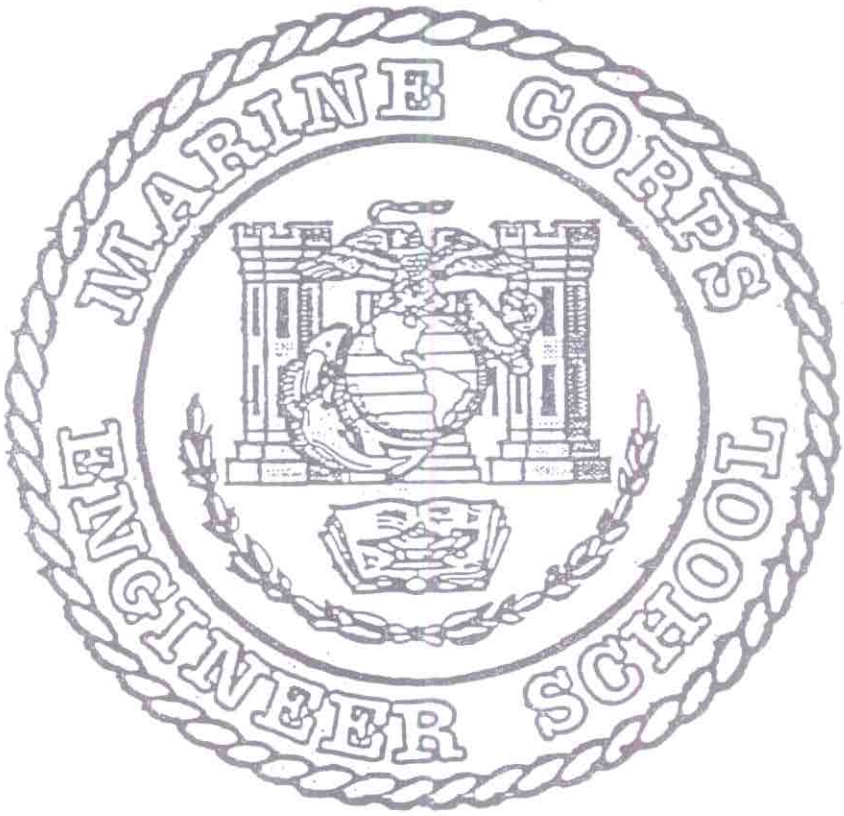
MARINE CORPS
STUDY GUIDE
SHOP OPERATIONS



ENGINEER EQUIPMENT
REPAIRER COURSE

FORT LEONARD WOOD, MO. 65473

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UNITED STATES MARINE CORPS
MARINE CORPS DETACHMENT
U.S. ARMY ENGINEER CENTER
FORT LEONARD WOOD, MISSOURI. 65475-5850

USMC-B1
OCT. 95

STUDENT OUTLINE

SHOP SAFETY

(1) Hazardous Material and Equipment: The very nature of being a mechanic means that you will frequently come in contact with hazardous materials.

a) Dry Cleaning Solvent:

1. Dry cleaning solvent is used to clean repair parts. It's stored in 5 gallon cans or a solvent tank.

2. You must wear protective clothing i.e. rubber gloves, apron, and eye protection.

b) Petroleum Oil and Lubricants:

1. At no time will you allow POL to be spilled or dumped on the deck or ground.

2. Your action as a mechanic in the event of a spill is to quickly try to contain it and immediately contact your NCOIC, who will direct appropriate action for cleanup, in accordance with unit SOP.

3. All waste oil and electrolyte will be disposed of in the appropriate container.

NOTE: Electrolyte must be placed in a rubber/plastic type container which will be sealed and is marked electrolyte.

c) Batteries:

1. All engineer equipment uses batteries for starting and you must know how to work around them safely.

2. The Marine Corps has a battery room in every maintenance shop for the maintaining and charging of batteries.

3. The Army Engineer maintenance Shop doesn't maintain batteries at unit level, but sends their batteries to the direct support maintenance for charging and maintenance.

4. Whenever you work with batteries you will use the following safety protective equipment or procedure:

   a Showers are used in the battery room.

   b Eye wash equipment.

   c Protective clothes (i.e. rubber gloves, boots, apron, and eye protection.

   d Proper ventilation for the escape of harmful gases.

5. Electrolyte is a mixture of 64% water and 36% sulfuric acid.

   a Used in batteries.

   b Very corrosive.

   c Will cause severe skin burns.

   d Can cause blindness if splashed in eyes.

6. All personnel will wear protective equipment when servicing batteries.

(2) Tools:

(a) You will use many tools while working in your shop. Many of these tools can injure you if they are not used properly.

(b) Always use eye protection when hammering or when using any power tools.

(c) Wear eye protection when using compressed air.

(d) When using a wrench, always pull it towards your body.

(e) Never exceed the limits of your tools by using a pipe to gain leverage on the work.

(f) Always work in a clean area. Tools not in use will always be put away and creepers should be stood up when not in use.

(3) Engineer Equipment Operation:

(a) Engineer equipment is very loud and can cause serious hearing loss. When you are operating equipment or are in close proximity of equipment in operation you will wear hearing protection.

(b) When operating equipment in the shop you must ensure adequate ventilation is present.

(c) When operating equipment in congested areas you must have a ground guide. The ground guide is responsible for safely guiding the equipment around the lot. If you are a ground guide and guide a tractor into an accident, it's your fault, so be sure to think safety when acting as a ground guide for equipment.

(d) Never allow passengers to ride on equipment with you.

(e) Remember, when operating equipment use 1st gear while in the lot area.

(4) Welding Equipment:

(a) Your maintenance shop may have welding capabilities so you should be familiar with welding safety.

(b) The flash of electric arc welding can cause sever eye damage, thus, at no time will you look at welding in progress without a mask for arc welding or goggles for gas welding.

(c) All welding areas will be screened to prevent eye damage to innocent passersby.

(5) Safety:

(a) In all maintenance operations, a comprehensive, effective and continuous safety program will be employed. The layout of shop or maintenance facility has a large impact on shop safety. Safety relates not only to facilities but, should be a key element in training. The continuous vigilance of all maintenance personnel is required to ensure that operating procedures and work methods do not unnecessarily expose personnel to injury, or property to loss or damage.

(b) At no time will you engage in or allow anyone to horseplay, push, shove, chase, trip, wrestle, or any other childish nonsense not associated with professional conduct.

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STUDENT OUTLINE

ENVIRONMENTAL AWARENESS

(1) Ways to Identify Hazardous Items: The first step of a good hazardous material plan is to identify which items are hazardous. There are several ways to identify these materials. Here are two ways:

a) Check the label on the container for cautions and warnings. These clue you that the product is hazardous.

b) Look for a Material Safety Data Sheet (MSDS). the manufacturer is required to send an MSDS with every item that can be hazardous material to the installation supply people. In turn, the supply people send a copy of the MSDS to the unit.

(2) Common Hazardous Items - The following are some common operations or processes that contain hazardous materials:

a) Operation or Process: Painting

1. Hazardous Material: Thinner, polyurethane's, waste epoxy, paint strippers, paints

b) Operation or Process - Vehicle Maintenance

1. Hazardous Material: Used oil, lubricants, coolants, petroleum, alcohol's, solvents asbestos (brake linings)

c) Operation or Process - Cleaning, degreasing

1. Hazardous Material: Solvents, detergents, ketone, freon

d) Operation or Process - Battery Shop Operations

1. Hazardous Material: Acids, bases, cyanide, heavy metals

e) Operation or Process - Washrack and motor pools

1. Hazardous Material: Used oil, solvents, heavy metals, contaminated sludge's

(3) Where to get help: Locally get help from your environmental control office, your installation safety office, your Directorate of Logistics (DOL) or others. If you can't find a reference in your local phone book for environmental concerns, contact your local Logistics Assistance Office.

(4) Personal Protection - You Need to Protect Yourself From the Following:

a) Absorbing harmful chemicals through your skin

b) Breathing in hazardous particles, vapors or gases. Never rely on smell as guide to whether you need to use protection or not. Just because you can't smell the material doesn't mean that it's harmless.

c) Types of Personal Protection: There are many ways to protect yourself from hazardous chemicals or vapors. Here are just a few:

d) Rubber framed goggles without ventilation holes or plastic face masks. This type protects your eyes from the mist and sprays of splashes of such liquids such as acids or alkali solutions. Make sure your face mask/goggles are free of scratches before you use them. Scratched lenses block your vision.

e) Respirators are designed to keep out paint fumes if you're working with paint or paint thinners. These respirators should be fitted by your medical folks. Use the respirator only in well-ventilated areas. Be sure to wear clothing that covers as much skin as possible.

(5) Storing Hazardous Waste - After use, service supplies and material become waste. It's important that you handle and store waste oil and the like safely so it does not damage the environment. The following are a few tips on storing waste:

a) Store waste containers that are in good condition. Check the container for rust or dents.

b) Keep the waste containers off the ground where moisture will cause them to rust and maybe cause a spill.

c) Mark containers with the words "HAZARDOUS WASTE". Put a label on the outside of the container that identifies the type of waste inside.

1. Hazardous Material: Used oil, solvents, heavy metals, contaminated sludge's

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b) Keep the waste containers off the ground where moisture will cause them to rust and maybe cause a spill.

c) Mark containers with the words "HAZARDOUS WASTE". Put a label on the outside of the container that identifies the type of waste inside.

d) Make sure the waste containers are away from the traffic flow so that accidental spills won't occur. Isolate containers with flammable or reactive waste.

e) Put different types of hazardous waste in separate containers. Don't mix hazardous and nonhazardous waste together.

f) Keep containers closed except when you fill or empty them.

g) Make sure you have a secondary containment, such as sand bags, around the container that will catch and contain spills.

(6) Reduce waste in the work place. You won't have to worry about disposing of a lot of waste if you cut down on the amount you generate.

(7) Handling Spills: We all get upset about a big spill like an oil tanker springs a leak. But even a small spill causes big trouble. If oil for instance leaks onto the ground, it can seep down into the water table and contaminate the water. When an accidental spill occurs, contain it and then clean it up immediately. Be prepared for accidental spills. Make sure your unit has a spill plan that list emergency telephone numbers. Here are five things to remember when a spill occurs:

a) PROTECT YOURSELF. Know where protective equipment is kept, whether it has been properly cleaned and maintained, and know how to use it.

b) STOP THE FLOW, if possible. If the spill is out of your control, evacuate the area and call the installation spill response team and let them handle the situation.

c) CONTAIN THE SPILL. Floor dry material is the most effective material to contain and clean up small spills.

d) REPORT THE SPILL. Check your Standard Operating Procedure (SOP) for reporting procedures. Usually this means to notify your supervisor. However, if your supervisor isn't handy and it's a real emergency situation, call the installation response team.

e) KNOW WHO TO CALL. Make sure you know whom to call with questions about hazardous waste or material. Make a list with POCs and post it. The primary POC is your local environmental officer.

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USMC-B3 Oct. 95

STUDENT OUTLINE

MARINE CORPS MAINTENANCE STRUCTURE

1. PURPOSE The Marine Corps Maintenance System consists of three separate categories. They are as follows:

(1) Organizational Maintenance

(2) Intermediate Maintenance

(3) Depot Maintenance

2. RESPONSIBILITIES: Specific responsibilities are assigned to each category of maintenance. The application of maintenance functions to end items will be consistent with the mission and responsibilities of the designated categories.

(1) Within each particular category you will have one or more echelons of maintenance. Each echelon has a particular purpose and definition.

3. CATEGORIES AND ECHELONS We will say that the maintenance system is made up of three categories and five echelons of maintenance.

a. Organizational Maintenance. This category of maintenance is the responsibility of and performed by the using unit on it's assigned equipment.

(1) This level of maintenance is the most important for ensuring equipment readiness.

(2) Both operators and mechanics share responsibilities for ensuring that all organizational level maintenance is properly performed.

1 First Echelon - This maintenance is performed by the user, wearer, or operator of the equipment. It includes the proper care, use, operation, cleaning, preservation, lubrication, minor adjustment, and parts replacement as prescribed by pertinent technical publications and tools allowed.

a. Limited in capabilities by lack of tools, supplies, and repair parts.

b. Uses the applicable TM-10 series manuals to conduct before, during and after checks.

2 Second Echelon - This type of maintenance is performed by specially trained personnel (mechanics) in the organization. Appropriate publications authorize second echelon maintenance, additional tools and necessary parts, supplies etc.

a. Most of the work consists of preventive maintenance services, adjustment, tightening, equipment inspections, and replacement of easily accessible components and assemblies.

b. Uses the applicable TM-14 and SL-4 to define responsibilities and procedures for performing maintenance and services.

c. Intermediate Maintenance. Is maintenance performed by designated activities in direct support of using units.

1 Third Echelon. Is maintenance performed by special units in support of one or more using organizations. It includes:

(a) Diagnosis and isolation of equipment malfunctions.

