TM 3-251-BD

TECHNICAL MANUAL

BATTLEFIELD DAMAGE ASSESSMENT

AND REPAIR

FOR

CHEMICAL DEFENSIVE MATERIEL

HEADQUARTERS, DEPARTMENT OF THE ARMY

23 SEPTEMBER 1987

C2

CHANGE
NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 31 August 1992

TECHNICAL MANUAL

FOR

BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR

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TECHNICAL MANUAL

FOR

BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR

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C1

CHANGE

No. 1

HEADQUARTERS
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WASHINGTON, D.C. 1 MAY 1989

OPERATORS, ORGANIZATIONAL, DIRECT SUPPORT/GENERAL SUPPORT MAINTENANCE MANUAL
FOR

BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR

TM 3-251-BD, 23 September 1987, is changed as follows:

1. Remove old pages, and insert new pages as indicated below.

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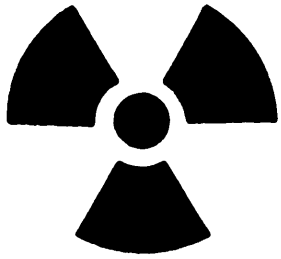
WARNING

This technical manual contains non-standard maintenance procedures. All normal safety procedures should be observed when the tactical situation permits. Extra care will be taken when the tactical situation requires performing maintenance with ammunition up-loaded and when fuels and lubricants are spilled.

WARNING

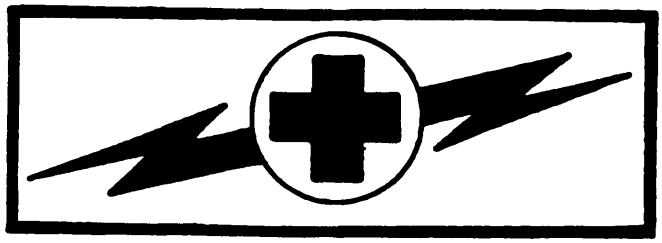
RADIATION HAZARD



The cell module of the M43A1 Detector contains a radioactive source (Americium - 241 as an oxide) sandwiched between two metal layers as a foil. The cell module is potentially dangerous if broken.

In any emergency event, contamination must be considered to be present until determined otherwise.

WARNING



HIGH VOLTAGE

High voltage is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions. Learn the areas containing high voltage in each piece of equipment. Be careful not to contact high voltage connections when installing or operating this equipment. Before working inside the equipment, turn power off and ground points of high potential before touching them.

for artificial respiration, refer to FM 21-11.

WARNING

DANGEROUS CHEMICALS

are used in this equipment.

DEATH

or severe burns may result if personnel fail to observe safety precautions.

WARNING

CARBON MONOXIDE POISONING CAN KILL YOU

Symptoms of carbon monoxide poisining are headache, dizziness, loss of muscular control, apparent drowsiness, and coma. The following precautions MUST be observed to ensure the safety of the crew.

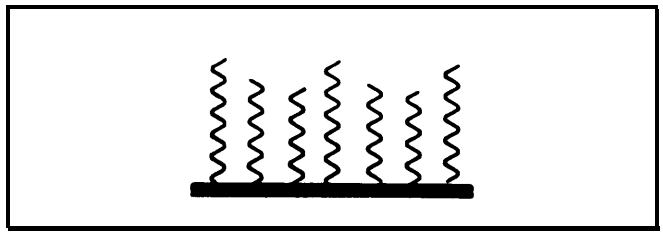
1. DON'T operate heater or engine in an enclosed area unless ADEQUATELY VENTILATED.

2. DON'T idle engine without maintaining ADEQUATE VENTILATION in vehicle.

3. DON'T drive vehicle with inspection plates, cover plates, or engine access panel and doors removed.

4. BE ALERT for exhaust odors and exposure symptoms. If either is present, IMMEDIATELY VENTILATE vehicle. If symptoms persist, remove personnel from vehicle and treat as follows: expose to fresh air; keep warm; DON'T PERMIT PHYSICAL EXERCISE; and if necessary, administer artificial respiration.

WARNING



HIGH TEMPERATURES

above 140°F (60°C) are present in the operation of some of this equipment.

SEVERE BURNS

can result if personnel fail to observe safety precaution.

Be careful not to contact high-temperature components when testing or operating this equipment. Always allow a cool down period before working on this equipment.

WARNING

Toxic solvents are used in servicing the equipment. Methylethylketone TT-M-261 is a highly flammable solvent containing toxic characteristics that may irritate the skin and cause burns or internal disorders if fumes are repeatedly inhaled. The safety measures described below should be observed in the handling and use of solvents.

1. Avoid prolonged or repeated breathing of vapors.
2. Use only in a well ventilated area.
3. Keep away from heat, sparks, or open flames.
4. Avoid contact with skin, eyes, and clothing. The use of gloves is advised to prevent irritation or inflammation of the skin. If contact with skin or eyes does occur quickly wash the affected area with water for at least 15 minutes. For eyes, seek medical attention immediately after flushing eyes with water.

WARNING

HIGH NOISE DANGER

Your hearing can be permanently damaged if you are exposed to constant noise of operating equipment. Always wear adequate hearing protection when working in high noise level areas.

WARNING

HANDLING WEIGHTS

This manual considers short term, nonrepetitive personnel lifts of equipment wighing up to 190 pounds to heights of about three feet. Under these conditions this manual assigns one man for each 65 pound increment of weight up to a total of four men to accomplish the required lifts. If local conditions mandate higher lifts, repetitive lifts, or carries greater than nine feet, refer to MIL-STD-1472 for a guideline on the number of personnel needed.

Technical Manual

No. 3-251-BD

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington,D.C 23 September 1987

Technical Manual
for
BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR
DEFENSIVE CHEMICAL EQUIPMENT

Battlefield Damage Assessment and Repair(BDAR)techniques in this manual pertain to the following end items:

Alarm Chemical Agent, Automatic: M8A1	(6665-01-105-5623)
DECONTAMINATING APPARATUS, Portable, DS2, 1 1/4 Qt, M11	(4230-00-720-1618)
DECONTAMINATING APPARATUS, Power-Driven, 500 Gal, M12A1	(4230-00-926-9488)
DECONTAMINATING APPARATUS, Power-Driven, Portable, Type A/E32U-8	(4230-01-153-8660)
DECONTAMINATING APPARATUS, Portable, 14 Liter, M13	(4230-01-133-41241
DISPERSER, Riot Control Agent, Portable M33A1	(1040-00-148-9824)
FILTER UNIT, Gas-Particulate, Hospital, 6-Man, 12 cfm, M7A1	(4240-00-203-3999)
FILTER UNIT, Gas-Particulate, Tank, 3-Man, 12 cfm, M8A2	(4240-00-691-1505)
FILTER UNIT, Gas-Particulate, Tank, 3-Man, 12 cfm, M8A3	(4240-00-853-3201)
FILTER UNIT, Gas-Particulate, Tank, 5-Man, 20 cfm, M13	(4240-00-601-8372)
FILTER UNIT, Gas-Pariculate, Tank, 5-Man, 20 cfm, M13A1	(4240-00-964-9061)
FILTER UNIT, Gas-Paticulate, Armored Ambulance, M14	(4240-00-010-5267)
SHELTER SYSTEM, Collective Protection, CB, 10-Man, M51	(4240-00-854-4144)
GENERATOR, Smoke, Mechanical: Pulse Jet, M3A4	(1040-01-143-9506)
CB HOOD, Mask, Aircraft, M7	(4240-00-021-8695)
CB HOOD, Mask, Field, M6A2	(4240-00-999-0420)
CB HOOD, Mask, Tank, M5	(4240-00-860-8987)
MASK, CB, Protective, Aircraft, M24	(4240-00-776-4384)
MASK, CB, Protective, Field, M17A1	(4240-00-926-4199)
MASK, CB, Protective, Field, M17A2	(4240-01-143-2017)
MASK, CB, Protective, Tank, M25A1	(4240-00-994-8751)
MASK, CB, Attack Helicopter, M43	(4240-01-208-6967)
MASK, CB, Special Purpose, M9A1	(4240-00-368-6095)
MASK, CB, Field Mask, M40	(4240-01-258-0062)
MASK, CB, Combat Vehicle, M42	(4240-01-258-0064)
GENERATOR SET, Smoke, Mechanical: Pulse Jet, M157	(1040-01-206-0147)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Fom 2028, Recommended Changes to Publications and Blank Forms, or DA Form 2028-2 should be mailed directly to: Commander Chemical Research & Development Center, ATTN: SMCCR-MAT, Aberdeen Proving Ground, MD 21010-5423. A reply will be furnished direct to you.

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CHAPTER 1

GENERAL INFORMATION

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

1-1. PURPOSE.

a. This technical manual (TM) is for use by operators, organizational, and direct support/general support maintenance personnel. It provides procedures and guidelines for battlefield repairs on defensive chemical equipment.

b. he purpose of Battlefield Damage Assessment and Repair (BDAR) is to rapidly return disabled defensive chemical equipment to the operational commander by expediently fixing, by-passing, or jury-rigging components to restore the minimum essential systems required for the support of the specific combat mission. These repairs may be temporary and may not restore full performance capability.

1-2. SCOPE.

a. This TM describes BDAR procedures applicable specifically to defensive chemical equipment.

b. All possible types of combat damage and failure modes can not be predicted nor are all effective field expedient repairs known. This TM provides guidelines for assessing and repairing battlefield failures of defensive chemical equipment and is not intended to be a complete catalog of all possible emergency repairs. The repairs described here will serve as guidelines and will stimulate the experienced operator or mechanic to devise expedients as needed to rapidly repair equipment in a combat crisis.

1-3. APPLICATION.

a. The procedures in this manual are designed for battlefield environments and should be used in situations where standard maintenance procedures are impractical. These procedures are not meant to replace standard maintenance practices, but rather to supplement them strictly in a battlefield environment. Standard maintenance procedures will provide the most effective means of returning damaged equipment to ready status provided that adequate times replacement parts, and necessary tools are available. BDAR procedures are only authorized for use in an emergency situation in a battlefield environment, and only at the direction of the ccnunander.

b. BDAR techniques are not limited to simple restoration of minimum functional combat capability. If full functional capability can be restored expediently with a limited expenditure of time and assets this should be done.

1-3. APPLICATION - CONT.

c. Some of the special techniques in this manual, if applied, may result in shortened life or damage to components of defensive chemical equipment. The commander must decide whether the risk of having one less item available for use outweighs the risk of applying the potentially destructive expedient repair technique. Each technique gives appropriate warnings and cautions, and lists systems limitations caused by this action.

1-4. DEFINITIONS.

a. Battlefield Damage. The term battlefield damage includes all Incidents, such as combat damage, random failures, operator errors, accidents, and wear-out failures which occur on the battlefield and which prevent defensive chemical equipment from accomplishing its mission.

b. Repair or Fix. Repair or fix in this manual includes any expedient action that returns a damaged part or assembly to a full or an acceptably degraded operating condition, including:

(1) Short cuts in parts removal or installation.

(2) Installation of components from other items that can be modified to fit or interchange with components on the unit.

(3) Repair using parts that serve a non-critical function elsewhere on the unit for the purpose of restoring a critical function.

(4) Bypassing of non-critical components in order to restore basic functional capability.

(5) Expeditious cannibalization procedures.

(6) Fabrication of parts from kits or readily available materials.

(7) Jury-rigging.

(8) Use of substitute fuels, fluids, or lubricants.

c. Damage Assessment. Damage assessment is a procedure to rapidly determine what is damaged, whether it is repairable, what assets are required to make the repair, who can do the repair (i.e. crew, maintenance team (MT), or maintenance support team (MST)), and where the repair should be made. The assessment procedure includes the following steps:

(1) Determine if the repair can be deferred, or if it must be done.

(2) Isolate the damaged areas and components.

(3) Determine which components must be fixed.

(4) Prescribe fixes.

(5) Determine if parts or components, materials, and tools are available.

1-4. . DEFINITIONS - CONT.

(6) Estimate the manpower and skill required.

(7) Estimate the total time (clock-hours) required to make the repair.

(8) Establish the priority of the fixes.

(9) Decide where the fix shall be performed.

(10) Decide if recovery is necessary and to what location.

d. Maintenance Team. A Maintenance Team (MT) consists of unit mechanics, who may be trained in assessing battle damage and field repair procedures. MT is called to out-of-action equipment to supplement (or confirm) the crew's original damage assessment. MT assessment determines if field repairs will be conducted or if recovery is required. Depending on available time, the MT will assist the crew in restoring the equipment to mission capability.

e. Maintenance Support Team. A Maintenance Support Team (MST) consists of direct support/general support mechanics and technical specialists, who are trained in assessing battle damage in addition to their speciality. The MST is called by the MT when equipment damage exceeds MT assessment capability or organizational repair capability.

f. MT/MST Assessor. A MT/MST assessor is a senior member of the forward MT/MST This person is a systems mechanic/technician trained in BDAR techniques. This person must know:

(1) The unit's mission and the commander^{s} requirements.

(2) The maintenance capability of the unit, including the available skills, tools, repair parts, and materials.

(3) How to detect contamination and effect decontamination of equipment.

(4) The unit's maintenance workload.

(5) The maintenance capability of all accessible rally and maintenance collection points.

g. Fully Mission Capable. Fully Mission Capable (FMC) means that the equipment can perform all its combat missions without endangering the life of the crew. To be FMC the equipment must be complete and fully operable with no faults listed in the "Equipment is not ready/available if" column of the operator's Preventive Maintenance Checks and Services (PMCS).

h. Combat Capable. Combat capable means that the equipment meets the minimum functional combat capability requirements. (See paragraph 1-10.)

i. Combat Emergency Capable. Combat emergency capable means that the equipment meets the needs for specific tactical missions; however, not all systems are functional. Also, additional damage due to the nature of an expedient repair may occur to the equipment if it is used. The commander must decide if these limitations are acceptable for that specific emergency situation.

1-4. DEFINITIONS - CONT.

j. Cannibalization. Cannibalization as used in this TM means any use of repair parts or components obtained from other equipment either damaged or of lower priority to the immediate mission. In this TM, the term is used to include controlled exchange.

1-5. BDAR RECOMMENDATIONS AND QDR/EIR.

a. Personnel originating new BDAR procedures should forward them directly to Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAR-E (A), Aberdeen Proving Ground, MD 21010-5423. Personnel are encouraged to develop and report new BDAR ideas, techniques and procedures.

b. Equipment Improvement Recommendations (EIR) may be submitted by anyone who knows of an unsatisfactory condition with equipment design or use. You do not have to show a new design or list a better way to do a procedure, just tell why the design is unfavorable or why a procedure is difficult. EIR may be submitted on SF 368, Quality Deficiency Report. Mail these directly to Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAR-E (A), Aberdeen Proving Ground, MD 21010-5423. A reply will be sent directly to you.

SECTION II. BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR - STANDARDS AND PRACTICES

1-6. BDAR CHARACTERISTICS.

BDAR capability requires simplicity, speed, and effectiveness. Some BDAR procedures include repair techniques that violate standard peacetime maintenance practices. In a combat emergency situation, greater risks are necessary and acceptable.

1-7. TRAINING.

The unit commander should ensure that an adequate number of members of his organization, including supervisors, are trained in BDAR procedures applicable to his equipment. Each crewman should be trained to perform initial battle damage assessment for his crew position.

1-8. WAIVER OF PRECAUTIONS.

Under combat conditions, BDAR may be performed on chemical equipment which is fueled and/or armed. Other similar precautions may be waived at the discretion of the commander.

1-9. ENVIRONMENT.

BDAR may be required in a chemically toxic environment or under other adverse conditions with severe limitations in personnel, facilities, equipment, and materials. Performance of repair tasks may be necessary while wearing protective gear. Expedient decontamination procedures are described in FM 3-5.

1-10. SERVICEABILITY AND OPERABILITY (OPERATING CHARACTERISTICS).

The Minimum Functional Combat Capability (MFCC) criteria for defensive chemical equipment are as follows:

a. Collective protective equipment reference shall be made to each item.

b. Decontamination equipment reference shall be made to each item.

c. Detection and alarms reference shall be made to each item.

d. Individual protection equipment reference shall be made to each item.

e. Smoke generation equipment reference shall be made to each item.

1-11. PERMANENT REPAIR.

Upon completion of the mission, or at the next practicable opportunity, the equipment will be recovered or evacuated to the appropriate maintenance facility for permanent standard repair as required.

SECTION III. BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR - TASKS AND RESPONSIBILITIES

1-12. GENERAL.

a. Battlefield damage assessment and repair procedures are applicable at all levels from crew through general support maintenance depending on the extent of the damage, the time available, the skills required, and the parts, components, tools, and materials available. Within these limits, each maintenance level will rapidly take whatever action is necessary and possible to restore the equipment to the combat ready condition required for continuation of the mission.

b. Battlefield damage repair kits consisting of essential tools, may be carried by each unit to enable the crew to rapidly fix the simplest and most common types of damage/failure.

1-13. COMMANDER AND CREW.

a. The crew of the damaged equipment will make the first assessment immediately after damage has occurred. Crew members will provide the commander with an initial damage assessment which will include notice of system failure and all major systems visibly damaged, inoperative, or impaired. If possible all systems will be checked at the same time by different crew members. If the failure is due to hostile fire, the report will include the location of impact and the manning status. Immediacy of the report is more important than how long it will take to get back into action. The initial report, therefore, may omit repair time estimates. The commander must make an initial out-of-action report to the executive officers post including these essentials:

(1) Equipment damaged (out-of-action or impaired).

(2) Location of equipment.

1-13. COMMANDER AND CREW - CONT.

(3) Serviceable status.

(4) Mobility status.

(5) Manning status.

(6) Current and anticipated enemy action.

b. If communication capability is damaged, the commander should approach the nearest friendly radio and make his report.

c. In the forward battle area it is imperative that the crew attempt to move the equipment to a covered or concealed position to prevent additional combat damage, This is the first priority.

d. Battlefield Damage Assessment Procedures are provided in Chapter 2 to permit a systematic assessment by crew. Assessment checks include looking at the damaged parts, determining what system they belong to, and deciding how they can be fixed or jury-rigged to permit immediate operation (full or partial).

e. A safety check should be made for any obvious hazards.

f. A functional/operational test should be performed next on those systems which appear undamaged. For systems with a built-in self-test feature, this will be done. Only those systems found to be damaged or inoperative, shall be identified.

g. The commander shall report the results of the crew’s damage assessment to the executive officer's post, naming the major known causes of the inoperability of the equipment. If repair by crew is possible, he shall report a total estimated repair time and what functions may be restored.

h. The executive officer’s post will respond with directives and, if required, will call a MT to the location of the damaged equipment for assistance. If possible, sufficient information will be provided to enable the MT to bring any needed repair parts or special tools.

i. The crew shall proceed to make any possible field expedient repairs to restore the equipment to the limit of their skills, materials, and tools available.

1-14. UNIT MAINTENANCE TEAMS (MT).

a. The unit maintenance team (MT) and assessor operate out of the company-sized unit of battalion trains. The MT assessor performs his assessment and the maintenance team completes repairs if possible at the damage site. If the site is within direct fire or under enemy observation, movement to a more secure site in defilade may be necessary. This is still considered "on-site".

b. If the equipment has been left unattended in the forward battle area, the immediate area of the equipment should be checked for mines and the equipment should be checked for booby traps before starting the battle damage assessment.

1-14. UNIT MAINTENANCE TEAMS (MT) - CONT.

c. The MT assessment will be more thorough than the crew's, using unit maintenance support tools and equipment as needed. MT assessment includes:

(1) Reviewing the crew’s out-of-action report, if available.

(2) Interviewing commander and crew, if available.

(3) Visually inspecting damaged parts and systems.

(4) Performing a self-test.

(5) Making tests with organizational test equipment, if required.

(6) Performing additional equipment operational tests, as necessary.

d. Using this information and following the steps of paragraph 1-4c, the MT will:

(1) Determine what must be repaired or replaced.

(2) Determine sequence and priority of repair actions.

(3) Estimate repair times for each repair task.

(4) Total the repair task times and determine if the repairs can be performed in the time available.

(5) Determine repair location and, if other than on-site, arrange for recovery of the equipment to the repair site.

e. If all critical repairs can be made within the available time with the skills, materials, tools, and equipment at hand, the MT, assisted by the crew, will proceed with the on-site repair.

f. If the damage exceeds the repair capability of the MT, and time is available for an MST on-site fix, the MST shall be called.

g. If time for an MST on-site fix is not available, but the equipment is repairable, the MT shall provide for recovery of the vehicle to a designated collection point.

h. If the equipment is not repairable, the MT shall provide for one of the following:

(1) Recovery to a maintenance collection point for evacuation to the rear.

(2) On-site stripping (if approved by Commander, coordinated with support maintenance).

(3) Abandonment/destruction (if directed by commander).

1-14. UNIT MAINTENANCE TEAMS (MT) - CONT.

i. Some equipment should never be abandoned if recovery/evacuation is possible because some equipment can almost always be rebuilt, no matter how badly damaged. If the equipment is damaged catastrophically and evacuation is not possible, remove items in the following order:

(1) Needed spares on-site.

(2) Sensitive, high value, limited size items.

(3) Other needed spares or repair parts.

j. If the equipment is contaminated, the MT shall mark the equipment with contamination markers and arrange for recovery to a decontamination site.

1-15. DIRECT SUPPORT/GENERAL MAINTENANCE SUPPORT TEAM (MST).

a. The MST shall assist the MT as needed, using direct support maintenance tools and equipment. MST assessment and repair procedures are the same as those of the MT except at a higher level. If possible, the MT will tell the MST what tools and spare parts are needed to perform the repairs. While waiting for the MST to arrive, the crew, under the supervision of the MT, will open up the equipment and make it ready for the MST to perform the BDAR when it arrives.

b. Damaged equipment removed to designated repair sites shall be selected for repair by the MST in order of:

(1) Most essential to the completion of the mission.

(2) Can be repaired in the least amount of time.

1-16. TIME LIMITS FOR REPAIRING DAMAGE.

a. In combat, the time available for BDAR is limited. One of the factors to be considered in the selection of a repair site is the amount of time available at the site based on the tactical situation. The assessment includes an estimate of total elapsed time for all tasks required to restore the equipment. The time available at the selected repair site must equal or exceed the estimated time required to accomplish all tasks associated with the BDAR.

b. Determining where BDAR will take place should be based on the guidelines in Table 1-1. These are general rules which must be adjusted by the commander based on his best estimate of how the most responsive maintenance support can be provided. He must consider the tactical situation, maintenance backlog, personnel, tools, TMDE, and repair parts available. The guidelines are based on a defensive scenario and can be extended when applied to the offense.

1-16. TIME LIMITS FOR REPAIRING DAMAGE - CONT.

Table 1-1. Summary of BDAR Time Guidelines

Location	Elements performing BDAR	Time guidelines
Breakdown Site	1. Operator/Crew 2. Battalion Maintenance Team (MT) 3. Maintenance Support Team (MST) from Forward Support Maintenance Company	2 hours
Battalion Trains Organizational Maintenance Command Post (OMCP)	1. Battalion Maintenance Platoon 2. Maintenance Support Team (MST) from Forward Support Maintenance Company 3. Maintenance Support Team (MST) from Maintenance Battalion	6 hours
Brigade Support Area	1. Forward Support Maintenance Co. 2. Maintenance Support Team (MST) from Maintenance Battalion 3. Maintenance Support Team (MST) from Combat Support Command (COSCOM)	24 hours
Division Support Area	1. Maintenance Battalion 2. Maintenance Support Team (MST) from COSCOM	36 hours
Corps Support	1. COSCOM Maintenance Companies	96 hours

1-17. RECORDING BDAR REPAIRS.

a. All equipment parts, which are repaired using BDAR or other expedient techniques, shall be marked with a tag, DD Form 1577, or similar conspicuous tag. It is not necessary to fill out the form. The purpose of marking an item which has been repaired using BDAR techniques is to quickly enable mechanics to recognize these parts when the equipment is subsequently returned for authorized permanent repair.

b. Since it is impractical to attach tags to expediently repaired components located on the outside of the equipment, the fix shall be noted on DD Form 1577 or similar tag, and the tags stored in the compartment normally reserved for the equipment log book.

c. A tag should also be placed conspicuously on the equipment when a BDAR procedure has resulted in a degraded operating capability. This tag should be marked "BDAR" and noted with its specific limitations or cautions.

d. When a component is cannibalized from a repairable piece of equipment, a tag should be attached in the space created by the missing part to alert downstream repair personnel quickly that the part has been removed.

