

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

**PAINTING, REPLATING, AND PRESERVING
INSTRUCTIONS FOR
COMMUNICATIONS SECURITY EQUIPMENT**

Headquarters, Department of the Army, Washington, D.C.
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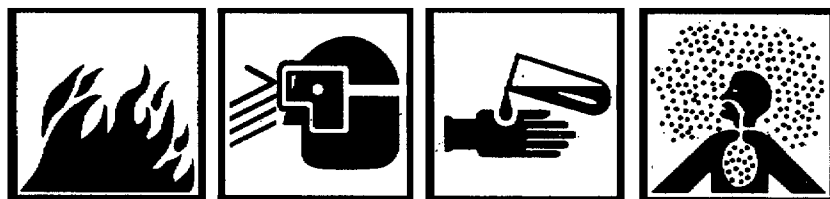
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WARNING

Dangerous chemicals are used in equipment cleaning, painting, and preserving procedures.

DEATH, severe sickness, or damage to property may result if personnel fail to observe safety procedures and fire regulations.



PAINTING MATERIALS AND SOLVENTS

Use painting materials and solvents in well ventilated areas only. Avoid prolonged breathing of vapors. Avoid bodily contact. The use of chemical gloves (solvent resistant) and chemical splash goggles are required when using this material. Do not use near heat, spark, or flame. These substances are reactive with acids and oxidizers. Organic vapor respirator with dust and mist filter is recommended when these substances are spray applied. Keep containers closed between applications. Provide mechanical ventilation if used in confined spaces. Coordinate the use of these materials with your supporting Industrial Hygiene and Safety Offices. Ensure you read and understand the Material Safety Data Sheet (MSDS) for this solvent prior to use.

Storage of Materials

Handle painting materials and solvents as combustible liquids. Store away from heat, sparks and flame. Keep containers sealed when not in use. Saturated waste rags must be placed in a sealable metal container after use to avoid the possibility of spontaneous combustion.

For artificial respiration or flushing of eyes, see FM 21-11.

CHAPTER 1 INTRODUCTION

1-1. Scope. This bulletin is a guide for personnel responsible for the repainting, replating, and preserving of communications security (COMSEC) equipment. Chapter 4 provides special procedures for cleaning and preserving equipment exposed to salt water and certain other corrosive elements. Information and instructions reflecting Army policy and procedures are contained herein, and are supplemental to the technical information contained in National Security Agency (NSA) documents.

1-2. Application. The instructions contained or referenced in this bulletin will be followed when COMSEC equipment is to be cleaned, touchup painted, completely repainted, or replated. Touchup painting shall be performed only at direct support, general support, or depot maintenance facilities. In some instances it may be economically desirable to apply touchup paint only at depot facilities. Complete repainting or replating will be performed only at depot facilities.

1-3. Workmanship. All finishes shall reflect skilled workmanship and shall be applied in accordance with the best military and commercial practices for protection of equipment.

1-4. Safety Precautions.

a. Prior to performing any procedures described in this TB, make sure you have read the Material Safety Data Sheets (MSDS) on all substances specified for use during the procedures. The MSDS list any special precautions or procedures needed to handle the substances, as well as appropriate first aid measures.

b. When performing the procedures described in this bulletin, adequate ventilation and protective clothing and equipment are required to remove any

personnel hazard caused by dust, inflammable gases, or dangerous vapors. TB MED 514 contains information on respiratory protection. Get and read it prior to performing any procedures described in this TB.

1-5. Other Precautions.

a. Safe operating procedures must be observed at all times, especially when handling volatile solvents, and during spraying operations.

b. Only government approved solvents and cleaning agents will be used.

c. Fire regulations must be strictly observed. Fire extinguishing equipment must be kept handy in the immediate work area.

d. Goggles and/or masks must be worn whenever compressed air is used for sandblasting or spraying and during grinding and buffing operations. Synthetic rubber gloves must be worn when handling solvents.

e. Rags and wiping cloths impregnated with oil or other inflammable material must be disposed of in sealed metal containers or dried thoroughly in a well-ventilated area to reduce the danger of spontaneous combustion.

1-6. Reporting of Errors. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded directly to the Director, U.S. Army Communications-Electronics Command, Communications Security Logistics Activity, ATTN: SELCL-EP-C, Fort Huachuca, AZ 85613-7090.