(b) Repair of equipment using piece parts, assemblies, and components.

(c) Limited repair of modular components requiring cleaning, seal replacement, application of external parts, and repair kits.

(d) Performing light body repairs.

(e) Contact teams may be used to perform or assist in performing on-site diagnosis/repair.

(f) Third echelon is authorized a greater selection of tools than 2nd echelon plus special test and diagnostic equipment used to accomplish the maintenance mission.

2 Fourth Echelon. Maintenance is performed by units organized as semi-fixed or permanent shops to serve lower echelons within a assigned geographical area. They are the highest maintenance unit available in the field and require an extensive inventory of specialized tools and equipment.

(a) Includes the overhaul and rebuild of components and subassemblies,such as engines and transmissions

(b) The diagnosis/isolation of internal parts failures and the repair of failed assemblies.

(c) Also includes heavy body and frame repair, and repairs which require specialized welding and machining such as grinding of valves, valve tappets, and valve seats.

c. Depot Maintenance. Is maintenance performed by the Marine Corps Logistics Base (MCLB), either at MCLB Albany, GA; or at MCLB Barstow, CA in support of all units requiring fifth echelon maintenance.

1 Fifth echelon maintenance is performed by what is commonly called rebuild centers.

(a) Fifth echelon maintenance basically consists of the complete rebuild/overhaul of the major end items of equipment, rebuilds components, performs repairs beyond the capability of the FMF, manufactures items and parts not provided by or stocked in the supply system, provides technical assistance to field units and provides stocks of serviceable equipment.

4. BASIC TERMS AND ACRONYMS

a. MIMMS - Marine Corps Integrated Maintenance Management System.

1 Adopted in 1975 to standardize maintenance management throughout the Marine Corps.

2 All ground equipment commodity areas adhere to standardized policies and procedures under the integrated management system.

b. AIS - Automated Information System.

1 A clerk is assigned to input data from records and forms used in the MIMMS system into a computer network. This clerk is commonly referred to as the 'MIMMS Clerk'.

2 The data input into the system is automatically tabulated to provide required reports concerning equipment readiness.

c. PMCS - Preventive Maintenance Checks and Services.

1 Maintenance performed to prevent an item from becoming unserviceable.

2 Involves inspecting, cleaning, servicing, lubricating, adjusting, and minor repair. These services are performed by operators and mechanics.

d. CM - Corrective Maintenance.

1 Easily defined as the actions taken to repair an item of equipment after failure which will return the equipment to operational condition.

2 CM is generally performed by trained technicians (mechanics).

e. ERO Parts Bin -

1 Commonly referred to as layettes.

2 An area where parts waiting to be placed on equipment are stored. It can be a shelf, box, or something similar.

(a) All parts for the same ERO are stored together.

(b) The ERO parts bin must be controlled to provide accountability for all repair parts ordered and received.

f. PEB - Preexpended Bin.

1 Provides ready access to common, low cost, high usage hardware items.

2 PEB will also contain Broken Units of Issue.

g. Quality Control -

1 A position or billet which is assigned to an individual with advanced knowledge and understanding of engineer equipment and repair procedures/policies.

2 Responsible for inspecting and testing equipment to determine maintenance requirements. Also ensures satisfactory maintenance performance is met.

h. Deadline - To remove an item of equipment from use due to:

1 It is inoperative as a result of damage, malfunctions, or necessary repairs.

2 It is unsafe to operate.

3 It would be damaged by further use.

UNITED STATES MARINE CORPS
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STUDENT OUTLINE

TECHNICAL PUBLICATIONS

1. RESPONSIBILITIES:

a. Technical Publications. Each item of equipment in the Marine Corps has its own Technical Manual. You will be required to:

(1) Perform preventive maintenance checks and services in accordance with the Technical Manual.

(2) Perform corrective maintenance as specified in the Technical Manual to include:

(a) adjustments

(b) inspections for serviceability (brake shoes)

(c) disassembly and assembly of components or assemblies

(d) troubleshooting and testing

(e) identifying special tools or equipment

b. Parts Manuals. Each item of equipment also has its own parts manual. Some requirements for the use of these manuals will be:

(1) Correctly identify parts needed to repair and service equipment.

(2) Extract pertinent information used to order parts and ensure they are within your echelon of maintenance.

(3) It may be necessary for you to interpret the parts list drawings to ensure that the assembly process is completed correctly.

c. Components List. Will list all required tools and equipment for general and specific tool kits, and equipment.

(1) You will be required to regularly account for tools issued to you using a component list.

(2) You may be required to identify and use special equipment associated with an item of equipment.

2. TECHNICAL MANUALS (TM'S)

a. Purpose. The purpose of a TM is to provide technical information used in the inspection, services, adjustments, removal, installation, and testing of the end item and its components.

b. Contents.

(1) Front Cover.

(2) The short title in the upper right hand corner of the cover will give you the following information:

(a) TM - Indicates this is a technical manual, not a stocklist or Marine Corps Order, etc.

(b) 08602 - This five digit number is what is referred to as an Item Designator Number. ID's will always be five digits and are assigned to equipment upon its introduction into the Marine Corps inventory.

(c) A - This letter, the last part of the ID number, indicates the model of equipment covered by this publication. Lack of a model designator means more than one model is covered by the publication and they will be listed on the front cover.

(d) 14/1 - This number indicates the echelon(s) of maintenance covered within the publication. This particular one covers 1st through 4th echelons of maintenance. Not always will it be a 14; however, you can have any combination of numbers such as: -24 = 2nd-4th; -35 = 3rd-5th; -10 = 1st only; -20 = 2nd only; -40 = 4th only, etc.

(3) The short title will appear on all Marine Corps publications, not just TM'S. It is very important that you know what it means and can often save time in using publications.

(4) After the cover you can expect to find the following information in most TM's.

(a) Table of Contents - This gives a listing of the information contained in the manual cross-referenced to paragraph and page number.

(b) List of Illustrations - Lists all illustrations cross-referenced to page and possibly paragraph number.

(c) List of Tables - This section lists tables such as table of specifications, torque, etc. Tables are cross-referenced to page number.

(d) Safety Summary - This is a listing of all the safety warnings that are used in the manual, compiled and listed in the front of the manual.

(e) General Description of Item - This section does just as the name implies, gives weights, measurements, etc. for the item.

(f) Preparation for Use Instructions - This section gives instructions on how to prepare the item for use, just like dealers must do on new automobiles before sales.

(g) Operating Instructions - This section tells the user how to start, run, and utilize all controls and functions associated with equipment operation.

(h) Principles of operation - This section explains individual assemblies and the principles which apply to them.

(I) Organizational and Field Maintenance Section - This section shows those 1st through 4th echelon maintenance services to be performed.

(j) Overhaul Section - Here is where you find the rebuild and overhaul instructions for the equipment and its components/assemblies.

(k) Glossary - provides definitions for abbreviations and acronyms used in the Technical Manual.

(l) Index - Like any index it shows what is in a publication and the page on which it is found. This is set up in alphabetical sequence and should be used to avoid unnecessary time thumbing through pages.

(5) Army Publications. The Marine Corps will Utilize publications from other branches of the service. They are similar to the Marine Corps counterpart but there are some differences.

(a) Technical Manual short title.

1. The first number in a TM number indicates the general type of equipment that is covered in the manual. For example the number 5 is for engineer types of equipment and 9 is for ordnance equipment.

2. The second set of numbers are for the federal supply class or group. The four digit code assigned is for a more specific type of equipment. For example 3805 represents earth moving, excavating and highway maintenance type equipment.

3. The third set of numbers are for the numerical sequence number. This group of numbers pertain to the specific model and make of equipment, for example 262 identifies this is a TM for JI Case model MW24C, Scoop Loader.

4. The last two numbers signify the category of maintenance or level covered by the manual. For example -20 stands for organizational level of maintenance. When a manual applies to more than one category of maintenance the first digit will indicate the lowest level and the second digit will indicate the highest level. For example -24 indicates that the manual covers second through fourth echelon maintenance. Another configuration of technical manuals, -24 & P indicates maintenance instructions and repair parts included in one manual.

3. COMPONENTS LIST (SL-3):

a. Purpose. The SL-3 provides a listing of components and accessories needed to make an item complete or used with an item. These components and accessories are not repair parts but items like tools, fire extinguishers, hoses, pressure gauges, sirens, flashing lights, etc. The main purpose of the SL-3 is for inventory control. The SL-3 is read in the same manner as the SL-4.

6. REPAIR PARTS LIST (SL-4)

a. Purpose. The SL-4 is used to list and identify repair parts. It also provides the requisitioning data for those parts.

b. Content.

(1) The short title is like that of the SL-3, the only difference is a SL-4 is always a repair parts list and not a components list.

(2) Before you actually get into the parts listing itself, you will find several appendixes in the front of the book.

(a) Table of Contents - Like any book this merely shows the page certain items appear on.

(b) Preface - This section gives you a columnar description of what appears in the item identification listing. It also provides codes definition and special notes to help the user.

(c) Federal Supply Codes for Manufacturers - This lists the name and address of those manufacturers who make parts/components for that item. As you see, the manufacturers are also assigned a number, called an MFR. Code, and will be needed in cross-referencing as you will see later.

(3) Part I is an item identification listing, and illustrations are part of this section of the SL-4. The illustrations and item listing should be used to complement each other. Illustrations make use and identification much easier. There are several columns of information in Part I.

(a) Item Number - Starting with item number 1 which is the end item itself, everything is numbered sequentially as it appears in the SL-4. If there were 50,000 replaceable/repairable items then that's how many items would be shown and numbered. The item number is also used for cross-referencing when that particular part does not have a NSN.

(b) Model - This indicates the model to which the part applies if the SL-4 covers more than one model.

(c) NSN - The National Stock Number is a 13 digit number used to requisition the part. If no NSN is listed you may have to go to Part II and obtain a part number and MFR. Code to obtain the item. Depending upon the Source Maintenance Recoverability Code (SMR) you may have to obtain the next higher assembly or even get the item from salvage. We will discuss those when we get to the SMR column.

(d) Reference Designator/Figure Key - This is a cross-reference to the associated illustration. It allows you to go back to the numbered figure and the itemized part for identification/clarification purposes. These figures are also very useful in determining what the next higher assemblies would be for "XA" Coded Parts as they are usually bracketed.

(e) Indenture Code - Indicates the relationship of the item to the next higher assembly or end item.

(f) Item Identification - Provides the name and description of the item. When an item is duplicated only the name will appear and not the description. What you will see below the name will be a "S/A" meaning Same As and will refer you back to an item number where it was first listed in the SL-4.

(g) Unit of Measure - Provides the measurement standard as it relates to the specific end item, not necessarily the one to use for requisitioning the part.

(h) Quantity - Subdivided into per application and per equipment. This column shows how many are used for a particular application and how many of those particular items/parts are used within the end items.

(i) SMR Code - This is Source, Maintenance and Recoverability Code: shows where (source) you obtain the item; what echelons of maintenance can remove and replace the item, what echelon can repair, assemble, test and rebuild the item; and, the disposition of the part.

(4) Part II is an item number cross-reference and provides the following data.

(a) A list of all item numbers not assigned NSN's in Part I.

(b) Listed in item number sequence and provides you with the part number and MFR. Code.

(c) Consists mainly of those "XA" and "XB" code items.

(5) Part III is a NSN cross-reference and provides the following data.

(a) From NSN to item number, part number, and manufacturer's code.

(b) It contains only those items that had a NSN in Part I

(6) Part IV is a part number cross-reference and provides the following:

(a) A cross-reference from part number to manufacturer's code and NSN.

(b) This section is in alpha-numeric part number sequence, not just numerical.

Method of instruction: CO/DEMO Instructor to student ratio is 1 : 10.

Time of instruction: 2.5 hours.

Media Laptop computer/ Digital Projector

PRESENTATION

1. Electronic Technical Manual (ETM)

a. The ETM is an Electronic Technical Manual that is replacing the paper printed Technical Manual. The ETM is on a Compact Disk (CD) that is to be read by using a computer.

b. Computer Hardware

(1) On/off button.

a) Turns the computer on and off.

(2) Hard-Drive

a) Stores information in the personal computer.

(3) CD Drive

a) Reads information from a compact disk(CD)

(4) 3 5 floppy drive

a) Reads information from a disk and you can save information to the disk as needed

(5) Mouse

a) Used to maneuver the pointer on the computer screen

1) The left mouse button is used to select options by double clicking on the option you wish to activate.