1-17. RECORDING BDAR REPAIRS - CONT.

e. When the equipment is recovered/evacuated for permanent standard repair, and DA Forms 2404 and 2407 are used, the notation “BDAR” shall be added in the space provided for description of deficiencies.

f. DA PAM 738-750 provides for disposition of DA Form 2404 and copy number 3 of DA Form 2407. When “BDAR” is noted on these forms, they shall be mailed to: Survivability/Vulnerability Information Analysis Center, FIES/SURVIAC, Wright Patterson AFB, OH 45433. The information on these forms will provide data for designing equipment to be less susceptible to combat damage and easier to repair when damaged.

CHAPTER 2

ASSESSING BATTLEFIELD DAMAGE

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

2-1. SCOPE .

This chapter provides guidelines to use to assess battlefield damage to defensive chemical equipment. It directs you to an expedient repair procedure, or to the standard system TM if an expedient repair procedure for your problem doesn't exist.

2-2. GENERAL .

Use this TM in conjunction with the equipment's Technical Manuals (TM). This chapter explains how to use this manual to assess and fix battlefield damage that prevents the equipment from functioning. This chapter contains the general fault assessment tables, general troubleshooting, and maintenance instructions including battlefield damage assessment/repair forms. General fault assessment tables, specific fault assessment tables, and detailed assessment procedures are used to locate the damage; and an expedient repair procedure tells how to fix the damage. An index of the expedient repair procedures is located in each chapter. If you don't know or aren't sure exactly what your problem is, you should use the assessment tables and procedures to find the fault.

2-3. APPLICATION.

Use the following steps to find and fix battlefield damages:

a. Do the Preventive Maintenance Checks and Services (PMCS) in the TM. At the same time look for obvious damage to the equipment.

b. If applicable, do the troubleshooting/repair recommended in the TM.

c. If you find the problem, determine its effect on the operation of the item.

d. If you can't fix the problem using the PMCS's and procedures in the standard TM, use the assessment tables to assess and fix the problem.

e. If the problem does not affect equipment operation, the commander will decide whether to attempt to fix the problem or continue with the mission.

f. If the damage does affect equipment operation, do one of the following:

(1) Replace the bad part/assembly with a good one (from supply or other source).

2-3. APPLICATION - CONT.

(2) Replace the bad part/assembly with a substitute, if one exists.

(3) Use the expedient repair procedures in this manual to repair the damage.

SECTION II. GENERAL FAULT ASSESSMENT TABLES

2-4. GENERAL.

a. This section provides an overall damage assessment procedure to evaluate the functional capability of defensive chemical equipment.

b. The assessment procedures are designed to ensure that all necessary aspects of defensive chemical equipment capability are evaluated during the assessment process. The procedures refer you to:

(1) procedures in this manual if a “quick-fix” is possible,

(2) the standard TM if the best repair is covered in the system TM, or

(3) a higher maintenance level if access to devices or materials to do the quick-fix are available only at those levels.

c. Each procedure:

(1) contains general information about the problem.

(2) lists materials and/or tools required other than those commonly available to the crew, MT, and MST (If the listed items are not available, improvise. Anything that will do the job is acceptable.)

(3) lists the estimated number of soldiers needed and the estimated time required to complete the repair,

(4) states the operational limitations caused by the repair action before experiencing further damage/degradation to the equipment,

(5) provides other expedient options you can use depending on the availability of personnel, materials, tools, and/or time. (This does not include standard maintenance procedures *or* recovery.)

d. Following each assessment procedure is an index of the procedures contained in that chapter. If you know exactly what your problem is, you can use the index to find the proper expedient repair procedure.

e. Additional data is contained in the appendices.

(1) Appendix A lists publications referenced in TM text.

(2) Appendix B lists special or fabricated tools used in performing BDAR repairs.

2-4. GENERAL - CONT.

(3) Appendix C contains lists of expendable/durable supplies and materials that are available for BDAR fixes.

(4) Appendix D lists substitute materials/parts that maybe used for BDAR fixes.

2-5. ASSESSMENT PROCESS.

a. The assessment procedures are structured using the assessment logic example shown in figure 2-1 below.

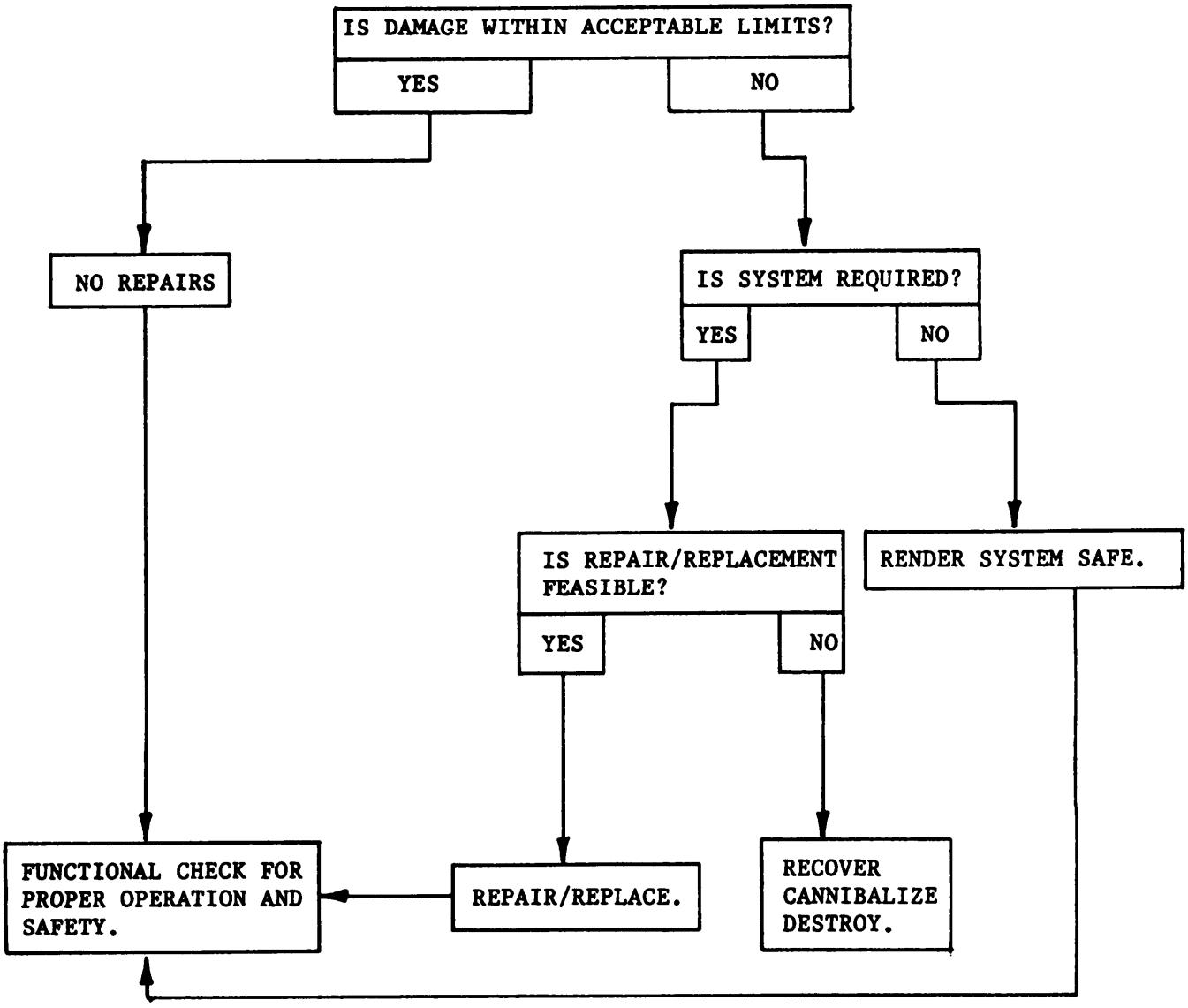


Figure 2-1. Assessment Logic Example

2-5. ASSESSMENT PROCESS - CONT.

b. All assessment procedures follow the sequence:

(1) visually inspect (repair, if necessary),

(2) functionally test (repair, if necessary) and,

(3) assess the performance.

The field fixes will enable the crew to continue operations in some cases, but will usually be most useful to the MT/MST for scheduling and accomplishing fix-forward repairs and assessing combat capabilities for reporting to commanders.

c. There are three kinds of assessments performed on damaged equipment.

(1) The first assessment is extent and kind of damage and how it affects equipment operation and capabilities.

(2) The second is whether the damage needs to be repaired.

(3) The third is assessment of where and how to repair the damage.

d. Assessments of damage may be made in turn by operator/crew, MT, and MST assessors.

(1) Extent and kind of damage is readily assessable.

(2) Whether or not *to* repair the damage may be readily assessable. However, whether to attempt repair and when and how to repair the damage may be judgment calls. No procedure can take all possible situations into account. Assessment of whether the damage needs to be repaired will be made jointly by the MT and the commander as they evaluate the equipment for further operation or recovery.

(3) Assessment of where and how to repair the damage will be made by the MT usually with some suggestions by crew/operator. MST's may redirect or change MT's decisions.

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES.

a. This procedure can be used by the crew, but it will be of more use to an MT or MST assessor working to "quick-fix" equipment for a mission. The procedure provides for assessing the kind of damage and determining:

(1) the effect of the damage and if it needs to be fixed,

(2) if the damage can be fixed using BDAR or if only regular maintenance operations can fix it, and

(3) how long it will take to fix it.

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

b. This is accomplished by structuring this manual In rank order, from the equipment function overview down to the specific. Each major function and each subsystem that makes up a part of providing that function, has a stand-alone assessment procedure to make it easier to quantify each significant problem encountered in battlefield damaged equipment.

c. As an example, a M12A1 Decontaminating Apparatus develops an engine fuel control problem. The overall assessment table directs the user to perform a number of visual and functional checks, which will narrow down the number of areas possible at fault. The overall assessment table provides references to chapter and/or sections dealing with a subsystem in which the problem may be found. Additional assessment procedures in that chapter will either eliminate further assessment in that area or confirm the likelihood of a problem in that area by directing the user to check out specific assemblies or components. Assessment procedures in the beginning of each chapter provide references to specific paragraphs which may expediently solve the problem.

d. At any point on each of the assessment levels, the assessor can abort the procedure and initiate other actions if the tactical situation dictates.

e. Refer to table 2-1, Chemical Equipment Assessment, to begin the assessment process.

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment.

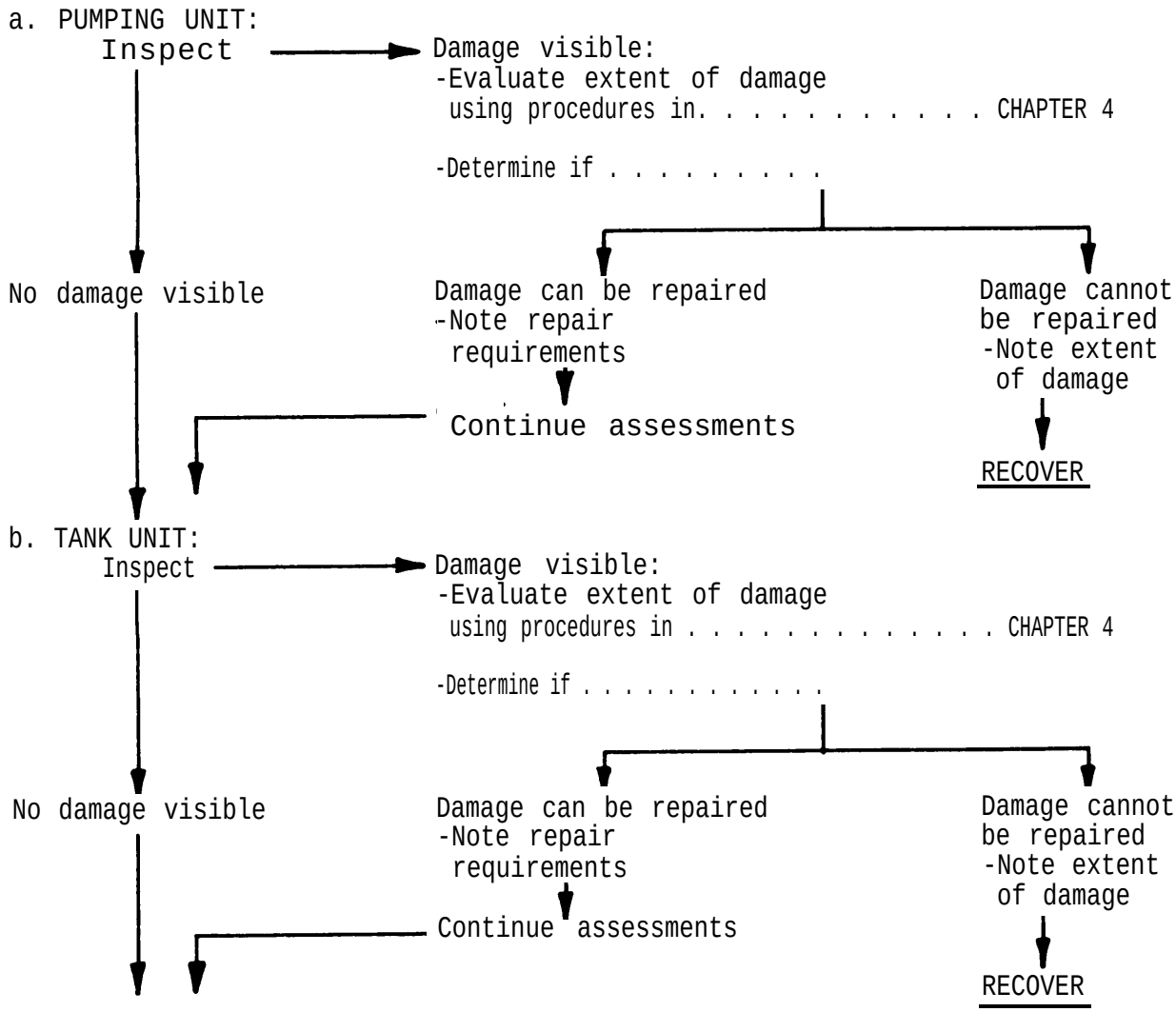
ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE

NOTE

Items checked in this procedure must work to provide minimum functional combat capability. Even if all systems work the item may be unsafe and may not satisfy normal required operating capabilities or may not receive mission-essential maintenance.

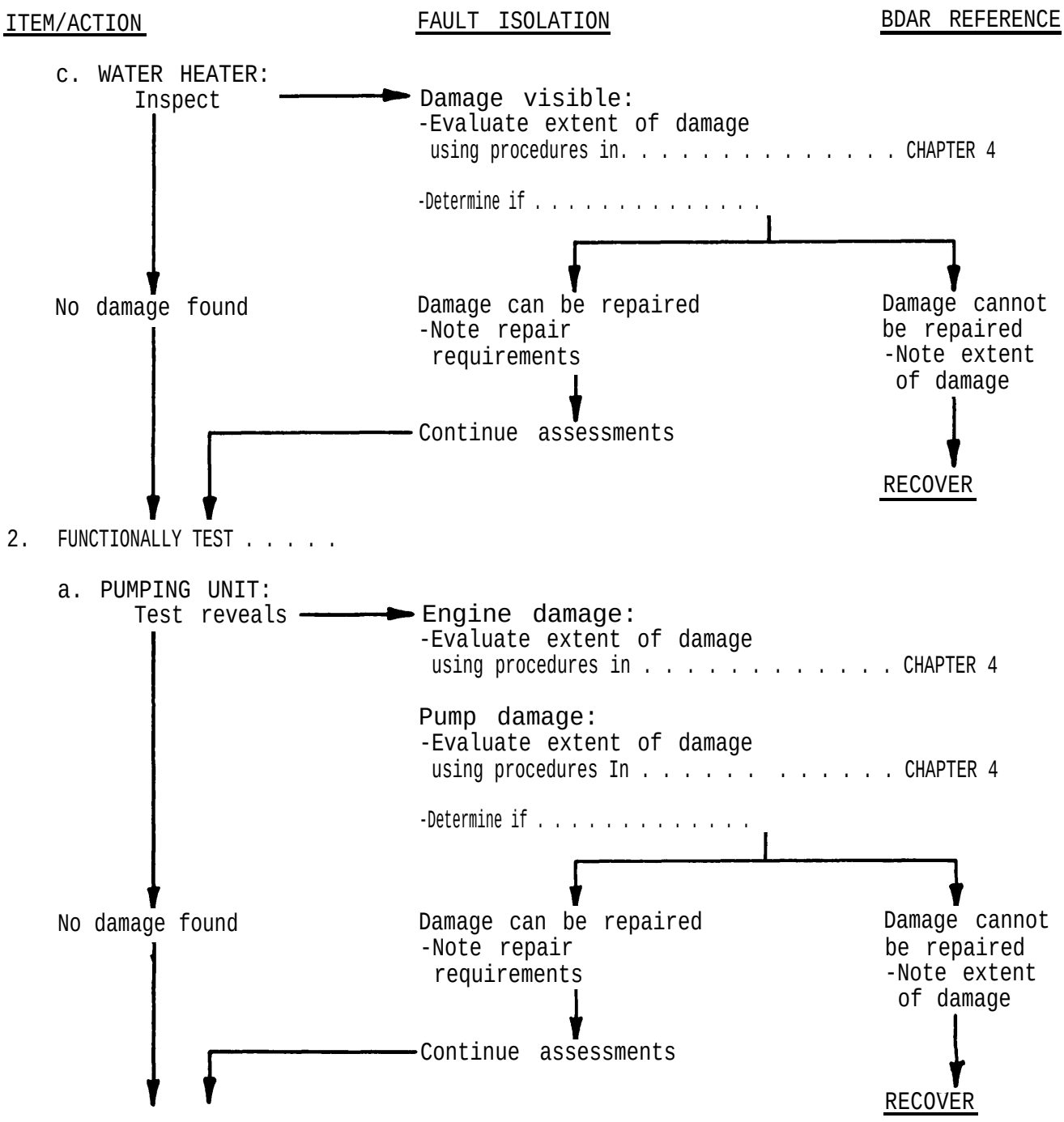
A. M12A1 Decontaminating Apparatus Assessment.

1. VISUALLY INSPECT . . . . . .



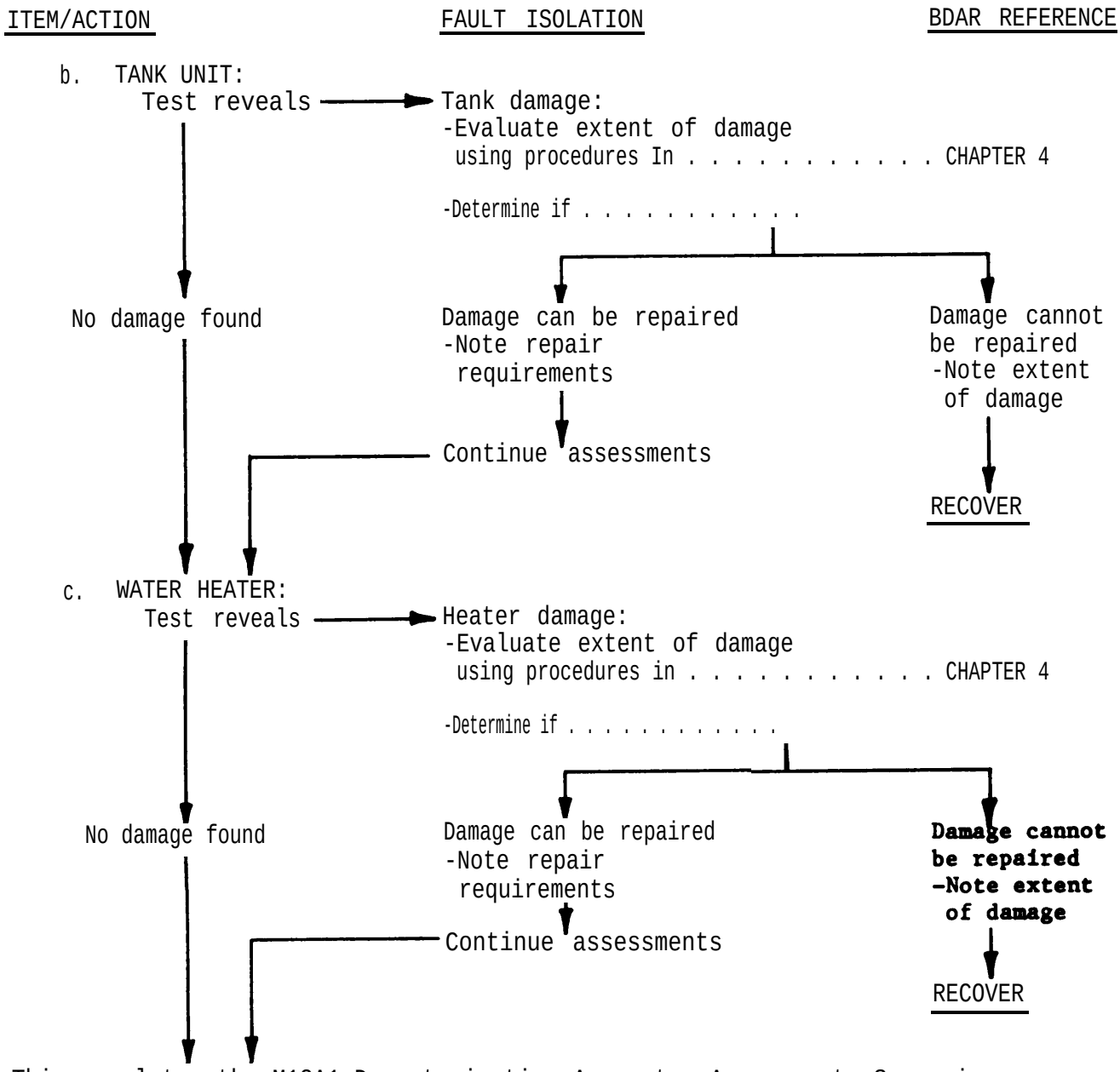
2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.



2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.



This completes the M12A1 Decontaminating Apparatus Assessment. Summarize assessment findings and prepare to report assessment findings to Commander for status/disposition determination.

B. ABC-M11 Decontaminating Apparatus Assessment.

Refer to chapter 5 for the assessment procedure.

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
C. TYPE A/E32U-8 Decontaminating Apparatus Assessment.		
1. VISUALLY INSPECT		
a. ENGINE:		
Inspect →	Damage visible: -Evaluate extent of damage using procedures in . . . . . CHAPTER 6 -Determine if	
No damage visible	Damage can be repaired -Note repair requirements Continue assessments	Damage cannot be repaired -Note extent of damage RECOVER
b. HEAT EXCHANGER:		
Inspect →	Damage visible: -Evaluate extent of damage using procedures in . . . . . CHAPTER 6 -Determine if	
No damage visible	Damage can be repaired -Note repair requirements Continue assessments	Damage cannot be repaired -Note extent of damage RECOVER

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
2. FUNCTIONALLY TEST		
a. ENGINE:		
Test reveals →	Engine damage: -Evaluate extent of damage using procedures in. . . . . CHAPTER 6 -Determine if	
No damage found	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER
b. HEAT EXCHANGER:		
Test reveals →	Heat exchanger: -Evaluate extent of damage using procedures in . . . . . CHAPTER 6 -Determine if	
No damage found	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER

This completes the TYPE A/E32U-8 Decontaminating Apparatus Assessment. Summarize assessment findings and prepare to report assessment findings to Commander for status/disposition determination.

D. M13 Decontaminating Apparatus Assessment.

Refer to chaper 7 for the assessment procedure.