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CHAPTER 2 PAINTING

2-1. Use of Paint for Painting and Preserving.

a. Paint, varnish, and similar compositions are used to-

(1) Protect exposed surfaces from the harmful effects of weather, moisture, fungus, chemical agents, and other corrosive agents.

(2) Increase visibility of potential hazards, safety devices, and other objects or areas where care or caution should be exercised for the safety of personnel and property.

(3) Enhance cleanliness. Dust, dirt, and other foreign matter may be removed more readily from painted surfaces than from unpainted surfaces, thereby facilitating preventive maintenance.

(4) Enhance appearance.

b. For simplicity, the words "paint" and "painting" are used in a broad sense to apply to paint lacquers, plastics, varnishes, and other liquid coating materials, to include Chemical Agent Resistant Coating (CARC).

2-2. General Information.

a. Any painting operation involves three basic steps: preparation of the painting surface, application of the primer or undercoating, and application of the finish or top coat.

b. Although the basic procedures are simple, selection of the best combination of sealers, primers, and finishes to insure maximum protection is more involved. For example, aluminum and steel require different primers because of the chemical reactions that affect the adhering qualities of the primers. For these and other reasons, the approved combination of materials should be used for long-lasting results.

c. When touch up painting, a perfect match with the exact shade of the original paint surface may not be possible. There are many reasons for this, such as change in the original pigment because of oxidation, and differences in manufacture. The prevention of corrosion and deterioration is the most important consideration in touch up painting; appearance is secondary. Inspection personnel should make allowances for slight color mismatch where minor touch ups has been done. Allowances will not be made for neglect, poor workmanship, or cases where an obvious need for refinishing has been ignored.

d. The following are some of the painting and accessory materials available for use:

(1) *Strippers*. Strippers are liquid or jellied solvents used to remove paint chemically and may be applied by brush, roller, or spray. When used, care should be taken to avoid contact with the skin. Before repainting after strippers have been used, the surface should be washed thoroughly. Directions on the container should be followed to insure safe handling and best results.

(2) *Primers*. Primers are used as corrosion or moisture-resistant undercoatings. They serve as a fast-adhering base for the finish or top coat. The proper type of primer must be used for good results.

(3) *Finish, or Top, Coats*. The finish coat is the final or top coat applied over the primer.

(4) *Thinners*. Thinners are volatile solutions used to thin or reduce paint to the desired consistency. The type of thinner to use and the recommended quantity are usually stated on the paint container.

2-3. Materials Information. TM 43-0139 (Painting Instructions for Army Material) identifies many painting materials that are available for Army use on electronic equipment. Additional materials information is contained in other references listed in Appendix A.

2-4. Corrosion.

a. *Corrosion and Deterioration*. Corrosion is the disintegration and deterioration of metals by chemical reaction with other elements. Left unchecked, corrosion destroys the usefulness of metals. The importance of preventing corrosion can not be overemphasized. Some types of corrosion are:

(1) *In iron and steel*. Discoloration is a form of corrosion which appears as a thin gray, black, or reddish film on ferrous metals. However, the major type of corrosion of ferrous metals is called rusting, which exists in the following forms:

(a) *Black rust*. This is produced by the intense heat used in heat treatment, hot rolling, welding, or torch cutting. Its action is not progressive under ordinary conditions.

(b) *Red rust*. This is ferric oxide and/or ferric hydroxide. It is caused by the action of water and oxygen on iron and steel and is very destructive. Unless rust is completely removed from the metal, its action will continue beneath the surface rust and aggravate the condition until the rust is removed and the metal is properly treated.

(2) *Corrosion of nonferrous metals.* This results from the reaction of water and oxygen, or by reactions with other chemicals or corrosive substances. Some of the indications of corrosion are -

(a) *Discoloration.* This appears as a white or gray powder on aluminum, magnesium, zinc, and other alloys. On copper and copper alloys, it may appear in various colors.

(b) *Caked corrosion.* This type has generally progressed to a point where the surface is etched or pitted when the caking is removed.

b. *Corrosive Substances and Agents.* Bare metals are corroded by the electrolytic reaction of oxygen with moisture. The action is increased when other factors are present; e.g., high temperatures, and substances such as those described below:

(1) *Acid deposits and solutions.* Acidic corrosion may be due to residue from acid cleaning, soldering flux, decomposition of other materials, or by certain gases.

(2) *Alkaline deposits and solutions.* These substances corrode aluminum, zinc, and other alloys.

