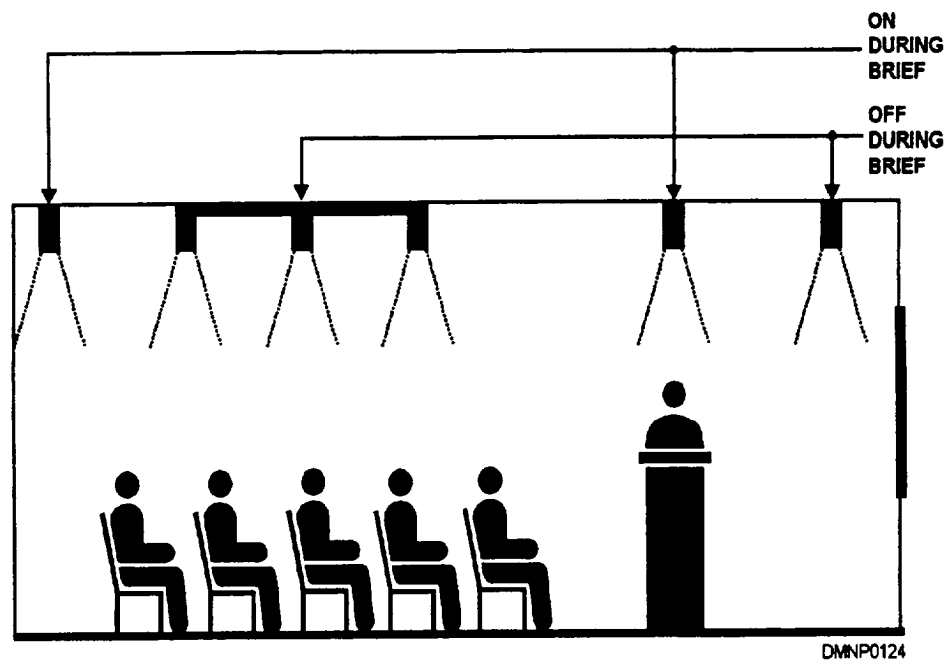
Figure 5-13. —Lights in a briefing theater.

Briefing Theater, Continued

Speakers

Place the speakers in the theater in front of and facing the audience. Place the speakers as far forward of the lectern as possible to prevent squeal or feedback. Make sure the speaker wire does not present a trip hazard.

Facilities

Make sure the briefing theater, conference room, or classroom is near head facilities. If gedunk machines or a smoker's lounge are nearby, so much the better. Presentations run smoother and on time when breaks are adequate and convenient.

Scheduling

Only one division should be responsible for assigning and scheduling the conference room or briefing theater. Establishing a priority method for scheduling will eliminate conflicts. The individual responsible for scheduling should conduct a pre- and post-presentation inspection for cleanliness and material condition. Discourage loitering and impromptu meetings; keep the presentation room locked when it is not in use. Field day the briefing theater as part of the normal field day routine.

Mechanical environment

The equipment, seating, and type of projection you use in the briefing theater is part of the mechanical environment of the room. Your failure to maintain ready equipment disables the command's ability to communicate.

Equipment

Not only is the type of equipment and its material condition important, but so is the placement of the equipment and how much noise it produces. Select the equipment that best suites the room and audience size. For front projection, position the equipment so that it projects over the heads of the audience. Stagger the projectors in a projection rack to allow multimedia capability. For rear projection, if you have the room, position the projector to project directly onto the screen. If space is limited, reflect the light from a mirrored surface at a 45-degree angle to the screen.

Briefing Theater, Continued

Equipment (Continued)

Figure 5-14 shows equipment positions for front and rear screen projection.

FRONT PROJECTION

REAR PROJECTION

DMNP0125
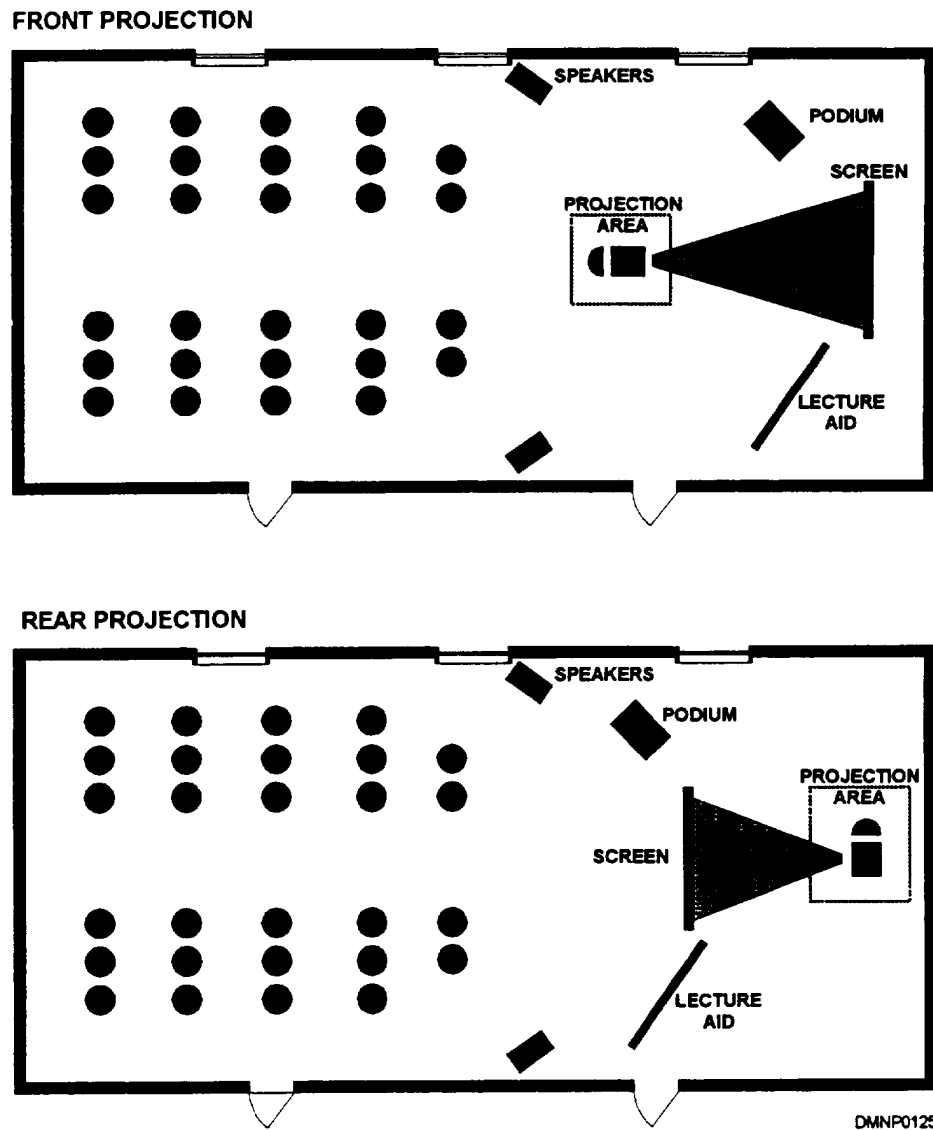
Figure 5-14. —Equipment positions.

Briefing Theater, Continued

Seating
Often, the seating type and arrangement already existed before you arrived at the command. Carefully assess the seating in the briefing theater. The audience should be no closer to the screen than twice the screen width and no farther from the screen than eight times the screen width. All seats should be within the purview of the angle of projection for the screen in the briefing theater. Seats should be comfortable without being plush. Seats should face forward except in a briefing theater where the flag staff or dignitary seating should have the ability to rotate.

Lectern
Place the lectern in front of and to one side of the screen. The lectern should not interfere with the audience view of the screen. If the speaker uses any lecture aids, such as an easel or marker board, place them on the opposite side of the room, angled toward the audience, and not obstructing the audience's view of the screen.

Projection area
The area used to setup the projection devices is the projection area. Restrict free movement through this area to minimize trip hazards and possible damage to the machines and machine connections. In some commands, this projection area is an enclosed booth; in others, it is no more than a mobile rack in the back of a room or a projector on the end of a large table.

Summary

Review

This chapter covers the operation and maintenance of common audiovisual projectors, such as the opaque projector, the overhead projector, and the slide projector and their accessories. It also briefly covers audio devices, video cassette recorders, and video projectors. The topics of screen selection and the set up of a briefing theater or conference room complete this chapter.

Comments

One of the most interesting, demanding, and rewarding DM billets is that of a briefing draftsman or draftsman attached to a flag staff. Nowhere else are your professional abilities and customer service skills challenged and scrutinized daily, and nowhere else are your creative talents more highly visible by personnel in the upper echelon. These pressurized billets provide immediate job satisfaction in the form of a daily summary or conference. Another rewarding duty is at a teaching or educational command. Good students quickly spot poor graphics or illogically planned visuals. Poor visuals and poorly presented visuals distract, irritate, and impair communication. Understand what you are illustrating. Understand the effect your artwork has in the long haul. Know how to best communicate the message. If you do not, you have missed the point of visual communication. Think about the message the visual must convey and the method of presentation before creating the visual.

APPENDIX I
GLOSSARY

Glossary

Introduction	One important key to success in any technical rate is the language associated with it. Learn the glossary as an integral part of your learning process. Use the terms other professionals are using in your field.

A	**ACCENT LIGHT—** A light that highlights or emphasizes the subject in a scene.
	ACETATE— Tough, transparent, or semitransparent sheets available in various thicknesses used as overlays in color separation, friskets in retouching, eels for animated drawings, and displays. Treated acetate readily accepts ink and paint.
	ACHROMATIC— Black, white, and the grays in between.
	ACRYLIC PAINTS— *See* POLYMER.
	ACTINIC LIGHT— The short waves of the light spectrum (green, blue, and ultraviolet) that cause chemical changes in light-sensitive photographic emulsions.
	ACTION LINES— Extra lines drawn around or following a cartoon figure or object to emphasize motion.
	ACTIVATOR— The solution or chemical that starts the reaction of the developing agent in a photosensitized emulsion.
	ADDITIVE PROCESS— A process that produces white light by starting with darkness and combining colored light.
	ADHESIVE— (1) A gelatin or casein used as a binder in pigment; (2) A chemical compound used as a glue.

Glossary, Continued

A (Continued)

ADVANCING COLORS— Colors that appear to come forward, such as red, yellow, and orange.

AESTHETIC— Pertaining to the beautiful, particularly in art.

AGATE— Type size of 5 1/2 points.

AIRBRUSH— An atomizer that applies a fine spray of paint under pressure from a tank of compressed air or carbonic gas.

AIRBRUSHING— Using an airbrush to create art or improve the appearance of art.

ANALOGOUS COLORS— Colors closely related to one another on a color wheel, such as blue, blue-green, and green.

ANATOMY— The bone and muscle structure of humans and animals as it affects the appearance of surface forms and contours.

ANGLE— A figure formed by two lines or planes extending from, or diverging at, the same point.

ANHYDROUS AMMONIA SYSTEM— A system that uses a mixture of water and ammonia in the developing section of some whiteprint machines.

ANILINE COLORS—Brilliant colors derived from coal tar that tend to fade in time.

ANIMATED CARTOON— A cartoon drawn in a series of progressive actions to give the effect of continuous movement.

ANIMATION— Sequentially drawn pictures displaying a range of motion which, when viewed in rapid sucession, appear to be moving.

ALIGNED SECTION— A sectional view that revolves some internal features into or out of the plane of view.

Glossary, Continued

A (Continued) **AMERICAN STANDARDS ASSOCIATION—** *Also called* ASA. *See* ISO or EXPOSURE INDEX.

ANTIQUE STOCK— A rough-surfaced paper, such as wove or laid.

APERTURE— An opening behind the lens that allows exposure to one frame of film.

APPLICATION BLOCK— The part of a drawing of a subassembly, showing the reference number for the drawing of the assembly or adjacent subassembly.

ARC— A portion of a curved line.

ARC LAMP— A light source resulting from the application of current to two carbon electrodes that form an electric arc.

ARCHITECT'S SCALE— A scale used when dimensions or measurements represent feet and inches.

AREA (PICTURE)— The flat surface within the border of a picture.

ARROWHEAD— An indicator shaped like an elongated triangle used at the end of a lead line to direct attention to an object or a point of reference.

ART— Any copy other than text; any photograph, painting, or drawing in line, halftone, or continuous tone.

ART BRUSHES— *See* BRUSHES.

ART GUM— A soft, grit-free eraser used to clean drawings and remove unwanted pencil lines.

ARTIST'S BOARD— *See* ILLUSTRATION BOARD.

ARTWORK— Illustrations, drawings, photographs, renderings, paintings, sketches, and copy.

Glossary, Continued

ASCENDERS— The part of lowercase letters that project above the main body waistline, such ash, d, and f.

ASPECT RATIO—The proportion of the media format that governs the size of the original artwork.

ASSEMBLE EDITING—Putting scenes in chronological or progressive order.

ASYMMETRICAL— An informal balance of objects or sections of equal mass and weight on each side of a center line.

ATTITUDE— A position or action of the body or part of the body that approximates an emotion, character, or personality.

ATTRIBUTES OF MEDIA—Specific characteristics of a chosen medium.

AUDIO— Sound that is heard.

AUDIO-TUTORIAL— *Also called* AT. Instructions given to a student that uses primarily sound.

AUDITABLE PICTURE ADVANCE SIGNAL—An auditable signal that indicates the moment to change the image to another.

AUTO-TRACE— A software option that allows the tracing of one image into another file option.

AUXILIARY VIEW— A drawing showing the true shape of objects that have features not parallel to the three principal planes of projection.

AXONOMETRIC PROJECTION—A drawing that shows the inclined position of an object in an isometric, dimetric, or trimetric format.

BACKGROUND ART— Design, texture, pattern, or other form of artwork used to create a background effect for type and illustration.

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B (Continued)	**BACKUP—** The registration of two sides of a printed sheet.

BALANCE— A harmonious arrangement of the various components in a picture plane in a symmetrical (formal) or asymmetrical (informal) format.

BALL-AND-SOCKET JOINT— A flexible joint that rotates in all directions.

BALLOON— (1) A space containing the words spoken by cartoon characters; (2) A distortable shape used as a base to draw a cartoon head.

BALLOON LETTERING— Informal, single-stroke lettering used in comic strip balloons.

BAR CHART— A graphic representation comparing numerical values by means of rectangles of equal width.

BASE ART— *Also called* BASIC ART and BLACK ART. *See* BLACK ART.

BEADED SCREEN— A screen comprised of glass or plastic beads that reflect light from a projected image.

BEAM COMPASS— A compass capable of drawing circles and' arcs that exceed the limits of a standard compass.

BEND ALLOWANCE— An additional amount of metal used in a bend in metal fabrication.

BENDAY— Mechanical shading applied to artwork to give a variety of tones to line drawings. Benday is named for its inventor, Benjamin Day.

BÉLZIER CURVES— A computer tool that draws precise curves with great accuracy.

BILL OF MATERIALS— A list of standard parts or raw materials needed to fabricate an item.

B (Continued)   **BINDER—** An adhesive, coagulate, reducer, or extender added to pigments to maintain consistency, to promote adhesion, and to facilitate application.

BISECT— To divide into two equal parts.

BIT– The smallest unit of electronic information a computer can handle.

BIT MAP— *Also called* PIXEL MAP. A matrix of dots or pixels.

BLACK ART— *Also called* BASE ART. Art used in making process plates for illustrations of two or more colors.

BLACK-AND-WHITE— (1) Line art executed in a black-and-white medium only; (2) Continuous-tone art executed in black, white, and intermediate tones.

BLACK PATCH— A black masking patch pasted into the exact size and location on artwork where a photograph is to appear on the reproduction copy.

BLEED— The borders on the artwork and printing plate that extend beyond the final trimmed edge of the sheet.

BLENDING— Mixing or incorporating one color or tone with another.

BLOCKING IN— Indicating the broad outline of an object or shapes in a picture using preliminary lines.

BLOCK OUT— Elimimting an unwanted section of a picture.

BLOWUP— An enlargement.

BLUEPRINT— A direct, positive print made on chemically treated paper from a translucent or transparent drawing.

BOARD— Any heavy material used for mounting art or making displays.

Glossary, Continued

B (Continued)

BOARD ART— Any artwork mounted on heavy board stock.

BODY TYPE— Type used for the main body of text in printed matter.

BOLDFACE— Type emphasized by darkening or increasing letter weight.

BOOKLET— A pamphlet bound within paper covers.

BOOT-UP— Start-up of the computer.

BONE— An instrument with a plastic, agate, or metal tip used for burnishing shading sheets, pressure-sensitive letters, and paste-ups.

BORDER AREA— The areas around a graphic that represents a protective perimeter.

BOUNCE LIGHT— Lighting set up to reflect from nearby surfaces onto a subject.

BOURGES PROCESS— A method of color separation using prepared colored or toned papers or acetate sheets.

BOW INSTRUMENTS— Drafting tools that draw circles and arcs less than one inch in diameter.

BOX— To enclose with borders or rules.

BREAK LINE— Lines to reduce the graphic size of an object, generally to conserve paper space.

BRIEFING CHART— Also *called* BRIEFING PAD. A visual aid that presents information on large paper or board.

BRIGHT— A short haired, flat, chisel-shaped brush.

BRISTLE.— A hog hair brush used primarily in oil painting.

B (Continued)   **BRISTOL BOARD—** A drawing surface made of fine, tough, flexible cardboard available in several thicknesses and in a variety of surfaces.

BROADSIDE— *Also called* BROADSHEET. A large, folded advertising piece.

BROCHURE— A bound pamphlet.

BROKEN COLOR— Two or more colors applied simultaneously to artwork without prior mixing or blending.

BROKEN OUT SECTION— An auxiliary view used when a partial view of an internal feature is insufficient.

BROWNPRINT— A photographic print or silverprint that produces a brown image.

BRUSHES— A collection of bristles or hairs used to apply pigment and glues.

BULLET— A symbol (●) used to preface listed items.

BURNISH— The application of pressure to secure paste-ups, shading sheets, and lettering to artwork.

BURNISHER— *Also called* BONE. An instrument made of plastic, wood, glass, metal, stone, or ivory used to flatten, smooth, or polish a surface with hand pressure.

BUSY— Excessive or competing detail.

BUTTON BAR— *Also called* TOOL BOX. A program specific legend of options available to a computer user.