2) The right mouse button is used to pull up an additional task lists

2. Using the ETM

a. Once your computer has been turned on simply DOUBLE CLICK on the Alliant Library Manager (ALM) icon. If there is no ALM icon move to the START MENU click and move your mouse pointer to Programs. Another window will appear with the ALM icon in it, now just click that icon

b. The ETM title page appears, and lists all of the publications available on a particular CD. It is used to select the appropriate publication that you would like to view

3. Selecting a Publication

a. There are two ways to locate the appropriate TM that you want. One is to use the find button and type in the TM number or the model number of the equipment that you are working on and press FIND. The other way is to scroll down to the appropriate TM number or manual that you want to use. DOUBLE CLICK on the manual that you would like to view and then click on the IGNORE button

1) SL-3

2) SL-4 VOL 1& 2 Stock List

3) LI-Lube Instructions

4) MI – Modification Instructions

5) SI – Supply Instructions

6) TI – Technical Instructions

7) RS – Rebuild Standards

8) TM – Technical Manual

NOTE: **Have students open the Technical Manual 08757A for the next set of instructions.**

b) **The ETM tool bar located across the top of the window starting from the left and going to the right.**

1) **Page button** - the first button on the tool bar will display the TM page across the whole screen. It provides the largest viewing area.

2) **Bookmark and Page button** - the second button on the tool bar is used to display both the bookmarks and the page of the TM at the same time.

3) **Thumbnails and Page button** - the third button on the tool bar is used to display thumbnails of the each page and the page that has been selected at the same time. The Thumbnails are used to select one page at a time.

4) **Hand Tool button** - The hand tool is used to grab a hold of the viewed page and moving the page up, down, left, and right with the mouse.

5) **Zoom in tool** - The zoom-in tool is used to magnify the viewed page.

6) **Select text button** - the select text button (abc), is used when a portion of the text in the TM is to be copied to another program.

7) **First Page Arrow** - used to go directly to the first page of the TM.

8) **Previous Page Arrow** - used to go back one page.

9) **Next Page Arrow** - used to go to the next page.

10) **Last Page Arrow** - used to go to the last page of the TM.

11) **Previous View Arrow** - used to go to the last viewed page of the TM.

12) **Next View Arrow** - used to return to the next view.

13) **Page View button** - sets the zoom on the viewed page to 100%.

14) **Page Fit button** - makes the current page fit inside the window.

15) **Page View Fit button** - makes the visible width of the current page fit inside the window.

16) **Find button** - used to display the find dialog, the find button is identified by a pair of binoculars.

NOTE: **All of the same functions as the tool bar can be accessed and used from the file tool menu on top of the window screen.**

TECHNICAL PUBLICATIONS

PRACTICAL APPLICATION #1

Student Reference: TM-08757A-14/1

Using the **TM-08757A-14/1** in the binders, provide the information requested.

1. What is the refill capacity of the Final Drives? _____
   a. How often should the Final Drives be drained and flushed? _____
2. At what hourly interval should the transmission lubricant be changed? _____
3. What is the maximum permissible end play on the front idler shaft? _____
4. Using the trouble shooting chart, find the most probable cause for oil in the cooling system? _____.
5. What is the torque for the adapter bolts on the turbocharger? _____.
6. What tools are needed for the Cab tilt and removal operation? _____.
7. What is the maximum speed in 2nd gear forward? _____.
8. Using the chart for wear specifications, what is the minimum "use again" distance in inches for part number 2P3669? _____
9. The D7G Dozer uses what type of Electrical system? _____.
   a. How many batteries does it use? _____.
10. What drives the Winch?
    a. Power steering motor
    b. Hydraulic system
    c. Transmission/Torque converter shaft
    d. Engine
11. How long should the procedure of bumping and tapping the air cleaner element continue to ensure a clean filter? _____

12. Figure 2-13, Key #2 shows the 60 amp Starting and Charging Circuit Breaker. If it trips to provide protection against possible shocks, fire, or damage to components, what action should be taken?

_____

13. According to Table 4-17, what special tool is required to install the pistons in the cylinder block? _____

    a. What is the Part No. for the special tool? _____

14. What is the first step for Inspection and Testing of the backup alarm system?

_____

15. There are 3 different methods listed in the "Other Demolition Methods" section, what are they? _____.

16. What would the red signal of the Air filter indicator mean?

_____.

17. When testing the Lubrication System for low oil pressure, what is the minimum permissible pressure in psi, if you are using SAE 30 weight oil?

    a. 600 to 800 rpm _____

    b. 1500 rpm or above _____

18. What does figure 4-182 show? _____.

19. What is the first task when removal of the Hydraulic Tank from the D7G Tractor is required?

_____

20. What is the weight of the Electric Starting Motor used on the D7G Tractor engine?

_____

21. What is the Torque specification for the nut that holds the pulley on the Alternator Shaft?

_____

22. When installing the muffler on the D7G Tractor, what should be used on the threads of the fasteners?

_____

23. What is the weight of the D7G Tractor with blade and no ripper?

_____

TECHNICAL PUBLICATIONS

PRACTICAL APPLICATION #2

Student Reference: TM-08757A-14/1

Using the **TM-08757A-14/1** in the binders, provide the information requested.

1. What is the displacement of the engine for the D7G Tractor?
   _____
2. What safety warning applies when performing maintenance on the air intake system?
   _____
3. The electrical system contains 3 separate circuits. Name them:
   _____
   _____
   _____
4. What component on the electrical system charging circuit controls electrical output to keep the batteries at full charge?
   _____
5. How many forward and reverse speeds does the D7G Transmission have?
   _____
6. What type of brakes does the D7G tractor utilize?
   _____
7. List the three 'During Operations' checks the equipment operator must perform:
   _____
   _____
   _____
8. After starting the engine, how long should the tractor sit at low idle to provide proper lubrication of the turbocharger?
   _____
9. The D7G Tractor can safely perform water fording operations in water up to what depth?
   _____
10. When replacing the engine oil filter element, what should be applied to the gasket of the new filter?
    _____

11. What must be used to relieve the check valve in the hydraulic tank when draining the hydraulic oil?

_____

12. When checking the lubricant level of the final drives, where should the oil level be?

_____

13. What should be used to install the Secondary Fuel Filter Element?

_____

14. What is the Part Number for the special socket used to tighten the nuts on the fuel injection lines?

_____

15. Table 4-2 (Maintenance Checklist) requires that the battery electrolyte level be checked every 100 hours; in what paragraph will you find the procedures for this service?

_____

16. At what interval is an engine tune-up performed during preventive maintenance?

_____

17. How often are the Fan and Alternator belts inspected for wear or damage?

_____

18. When performing Troubleshooting Procedures, what preliminary check or test should be made first when checking for electrical trouble?

_____

19. What is the most probable cause for not enough power on the D7G engine?

_____

20. What is the most probable cause for an engine that produces too much white or blue smoke?

_____

21. If the Alternator gives no charge and the drive belt is properly adjusted; what corrective action would you perform next?

_____

22. What is the most probable cause if the transmission operates in forward speeds only?

_____

23. If the hydraulic oil system gets too hot, and a short rapid duty cycle is suspected, what damage will occur if the oil temperature goes above 210 degrees F?

_____

24. In which direction is the spring on the thermostat installed in the thermostat housing?

_____

TECHNICAL PUBLICATIONS

PRACTICAL APPLICATION #3

Student Reference: TM-08757A-14/1

Using the **TM-08757A** in the binders, provide the information requested:

1. When adjusting the engine fan belts, what tool should be used to check belt tension?

   _____

2. What is the rating of the Alternator on the D7G?

   _____

3. What special tools are required to remove the fuel injection valves/nozzles?

   _____

4. Using figure 4-81, what is key number 36 shown in the illustration?

   _____

5. What should be used to clean the magnets on the transmission and steering clutch filter?

   _____

6. What is the weight of each cab door on the D7G Tractor?

   _____

7. When adjusting the brake bands on the D7G Tractor, what is the proper position of Socket (Key 7, Fig 4-135) after the brake band is tight on the brake drum?

   _____

8. What type of lubricant should be used when installing the Brake Cooling and Lubrication Relief Valve?

   _____

9. If using ¾" diameter Plow Bolts to attach cutting edges and end bits, what is the recommended torque specification?

   _____

10. What is the first step during installation of the winch on the D7G Tractor?

    _____

11. List the maximum allowable bore for a worn cylinder liner during engine repair and replacement.

12. During assembly of the Water Pump at Field Echelon maintenance, what is the only permitted type of lubricant?

13. What special tools are required during installation of the Fuel Injection Pump housing and Governor?

14. Which Figure lists the Cylinder Head Bolt tightening sequence?

15. Using Figure 4-237, what tool is used to measure the Cylinder Liner projection during installation?

16. If removal of the engine from the D7G Tractor is required, what is the first step or operation?

17. What is the lubricant capacity of the Engine Crankcase?

18. At what interval is the Final Drive Lubricant and Breather required to be changed?

19. What is the capacity of the fuel tank?

20. How often must the Engine Coolant System be drained, flushed, and refilled?

21. According to the Lubrication and Maintenance Chart, when should the Air Intake Primary Element be cleaned?

22. When should the Air Intake Primary Element be replaced?

23. How often should the Air Intake Secondary Element be removed and cleaned?

TECHNICAL PUBLICATIONS

PRACTICAL APPLICATION #4

Student References: SL-4-08757A

Utilizing the **SL-4-08757A** in the organizer, provide the information requested.

1. Engine Starter

   a. Item Number: _____

   b. NSN: _____

2. Item Number 544

   a. Part Number: _____

   b. Manufacturer's Code: _____

   c. NSN: _____

3. Item Number1654

   a. Part Number: _____

   b. Manufacturer's Name: _____

   c. What does the entry; S/A RPL Line 001092, in Column 6 (Item Identification) mean?
   _____

4. Item Number 2465

   a. What is the SMR Code for this item? _____

   b. List the *Source Code* for this item _____ and explain the method by which you would obtain this part. _____
   _____

   c. Which Echelon is authorized to *Use* this part? _____

5. Who is authorized to dispose of the Transmission Assembly? _____

6. NSN 5930-00-434-9121

a. Part Number: _____

b. Item Number: _____

c. Manufacturer's Code: _____

7. NSN 5330-00-865-5253

a. Part Number: _____

b. Manufacturers Code: _____

c. Item Name: _____

8. Part Number 2-129N674-7

a. Manufacturer's Code: _____

b. NSN: _____

c. SMR Code (Fuel Transfer Pump application): _____

d. Which echelon is authorized to *Dispose* of this part? _____

9. Figure 069, Key 003

a. Name: _____

b. NSN: _____

c. SMR Code: _____

10. Item Number 459

a. Part Number: _____

b. MFG Code: _____

c. SMR Code: _____

d. Is there an NSN listed for this item in the SL-4: _____

11. List the SMR Code for Item Number 183. _____

12. Part Number 397

a. Item Name: _____

b. SMR Code: _____

c. List the *Source Code* for this item _____, and explain the method by which you would obtain this part. _____

_____

13. Part Number 0S1626

a. NSN: _____

b. Item Name: _____

c. Size (Description): _____

14. If the electrical lead assembly (Item Number 2709) on the fuel tank Fuel Level Indicator required replacement, how would you obtain this repair part?

_____

15. Figure 044, Key 005

a. Item Number: _____

b. Unit of Measure: _____

c. Quantity Required Per Application: _____

16. List the following information for the center, front windshield:

a. NSN: _____

b. SMR Code: _____

c. Part Number: _____

17. List the following information used to order the Rear Windshield Wiper Blade.

a. Ref. Desig. Fig-Key Number: _____

b. NSN: _____

c. MFG Code (FSCM): _____

d. Manufacturers Name: _____

TECHNICAL PUBLICATIONS

PRACTICAL APPLICATIONS #5

STUDENT REFERENCES: SL-4-08757A

Utilizing the **SL-4-08757A** in the organizer, provide the information requested.

1. How many bolts are needed to secure the fan to the pulley adapter? _____

   a. What NSN would you use to order them? _____

2. If you were in a 2nd Echelon shop, could you replace the Fuel transfer pump?

   _____

   a. Who could replace it? _____

   b. Who could repair it? _____

   c. Who would dispose of the pump if it were unserviceable? _____

3. What are the dimensions for NSN 5310-00-080-6004?

   _____

4. What is the part number for Item 4312 ?

   _____

5. FSCM 27315 identifies what company?

   _____

6. What echelon of maintenance can replace the winch control group?

   _____

7. At what level of maintenance can the Turbocharger be disposed of?

   _____

8. What NSN would you use to order the Hydraulic Filter?

   _____

9. List the NSN's you would use to order the thermostat and gasket.

   a. Thermostat: _____

   b. Gasket: _____

10. What is the SMR Code for the Diesel Engine?

_____

a. Provide a brief definition for this SMR Code (PAFHD).

1) Source (PA) _____.