(3) *Salts.* The action of common salt and other water-soluble salts is very destructive to metals. Salt may be deposited by sea water and air, rock salt used to melt ice or snow, perspiration from the hands, soldering flux, etc. (See chapter 4 for special cleaning methods.)

c. *Inspection.* Corrosion and deterioration are ever-present destructive factors which cannot be neglected. Equipment and materials should be inspected regularly to prevent and minimize such damage. A few minutes spent in removing corrosion and protecting against deterioration at an early stage may save many hours and dollars spent on major repairs.

2-5. Fungus and Mildew. The growth of fungus, such as mildew and mold, is a serious problem, especially in warm, damp climates. Fungus will thrive on organic materials and on metal surfaces that are finished with organic coatings or on which dirt and/or other deposits are allowed to accumulate. Some general procedures for removing fungus are -

a. *Cotton Duck Cloth, Textile Webbing and Tape.* If the cloth, webbing or tape is wet, dry it. When the article is dry, brush the affected area to remove the mold, mildew and any dirt on the surface. Inspect the article for any remaining growth. This can be removed by washing, using a brush if necessary,

with hot soapy water. After thoroughly rinsing with clean water, allow the article to dry in a well-ventilated place or in sunlight.

b. *Electrical Connectors.* Connectors should be cleaned with an appropriate electrical cleaner. A toothpick or small brush may be used to clean recessed areas of the contacts.

c. *Metal Surfaces.* Mildew and mold should be removed from exposed surfaces by sanding down to the bare metal with an aluminum oxide cloth, emery cloth, or sand paper. Follow the cleaning procedure provided in paragraph 2-7d below.

2-6. Paint Problems. The following are examples of undesirable paint conditions:

a. *Alligating.* Alligating is characterized by irregular separations and wide cracks in the finish coats. Both conditions are usually due to a soft undercoat, or the application of the finish coat over an underlying coat which was not completely dry.

Another possible cause of alligating is incompatibility of thinners/reducers and the primer or finish coat. One way to avoid alligating is ensuring only thinners/reducers specified for the primer and finish coat are used. To correct this condition, remove the affected paint and refinish.

b. *Bleeding.* Bleeding refers to a condition where the color of a previous coat shows through the finish coat. An additional finish coat will be sufficient to correct bleeding.

c. *Blistering.* Blistering is the formation of bubbles or pinpoint holes on the surface of the finish coat. Minute blistering is hard to identify without a magnifying glass. This condition is sometimes confused with dirt in the paint. To determine the reason for the blistering, uncover the affected area with a sharp object. Blistering may be caused by moisture, rust, or other foreign matter being left on an improperly cleaned surface when the paint was applied. Correct this condition by removing the affected paint and refinishing.

d. *Chalking.* Chalking is the formation of a thin film on a surface. In many instances, this condition can be corrected by polishing the affected area, or by sanding it lightly with a crocus cloth.

e. *Checking.* Checking is characterized by thin, straight lines crisscrossing each other. The lines usually increase in number and length as the paint ages. When this condition exists, the affected paint should be removed and the surface refinished. (Alligating, described in paragraph 2-6a, above, is a severe form of checking.)

f. *Chipping.* Chipping refers to damage caused to the paint by sharp blows or gouging. This condition can usually be corrected by touch up painting.

g. *Cracking.* Cracking is caused by the paint curling. It is usually the result of poor mixing or a change in temperature during the application and drying of the primer or finish coat. Affected areas should be refinished.

h. *Crowfooting.* Crowfooting is the appearance of small lines branching in many directions and crisscrossing each other. It results from applying a top coat before the previous coat dried sufficiently; thinners evaporating too fast; or coats being applied too thickly. This condition can be corrected by sanding the top coat and refinishing, or by removal of the paint and refinishing, depending on the extent of deterioration.

i. *Foreign Matter.* Foreign matter, such as dirt, in the paint causes a poor finish. It is sometimes confused with blistering. Effected areas should be sanded and refinished. If the condition is extensive, the paint should be removed and the surface repainted.

j. *Orange Peel.* An orange-peel finish resembles the surface of the fruit. It is often caused by improper thinning. This condition can usually be corrected by sanding and refinishing the affected area.

k. *Peeling.* Peeling is caused by the separation of the finish coat from the primer, or the primer from the surface. It is generally the result of paint being applied on an unclean or wet surface and should be corrected by refinishing, as necessary.