C	**CABINET PROJECTION—** A type of oblique drawing with the angled receding lines drawn to one-half scale.
	CALLOUT— To call attention to a part or item in an illustration.
	CAMCORDER— A video camera and recorder in one unit.
	CAMEO PAPER— Paper of a dull, smooth finish used frequently for carbon and graphite pencil drawings.
	CAMERA LUCIDA— *Also called* LACEY LUCY. An instrument with prism lenses used for enlarging or reducing artwork.
	CAMERA-READY COPY— *See* REPRODUCTION COPY.
	CANVAS— A surface made of cloth, usually cotton or linen, for painting.
	CANVAS BOARD— Cardboard covered with cotton or linen used as a surface for painting.
	CANVASKIN— A paper with a textured surface resembling canvas.
	CAPTION— Any descriptive heading or title for an illustration or table.
	CARBON PENCIL— Pressed carbon in a wood casing.
	CARICATURE— The deliberate exaggeration and distortion of prominent features or mannerisms.
	CARPENTER'S PENCIL— A wide, flat lead pencil ideal for chisel point lettering or laying in broad tones.
	CARTOON— A comic or satiric drawing.
	CARTOUCHE— A scroll-like design used ornamentally in printing or hand lettering.

C (Continued)   **CASEIN—** A curd of milk and lime used as a binder in tempura paint.

CAVALIER PROJECTION— A form of oblique drawing with the receding lines drawn full scale at 45° to the orthographic front view.

CD– *See* COMPACT DISK.

CD ROM– *See* COMPACT DISK READ—ONLY MEMORY.

CEL— Acetate overlays used in television art and animation.

CEL LEVEL— The number of eels placed one over another on the same background and photographed at the same time.

CENTER DISK— A drafting instrument that protects the paper surface from damage when drawing multiple concentric circles with a compass.

CENTER OF INTEREST— The part of the picture that attracts the most attention.

CENTER LINE— Lines that indicate the center consisting of alternating long and short dashed evenly spaced.

CENTER SPREAD— Two facing pages formed by one folded sheet of paper.

CENTRAL PROCESSING UNIT— *Also called* CPU. The integrated circuit (IC) chip that controls the speed and processing power of the computer.

CHAIN or CIVIL ENGINEER'S SCALE— A scale, generally triangular, divided in decimal units or units of 10.

CHARACTER— Any letter, number, punctuation mark, or space in printed matter.

Glossary, Continued

C (Continued)   **CHARACTER GENERATOR—** A computer hardware or software device that provides a means for formulating a character font and as a controlling function during printing.

CHARCOAL— Specially charred willow sticks used for drawing on a paper with tooth.

CHARCOAL DRAWING— A drawing made with charcoal.

CHARCOAL PENCILS— Charred willow sticks encased in wood for strength.

CHIAROSCURO— Rendering forms using a balanced contrast between pronounced light and dark elements.

CHINESE WHITE— An opaque white watercolor pigment.

CHISEL POINT— Drawing or lettering with a wide, flat point.

CHOKES— Used to trap a dark element over a light background to avoid or minimize white space showing around the element during press plates misalignment.

CHROMA— *See* INTENSITY,

CIRCULAR SCREEN— A photographic screen used with a process camera, which allows screen adjustment to eliminate the wavelike or checkered effect, called moire.

CIRCUMFERENCE— The length of a line that forms a circle.

CIRCUMSCRIBED— To draw around or enclose within one geometric form another form or object.

CLICK ON— To select a computer function by clicking the buttons on a mouse.

C (Continued)   **CLIP ART—** A collection of artwork filed away for future use.

CMYK— An acronym for cyan, magenta, yellow, and black, a color specification system for color separation and printing.

COATED PAPER— Paper coated with a finely ground filler or clay to produce a smooth surface.

COBALT DRIER— A liquid agent used in a medium to accelerate the drying of oil paints.

COLD COMPOSITION— Composition of type that uses no molten metal to form the image.

COLD MOUNT— A method of mounting artwork or photographs to a surface.

COLD PRESSED— A paper or illustration board with a medium to rough surface texture.

COLLAGE— Artwork made by arranging and pasting pieces of cloth, newspaper, and various other materials on a surface to form a composition.

COLLATING— Gathering single sheets or leaves in sequence.

COLLOTYPE— A method of reproducing paintings and drawings using a gelatin plate.

COLOR— A sensation caused by light waves of different lengths comprised of three elements: hue, value, and intensity.

COLOR BARS— Bars of color that appear on a video screen to facilitate fine tuning of the color resolution.

COLOR BLENDING— Blending or combining different colors to form another color or smooth gradient.

C (Continued)   **COLOR CHART—** An arrangement of colors.

COLOR CYCLING— A spectral effect that creates the illusion of movement on the computer screen.

COLOR DIMENSIONS— The three elements of color: hue, value, and intensity.

COLOR GRAPHICS ADAPTER BOARD— *Also called* CGA or a Video Graphics Adapter (VGA). This IC chip defines the ability of the computer to execute commands during the creation of artwork in the computer.

COLOR HARMONY— A unified or aesthetically pleasing effect produced by a combination of colors.

COLOR INTERVAL— The degree of visual difference between two colors as measured by hue, value, and intensity.

COLOR KEY— The overall effect of the selected pallette, for instance, a high-key illustration of light, bright or vibrant color and a low-key illustration of dull or monotonous colors.

COLOR NOTATION— The specification of color by written symbols and numerals based on an established color system used on sketches for future reference.

COLOR PROOF— An engraver's or printer's proof showing the effect of final color in perfect registration.

COLOR SCALE— A series of colors that display a change or gradation in hue, value, and intensity.

COLOR SCHEME— A group of colors that dominate a picture or create a unity within it.

C (Continued)   **COLOR SEPARATION—** (1) The photographic process of separating full-color originals into the primary printing colors; (2) An artist manually separating the originals for full color reproduction in the creation stage of a master artwork.

COLOR SKETCH— A rough drawing or layout approximating the color in the final picture.

COLOR SYMBOLISM— The use of color to signify or suggest an emotion, idea, or characteristic.

COLOR WHEEL— A circular color chart with colors arranged according to their positions as a primary, secondary, or tertiary color.

COLUMN— (1) A section of text or other matter that makes up a vertically divided page; (2) A vertical section of a table.

COMBINATION PLATE— A press plate that combines both halftones and line work.

COMIC STRIP— A series of drawings, in panel format, portraying the adventures of characters, humorous or otherwise, usually published in newspapers.

COMMERCIAL ART— Artwork of any kind prepared for commercial advertising and general promotion.

COMPACT DISK— Also *called* CD. A small disk of electronic files encased in a plastic casing.

COMPASS— An instrument for drawing circles and arcs.

COMPUTER DISPLAY MONITOR— An output device that allows the computer operator to see an image of electronic media on a cathode-ray screen similar to a television monitor.

Glossary, Continued

C (Continued)   **COMPUTER PLATFORM—** The use of a particular brand of computer to develop software programs specifically for that brand.

COMPLEMENTARY COLORS— Any two opposing hues on a color wheel.

COMPOSITE— Comprised of two or more parts.

COMPOSITION— The arrangement of forms, colors, lines, and other pictorial units.

COMPOSITOR— A machine that converts electronic data into an acceptable format for a printer.

COMPREHENSIVE— A layout of art or type, either in black-and-white or color.

COMPREHENSIVE SKETCH— A finished layout that defines all of the elements, such as type, illustration, and spacing.

COMPRESSED FILES— Compacting computer-generated files to save disk and memory space or to facilitate faxing.

COMPUTER GRAPHICS— Artwork created by the use of a computer.

CONSTRUCTION— The drawing of objects so that they appear solid or three dimensional.

CONSTRUCTION LINES— Lightly drawn lines used in the preliminary layout of a drawing.

CONTACT SCREEN— A screen placed in direct contact with the film or plate to obtain a halftone pattern from a continuous-tone original.

CONTINUOUS-TONE ART— Artwork created using any medium that does not use a halftone process to represent tone.

Glossary, Continued

C (Continued)   **CONTOUR PEN—** Adjustable pen nibs on a rotatable shaft used for drawing curvilinear lines.

CONTRAST— The range of tonal differences.

COOL COLOR— Colors that appear to project cooler temperatures.

COOLED COLOR— A color resulting from the addition of a cool color to a warmer color.

COPY– Any matter, including photographs, rules, designs, and text, used for producing printed matter.

COPYBOARD— A table or frame that holds original copy during a photographic exposure.

COPYFIT— Scaling copy to fit into an allotted space.

COPYRIGHT— Exclusive protection of ownership given to a creator of an original work.

COQUILLE BOARD— A drawing board that comes in a variety of roughened surfaces that break up crayon or brush strokes into texture more suitable for line reproduction.

COURSEWARE— All materials pertaining to a software program or course of instruction.

CPU— *See* CENTRAL PROCESSING UNIT.

CRAWL DEVICE— A rotating drum used to display credit lines for television transmissions.

CREMNITZ— *See* WHITE LEAD.

CROP— To cut Off.

C (Continued)	**CROP MARKS—** Marks used to define the limits of an image for reproduction.

CROPPING— Defining the limits of an image for reproduction.

CROSSHATCH— Parallel lines drawn across other parallel lines to indicate tone.

CROW QUILL— A fine, stiff pen nib with little spring used for drawing fine lines and lettering.

CRT— *Also called* CATHODE-RAY TUBE. A screen or monitor that converts light rays to electrical impulses for transmission or receiving.

CUBE— A solid form of six equal square sides.

CURSOR— A position indicator on a computer monitor.

CUTAWAY DRAWING— A drawing where a portion of the object is cut away revealing the internal structure.

CUTLINE— The placing of a caption in an illustration.

CUTTING PLANE LINE— A sectional view showing a theoretical cut on the item.

CYAN— Light blue-green color,

CYCLE OF ACTION— The completion of a single action of animated movement.

D	**DAISY WHEEL PRINTER—** A spinning wheel with spokes having raised letters and numbers.

DAMAR FINISH— Varnish used as a final protective coat over a painting or mixed as part of the painting medium.

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D (Continued)   **DATA POINTS—** Symbols used to plot information or events on a graph or chart.

DATUM LINE— A line that indicates the position of a datum plane.

DEADLINE— Final delivery date.

DEBUGGING— Locating and eliminating software deficiencies.

DECAL— *See* DECALCOMANIA.

DECALCOMANIA— An image printed on specially prepared paper or film for transfer to another surface.

DECKLE EDGE— The rough or uneven edge of paper intentionally produced during manufacturing.

DELINEATE— To give depth to line art by making particular lines heavier.

DENSITY RANGE— *Also called* DENSITY SCALE. Measured differences between the minimum and maximum densities of a particular negative or positive.

DEPICT— To represent.

DEPTH— Thickness as measured downward from the surface of an object.

DEPTH OF FIELD— The distance between the closest sharply focused point to the farthest point in focus.

DESCENDERS— The parts of lowercase letters that fall below the main body base line, such as g, p, and q.

DESIGN— A planned or intended arrangement of the elements in a composition.

DESIGNER'S COLORS— Opaque watercolors of high quality.

D (Continued) **DESKTOP PUBLISHING—** The preparation of copy ready to go directly to press.

DETAIL DRAWING— A drawing that gives specific information.

DETAIL PEN— *Also called* SWEDE PEN. Abroad nibbed, adjustable ruling pen with greater ink capacity than a standard ruling pen.

DETAIL VIEW— A view that shows part of the principal view of an item using the same plane and arrangement but in greater detail and in a larger scale.

DEVELOPER— A chemical that causes a reaction in an exposed emulsion to reveal an image in that emulsion.

DIAZO FILM— A flexible transparent base coated with an emulsion of diazo salts and couplers.

DIAZO PAPER— Paper treated with a diazo compound and azo dyestuff component.

DIAZOCHROME— Diazo sensitized films that produce colored dye images on a transparent plastic base.

DIFFUSED LIGHT— Evenly spread light.

DIMENSION LINE— A thin, unbroken line with each end terminating in an arrowhead used to define the dimensions of an object.

DIMETRIC PROJECTION— An axonometric projection of an object where two axes make equal angles with the plane of projection and the third axis makes a smaller or larger angle with the plane of projection.

DINGBATS— Stars or ornaments used to embellish type.

DISCHORD— Color or elements that compete or are not in visual harmony that creates an uneasy or unattractive image.

D (Continued)

DISK– *Also called* DISC. (1) A flat photomatrix used in phototypesetting and computer equipment; (2) A layer of magnetic oxide used to store electronic data.

DISK DRIVE— A device that reads, adds, or deletes information stored on a disk.

DISPLAY LETTERING— Any large, prominent lettering used to attract attention.

DISPLAYS— A collection of objects and images arranged to tell a story.

DISPLAY TYPE— Large type used for headings and titles.

DISSOLVE— The fading of one scene as another replaces it,

DISSOLVE UNIT— An electronic device that automatically pulses a slide projector to dissolve an image and replace it with another.

DISTORTION— Changed or twisted out of natural shape,

DIVIDERS— An instrument used for dividing lines into equal segments and transferring measurements.

DOMINANT— Prominent or most important.

DOT MATRIX PRINTER— A printer that uses a number of pins to form letters and numbers.

DOTS PER INCH— *Also called* DPI. A standard measurement for resolution in the computer graphics industry.

DOUBLE-ACTION AIRBRUSH— An airbrush that requires the user to push down a button to expel air through the brush and to pull back the button to release paint.

Glossary, Continued

DRAFTING MACHINE— A machine that combines the functions of a T-square or straightedge, a triangle, a ruler, and a protractor.

DRAWING— The representation of objects, ideas, or emotions on a flat surface using line, tone, or color.

DRAWING THROUGH— Sketching in the structural lines of an object as if it were transparent.

DRIER— A substance used to hasten the drying times of paint or ink.

DROP CARDS— Drop-out or drop-in title cards rigged to fall in and out of camera view.

DROP OUT— Masked or opaqued areas present in the halftone negative, print, or plate.

DROP-OUT HALFTONE— A halftone reproduction that eliminates the screen dots in white areas, often accomplished photographically by the platemaker or by re-etching.

DRY BRUSH— Drawing or painting with a brush that contains very little substance to create a textural effect.

DRY MOUNT— Mounting photographs without paste or rubber cement.

DRY MOUNTING PRESS— An electrically heated press that activates an adhesive sheet or foil placed between the image and the illustration board.

DUCK— A lead weight used to position a spline while drawing irregular curves.

DUMMY— A rough draft or proposal of printed material pasted or bound together in exact reproduction size that show the areas illustration and text will occupy.

DUOTONE— Two-color halftone print made from a screened photograph.

E	**EARTH COLORS—** Pigments made from earth minerals.
	EDGE— The border or outline of a form or shape.
	EDIT— To check, add, or delete.
	EDIT CONTROLLER— A machine that locates the beginning and end of a scene used for cueing VCRs for presentation.
	EGGOIL TEMPERA— An opaque watercolor similar to egg-based tempura but with an added oil that makes the medium easier to handle and adaptable to a wider range of effects.
	EGG TEMPURA— An opaque watercolor paint that uses egg yoke as a binder.
	ELECTRONIC IMAGING— The creation, enhancement, and alteration of images through electronic or computer digitization.
	ELEVATION— A four-view drawing of a structure showing front, sides, and rear.
	ELITE— A type size for typewriters approximating 10 point printing type having 12 characters to the linear inch of copy and 6 lines to the vertical inch.
	ELLIPSE— The enclosed plane forming a regular oval where the shortest dimension through the center is the minor axis and the longest dimension is the major axis.
	EM— A measure of type equal to the square of the type body, derived from early type practices in which the letter *M* was cast on a square body.
	EMPHASIS— Stress or accent on any part of a design or picture.
	EMULSION— A suspension of fine drops or globules of one liquid in another liquid.

E (Continued)

EN– A measure of type equal to one half of an EM.

ENCRUSTING— Taking a video image and wrapping it around an image of an object.

ENGINEERING DRAWING— An orthographic drawing of a piece of equipment or of its detailed parts containing information and instructions sufficient for manufacture.

ENGINEER'S SCALE— A scale used whenever dimensions are in feet and decimal parts of a foot, or when a scale ratio is a multiple of 10.

ERASING SHIELD— A small, thin spring metal plate with variously sized and shaped openings used to protect the surrounding area of a drawing while erasing in an adjacent area.

ESSENTIAL AREA— The part of a picture that contains all of the title or lettering intended for viewer consumption and often corresponding with the safe title area.

EQUALATERAL— Equal angles and equal sides.

EXPLODED VIEW— A pictorial view of a device in a state of disassembly, showing the appearance and interrelationship of parts.

EXPOSURE INDEX— The degree of light sensitivity of film.

EXPORT— The transfer of files to another software application.

EXTENSION BAR— A leg extension to a standard compass which expands the diameter of a circle that the compass is able to draw.

EXTENSION LINE— A line used to indicate the extent of a dimension.

EYE LEVEL— *Also called* HORIZON LINE. The horizontal plane at the artist's eye level to which that person relates linear perspective.

F

FACE— *Also called* TYPEFACE. A style of type.

FADE-IN— To bring an image from a pale version into full contrast gradually.

FADE-OUT— To bring an image from a full contrast of darks and lights to a pale version gradually.

FEATHER— A bleeding effect where small featherlike indications surround the characters.

FEATURE— A cartoon panel or strip appearing regularly in a publication.

FELT NIB PEN— A drawing pen with a felt nib or tip that ink soaks through from a reservoir.

FERRULE— The part of a brush that holds the hairs or bristles.

FIGURE— A line illustration or photograph of any kind used in a publication.

FILLS— Color, shades, or patterns added to computer-generated imagery.

FILM NEGATIVE— A photolithographic negative produced by a process camera.

FILM POSITIVE— A film- or acetate-based material having a black area or image and a translucent or clear background.

FILM SPEED— The degree of light sensitivity of film.

FINE ART— The personal expression of the artist who creates it.

FINISHED ART— Any piece of artwork complete or ready for reproduction.

FINISH MARKS— Marks used to indicate the degree of smoothness of the finish on machined surfaces.

F (Continued) **FIRST GENERATION—** Photographically reproduced copy made from the original.

FIX— To spray with a clear coat to protect or preserve an image surface.

FIXATIVE— Any clear solution sprayed or coated on a surface to stabilize, protect, or preserve an image.

FIXER— A solution or chemical that stabilizes the development of photosensitized films.

FLEXIBLE CURVE RULE—A scale or rule that bends in shape to irregular curved surfaces.

FLAKE WHITE— *See* WHITE LEAD.

FLANNEL BOARD— *Also called* FELTBOARD. A presentation board covered in felt or flannel that cut out shapes backed with a slightly abrasive backing will cling to.

FLAPPING— *See* MOUNTING AND FLAPPING.

FLAT BRUSH— A flat oil painting brush that is thicker and with longer bristles than the bright brush.

FLAT COLOR— Color that is dull or grayed or has a matte surface.