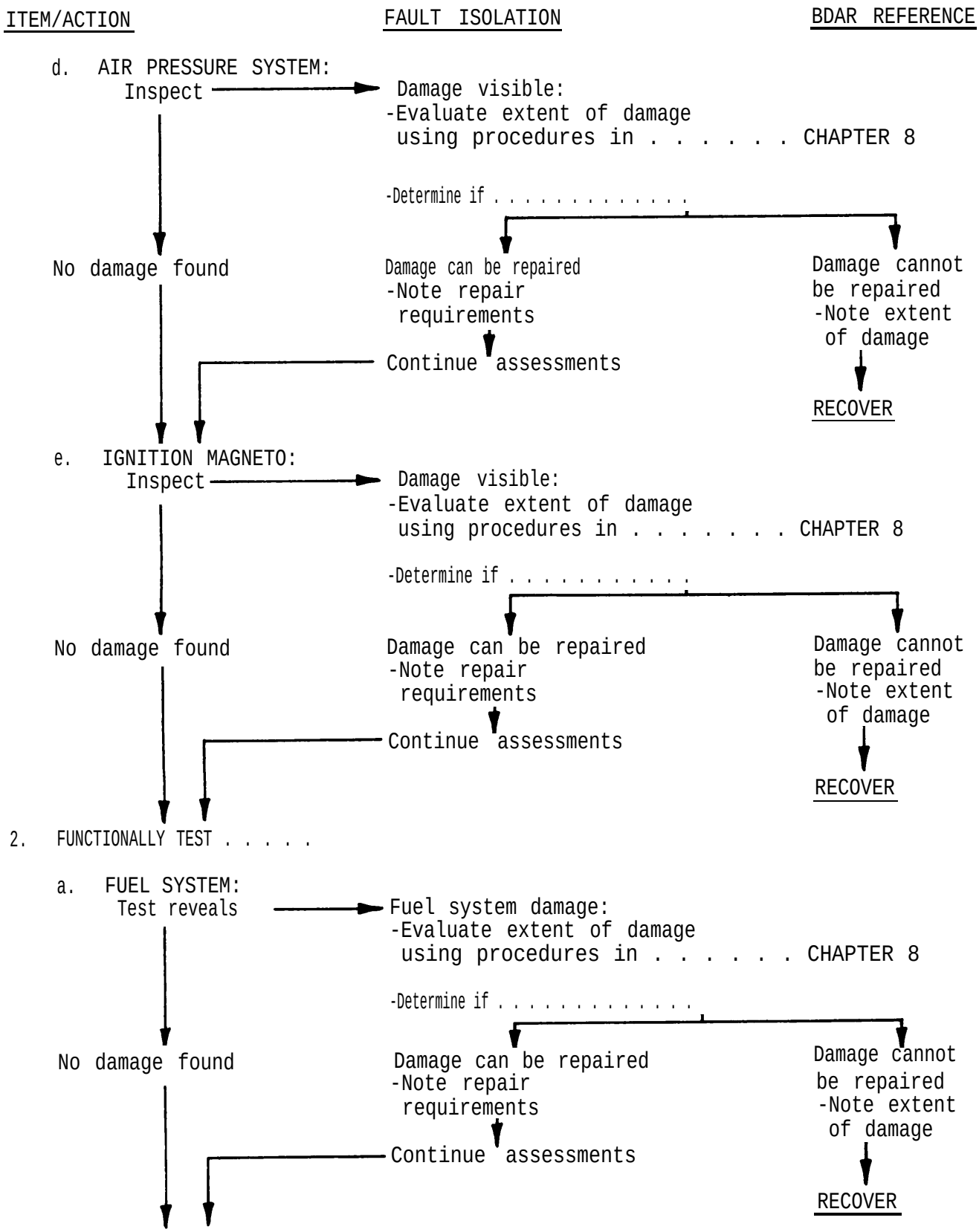
2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
E. M3A4 Smoke Generator Assessment.		
1. VISUALLY INSPECT		
a. FUEL SYSTEM: Inspect	Damage visible: -Evaluate extent of damage using procedures in . . . . . CHAPTER 8 -Determine if	
No damage visible	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER
b. INDICATOR SYSTEM: Inspect	Damage visible: -Evaluate extent of damage using procedures in, ... CHAPTER 8 -Determine if	
No damage visible	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER
c. FOG OIL SYSTEM: Inspect	Damage visible: -Evaluate extent of damage using procedures in . . . . . CHAPTER 8 -Determine if	
No damage visible	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER

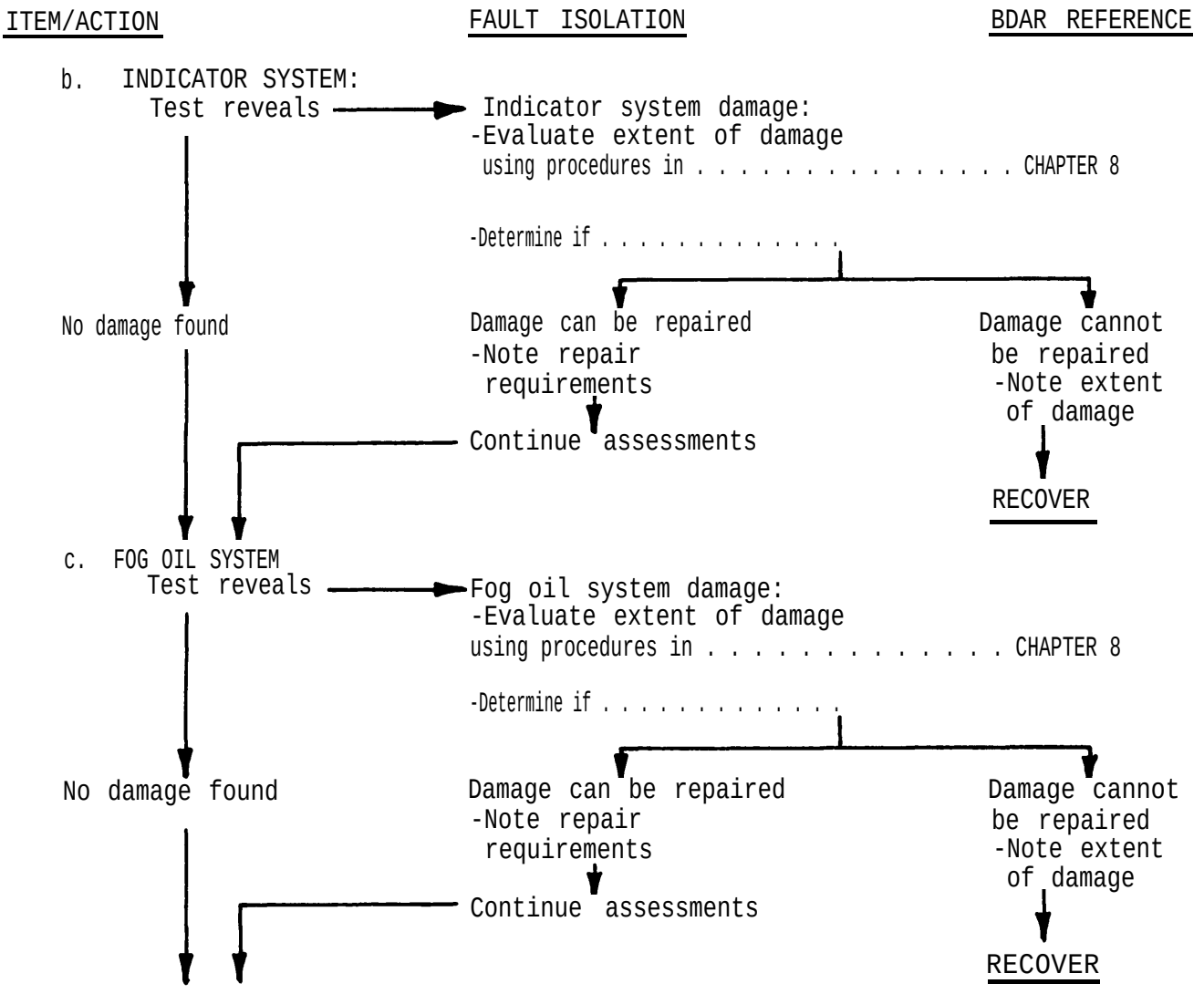
2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.



2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.



2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
d. AIR PRESSURE SYSTEM: Test reveals	Air pressure system damage: -Evaluate extent of damage using procedures in . . . . . CHAPTER 8 -Determine if	
No damage found	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER
e. IGNITION MAGNETO: Test reveals	Ignition magneto damage: -Evaluate extent of damage using procedures in. . . . .CHAPTER 8 -Determine if	
No damage found	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER

This completes the M3A4 Smoke Generator Assessment. Summarize assessment findings and prepare to report assessment findings to Commander for status/disposition determination.

F. Gas-Particulate Filter Units Assessment.

Refer to chapter 9 for the assessment procedure.

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
G. M51 Shelter System Assessment.		
1. VISUALLY INSPECT		
a. ENGINE :		
Inspect →	Damage visible: -Evaluate extent of damage using procedures in	CHAPTER 10
	-Determine if	
No damage visible	Damage can be repaired -Note repair requirements → Continue assessments	
	Damage cannot be repaired -Note extent of damage →	RECOVER
b. SHELTER SYSTEM:		
Inspect →	Damage visible: -Evaluate extent of damage using procedures in	CHAPTER 10
	-Determine if	
No damage visible	Damage can be repaired -Note repair requirements → Continue assessments	
	Damage cannot be repaired -Note extent of damage →	RECOVER

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES - CONT.

Table 2-1. Chemical Equipment Assessment - Cont.

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
2. FUNCTIONALLY TEST		
a. ENGINE UNIT: Test reveals →	Electrical system damage: –Evaluate extent of damage using procedures In	CHAPTER 10
	Fuel system damage: -Evaluate extent of damage using procedures In.	CHAPTER 8
	-Determine if	
No damage found	Damage can be repaired -Note repair requirements → Continue assessments	Damaged cannot be repaired -Note extent of damage → RECOVER
b. SHELTER: Test reveals →	Electrical system damage: -Evaluate extent of damage using procedures in.....	CHAPTER 10
	Pressurization system damage: -Evaluate extent of damage using procedures in	CHAPTER 10
	Environmental control system damage: -Evaluate extent of damage using procedures in.	CHAPTER 10
	-Determine if	
No damage found	Damage can be repaired -Note repair requirements → Continue assessments	Damage cannot be repaired -Note extent of damage → RECOVER

This completes the M51 Shelter Syster Assessment. Summarize assessment findings and prepare to report assessment findings to Commander for status/disposition determination.

2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES (CONT)

Table 2-1. Chemical Equipment Assessment (Cont)

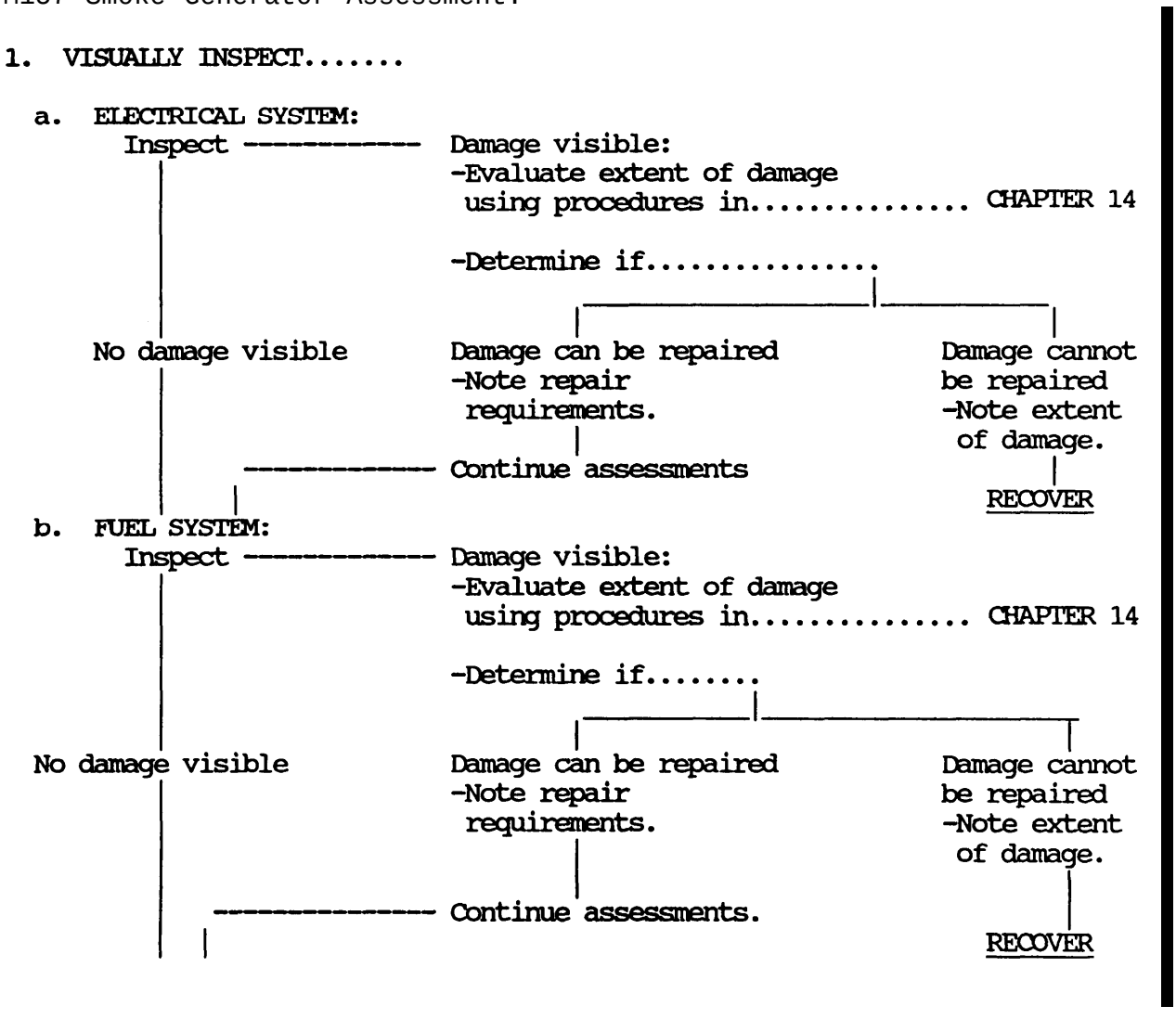
ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE

H. Mask Hood Assessment. Refer to Chapter ll for the assessment procedure.

I. Chemical-Biological Protective Mask Assessment. Refer to Chapter 12 for the assessment procedure.

J. Chemical Agent Alarm Assessment. Refer to Chapter 13 for the assessment. procedure.

K.M157 Smoke Generator Assessment.



2-6. OVERALL EQUIPMENT ASSESSMENT PROCEDURES. (CONT)

Table 2-1. Chemical Equipment Assessment (Cont)

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
c. FOG OIL SYSTEM:		
Inspect	Damage Visible: -Evaluate extent of damage using procedures in	CHAPTER 14
	-Determine if.	
No damage visible	Damage can be repaired -Note repair reqirements	Damage cannot be repaired -Note extent of damage.
	Continue assessments.	RECOVER
2. FUNCTIONALLY TEST		
a. ELECTRICAL SYSTEM:		
Test reveals	Electrical damage: -Evaluate extent of damage using procedures in	CHAPTER 14
	-Determine if	
No damage found	Damage can be repaired -Note repair requirements.	Damage cannot be repaired -Nate extent of damage.
	Oontinue assessments	RECOVER
b. FUEL SYSTEM:		
Test reveals	Fuel system damage: -Evaluate extent of damage using procedure in	CHAPTER 14
	-Determine if.	
No damage found	Damage can be repaired -Note repair requirements	Damage cannot be repaired -Note extent of damage.
	Continue assessments.	RECOVER

2-6 OVERALL EQUIPMENT ASSESSMENT PROCEDURES. (CONT)

Table 2-1. Chemical Equipment Assessment (Cont)

ITEM/ACTION	FAULT ISOLATION	BDAR REFERENCE
c. FOG OIL SYSTEM:		
Test reveals	**Fog oil system damage:**	
	-Evaluate extent of damage using procedures in	**CHAPTER 14**
	-Determine if	
No damage found	**Damage can be repaired -Note repair requirements.**	**Damage cannot be repaired -Note extent of damage.**
	Continue assessments	**RECOVER**

This completes the M157 Smoke Generator Assessment. Summarize assessment findings and prepare to report assessment findings to Commander for status/ disposition determination.

CHAPTER 3

GENERAL REPAIR

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

3-1. SCOPE.

This chapter describes quick fix procedures for those items common to the chemical equipment.

3-2. ASSESSMENT PROCEDURE.

Visually inspect damaged components to determine the extent of damage and the repair required.

3-3. REPAIR PROCEDURE INDEX.

SECTION II. GASKETS

3-4. GENERAL.

Gaskets may become damaged, causing leakage from components. Procedures are available to make or repair gaskets if standard replacements are not available. Lift capability may be required to gain access to the gasket. Heat and pressure should be considered when selecting gasket materials.

3-5. GASKETS, LEAKING.

NOTE

Refer to paragraphs 3-6 and 3-7 for engine head gaskets and environmental gaskets.

General Information:

When some metal surfaces are bolted together, a compressible gasket is required to reduce or eliminate the leakage of fluids or lubricants. Gaskets are also used to

3-5. GASKETS, LEAKING - CONT.

seal systems against fuel leakage or keep contaminants from entering. Leaks can be tolerated if the fluid leaking does not constitute a fire hazard or does not leak at a rate which will deplete

Limitations:

• Frequent inspections required

Personnel/Time Required:

• 2 soldiers
• 1.0 hour

Materials/Tools:

• Gasket material such as leather, used gasket, cardboard, or similar material
• Antiseizing tape
• Gasket forming compound
• Adhesive sealant (Silicone)
• Gasket shellac

Other Options:

• Continue operation, refilling fluids as required.

Procedural Steps:

Option 1: Manufactured gasket.

1. Cut leather, cardboard, or other material to fit the mating surfaces.

   (a) Hold gasket against mating surface and mark an outline of the component, cut the material with a knife or shears.

   (b) Hold material against mating surface. Tap the gasket material with a ballpeen hammer along the edges of the mating surfaces to remove unwanted gasket material.

2. Coat the gasket with adhesive sealant (2, appx C) or gasket shellac.

3. Join components and bolt.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 2: Used gaskets.

1. Coat mating surface with adhesive sealant (2, appx C).

2. Place used gasket or sections of broken gasket onto mating surface.

3-5. GASKETS, LEAKING - CONT.

3. Coat other mating surface with adhesive sealant (2, appx C).

4. Join components and bolt.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 3: Gasket sealer.

1. Remove old gasket material and residue.

2. Coat mating surfaces with gasket forming compound (18, appx C).

3. Allow gasket forming compound to form a skin (5 to 10 minutes).

4. Join components and bolt.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

3-6. GASKETS, ENGINE.

General Information:

Engine cylinder head gaskets may seal both compression and fluid galleries. Leakages can be detected through:

a. lack of power,

b. rough, uneven engine operation,

c. abnormal pressure in crankcases

d. or contaminants in oil.

BDAR procedures are more difficult to perform on cylinder head gaskets but limited operation can be restored. Frequent checks must be made for leakage and temperature changes. Engine speeds should be reduced.

Limitations:

• Degraded mobility

Personnel/Time Required:

• 2 soldiers
• 3.0 hours

3-6. GASKETS, ENGINE - CONT.

Materials/Tools:

- Epoxy
- Copper wire
- Gasket forming compound
- Gasket shellac

Other Options:

- Continue operations, check temperature constantly.

Procedural Steps:

Option 1: Gasket sealer.

1. Remove cylinder head.

2. Locate leaking area.

3. Liberally coat leaking area with gasket forming compound (18, appx C).

4. Replace cylinder head, tighten mounting bolts or studs.

5. Check engine operation.

6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 2: Wire and sealer.

1. Remove cylinder head.

2. Remove gasket or O-rings.

3. Lay soft copper wire (42, appx C) around each cylinder bore and trim to eliminate any overlap.

4. Reinstall old gasket coated with gasket shellac (19, appx C), varnish, or paint.

5. Reinstall cylinder head, tighten mounting bolts or studs.

6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

3-7. GASKETS, ENVIRONMENTAL.

General Information:

Inspect for water or foreign matter in compartments or areas that should be sealed. Rubber weatherstripping from civilian vehicles or any rubber hose securely glued and sealed will stop leaks. Canvas or rubber inner tubes will also seal the system. These seals will prevent excessive water and air leaks but may not provide adequate Nuclear, Biological, Chemical (NBC) protection.

Limitations:

- There will be degraded NBC protection.

Personnel/Time Required:

- 1 soldier
- 1.0 hour

Materials/Tools:

- Rubber hose, rubber weatherstripping, inner tube, canvas tarp, poncho, or similar material
- Gasket shellac

Procedural Steps:

1. Locate leak, remove component or cover.
2. Remove defective gasket and clean the sealing surface.
3. Obtain material to fabricate sealing gasket.
4. Cut gasket to fit.
5. Apply available gasket shellac (19, appx C), follow instructions on container.
6. Place gasket in proper location.
7. Reinstall component or cover.
8. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using the standard maintenance procedures.

SECTION III. BELTS

3-8. GENERAL .

V-belts provide direct drive and can be substituted or replaced if the basic factors about each belt is considered. Substitute belts must be wide enough to prevent bottoming in the pulley “V” and of the correct length to maintain tension. Inspect width and length of the belt. Smaller, narrower belts may be substituted or V-belts may be taken from one item and used on another item if there are twin belt drives.

3-9. V-BELTS.

General Information:

Some chemical equipment subsystems are driven by V-belts. The alternator is also belt driven. Worn or frayed V-belts can slip or break causing the system to fail.

Limitations:

- Degraded mobility
- Frequent adjustment may be required

Personnel/Time Required:

- 1 soldier
- 1.0 hour

Materials/Tools:

- Adjustable link V-belts
- Rope
- Wire

Procedural Steps:

Option 1: Wire or rope.

1. Rope or wire can also be used but thin wire must be braided to ensure the needed friction is provided.

2. Assemble the rope (30, appx C) or wire as close as possible to the original length of the correct belt.

3. Adjust with the tensioner assembly.

4. Record the BDAR action taken. When the mission is completed, as soon as practical, repair the item using standard maintenance procedures.

Option 2: Separable - link belts.

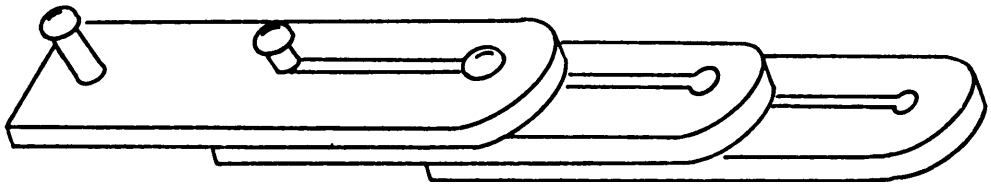
1. Separable-link belts (table 3-1) can be used, if available.

Table 3-1. Belting, V, Adjustable Link

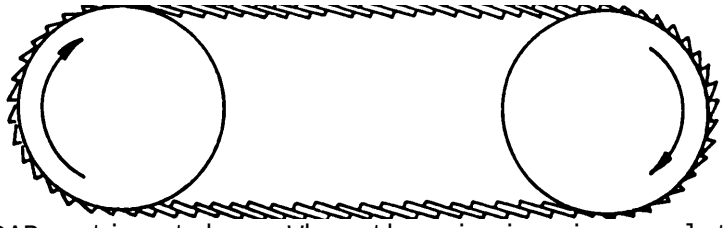
Size	NSN	u/i
l/2-in. W	3030-00-224-8358	FT
3/4-in. W	3030-00-233-9126	FT

2. Assemble the belting (3 or 4, appx C) as close as possible to the original length of the correct belt.

3-9. V-BELTS - CONT.



3. Install the belt as shown (this will prevent undue strain on the belt links) and adjust the belt tensioner.



4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

SECTION IV. HOUSINGS, CASTINGS, AND PLATES

3-10. GENERAL .

Housings, castings, or plates may be serviceable even with holes or cracks providing the internal structure is not significantly weakened. Internal structures such as crankshaft bearing journal webs are necessary to distribute loads within the casting. Some damage to these elements of the structure can be allowed, but fatigue failures from crack growth cannot be predicted, and service life will depend on the extent of damage.

3-11. HOUSINGS, CASTINGS, AND PLATES.

General Information:

Small cracks or holes may develop in a cylinder head, block, or housing, caused by vibrations, overheating, or explosive shocks. Cracks that do not harm the structural strength of a housing can be deferred, but cracks that allow coolant or oil to escape must be repaired. Large holes or cracks will require exchange of the component.

Limitations:

- Reduced mobility
- Frequent fluid level checks must be performed

Personnel/Time Required:

- 2 soldiers
- 2.0 hours

3-11. HOUSINGS, CASTINGS, AND PLATES - CONT.

Materials/Tools:

- Sandpaper
- Metal filled epoxy adhesive and sealing compound
- Plastic steel
- Metal plate
- Lifting capability

Procedural Steps:

Use of one of the following steps to repair a small crack or hole in housing:

Option 1: Repair of small crack.