l. *Runs and Sags.* Runs and sags are the unwanted flow of paint on the surface caused by the application of too much paint. This is an appearance defect which can be corrected by refinishing.

m. *Scratches.* Scratches are marks in the paint which may or may not penetrate through the painted surface and which can usually be corrected by touch up painting.

n. *Wrinkling.* Wrinkling may be caused by too much paint, improper brushing, or too much drier or oil thinner. The wrinkled paint should be sanded smooth or removed entirely, and the surface refinished with recommended materials.

loose scale should be removed with scrapers or wire brushes. Previous paint should be removed with paint remover or scrapers. The surface should be dried thoroughly, then sanded smooth, dusted with a brush or compressed air, and wiped with a lint-free cloth or chamois.

b. *Types of Residues and Contaminants.* There are generally four types of residues. They are:

(1) Skin oils/perspiration which should be removed using a suitable solvent.

(2) Inorganic contaminants, such as salts, dust, or chemical solutions, which can be removed using water-based solvents.

(3) Oil, grease, and similar residues which can be removed using organic solvents.

(4) Caked or grimy deposits, dirt, corrosion, or previous finishes which may require scraping, sanding, or scouring for removal.

c. *Cleaning Metal for Welding.* All metals requiring welding should be cleaned to remove corrosion, oil, grease, and other deposits. Rust, loose scale, and oxide coating are best removed using a wire brush and sanding. Oil and grease should be removed with an organic solvent.

d. *Cleaning Bare Metal for Painting.* Before the primer is applied, the metal surface should be cleaned and thoroughly dried. Remove dirt, oil, and grease using mineral spirits, paint thinner, dry cleaning solvent, or by washing with an alkali solution. Alkali cleaning should be followed with a thorough rinsing, preferably with hot water. Rust, corrosion, and loose scale should be removed by wire brushing (power driven or manual), sanding, or chemically with metal conditioner corrosion-removing compound. Once the surface has been cleaned, it should be sanded with flint abrasive paper, starting with grade No. 1 or No. 2 and finishing with No. 000. All dust must be removed using a dust brush, vacuum cleaner, or compressed air. After dusting, wipe surface with a clean, lint-free cloth.

e. *Cleaning Deteriorated Paint on Metal.* Painted surfaces which show signs of deterioration, such as peeling and scaling, should be prepared for reconditioning as follows:

(1) If on visual inspection, the primer coat appears to be in good condition, e.g., well-bonded to equipment surface, sand the equipment surface and apply the finish coat.

(2) If the prime coat is in poor condition, the paint should be stripped and sanded; whichever is more practical.

(3) If a small portion of the painted surface is in poor condition, only the affected area should be refinished.

2-7. Cleaning and Surface Preparation.

a. *General.* A thoroughly cleaned surface is essential if effective preservation is to be assured. If the surface is not completely free from contaminants, they will interfere with the adhesion of the preservative used. Paint and other protective coatings will not adhere properly over foreign matter, such as oil, grease, dirt, moisture, or to previous paint that is loose or badly cracked. Contaminants should be removed by washing detergents, when practicable, or with organic solvents. Corrosion and

After the paint is removed, the surrounding edge of the original finish should be feathered to eliminate the distinct edge.

- f. *Cleaning Plastic Parts.* Because plastics vary widely in chemical and physical characteristics, be careful when selecting materials used for cleaning plastics. Petroleum solvents or paint thinners should not be used. Generally, clean water and a mild soap solution should be used in most cases. Per Federal Specification TT-N-95 () to remove oil or grease from acrylate and methacrylate resin plastics, such as plexiglass, use with aliphatic naphtha (not to be confused with aromatic naphtha). Plastic electrical insulation may be cleaned with denatured alcohol.
- g. *Cotton Duck Cloth, Textile Webbing and Tape.* If the cloth, webbing or tape is wet, dry it. When the article is dry, brush the affected area to remove mold, mildew and any dirt on the surface. Inspect the article for any remaining growth. This can be removed by washing with hot soapy water, using a brush if necessary. After thoroughly rinsing with clean water, allow the article to dry in a well-ventilated place or in sunlight.

2-8. Application of Coatings.