FLAT TONE— An area of uniform or even color.

FLIP CARD— One of a series of photographs or drawings shown in sequence to tell a story or deliver a message.

FLOP— To reverse from right to left or vice versa.

FLOPPY DISK— A disk of magnetic oxide that stores electronic data for retrieval by a computer disk drive.

Glossary, Continued

FLOW CHART— A chart that shows the flow of data through a data processing system and the sequence of their performance.

FLOUROGRAPHIC— *See* DROP-OUT HALFTONE.

FLUSH— Even with the margin or the widest line in a column or page.

FOCAL POINT— Center of interest.

FOCAL LENGTH— The distance from the center of the lens to the film plane.

FOCI METHOD— A method of drawing ellipses by plotting a series of points as their circumference using two points on the major axis (foci) as reference and connecting these points with french curves.

FOCUS— Image sharpness.

FOLIO— A sheet of paper folded once giving four pages.

FONT— Typeface designs and sizes.

FORESHORTEN— To depict an objector line in less than its true length.

FORM— The shape and structure of an object or figure.

FORMAL BALANCE— *See* BALANCE or SYMMETRY.

FORMAT— A general structure or composition.

F/STOP— Settings on the lens diaphragm of a camera lens that measure the amount of light allowed to reach the film.

F/16 RULE— Setting the camera for an f/stop of f/16 and the shutter speed close to the ASA/ISO rating of the film.

FRAME— A single unit in a storyboard, a cartoon feature or a film strip.

Glossary, Continued

F (Continued)

FRAME GRABBER— *Also called* VIDEO CAPTURE. A device that isolates one frame of a video image and inputs this frame into a computer.

FREEHAND DRAWING— Drawing without the use of mechanical aids.

FRENCH CURVES— Instruments used to draw smooth, irregular curves.

FRESCO— Painting on freshly spread, moist plaster with pigments.

FRESNEL LENS— A intense prismatic lens of concentric divisions, which concentrate and focus light through a transparent image onto a mirror and to a screen in an overhead projector.

FRISKET— A covering placed over part of a drawing or photograph to protect that section while working on the rest of the artwork.

FRONTISPIECE— An illustration preceding and usually facing the title page of a book.

FULL-COLOR PAINTING— A painting in which the three primary colors or some variation of them is evident.

FULL MEASURE— The entire width of a line of type flush with both margins measured in picas.

FULL SECTION— A sectional view that passes entirely through the object.

FULLER'S EARTH— A fine white powder used for preparing the surface of a photograph to accept retouching.

G

GALLEY PROOF— A rough proof of type made for proofreading, submitted before pages are made up.

GANG RUN— Several different jobs printed simultaneously on a large press in the same colors on one sheet to save time and reduce costs.

Glossary, Continued

GANG SHOOTING— Photographing several pages of original copy at the same time.

GELATIN— A pure glue made from animal or vegetable matter.

GENERATION— A single step in a reproduction process.

GIGABYTE— Approximately one billion bytes of information, a kilobyte to the third power (1,024 x 1,024 x 1,024).

GLAZE— An application of a transparent color or value over another color or value.

GLOSSY PRINT— A print having a shiny finish, which does not readily absorb inks or paints.

GLYCERIN— A heavy oil, colorless and odorless, used in the preparation of watercolor pigment.

GOLDENROD— Paper or plastic mask material used to support negatives in making press plates.

GOTHIC— An alphabet or typeface characterized by strokes of equal or almost equal thickness, usually without serifs.

GOUACHE— An opaque watercolor.

GRADED WASH— A wash that blends a light tone to a dark tone or vice versa.

GRADUATED FILL— To fill with color, shade, or pattern that variegates from dark to light or vice versa.

GRAPHIC ARTS— A form of art specializing in work prepared primarily for conveying information.

G (Continued)

GRAPHIC INTERFACE— Screen graphics on the computer screen that make the computer easier to use.

GRAPHICS PRINTER— A high-resolution printer capable of printing graphic images.

GRAPHICS TABLET— An electronic input device that allows the user to draw on the tablet before committing the image to memory.

GRAPHITE— The black marking substance in a lead pencil.

GRAVER— A needle or square pointed tool used to scratch lines into scratchboard.

GRAVURE— A photomechanical printing process (intaglio) with the images recessed below the surface of the plate.

GRAY— A color formed by mixing black and white or complementary colors.

GRISAILLE— A decorative gray monochromatic painting designed to create the illusion of a bias-relief sculpture.

GUM ARABIC— A water soluble gum used as a binder in some watercolors and tempura paints.

GUTTER— (1) The inner margin of a printed page extending from the printed portion to the fold or binding; (2) The area between two columns on a printed page.

H

HALF SECTION— A combination of an orthographic projection and a section view to show two halves of a symmetrical object.

HALFTONE— A tonal pattern of shades from white through black defined by a series of dots.

Glossary, Continued

HALFTONE SCREEN— A screen placed in front of the negative material in a process camera to break up a continuous-tone image into a dot formation.

HARD COPY— Copy of any kind produced on paper or any substrate except film, used for proofing, checking, revising, or redrawing.

HARMONY— A pleasing arrangement of the picture elements, because of the similarity of one or more qualities.

HEXAGON— A six-sided figure.

HIDDEN LINE— Thick, short dashed lines used to show a hidden part or edge.

HIGHLIGHT HALFTONE.— *See* DROP-OUT HALFTONE

HIGH SURFACE— *See* HOT PRESSED.

HINGE JOINT— A joint limited to back-and-forth movement.

HOLDING LINE— A line usually drawn in black on a mechanical intended for reproduction.

HOOK AND LOOP BOARD— A briefing board covered with nylon hook material to which items backed with a nylon loop material will stick.

HORIZON LINE— An imaginary horizontal line representing the observer's line of sight.

HOT PRESSED— *Also called* HIGH SURFACE. A smooth art paper or illustration board.

HUE— The name given to distinguish any color.

HYPO— *See* SODIUM THIOSULFATE.

Glossary, Continued

I

ICON— Onscreen computer symbols that portray functions by graphic images.

ILLUMINATION— The hand decoration of text in a book, a manuscript, or a diploma.

ILLUSTRATION— A picture designed to interpret a story or an article.

ILLUSTRATION BOARD— Heavy paper board manufactured especially for artists available in a variety of sizes, surfaces, and weights.

IMAGE AREA— An area that encompasses a printed, drawn, or photographed image and the light or dark background space around the image.

IMPORT — The transfer of files from other software applications.

INDEFINITE BLENDING— Adding paint or ink to a wet surface to promote indefinite effects.

INDIA INK— Pigment made of lampblack and a binder suspended in water as a fluid ink.

INFINITY— The farthest distance marking on a lens.

INFORMAL BALANCE— *See* BALANCE.

INK JET PRINTER— A high-resolution printer that uses a minute jet spray of ink to create an image.

INPUT— Text or parameters entered into a computor memory or saved on disk.

INPUT DEVICE— *See* KEYBOARD or JOYSTICK. An accessory used to provide text or commands into a computer or disk.

INSCRIBED— An object completely enclosed by another.

I (Continued)   **INTAGLIO—** Printmaking from engraved or etched lines and surfaces.

INTENSITY— The degree of strength, saturation, or purity of a color.

INTERFACE— Interaction between accessories.

INTERMEDIATE— A copy of an original on translucent or transparentized film, paper, or cloth, which now becomes a master to make other copies.

IRREGULAR CURVES— Curvilinear forms that do not contain arcs easily replicated by a compass or circle template.

ISOMETRIC PROJECTION— A set of three or more views of an object that appears rotated, giving the appearance of viewing the object from one corner.

ITALICS— Letters whose form has an oblique slant to the right or left.

IVORY BLACK— A fine black pigment.

J   **JOYSTICK—** *See* TRACKBALL or MOUSE. A computer input device used for remote manipulation of a cursor.

JUSTIFICATION— Spacing within the line of type of a predetermined measure to align the margins.

JUXTAPOSITION— Side-by-side placement for a desired effect.

K   **KERN—** Part of a letter that appears as a hairline connection between adjacent letters.

KERNING— The addition of space between characters.

KEY— A scale of values, tones, or hues.

KEY ART— *See* BLACK ART.

Glossary, Continued

KEY LINE— A line drawn in red on a mechanical to indicate position and size of a piece of copy that will not be visible in the reproduction.

KEYBOARD— A computer input device based on the principle of a typewriter keyboard used to input text and commands into a computer.

KEYSTONE EFFECT— Onscreen distortion created when the projector is not parallel to the deck or screen surface.

KID FINISH— A medium-textured surface of art paper or illustration board.

KILOBYTE— Abbreviated as K, a kilobyte is 1,024 bytes of data.

L **LAMINATE—** (1) A transparent plastic or acrylic cover material; (2) To cover a surface with a transparent plastic or acrylic material.

LAMINATION— A plastic or acrylic used to cover a surface.

LAMPBLACK— A very fine black pigment used in various black paints and inks.

LASER— An acronym for Light Amplification by Simulated Emission of Radiation.

LASER PRINTER— A high-resolution printer that uses laser technology to create an image.

LAYING IN— The initial broad application of tone to a picture.

LAYOUT— The arrangement of a book, a magazine, or other publication so that text and illustrations follow a desired format.

LEADING— Spacing between lines of type, measured in points.

LEADER LINE— Thin, unbroken lines used to connect numbers, references, or notes to appropriate surfaces.

L (Continued)

LEAF— A single sheet that includes both sides.

LEAK— An accidental escape of fill color or texture from an objector shape not completely enclosed by pixels.

LENS— Optical glass components arranged in a formation that creates a focal point at a specific distance from a screen.

LENS DIAPHRAGM— Controls the amount of light allowed to reach the film.

LEGEND— A description of any special or unusual marks, symbols, or line connections.

LENTICULAR SCREEN— A projection screen with a surface patterned to reflect a projected image with minimum glare.

LETTERHEAD— (1) The printed matter, usually the name and address of a company, at the head of a sheet of letter-quality paper; (2) A sheet of paper bearing a letterhead.

LETTERING— Letters and words formed or printed by hand.

LETTERPRESS PRINTING— A printing process in which the raised, inked surfaces of the type and/or plates transfer an impression directly to the paper.

LETTER-QUALITY PRINTER— A printer that imitates letters with resolution similar to a typewriter.

LETTERSPACING— Placing additional space between the letters of words to expand the length of a line or to improve and balance typography.

LIFT METHOD— (1) The process of using laminate material to remove or lift an image from clay-coated stock; (2) scanning text or graphics onto disk for importation to another application.

L (Continued)   **LIGHT BOX—** A box with a translucent glass or plexiglass top illuminated from underneath, used for tracing and layout.

LIGHTFACE— The lightest and thinnest form of a type series.

LIGHT PEN— An electronic input device used to draw freehand against a CRT screen.

LIMITED PALETTE— (1) A palette with a restricted number of pigments; (2) A palette that lacks one or more of the three primary colors.

LINE— A continuous, unbroken mark made by a pen, a pencil, a brush, or other drawing instrument.

LINE AND WASH— A technique combining a black line with transparent wash.

LINE COPY— A composition of black lines and masses without gradation of tone.

LINE DRAWING— A drawing composed entirely of lines, dots, and areas of solid black.

LINE OF DIRECTION— The line the eye follows when looking at the picture.

LINES PER INCH— *Also called* LPI. A standard measurement of resolution for the color printing trade.

LINE WEIGHT— The thickness of pencil, ink, or other lines in artwork.

LINSEED OIL— An oil obtained by pressing the seeds of a plant, which produces linen fiber used as a medium in oil painting.

Glossary, Continued

L (Continued)	**LITHOGRAPHY—** *See* OFFSET PRINTING or OFFSET LITHOGRAPHY. A reproduction process in which grease crayon lines and masses drawn on a flat, polished stone print through the affinity of grease to grease (grease crayon and printer's ink). The wetted stone repels the ink from the other areas not covered with crayon.

LITHOGRAPHIC PENCILS— An oily pencil or crayon used to mark lithographic plates.

LOCAL COLOR— The actual color of an object without regard to the effect of changing light and shadow conditions.

LOCAL COLOR VALUE— The actual lightness or darkness of a color without regard to the effect of changing light and shadow conditions.

LOGOTYPE— *Also called* LOGO. The lettered signature, nameplate, or trademark of a commercial firm.

LONGSHOT— A picture showing a full figure or a distant view.

LACEY LUCY— *See* CAMERA LUCIDA.

M	**MACHINE COMPOSITION—**Type set by a machine.

MACRO LENS— A short focal-length lens specifically designed to allow closeup photography.

MAHLSTICK— A rod used in the palette hand to support or steady the painting hand.

MAKEUP— *See* LAYOUT. The arrangement of text and illustrations on a page in conformance to standard practices in the industry or to publication requirements.

MAGNETIC CHALKBOARD— A briefing board that accepts chalk markings and magnetic attachments.

M (Continued)

MARS COLORS— Artificial earth colors.

MASKING— To block out a portion of an illustration by pasting paper over it to prevent it from reproducing.

MASKING TAPE— An opaque, paper tape used to cover the edges of a picture while painting and to fasten artwork temporarily to a drawing board.

MASTER— An original typed, drawn, or typeset copy intended for reproduction.

MAT— A cardboard or paper decorative enclosure around a picture.

MATCH DISSOLVE— Holding one element on a screen as one scene dissolves into another.

MATTE— Dull or without shine.

MATTE PRINT— A print having a dull finish.

MATTE SCREEN— A projection screen with a dull surface to reduce glare from overhead lights.

MEASURE— The length of a line of type measured in picas.

MEATBALL— *See* BULLET.

MEDIA INTEGRATION— *Also called* MULTIMEDIA. Mixing various presentation devices in the same presentation.

MECHANICAL— A page or layout prepared as an original for photomechanical reproduction.

MECHANICAL DRAWING— A method of drawing using precision tools to produce mathematically precise layouts, diagrams, and engineering drawings.

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Glossary, Continued

MEDIUM— (1) A liquid that dilutes a paint without damaging its adhesive; (2) The mode of expression employed; (3) The actual instrument or material used by the artist.

MEGABYTE— Abbreviated MB or M, approximately one million bytes of data.

MEMORY— That portion of computer hardware that retains data for later retrieval.

MENU— A selection of options displayed on a computer screen.

MICROCOMPUTER— Another name for a personal computer or computer workstation not attached to a mainframe system.

MILITARY STANDARDS— *Also called* MIL-STD. A formalized set of government standards.

MIXED MEDIUM— *Also called* MIXED MEDIA. A combination of two or more mediums.

MODEM— An electronic input/output device that connects computer workstations for communications.

MOIRÉ—An An wavey or checkered pattern that results when photographing a halftone through a screen.

MONOCHROMATIC— Shades or tints of one color.

MONTAGE— See COMPOSITE. (1) Arranging a number of pictures or designs in a combination, often with some overlapping, so that they form a composite whole; (2) The resultant arrangement or composition.

MONITOR— The viewing screen of a computer system.

MOOD— An outward projection of a feeling or emotion that affects behavior communicated by action, situations, or symbology in a picture.

M (Continued)	**MORGUE—** *See* PICTURE MORGUE, CLIP ART, or RESEARCH FILE.

MOUNT— To fasten onto another surface. .

MOUNTING AND FLAPPING— Fastening original artwork or copy to a board allowing sufficient excess around the picture borders to accommodate attaching a protective overlay along one side.

MOUNTING BOARD— Heavy paper boards used as backboards to support drawings, paintings, and photographs.

MOUSE— A hand-held computer input device that allows rapid movement and selection.

MULTIMEDIA— *Also called* MEDIA INTEGRATION. A combination of presentation devices used in the same presentation.

MULTIPURPOSE BOARD— A briefing board with a slick, bright, white surface that accepts erasable, marker, marker, and magnetic backed accessories.

MUNSELL COLOR SYSTEM— A system of color analysis and identification that distinguishes between the three measurable dimensions of hue, value, and chroma (intensity).

MURAL— Any picture painted or freed permanently on a wall or ceiling.

MYLAR— Tough, highly stable, polyester film used as a base for engineering drawings, laminating, overlays, and a wide variety of other applications.

NARRATION— *Also called* VOICE OVER. The description or commentary that accompanies television and video presentations.

NCR PAPER— No Carbon Required paper; chemically coated paper that transfers a copy of an image to the sheet directly behind it without the use of a carbon.

N (Continued)

NEGATIVE, PHOTOLITHOGRAPHIC— A film negative having a translucent image and a black background produced by a process camera and used primarily to make printing plates.

NEUTRAL COLOR— (1) A color that lacks hue and intensity; (2) A color that contains some amount of its complementary; (3) An earth color.

NIB— A point at the end of a pen or marker.

NOISE— Adding a random pattern of pixels over an image to add texture, create a new value, or give a painterly effect.

NORMAL LENS— *Also called* STANDARD LENS. A 50mm focal-length lens, which most closely approximates normal vision with minimal distortion.

O

OBLIQUE PROJECTION— A view produced when the projectors are at an angle to the plane of the object illustrated.

OCTAGON— A figure having eight sides.

OFFSET LITHOGRAPHY— *See* LITHOGRAPHY. Lithographic printing where an inked plate prints on a rubber blanket, which then offsets the image to paper stock.

OFFSET SECTION— A section view of two or more planes in an object to show features that do not lie in the same plane.

OIL PAINT— Any pigment ground in linseed oil or poppy oil.

OILSTONE— A stone or abrasive used to sharpen needlepoints and blades.

ONE POINT PERSPECTIVE— *Also called* PARALLEL PERSPECTIVE. When the height and width of an object are parallel to the plane of projection.

ONION SKIN— *Also called* MANIFOLD PAPER. Thin, translucent paper used to make a typewriter carbon copy or to serve as a tissue overlay for work requiring correction or protection.

Glossary, Continued

ONSCREEN— An image that appears on the computer or television screen.

OPAQUE— (1) Impermeable to light; not transparent or translucent; (2) To paint over unwanted portions of a negative with a solution to prevent light from seeping through.

OPAQUE PROJECTOR— A device that projects an opaque object to a desired size on another surface.

OPAQUE WATERCOLOR— *See* WATERCOLOR. A creamy, opaque paint-like gouache or tempura, available in tubes, jars, or by mixing white with transparent colors.

OPAQUING— Covering up with opaque paint.

OPTICAL CENTER— A point slightly above (10%) the geometric center of a layout that the eye perceives as the center.

OPTICAL ILLUSION— An unreal or misleading image perceived by the eye as real.

OPTICAL SPACING— The arrangement of spacing between letters for legibility and appearance, which varies with the shape of the letters to achieve optical equalization.