2) Use (F) _____

3) Repair (H) _____

4) Recoverability (D) _____

11. List the following information for the Cab Heater Air Cleaner.

a. NSN: _____

b. SMR Code: _____

c. QTY Per Application: _____

12. List the NSN's you would use to order the following lamps:

a. Working Light: _____

b. Flood Light: _____

c. Instrument Panel: _____

d. Cab Light: _____

13. Provide the following information for the Drive Shaft Universal Joints.

a. NSN: _____

b. SMR Code: _____

c. QTY Per Application: _____

d. Part Number: _____

UNITED STATES MARINE CORPS
MARINE CORPS DETACHMENT
U.S. ARMY ENGINEER CENTER
FORT LEONARD WOOD, MISSOURI 65473-5850

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STUDENT OUTLINE

RECORDS AND FORMS

TERMINAL LEARNING OBJECTIVE:

Provided data, an equipment Repair Order (NAVMC 10245), an Equipment Repair Order Shopping List (NAVMC 10925), and a Worksheet For Preventive Maintenance And Technical Inspection For Engineer Equipment (NAVMC 10560); with the aid of notes and references complete the NAVMC 10245, the NAVMC 10925, and the NAVMC 10560 in accordance with the TM-4700-15/1 and UM 4790-5 (1341.1.1, 1341.1.2).

ENABLING LEARNING OBJECTIVE(S):

(1) Given a Worksheet for Preventive Maintenance and Technical Inspection for Engineer Equipment (NAVMC 10560) and an item of engineer equipment, with the aid of notes and references, complete the NAVMC 10560 in accordance with TM 4700-15/1. (1341.1.2)

(2) Given a NAVMC 10245 (Equipment Repair Order) and Maintenance information, with the aid of notes and reference complete the ERO in accordance with TM 4700-15/1. (1341.1.1a)

(3) Given a NAVMC 10925 (ERO Shopping/Transaction List), Input Transaction Templates, and input transactions to be performed, with the aid of notes and references, complete the input transactions in accordance with UM-4790-5. (1341.1.1b)

METHOD/MEDIA: I will do this by lecture, demonstration, and practical application.

EVALUATION: There will be an examination at the end of this period of instruction.

STUDENT REFERENCES: TM-4700-15/1, UM 4790-5

OUTLINE

1. RESPONSIBILITIES:

a. As Engineer equipment mechanics, it will be your responsibility to know who is responsible for records, what records are required, and where to find instructions for complete usage of records and forms.

b. Unit Commanders are primarily responsible for proper completion and maintenance of all equipment records.

(1) However, it is the responsibility of the operator and maintenance personnel to make required entries on these records and forms once a PM (preventive maintenance) or CM (corrective maintenance) service has been completed.

(2) TM-4700-15/1 lists the minimum required records and forms for proper operation and maintenance that are mandatory for use in the Marine Corps Maintenance System.

(3) TM-4700-15/1 provides instructions for the preparation, use and disposition of the minimum required records and forms associated with the operation and maintenance of Marine Corps equipment.

2. NAVMC 10560 WORKSHEET FOR PREVENTIVE MAINTENANCE AND TECHNICAL INSPECTION FOR ENGINEER EQUIPMENT

a. Purpose - The purpose of the NAVMC 10560 is to provide a checklist for performing and recording Preventive Maintenance Checks and Services (PMCS) and Limited Technical Inspections (LTI's)

(1) Acceptance LTI's - Performed by maintenance personnel upon receipt of equipment and prior to placing the equipment in service.

(2) LTI's Prior to Repair - The equipment chief will ensure that equipment requiring repairs is inspected and results recorded on the NAVMC 10560 before the equipment is repaired.

(3) Preventive Maintenance - The maintenance unit, with the assistance of the operator performs required services, records them on the NAVMC 10560, and signs the worksheet indicating that the services have been performed.

b. Responsibilities

(1) The Equipment owner, custodian or user, is responsible for preparing the worksheet for the PMCS. A template indicating the required services will be prepared for each item of equipment to aid in preparing the worksheet.

(2) The template is placed on the NAVMC 10560 and non applicable portions of the form are blanked out. Once the worksheet is prepared it is transmitted to the maintenance unit with the equipment.

c. Preparation Instructions

(1) The preparing activity may be the equipment owner, the equipment user (temp loaned gear), or the equipment custodian. The preparing activity is responsible for initial preparation of the NAVMC 10560. Items marked with an asterisk will be completed by the preparing activity.

(2) SECTION "A"

(a) Section A is filled out by the equipment dispatcher. We will cover the required information as you will need to ensure the correctness of the information.

(b) Use Servicing Symbols (SS) to list requirements for PMCS.

1. A - Adjust. Used when an adjustment is required during a PM service. (Example: D-3 adjust valve mechanism clearance.)

2. C- Clean. Used to identify requirements for cleaning during the PM service. (Example: Clean battery box.)

3. I - Inspect. Used to identify requirements for specific inspection during the PM service. (Example: Inspect brake shoes for wear.)

4. S - Service. This entry will denote a service requirement such as oil filter / engine oil change. Cleaning the air filter or hydraulic strainers may also be noted with this symbol. (Example: Service hydraulic oil, filter, and strainer.

5. T - Tighten. This entry will be used when a specific assembly is required to be tightened or torqued. (Example: Torque wheel mounting nuts.)

(c) Use Legend for Marking (SS) to list requirements for CM.

1. N/A - Not applicable to this particular type of equipment. This is usually marked off by the equipment chief or dispatcher. (Example: D-17 a carburetor is not found on an D-7G.)

2. M - Missing is self-explanatory. An item that belongs on this piece of equipment simply is not there. (Example: D-21 fuel tank cap is not on the vehicle. You would place an M in that block (ss) next to 21.)

3. CHECK-MARK - Satisfactory. The component is present and has no defects or discrepancies. (Example: D-9 the water pump, fan and shroud are in good working order.)

4. X - Adjustment required. When the repair can be corrected immediately, the mechanic should take the steps to do so. (Example: D-2 valve cover loose.)

5. XX - Repair required. This marking is used when a part is in need of repair. (Example: D-37 broken wire under dash.)

6. XXX - Replacement required. This symbol is used when a part has to be replaced. (Example: D-36 front right head light is out. Replace head light.)

7. D - Immediate deadline or D/L. This symbol is used when further operation will cause damage to the equipment and/or the operator. (Example: F-13 the vehicle has no brakes and cannot be stopped safely. This deadlines the unit until the brakes can be repaired.).

8. U - Unsatisfactory. This symbol is mainly used in Section A. The boxes marked appearance or operator's daily PM.

9. MR - Modification required. This is just as it reads. A modification has not been completed and is still required.

* (d) Nomenclature - Enter the Nomenclature listed on the Data Plate.

* (e) Make - Enter the make or manufacturer of the equipment.

*(f) Model - Enter the model number of the equipment.

*(g) Organization - Enter the full name of the activity that owns the equipment.

*(h) Date - Enter the date the NAVMC 10560 is being prepared.

*(i) Hours - Enter the equipment hour meter reading if so equipped, otherwise leave blank.

*(j) Miles - Enter odometer reading if so equipped, otherwise leave blank.

*(k) Registration No. - Enter the USMC registration number.

*(l) Engine Make/Model - Enter the equipment engine make / model. List both engines if applicable.

*(m) Engine Serial No. - Enter the equipment's engine serial number. List both engines if applicable.

*(n) Attachments - Enter the equipment's attachments nomenclature, make and model, and serial number.

*(o) Indicate Purpose - Use an "X" to indicate if the NAVMC 10560 is used for:

1. Technical Inspection

2. Limited Technical Inspection

3. Hourly PM - Enter which hourly if applicable.

4. Other (state) - List a description.

(p) The Legend for marking is used to complete Equipment Record Folder, Publications Available, Appearance, Operators Daily PM, Fire Extinguisher, and Tools and Equipment.

(3) SECTION "B"

(a) List all items that are not satisfactory in the (SS) column of Sections "D" - "M".

(b) List all Modification and Technical Instructions that need to be accomplished.

(c) List all items listed in section "B" onto the ERO.

(4) SECTION "C"

(a) Section "C" is only required when a condition code is requested.

*(b) Item Cost - Enter the current Item cost.

*(c) Equipment Age - Enter the age of the item of equipment.

(d) Repair Limit - Enter the one time repair limit and the cost limit.

EXAMPLE: Equipment cost is $55,000.

One Time Repair Limit is 65%

Cost Limit is $35,750

(e) Est. Cost This Repair - Enter estimated cost to repair items listed in Section B.

(f) Condition Code - Enter the condition code.

(5) SECTIONS "D" THROUGH "M" (SS) COLUMNS

(a) Section D - Engine And Power Unit

1. This section is used to check the engine and related components.

2. The "SS" column is where the Servicing Symbols (SS) or the Legend For Marking (SS) are placed.

3. Some examples of marking this section would be:

a. D-2 rain cap on muffler is missing

b. D-3 valve cover gasket leaks

c. D-4 not taken

d. D-5 service engine oil

(b) Section E - Power Trains

1. This section is used for the power trains. U-Joints, gear housings, transmissions, and brake shoes, drums or discs.

2. Some examples of marking this section would be:

a. E-1 service u-joints

b. F-5 adjust transmission oil level

(c) Section F - Skids / Frame and Suspension

1. This section is used for the main frame, outriggers, tires, and hydraulic cylinders.

2. Some examples of marking this section would be:

a. F-2 right front outrigger cylinder leaks

b. F-12 front windshield broken

(d) Section G - Attachments / Blades / Cutting Edges

1. This section is used for attachments, winch cables, and cutting edges.

2. Some examples of marking this section would be:

a. G-6 cable sheave broken

b. G-7 cutting edges worn - unserviceable

c. G-11 fork attachment hydraulic lines broken

(e) Section H - Pumps and Compressors Water / Hydraulic / Pneumatic

1. This section is used for separate pumps and compressors such as a 250 CFM Air Compressor, or a 55 GPM Water Pump.

2. If this section does not apply it would be lined out.

(f) Section I - Mobile Electric Power Generating Source

1. This section is for end item generators.

2. This section would be lined out if not working with this type of gear.

(g) Section J - Refrigeration / Air Conditioning

1. This section is used for refrigeration and air conditioning assemblies which are not installed on heavy equipment. This section would be used for end items also.

2. This section would be lined out.

(h) Section K - Water Supply Equipment

1. This section is for water purification units or laundry units.

2. This section would be lined out.

(i) Section L - Chain and Power Saw

1. This section would be used when working on chain saws. Special Tool Kits and some Equipment (SEE Tractor) contain chain saws which will require periodic maintenance.

2. If not applicable this section would be lined out.

(j) Section M - Marine Equipment

1. This section is used for watercraft and related equipment.

2. If not applicable this section would be lined out.

*(k) Section N - Modification Instructions

1. Enter all applicable MI / TI numbers in this block. The Title of the MI / TI is entered in the block immediately following the MI / TI number.

2. Enter a checkmark in the "Performed" block to indicate if the modification has or has not been performed.

(l) Section O - Instructions

1. This section contains simple instructions for completing this form.

2. Number 5 refers you to the Equipment Technical Manual for detailed instructions and service / maintenance requirements for completing this form.

(m) Section P - Signature Block

1. In the Mechanic / Operator (Name, Grade, Organization) block, enter the name, grade, and organization of the person preparing sections "B" through "M".

2. In the Maintenance / Operations Chief (Name, Grade, Organization) block, enter the name, grade, and organization of the maintenance / operations chief of the mechanic / operator entered in the previous block.

3. In the ERO block enter the ERO number assigned to this task (PM service, LTI, corrective maintenance).

4. In the Date block enter the date the ERO was assigned.

5. The Maintenance / Operations Officer will sign the appropriate block as required.

6. The Responsible Officer will sign the appropriate block as required.

(6) TACTICAL ENGINEER EQUIPMENT

(a) The NAVMC 10245 (ERO) will be used in conjunction with the NAVMC 10560. All PMCS and CM services performed will be recorded on the ERO.

(b) The NAVMC 10925 (EROSL) will be used to request parts.

(7) FILING AND DISPOSITION

(a) When the Maintenance Officer / Chief has verified that requirements listed in Section "B" have been transferred to an ERO the NAVMC 10560 may be destroyed.

(b) A NAVMC 10560 used for investigation will be retained until released from investigation. It will then be treated as a Corrective Maintenance LTI.

3. NAVMC-10245, EQUIPMENT REPAIR ORDER

a. Purpose

(1) The purpose of an ERO is to request the performance of equipment maintenance to include:

(a) Modifications

(b) Calibration

(c) Corrective maintenance

(d) Preventative maintenance

(e) LTI's on tactical ground equipment.

(2) It is used for transmitting work to higher echelons for maintenance and for recording and reporting the services performed in its accomplishment.

(3) Maintenance personnel will use the ERO in all instances where either maintenance resources, or repair parts are required in the performance of maintenance.

(4) This form is not used to request or record either operator maintenance (first echelon) or depot level maintenance (fifth echelon). However, it will be used to evacuate equipment requiring second and higher echelon maintenance when the supporting unit for second through higher echelon maintenance is other than the owning unit.

(5) It may also be used by first echelon maintenance personnel in conjunction with the EROSL (Equipment Repair Order Shopping/Transaction List) to order SL-3 components.

b. Responsibilities

(1) Preparing activities

(a) The preparing activity may be the equipment owner, the equipment user (e.g., the equipment is on temporary loan), or the equipment custodian as in the case of the maintenance shop evacuating to the next higher echelon.