- a. *General.* The method used to paint, touch up, or apply preservatives depends on the extent of the painting/repainting needed, the materials used, and the tools, facilities, and time available. Spray painting is faster and results in a smoother surface than other methods. However, the time and labor required to set up spray equipment may be not be justified if the affected area is small, extensive equipment masking is required, or the amount of work is limited. Brushes or rollers are recommended where spraying is impractical or unsuitable. For further clarification of paint types and techniques to use, refer to MIL-F-14072 () and MIL-T-704 ().
- b. *Application of Primer on Metal.*
- (1) Before primer or undercoating is applied, determine what material the item being painted is made of and how it will be used.
 - (2) Clean the surface to be painted thoroughly. See paragraph 2-7.
 - (3) Spray or brush the primer on using a technique that ensures uniform coverage, e.g., if a brush is used, the brush should be laid on and off in a light, sweeping motion that does not leave excessive paint or brush marks. If large, unbroken areas require painting, consider using a roller. The thickness of the coat shall be as directed in the appropriate specification for the type of paint/coating being used.

(4) When possible, the item or material painted should be kept in a dry, dust-free place until the primer dries and hardens. Drying time is approximately one hour.

(5) If superior adhesion is required, the bare metal should be painted with pretreatment coating (per MIL-P-1 5328 ()) as a base for the primer.

c. *Application of Top coat on Metal.*

(1) The type of top coat, and the number of coats required, depends on the use or function of the item being painted and its environment when in use. In many cases, one top coat will be sufficient. Two or more coats may be required when protection against extreme exposure is required. In this situation, the equipment and/or the top coat manufacturer's recommendations and engineering estimates will be used to determine the proper number of coats required.

(2) After the undercoat or primer has dried and has been sanded smooth, apply the first finish coat using spray equipment, brush, or rollers. The application method used depends on the type of finish required, materials used, and surface to be finished. Take care to keep the area free of dust and other foreign matter.

(3) If more than one top coat is needed, the previous coat should be allowed to dry thoroughly, sanded smooth (if necessary) and wiped clean of any accumulated dust which might mar the final finish coat.

2-9. Other Considerations.

- a. *Metal Joints.* All joined metallic surfaces, regardless of whether they are of similar or dissimilar metals, should be finished with two coats of primer, per MIL-P-85582 ().
- b. *Nameplates, Decals, and Other Markings.* If the equipment is being repainted from any other paint or coating to CARC, all labels and decals will be removed and reapplied after the CARC is applied. If the equipment already has CARC, or compatible paints/coatings, nameplates and decals may be removed or masked before painting, whichever is more practical. Regardless, do not paint over nameplates, decals, modification work order (MWO) information, or other markings or labels. Engravings should be cleaned and repainted with engraving filler, as required. If it is necessary to remove or cover MWO information, the MWO data should be recorded for reference and reapplied in accordance with the original MWO instructions.

CHAPTER 3 REPLATING

3-1. Replating Policy. The replating of COMSEC equipment parts shall be performed only by the Tobyhanna Army Depot. The only exception to this policy will be when specifically authorized in writing by CCSLA, ATTN: SELCL-EP.

3-2. Replating of Parts. When required and authorized, replating shall conform to the specifications contained in individual part drawings. In those cases where replating is determined to be practical and economical, part drawings will be provided by CCSLA, ATTN: SELCL-EP.

CHAPTER 4 CLEANING EQUIPMENT EXPOSED TO SEA WATER, SAND, DUST, AND CORROSIVE VAPORS

Section I. INTRODUCTION

4-1. General. COMSEC equipment operated in coastal areas is sometimes exposed to sea water and sea water spray, sand and dust, and corrosion from other elements. Because of the compactness of COMSEC equipment, adequate cleaning of all boards and components so exposed is difficult, but nevertheless, necessary for proper maintenance.

4-2. NRL Procedure. The Naval Research Laboratory (NRL) has developed a procedure for removing sea water and oily residues from equipment surfaces. The procedure was developed to reclaim electrical and electronic equipment, as well as other items, damaged

by sea water, smoke, soot, sand, dust, and corrosive vapors.

4-3. COMSEC Cleaning Procedures. Cleaning procedures for COMSEC equipment based on the NRL procedures are set forth in the following sections. The procedures require -

- a. Immediate action upon recovery of an item from sea water or other corrosive exposure. (Field Preservation Procedure.)
- b. Complete cleaning and preserving procedures at general support or depot level maintenance facilities.

Section II. FIELD PRESERVATION PROCEDURES

4-4. Avoiding Delays. This procedure must be executed immediately upon removal of COMSEC equipment from immersion in or exposure to sea water.