ORGANIZATION CHART— A block chart or diagram showing the names, titles, departments, and responsibilities of personnel in an organization.

ORIGINAL— *See* MASTER. Copy submitted to the printer for reproduction.

ORTHOGRAPHIC PROJECTION— A method of projection with six principal views.

OSCILLATING AIRBRUSH— An airbrush with a reciprocating needle used for fine detailed work.

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Glossary, Continued

O (Continued)	**OUTPUT—** The end product generated by an electronic device, such as a computer, printer, or copier.

OUTPUT DEVICE— An electronic accessory to a computer system that provides some type of end product either visually or as a hard copy.

OUTLINE— The outside edge of a shape or form.

OUTLINE DRAWING— A drawing where lines define the outer limits of the forms without the representation of modeling, light, or shadow.

OVERHEAD PROJECTION— A projector that uses of a system of mirrors and a fresnel lens to project a transparent image or object to another surface or screen.

OVERLAP— To cover a part of one shape or line with another.

OVERLAY— A transparent or translucent sheet taped over the original art for protection or to indicate instructions or corrections.

OVERPRINTING— Printing an image over another impression.

OZALID MACHINE— An ammonia process printmaking machine that produces the same-size copy from transparent or translucent originals.

P   **PAINTING KNIFE—** *See* PALETTE KNIFE. A type of palette knife made for applying paint to a picture.

PALETTE— (1) The surface on which the artist places paint and mixes colors before applying them to canvas or other painting surface; (2) A group of colors or gray values chosen for use in the same picture.

PALETTE KNIFE— A thin, flexible, steel blade set in a wooden or plastic handle available in a variety of shapes used for mixing paints and impastos, applying paint directly to a canvas or to create special textures directly on the surface of a picture.

Glossary, Continued

PALETTING— Moving the pigment back and forth across a palette with a paint brush to achieve a certain consistency in texture or color or to load the brush with pigment adequately.

PANEL— (1) A given area in which a cartoon is drawn, with or without a defined frame; (2) One box or frame of a comic strip; (3) One unit of a storyboard.

PANORAMA— *Also called* PAN. Slow, steady camera movement from side to side.

PANTOGRAPH— A mechanical device based on the shape of a parallelogram, used to reduce, enlarge, or copy pictures.

PANTONE COLOR SYSTEM— An industry accepted system of color analysis and identification which distinguishes between the three measurable dimensions of hue, value, and chroma (intensity).

PARABOLIC REFLECTORS— Lamp reflectors that assist even illumination and shorten exposure time.

PARALLAX— Distortion present when exposing film through a lens not aligned with the veiwfinder, distortion corrected by a rangefinder camera.

PARALLEL PROJECTION— *See* ONE POINT PERSPECTIVE.

PARALLEL STRAIGHTEDGE— A long, straight edge supported at both ends to maintain parallel motion.

PARTIAL SECTION— A sectional view consisting of less than a half section.

PASTEL— (1) A dry pigment mixed with a variety of binders to forma stick or crayon for application to a picture surface; (2) A picture executed in the pastel medium.

P (Continued)   **PASTE-UP—** The process of pasting an image or part of an image on a reproduction page or sheet before photographing for platemaking or printing.

PATTERN— (1) The regular or irregular distribution or arrangement of elements; (2) Regularly repeated flat designs used to create two-dimensional textures.

PENS, PLOTTER— A pen nib or jet spray attached to a plotter output device.

PENS, STEEL BRUSH— Steel pen nibs designed to create large poster size lettering.

PENS, TECHNICAL— Conical or tubular tipped pen nibs designed to produce a consistently even line of a predetermined weight in a standard or metric measurement available with and without a reservoir.

PENTAGON— A five-sided figure generally having equal sides and angles.

PERCENTAGE CHART— *Also called* PIE CHART. A circular chart divided into wedges whose sum equals 100% or 360°.

PERPENDICULAR— A vertical line meeting or intersecting a horizontal line at 90°.

PERSONIFICATION— Attributing human qualities to animals or inanimate objects.

PERSPECTIVE— The visual impression of lines moving closer together as distance increases.

PHANTOM LINES— *Also called* ALTERNATE POSITION LINES. Lines consisting of one long and two short dashes, evenly spaced, terminating in a long line, used to indicate an additional position of a part or object.

Glossary, Continued

P (Continued) **PHANTOM VIEW—** A view showing an alternate position of a movable object.

PHOTOGRAPHIC TYPESETTIHIS—_See_ TYPESETTERS, PHOTOGRAPHIC.

PHOTOLE'ITERING— A method of simulating hand lettering or display type by photographic means.

PHOTOLITHOGRAPHY— The transferring of a drawing to a lithographic plate by photography.

PHOTOMECHANICAL— Pertaining to any process of printing or duplicating images by mechanical means from a photographically prepared printing plate.

PHOTOSTAT— _Also called_ STAT. A photographic image recorded by a camera so constructed that it photographs and develops directly on paper, in negative values.

PHOTOTYPE— Type set by photographic means.

PICA— A unit of measure equal to 12 points or 1/6 of an inch.

PICKUP— A square of gum rubber used to remove excess rubber cement.

PICTORIAL DRAWING— Any drawing that depicts an object with recognizable clarity.

PICTURE AREA— The flat surface within the borders of a picture.

PICTURE MORGUE— _Also called_ MORGUE. See CLIP ART.

PICTURE PLANE— An imaginary plane placed between the observer and the object, usually at right angles to an observer's line of vision.

PIE CHART— _See_ PERCENTAGE CHART.

P (Continued)   **PIGMENT—** Dry color matter that becomes paint when mixed with a vehicle or binder.

PINHOLE— A small light spot that appears on a developed photographic negative resulting from particles of dust and lint on the unexposed negative, the camera lens, the vacuum board glass, or other parts of the camera.

PIN REGISTER— A method of holding elements in place in overlay work and animation.

PIXEL— *Also called* PICTURE ELEMENT. A small bit of digital data from a computer screen.

PIXEL MAP— *Also called* BIT MAP. A matrix of pixels that forma digital image on the computer screen.

PIXELATED— Having jagged edges.

PIXELATION— Specifying the size of a pixel on the computer screen.

PLAIN TITLE CARD— Printed information only on a card for television transmission of credit lines.

PLAN VIEW— A view of an object or area as it would appear if viewed from directly above.

PLANE— A flat surface.

PLANNING CARDS— A small card containing a idea or point placed in sequence on a storyboard.

PLAT— A map or plan view of a lot showing principal features, boundaries, and location of structures.

PLATE FINISH— A smooth surfaced paper.

PLY— A single layer of drawing paper.

P (Continued)

POINT— A standard type measure of 1/72 of an inch or 72 points equals 6 picas.

POLYMER— Paints that have polyvinyl acetate or acrylic resin as a binder used as either a transparent or opaque medium.

POLYGON— Common geometric constructions.

PORTRAITURE— The process or art of depicting an individual by drawing, painting, or photographing from life.

PORTIUY— To delineate or depict.

POSTER— A large cardboard or paper display sign.

POSTER BOARD— A medium weight cardboard suitable for show cards.

POSTER COLOR— An opaque watercolor used for making show cards.

POSTERIZATION— A technique for adding poster-like qualities to a photograph, a film, or an illustration by separating the normal tones of a subject into distinctly separated, strong tones.

POUNCE— A powdered substance that improves the ink-absorbing qualities of tracing cloths and papers.

PRELIMINARY DRAWINGS— Drawings done in preparation for a finished piece of art.

PRE-PRESS— The preparatory stage of art or copy immediately before committing the image to a plate.

PRIMARY COLORS— The red, yellow, and blue in a subtractive process and the red, yellow, and green in the additive process of color theory.

PRINT— An image made from a master negative or plate.

P (Continued) **PRINTING—** A process for reproducing copy.

PRINTING PLATE— *Also called* CUT. A flat piece of metal used on a printing press that contains the image either engraved or etched photographically on the surface.

PRISM— A transparent piece of crystal or optical glass having two plane surfaces which are not parallel that separate white light into the visible colors of the spectrum.

PROCESS COLOR REPRODUCTION— A combination of halftone plates, usually red, yellow, blue, and black, which when printed in perfect register, combine to produce a full-color reproduction.

PRODUCTION DEPARTMENT— The people responsible for purchasing and maintaining schedules on printing, typography, engravings, bindings, paper, and sometimes the purchase of art for an organization.

PROGRESSIVE PROOFS— Proofs showing the order of printing and shade of ink for each required plate.

PROGRESSIVE DISCLOSURE— Systematically revealing information on a partially obscured visual.

PROJECTION— The act or art of projecting lines and planes in orthographic and perspective drawings.

PROJECTOR— A device containing a light and lenses for projecting an image onto another surface.

PROJECTURAL— (1) An image projected onto another surface; (2) The image so projected.

PROOF— A printed impression from a negative, a plate, or a body of type submitted for examination or correction.

P (Continued)

PROOFREADER'S MARKS— Standard marks placed in the margin nearest the word that indicate corrections in typeset copy.

PROPORTION— The relation to size of one part or thing to another or one portion of something to the whole.

PROPORTIONAL DIVIDERS— A drafting instrument used for transferring measurements from one scale to another or to divide lines and circles into equal parts.

PROPORTIONAL SPACING— *Also called* DIFFERENTIAL LETTERSPACING. The spacing of characters in proportion to size by means of the typewriters and office composing machines used in the preparation of cold composition copy.

PROPS— Accents or accessories that identify the time frame or location of a subject.

PROTRACTOR— A circular or semicircular rule for measuring off the degree of an angle.

Q

QUILL PEN— *See* CROW QUILL. A pen nib made from a feature quill.

R

RADIAL FILL— To fill an object with color, pattern, or shade that appears to radiate from the center of the object.

RADIATION— A divergence of lines, tones, or colors from a common point to different directions.

IUMXUS— A straight line from the center of a circle or sphere to a point on its circumference.

RADIUS CURVE— A drawing tool used to draw arcs of a predetermined radius.

R (Continued)

RANDOM ACCESS MEMORY— *Also called* RAM. Retrievable computer memory accessible at will without sequential reading.

RANGEFINDER— The ground glass in a camera used to focus an image.

RASTER-BASED— An image based on the manipulation of a matrix of pixels or dots.

RASTER IMAGE PROCESSOR— *Also called* RIP. A device for converting vector-based imagery to high resolution raster images.

READ— To access electronically stored data.

REAR PROJECTION SCREEN— A matte surface, translucent screen used when projecting an image from behind to a screen.

REBOOT— Restart the computer system.

RECEDING COLORS— Colors that appear to move away or create the illusion of distance.

RECTANGULAR COORDINATE GRAPH— A graph based on a grid system where values are plotted by X and Y coordinates.

REFERENCE NUMBERS— Numbers used on one drawing to refer to another drawing for further details.

REFERENCE PLANE— The normal plane used to reference all information.

REGISTER— To align a page or any elements of an image or impression to match the position of successive impressions.

REGISTER MARKS— Marks used to key an overlay to a drawing or mechanical as in color separation or combination plates.

REMOVED SECTION— A drawing of the internal cross section of an object located near the basic drawing of the object.

R (Continued)   **RENDER—** To represent, portray, or depict in a drawing or painting.

RENDERING— A drawing or painting in which tonal values vary from white through black or from light to dark shades.

REPRODUCIBILITY— The ability of line and halftone copy to reproduce as acceptable and legible.

REPRODUCIBLE ART— Second-generation art made from the original art and mortised or pasted onto the reproduction page.

REPRODUCTION— Making one or more copies of an original piece of work.

REPRODUCTION COPY— *Also called* CAMERA-READY COPY. Copy ready in all respects for photomechanical reproduction.

REPRODUCTION PROOFS— *Also called* REPROS. Exceptionally clean, sharp proofs on a highly coated paper used for reproduction.

REPROGRAPHICS— The reproduction of images by copying machines and their methods and processes.

RESCALE— To enlarge or reduce in size or to change in shape without changing proportion to fit new space configurations.

RESEARCH FILE— *See* MORGUE, PICTURE MORGUE, or CLIP ART.

RESOLUTION— Clarity, focus, or density.

RETOUCH— To delete unwanted image areas or make repairs to copy by painting out with an opaque solution.

RETOUCH GRAYS— A series of opaque watercolors ranging from white to black.

Glossary, Continued

RETOUCHING— The alteration of detail or removal of spots and blemishes in a photographic print or negative.

RETOUCH VARNISH— A light, colorless varnish sprayed on a dull, dried-out area or an unfinished oil painting to restore the "wet" colors or values, making it easier to mate with new paint.

REVERSE— *See* FLOP. To turn over.

REVERSAL— *See* REVERSE PRINT.

REVERSE PRINT— A print where the black values of the originals are white.

REVISION BLOCK— Space located in the upper-right comer of a drawing to record any changes to the original drawing.

REVOLVED SECTION— A drawing of the internal cross section of an object superimposed on the basic drawing of the object.

ROMAN— One of a group of alphabets or typefaces characterized by thick and thin strokes and often with serifs.

ROSS BOARD— An illustration board that comes in a variety of roughened surfaces that divide crayon or brush strokes into broken textures suitable for reproduction.

ROTATION— A view in which the object is rotated or turned to reveal a different plane or aspect.

ROUND BRUSH— A cylindrical brush having an evenly tapered point.

RUBBER CEMENT— Semitransparent glue consisting of gum rubber and a petroleum or benzol solvent.

RUB-ONS— Transfer sheets containing reprinted characters, symbols, and numerals applied by burnishing over an acetate or paper back sheet.

Glossary, Continued

R (Continued)	**RULING PEN—** An instrument that holds ink between two adjustable blades.
	RUNNING HEAD— The title repeated at the top of consecutive pages in a book or magazine.
S	**SABLE BRUSH—** A flat or round-shaped brush made from the tail hair of a Kolinsky (Asiatic) mink.
	SAFELIGHT— A colored light used to illuminate a darkroom without harming photosensitive film or paper.
	SANDPAPER PAD— A pad of sandpaper sheets mounted on a strip of wood used to sharpen a pencil lead or pastel.
	SANS SERIF— Without serifs, a letter that does not have a finishing stroke.
	SATURATION— The purity or intensity of color.
	SCALE— (1) Proportions or relative dimensions; (2) To enlarge or reduce without changing the original proportions.
	SCALE CLIP— A clip attached to a scale that focuses on the scale currently in use.
	SCALE DRAWING— A drawing that shows relative sizes and proportions.
	SCALING— *Also called* DIMENSIONING or SIZING. Enlarging or reducing copy or an image to the correct dimensions to occupy a given area.
	SCANNING AREA— The total area or picture that the camera sees.
	SCRAP FILE— *See* RESEARCH FILE.
	SCRATCHBOARD— A type of illustration board with a chalky surface uniformly covered with ink.

S (Continued)   **SCREEN—** A glass plate or film with crosshatched lines which photographically produces a halftone for reproduction from a continuous-tone original.

SCREEN PROCESS PRINTING— *Also called* SILKSCREEN. A form of stencil printing that uses silk, nylon, or metal screen to contain the image.

SCREEN REFRESH— A continuous update of computations that create the image on a computer screen.

SCRIPT— (1) Lettering based on hand writing; (2) A paper or papers which describe in detail all of the elements of a commercial or story.

SCROLL— A rapid up-or-down movement of a computer screen image during a search function.

SECONDARY COLORS— The colors (orange, green, and violet) that lie halfway between the three primary colors.

SECTION LINE— Thin, diagonal lines used to indicate the surface of an imaginary cut in an object.

SECTIONAL VIEW— The view obtained by cutting away part of an object in an illustration to show the shape and construction of the interior.

SEPIA— A dark, warm brown color of low brilliance.

SEPIA INTERMEDIATE— An intermediate used in making duplicate transparencies by the whiteprint process.

SERIF— The finishing stroke or line projecting from the end of the main stroke of many letters in some typefaces.

SET PALETTE— One hue mixed with a group of colors to create color harmony or unity in a chosen palette.

S (Continued)	**SETTING—** Background or surrounding.

SETTING— Background or surrounding.

SHADE— A mixture of pure color and black.

SHADING— Lines, values, or color applied to create form, shadow, or pattern.

SHADING MEDIUMS— Preprinted tones and patterns used to enhance the appearance of copy and artwork.

SHADING SHEETS— Sheets of cellophane or acetate preprinted with tones and patterns with a low-tack adhesive for applying to artwork.

SHAPE— The flat silhouette or two-dimensional form of an object.

SHELF LIFE— The length of time before sensitized material deteriorates.

SHIP'S CURVES— Instruments for drawing elongated, irregular curves that closely approximate the curves found in shipbuilding.

SHUTTER SPEED— A method of controlling the length of time that light can reach a film.

SIGHT LINE— An imaginary line extending from the eyes of a figure in a drawing to an object indicating that person's direction of glance.

SINGLE-**ACTION AIRBRUSH—** A device that releases both air and pigment by pressing down on a button.

SIGNATURE— A sheet of paper printed on both sides and folded to make up part of a publication.

SILHOUETTE— An outline of an object or figure filled in solidly without indication of modeling or surface structure.

SILKSCREEN— A method of printing through a stencil fixed to a screen of natural or synthetic fiber or metal mesh.

Glossary, Continued

SIZE— *Also called* SIZING. Various gelatinous materials made from starch, clay, glue, and casein used for glazing or coating papers and cloths.

SKETCH— A quickly executed drawing as a preparation toward more finished work.

SKETCHING PENCIL— *See* CARPENTER'S PENCIL. A soft-leaded pencil used for freehand sketching.

SMALL CAPS— Capital letters smaller than the standard capitals of a typeface and the size of the body of the lowercase letters.

SODIUM THIOSULFATE— *Also called* HYPO. A salt with water solution that dissolves the silver halides used in photographic papers and films.

SOFT EDGE— A blended or graduated transition from one value or color to another.

SOFIWARE— Computer programs that direct the output devices and determine the input devices effectivity.

SPECIAL EFFECTS GENERATOR—A device that adds or creates effects to visual images during recording on videotape.

SPECIAL IRREGULAR CURVE— Irregular curves for a specific purpose, such as ship's curves, mechanical engineer's curves, conic sections, logarithmic spirals, and flexible curve rules.

SPECTRUM— The arrangement of colors side-by-side as refracted by a prism.

SPEEDBALL PENS— Lettering and drawing pens manufactured by the Hunt Manufacturing Company that are the hallmark of hand lettering pen ribs.

SPEED LINES— Extra lines following a moving figure or object in a cartoon representing the disturbance the movement causes in the atmosphere.

S (Continued)	**SPHERE—** A form where all points are equidistant from the center.

SPHERE— A form where all points are equidistant from the center.