(b) The preparing activity is responsible for initial preparation of an ERO to include completion of the heading and description of work to be performed.

(2) Maintenance activities

(a) The maintenance activity will receipt for the equipment by completing the "ACCEPTED BY", DATE (DRIS), and ERO number blocks.

(b) The maintenance activity will enter information on work performed as maintenance actions are completed and will close out the ERO.

(c) If it becomes necessary for a maintenance activity to evacuate the equipment to the next higher maintenance echelon, the maintenance activity will initiate a new ERO, completing those items required of the preparing activity and using its ERO number as the request number.

(3) Preparation instructions

(a) ERO Number - The work order number assigned by the maintenance activity performing the repairs.

(b) Accepted By (signature) - Enter the signature of the person accepting the equipment for the maintenance shop performing the repair.

(c) Date DRIS (date received in shop) - Enter the julian date on which the equipment is accepted by the maintenance shop performing the repairs.

(d) Organization Doing Repairs - Enter the name of the maintenance shop performing the repairs to which the equipment is being evacuated for repairs. This entry is made by the preparing activity. However, it is important that it be covered in class due to the fact you will need to know it when doing the "4" card practical application.

(e) Ech (echelon) - The echelon of maintenance performing the repairs is entered here by the preparing activity.

(f) Serial Number - The preparing activity will enter the serial number of the equipment from the data plate. This entry is right justified.

(g) Owning organization - The preparing activity will enter the noun name of the owning organization

(h) Authorized By (Signature) Date - The person who has been designated at the preparing activity to authorize work to be performed. This is a required entry.

(i) Priority - Enter the priority assigned to the ERO. This entry is made by the preparing activity. However, it is important that I cover it in class since you will be using it during your "4" card practical application.

(j) JON (job order number) - This field will be left blank.

(k) ID number - The preparing activity will enter the Item Designator number of the equipment.

(l) Nomenclature - The preparing activity will enter the short noun nomenclature and/or model number of the equipment.

(m) Category code (circle one) - The preparing activity will circle the category code that describes equipment undergoing repairs.

1. "M" - Combat essential deadline equipment requiring critical repairs.

2. "N" - Equipment requiring non-critical repairs.

3. "P" - Non-combat essential equipment requiring critical repairs.

4. "X" - combat reportable equipment requiring critical repairs that does not deadline the equipment but does degrade its operational capability.

(n) Shop Section - The maintenance activity enters the appropriate shop section code as indicated in UM-4790-5. The number "2" will always be entered for engineers.

(o) Item Number - Enter the number of each task performed in numerical sequence.

(p) Description of Work - The preparing activity will enter a brief description of each task or symptom of the failure or work to be performed.

(q) Labor (hours) - Enter the total labor hours to the nearest one-tenth of an hour required to repair each defect or task listed in the "Description of Work" block.

(r) Mechanic (signature) - Enter the signature of the mechanic performing the repair of the defect. If more than one mechanic performs the repair, the senior supervisor will sign his/her signature as the responsible individual.

(4) ERO composition/disposition

(a) An ERO consists of sheets of self-carbonizing paper of four different colors: white, pink, green, and yellow.

(b) The white copy is the original. Upon completion of all required maintenance service, the white copy will be returned to the user/owning unit and filed in the equipment record jacket for one year.

(c) The pink copy is the administrative copy. The pink copy can be used to input "0" and "9" card data directly into the AIS (Automated Information System). The pink copy is attached to the original during the repair cycle, then destroyed in accordance with local procedures when all actions are completed.

(d) The green copy is the shop copy. The green copy will contain the original signature of the individual accepting equipment from the maintenance shop. The green copy will be retained in the files at the maintenance shop for a minimum of one year.

(e) The yellow copy is the owning unit receipt for equipment while at the maintenance activity. The yellow copy will be returned to the maintenance shop upon completion of all repairs. The yellow copy may be destroyed by the maintenance shop once the equipment is returned to owning unit.

4. NAVMC-10925 EROSL (ERO SHOPPING/TRANSACTION LIST)

a. Purpose - The EROSL will be used in conjunction with the ERO to requisition, receipt for, cancel, and record partial issues and credits of repair parts associated with ground equipment undergoing repair. The EROSL is primarily for units supported by the FMSS (Field Maintenance Sub System) of the MIMMS AIS (Marine Corps Integrated Maintenance Management Automated information System). Units not supported by the FMSS are encouraged to use this form to standardize procedures and continue training of maintenance personnel in the use of the form.

b. Configuration - The EROSL is packaged in pads of 100 sheets. It is self carbonizing to permit preparation of the desired number of copies. The front and back covers are printed with instructions which may be used as templates for completing the EROSL.

1. To use the templates, select the one for the appropriate transaction type. Lay the template on the EROSL, ensuring that the card columns of the template are aligned with the card columns on the EROSL, and complete the desired entries.

2. We will be using the Supply Request "4" Transaction template. uses of other templates and descriptions of transaction types are listed in the current UM--4790-5. The headings highlighted on the templates (on desk) are required entries. If required entries are not performed for a specific transaction, it will not process.

c. Preparation Instructions

(1) Header Section

(a) ERO NO. - Enter the ERO number assigned to the equipment for which parts are being ordered.

(b) UNIT - Enter the name of the section to identify who is ordering the part.

(c) DATE - Enter the Julian Date the EROSL was prepared.

(d) MAINT. - The individual authorized to approve the requisition enters the date and required initials.

(e) MATERIAL USAGE CODE - Circle the appropriate code.

1. "6" is for SL-3 components.

2. "7" is for corrective maintenance.

3. "8" is for modifications.

4. "9" is for preventive maintenance.

(f) SHOP SECTION - Enter the shop section from block 77 of ERO.

(g) Other blank spaces are used as specified in the local sop (Standing Operating Procedures) to provide additional information. The reference used to locate the NSN or Part Number must be entered.

(2) Transaction Section

(a) TRANSACTION CODE (CC 1) - Enter transaction code "4" on the EROSL.

(b) ERO NUMBER (CC 2-6) - Enter the ERO number.

(c) NSN (CC 11-23) - Enter the National Stock Number of the part(s) requested.

(d) QUANTITY (CC 24-26) - Enter the quantity requested.

(e) MATERIAL USAGE CODE (CC 37) - Enter the material usage code from header.

(f) PRIORITY (CC 42-43) - Enter the priority of the part requested. This entry must not be higher than the priority of the ERO.

(g) UNIT OF ISSUE (CC 49-50) - Enter the correct unit of issue for the part requested.

(h) JON (CC 51-64) - Enter the Job Order Number to which parts are to be charged.

(i) DEMAND CODE (CC 66) - Enter the proper demand code which reflects whether the demand for repair parts is recurring (R) or nonrecurring (N).

1. A repair part is normally recurring (R).

2. A modification is non-recurring (N).

(j) NOT MISSION CAPABLE SUPPLY (CC 66) - NMCS indicates that an item of equipment is nonoperational due to lack of repair parts.

1. Equipment must be Readiness Reportable.

2. Use an "N" for equipment which is NMCS.

3. Use "E" for anticipated NMCS.

(k) ADVICE CODE (CC 68-69) -

1. For PEB parts enter PB.

2. For scrounged parts enter SC.

3. If parts were neither PEB or scrounged; coordinate with the unit supply section for appropriate advice code.

(l) NOMENCLATURE or PART NAME (CC 70-79) - Enter the name of each part.

(m) TRANSACTION TYPE (CC 80) - Enter the transaction type code as "A" for add (new demand), or "C" for change (change to existing part(s) record).

d. Special Instructions

(1) Upon receipt of parts which will not be immediately installed, the EROSL will be annotated as to the date/quantity of items received.

(2) When parts are removed from ERO bin for installation, the EROSL will be annotated by the mechanic or shop chief accordingly.

(3) Annotations may be made by circling, check mark, use of blanks in the heading, use of unused card columns, or written information on the EROSL.

e. Disposition

(1) When all required action is completed by the issue point, and keypunch center, and all required information has been automated, the original EROSL is returned to the originator and joined with the original ERO.

(2) FMSS supported units are not required to retain the EROSL after the ERO has been closed.

ASSET TRACKING LOGISTICS AND SUPPLY SYSTEM (ATLASS)

Overview

The MIMMS (AIS) system; currently in use by the Marine Corps for maintenance management purposes, is being replaced by ATLASS II+ (Asset Tracking Logistic and Supply System). While there are similarities between the two systems, the most noticeable difference is the medium used to track and record maintenance efforts. The MIMMS system requires records and forms to be filled out manually with pen, while the ATLASS system is completed using Automated Data Processing equipment (computers).

1. Equipment Work Order

a. **Purpose**. The purpose of an equipment work order is to request modification, calibration, corrective maintenance (CM), preventive maintenance checks and services (PMCS), and limited technical inspection (LTI) on the owning units equipment.

1) The work order is also used for requesting higher echelon maintenance support and for recording and reporting maintenance performed. Maintenance personnel will use a work order in all instances where either maintenance resources, repair parts, or secondary repairables are required to perform requested maintenance.

2. Responsibilities

a. **Organizational Maintenance Activity (OMA)**. The OMA may be the equipment owner, or the equipment user; for example, the equipment is on temporary loan, or the equipment custodian as in the case of the maintenance section evacuating to higher echelon activities.

1) When an end item of equipment requires maintenance beyond operator's maintenance, a work order will be completed listing those items required of the OMA.

2) The OMA will receipt for the equipment by completing the "Accepted and Approval" portion of the work order. The maintenance activity will update information on the work order as maintenance actions are completed and will the close the work order when all maintenance actions are completed.

3. Equipment Work Order Task Procedures

a. **Accessing ATLASSII+:**

1) The user must enter their login **Name** and **Password** to enter the ATALSS II program. The user's login identity will determine their access within the program.

2) Double click on the **ATLASSII+** icon from the start-up menu or desktop. If a "WARNING" screen appears, you must press "**ACCEPT**" to continue processing.

3) Double click on the **MML950ss** icon to enlarge (refer to figure 1). Repeat this step on the Marine holding the globe (Figure 2) to access ATLASS II.

Fig. 1

Fig. 2

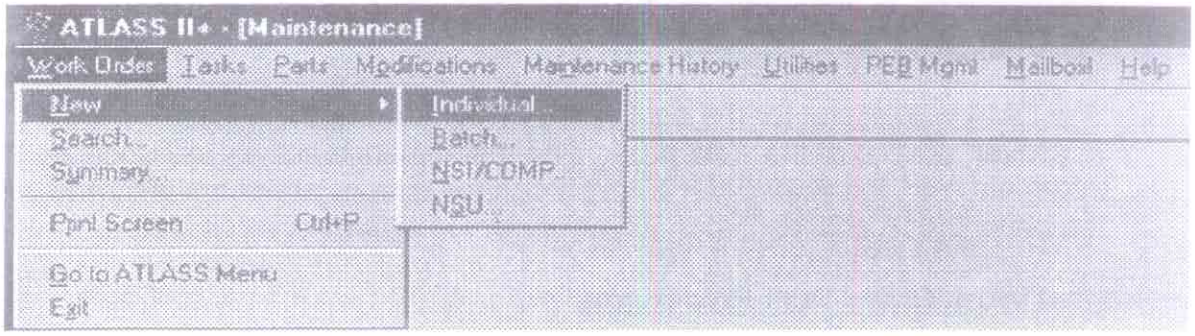
4) The seven available icons (refer to Figure 3) will access; Maintenance, Supply, Readiness, Reports, System, Exit, and Help menus. Place the cursor over the icon to view field name.

Fig. 3

5) Click on the **Maintenance** icon to access maintenance information (figure 4).

Fig. 4

6) To establish a new work order, from the top line menu, click on **Work order** and continue by clicking on **New** and **Individual** (refer to Figure 5).



7) From the **New Work Order** drop down window (refer to figure 6) select the **Organization** (Unit Identification Code) and **Section** (Work Section).

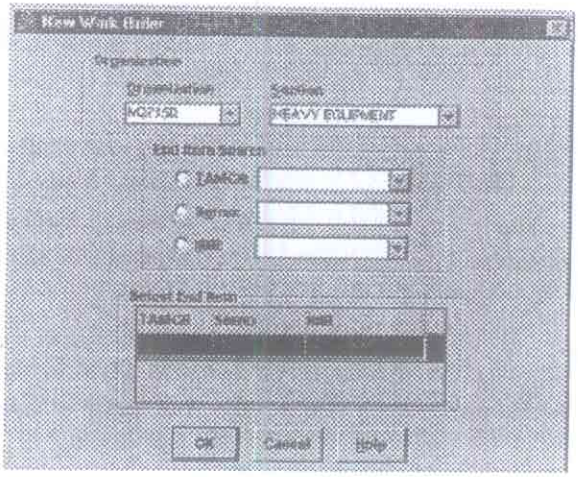


Fig. 6

8) Select from the **End Item Search;** either **TAMCN, Serno,** or **NIIN** to start your new work order. Select from the choices available to identify the specific item to start the new work order. Only select (1) of the three choices to begin a search.