4-5. Equipment and Materials Required.

NSN	Description	Qty
	Hose, water	1
4730-00-223-6731	Nozzle, Water, Adjustable, 35-lb. Pressure, FED SPEC A-A-50461 ()	1
	Compressor, Air	1
	Fan, Air Circulating	1
6850-00-142-9389	Water Displacing Compound, Type I, FED SPEC O-W- 1284 (), 16-oz aerosol	1

4-6. Procedure.

- a. Open case and remove all pluck-out assemblies. Flush case and all assemblies with fresh water heated to 135° F. (57° C.). Flushing may be accomplished by spraying, or by submerging the equipment in a tank and agitating the water.
 - (1) If spray is used, nozzle pressure must not exceed 40 psi.
 - (2) Special effort should be made to thoroughly wash all electronic/electromotive parts.
- b. Remove as much water as possible by one or both of the following methods.
 - (1) Place in a well ventilated oven at temperatures not to exceed 135° F. (57° C.). Depending on the moisture content of the equipment and the atmospheric conditions, the time needed may be as little as several hours or as long as overnight.

(2) Dry by forced air stream at a pressure of 40 psi or less.

WARNING

The Water Displacing Compound gives off butyl alcohol vapors that are noxious. An adequately ventilated workspace or the use of a respirator is necessary.

c. Thoroughly cover all of the equipment and

components with Water Displacing Compound, Type I, aerosol.

d. Dry the equipment with a warm, dry air stream, or place in a well ventilated oven, or in a room where the temperature can be controlled so as not to exceed 135° F. (57° C.).

4-7. Identification and Shipment. Items treated as above should be tagged to indicate treatment for salt water salvage and shipped with desiccant to the general support or depot maintenance facility responsible for final cleaning and testing.

Section III. GENERAL SUPPORT OR DEPOT MAINTENANCE PROCEDURES

4-8. Dry Storage. When field-preserved equipment is received at the general support or depot facility, it must be stored under controlled heat and humidity prior to final cleaning. The driest possible atmosphere and location available at the facility is required.

4-9. Equipment and Materials Required.

a. *Spray Equipment.*

(1) Pressurized tap water, or an auxiliary tank with a pump, and spray equipment to spray fresh water at pressures up to 40 psi.

(2) A paint spray gun for applying water-displacing compound in a fine mist (if aerosol cans are not used).

b. *Ultrasonic Cleaning Apparatus.* Equipment with

a power rating of at least 5 watts/sq. in. and a cleaning tank at least 24 inches in diameter and 16 inches deep. A method to heat the water/emulsion is required.

c. *Rinse and Storage Tanks.* Two or four galvanized steel tanks, at least 24 inches in diameter and 20 inches deep, for storing fresh water and/or emulsion-cleaner.

d. *Clean Compressed Air Supply.* Clean compressed air supply or high velocity cold air blower for removal or rinse water.

e. *Drying Equipment.* Drying oven with temperature control and/or portable hot air blower for final drying of salvaged equipment.

f. *Cleaning and Preserving Materials.*

National Stock Number (NSN)	Description	Federal Specification	Quantity
6850-00-142-9389	Water Displacing Compound, Aerosol, Type I	O-W-1284 ()	16 oz
6850-00-142-9409	Water Displacing Compound, Aerosol, Type II	O-W-1284 ()	16 oz
6850-00-285-8011	Dry Cleaning Solvent, Type II	P-D-680 ()	55 gal
6850-00-274-5421	Dry Cleaning Solvent, Type II	P-D-680 ()	5 gal
9140-00-255-7764	Diesel Fuel Oil, Marine	(MIL Spec) MIL-F-16884 ()	5 gal
7930-00-531-9716	Detergent, General Purpose (Liquid Nonionic)	(MIL Spec) MIL-D-16791 ()	5 gal
6810-00-285-4309	Ethylene Glycol Mono Ether (Water Softener)		1 gal

g. *Preparation of Cleaning Concentrate.* The cleaning concentrate should be formulated from the materials in f above in the following proportions:

	<i>% by Volume</i>
Dry Cleaning Solvent	94
Diesel Fuel Oil, Type I.....	5
Detergent, General Purpose.....	1

This concentrate will have a shelf life in excess of 1 year.

h. *Water Softener.* The water used for preparing the emulsion cleaner should not have a hardness greater than 10 parts per million. Harder water must be softened by adding a water softener (tetrasodium ethylenediaminetetraacetate dihydrate). The dosage may be determined by using the following formula: Parts per million (ppm) hardness of available water divided by 2 = ounces of softener required per 100 gallons of water.

i. *Preparation of Emulsion Cleaner.* Just before using, emulsify the cleaner concentrate with water of the proper softness (See paragraph h above) in proportions of from 15 to 50 percent of concentrate to water, by volume. The proportions used depend upon the degree of oily contamination to be removed; the higher the amount of oil contaminate, the higher percentage of concentrate needed.