SPINE— The bound edge of a book.

SPLINE— A flexible rule, held in place by lead ducks, used to draw irregular curves.

SPLIT BRUSH TECHNIQUE— *Also called* DRY BRUSH TECHNIQUE. Painting or drawing with a brush having the hairs separated to form more than one point.

SPLIT COMPLEMENT— A color scheme that uses a key hue with the two colors that lie adjacent to its opposite on the color wheel.

SPLIT FIELD— A rangefinder that focuses an image by dividing the image in half and requiring alignment into a whole.

SPOT COLOR– Using a combination of two individual colors, a main color, usually black, and an accent color instead of a full-color output.

SQUEEGEE— (1)An implement used on silk process printing presses that forces ink and ink compounds through the screen and stencil onto a printing surface to form the image; (2) The process of forcing pigment across a surface with other than a brush.

STABILIZER— A chemical that arrests the continued development of an image and fixes that image into the surface.

STABILO PENCIL— A pencil that uses grease or wax as a binder for pigment and is capable of writing on glass.

STAT— *See* PHOTOSTAT.

STATIC— Lacking in movement.

STATION POINT— The point of observation in the making of perspective drawings.

Glossary, Continued

S (Continued)

STILL LIFE— A pictorial arrangement of inanimate objects.

STIPPLE— The effect obtained by using a series of dots or flicks in drawing.

STOCK— Material printed or worked on by printers or artists.

STOP BATH— A chemical solution that stops photographic development.

STOPPER— An eye-catching device in a picture that grabs and holds a viewer's attention.

STORYBOARD— A panel presentation of rough sketches of a proposed series of views.

STRAIGHTEDGE— An instrument with long, straight edges.

STRIP IN— To position copy not pasted upon the mechanical before platemaking.

STRIPPING— Cutting out and placing in position.

STUDIO CARD— Illustration or pictorial information on a card intended for television transmission.

STUMP— A pencil-shaped roll of paper used to blend pastel, pencil, and charcoal.

STYLIZED— Charactertied by an emphasis on style and design.

STYLUS— A scraping instrument with sharp or chiseled edge.

SUBHEAD— A secondary headline or title.

SUBTRACTIVE COLOR PROCESS— The process of forming colors by mixing pigments.

Glossary, Continued

S (Continued)	**SUBORDINATION—** Subduing part of a picture to make it less important than another part.

SUPERIMPOSED— *Also called* SUPER. One image or text placed over another without totally obscuring the first.

SUPERIMPOSED IMAGE— A rangefinder that focuses an image by requiring the alignment of two images over each other.

SUPPORT— The reinforcement or backing for a painted surface.

SURREALISM— An art movement whose objective is to explore the realm of unconscious emotion and dreams.

SWATCH— A small sample specimen.

SWEDE PEN— A broad nibbed, adjustable ruling pen.

SWIPE FILE— *See* RESEARCH FILE.

SYMBOL— A visual element that represents something else.

SYMMETRY— Similarity in size, shape, and relative position of parts on opposite sides of a dividing line. |
| **T** | **TABOURET—** A portable cabinet used to hold the artist's drawing tools and materials.

TEAR SHEETS— *Also called* CLIP ART and PICTURE MORGUE.

TECHNICAL ILLUSTRATION— Drawings for technical reports, proposals, manuals, and catalogs, as well as visual aids, briefing charts, projecturals, slides, and posters.

TECHNIQUE— (1) The method of using a tool or medium; (2) The characteristic appearance of a medium; (3) The particular style of an artist. |

T (Continued)   **TELEPHOTO LENS—** A long focal-length lens that has the effect of bringing far objects nearer.

TELEVISION GRAPHICS— Graphics created specifically for transmission via television.

TEMPURA— Dry pigment mixed with an emulsion of egg yolk or milk to form an opaque watercolor.

TEMPLATE— A guide made to ensure the uniform consistency of frequently used symbols.

TERTIARY COLORS— Any intermediate hue that contains some part of each of the three primary colors.

TEXT— Typewritten or printed matter forming the main body of a work.

TEXTURE— The feel or appearance of a surface created by the repetition of forms or design.

THERMAL TRANSFER PRINTER— A printer that uses heat to fuse the image to a paper surface.

THIRD DIMENSION— The effect of depth or bulk achieved by the artist on a flat surface.

THREE DIMENSIONAL— Possessing height, width, and depth.

THREE-QUARTER VIEW— A view of an object rotated to a position halfway between a front and a side view.

THREE-POINT PERSPECTIVE— A view where no dimension, height, width, or depth, is parallel to the plane of projection.

THUMBNAIL SKETCH— Page layouts showing the allocation of space for headings, photographs, line artwork, and text.

T (Continued)

THUMBSPOTS— Visual indicators placed on a slide mount to identify the emulsion side of the film and simplify tray loading.

TILING— A fill pattern effect that repeats a pattern over and over.

TILT CARD— A vertical card that requires up-and-down camera movement.

TIME LINE— A projected plan of execution outlining significant milestones and deadlines used to monitor work in progress closely.

TINT— A mixture of pure color and white.

TISSUE OVERLAY— Thin, translucent paper placed over artwork for protection and corrections.

TITANIUM WHITE— An opaque white.

TITLE BLOCK— Space in the lower right comer that contains the identity of the drawing, the subject matter, the origins, the scale, and other data.

TITLE CARD— A television card that contains text only.

TONAL— Having gradations of gray or intermediate values.

TONE— (1) A value usually predominate which sets the key; (2) A thin layer of paint applied to a ground to eliminate the whiteness of the surface before painting.

TOOL BOX— See BUTTON BAR.

TOOTH— The ability of the paper surface to accept various mediums.

TORTILLON— *Also called* STUMP or STOMP. Tightly rolled paper, leather, or felt used to blend charcoal, pastels, pencil, chalk, or crayon.

TOUCHE— A liquid-masking agent or lithographic crayon applied by brush to a lithographic plate or stone.

T (Continued)

TOUCH SCREEN TECHNIQUE— Activating the pixels on a CRT screen through the touch of an electronic light pen or the fingertip.

TRACING PAPER— A thin, transparent, or translucent paper used for transferring an image from one surface to another by tracing.

TRACKBALL— *See* JOYSTICK or MOUSE.

TRAMMEL— A mechanical device used to draw an ellipse.

TRANSFER SHEET— Preprinted characters and symbols on cellophane or acetate used in preparing cold composition, camera-ready copy.

TRANSLUCENT— The characteristic of allowing light to pass through without permitting objects to be seen clearly through it.

TRANSPARENCY— Any transparent material intended for projection that bears an image.

TRANSPARENT— The characteristic of allowing light and objects to be seen clearly through it.

TRAPS— A slight overlap of the outline of an element to prevent white space from showing around the edges minimizing the effect of press plate misalignment.

TRIAD— The use of any three pigments equally spaced on a color wheel.

TRIANGLE— A triangular shaped ruling guide available in various sizes and angles usually made of clear plastic or metal.

TRIM MARKS— Marks used on printed sheets or other substrate to indicate where to cut or trim stock both vertically and horizontally.

TRIMETRIC PROJECTION— An axonometric projection of an object where no two axes make equal angles with the plane of projection requiring three different foreshortening ratios.

T (Continued)　　**T-SQUARE—** A ruling guide with a 90° angled crosspiece at one end used in making horizontal lines.

TURPENTINE— A solvent distilled from the sap of pine or from pine wood used as a thinner and to clean brushes.

TUTORIAL— A lesson guide.

TWO DIMENSIONAL— Flat, without depth, having only width and height.

TWO-POINT PERSPECTIVE— *Also called* ANGULAR PERSPECTIVE. The most common type of perspective drawing where the object is sitting at an angle to the plane of projection and each object has two vanishing points.

TYPEFACE— The printing surface of an alphabet judged by its design, printability, wearability, and position on the letter body.

TYPE FAMILY— A group of typefaces similar although not exactly alike in design.

TYPE SERIES— Different sizes of the same typeface.

TYPESETTERS, PHOTOGRAPHIC— Machines that supply a variety of type designs and sizes, automatically letterspaced and justified on transparent film or plastic-coated opaque paper.

TYPOGRAPHY— The art of type selection and arrangement.

U　　**ULTRAVIOLET LIGHT—** Actinic (shorter wavelength) or useable part of the light spectrum needed to reactor harden light-sensitive coatings.

UNDERTONE— A color whose effect is modified by other colors imposed over them.

UNRETOUCHED— Not altered or improved by any means.

U (Continued)	**UPPERCASE—** The capital letters of an alphabet.
	USER INTERFACE— The visual and physical attributes of a software program including tools-, text-, and graphics-handling characteristics.
	UTILITY PLAN— A floor plan of a structure showing locations of heating, electrical, plumbing, and other service components.
V	**VALUE—** The relative lightness and darkness of different areas of the picture represented in tones, shading, line balance, and layout.
	VALUE SCALE— The complete range of values from the lightest to the darkest.
	VAN DYKE— A brownprint negative and sometimes a brownline positive.
	VANISHING POINT— The point at which parallel lines receding from the observer appear to converge in a perspective drawing or photograph.
	VARIGRAPH— A lettering device that allows manipulation of letter size, slant, and shape.
	VARNISH— A solution made of a resin in a volatile medium.
	VEHICLE— A liquid used as a carrier of pigment in paint.
	VECTOR-BASED— Images based on a series of plotted points that define precise lines and geometric shapes.
	VELLUM— A kind of free, translucent paper resembling parchment or onion skin used for duplicating copies made with a whiteprint machine.
	VELOX— A print of a photograph or other continuous-tone copy prescreened before paste-up or platemaking with line copy eliminating the need for a composite negative.

Glossary, Continued

VERTICAL SCAN RATE— *Also called* FRAME RATE. The number of times per second a screen redraws an image.

VIDEO DIGITIZING CAMERA— A camera or film recorder attached to the front of a CRT screen used to record images.

VIDEO DISPLAY TERMINAL (VDT)— A visual display used in photocomposition work in conjunction with a keyboard.

VIEWING PLANE LINE— *See* CUTTING PLANE LINE.

VIEWGRAPH— *See* PROJECTURAL.

VIEWPOINT— The eye level of the viewer and the distance from the scene.

VIGNETTE— Fading an image from heavier to lighter tones blending it into the background or eliminating the background altogether.

VISIBLE LINE— The outline used for all edges seen by the eye.

VISUALIZING PAPER— A white, semitransparent paper used for making layouts and preliminary drawings.

VISUAL LITERACY— The ability to communicate effectively using only visual language.

W

WARM COLORS— Colors associated with heat or fire.

WASH— A monochromatic rendering with a brush and transparent watercolor.

WASH DRAWING— A watercolor painting consisting mainly of washes.

WATERCOLOR— A dry pigment bound by an adhesive, such as gum arabic, and applied, greatly reduced by water, to a surface in a transparent fashion.

W (Continued)

WAXER— A device that applies a thin layer of hot, adhesive wax to the back of a surface.

WET BRUSH— A blending technique of laying two pigments side-by-side and blurring the line of demarcation while the pigments are still wet.

WHITE LEAD— A free, poisonous, opaque white pigment used in flake white and Cremnitz white oil paints.

WIDE ANGLE LENS— A very short focal-length lens that encompasses a larger horizontal view than a standard lens. This lens, depending on the focal length, records an image with increasingly pronounced (barrel) distortion.

WINDOW— *See* BLACK PATCH.

WORD PROCESSING— The transformation of a concept or idea into printed communication media by using mechanical or automated systems, methods, or processes.

WORD SPACING— The adjustment of spacing between words to shorten or extend a line to achieve justification.

WORKING DRAWING— A thorough preliminary drawing done on tracing paper then transferred to a working surface for the finished rendering.

WOVE PAPER— A broad range of papers having an even fiber formation produced over fine wire mesh.

WRAPPING— (1) A computer feature that automatically enters a soft return revel code and continues to enter data on another line; (2) Selecting a pattern or design and wrapping it around an object on the screen.

WRICO— A hand-lettering system using a set of templates and a drop fed pen.

Glossary, Continued

X	**XEROGRAPHY—** A copying process that uses electrostatic forces to form an image.

Z	**ZINC WHITE—** A zinc oxide based pigment that is less opaque than titanium and lead white.
	ZIP-A-TONE— A transparent acetate sheet preprinted with patterns of dots or lines that create tone.
	ZONE NUMBERS— Numbers and letters on the border of a drawing to provide reference points to aid in locating specific points in the drawing.
	ZOOM LENS— A variable focal-length lens that functions as a telephoto lens but allows you to select the range of the object magnification.

APPENDIX II

References Used to Develop The NRTC

NOTE: Although the following references were current when this NRTC was published, you will need to ensure you are studying the latest revision.

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Chapter 2

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Assignment Questions

ASSIGNMENT 1

Textbook Assignment: "Shop Organization and Administration," chapter 1, pages 1-1 through 1-55.

1-1. An example of a local commitment to work with which of the following units is a shop obligation?

1. Printshop
2. Transiting SSBN
3. Regionally located command
4. A command in the same naval district

1-2. Generally, obligations to perform work subject to financial reimbursement for units and commands outside of your command are called what?

1. Reoccurring obligations
2. External commitments
3. Public relations (PR) work
4. Kumshaw

1-3. Interservice, interagency, and interdepartmental support agreements define external commitments for which of the following provisions?

1. Reoccurring services
2. Financial reimbursement
3. Both 1 and 2 above
4. Positional authority

1-4. Why is it important to understand the obligations of the shop to provide support to other units?

1. To order supplies
2. To schedule liberty
3. To extend the importance of the graphics shop
4. To effectively administer, manage, and supervise

1-5. Agreements with units that define reoccurring services and financial reimbursement do NOT include which type of agreement?

1. MSDS
2. MOA
3. MOU
4. ISA

1-6. Ideally, a Navy drafting shop consists of a work area and which other areas?

1. A reproduction area and a smoke area
2. A reproduction area and a storage area
3. A storage area and a smoke area
4. A storage area and a darkroom area

1-7. Why should you locate reproduction and storage areas away from work areas?

1. Convenience
2. Temperature variances
3. Eliminate distractions
4. Eliminate visual clutter

1-8. Which of the following light sources is NOT considered steady and readily available?

1. Desk light
2. Direct sunlight
3. Overhead light
4. Fluorescent light

1-9. In assessing an effective graphics shop, which factor must be planned intentionally?

1. Noise
2. Safety
3. Billeting
4. Personal space

1-10. A locally established policy or instruction on the function and use of the graphics shop produces all EXCEPT which of the following benefits?

1. Curtailment of abuse
2. Shop chain of command
3. Criteria for priority work
4. Request approval chain of command

1-11. Why is it important to gather and review instructions that pertain to the graphics shop?

1. As reference material
2. Instructions change periodically
3. Instructions govern shop procedures
4. Each of the above

1-12. Which of the following instruction provides guidance in writing performance evaluations and counseling procedures?

1. SECNAVINST 5216.5
2. SECNAVINST 5500.4
3. BUPERSINST 1610.10
4. BUPERSINST 1616.10

1-13. Guidance for using copyrighted material is found in which instruction?

1. SECNAVINST 5603.2
2. SEVNAVINST 5290.1
3. SECNAVINST 5870.5
4. SECNAVINST 5600.20

1-14. Formalized external agreements between units are specifically addressed in what instruction?

1. NAVPUBINST 5600.44
2. SECNAVINST 5215.1
3. OPNAVINST 5290.1
4. DODINST 4000.19

1-15. The Reprographics Management Program defines procedures, terminology, and economical copier limitations for what type of commands?

1. Sea only
2. Shore only
3. Both sea and shore
4. Training

1-16. What log provides information on the daily expenditures in stock and toner?

1. Job Log
2. Copier Production Log
3. Economical Copying Limit Log
4. Reproduction Production Log

1-17. When do you use the Copier Production Log?

1. To produce items in large quantity
2. To produce items in small quantity
3. To eliminate job orders
4. To expedite job orders

1-18. You display copier limitations at the copy machine on which type of log?

1. Job Log
2. Copier Production Log
3. Economical Copying Log
4. Reproduction Production Log

1-19. When tasked with producing a ship or station newsletter, which instruction should you consult?

1. NAVPUBINST 5600.42
2. NAVPUBINST 5603.10
3. NAVPUBINST P-2002
4. NAVSEAINST 4570.3

1-20. The NAVPUBINST P-2002 is a regulation that lists which of the following information?

1. Ceremonial printing
2. Copyright regulations
3. Color printing
4. Signage stock numbers, and unit of issue

1-21. A job order arrives requesting a sign that you know to be in the supply system, which action should you take?

1. Accept the job
2. Reject the job
3. Throw the job order away
4. Return the job order to the requester citing supply ordering data

1-22. Besides environmental protection, the Precious Metals Recovery Program provides what benefits to the Navy?

1. Reduced shop waste
2. Altered work routines
3. Waste disposal alternatives
4. Savings or credit

1-23. Acceptable limitations on the alteration of official DoD imagery includes which of the following categories?

1. Conventional photographic techniques
2. Video imagery
3. Post-production enhancement
4. All of the above

1-24. What instruction requires you to submit a visual information report?

1. OPNAVNOTE 5290
2. OPNAVINST 5290.1
3. OPNAVINST 5510.1
4. NAVPUBINST 5600.44

1-25. How often should you submit a visual information report?

1. Semiannually
2. Annually
3. Biannually
4. Every third year

1-26. The Navy security manual is known by what short title?

1. SECNAVINST 5510.30A/5510.36
2. OPNAVINST 5290.1
3. SECNAVINST 5210.11
4. SECNAVINST 5600.20

1-27. Which chapter of the Navy security manual identifies marking procedures?

1. Chapter 8
2. Chapter 6
3. Chapter 10
4. Chapter 11

1-28. The intent of the Navy Forms Management Program does NOT specifically include what feature?

1. Standardization
2. Reduction of duplication
3. Minimization of new forms creation
4. Encouragement of inter-service use of forms

1-29. Before reproducing a local form, what should you check?

1. The designator for an approved current form
2. The local forms coordinator signature
3. The administrative officer signature
4. The originator's signature

1-30. Which is correct form for reporting MLSR items?

1. DD Form 200
2. DD Form 844
3. OPNAV 5213/18
4. OPNAV 5213/19

1-31. What is the purpose for annual sight inventories on custody card items?

1. To discover discrepancies
2. To learn shop capabilities
3. To drill inventory procedures
4. To check custody card signatures

1-32. The Standard Subject Identification Code consists of how many (a) sections and (b) major subject groups?

1. (a) 5, (b) 12
2. (a) 5, (b) 13
3. (a) 4, (b) 12
4. (a) 4, (b) 13

1-33. After removing an item from a file, you should indicate its whereabouts by what means?