9) From the **Select End Item** window highlight the equipment for the new work order by clicking on the equipment **Serno** and click **OK** or double click on the **Serno**.

10) A new window will appear entitled "**Task -Basic Task**" (Figure 7). The fields that require information will be highlighted in bold print.

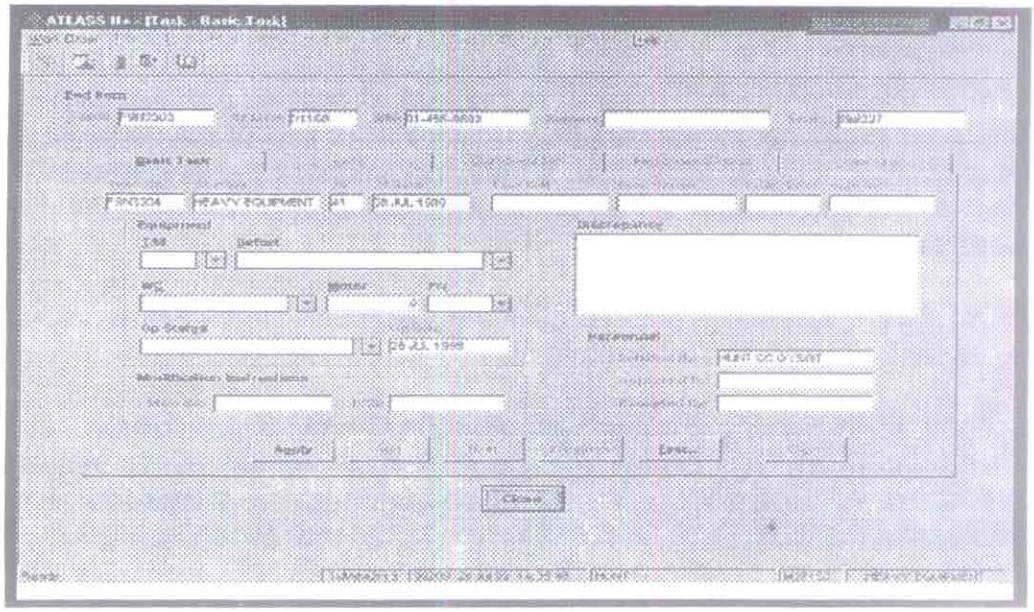


Fig 7

11) Enter the Type of Maintenance (**T/M**) to be performed from the drop down list. Highlight the appropriate service and proceed to the defect.

12) The **Defect** tab has several "hot keys" to assist in finding an appropriate defect for a task. For example: C = communications equipment, E = engineer equipment, I = LTI/inspections, M = Motor Transport and P = PM services. There are several hot keys to choose from. Select the defect that best describes the task to be performed and click **Enter**.

13) Work Center (**WC**). Select the appropriate work center, from the drop down box, performing the repairs to the task. The work center represents the section within the shop to conduct the maintenance action.

14) **Meter.** Enter the odometer or hour meter reading from the item of equipment requiring repairs.

15) Priority (**Pri**). Select the priority that best describes the urgency of the required repairs or maintenance action. Reference MCO 4400.16_.

16) Operational Status (**Op Status**). From the available options select the status that best describes the impact of the task on the equipment. For example: **Operational, Deadlined, Safety Deadlined, or Administrative Deadline**.

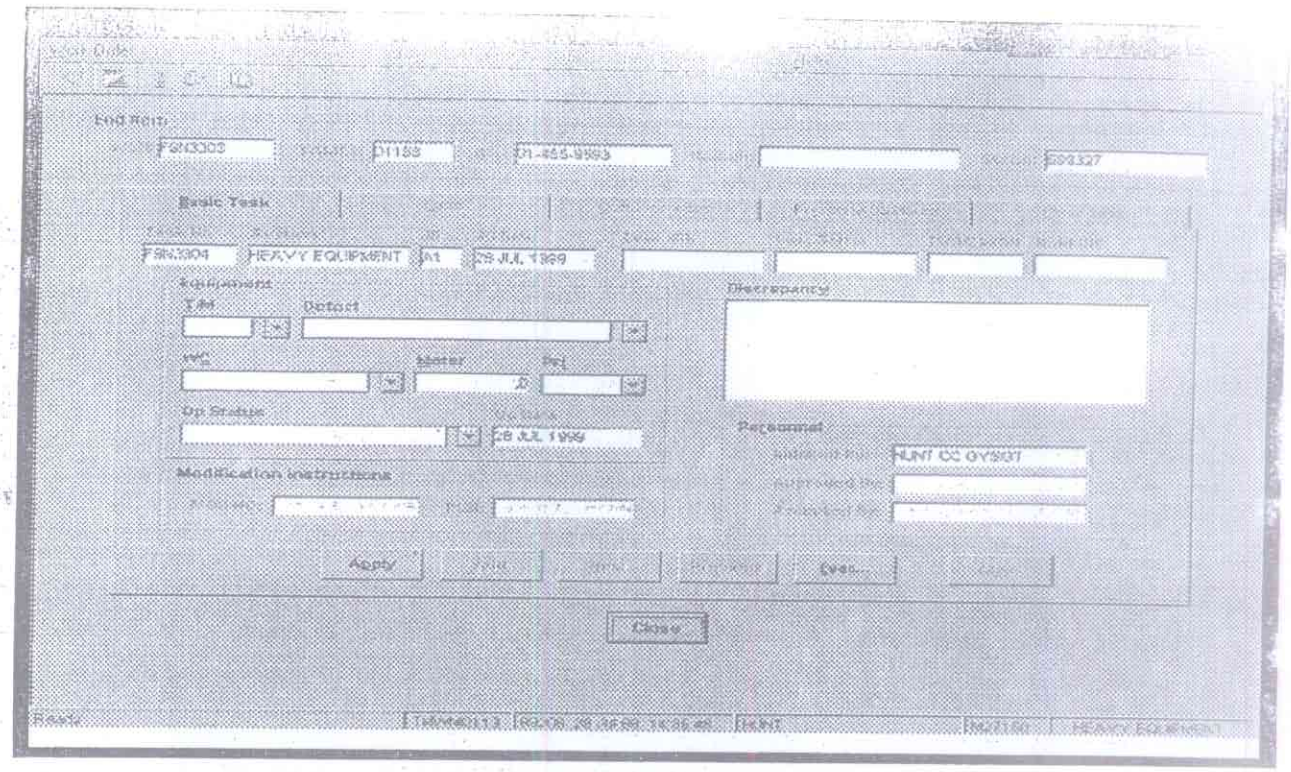
17) The last entry to be completed is the **Discrepancy**. There are 255 characters worth of space available to explain the task to be performed. This is a mandatory entry.

18) In the event that the information typed is not required press the **Clear** button to clear all the fields.

19) Press the **Apply** button to process the task. A new window will appear to verify the equipment meter reading. Click **Yes** to accept the meter reading. This will also send all tasks to a supervisor's mailbox pending approval. If a field was not completed, an error message will appear with instructions on what needs to be inserted.

20) If additional tasks are required click the **Add** button to continue processing tasks for the same item of equipment.

21) When all processing is completed click the **Close** button. This will send the user to the **Work Order** window. The work order window will display all tasks associated with the work order. To accept and approve a task the user must access the mailbox. Click **Close** to return to the maintenance window.



b. **Mailbox:** The mailbox is used to track and approve/accept tasks into the maintenance cycle. This is generally a supervisor's window into the maintenance shop and serves as a management tool.

1) To approve the task the supervisor will enter their **Login Name** and **Password** to confirm the task. After the task is approved it will move to the "**Task Pending Acceptance**".

2) The acceptance process is accessed in the **Mailbox Message Details** as mentioned above. This is the final step prior to adding the task to the work order.

c. **Parts Requisitioning:**

1) Prior to ordering parts you must be in the **Task – Basic Task** screen for the specific task requiring parts. The following steps will assist in recalling a specific work order and it's associated task.

2) From the top line menu click on **Work Order**.

3) Click on **Summary**.

4) From the drop down window select the appropriate **Organization** (Figure 9). Highlight the required work center from the **Sections Available** list to find a work order and associated tasks, then click on the **Add** button.

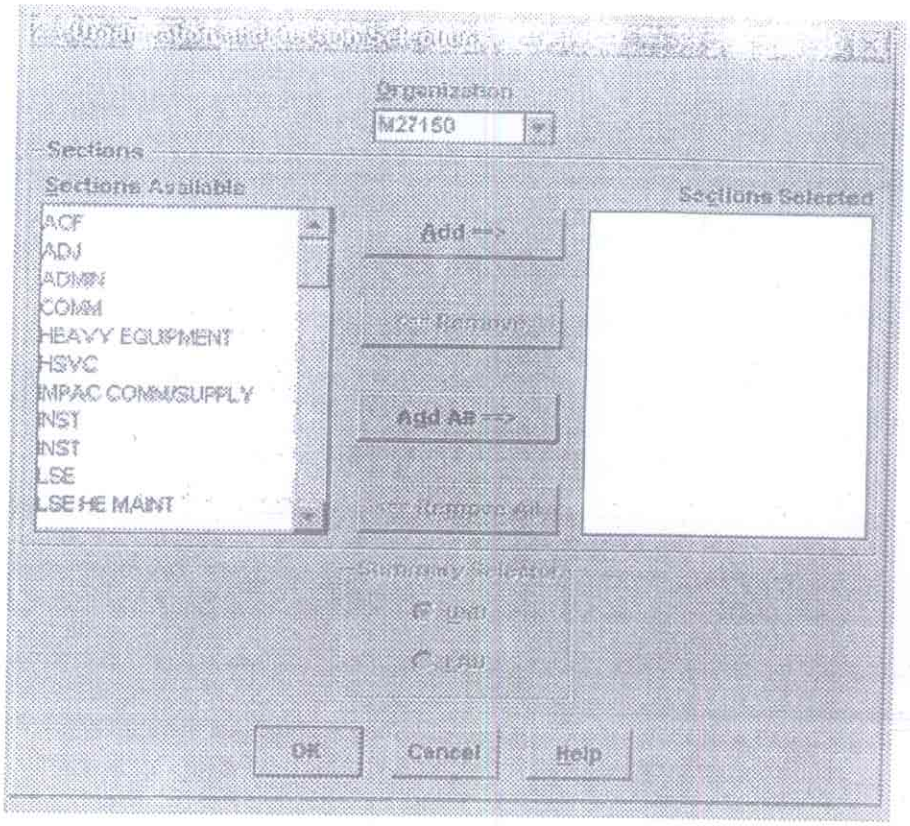


FIG. 9

5) The next drop down window will display a **Work Order Summary**. This window will display a list of Work Order Numbers (**WON**) and a chart for equipment Awaiting Maintenance (**AWM**), In Work (**IW**), Awaiting Parts (**AWP**), and Job Status Totals (**JS Total**). The **View** button will allow the user to see the information pertinent to the work order and associated tasks. The **Refresh** button will update the work order list. The **Task Summary** button will also show all the task associated with a work order. The **Close** button will close the **Work Order Summary.**

6) All parts must be ordered against the task associated with the repair parts. To accomplish this;

7) Click on the WON for the equipment requiring parts (see Figure 10).

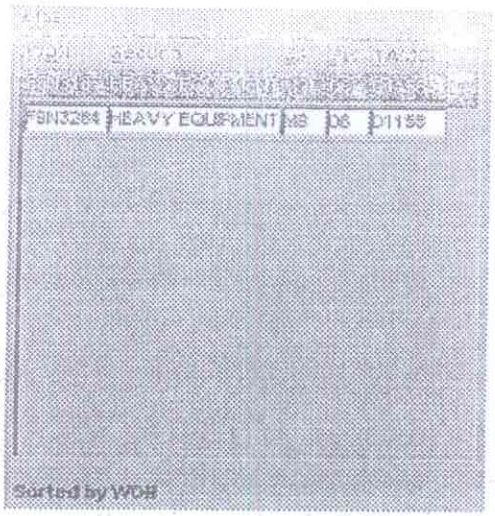


Fig. 10

8) Click **Task Summary**.

9) From the **Task Summary** window (figure 11), click on the desired task that corresponds to the parts to be requisitioned and click **View**. This will move the user to the **Task – Basic Task** window.