1. Remove all paint from around the crack.

2. Cover the crack and l/4-inch or more of the surrounding area with metal filling epoxy adhesive and sealing compound (1, appx C).

3. Allow metal filled epoxy adhesive and sealing compound to harden before running an engine. Use heat (heat lamp) to speed up curing.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 2: Repair of small crack or hole.

1. Remove all paint from around the area where metal plate is to be positioned.

2. Cover the area with a plate from any available metal large enough to cover the crack or hole. Seal the edges of the plate with metal filled epoxy adhesive and sealing compound (1, appx C).

3. Allow metal filled epoxy adhesive and sealing compound to harden before running engine. Use heat (heat lamp) to speed up curing.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 3: Repair of a small crack or hole.

1. Clean damaged area.

2. Fill small crack or holes in low stress area with metal filled epoxy adhesive and sealing compound (1, appx C).

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

SECTION V. BRACKETS AND BRACES

3-12. GENERAL .

Brackets are used on all items to mount or store items. Brackets are mounted to the item by bolting or welding in place and are subject to damage through vibrations, impact, or explosive forces. Repairs must be made to restore the brackets needed for restoring essential functions.

3-13. BRACKETS AND BRACES.

General Information:

Mounting brackets or braces welded to the frame of a chemical equipment item sometimes may break due to vibrations or collision with obstacles. Bolted brackets should be remounted using bolts if possible, because their removal may be required to gain access to other components.

Limitations:

- None

Personnel/Time Required:

- 2 soldiers
- 1.0 hour

Materials/Tools:

- Welding equipment
- File
- Elastic cords
- Wire or rope
- BII tiedown straps

3-13. BRACKETS AND BRACES - CONT.

Procedural Steps:

Option 1.

1. If bracket or brace is broken off at the base metal, with any mounting holes unaffected, reweld in place. Mounting holes may be elongated to compensate for mis-alignment for attaching items.

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 2.

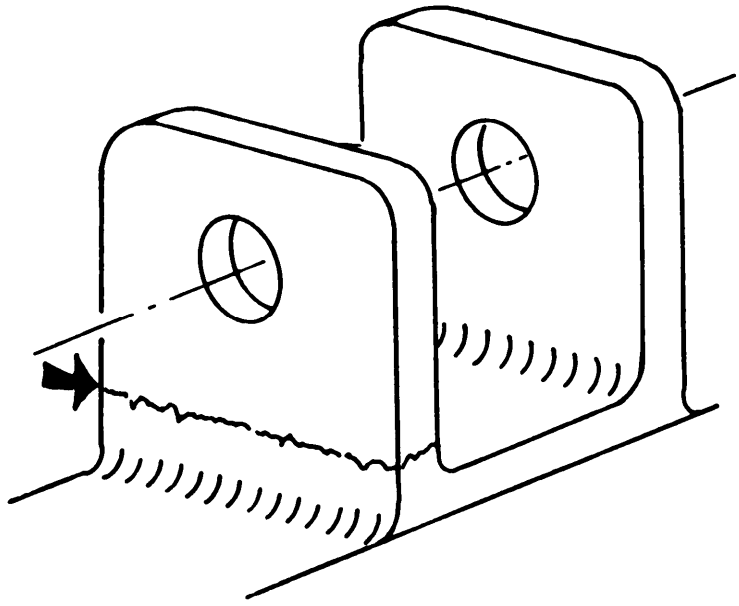
1. If the bracket mounting holes cannot be used because of stripped threads or broken bolts cannot be removed, weld the bracket to the location.

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.

Option 3.

1. If brackets cannot be welded or bolted, tie the component in place using rope (30, appx C), common wire, elastic cords, or BII tiedown straps.

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the item using standard maintenance procedures.



CHAPTER 4

M12A1 DECONTAMINATING APPARATUS

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION 1. INTRODUCTION

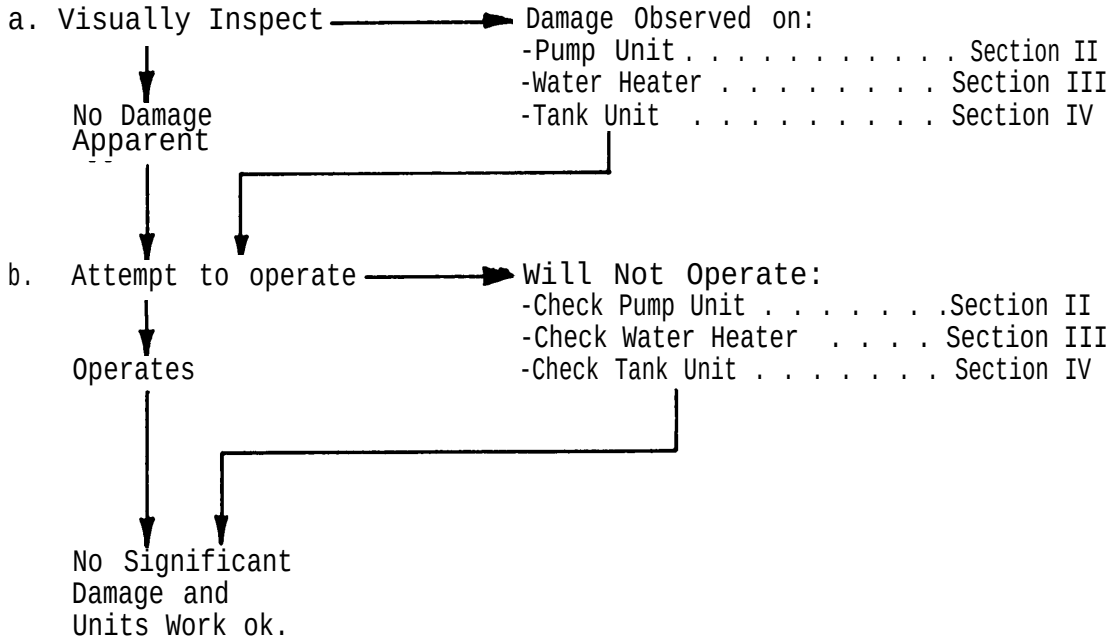
4-1. SCOPE .

This chapter contains BDAR procedures applicable to the M12A1 Decontaminating Apparatus.

4-2. DESCRIPTION.

The M12A1 Decontaminating Apparatus is comprised of three skid-mounted units; a water heater to heat water, a tank unit for storage of liquids, and a pump unit for pumping liquids. The apparatus can be used for spraying decontaminating mixtures and for personnel showers.

4-3. ASSESSMENT PROCEDURE.



4-4. REPAIR PROCEDURE INDEX.

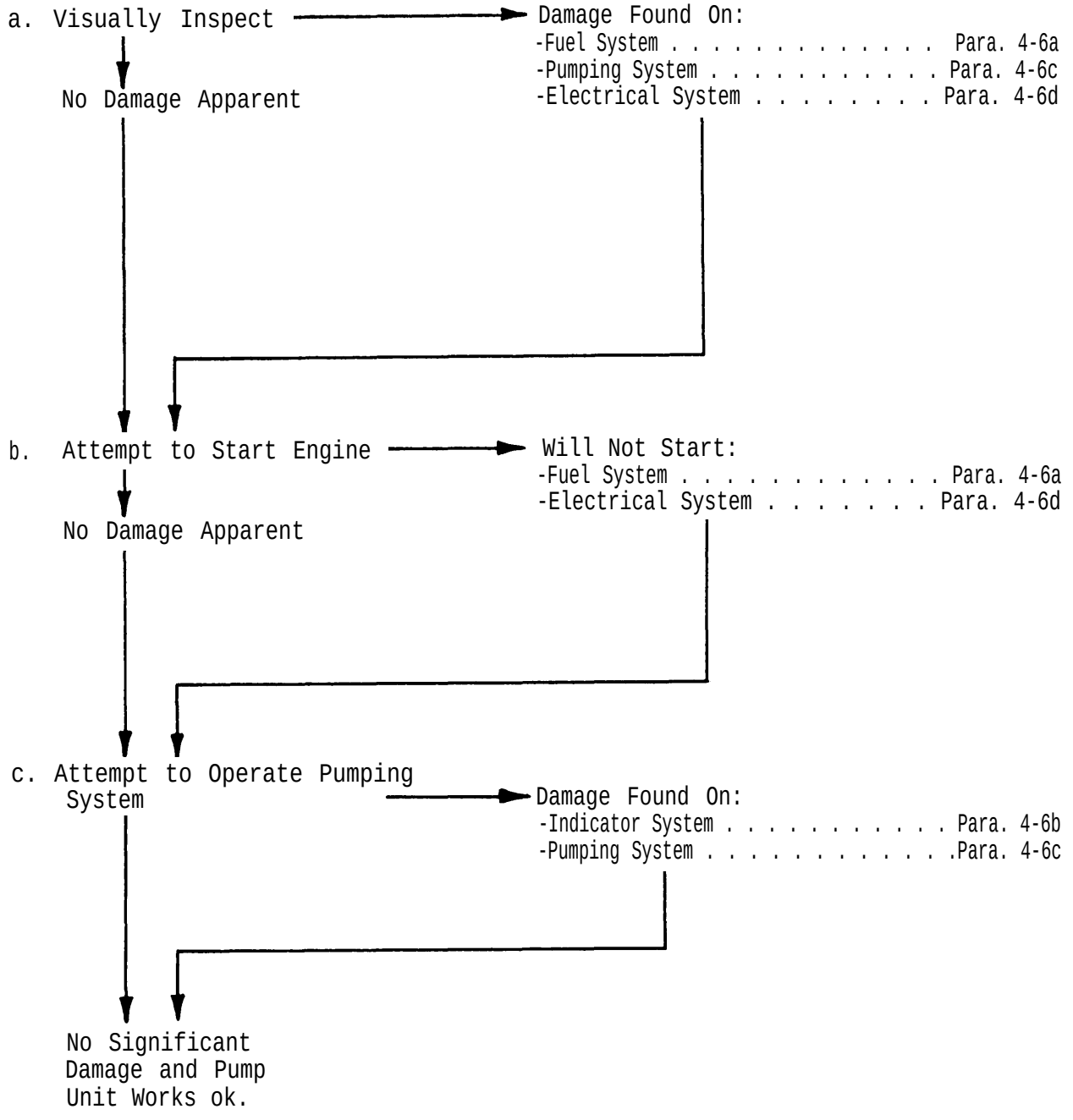
SECTION 11. PUMP UNIT

4-5. GENERAL .

NOTE

The M51 Shelter System uses the same engine as the pump unit. The engine or parts from the engine on the M51 Shelter System can be cannibalized and used on the pump unit.

This section contains BDAR procedures applicable to the pump unit.



4-6. PUMP UNIT BDAR PROCEDURES.

a. Fuel System Failures.

(1) Fuel hose leaking or fuel shut off valve defective.

General Information:

The fuel shut off valve can be bypassed without affecting the operation of the pump unit.

Limitations:

- None

Personnel/Time Required:

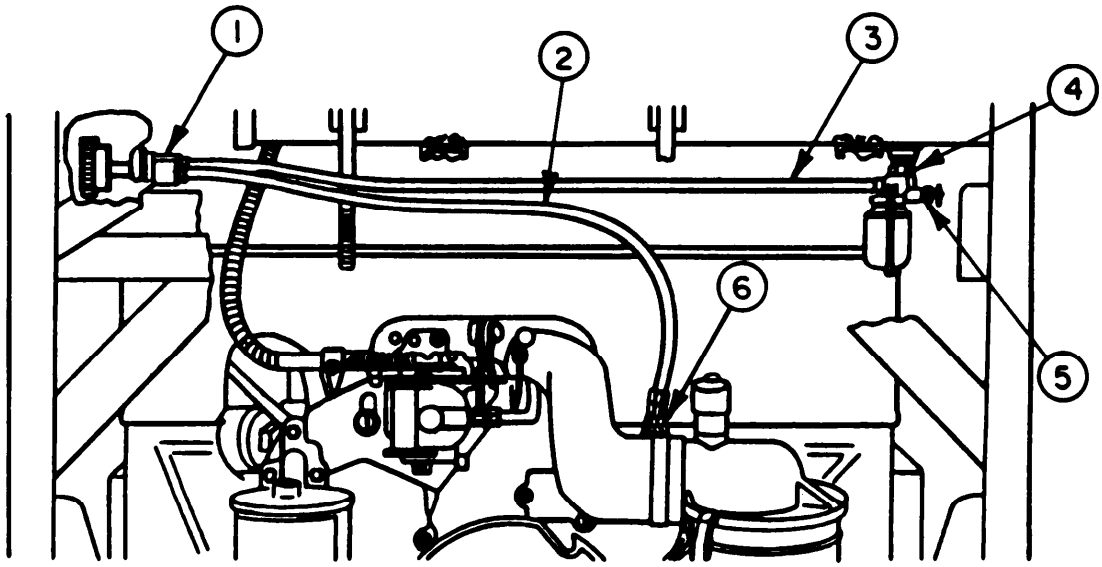
- 1 soldier
- 0.3 hour

Materials/Tools:

- Screwdriver
- 7/16- x 3/8-inch open end wrench

Procedural Steps:

1. Close sediment bowl valve (5) on the bottom of the fuel tank.



4-6. PUMP UNIT BDAR PROCEDURES - CONT.

NOTE

Perform steps 2, 3, and 6, if the fuel shut off valve is broken or if the fuel hose between the fuel shut off valve to the fuel pump is leaking.

2. Remove the fuel hose (2) between the fuel pump (6) and fuel shut off valve (l).

3. Remove end of fuel hose (3) from fuel shut off valve (1) and connect to fuel pump.

NOTE

Perform steps 4 thru 6, if the fuel hose between the sediment bowl or the fuel shut off valve is leaking.

4. Remove fuel hose between sediment bowl (4) and fuel shut off valve (l).

5. Remove end of fuel hose (2) from fuel shut off valve (1) and connect to sediment bowl (4).

6. Open sediment bowl valve (5).

7. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

(2) Fuel pump defective.

General Information:

The engine on the pump unit can be operated without the fuel pump.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.3 hour

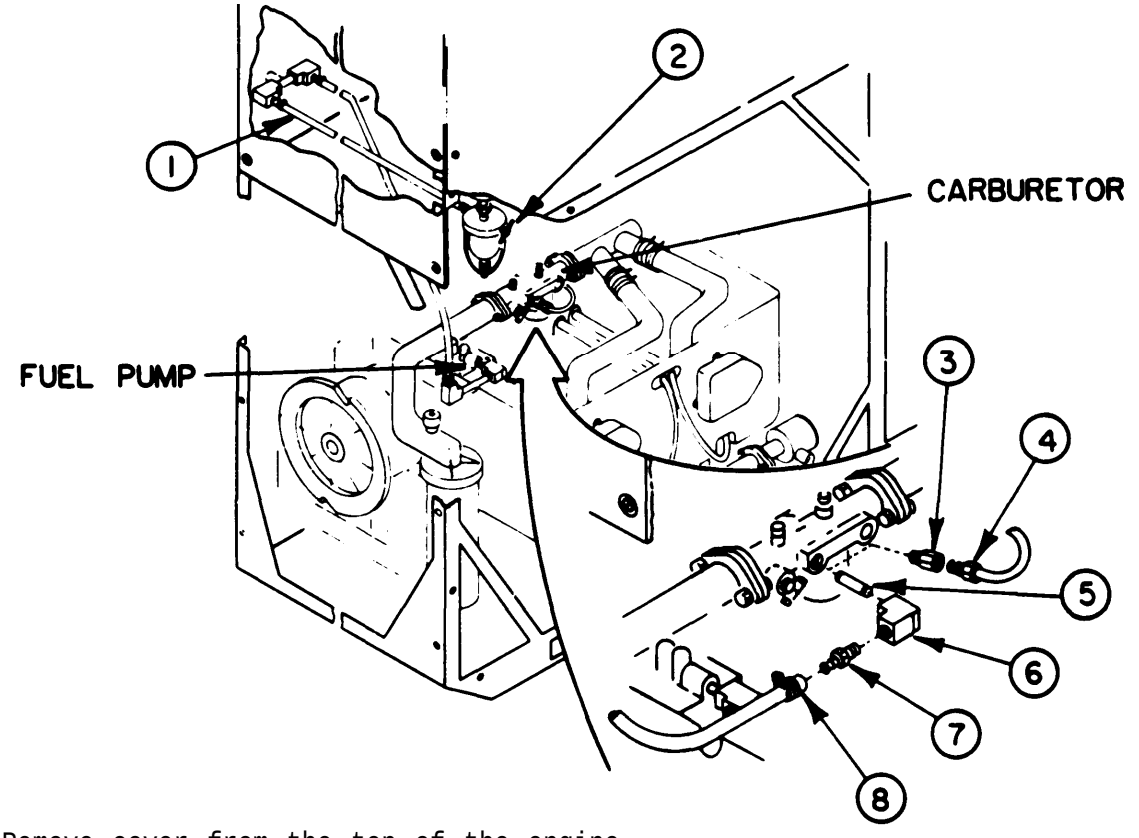
Materials/Tools:

- Antiseizing tape
- Screwdriver
- Adjustable wrench
- 7/16- x 3/8-inch open end wrench

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Shut off sediment bowl valve (2).



2. Remove cover from the top of the engine.

3. Remove fuel line (4) and adapter (3) from carburetor.

4. Remove fuel hose (8) from adapter (7) on fuel pump.

5. Remove pipe nipple (5), 90° elbow (6), and adapter (7) from the fuel pump.

6. Wrap threads on pipe nipple (5) and adapter (7) with antiseizing tape (35, appx C).

7. Install pipe nipple (5), 90° elbow (6), and adapter (7) in carburetor.

8. Reconnect fuel hose (8) to adapter (7) on carburetor.

9. Install cover on top of the engine.

10. Open sediment bowl valve (2).

11. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

b. Indicator System Failures.

(1) Tachometer defective.

NOTE

The pump unit can be operated with a defective tachometer. The maximum RPM of the engine on the pump unit will be limited by the governor to protect the unit from damage.

(2) Pressure gage defective.

NOTE

The pump unit can be operated with a defective pressure gage.

(3) Vacuum gage defective.

NOTE

The pump unit can be operated with a defective vacuum gage.

c. Pumping System Failures.

(1) Pump drain valve defective.

General Information:

The pump unit can be operated with normal water pressure after the pipe cap is installed. In a freezing environment, remove pipe cap to drain pump after mission is completed.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.3 hour

Materials/Tools:

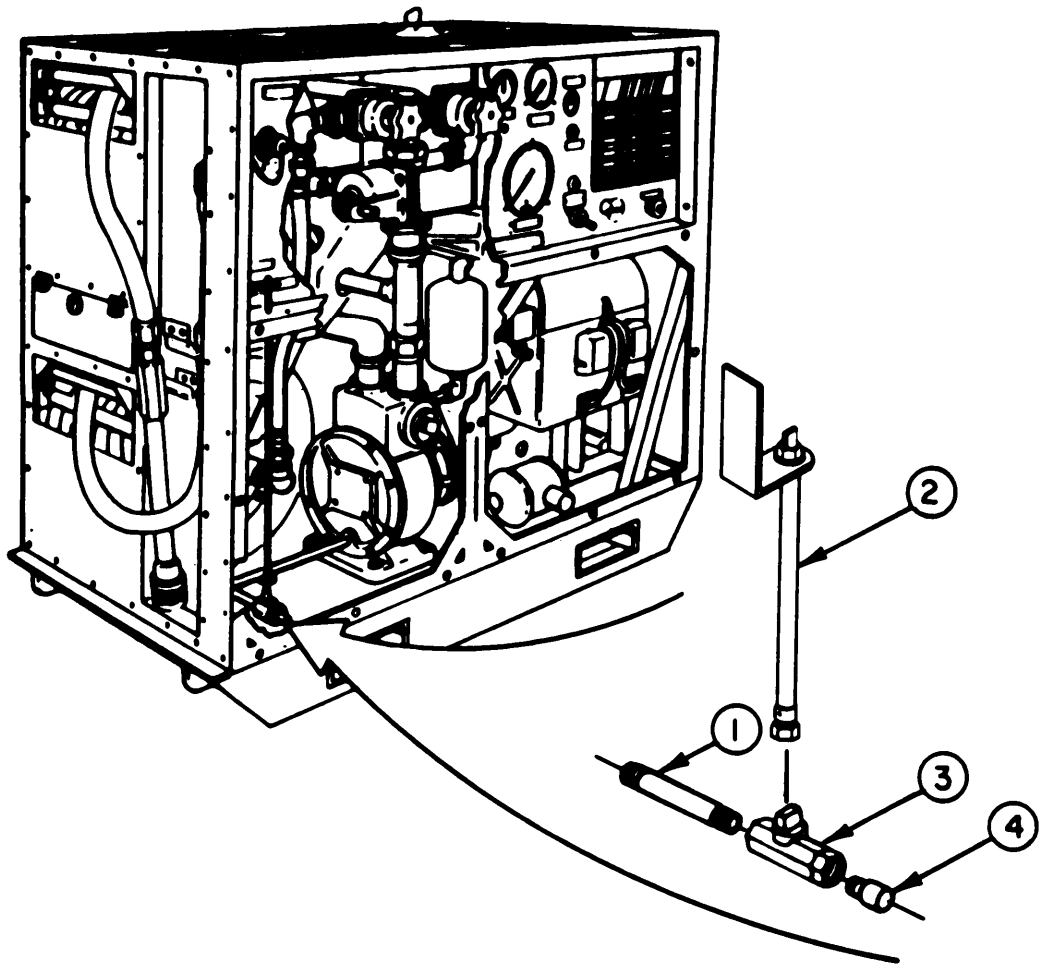
- l/2-inch pipe cap
- Pipe wrenches
- Antiseizing tape
- Adjustable wrench

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Disconnect handle extension (2) from valve (3).

2. Attempt to operate valve (3) by using a wrench on the valve stem. If valve does not function, proceed to step 3.



3. Remove defective valve (3) and adapter (4).

4. Wrap threads of nipple (1) with antiseizing tape (35, appx C) and install pipe cap (5, appx C) on nipple.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

(2) Vacuum hose defective.

General Information:

To detect small holes in the vacuum hose it may be necessary to manually fill the hose with water.

Limitations:

•This BDAR fix will not work on larger cuts, tears, or holes in the vacuum line, refer to the water hose BDAR fix for this type damage.

Personnel/Time Required:

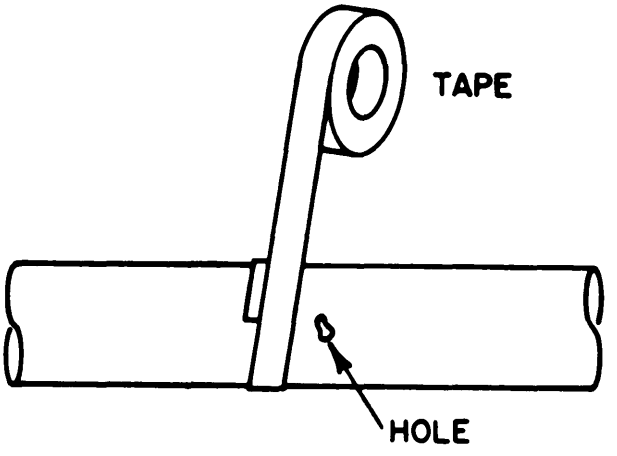
• 1 soldier
• 0.2 hour

Materials/Tools:

• Pressure sensitive tape

Procedural Steps:

1. Wrap several layers of pressure sensitive tape (37, appx C) over top of the hole.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

(3) Water hose defective.

General Information:

The water hose may not rewind properly on the hose reel after this BDAR fix.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

Limitations:

- If the water pressure is set at maximum pressure it may separate the spliced hose. Operate the pump unit with the water pressure set only to the minimum pressure required to complete the mission.