1. A blank sheet of paper
2. A new folder
3. A Chargeout record
4. A backing board

1-34. When you have found an item previously reported as lost or stolen, you should follow procedures outlined in what instruction?

1. SECNAVINST 5510.11
2. SECNAVINST 5215.1
3. SECNAVINST 5216.5
4. SECNAVINST 5500.4

1-35. A work of authorship or design that you created as part of your official duties is subject to copyright protection.

1. True
2. False

1-36. Information on the use of copyrighted materials is found in what instruction?

1. NAVSUP P-2002
2. OPNAVINST 3150.25
3. OPNAVINST 5290.1
4. OPNAVINST 5870.5

1-37. Who is held liable for copyright infringement or violations?

1. You
2. The shop LPO
3. The department head
4. The user activity

1-38. The word Navy in gothic letters is what type of official identifier?

1. Department seal
2. Activity seal
3. Logotype
4. Emblem

1-39. Ceremonial paper stock in the government supply system is found as part of what instruction?

1. NAVSO P-35
2. SECNAVINST 5603.2D
3. NAVPUBINST P-2002
4. NAVPUBINST 5600.42

1-40. Navy shops may print all EXCEPT which ceremonial printed material?

1. Change of Command invitations
2. CPO Dining-In invitations
3. CPO Wedding invitations
4. Command picnics

1-41. Information to complete the annual Visual Information (VI) report should come directly from what source?

1. The OPTAR
2. The job log
3. The copier log
4. The reproduction production log

1-42. By using a standard form whenever possible, you can save which of the following expenditures?

1. Time
2. Manpower
3. Supplies
4. Each of the above

1-43. The ability to retrieve desired material quickly is a feature of what managerial tool?

1. Good managerial decisions
2. An effective filing system
3. Good supervisory decisions
4. An effective storage system

1-44. Which of the following personnel is/are responsible for checking material into or out of shop files?

1. The LPO only
2. The senior DM only
3. The DM in charge of the files
4. All shop personnel

1-45. A picture morgue is meant to provide what kind of material to the DM?

1. Copy
2. Layout
3. Clip art
4. Reference

1-46. What information should you write on the back of each picture in your picture morgue?

1. Your name
2. Shop code
3. Command name
4. Copyright

1-47. You should fold a picture that is too large for a picture morgue folder in what way?

1. In half
2. In fourths
3. With the picture side in
4. With the picture side out

1-48. Which of the following actions will reduce the wasting of materials in the shop?

1. Curbing loans or giving supplies away
2. Using limited shelf life items
3. Correcting abuses
4. Each of the above

1-49. A combination of completed jobs, current jobs, upcoming special projects, and prospective deployments and exercises will show you what trends?

1. Absenteeism
2. Worker apathy
3. Supply quantities
4. Deployment intensity

1-50. When do you use the first in/first out method of storing supplies?

1. When the material is small
2. When the material is large
3. When the material is light sensitive
4. When the material has time or temperature sensitivity

1-51. What is the maximum dollar amount of a purchase on an emergency requisition signed by a supply corps officer?

1. $100
2. $500
3. $1,000
4. $1,500

1-52. What is the purpose of an Operational Target (OPTAR)?

1. To log print jobs
2. To log job orders
3. To track supplies ordered
4. To track shop long term goals

1-53. Dividing a job into manageable tasks is a function of which supervisory skill?

1. Planning
2. Organizing
3. Supervising
4. Coordinating

1-54. An efficiently run shop is a result of what characteristic?

1. Abundant liberty
2. Excessive personnel
3. Extended work hours
4. A clear-cut chain of command

1-55. The process of dividing work into manageable tasks and arranging them into logical order is the result of what supervisory skill?

1. Planning
2. Training
3. Organizing
4. Coordinating

1-56. Effective supervision is being supportive without doing which of the following?

1. Stifling creativity
2. Making suggestions
3. Providing feedback
4. Monitoring

1-57. Assigning workers to complete jobs independently does NOT encourage what advantage?

1. Pride in accomplishment
2. Development of new skills
3. Overview of the entire picture
4. Rapid production

1-58. When you coordinate support from outside shops, it's important for you to meet deadlines for what primary reason?

1. To maintain good order
2. To prevent work stoppages
3. To make your shop look good
4. To prevent cutting into support shop deadlines

1-59. Negative motivation results in desirable behaviors.

1. True
2. False

1-60. If praising a worker should take place in public, criticizing a worker should take place when?

1. In public
2. In private
3. At quarters
4. In the LPO's office

1-61. As an LPO, you have direct input into which form of tangible feedback?

1. Awards
2. Evaluations
3. Assignments
4. Each of the above

1-62. What should you consider when motivating your workers?

1. Your crew
2. Personal gain
3. Your popularity
4. Shop reputation

1-63. Inaccurate reporting on forms and inventories can result in which of the following consequences?

1. Overstocked supplies
2. Underused equipment
3. Inaccurate time cards
4. Loss of funding and billets

1-64. When you are unable to complete a task on time, you should take which of the following actions?

1. Avoid the originator
2. Renegotiate job priorities
3. Reassign the job to another worker
4. Follow-up and provide updates to the originator

1-65. You, as a worker and new DM, are most obliged to do which of the following tasks?

1. Field day the shop
2. Parrot the supervisor
3. Answer phone inquiries
4. Actively learn new skills

1-66. You should take responsibility for your actions when you are in which of the following positions?

1. LPO
2. Trainee
3. Work shop supervisor
4. Each of the above

1-67. Where should job orders be kept while a job is being worked on?

1. In the shop file
2. With the job
3. In the job log
4. With the originator

1-68. When you create a local job order form, you should include the criteria from what report?

1. VI report
2. JCP No. 1
3. JCP No. 5
4. JCP No. 6

1-69. As an LPO, what are you looking for when you review a job request?

1. A due date
2. An originator's name
3. An originator's phone number
4. Accurate and complete information

1-70. The reputation of the shop depends upon the actions of what individual?

1. The division officer
2. The supervisor
3. A co-worker
4. You

1-71. A goal that you should strive for in customer service relations is which of the following?

1. Deferring the customer
2. Deceiving the customer
3. Satisfying the customer
4. Accommodating the customer no matter what

1-72. Who should the LPO assign as a quality control inspector?

1. Only the DM with a keen eye for detail and knowledge of drafting standards
2. The shop know-it-all
3. The junior DM
4. The senior DM

1-73. Why should LPOs rotate the assignment of someone to inspect completed jobs?

1. To prevent boredom
2. To cross train workers
3. To increase a worker's workload
4. To decrease a worker's workload

1-74. When, if ever, should a quality control inspector mark on an original?

1. When the marks will not be seen
2. When the original will obviously need redrawn
3. When the marks will not photograph
4. Never

1-75. What two things should a quality
control inspector have before
evaluating artwork?

1. A knife and a waxer
2. A knife and a nonphoto blue
pencil
3. A copy of the original and a
red pen
4. A copy of the original and a
set of standards

ASSIGNMENT 2

Textbook Assignment: "Basic Equipment", chapter 2, pages 2-1 through 2-71.

2-1. You should maintain drafting shop tools in what condition?

1. Locked up
2. Out of sight
3. Clean and uncluttered
4. Ready for use on the table

2-2. You must be especially cautious to protect drafting equipment from what type of abuse?

1. Dirt
2. Loans
3. Misadjustment
4. Nicks and lacerations

2-3. To protect the tabletop, it is a good practice for you to do what to a drafting table?

1. Place it out of traffic areas
2. Put a cover on it
3. Paint it
4. Avoid using it

2-4. What is the primary purpose of a worktable?

1. To prepare tracings
2. To place additional reference material on
3. To use as a temporary workstation at a remote site
4. To keep your personal gear off the drafting table

2-5. You can seriously injure yourself with a light table by using its glass surface to perform which of the following activities?

1. Tracing prints
2. Leaning against it
3. Drawing pictures
4. Assembling negatives

2-6. A tabouret serves which of the following functions?

1. As workstation at a site away from the shop
2. As additional reference material
3. As a coffee mess station
4. As a storage unit

2-7. What type of table covering is best suited for permanent application?

1. Cork
2. Mylar
3. Vinyl
4. Cellulose acetate paper

2-8. What table covering, if applied incorrectly, will snap a drawing board?

1. Cork
2. Mylar
3. Vinyl
4. Cellulose acetate paper

2-9. You should cover a tabletop recently recovered with cork for additional protection.

1. True
2. False

2-10. One of the key considerations in your selection of a drafting chair should be what feature?

1. Arms
2. Color
3. Rollers
4. Comfort

2-11. When you arrange light for a left-handed draftsman, the light source should emanate from what direction?

1. Back
2. Upper left
3. Upper right
4. Directly overhead

2-12. You should attach a light source to a table based on the right- or left-handedness of the DM for what reason?

1. To minimize shadows cast by the DM's hands
2. To keep the light out of the DM's way
3. To avoid conflict with the straightedge
4. To keep the working side of the table free of clutter

2-13. Approximately what minimum time does it take a hand waxer to reach operating temperature?

1. 5 minutes
2. 10 minutes
3. 15 minutes
4. 20 minutes

2-14. A tabletop waxer should be a minimum of how full before you turn it on?

1. 1/4 full
2. 1/3 full
3. 1/2 full
4. 2/3 full

2-15. Exactly, how many times should you run a sheet of paper through a waxer to ensure even coverage?

1. One
2. Two
3. Three
4. Four

2-16. What amount of time should you wait after changing the temperature setting on a tabletop waxer before running your paper through again?

1. 10 minutes
2. 20 minutes
3. 30 minutes
4. 40 minutes

2-17. When using a paper cutter, individuals tend to make what common mistake?

1. Cutting film
2. Cutting cardstock
3. Cutting too much material
4. Cutting too little material

2-18. You should draw the cutting arm down on a paper cutter in what manner?

1. Slowly in one stroke
2. Swiftly in one stroke
3. Swiftly in rapid strokes
4. Carefully in rapid strokes

2-19. Your failure to engage the safety catch at the base of the paper cutter will result in damage to what component?

1. The spring mechanism
2. The cutter board
3. The tabletop
4. The safety catch

2-20. A drafting machine combines the functions of which of the following pieces of drawing equipment?

1. Straightedge, scale, and dividers
2. Template, T-square, and straightedge
3. parallel ruler, protractor, and triangle
4. Radius curves, template, and straightedge

2-21. You attach the removable scales to the scale mechanism of a drafting machine by what means?

1. Phillips head screws
2. Dovetail fittings
3. Elongated screws
4. Pipe fittings

2-22. The elongated screws that hold the dovetail fittings to the scales of a drafting machine serve what purpose?

1. To attach the scales
2. To adjust the scale length
3. To make slight angular adjustments
4. To align the scale on the drafting board

2-23. Which of the following is/are advantage(s) of the parallel straightedge?

1. Ideal use in tight quarters
2. Simple to adjust and care for
3. Useable by both left- and right-handed DMs
4. Each of the above

2-24. The most commonly used T-square has a blade of what length?

1. 15 inches
2. 24 inches
3. 36 inches
4. 42 inches

2-25. What should you do when a T-square becomes out of true or damaged?

1. Hang it up
2. Tell the LPO
3. Throw it away
4. Sand down the edge

2-26. How should you store a T-square when you are not using it?

1. Leave it hanging up
2. Place it upright in a corner
3. Place it under the tabletop
4. Place it on a shelf in a locker

2-27. What is the purpose of a steel straightedge?

1. To cut straight lines
2. To draw straight lines
3. To tear paper
4. To weigh down paper

2-28. Why should you store drafting instruments in their original case?

1. To present a neat and orderly appearance
2. To have a place to put them in
3. To protect the instruments from corroding
4. To keep the instruments out of sight

2-29. What is the purpose of proportional dividers?

1. To draw circles
2. To transfer measurements
3. To step off equal distances
4. To transfer irregular curves

2-30 What is the purpose of a set of dividers?

1. To transfer irregular curves
2. To step off equal distances
3. To divide arcs and circles
4. To draw circles

2-31. What is the purpose of a compass?

1. To draw arcs and circles
2. To draw irregular curves
3. To divide arcs and circles
4. To step off equal distances

2-32. What distance beyond the leg of the compass or divider should the needlepoint project?

1. 1/64 inch
2. 1/32 inch
3. 3/64 inch
4. 1/8 inch

2-33. What drawing instrument should you select to draw a circle exceeding 64 inches in diameter?

1. A standard compass with an extension
2. A hollow compass
3. A beam compass
4. A drop bow

2-34. What drafting instrument should you select to draw a circle 1/8 inch in diameter?

1. A set of bow dividers
2. A drop bow pen
3. A compass
4. A bow pen

2-35. Which of the following is a feature of the Swede pen?

1. Broad nibs
2. Parallel nibs
3. Extremely curved nibs
4. Hollow handle on a swivel base

2-36. The contour pen is best suited for what purpose?

1. To create straight lines
2. To use greater ink capacity
3. To create freehand, curvilinear lines
4. To create parallel lines of equal or differing width

2-37. Which pen should you select to draw parallel lines of equal or differing widths?

1. Swede pen
2. Detail pen
3. Contour pen
4. Railroad pen

2-38. Needlepoints for compasses and dividers are available in which of the following shapes?

1. Blunt
2. Tapered
3. Shouldered
4. Tapered and shouldered

2-39. What is the purpose of a center disk?

1. To stabilize the compass or dividers
2. To mark the center of the item being drawn
3. To prevent overenlarging a compass hole
4. To mark the center of the circle being drawn

2-40. Exactly how far up the nib should you fill a pen with ink?

1. 3/16 inch
2. 1/2 inch
3. 9/16 inch
4. 1   inch

2-41. Before using a new pen nib, what should you do to the nib surface?

1. Moisten it
2. Oil it slightly
3. Sand it slightly
4. Marinate it in ink

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2-42. In a reservoir pen, what component regulates the flow of ink?

1. The feed tube
2. The clamp ring
3. The conical tip
4. The weighted needle

2-43. When you leave reservoir pen parts in an ultrasonic cleanser too long, what is the result?

1. Bent nibs
2. Extra clean pens
3. Melted plastic parts
4. Cracked plastic parts

2-44. You should keep uncommon tools in commonly accessible places.

1. True
2. False

2-45. A combination of a 30/60- and a 45-degree triangle can produce a total of how many other angles?

1. 10
2. 11
3. 12
4. 13

2-46. What type of angle is drawn with the adjustable triangle?

1. Obtuse
2. Regular
3. Irregular
4. Supplementary

2-47. The flat segment on a radius curve is known by what term?

1. A flat
2. A radius
3. A tangent
4. A straightedge

2-48. What is the purpose of a french curve?

1. To draw irregular or noncircular curves
2. To draw the curvature of a ship
3. To draw logarithmic curves
4. To draw parabolic curves

2-49. What is the dimension of the minimum, radius of a flexible curve rule?

1. 1   inch
2. 1 1/2 inches
3. 2   inches
4. 2 1/2 inches

2-50. When you draw an irregular curve with a french curve, to what number of points of contact should the french curve correlate?

1. One
2. Two
3. Three
4. Four

2-51. Which of the following drafting instruments should you use to lay off an angle from a horizontal base?

1. A T-square
2. A protractor
3. Dividers
4. A compass

2-52. In laying off an angle from a horizontal base, to what number of points of reference should you use?

1. One
2. Two
3. Three
4. Four

2-53. What type of material is NOT suitable for making a template for repeated or extended use?

1. Heavy acetate
2. Sheet metal
3. Cardboard
4. Paper

2-54. What is the purpose of an ink riser?

1. To prevent the ink from bleeding under a drawing aid
2. To prevent the DM from abrading the surface of a drawing
3. To allow the DM to create cleaner drawings
4. To allow the DM to use a template repeatedly without wearing it down

2-55. What is the purpose of a scale clip?

1. To enable quick pickup of the scale
2. To keep pencils within easy reach
3. To focus attention on the scale face in use
4. To slide the scale along a drawing board

2-56. It is as convenient to measure from left to right as it is from right to left through the use of what scale?

1. Open division
2. Full division
3. Double numbering
4. Single numbering

2-57. What scale on a triangular architect's scale indicates full inches?

1. 3/16
2. 1
3. 3
4. 16

2-58. What scale is ideal for making graphs or decimal measurements?

1. The architect's
2. The civil engineer's
3. The railroad engineer's
4. The mechanical engineer's

2-59. To measure accurately with a scale, you should take which of the following actions?

1. Lay the scale against your straightedge
2. Slide a sharp pencil lead carefully down the graduation groove
3. Make the drawing surface with the increment
4. All of the above

2-60. What is the ratio of the measurements on the drawing to the same measurements on the actual object known as?

1. The equation
2. The scale
3. The ratio
4. The rule

2-61. What factor dictates the size of a brush?

1. The bristle thickness
2. The ferrule or quill
3. The bristle length
4. The handle

2-62. Red sable brushes are generally used for what medium?

1. Acrylic color
2. Enamel color
3. Water color
4. Oil color

2-63 What bristle is suitable for use with oils and acrylics?

1. Ox hair
2. Red sable
3. Camel hair
4. Both 2 and 3 above

2-64. After cleaning brushes dedicated to oil-based paints and before storing them, what action should you take?

1. Reshape the bristles
2. Curl the bristles to the right
3. Wash them thoroughly with water
4. Add a drop of oil to the bristles

2-65. How should you store brushes once you wash them?

1. Place them back in the desk drawer
2. Place them on the bristles
3. Place them upright on the handles
4. Place them on a locker shelf

2-66. What determines the rating or grade of a pencil?

1. The diameter of the lead
2. The composition of the lead
3. The hardness of the lead
4. The composition and hardness of the lead

2-67. Of the following pencil grades, what is most suitable for technical or precise drawing?

1. B to 3H
2. F to 2H
3. 4H to 6H
4. 6B to 2B

2-68. What is the main difference between a graphic pencil and a carbon pencil?

1. A graphite pencil is dense black; a carbon pencil is not
2. A graphite pencil reflects light; a carbon pencil does not
3. A carbon pencil is affected by humidity the graphite pencil is not
4. A carbon pencil leaves a residue;the graphite pencil does not

2-69. When relative humidity is high, what pencil should you select to replace a 2B pencil?

1. 2H
2. 3B
3. 4B
4. 6B

2-70. Why should you use a sky-blue pencil to mark a board before photographing it on black-and-white film?

1. Because no colored marks reproduce on black-and-white film
2. Because sky-blue lead fades under the intense light of the camera
3. Because photographic black-and-white films are blind to sky-blue
4. Because sky-blue pencil leads are wax-based and melt under the camera lights

2-71. Why must you constantly move an electric eraser over an error in a circular pattern instead of concentrating on it?