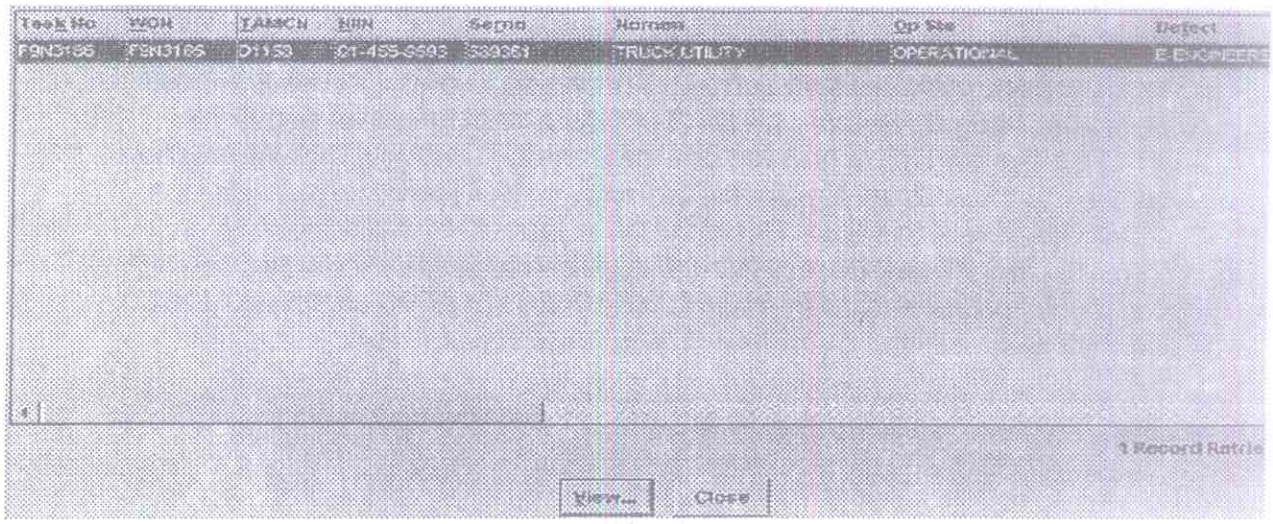
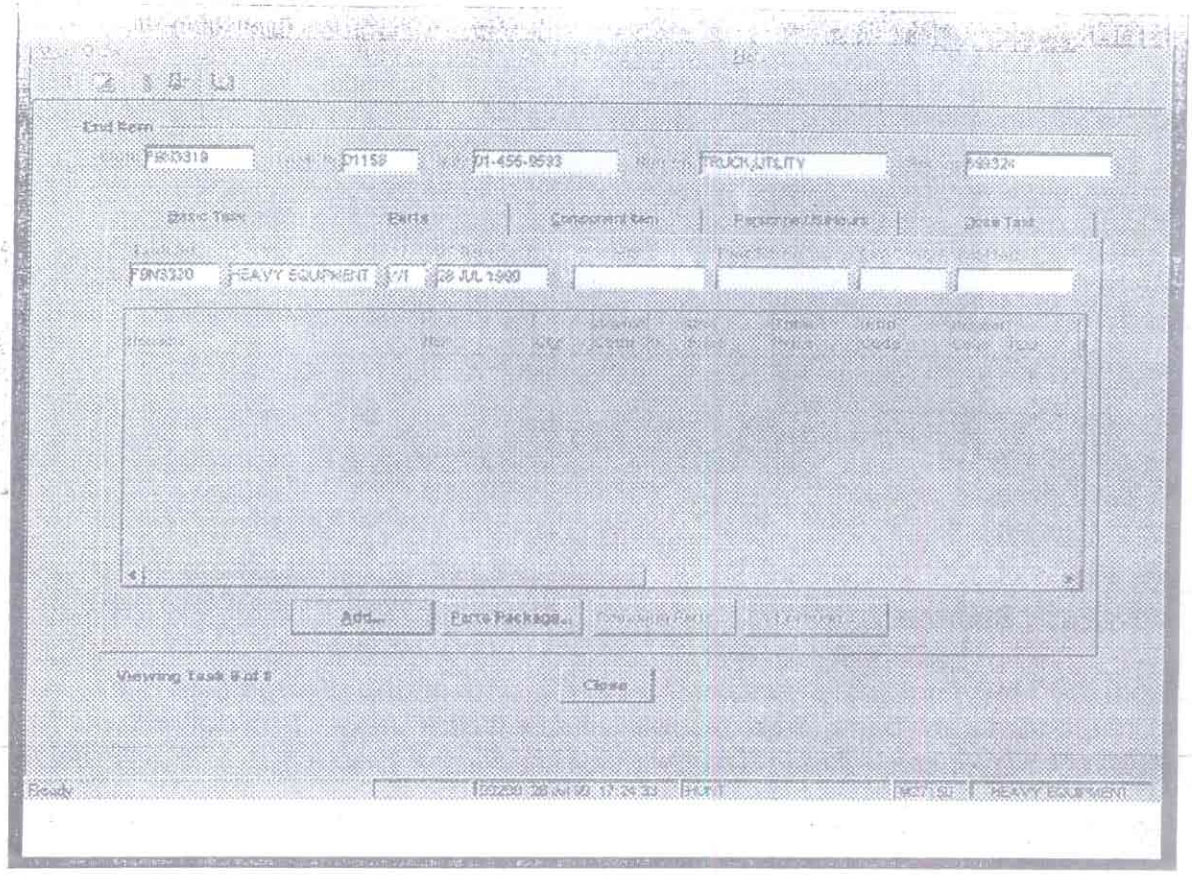


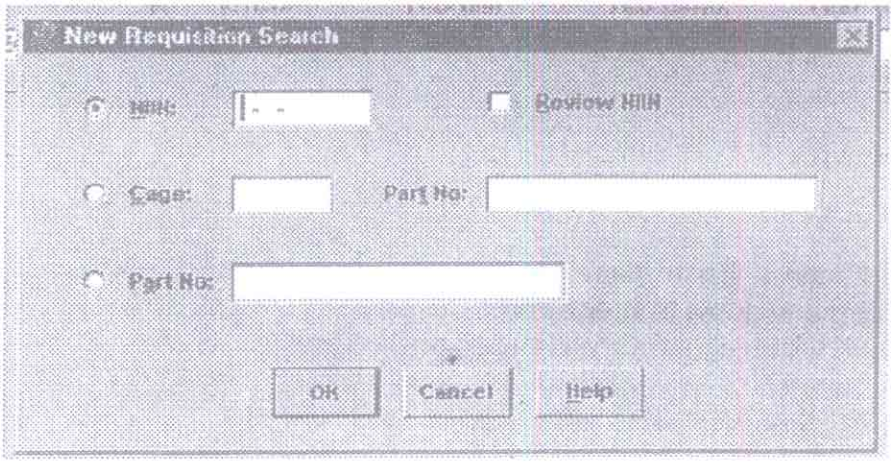
Fig 11

10) From the **Task – Basic Task** window click on the **Parts** folder heading. This will pull up the window to order parts.



11) To add a part, click the **Add** button. On the drop down window enter the **NIIN**, **Cage**, or **Part No** (only select (1) of the three options to begin the search) for the part to be ordered and click the **OK** button. This information should be obtained from the appropriate equipment technical publications.

12) From the **New Requisition** window the following areas should not be annotated by maintenance personnel but left for supply to complete. Medium & Status (**M&S**), Distribution Code (**Dist**), and Project (**Proj**).



13) The Quantity (**Qty**), Demand Code (**Dmd**), Supplementary Address (**SupAdd**), Priority (**Pri**), Required Delivery Date (**RDD**), Job Order Number (**JON**), and **Remarks** are responsibilities of the maintenance activity.

a) **Qty**: Enter the quantity of the NIIN to be requisitioned.

b) **Dmd**: Recurring (R) is the default. The other options available indicate specific information pertaining to how the NIIN should be ordered.

c) **SupAdd:** This code is used for local distribution of the repair part and may be left blank.

d) **Pri**: The priority of the requisition must be consistent with the work order, and with the mission essentiality of the item requisitioned for the task.

e) **RDD**: This is the date that the repair parts are required to perform required maintenance actions per the mission of the command. Double click in the box to access the calendar and double click on the specific date required to enter the date.

f) **JON**: JON numbers will be assigned by supply to maintenance personnel to control and account for fiscal budgeting. These numbers identify who is paying for the repair parts select the appropriate JON for the parts being requisitioned.

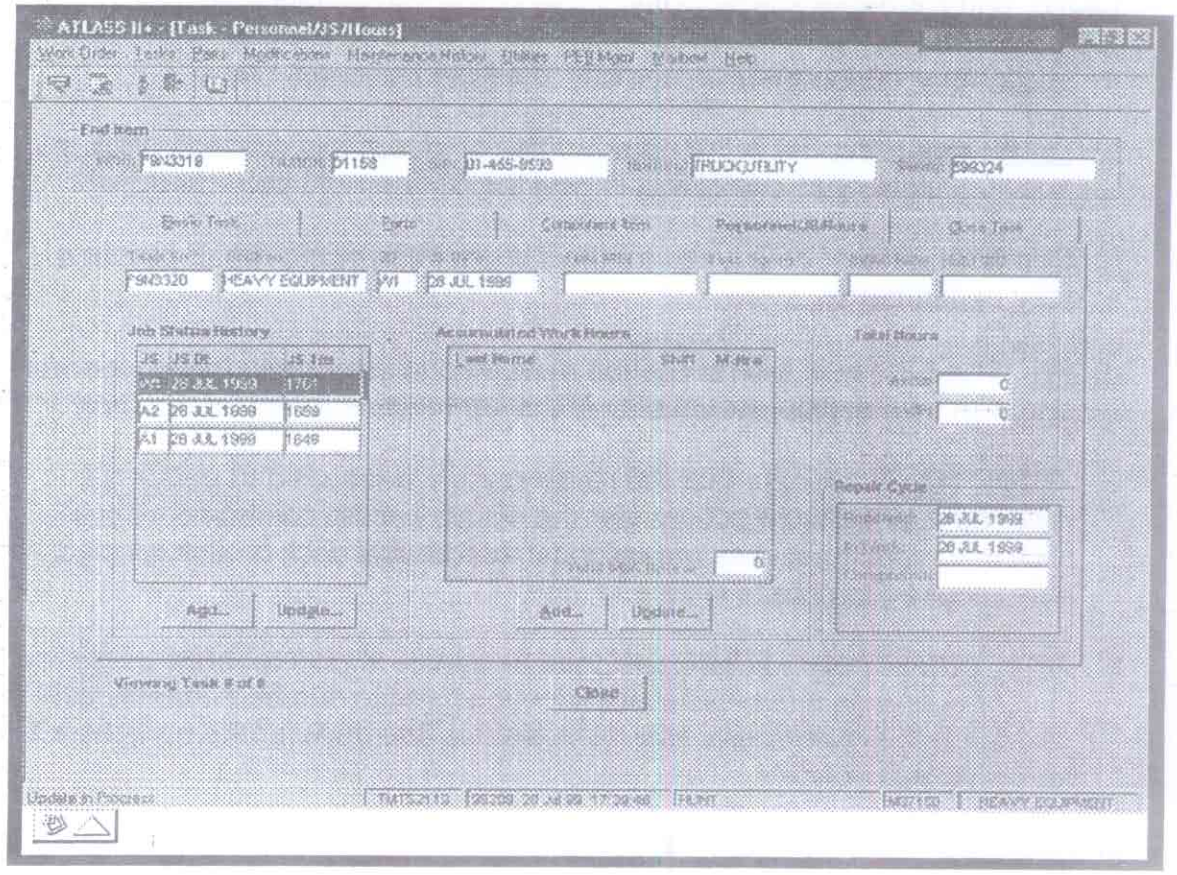
g) **Remarks**: Enter any comments that are pertinent to the part/s being requisitioned.

14) Once all information has been entered click **Save** to process the requisition. **Reset** will clear all the fields if the requisition is not required.

15) After the **Save** button has been clicked a window will appear to display the document number of the requisition. Clicking **Print** will provide a paper copy of the transaction or clicking **OK** will return the user to the **Parts** folder for additional processing.

16) After the parts are requisitioned the Job Status of the task will automatically updated to reflect parts on order.

d. **Personnel/JS/Hours:**



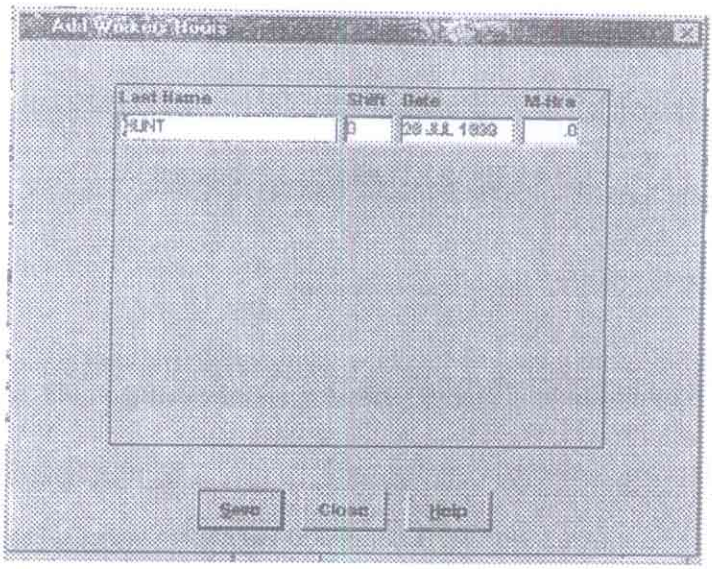
1) This folder is used to manually add/update the Job Status (**JS**), and add/update the **Accumulated Work Hours**. From the **Task – Basic Task** window click on the **Personnel/JS/hours** folder tab.