Personnel/Time Required:

- 1 soldier
- 0.4 hour

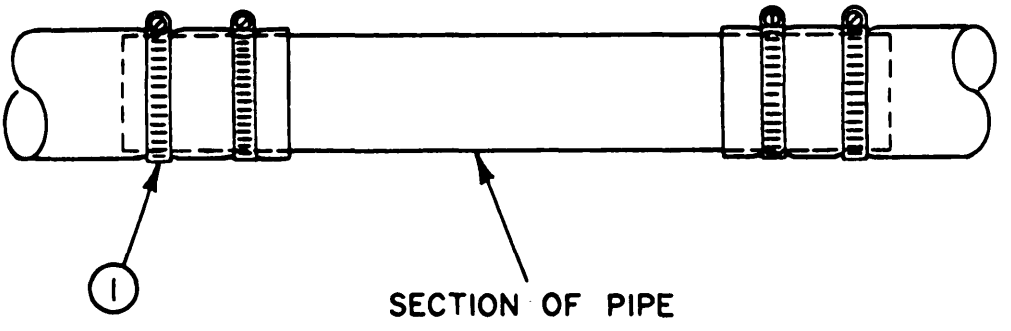
Materials/Tools:

- Galvanized pipe, copper pipe, or similar material
- Hose clamps (four required per fix)
- Screwdriver
- Utility knife
- Hacksaw

Procedural Steps:

1. Remove the damaged section from the water hose.

2. Cut a 6 to 8 inch length of pipe (28, appx C) with a diameter that fits inside the hose (use the largest diameter that will fit into the hose).



3. Install four hose clamps (8, appx C) (1) over hose, fasten clamps securely.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

(4) Pump housing cracked.

General Information:

CAUTION

The pump housing can be brazed, however, care must be taken not to overheat bearing or seal areas of the housing.

Limitations:

- None

Personnel/Time Required:

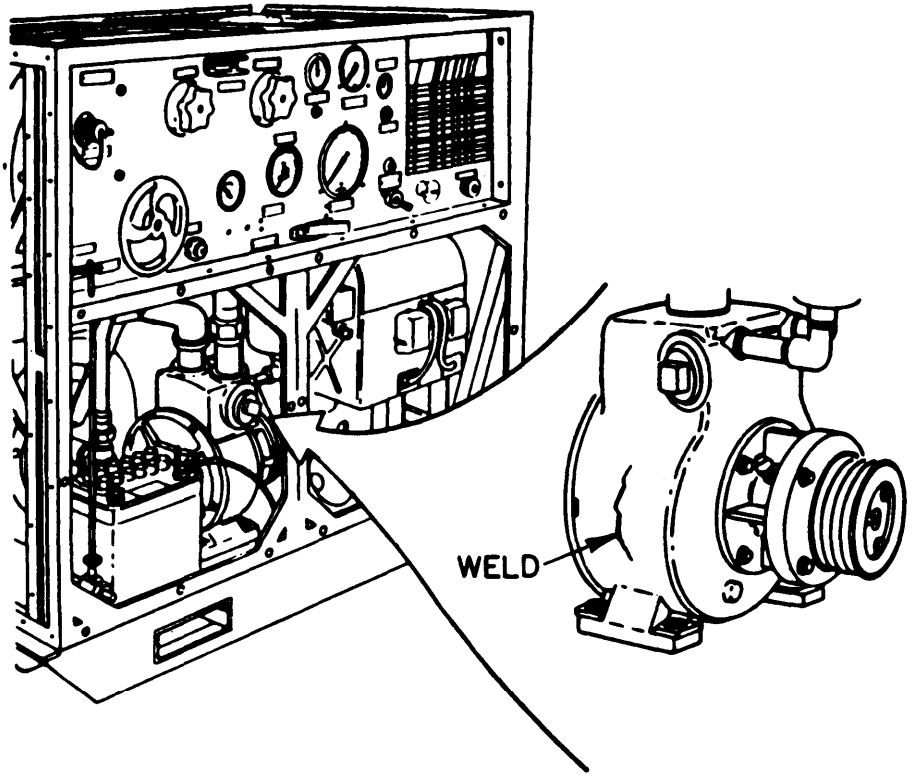
- 2 soldiers
- 0.5 hour

Materials/Tools:

- Oxygen/acetylene outfit

Procedural Steps:

1. Repair the pump housing with the oxygen/acetylene outfit, if it can be done in place.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

d. Electrical System Failures.

(1) Circuit breaker (CB1) defective.

General Information:

CAUTION

The circuit breaker can be bypassed with a 25 amp fuse. In the absence of a fuse, use regular wire. The use of regular wire will eliminate the 25 amp safety factor.

Limitations:

- None

Personnel/Time Required:

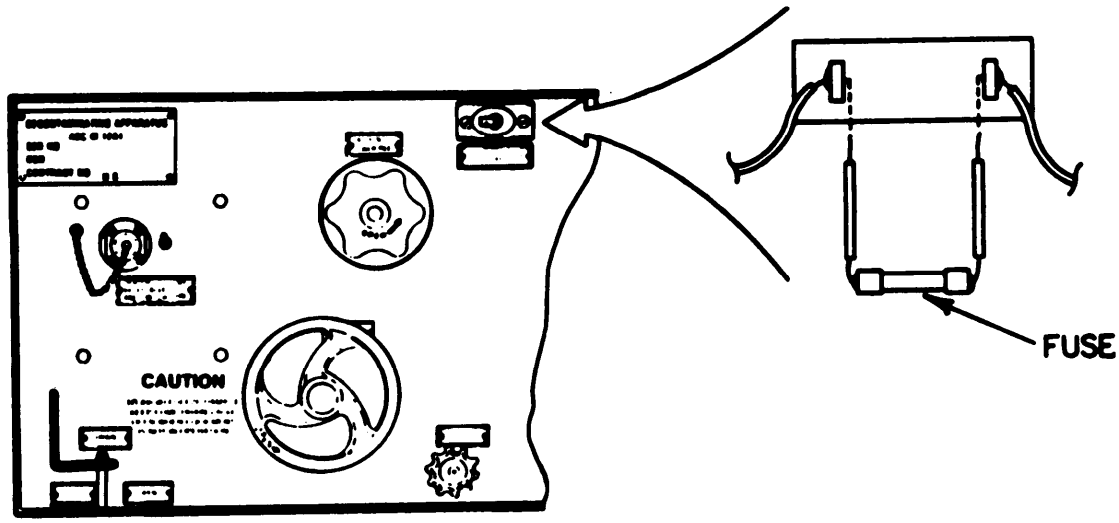
- 1 soldier
- 0.2 hour

Materials/Tools:

- 25 amp fuse
- Soldering iron
- Electrical wire (16 AWG or larger)
- Solder

Procedural Steps:

1. Cut two pieces of electrical wire (43, appx C) 2 inches in length and remove l/2-inch of insulation from each end.



2. Solder an electrical wire to each end of a 25 amp fuse (17, appx C).

3. Solder the fuse or a straight piece of regular wire between the two wire terminals on the back of the circuit breaker.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

(2) Electrical wire defective.

General Information:

Any broken electrical wire can be repaired by the following BDAR fix.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

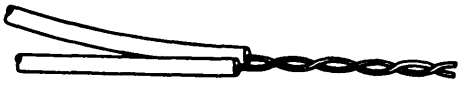
Materials/Tools:

- Electrical tape
- Pliers
- Soldering iron
- Solder

Procedural Steps:

1. Remove sufficient insulation from the broken wire ends to allow a minimum of four twists of the wire ends.

2. Twist the wire ends together a minimum of four turns.



3. Solder (34, appx C) the twisted wire ends, if possible.

4. Wrap electrical tape (36, appx C) around soldered wire ends.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

(3) Low oil pressure switch (S4) defective.

General Information:

The low oil pressure switch (S4) contacts must be closed before the battery will charge. The contacts close at 20 psi.

Limitations:

- None

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

Personnel/Time Required:

- 1 soldier
- 0.2 hour

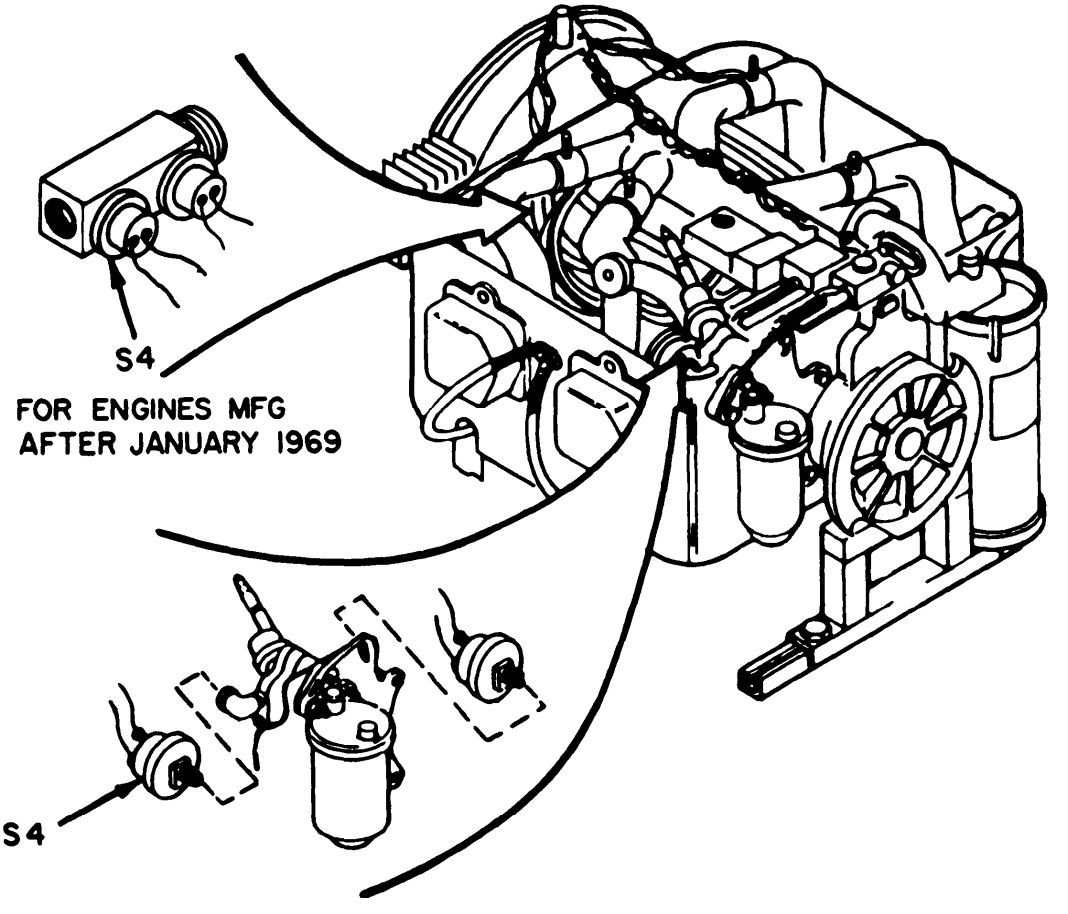
Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove cover from the top of the engine.

2. Remove either wire from the oil pressure switch (S4) and install on the same terminal with the other wire.



FOR ENGINES MFG
BEFORE JANUARY 1969

3. Replace engine cover.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

(4) Low oil pressure switch (S3) defective.

General Information:

CAUTION

The BDAR fix will eliminate the low oil pressure safety shutdown of the engine. Monitor oil pressure on the oil pressure gage.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.2 hour

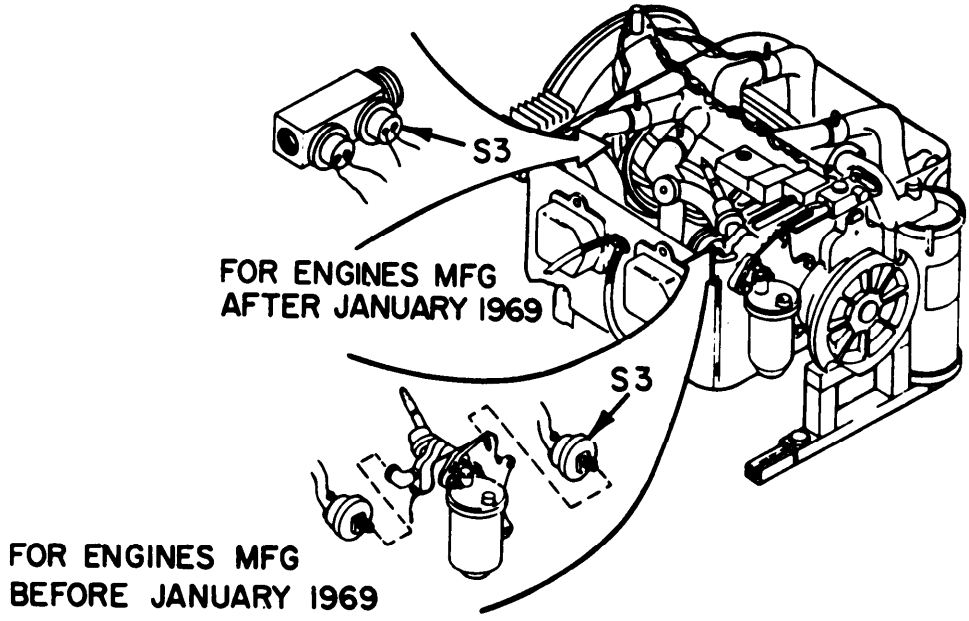
Materials/Tools:

- Electrical tape
- Screwdriver

Procedural Steps:

1. Remove cover from the top of the engine.

2. Remove the wire from the oil pressure switch (S3) that comes from connector J1 and wrap electrical tape (36, appx C) around wire end.



3. Replace engine cover.

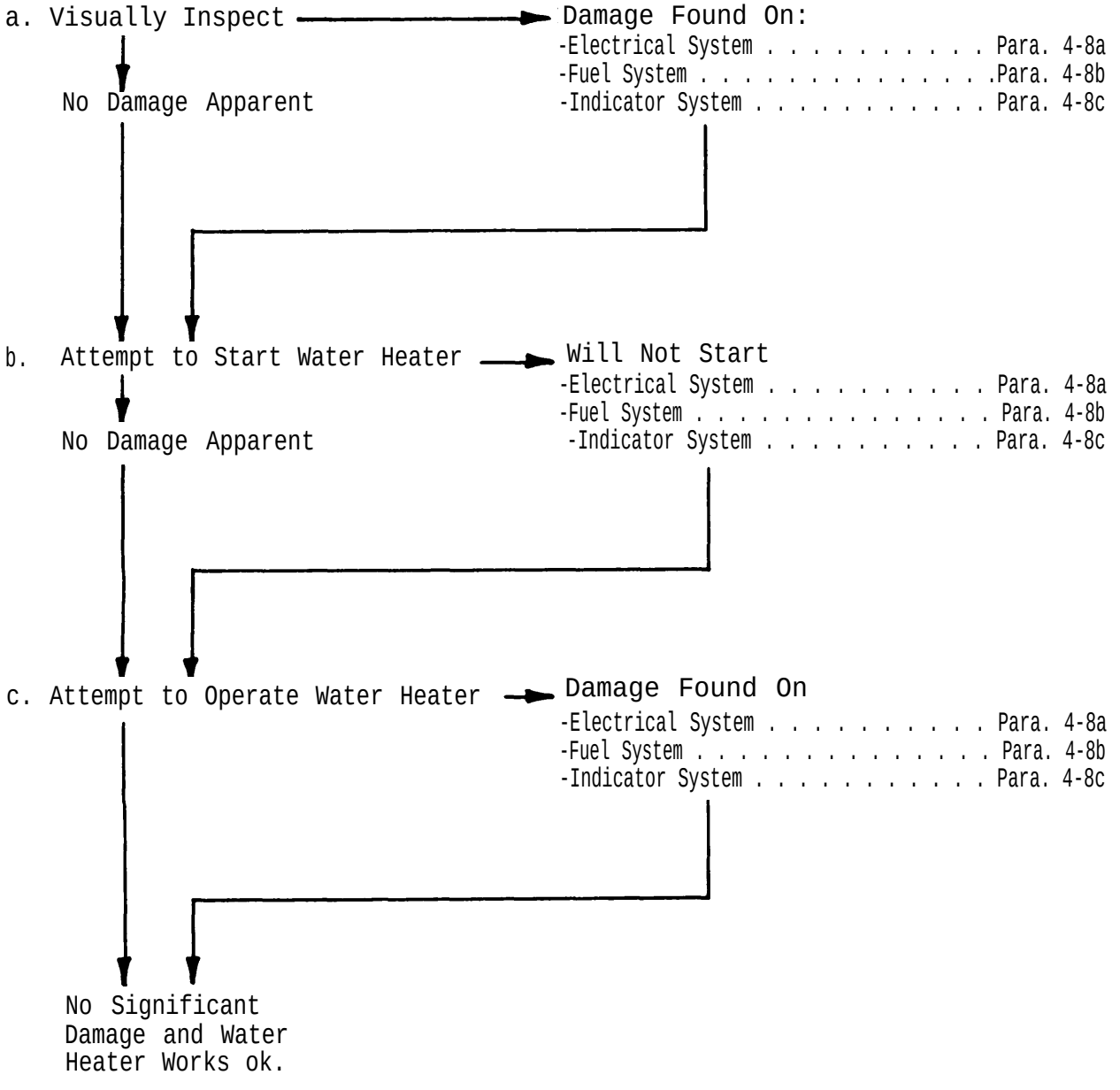
4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the pump unit using standard maintenance procedures.

4-6. PUMP UNIT BDAR PROCEDURES - CONT.

SECTION III. WATER HEATER

4-7. GENERAL .

This section contains BDAR procedures applicable to the water heater.



4-8. WATER HEATER BDAR PROCEDURES.

NOTE

The water heater can be bypassed by obtaining an immersion heater from the field kitchen and placing it directly into the tank unit.

a. Electrical System Failures.

(1) Time delay relays (TD1, TD2) defective.

CAUTION

This BDAR fix will eliminate one of the safety devices of the water heater.

General Information:

The water heater will not operate if the time delay relays are interchanged.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Electrical wire (solid), paper clip, or similar item

4-8. WATER HEATER BDAR PROCEDURES - CONT.

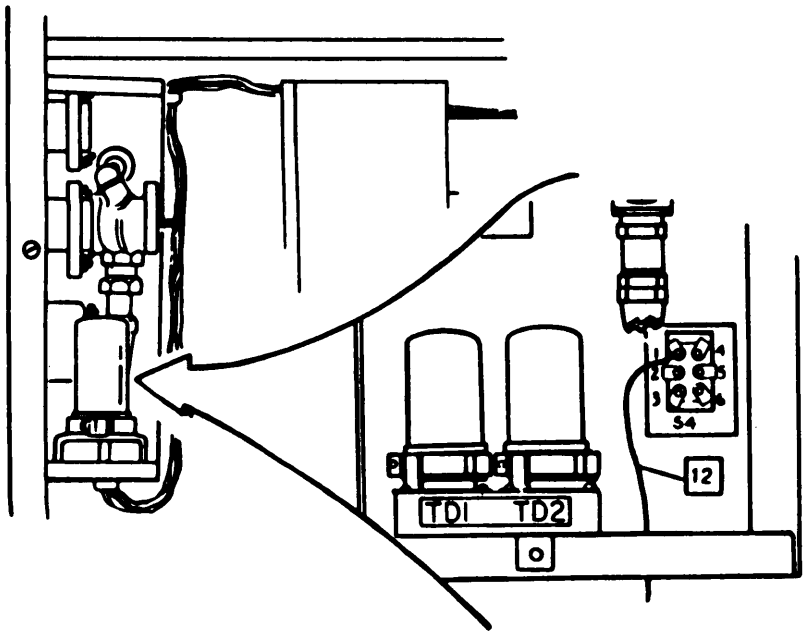
Procedural Steps:

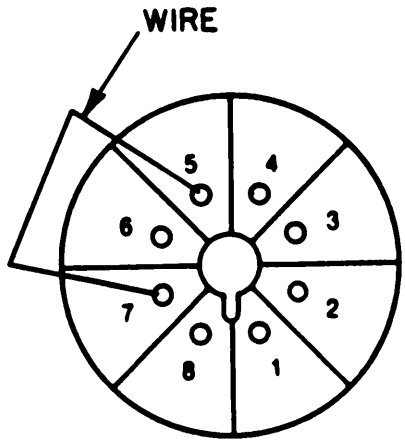
1. Remove outer cover and control box cover.

2. Remove defective time delay relay from socket.

3. Bend wire ends (44, appx C) so they fit securely into the pin holes on the time delay relay socket.

4. Insert the wire into pin holes 5 and 7 of the socket.





TD1 AND TD2 SOCKET
VIEWED FROM TOP

50 Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the water heater using standard maintenance procedures.

4-8. WATER HEATER BDAR PROCEDURES - CONT.

(2) Combustion air pressure switch (S3) defective.

General Information:

CAUTION

This BDAR fix will eliminate one of the safety devices of the water heater.

Limitations:

- None

Personnel/Time Required:

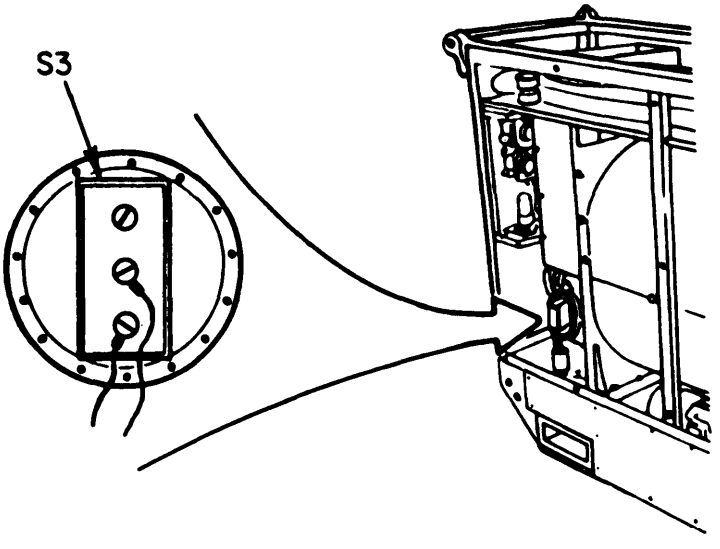
- 1 soldier
- 0.2 hour

Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove cover from the combustion air pressure switch (S3).



2. Remove either wire from the combustion air pressure switch (S3) and install on the same terminal as the other wire.

3. Replace cover on the combustion air pressure switch (S3).

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the water heater using standard maintenance procedures.

4-8. WATER HEATER BDAR PROCEDURES - CONT.

(3) Temperature limit switch (S1) defective.

General Information:

WARNING

Monitor water temperature constantly and keep below 220°F (104°C). A possibility of explosion exists if the temperature exceeds 220°F (104°C).

CAUTION

This BDAR fix will eliminate one of the safety devices of the water heater.

Limitations:

- None

Personnel/Time Required:

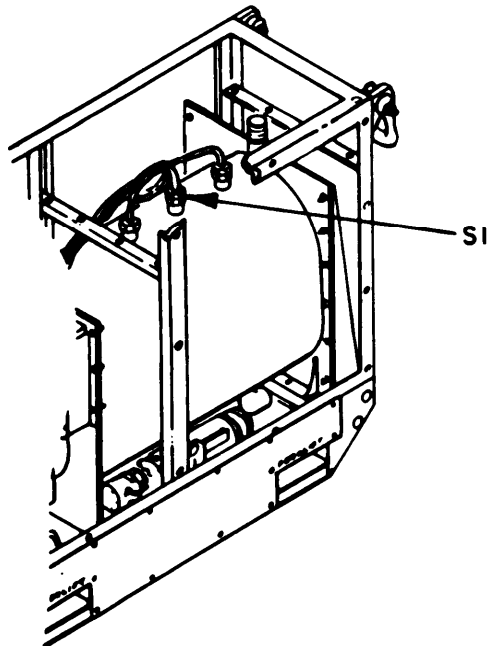
- 1 soldier
- 0.2 hour

Materials/Tools:

- Electrical tape
- Soldering iron
- Solder
- Utility knife
- Pliers

Procedural Steps:

1. Cut both wires off temperature limit switch (S1).



2. Remove approximately 1 inch of insulation from wire ends.

4-8. WATER HEATER BDAR PROCEDURES - CONT.

3. Twist wire ends together.

4. Solder wire ends, if possible.

5. Wrap electrical tape (36, appx C) around soldered wire ends.

6. Record the BDAR action takes. When the mission is completed, as soon as practicable, repair the water heater using standard maintenance procedures.

(4) Flame switch (S2) defective.