1. To lighten the image area around the error
2. To prevent damage to the paper surface
3. To keep your wrist from tiring
4. To blend in the correction

2-72. What eraser should you use to pick out highlights in a drawing?

1. A plastic eraser
2. A kneaded eraser
3. An art gum eraser
4. Pulverized eraser particles

2-73. What is the purpose of an erasing shield?

1. To isolate areas you want to erase
2. To shave eraser particles away from the drawing
3. To protect the eraser from dirt on the drawing
4. To protect the drawing surface you do not want to erase

2-74. What is the purpose of a stump or tortillon?

1. To blend pencil, charcoal, pastels, and crayons
2. To blend color and ink washes
3. To mix binders with pigments
4. To mix pigments

2-75. To make sure you are making a clean and accurate cut, when should you change the blade in the knife?

1. Daily only
2. Weekly only
3. Monthly only
4. As often as you feel the blade needs changing

ASSIGNMENT 3

Textbook Assignment: "Computer Equipment," chapter 3, pages 3-1 through 3-43

3-1.   Computer hardware includes which of the following items?

1. Applications software
2. Operating software
3. Program data
4. Disks

3-2.   What items should NOT be allowed near computer input devices?

1. Food
2. Books
3. Papers
4. Pencils

3-3.   You should interface with a computer by using what type of device?

1. Editing
2. Input
3. Output
4. Monitoring

3-4.   Which of the following items is an input device?

1. CPU
2. Printer
3. Monitor
4. Trackball

3-5.   What input device is the primary means for entering data into a computer?

1. Light pen
2. Keyboard
3. Scanner
4. Mouse

3-6.   What is the purpose of an enhanced keyboard?

1. To italicize
2. To key WP functions
3. To combine keystrokes
4. To minimize keystrokes

3-7.   What is the function of the BACKSPACE key?

1. To scroll horizontally
2. To backup to the last command
3. To delete keystrokes to the left of the cursor
4. To delete keystrokes to the right of the cursor

3-8.   What is the function of the ESC key?

1. To scroll
2. To blank out the screen
3. To exit a program or situation
4. To send a screen image to a printer

3-9.   Special-purpose keys access functions that are part of what computer component?

1. The disk
2. The software
3. The hardware
4. The keyboard

3-10.   Which of the following keys do/does NOT control cursor movement?

1. The NUM LOCK keys
2. The F1 through F10 keys
3. The cursor control keys
4. The SCROLL LOCK/BREAK keys

3-11.   When pressing the CTRL key in conjunction with the SCROLL LOCK key, you access what function?

1. Program interruption
2. Screen scrolling
3. Cursor movement
4. Delete

3-12.   When pressing the NUM LOCK key, you activate or deactivate what function?

1. Cursor movement
2. Number pad keys
3. Scrolling
4. Deletion

3-13.   You should use a scanner for what purpose?

1. To copy images not already on disk
2. To circumvent a copyright
3. To minimize keystrokes
4. To scan hue and tone

3-14.   A general-purpose grey scale scanner should offer a minimum of how many levels of grey?

1. 52
2. 64
3. 76
4. 88

14

3-15. A general-purpose color scanner has what dpi range?

1. 200 to 500
2. 300 to 600
3. 400 to 700
4. 500 to 800

3-16. What is the purpose of a flatbed scanner?

1. To scan slides
2. To do small quantity scanning
3. To scan pages from a book
4. To scan three-dimensional objects

3-17. To access a command using a mouse, you should take what action?

1. Click the mouse keys
2. Turn the mouse on/off
3. Roll the mouse around on a mouse pad
4. Press INSERT once the mouse is in position

3-18. What item is primarily a freehand drawing input device?

1. Mouse
2. Joystick
3. Trackball
4. Electronic tablet

3-19. A light pen leaves an image on a computer monitor by what means?

1. Leaving a latent image in ink
2. Clicking functions from the menu
3. Activating Photoelectric cells
4. Electronically enhanced recording

3-20. What component is part of the system unit?

1. The monitor
2. The printer
3. The mouse
4. The CPU

3-21. What terminology identifies a system unit that stands upright?

1. A CPU
2. A tower unit
3. A control unit
4. A control tower

3-22. The motherboard is a master printed circuit board that contains the integrated circuit chips, the math co-processor, the memory slots, and the clock.

1. True
2. False

3-23. The CPU performs which of the following functions?

1. Coordinates computer activities
2. Accepts input and provides output
3. Controls speed or processing power
4. Each of the above

3-24. What is the main difference between PCs and MAC computers?

1. Memory
2. Software
3. Capabilities
4. User interface

3-25. RAM memory is often referred to as what type of memory?

1. Read only
2. Long term
3. Read/write
4. Write once/read many

3-26. You should save information in RAM because it is what type of memory?

1. Long term
2. Read only
3. Short term
4. Write once/read many

3-27. Memory chips store information in all EXCEPT which of the following increments?

1. Kilobyte
2. Megabyte
3. Gigabyte
4. Trilobite

3-28. Read Only Memory (ROM) is required to provide what function?

1. To read a disk
2. To record a disk
3. To power a disk drive
4. To read and record a disk

3-29. You should upgrade the memory capacity of a computer when you add which of the following items?

1. Software
2. Printer
3. Monitor
4. Keyboard

3-30. What is the purpose of a disk drive?

1. To access data on disks
2. To print data from a disk
3. To organize data on a disk
4. To remove disks from the system unit

3-31. What is the purpose of the notch in the upper-right hand corner of the disk?

1. To clean the disk
2. To keep the disk clean
3. To prevent over-recording insertion into the drive
4. To ensure correct insertion into the drive

3-32. What is a major advantage of a hard disk drive?

1. A sealed unit
2. Speed of execution
3. Rigid metal platters
4. It is part of the system unit

3-33. What type of data belongs on a removable hard disk drive?

1. A command newsletter
2. Personal information
3. A Confidential brief
4. Command policy and directives

3-34. When many users need the same information and the nature of the information remains constant, what type of drive unit should be used?

1. Hard disk
2. Floppy disk
3. CD ROM disk
4. Removable hard disk

3-35. What type of technology drives compact disk read only memory?

1. CD-ROM
2. WORM
3. ROM
4. RAM

3-36. The size and resolution of a computer screen is controlled by what NIC?

1. VGA
2. WORM
3. MODEM
4. CD-ROM

3-37. Which of the following items is NOT an example of an output device?

1. Film recorders
2. Disk drives
3. Monitors
4. Plotters

3-38. What type of monitor displays both textural information and graphics with equally good resolution?

1. Laser
2. Analog
3. Digital
4. Multisynchronous

3-39. Computer screen resolution is referred to by what unit of measure?

1. PPI
2. DPI
3. LPI
4. BPI

3-40. A general-purpose 20-inch monitor has how many dpi resolution?

1. 40 by 80
2. 80 by 40
3. 640 by 480
4. 480 by 640

3-41. What are the two classifications of printers?

1. Impact and nonimpact
2. Dot matrix and daisy wheel
3. Daisy wheel and letter quality
4. Letter quality and near letter quality

3-42. What determines the letter quality of a character printed by a dot matrix printer?

1. The paper texture
2. The printer setting
3. The size of the matrix
4. The freshness of the ribbon

3-43. Which of the following types of printer is considered fastest?

1. Daisy wheel printers
2. Dot matrix printers
3. Nonimpact printers
4. Impact printers

3-44. What type of printer sprays electrically charged ink through nozzles in a printing element?

1. Continuous tone die sublimation printers
2. Ink jet printers
3. Wax printers
4. Laser printers

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3-45. A printer that prints with a beam of light is what type of printer?

1. Thermal transfer
2. Ink jet
3. Laser
4. Wax

3-46. What must you do before manually setting printer parameters?

1. Select MODE
2. Depress the RESET button
3. Advance the paper to the top
4. Put the printer in an offline status

3-47. When a printer is online, what type of software controls printer parameters?

1. Operating system
2. Word processing
3. Applications
4. Printer

3-48. To print a document with letter quality characters, what button would you depress?

1. MODE
2. PITCH
3. SPACING
4. TYPESTYLE

3-49. Which, if any of the following, wheels would you move when changing the position of a printer tractor wheel?

1. Left
2. Right
3. Both
4. Neither

3-50. A modem is which type of device?

1. Input
2. output
3. Input/output
4. Communications

3-51. What is the first step you should take when you set up a microcomputer system?

1. Make all necessary connections
2. Read the literature
3. Plug everything in
4. Load the software

3-52. You must make sure the computer and supporting devices are set to appropriate line voltages before connecting.

1. True
2. False

3-53. What is the purpose of a surge suppressor?

1. To even current flow
2. To prevent a surge of current
3. To activate backup power in a power loss
4. To surge current in the event of current lapse

3-54. What device should you plug into the surge suppressor first?

1. The system unit
2. The keyboard
3. The monitor
4. The printer

3-55. What is software?

1. Data stored on a disk
2. The monitor
3. A floppy disk
4. Program literature

3-56. What software program should you enter into the computer memory bank first?

1. Applications
2. Word processing
3. Operating system
4. Desk top publishing

3-57. What type of software is NOT an example of applications software?

1. Windows
2. System 7
3. DOS
4. ROM

3-58. You should restrain yourself from using the hard return key for which of the following reasons?

1. To key more rapidly
2. To prevent coding errors
3. To eliminate work effort
4. To maintain the reveal codes

3-59. What work habit will lessen data loss in the event of a system failure?

1. Bypassing the timed backup feature
2. Periodically saving material
3. Hitting the hard return key
4. Using reveal codes

3-60. To eliminate tedious after-editing, what should you do to a document before entering text?

1. Open it
2. Save it
3. Format it
4. Enter all text

3-61. What is the function of a macro?

1. To calculate mathematically
2. To eliminate repetitive steps
3. To highlight special functions
4. To insert fractions and whole numbers

3-62. What are the two types of software technology available for use in graphic programs?

1. Bit mapping and vector mapping
2. Raster-based and bit mapping
3. Vector mapping and matrix
4. Matrix and gridmaps

3-63. What is one disadvantage to raster-based imagery?

1. Limited effects
2. Difficult to learn
3. Pixel level execution
4. Enormous power and memory consumption

3-64. What is one disadvantage to vector mapped imagery?

1. Enormous power and memory consumption
2. Pixel level execution
3. Difficult to learn
4. Limited effects

3-65. You should base the selection of a software program for the graphics shop on which of the following factors?

1. Hardware limitations
2. Budget restrictions
3. Personnel abilities
4. Command needs

3-66. Your failure to encapsulate a shape with pixels completely before using the fill command will result in what effect?

1. Bleeding
2. Blending
3. Wash out
4. Black out

3-67. Immediate elimination of the effects of the last command given in a graphics package is done with what key?

1. UNDO
2. ERASE
3. DELETE
4. BACKSPACE

3-68. Electronically processed classified data stored on a disk is divided into what three categories?

1. Level I, Level II, and Level III
2. Confidential, Secret, and Top Secret
3. Classified, sensitive, and unclassified
4. Privacy information, classified material,and command policies

3-69. Within Level I, what are the four modes of electronic processing for classified material?

1. System high, System low, Controlled and Uncontrolled
2. System High, Dedicated, Multilevel, and Controlled
3. Sensitive, Confidential, Secret, and Top Secret
4. A, B, C, and D

3-70. Electronic processing at Level I in the multilevel mode allows various types and categories of classified material to be stored and processed concurrently.

1. True
2. False

3-71. How long may you store working copy disks before you destroy them?

1. 90 days
2. 120 days
3. 150 days
4. 180 days

3-72. When should you mark a classified disk?

1. When the document is created
2. When the document is complete
3. When the document is in its final form
4. After transferring to the finished media disk

3-73. How should you mark the computer monitor before displaying a screen with classified material on it?

1. At the top of the monitor
2. At the bottom of the monitor
3. One both sides of the monitor
4. On the side of the monitor facing traffic areas

3-74. What action do you take before destroying a disk containing classified material?

1. Log it in a book
2. Degauss or erase the disk
3. Get permission from the ADPSSO
4. Give it to the ADPSSO for destruction

3-75. Which of the following types of information should you record as part of your equipment inventory?

1. Make and model
2. Mode of operation
3. Kind of information the computer processes
4. All of the above

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ASSIGNMENT 4

Textbook Assignment: "Reproduction Equipment," chapter 4, pages 4-1 through 4-42.

4-1. What should you avoid when using reproduction equipment?

1. Too many extension cords
2. Surge suppressors
3. Using equipment too long
4. Using too many pieces of equipment at once

4-2. Before cleaning a piece of reproduction equipment, what is the first step you should take?

1. Turn the power on
2. Turn the power off
3. Inform the supervisor
4. Check out with the supervisor

4-3. When should you de-energize electrically powered equipment?

1. When the deck is wet
2. When the humidity is high
3. When you secure for the day
4. When you secure for the weekend

4-4. Which of the following clutter is especially dangerous near a keyboard?

1. Food
2. Drink
3. Ashes
4. Debris

4-5. What action do you take to protect equipment before deploying?

1. Unplug and clean equipment
2. Tie, strap, or secure equipment
3. Power down and unplug equipment
4. Power up and make ready equipment

4-6. What criteria is used to classify copiers?

1. Volume range and speed
2. Shop or command needs
3. Options and speed
4. Options and brand

4-7. When purchasing a black-and-white copier, what primary variables do you consider?

1. Electrostatic, thermographic, or digital technology
2. Speed, resolution, and volume
3. Location, options, and brand
4. Space and electrical draw

4-8. What type of copier technology fixes the toner image to paper with heat?

1. Laser
2. Thermal
3. Digital
4. Electrostatic

4-9. What type of copier technology uses color toner instead of a ribbon to create an image on paper?

1. Electrostatic
2. Thermsl
3. Digital
4. Laser

4-10. You can increase the contrast in a weak master by depressing which of the following buttons?

1. REDUCE
2. ENLARGE
3. COLLATE
4. LIGHT/DARK

4-11. When a copier is consistently troublesome, why should you notify a key operator?

1. To admit defeat
2. To have it fixed right
3. To have someone else fix it
4. To have someone trained in copier technology fix it

4-12. A copier that is low on toner will have which of the following symptoms?

1. Blank pages
2. Letter fill in
3. Letter drop out
4. Uneven resolution

4-13. What machine is capable of producing quality copies on vellum, acetate, and paper?

1. A thermographic copier
2. A diazo machine
3. A ditto master
4. A typewriter

4-14. What component of an anhydrous diazo machine distributes the ammonia vapor?

1. Drip trays
2. Heater rods
3. Blower unit
4. Distilled water

4-15. A diazo machine consists of four distinct components that include a printing section, a developing section, and what other sections?

1. Blower and timer
2. Blower and heating
3. Cooling and exhaust
4. Cooling and ejection

4-16. The heating rods of an anhydrous diazo machine are a part of what section?

1. Developing
2. Printing
3. Cooling
4. Exhaust

4-17. The blower and timer serve which of the following functions?

1. To expel fumes
2. To cool heater rods and drip trays
3. To deposit residue into the residue collection bottle
4. Each of the above

4-18. What is the first step in starting up the diazo machine for use?

1. Turn on the machine
2. Adjust the ammonia flow
3. Run the machine for a warm-up period
4. Insert the drain tube into the residue collection bottle

4-19. To what speed should you adjust the ammonia feed rate after turning the main power switch on?

1. 50 to 60 drops per minute
2. 60 to 70 drops per minute
3. 20 feet per minute
4. 20 minutes

4-20. What is the approximate warm-up time for a diazo machine?

1. 10 minutes
2. 20 minutes
3. 30 minutes
4. 40 minutes

4-21. What is the approximate cool down period for a diazo machine that has been running continuously for 6 hours?

1. 10 minutes
2. 20 minutes
3. 30 minutes
4. 40 minutes

4-22. When you secure the machine for the day, why should you feed a sheet of porous paper through the diazo machine?

1. To soak up residual ammonia
2. To cool the printing cylinder
3. To prevent the web belts from sticking
4. To prevent the sealing sleeve from sticking and the belts from residual heat

4-23. What steps are a part of daily maintenance for a diazo machine?

1. Cleaning the feedboard
2. Lubrication of all bearings
3. Cleaning and dusting all hoses
4. Cleaning the inside of the cylinder

4-24. Careless handling of ammonia can cause what problems?

1. Smoke and fire
2. A pungent odor
3. Blindness and burns
4. Discoloration and fading of surfaces

4-25. Desensitized areas in a diazo blueline print will appear as what color after development?

1. Blue
2. Black
3. Clear
4. Yellow

4-26. Why should you NEVER store diazo prints and foils with conventional photographs?

1. Diazo images will deteriorate
2. Photographs will fade and discolor
3. Diazo images will transfer to the photograph surface
4. Photographic surfaces will transfer to the diazo print

4-27. Diazo material is NOT sensitive to light or temperature, but is sensitive to time.

1. True
2. False

4-28. What type of bulb is found in most diazo machines?

1. Fluorescent
2. Ultraviolet
3. Incandescent
4. Mercury vapor

4-29. The best image possible from a diazo machine occurs when the master and the material enter the feed assembly in what fashion?

1. Emulsion side up
2. Emulsion side down
3. Emulsion to emulsion
4. Emulsion against the feedboard

4-30. Why must you carefully handle paper or film when you load a phototypesetting machine?

1. To avoid chemical contamination by your hands
2. To avoid chemical contamination to your hands
3. To avoid spilling chemical developers
4. To avoid damage to the soft emulsion

4-31. To make sure the phototypesetter operates well, which maintenance step should you perform daily?

1. Rinse the roller assembly and trays
2. Oil all bearings with No. 10 lube oil
3. Clean all mirrored surfaces with a rag
4. Clean all optical surfaces with glass cleaner

4-32. What type of phototypesetter is commonly found in Navy Graphics shops?

1. CRT technology
2. Raster scan technology
3. First-generation technology
4. Fourth-generation technology

4-33. The term "on the fly" refers to what type of phototypesetter process?

1. Fiber optics
2. Digital memory
3. Raster scanning
4. Electromechanical

4-34. What phototypesetter technology is an example of fourth-generation technology?

1. Raster scan and fiber optics
2. Electromechanical
3. Cast hot type
4. Digitization

4-35. A halftone, point, and pixel are synonymous units of measure for image definition.

1. True
2. False

4-36. What developing process is not permanent?

1. Stabilization
2. Photographic
3. Transfer
4. Therms 1

4-37. How can you tell if the chemicals in a phototypesetter need replenishment?