2) **Job Status History**: The job status history is made up of automatic job status changes that occur as the equipment moves through the various processing cycles. However, from time to time a task may need to be manually updated to accurately reflect the actual status of the equipment.

3) **Add**: Used to manually add a job status.

4) **Update**: Used to manually change a job status that was incorrectly processed. Job statuses A1 = Task Initiation, A2 = Task Approved, and A3 (associated only to a work order) = Accepted By should **NEVER be updated. An attempt to update these statuses will create an ERROR in the system and may prevent the user from further processing of the task**.

5) **Accumulated Work Hours**: As work order/tasks are completed each individual performing repairs enters their Last Name, Shift, and the Man-hours spent performing the repairs. Click **Add** to add a new entry or **Update** to update an existing entry.



6) **Last Name**: Enter the last name of each individual performing repairs.

7) **Shift**: Enter the shift that represents the time in which the work was completed (1, 2, and 3).

8) **Date**: Automatically entered.

9) **Man–Hours**: Enter the total man-hours spent to repair each task to the nearest tenth of an hour.

10) Upon completion of these fields click **Save**.

11) **Total Hours** and **Repair Cycle** will automatically be updated as entries are made during the active maintenance phase.

12) After all entries have been entered click the **Close** button.

ENGINEER EQUIPMENT RECORDS AND FORMS

PRACTICAL APPLICATION #1

Given a blank NAVMC 10560 complete all sections

a. On 11 October 2000 your unit, 7th Engineer Support Battalion (7th ESB) assigned you to LTI an item of equipment. The equipment specifications are as follows:

Nomenclature: Tractor,Medium, Full Tracked **Make:** Caterpillar

Model: D7G **USMC Number:** 586655

Engine Make / Model: Caterpillar 3306 **Engine Serial Number:** 08Z40429

Attachment: Winch **Make/Model:** Caterpillar/Model 57 **Serial:** 29V04780

b. Upon arrival the equipment had 832 hours on the hourmeter. The equipment has no odometer. The Bulldozer has a winch as an attachment, this information is listed above. The Equipment Record Folder is current, publications are available, the operators PM was performed, and the equipment was washed prior to the requested LTI. There are no special tools and equipment or fire extinguisher required for this item of equipment.

c. During the LTI, you discovered that the work light on the right side was inoperative and requires repair to a broken wire. You also discovered that the exhaust rain cap is missing and that the fan belts are worn and cracked. You noticed that the water pump is leaking coolant past the gasket on the cover and requires corrective maintenance.

The Engine Fuel Priming Pump handle is broken and there is leakage around the stem of the pump. It was determined that this defective priming pump was the cause of the operators complaints of engine misfiring and running roughly.

d. You are the mechanic performing the LTI assisted by Pvt Jimmy H. Woods the equipment operator. Your Maintenance Chief is GySgt Alfred J. Thomas. Upon completion of this LTI your MIMMS Clerk assigned ERO# YW040 to the Equipment Repair Order for this item of equipment, which was opened on 11 Oct 2000 also.

ENGINEER EQUIPMENT RECORDS AND FORMS

PRACTICAL APPLICATION #2

This practical application consist of two forms, (NAVMC 10245 ERO, and 10925 EROSL) you are to complete these forms according to the instructions provided herein.

PART #1

1. You have just completed an LTI on a D7G Dozer, Serial #586655, and identified discrepancies which require maintenance action. Complete the ERO provided to correct these discrepancies.

a. 7th ESB Heavy Equipment section is the equipment owner. 7th ESB's organizational maintenance section will be performing the repairs within their echelon of maintenance. Your Quality Control NCO is Sgt Jeffery D. Cochrane and he is authorized to accept equipment into the shop. GySgt J. Daniels is the Operations Chief and has written authority to authorize ERO's up to and including 06 priority. The priority for this ERO will be 06, and the category code will be "X". The equipment Item Designator number is 08757A. The shop section is '2', and the operations section phone number is 555-0001. The ERO# assigned to this work request is YW040, and the MIMMS Clerk opened this ERO on 11 Oct 2000.

b. Using the NAVMC 10560 (LTI) you have already completed, complete the Item No., and Description of Work blocks.

ENGINEER EQUIPMENT RECORDS AND FORMS

PRACTICAL APPLICATION #2

PART #2

1. The ERO you have just completed was presented to your MIMMS Clerk and assigned the ERO#. The green copy of the ERO was given to your floor chief who in turn gave it to you; and instructed you to correct any discrepancies which you are able to, and order the required parts for those which you are not. Ensure that all maintenance performed is within your echelon of maintenance.

a. The reference used to order parts will be entered on line "A" of the header. The Equipment Nomenclature will be entered on line "B" and line "C" will list the Equipment Serial #.

b. The Job Order Number used to order these parts will be: BK5S200107001T. Questions concerning the proper NORS (NMCS) Indicator for the parts you are ordering should be addressed to the instructor.

c. The Transaction Type will be 'A', for a new request, for all parts ordered.

GENERAL MECHANIC'S AND SPECIAL TOOLS

Some of you may or may not be familiar with hand tools. If you do not know yet, you will soon know that the pride of a mechanic is his/her tools. Good mechanics know how to properly care for, and account for their tools.

During this lesson, you will be taught the correct nomenclature for all tools in the general mechanic's tool kit, specific tools from No. 1 common, and selected special tools. Tools as well as all equipment in the military must be accounted for. Accounting for tools is done by inventory. When inventorying tools you must annotate the quantity on hand or any short comings on inventory sheets that are provided to you by your chief or motor sergeant. Depending on what branch of service you are in determines what type of inventory sheets you use. You will be shown how to properly complete a tool box/kit inventory at you unit or fleet. At the conclusion of this lesson, you will be able to correctly identify, use, and maintain accountability for these tools.

(1) General Mechanic's Tool Kit:

(a) Bar, Pry: It is used to take apart components that are hard to remove and to align them for assembly.

(b) Brush, Cleaning: Used to remove particles or clean components with clean solvent. It is not used for painting.

(c) Chisel, Cold Hand: Designed to cut and shape cold metal and is usually struck with a hammer.

(d) File, Hand - Flat Type: Used to shape and remove small amounts of the surface from metal, wood, and other material.

(e) File, Hand, Round Type: Used for filing circular openings or concave surfaces.

(f) File, Hand, 3 SQ Type: Used to file internal angles and for cleaning out square corners.

(g) Flashlight: Used in low light/visibility situations to perform maintenance or inspections.

(h) Gauge, Cap Setting: Used to check and adjust the gap on spark plugs.

(i) Gauge, Thickness: Used to check the piston ring gap, valve clearances, point gap and various other gap type tolerances.

(j) Hammer, Hand, Machinist, Ballpeen: Used to strike and shape metal other tools. The hammer can also be used to fabricate gaskets.

(k) Handle, File, Adjustable: Used with files to prevent injury to hand and to more accurately control the file.

(l) Handle Socket Wrench, Brace W/Single Revolving Grip: Used with a socket to rapidly remove nuts or bolts that have already been loosened.

(m) Key Set, Head Screw socket - Hex Drive: Used to remove/in[illegible]l hex head bolts (Commonly referred to as allen wrenches).

(n) Knife, Putty: Used to scrape off gaskets and to spread material.

(o) Padlock: Used to secure the tool box.

(p) Pliers, Diagonal Cutting: Used to cut small gauge wire or light materials, such as cotter pins.

(q) Pliers, Slip Joint: Used to grip objects and cut soft wire or nails.

(r) Pliers, Long Round Nose: Used to grip small objects or make loops in wire.

(s) Punch, Aligning: Used to line up mating parts for assembly.

(t) Punch Center, Solid: Used to start drill holes.

(u) Punch, Drive Pin Brass: Used to install seals or other parts made of soft material that could be damaged during installation.

(v) Punch, Drive Pin Tapered: Used to remove/install tapered pins.

(w) Punch, Drive Pin, 1/4, 1/8, 3/8: Used to remove/install pins.

(x) Retrieving Tool, Magnetic: Used to retrieve tools, hardware or other metal objects from otherwise inaccessible areas.

(y) Rule, Steel, Machinists: Used to measure work where accuracy is not an extremely important factor.

(z) Screwdriver, Crosstip, Size 1, Size 2, Size 3: Used to remove or install screws with the cross type or phillips pattern.

(aa) Screwdriver, Flat Tip, 1/4, 3/8, and 5/16 Tips: Used to remove and install slotted type screws.

(ab) Shears, Metal Cutting: Used to cut light gauge sheetmetal and gasket material.

(ac) Wrench, Socket, 13/16 and 7/8: Used to remove and install spark plugs.

(ad) Socket Set 1/4" Drive 5mm through 14mm: Used to remove or install metric nuts and bolts.

(ae) Tester, Electrical Circuit, 2 through 18 volt (DC): Used to check electrical terminals or wires for DC voltage.

(af) Wrench, Box and Open End Combination, 9mm through 32mm: Used to remove and install metric nuts and bolts.

(ag) Wrench set, Box and Open End combination, 5/16" through 1": Used to remove and install U.S. Common nuts and bolts.

(ah) Wrench Set, Box and Open End Combination, 5/16" through 1": Used to remove and install U.S. Common nuts and bolts.

(ai) Wrench Set, Open End Double Head Metric, 6mm through 32mm: Used to remove and install metric nuts and bolts.

(aj) Wrench Set, Socket, 1/4" drive: Set includes 2" extension, 3 1/4" driver, ratchet, 3/16" through 1/2" sockets and a

universal joint. Used to remove and install nuts and bolts.

(ak) Wrench Set, Socket, 1/2" drive: Set includes 2", 5", and 10" extensions, rachet, 9" and 14 1/2" breaker bars, 7/16" through 1 1/8" sockets and a universal joint.

(al) Wrench Set, socket, 23 piece metric 10mm through 32mm 1/2" drive: Used to remove and install metric nuts and bolts.

(am) Wrench Adjustable 6" and 12": Used to remove and install nuts, bolts and fittings.

(an) Wrench, Box Half Moon Doublehead 9/16" and 5/8": Used to remove and install hard to reach nuts and bolts.

(ao) Wrench, Crowsfoot: Used to remove and install military type sparkplug wires.

(ap) Wrench, Flarenut, Double End: 3/8" and 7/16", 1/2" and 9/16", 5/8" and 3/4": Used to remove and install fittings.

(aq) Wrench, Open End, Double Head, 3/8" and 7/16", 1/2" and 9/16", 5/8" and 11/16": Used to remove and install nuts and bolts.

(ar) Wrench Curved Jaw (Vise Grips): Used to clamp items together and to remove rounded off nuts and bolts.

(as) Wrench Spanner: Used to remove and install military type wiring harness connectors.

(at) Flaring Tool, Tube: Used to put flares on soft tubing. Capable of fabricating single or double flare.

(au) Filler and Bleeder: Used to fill and purge the air form the hydraulic brake system. Provides a method to bleed brakes utilizing only one person.

(av) Wrench, Torque: Used to measure a specific degree of tightness of nuts and bolts.

(aw) Tap and Die Set: Taps and dies are used to cut threads in metal, plastics or hard rubber.

Practical Exercise Site 1: the students will be given instruction on how to properly fabricate a single and double flare using the tubing flaring kit. The students will then make a single and double flare. the students will then use the student workbook and with the instructors guidance put the filler bleeder into operation and bleed the brakes on the mock-up brake system.

Practical Exercise Site 2: Given the necessary tools and Technical Manual and under the instructors guidance the students will remove the cylinder head from a gasoline engine. The students will then demonstrate the correct procedures for torquing the cylinder head. The students will be given instruction on common tools used on the contact truck, and purpose of contact truck. Also, will be taught the location and functions of common tools found on the contact truck. The students will then demonstrate the correct procedures for torquing the cylinder head. The students will be given instruction on common tools used on the contact truck, purpose of contact truck. Also, will be taught the location and functions of common tools found on the contact truck. The students will then be given instruction from the student workbook pertaining to common hardware.

Practical Exercise Site 3: The students will be given instruction on the proper methods for using various handtools, tap and die set and the electric drill. The students will then use these tools to fabricate a project. This project must meet the specifications given by the instructor.

Practical Exercise Site 4: The students will be given instruction on measuring devices, their uses and proper procedures for calculating measurements. The students will then perform various measurements on hardware utilizing the steel rule, micrometer, gap and thickness gauges. The students will then be given instruction from the student workbook pertaining to common hardware.

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