General Information:

CAUTION

This BDAR fix will eliminate one of the safety devices of the water heater.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

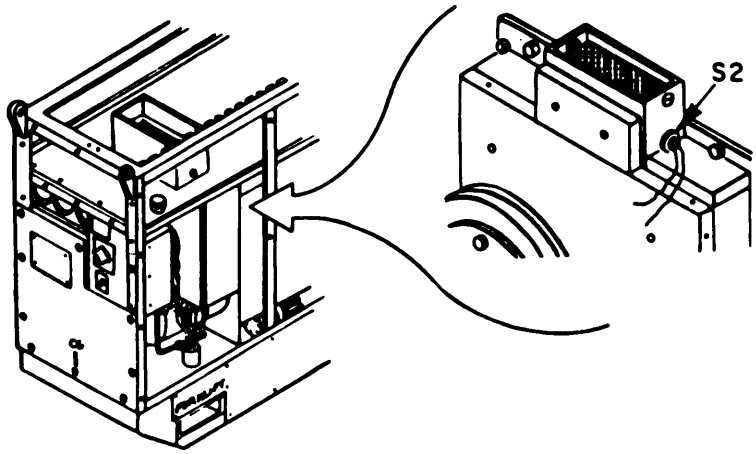
- Electrical wire (16 AWG or larger)
- Electrical tape
- Soldering iron
- Solder

4-8. WATER HEATER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove all the insulation from a piece of electrical wire (43, appx C) 2 to 3 inches in length.

2. Remove both wires from flame switch (S2). If heavy corrosion exists, it may be necessary to cut the wires to remove them.



3. Wrap several turns of bare electrical wire around terminals on both wire ends; solder (34, appx C) terminals together, if possible.

4. Wrap electrical tape (36, appx C) around soldered wire ends.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the water heater using standard maintenance procedures.

(5) Electrical wire defective.

General Information:

Any broken electrical wire can be repaired by the following BDAR fix.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Electrical tape
- Utility knife
- Pliers
- Soldering iron
- Solder

4-8. WATER HEATER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove sufficient insulation from the broken wire to allow a minimum of four twists of the ends.

2. Twist the wire ends a minimum of four turns.

3. Solder (34, appx C) the twisted wire ends, if possible.

4. Wrap electrical tape (36, appx C) around soldered wire ends.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the water heater using standard maintenance procedures.

b. Fuel System Failures.

Fuel hose defective.

General Information:

The water heater uses two fuel hoses; an inlet hose and a return hose.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

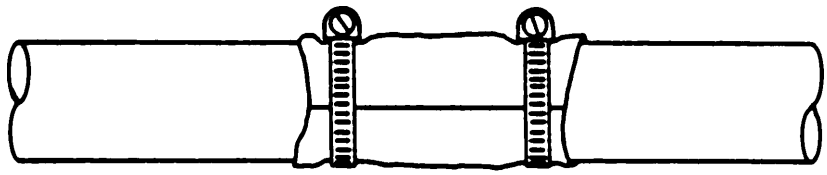
Materials/Tools:

- Pressure sensitive tape
- Hose clamps

4-8. WATER HEATER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Wrap 3 to 4 layers of pressure sensitive tape (37, appx C) over hole in fuel hose.



2. Install two hose clamps (6, appx C) over tape (one on each side of hole) or tie with string, twine, or other suitable material.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the water heater using standard maintenance procedures.

c. Indicator System Failures.

Water pressure gage or water temperature gage defective.

General Information:

WARNING

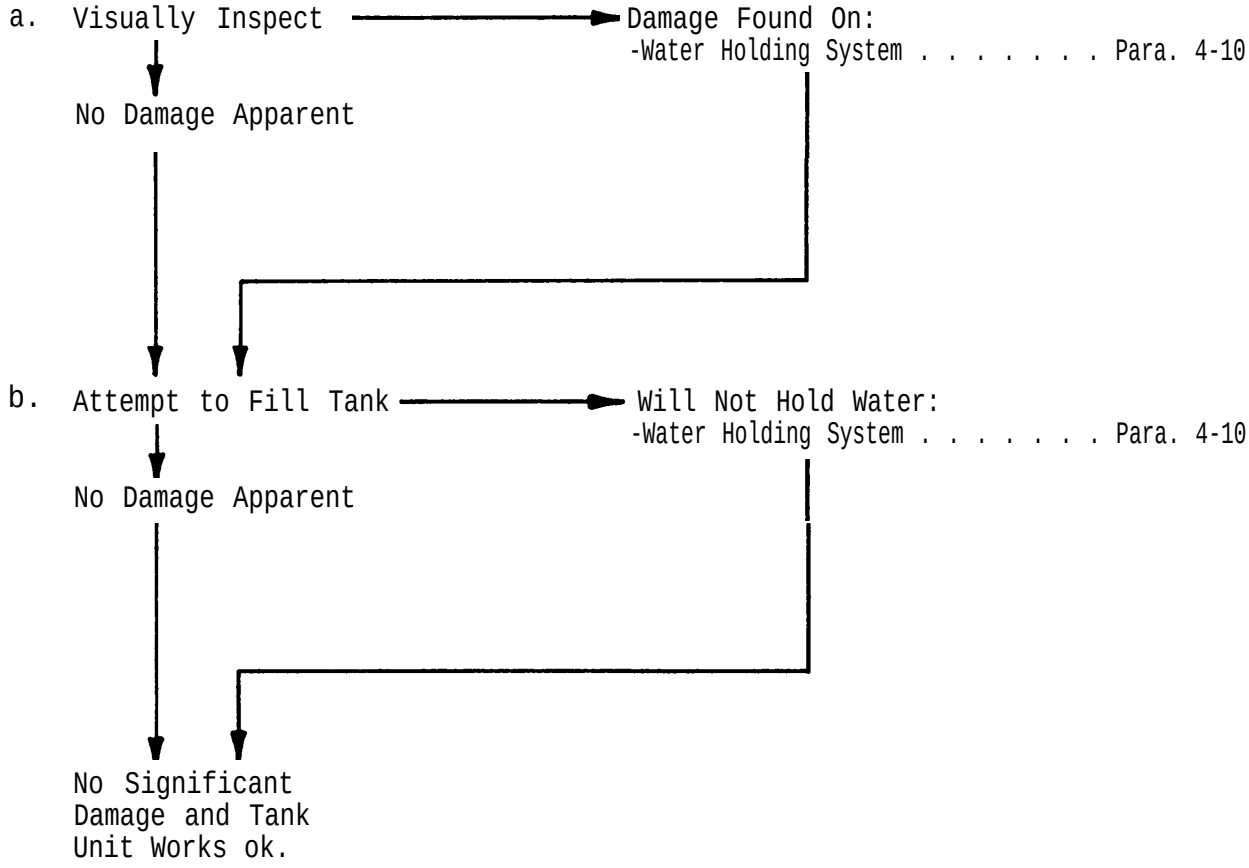
When using the personnel shower, constantly monitor the water heater output temperature to prevent burns to personnel.

The water pressure gage or the water temperature gage are not required for operation of the water heater.

SECTION IV. TANK UNIT

4-9. GENERAL.

This section contains BDAR procedures applicable to the tank unit.



4-10. TANK UNIT BDAR PROCEDURES.

Water Holding System Failures.

(1) Drain valve defective.

General Information:

The tank unit drain valve can be replaced with the valve from the pump unit or repaired by the following BDAR fix.

Limitations:

- None

Personnel/Time Required:

- 2 soldiers
- 0.5 hour

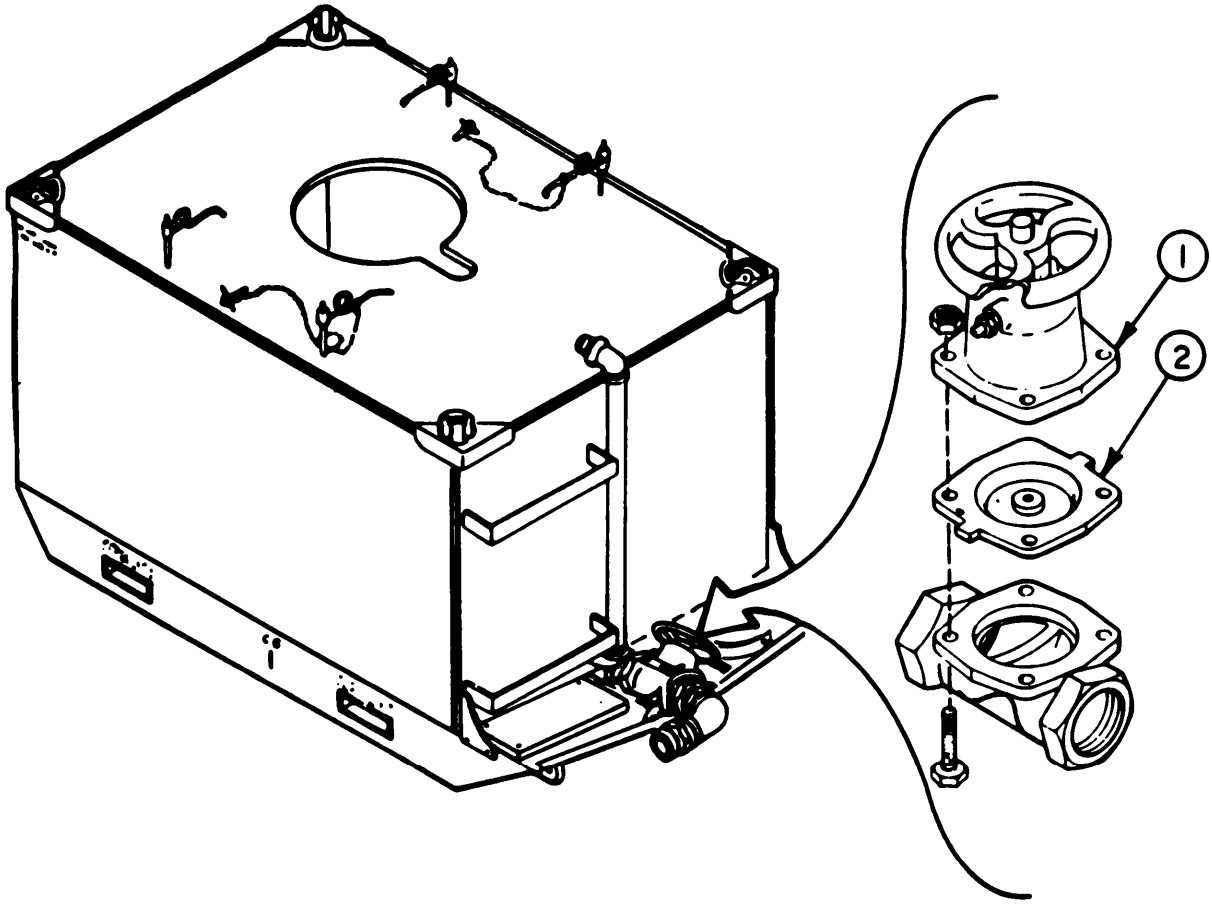
4-10. TANK UNIT BDAR PROCEDURES - CONT.

Materials/Tools:

- Inner tube
- Utility knife
- Pipe wrenches
- Socket set (3/8-inch drive)

Procedural Steps:

1. Remove the valve top (1) from the defective valve assembly.



2. Remove the defective diaphragm (2) from the regulating valve assembly.

3. Cut two new diaphragms from the inner tube (22, appx C), the same shape and size as the defective diaphragm.

4. Install both fabricated diaphragms in the valve assembly.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the tank unit using standard maintenance procedures.

4-10. TANK UNIT BDAR PROCEDURES - CONT.

(2) Water tank leaks.

General Information:

The water tank is made of stainless steel and can be welded.

Limitations:

- None

Personnel/Time Required:

- 2 soldiers
- 0.5 hour

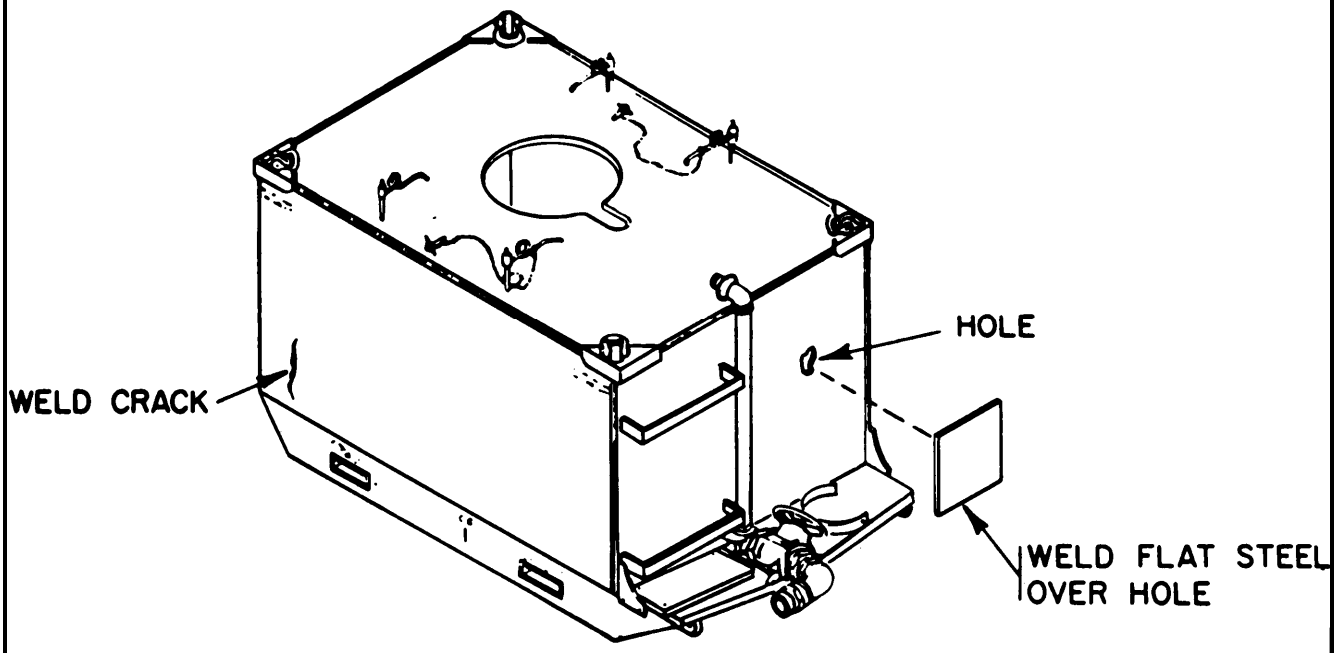
Materials/Tools:

- Oxygen/acetylene outfit
- Flat steel

Procedural Steps:

1. Drain the water from the tank sufficiently below the hole or the crack to allow proper welding.

2. If the tank is cracked, weld the crack. If the tank has a hole in it, weld piece of flat steel over the hole.



3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the tank unit using standard maintenance procedures.

CHAPTER 5

Mll DECONTAMINATING APPARATUS

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

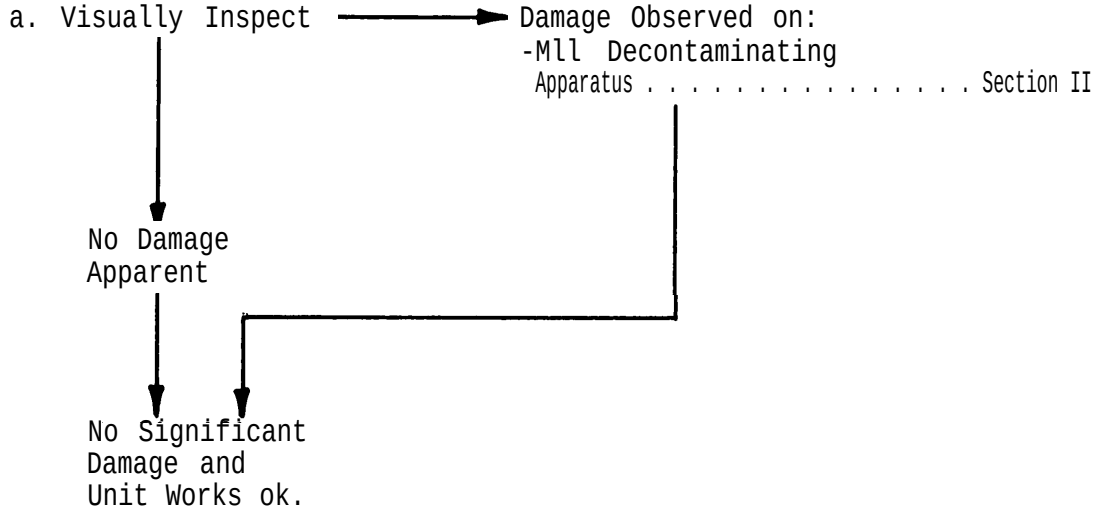
5-1. SCOPE.

This chapter contains BDAR procedures applicable to the M11 Decontaminating Apparatus.

5-2. DESCRIPTION.

The Mll Decontaminating Apparatus is a hand held portable unit. The unit holds 1-1/2 quarts (1.4 liters) of decontaminating agent (DS2) and will decontaminate an area of approximately 135 square feet (12.5 square meters).

5-3. ASSESSMENT PROCEDURE.



5-4. REPAIR PROCEDURE INDEX.

Section II. Mll DECONTAMINATING APPARATUS

5-5. GENERAL .

This section contains BDAR procedures applicable to the Mll Decontaminating Apparatus.

5-6. Mll DECONTAMINATING APPARATUS BDAR PROCEDURES.

a. Handle Failure.

General Information:

The handle is used to release nitrogen from the cylinder to pressurize the container.

Limitations:

- This BDAR fix will not work if the handle is missing or too much of the handle is broken off.

Personnel/Time Required:

- 1 soldier
- 0.1 hour

Materials/Tools:

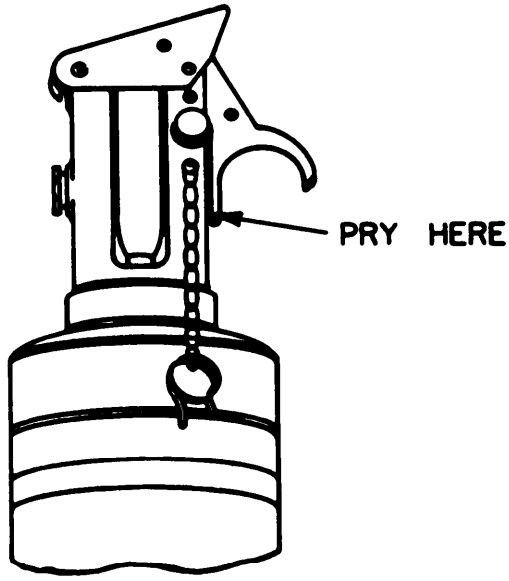
- Screwdriver or similar tool

5-6. Mll DECONTAMINATING APPARATUS BDAR PROCEDURES - CONT.

Procedural Steps:

1. Insert screwdriver under the handle.

2. Pry handle up until it locks in place.



3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M11 Decontaminating Apparatus using standard maintenance procedures.

b. Thumb Lever Missing.]

General Information:

The thumb lever is used to release the DS2 from the container.

Limitations:

- None.

Personnel/Time Required:

- 1 soldier
- 0.1 hour

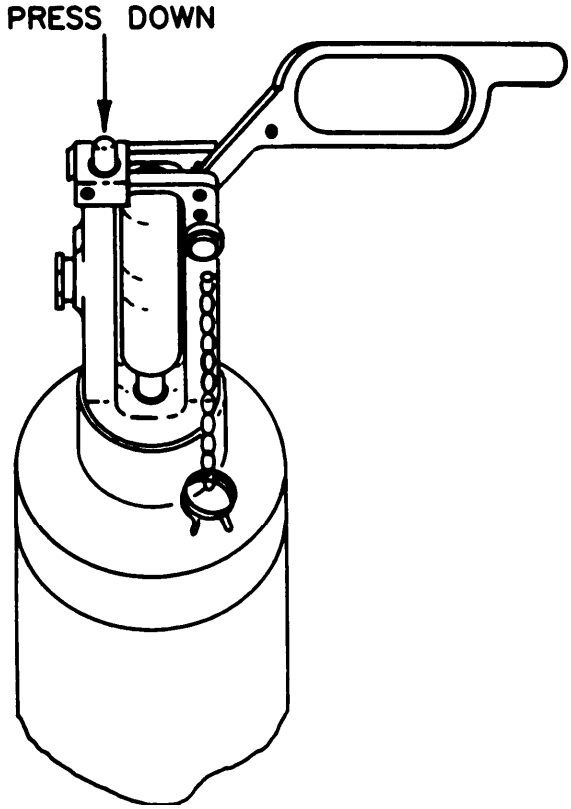
Materials/Tools:

- None

5-6. Ml1 DECONTAMINATING APPARATUS BDAR PROCEDURES - CONT.

Procedural Steps:

1. Press down on the valve stem with the thumb to release DS2 from the container.



NOTE

If the valve stem cannot be pushed down with the thumb, use a small stone or similar hard material.

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Mll Decontaminating Apparatus using standard maintenance procedures.

CHAPTER 6

TYPE A/E32U-8 DECONTAMINATING APPARATUS

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION 1. INTRODUCTION

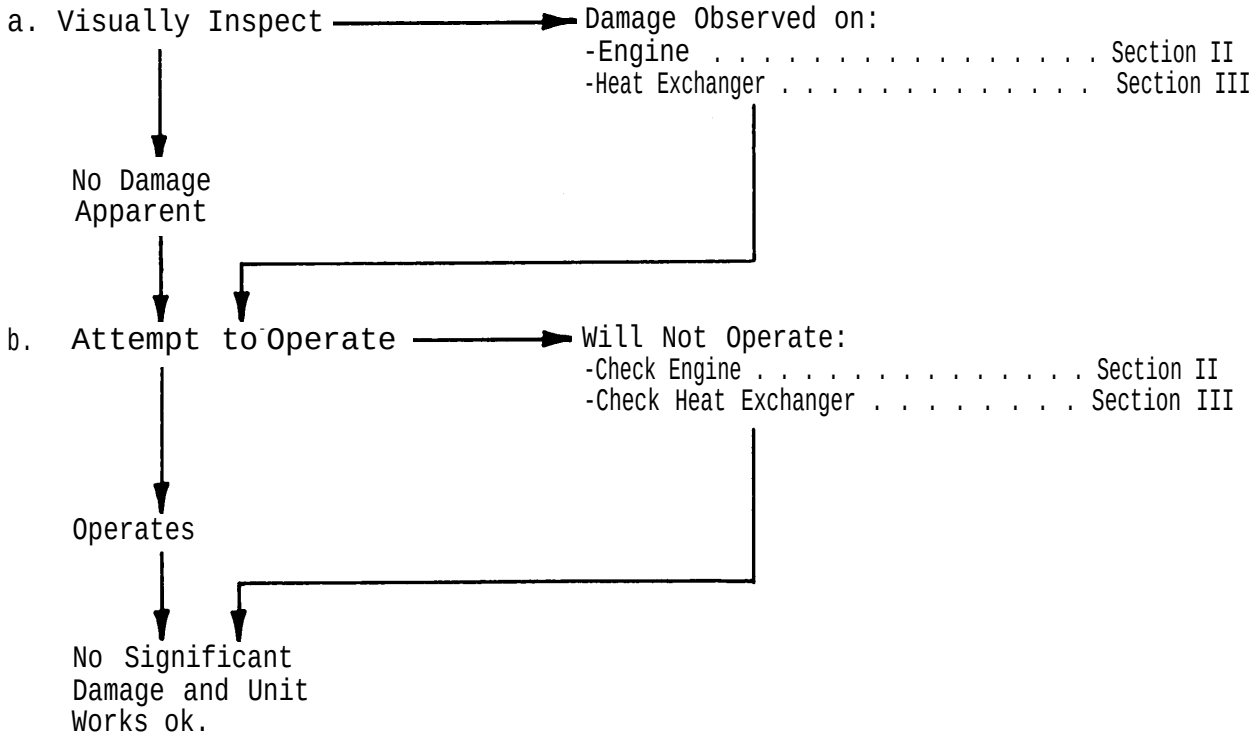
6-1. SCOPE.

This chapter describes BDAR procedures applicable to the TYPE A/E32U-8 Decontaminating Apparatus

6-2. DESCRIPTION.

The TYPE A/E32U-8 Decontaminating Apparatus is a portable unit. It is operated without external power. A two-cycle, air cooled engine drives the unit. The apparatus can deliver water at various pressures and temperatures. The system can be connected to provide personnel showers. It can also be used with cleaning wands or siphon injector to decontaminate equipment.

6-3. ASSESSMENT PROCEDURE.