1. Weak images
2. Streaked images
3. Thin grey images
4. Each of the above

4-38. Pressure process lettering machines produce which kind of letter?

1. Ghost
2. cutout
3. Carbon
4. Carbon or cutout

4-39. When you use a pressure process lettering machine that cuts letters from a vinyl or paper tape, how do position the raised image on the font in the channel?

1. Toward the tape
2. Behind the tape
3. Between the tape
4. Away from the tape

4-40. What must you do to preserve the carbon image from a pressure process lettering machine?

1. Burnish the tape
2. Laminate the tape
3. Spray the tape with fixative
4. Spray the tape with clear spray paint

4-41. Why must you be careful when using a carbon lettered strip on master artwork you intend to expose to hot lights?

1. Adhesive seepage
2. Melted carbon image
3. Melted plastic carrier
4. Dry and cracked carbon image

4-42. When you peel the backing paper away from a strip of cutout lettering, what angle must you attempt to maintain?

1. A low angle
2. A high angle
3. A 90-degree angle
4. A 45-degree angle

4-43. Engravers resemble what drafting instrument in principle and construction?

1. A hand-lettering set
2. A drafting machine
3. A pantograph
4. A trammel

4-44. For what item would you use a diamond-tipped cutter?

1. A plastic water fountain sign
2. A brass trophy plate
3. A plastic door sign
4. A plastic nameplate

4-45. For what item would you connect the pulley and motor to engrave?

1. A plastic door sign
2. A brass trophy plate
3. An aluminium desk plate
4. A brass shadow box plate

4-46. When preparing to use the engraver, in addition to cleaning away debris, what should you be concerned about?

1. Debris in the galley
2. Sharp cutter points
3. Debris in the jaws
4. Sawdust

4-47. While you are engraving, what is the purpose of your left hand?

1. To apply pressure to the cutter
2. To apply pressure to the tracer
3. To apply pressure to the forehead
4. To tighten the thumbscrews in the galley

4-48. While you are engraving, what is the purpose of your right hand?

1. To apply pressure to the cutter
2. To apply pressure to the tracer
3. To apply pressure to the forehead
4. To tighten the thumbscrews in the galley

4-49. From where do process cameras derive power?

1. Timers
2. Battery
3. Electricity
4. Rotating handwheels

4-50. What should you look for in the battery compartment of a battery-driven camera?

1. Battery color
2. Clean contacts
3. Dust and debris
4. Swollen or leaking batteries

4-51. What feature is typical of a darkroom type process camera?

1. A film plane built into a wall
2. Absence of handwheels
3. Vertical orientation
4. Free-standing unit

4-52. How many parallel planes comprise a process camera system?

1. One
2. Two
3. Three
4. Four

4-53. What is the purpose of the copy plane?

1. To hold the copy in place
2. To hold the lens in place
3. To hold the film in place
4. To hold the lights in place

4-54. The plane that holds the lens in place also performs which additional function?

1. To assist in proportional reductions and enlargements
2. To assist in fine focusing of the image
3. To align original copy
4. To hold filters

4-55. You attach halftone and color separation filters to which of the following planes?

1. The copy plane
2. The lens plane
3. The film plane
4. The pressure plane

4-56. To maintain the lighttight integrity of the camera system is the function of what camera element?

1. The focusing control
2. The copy plane
3. The bellows
4. The scales

4-57. An automated camera that sets the aperture after you set the shutter speed is what type of camera?

1. Shutter speed priority
2. Aperture priority
3. Automatic
4. Manual

4-58. What type of light is a principal requirement for good photographic exposures?

1. Copy
2. Normal
3. Flourescent
4. Temperature matched

4-59. You should select a copyboard illuminated from underneath to shoot 35mm slide film for which of the following effects?

1. Even illumination
2. Light enters lens directly
3. Control of negative density
4. Minimization of surface flaws in the artwork

4-60. Light temperature or an unbalanced light source will unevenly render color on black-and-white photographs.

1. True
2. False

4-61. You would NOT select a 3400 degree Kelvin light source for general-purpose work for what reason?

1. Too hot a light source
2. Too cool a light source
3. Too short a useful life
4. Too expensive to replenish

4-62. What type of light would you select to illuminate artwork created on a heavily toothed cardstock evenly?

1. 3200 degree K
2. 3400 degree K
3. Fluorescent
4. Quartz iodine

4-63. What is the purpose of a lens hood?

1. To protect the bulb
2. To protect the artwork
3. To prevent dust on the light
4. To prevent glare and stray light

4-64. Why is it necessary for you to replace all lights in an assembly when only one light burns out?

1. They are sold in sets only
2. They will all be clean and new
3. They will all be the same brand
4. They will all have the same color temperature

4-65. The main difference between a single lens reflex and a rangefinder camera is in what feature?

1. The way an image projects onto the film plane
2. The shutter speed selection
3. The aperature selection
4. The focusing mechanism

4-66. What is parallax?

1. A waxy deposit left by swollen batteries
2. The spectral coating that reflects glare from a len's surface
3. The distance between the viewing lens and the lens through which the exposure is made
4. The distance between the film plane and the object being photographed

4-67. Why are certain 35mm cameras sometimes called a single lens reflex?

1. Only one lens is used at a time
2. Only one lens records on film
3. Only one lens is available for a single lens reflex
4. The viewing lens is the same lens that records the image

4-68. With 35mm photography, what item takes the place of the copy plane?

1. The object
2. The f/stops
3. The shutter
4. The automatic sensors

4-69. As you select a smaller focal length lens, what, if anything, can you expect to happen to the rated speed of the lens?

1. It will be slower
2. It will be faster
3. It will be smaller
4. Nothing will happen to it

4-70. Your task is to photograph a small machine part for a 35mm color slide. What lens would you select?

1. Short range
2. Standard
3. Variable
4. Macro

4-71. You are in a situation that is deteriorating rapidly. You have the only camera handy and know the CO will want photographs. What action can you take?

1. Use the rule of f/16
2. Give the camera to the PH
3. Ignore the situation
4. Carefully determine each exposure, risking loss of an important scene

4-72. After you set the shutter speed to T and depress the shutter button, how long will the shutter remain open?

1. 1 second
2. 2 seconds
3. 3 seconds
4. Until you depress the shutter button again

4-73. Because the PH is not available, you are shooting the retirement of the command master chief in the auditoruim. What film type reasonably ensures correct exposure?

1. ISO 1000
2. ISO 400
3. ISO 125
4. ISO 25

4-74. The repair officer summons you to photograph a broken pulley in the nuclear storage facility. There is ample light, you have a fast lens, plenty of time, and you suspect he or she will want detailed enlargements. Which film should you select?

1. ISO 2000
2. ISO 400
3. ISO 200
4. ISO 25

4-75. You are reproducing slides for which there is no existing artwork. What additional corrections can you make with a slide duplicator?

1. Minor exposure and compositional errors
2. Extreme exposure errors
3. Serious compositional errors
4. Color balance errors

ASSIGNMENT 5

Textbook Assignment: "Audiovisual Equipment," chapter 5, pages 5-1 through 5-32.

5-1. Before a major presentation, what action regarding the maintenance of projection devices should you take?

1. Test the device
2. Inspect the device
3. Clean all optical surfaces
4. Each of the above

5-2. What do you use to clean the optical surfaces of a projection device?

1. A chamois
2. A lint-free cloth
3. Both 1 and 2 above
4. A camel hair brush

5-3. Why would you run a projection device 5 minutes before the presentation?

1. To warm it up
2. To make sure it is working
3. To review the presentation
4. To prepare the audience for the presentation

5-4. What angle between the projection lens and the screen prevents keystoning?

1. 30 degree
2. 60 degree
3. 90 degree
4. 120 degree

5-5. The opaque projector operates by reflecting light off of what type of object?

1. Transparencies
2. Slides
3. Books
4. Glass

5-6. An opaque projector will project three-dimensional objects, such as small machine parts, gears, and cams.

1. True
2. False

5-7. What is the purpose for the roll feed assembly of an opaque projector?

1. To lower the assembly platform
2. To raise the conveyor belt into place
3. To raise the projection platform
4. To slide objects into the projection platform

5-8. What is the thickest object that will fit on the platen assembly of an opaque projector?

1. 1 1/2 inches
2. 2 inches
3. 2 1/2 inches
4. 3 inches

5-9. What is the first step for replacing the bulb in an opaque projector?

1. Remove the plug from the wall socket
2. Allow the lamp to cool down
3. Press down on the bulb
4. Turn off the power

5-10. What is the last step for replacing a bulb in an overhead projector?

1. Turning on the power
2. Warming up the bulb for 1 minute
3. Pluging the projector into the socket
4. Cleaning the new bulb of all fingerprints

5-11. An overhead projector projects what type of material?

1. Opaque
2. Translucent
3. Transparent
4. Three dimensional

5-12. What is a disadvantage to using an overhead projector?

1. Heat buildup
2. Overly sensitive bulbs
3. Extended cool down periods
4. Distracting noise from motor

5-13. What is a major advantage of an overhead projector?

1. Simplicity
2. Low-watt consumption
3. Writing directly on the visuals
4. Projecting three-dimensional objects

5-14. What is the name of the concentric circular scribes that focus and intensify the light source?

1. Fresnel lens
2. Mirror assembly
3. Polarized spinner
4. Thermostatic control

5-15. How would you place a visual on an overhead projector for front screen projection?

1. With the bottom of the projectural facing the screen
2. With the top of the projectural facing the screen
3. So that the projectural is illegible
4. With the face down on the projection stage

5-16. For rear screen projection, how would you place the projectural on an overhead projector?

1. With the face up
2. So that it is legible to the operator
3. So that it is illegible to the operator
4. With the bottom of the projectural facing the screen

5-17. Why is the overhead projector equipped with a three-position switch?

1. To turn on the lamp and advance the transparencies
2. To power the lamp and the polarized spinner
3. To turn on the blower and advance the transparencies
4. To power the blower to cool the bulb once the projector is off

5-18. What type of projector is the most common type in military commands?

1. Slide
2. Opaque
3. Overhead
4. Portable overhead

5-19. To select a particular slide in a loaded tray during a presentation, which action should you take?

1. Remove the slide tray and remove the slide
2. Set the slide timer to M and forward through the slides
3. Depress the select button to sequence through the slides
4. Depress the select button and move the tray to position the slide above the gate

5-20. When you operate a slide projector and set the timer at the M position, how many seconds will each slide project?

1. 5
2. 10
3. 15
4. As long as the operator desires

5-21. What action do you take when it is difficult to remove the slide tray from a slide projector?

1. Use a coin to turn the slotted screw on the top of the tray
2. Turn off the projector, then turn it back on
3. Jiggle the tray until it gives way
4. Force it from the top

5-22. What is the first step for changing the bulb of a slide projector?

1. Turn off the power
2. Turn off the blower
3. Allow the bulb to cool
4. Remove the plug from the socket

5-23. After replacing the bulb in a projector, how long should you run the projector?

1. 1 minute
2. 3 minutes
3. 5 minutes
4. 7 minutes

5-24. What is the purpose of a stack loader?

1. To allow rapid loading and rearrangement of slides
2. To permit stacking the projectors in a projection rack
3. To allow the operator to stack projection devices on the same plug
4. To allow different briefs or presentations to follow directly after the last

5-25. Which slide projection accessory has flashing or overlay capabilities?

1. A programmer
2. A slide tray
3. A stack loader
4. A dissolve unit

5-26. What should you consider when positioning a projector rack in a media integrated theater?

1. Access
2. Ventilation
3. Angle to the screen surface
4. Each of the above

5-27. What advantage does switching from SP to LSP give you?

1. More recording time
2. Less recording time
3. More positive tracking
4. Better recording quality

5-28. A VHS prerecorded tape chatters or stutters when you play it. VHS action should you take?

1. Switch the speed of play
2. Adjust the track dial
3. Clean the tape heads
4. Rewind the tape

5-29. How do you disable the record function of a tape cartridge?

1. Cut the tape
2. Degauss the tape
3. Break the tab on the tape cartridge
4. Place masking tape over the tab on the tape cartridge

5-30. A misadjusted video projector projects what sort of image?

1. An out-of-focus image
2. An image that chatters
3. A faded image
4. A ghost image

5-31. What is the purpose of a tape counter?

1. To cue sound and monitor tape
2. To measure tape left on a reel
3. To total the amount of tape on a cartridge
4. To meter time left to a presentation

5-32. To record on a cassette tape, what buttons must you depress simultaneously?

1. Play and Pause
2. Record and Stop
3. Play and Record
4. Record and Pause

5-33. How often should you clean the heads on a cassette player/recorder?

1. Every 6 hours
2. Every 8 hours
3. Every 10 hours
4. Every 18 hours

5-34. What should you do with damaged speakers?

1. Replace or repair them
2. Use them only ocassionally
3. Move them to the front of the theater
4. Move them to the back of the theater

5-35. What causes a speaker wire to cut in and out?

1. A torn speaker
2. A bad amplifier
3. A crushed speaker
4. An oxidized speaker wire

5-36. What combination illustrates the use of media integration?

1. A speaker and a slide show
2. A projector and a lectern
3. A projector and a lecture pad
4. A projector and controllable lights

5-37. What is NOT an example of a lecture aid?

1. A script
2. A pointer
3. A lectern
4. A light switch

5-38. What item would you NOT place near an electrified podium?

1. A glass of water
2. A pointer
3. A script
4. A fan

5-39. How can you make lightweight, cut out objects stick to a flannel board?

1. Pin them on the board
2. Put glue on the back of them
3. Put tape on the back of them
4. Put a slightly abrasive backing on them

5-40. What is the one advantage hook and loop boards have over a flannel board?

1. Objects hung on the board may be larger or heavier
2. Objects hung on the board must be lighter
3. Objects hung on the board may be smaller
4. The board covering is more colorful

5-41. What type of markers must you use on a marker board?

1. Felt tip
2. Erasable
3. Pantone
4. Common

5-42. Why should you place an additional sheet of paper under the lecture pad paper you intend to mark on?

1. To make the paper appear more white
2. To make the paper surface smoother
3. To prevent scoring the next sheet of paper
4. To prevent ink from bleeding through

5-43. Writing legibly and using fresh markers will prevent embarrassment in front of an audience.

1. True
2. False

5-44. What two basic types of projection screens are found in presentation theaters?

1. Front and rear
2. Front and white
3. White and silver
4. Rear and translucent

5-45. How can you project in rear screen projection an image that is too large for direct projection?

1. Set up a mirror at a 45-degree angle
2. Move the projector to the front
3. The image is reshot as a slide
4. Schedule a larger theater

5-46. What criteria do you use to base the selection of a front projection screen for a presentation?

1. Room dimension
2. Screen surface
3. Angle of projection
4. Both 1 and 3 above

5-47. What screen is brighter than a beaded screen?

1. Lenticular
2. Matte
3. White
4. Grey

5-48. What screen rejects room light from its surface?

1. High gain aluminium
2. Lenticular
3. Beaded
4. Matte

5-49. What screen reflects all light including the light from overhead?

1. High gain aluminium
2. Lenticular
3. Beaded
4. Matte

5-50. What screen diffuses light evenly and in all directions?

1. High gain aluminium
2. Lenticular
3. Beaded
4. Matte

5-51. How close to the screen should you place the first row of chairs for the audience of a classroom presentation?

1. 2 screen heights
2. 3 screen heights
3. 4 feet
4. 6 feet

5-52. What is the farthest distance away from the screen that you should place the last row of chairs for a presentation?

1. 6 screen heights
2. 8 screen heights
3. 10 feet
4. 12 feet

5-53. What misadjustment creates the effect of keystoning?

1. A projector not in focus
2. A projector too close away from the screen
3. A projector too far away from the screen
4. A projector not perpendicular to the screen surface

5-54. Keystoning appears on the screen as what shape?

1. Box
2. Cone
3. Wedge
4. Circle

5-55. You should groom the command briefing theater or conference room to make a positive first impression on new personnel.

1. True
2. False

5-56. What action can you take to lessen the amount of sound affecting the briefing theater or conference room?

1. Carpet the room
2. Post signs requesting silence
3. Add upholstered furniture to the room
4. Each of the above

5-57. Why should you adjust the temperature in a conference room not to be overly warm?

1. To prevent numbness
2. To prevent slumber
3. To reduce bacteria
4. To reduce odor

5-58. You should divide lighting in the theater into how many phases?

1. One
2. Two
3. Three
4. Four

5-59. While the audience enters the theater but before the presentation begins, what lights in the theater should be on?

1. The lights over the speaker
2. The lights over the audience
3. The lights in back of the room
4. The lights in front of the screen

5-60. Once the audience sits and just before the presentation, you should turn off what lights?

1. The lights in front of the screen
2. The lights in back of the room
3. The lights behind the audience
4. The lights over the audience

5-61. During the presentation, when do you turn off the lights on the screen?

1. After the introduction of the speaker
2. As the audience enters the theater
3. As the audience leaves the theater
4. After the first introductory slide

5-62. Leaving the lights on behind the audiences provides what advantage?

1. A decrease in eyestrain
2. An increase in eye contact
3. An increase in temperature
4. A decrease in note taking

5-63. What lights are on as the audience leaves the briefing theater?

1. The lights over the speaker and on the screen
2. The lights over the speaker and over the audience
3. The lights over the speaker and behind the audience
4. The lights in front of the audience and on the screen

5-64. Where would you place the speakers in a theater to prevent squeal or feedback?

1. In front of and to the right of the audience and the lectern
2. In back of and to the right of the lectern and the audience
3. In front of the lectern and facing the audience
4. In back and facing the audience and the lectern

5-65. Why should only one division be responsible for maintaining the briefing theater?

1. To stop loitering
2. To stop littering
3. To control access
4. To schedule and assign time

5-66. Why is it important to maintain the theater in a state of optimum readiness?

1. To communicate effectively
2. To look good to new personnel
3. To control access to the theater
4. To maintain cleanliness in the theater

5-67. Staggering the projectors in a projection rack gives you what capability?

1. Adequate ventilation
2. Projector access
3. Untangled cords
4. Multimedia

5-68. What seats in a briefing theater should be able to rotate or move?

1. The first row
2. The second row
3. The third row
4. Dignitary seating

5-69. Where should you place the lectern in a theater?

1. Near the door
2. In the center of the screen
3. To one side and even with the screen
4. To one side and in front of the screen

5-70. Where should you place a speaker when using a lecture aid?

1. Between the lectern and the screen
2. Next to the lectern, opposite the screen
3. Opposite the podium, with the screen in between
4. In front of the lectern, between the audience and the speaker

5-71. The area surrounding the projection devices is known by what name?

1. The projection area
2. The projection rack
3. The projection stage
4. The projection assembly