4-10. Disassembly. Prior to ultrasonic cleaning, the equipment must be disassembled to facilitate complete immersion of all parts in the ultrasonic tanks.

4-11. Degassing. Both the emulsion and the rinse water must be degassed using the following procedure.

- a. Place cleaning emulsion in one ultrasonic cleaner tank and rinse soft water in the other.
- b. Switch on the ultrasonic cleaners and raise temperature of both tanks to 190° F. (88° C.).
- c. Turn heat off and allow temperature of tanks to drop to 135° F. (57° C.). Maintain 135° F. (57° C.) throughout the cleaning procedure

4-12. Ultrasonic Cleaning and Rinsing. Proceed to clean and rinse salvaged equipment ultrasonically taking the following precautions:

CAUTION

When cleaning printed circuit boards or other assemblies containing transistors, it is most important to position the assemblies in the

ultrasonic bath so that the energy waves strike the cylindrical sides of the transistors rather than the tops or bottoms. If the energy waves are directed against the tops of the transistors, some of them may break down in less than a minute. Prior to cleaning batches of equipment by the ultrasonic cleaning method, a single printed circuit board or small sample of the equipment to be salvaged should be cleaned. This trial may indicate that shorter cleaning and rinsing periods than those listed in a and c below. Shorter times may be required to insure that excessive exposure to ultrasonic radiation is avoided. A balance must be achieved that avoids component breakdown yet, adequately cleans and rinses the item.

- a. Cleaning time shall not exceed 5 minutes.
- b. Flush the cleaning emulsion from the equipment by spraying or by immersing in water. If immersion is used, ultrasonic or air agitation of the water is required.
- c. Rinsing time shall not exceed 6 minutes.

4-13. Final Cleaning Steps.

- a. Use a clean air stream at pressure not to exceed 40 psi to blow all excess water from the equipment.

WARNING

The Water Displacing Compound gives off butyl alcohol vapors that are noxious. An adequately ventilated workspace or the use of a respirator is necessary.

- b. Spray all surfaces of the equipment with Water Displacing Compound, Type II.
- c. Allow equipment to stand for about 20 minutes to let the compound penetrate all surfaces. Dry in oven at 135° F. (57° C.) for several hours or overnight.

4-14. Testing and Lubrication. Equipment is now ready for testing and necessary parts repair. Any bearings or other moving parts which were originally lubricated must be relubricated.

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**APPENDIX A
REFERENCES****A-1 Department of the Army.**

TM 43-0139	Painting Instructions for Army Material
TB MED 514	Occupational and Environmental Health Respiratory Protection Program
FM 21-11	First Aid for Soldiers

A-2 Federal/Military Specifications.

TT-N-95 ()	Naptha, Aliphatic
P-D-680 ()	Dry Cleaning and Degreasing Solvent
MIL-T-704 ()	Treatment and Painting of Material
O-W-1284 ()	Water Displacing Compound (with Corrosion Inhibitor)
MIL-F-14072 ()	Finishes for Group Based Electronic Equipment
MIL-P-15328 ()	Primer, (Wash), Pretreatment (Formula No. 117 for Metals) (Metric)
MIL-D-16791 ()	Detergent, General Purpose (Liquid, Nonionic)
MIL-F-16884 ()	Fuel, Naval Distillate
A-A-50461 ()	Nozzles; Garden Hose (for 5/8- and 3/4-inch hose)
MIL-C-53072 ()	Chemical Agent Resistant Coating (CARC) System Application and Quality Control Inspection
MIL-P-85582 ()	Primer Coatings, Epoxy Waterborne

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By Order of the Secretary of the Army:

Official:

DENNIS J. REIMER
General, United States Army
Chief of Staff

YVONNE M. HARRISON
Administrative Assistant to the
Secretary of the Army

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