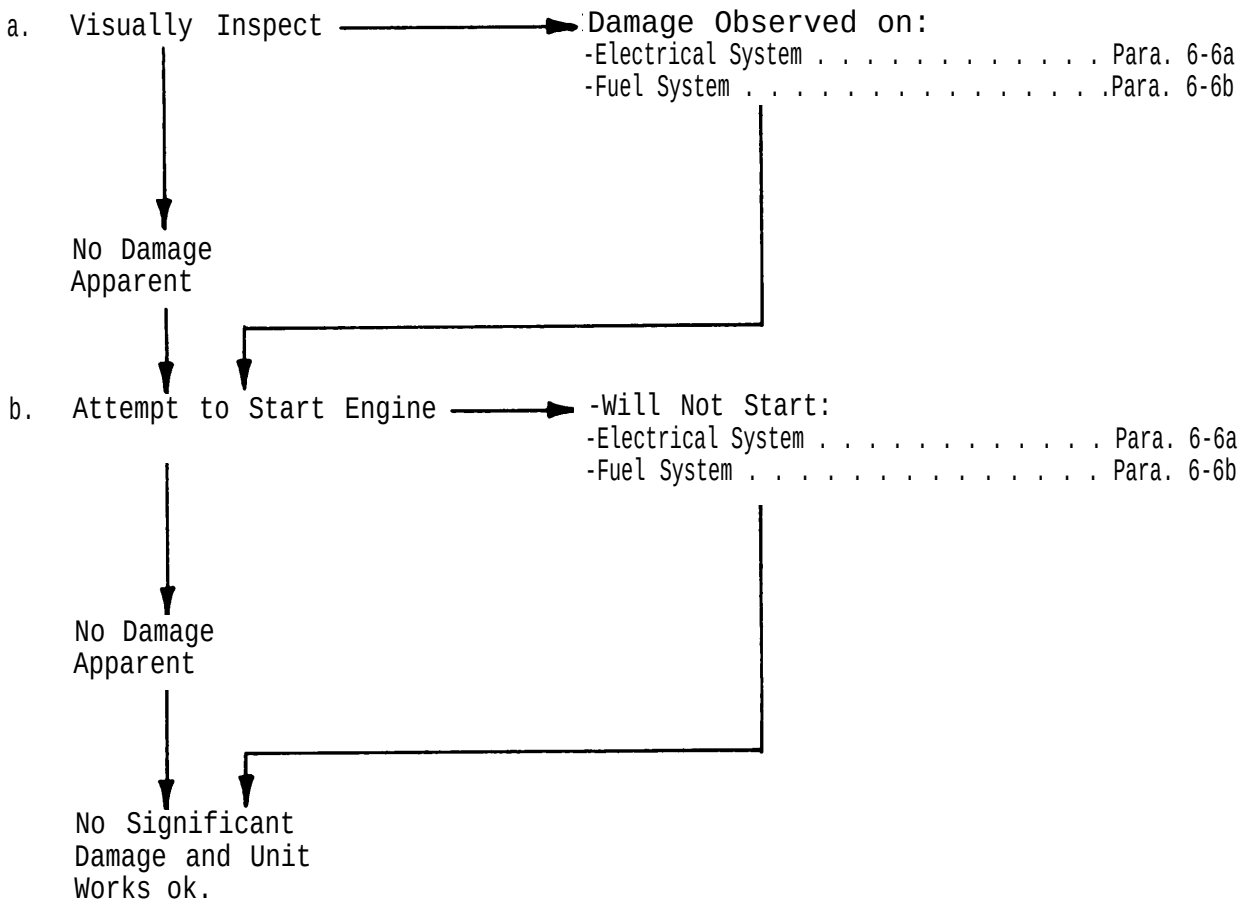


6-4. REPAIR PROCEDURE INDEX. Para.

Section II. ENGINE

6-5. GENERAL.

This section contains BDAR procedures applicable to the engine.



6-6. ENGINE BDAR PROCEDURES.

a. Electrical System Failures.

(1) Electrical wire defective.

General Information:

Any broken electrical wire can be repaired by the following BDAR fix.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.2 hour

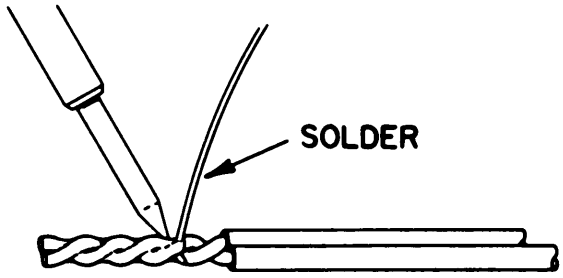
6-6. ENGINE BDAR PROCEDURES - CONT.

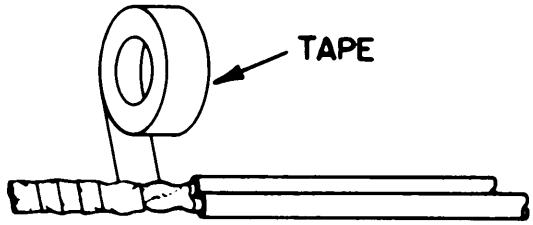
Materials/Tools:

- Electrical tape
- Pliers
- Soldering iron
- Solder

Procedural Steps:

1. Remove sufficient insulation from the broken wire to allow a minimum of four twists of the wire ends.





2. Twist the wire ends together a minimum of four turns.

3. Solder (34, appx C) the twisted wire ends, if possible.

4. Wrap electrical tape (36, appx C) around soldered wire ends.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Type A/E32U-8 Decontaminating Apparatus using standard maintenance procedures.

(2) Spark plug defective.

General Information:

If no replacement is available, the spark plugs in the engine and heat exchanger are interchangeable.

Limitations:

- Heating portion of the system will not operate.

6-6. ENGINE BDAR PROCEDURES - CONT.

Personnel/Time Required:

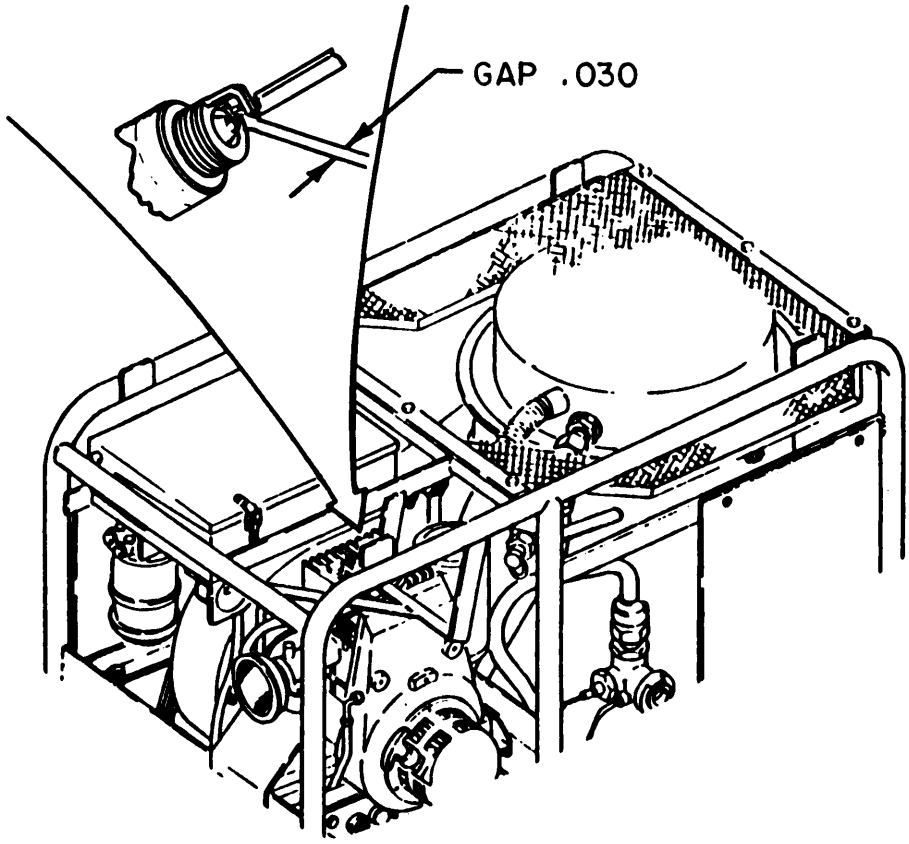
- 1 soldier
- 0.2 hour

Materials/Tools:

- Feeler gage
- Spark plug wrench

Procedural Steps:

1. Remove spark plug from engine.
2. Remove spark plug from the heat exchanger.



3. Using feeler gage, re-gap the heat exchanger spark plug to 0.030 inch.
4. Install the spark plug in the engine.
5. Remove fuel pump drive belt.
6. Remove the heater fuel can.
7. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the engine using standard maintenance procedures.

6-6. ENGINE BDAR PROCEDURES - CONT.

b. Fuel System Failures.

(1) Engine fuel pump defective.

General Information:

The engine can be operated without the fuel pump.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.2 hour

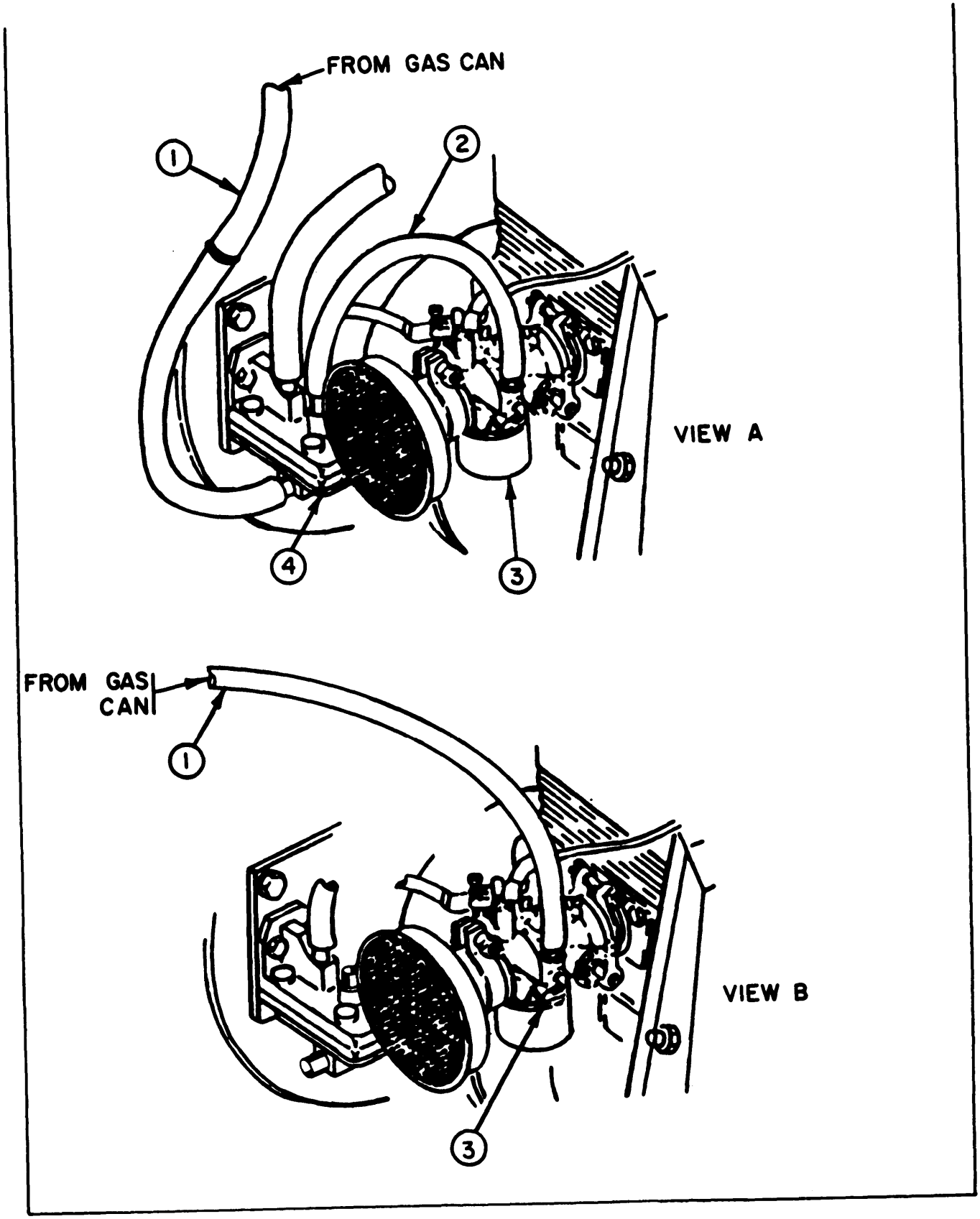
Materials/Tools:

- None

Procedural Steps:

1. Remove hose (1) (view A) from engine fuel pump (4).
2. Remove hose (2) from engine fuel pump (4) and carburetor (3).
3. Connect end of hose (1) (view B), removed in step 1, to carburetor (3).
4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the engine using standard maintenance procedures.

6-6. ENGINE BDAR PROCEDURES - CONT.



6-6. ENGINE BDAR PROCEDURES - CONT.

(2) Fuel hose leaking.

General Information:

The fuel hose can be repaired without affecting the operation of the engine.

Limitations:

- None

Personnel/Time Required:

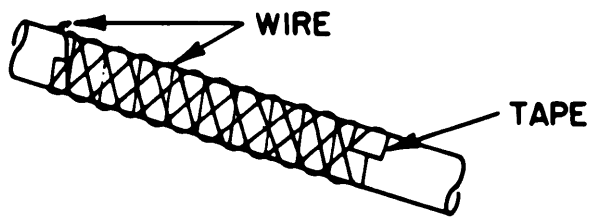
- 1 soldier
- 0.3 hour

Materials/Tools:

- Patch (from repair kit)
- Sealant
- Pressure sensitive tape
- Solid wire (20 AWG or larger)

Procedural Steps:

1. Clean all dirt and grease from around the leak.
2. Coat the leaking area with sealant (33, appx C).



3. Wrap the hose with patching material.
4. Wrap the patched area with pressure sensitive tape (37, appx C).
5. Wrap wire (41, appx C) around the pressure sensitive tape as reinforcement.
6. Wrap an additional coating of pressure sensitive tape over the wire.
7. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the engine using standard maintenance procedures.

Section III. HEAT EXCHANGER

6-7. GENERAL .

This section contains BDAR procedures applicable to the heat exchanger.

a. Visually Inspect. → Damage Observed on:
- -Electrical System . . . . . Para. 6-8a
- -Fuel System . . . . . Para. 6-8b
- -Indicator System . . . . . Para. 6-8c

No Damage Apparent

b. Attempt to Start Heat Exchanger → Will Not Start:
- -Electrical System . . . . . Para. 6-8a
- -Fuel System . . . . . Para. 6-8b
- -Indicator System . . . . . .Para. 6-8c

No Damage Apparent

c. Attempt to Operate Heat Exchanger → Damage Found on:
- -Electrical System . . . . . .Para. 6-8a
- -Fuel System . . . . . Para. 6-8b
- -Indicator System . . . . . .Para. 6-8c
- -Pumping System . . . . . Para. 6-8d

No Significant Damage and Heat Exchanger Unit Works ok.

6-8. HEAT EXCHANGER BDAR PROCEDURES.

a. Electrical System Failures.

(1) 45°C thermostat (S4) defective.

General Information:

WARNING

This BDAR fix will eliminate on of the safety devices, the 45° C thermostat (S4). Be extremely careful during operation. Water temperature must be constantly monitored by trained personnel to prevent serious burns or scalding.

NOTE

The 45°C thermostat (S4) can be bypassed by switching the THERMOSTAT SELECTOR to the 120°C position and monitoring the WATER TEMPERATURE gage to keep the water below 45°C on the gage. Pressure must be monitored to keep below 100 psig.

(2) 120°C thermostat (S3) defective.

General Information:

WARNING

This BDAR fix will eliminate one of the safety devices of the heat exchanger, the 120°C thermostat. Explosion may occur if temperature is not constantly monitored.

NOTE

The 120°C thermostat (S3), can be bypassed without affecting the operation of the heat exchanger. You must monitor the WATER TEMPERATURE gage to keep the water below 120°C on the gage.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.3 hour

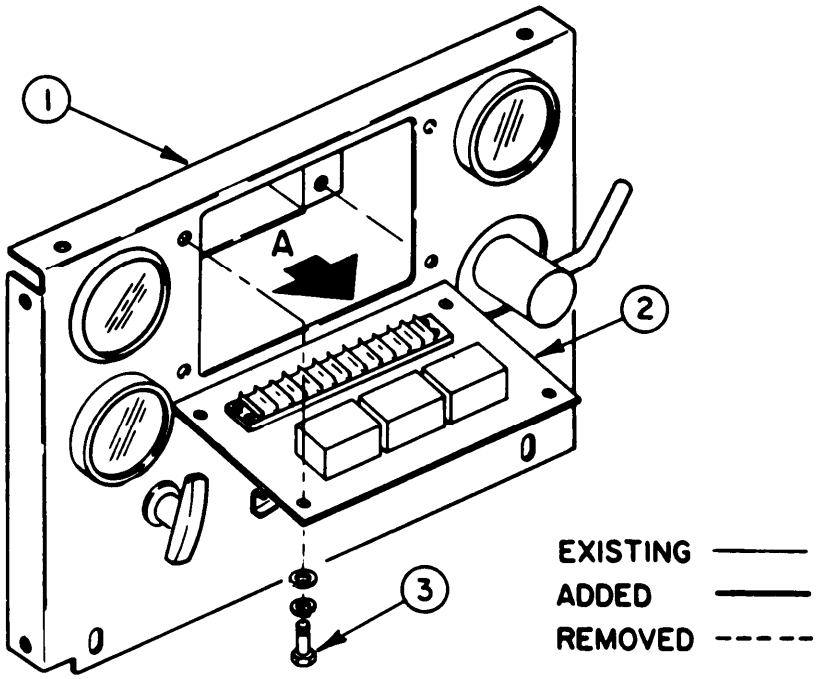
Materials/Tools:

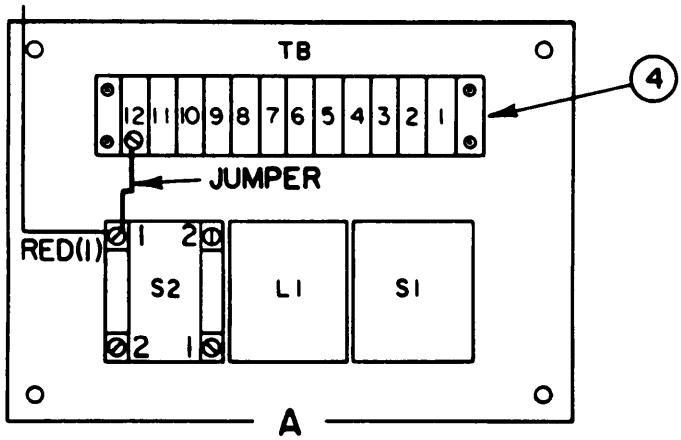
- Electrical wire (18 AWG or larger)
- Screwdriver

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the front panel (2) from the control panel (1) by removing the four screws (3).





2. Remove l/2-inch of insulation from both ends of a 6-inch length of wire (43, appx C.)

3. Loosen the screw on terminal 1 of S2 that has a red wire marked 1.

4. Install one end of the jumper wire to terminal 1 and tighten the screw.

5. Loosen the screw on terminal 12 of the terminal board.

6. Install the other end of the jumper wire to terminal 12 and tighten the screw.

7. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

(3) THERMOSTAT SELECTOR switch (S2) defective (120°C switch position).

General Information:

The 120°C position of the THERMOSTAT SELECTOR switch (S2) can be bypassed without affecting the operation of the heat exchanger; however, the operation of the 45°C thermostat is lost.

Limitations:

- None

Personnel/Time Required:

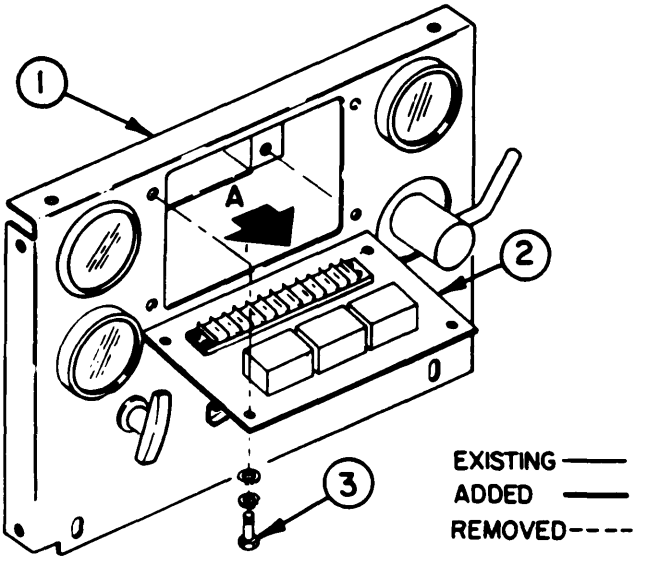
- 1 soldier
- 0.2 hour

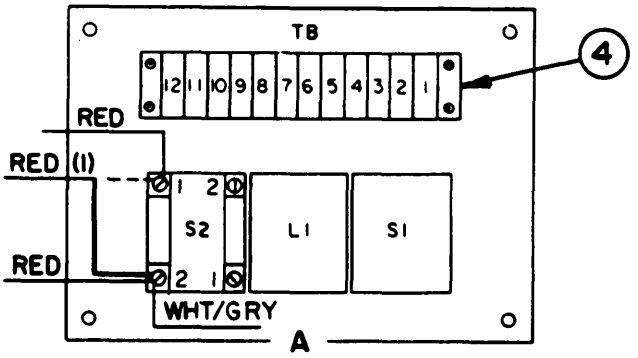
Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove the front panel (2) from the control panel (1) by removing four screws (3).





6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

2. Loosen the screw on terminal 1 of S2, disconnect red wire marked 1, and tighten the screw.

3. Loosen the screw on terminal 2 with the red and white/gray wires attached, connect the red wire marked 1 to terminal 2S and tighten the screw.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

(4) THERMOSTAT SELECTOR switch (S2) defective (No 120°C or 45°C selection, desired temperature 45°C).

General Information:

The 45°C mode of operation can be obtained by bypassing the THERMOSTAT SELECTOR switch (S2).

NOTE

To shut off the heat exchanger, you must return the wire to its original position.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

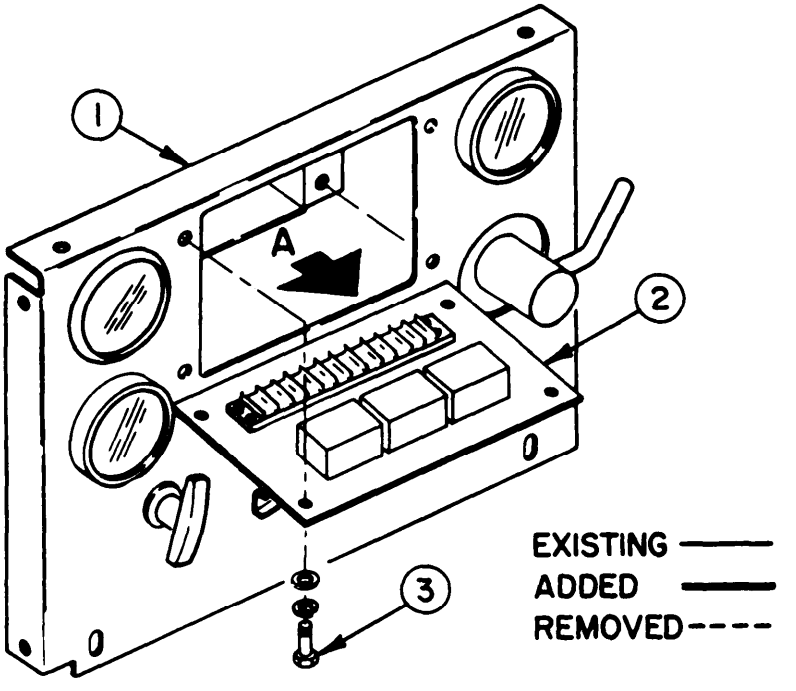
- Screwdriver

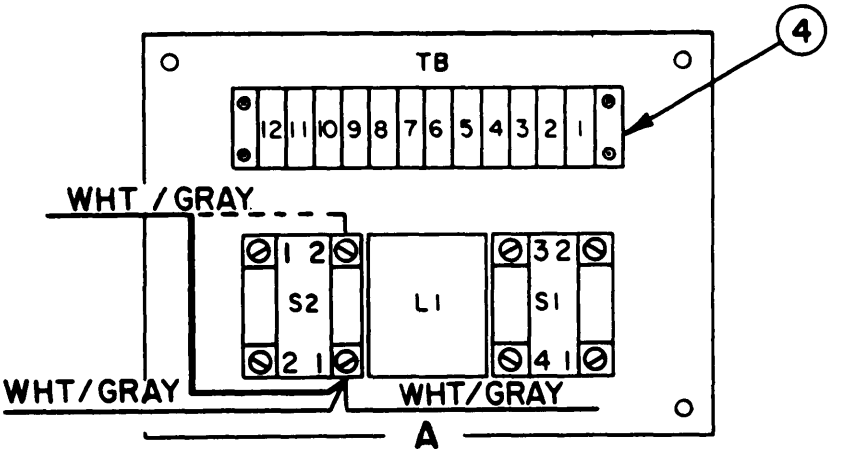
6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the front panel (2) from control panel (1) by removing four screws (3).

2. Loosen the screw on terminal 2 of S2 with 1 white/gray wire attached, disconnect the wire, and tighten the screw.





3. Loosen the screw on terminal 1 with two white/gray wires attached, connect the white/gray wire removed in step 2 above, tighten the screw.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

(5) THERMOSTAT SELECTOR switch (S2) defective (No 120°C or 45°C selection, desired temperature 120°C).

General Information:

The 120°C mode of operation can be obtained by bypassing the THERMOSTAT SELECTOR switch (S2),

NOTE

To shut off the heat exchanger, you must return the wire to its original position.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

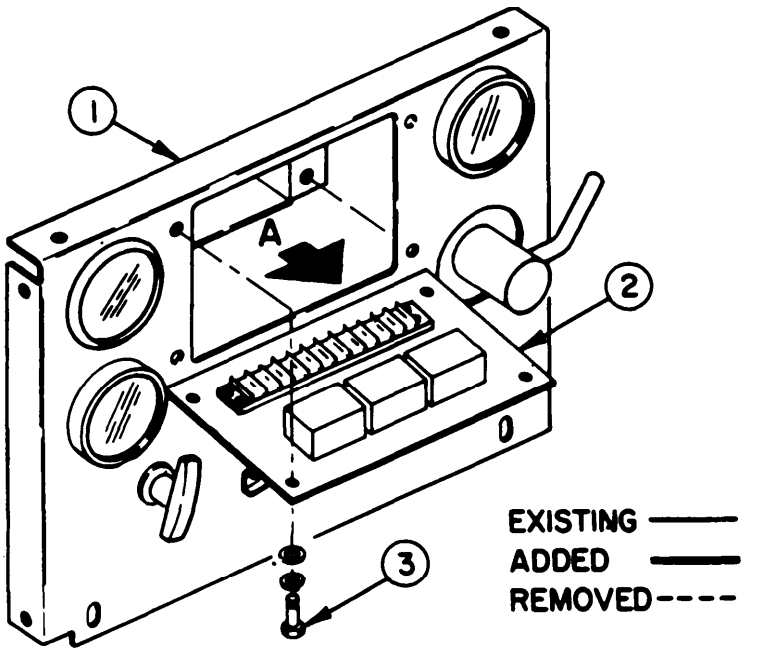
Materials/Tools:

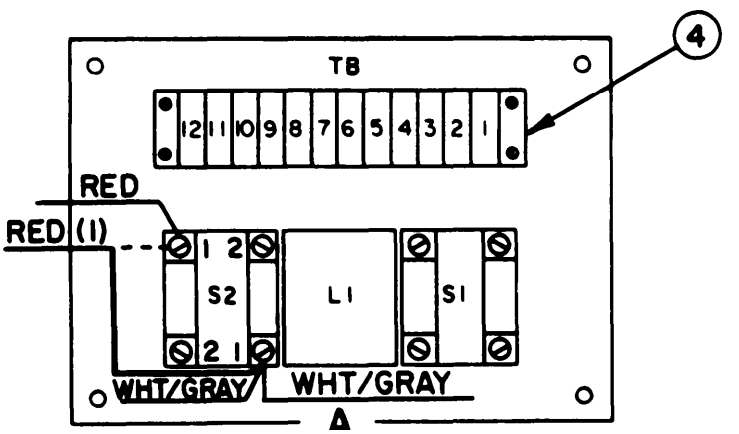
- Screwdriver

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the front panel (2) from the control panel (1) by removing four screw (3).





2. Loosen the screw on terminal 1 of S2 with two red wires attached, disconnect the red wire marked 1, and tighten the screw.

3. Loosen the screw on terminal 1 of S2 with two white/gray wires attached, install the red wire marked 1 removed in step 2 above, and tighten the screw.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures-

i6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

(6) Electronic control module defective. (Burner will ignite when START BURNER switch is depressed; however, it will go out when the switch is released.)

General Information:

The electronic control module can be bypassed without affecting the operation of the heat exchanger.

WARNING

This BDAR fix will eliminate the low and high water pressure safety shutdown of the heat exchanger. Monitor the water pressure on the water pressure gage. Keep the pressure below 130 psig and above 22 psig.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Screwdriver

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

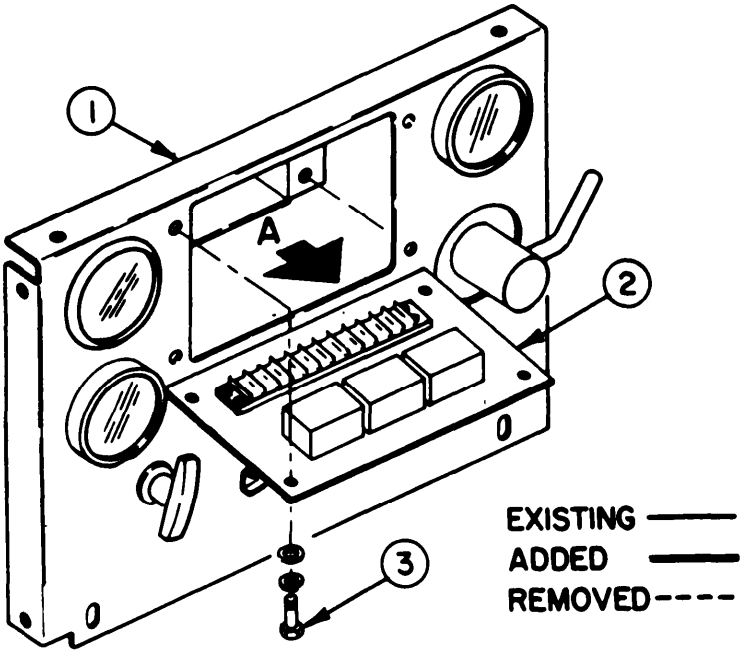
WARNING

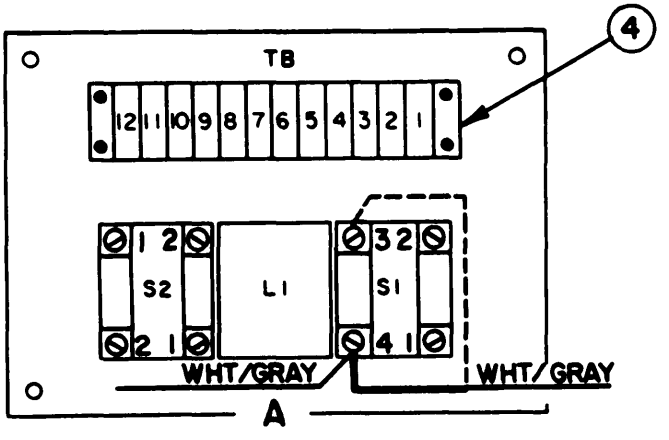
Do not pump fuel into heat exchanger for more than 2 seconds. Heater flooding could occur and cause a fire or explosion. This could result in equipment damage or serious injury to personnel.

NOTE

To start heat exchanger with START BURNER switch bypassed, turn THERMOSTAT SELECTOR switch to the 45° or 120°C position for not more than 2 seconds. To shut down the heat exchangers turn the switch to OFF.

1. Remove the front panel (2) from the control panel (1) by removing four screws (3).





6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

2. Loosen the screw on terminal 3 of S1, disconnect the white/gray wire that connects V1 and S1 and tighten the screw.

3. Loosen the screw on terminal 4 of S1, install the white/gray wire removed in step 2 above and tighten the screw.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

(7) High pressure switch (S5) defective.

General Information:

WARNING

The high pressure switch (S5) can be bypassed. Bypassing the switch eliminates the high pressure safety factor and could cause a fire and/or explosion resulting in equipment damage or serious injury to personnel. Monitor the water pressure on the WATER PRESSURE gage and keep it below 130 psig.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

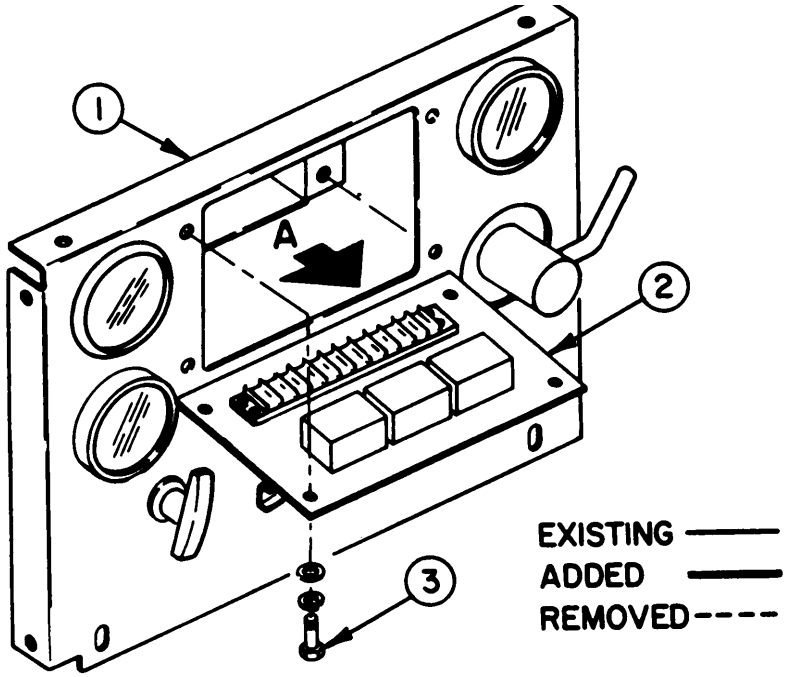
Materials/Tools:

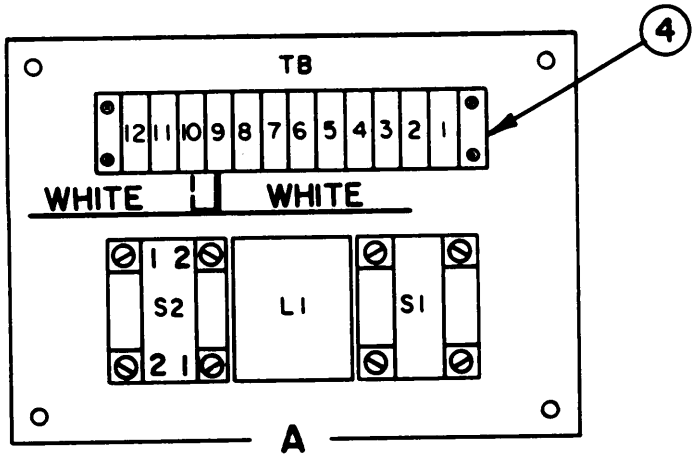
- Screwdriver

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the front panel (2) from the control panel (1) by removing four screws (3).





2. Loosen the screw on terminal 10 of the terminal board, remove the white wire, and tighten the screw.

3. Loosen the screw on terminal 9, install the white wire removed in step 2 above, and tighten the screw.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

(8) Low pressure switch (S6) defective.

General Information:

CAUTION

The low pressure switch (S6) can be bypassed. Bypassing the switch eliminate the low pressure safety factor; monitor the water pressure on the WATER PRESSURE gage and keep it above 22 psig.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

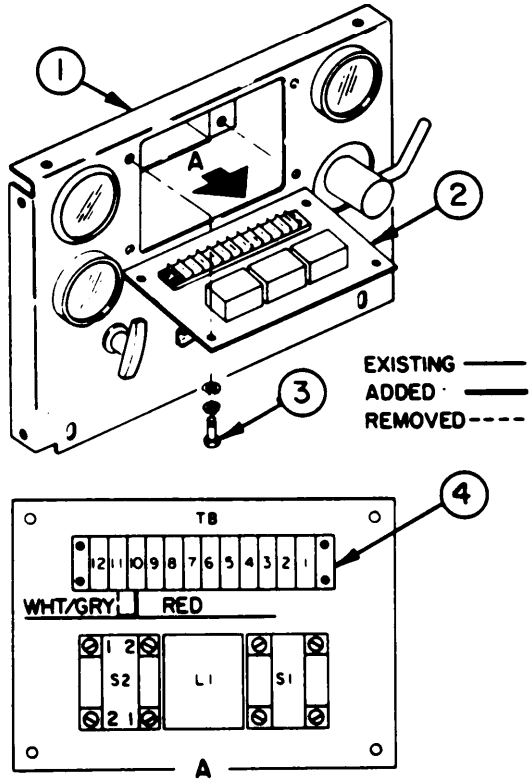
Materials/Tools:

- Screwdriver

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the front panel (2) from the control panel (1) by removing four screws (3).



2. Loosen the screw on terminal 11 of the terminal board and disconnect the white/gray wire; tighten the screw.

3. Loosen the screw on terminal 10 and install the white/gray wire removed in step 2 above; tighten the screw.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

(9) Photocell assembly defective.

WARNING

This BDAR fix will eliminate the low and high water pressure safety shutdown of the heat exchanger. Monitor the water pressure on the water pressure gage. Keep the pressure below 130 psig and above 22 psig.

NOTE

The photocell assembly can be bypassed by using the BDAR fix in paragraph 6-8a(6).

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

b. Fuel System Failures.

(1) Fuel hose defective.

NOTE

The fuel hoses can be repaired by using the BDAR fix in paragraph 6-6b(2).

(2) Heater fuel filter defective.

General Information:

The heater fuel filter can be bypassed without affecting the operation of the heat exchanger unit.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.3 hour

Materials/Tools:

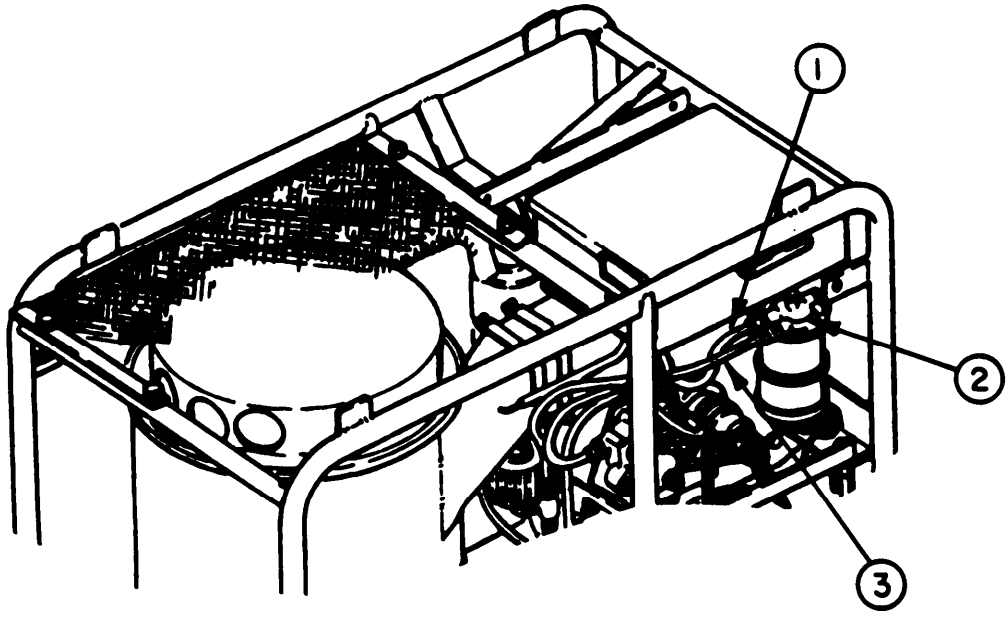
- Copper tubing or similar material
- Hose clamps
- Screwdriver
- Utility knife
- Hacksaw

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

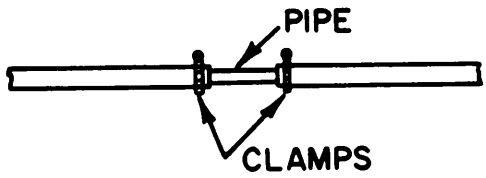
Procedural Steps:

1. Remove fuel can.

2. Cut hoses (1) and (3), as close to fittings as possible, and remove from heater fuel filter (2).



3. Connect free ends of hoses using tubing (38, appx C) and clamps (6, appx C).



4. Re-install fuel can.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

6-8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

c. Indicator System Failures.

(1) WATER TEMPERATURE gage defective.

NOTE

The heat exchanger can be operated with a defective WATER TEMPERATURE gage. The 120°C thermostat (S3) and 45°C thermostat (S4) will limit the water temperature.

(2) WATER PRESSURE gage defective.

NOTE

The heat exchanger can be operated with a defective WATER PRESSURE gage. The high and low pressure switches will protect the unit from damage.

d. Pumping System Failures.

(1) Hole in heater casting.

NOTE

The heat exchanger can be operated with a hole in the casting, provided the heater coil is not leaking.

(2) Water hose defective.

General Information:

The water hose can be repaired without affecting the operation of the heat exchanger.

Limitations:

- If the water pressure is set at maximum pressure, the spliced hose may separate. Operate the pumping system with the water pressure set to the minimum pressure required to complete the mission.

Personnel/Time Required:

- 1 soldier
- 0.4 hour

Materials/Tools

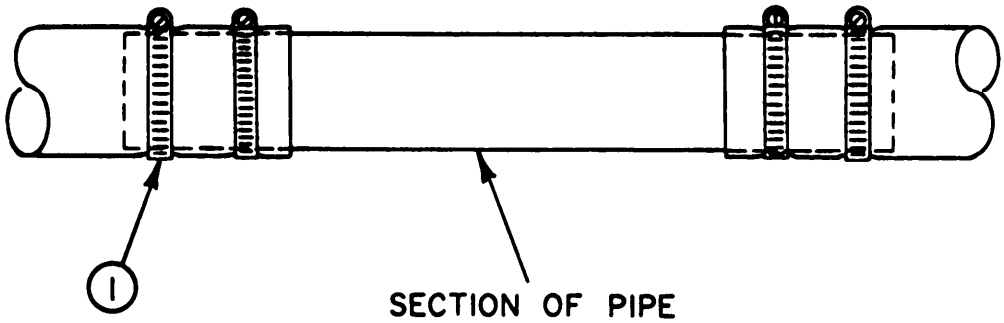
- Galvanized pipe, copper pipe, or similar material
- Hose clamps
- Screwdriver
- Utility knife
- Hacksaw

8. HEAT EXCHANGER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the damaged section from the water hose.

2. Cut a 6 to 8 inch length of pipe (28, appx C) with an outside diameter that fits tightly inside the hose.



3. Install four hose clamps (7, appx C) (1) over the hose and tighten clamps securely.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the heat exchanger using standard maintenance procedures.

CHAPTER 7

M13 DECONTAMINATING APPARATUS

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

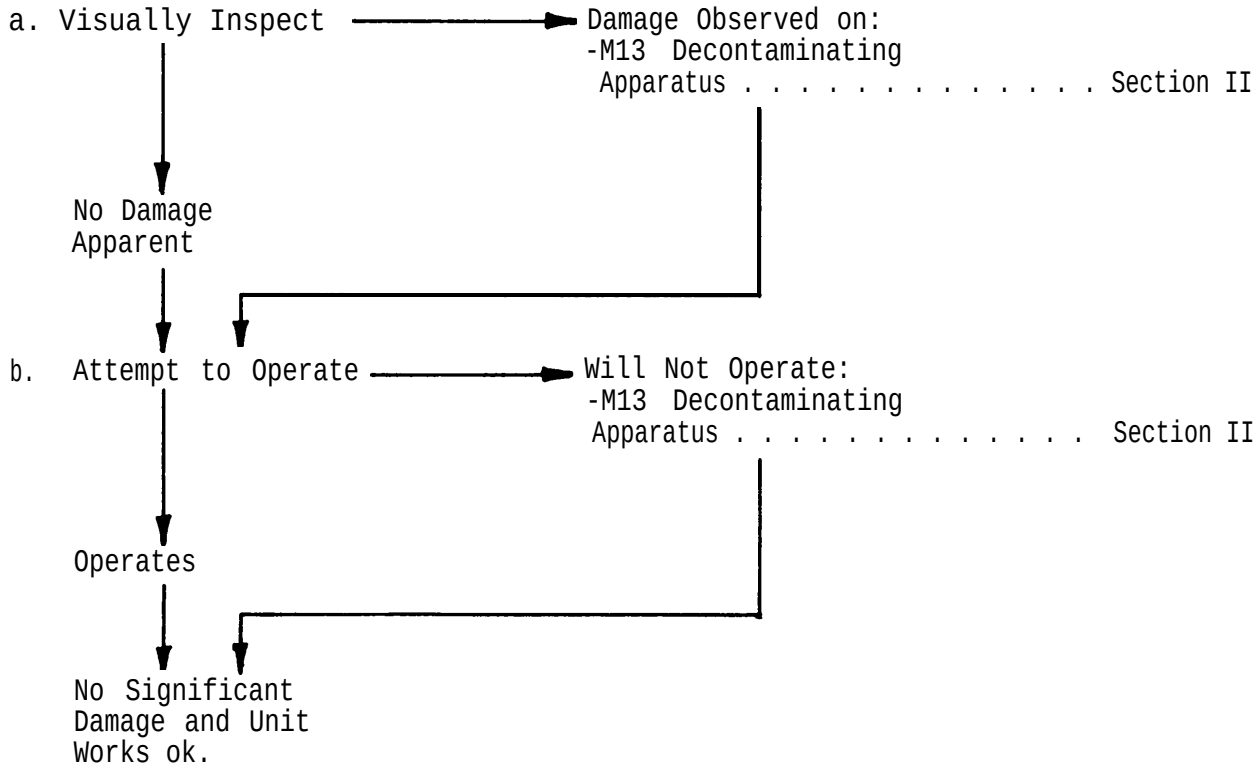
7-1. SCOPE.

This chapter describes BDAR procedures applicable to the M13 Decontaminating Apparatus.

7-2. DESCRIPTION.

The M13 Decontaminating Apparatus is a one man portable unit. The unit holds 14 liters (3.7 gallons) of decontaminating agent (DS2) and will decontaminate an area of approximately 111.5 square meters (1200 square feet).

7-3. ASSESSMENT PROCEDURE.



7-4. REPAIR PROCEDURE INDEX.

Section II. M13 DECONTAMINATING APPARATUS

7-5. GENERAL .

This section contains BDAR procedures applicable to the M13 Decontaminating Apparatus.

7-6. M13 DECONTAMINATING APPARATUS BDAR PROCEDURES.

a. Hose Cut

General Information:

The hose is used to transfer the DS2 from the fluid container to the cleaning brush.

WARNING

Wear proper protective clothing when using DS2, which may cause severe burns to exposed skin and eyes.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.4 hour

Materials/Tools:

- Pressure sensitive tape
- Metal tube (outside diameter of tube same as inside diameter of hose)
- Hose clamps

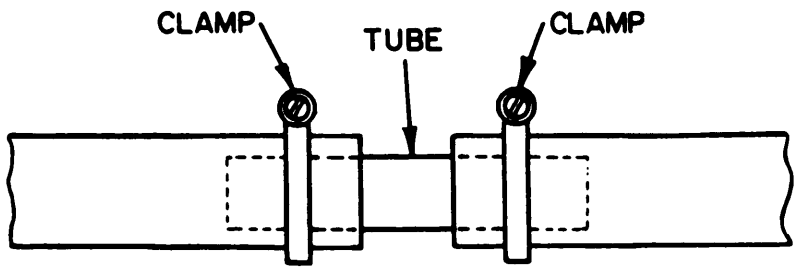
7-6. M13 DECONTAMINATING APPARATUS BDAR PROCEDURES - CONT.

Procedural Steps:

1. Cover hole with pressure sensitive tape (37, appx C).

2. If hole is too large, cut out damaged section of hose. Clean loose particles from hose.

3. Cut tightly fitting metal tube (26, appx C) to proper length.



4. Install metal tube inside cut ends of damaged hose.

5. Secure with hose clamps (6, appx C).

6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M13 Decontaminating Apparatus using standard maintenance procedures.

b. Wands Leaking at Connectors.

General Information:

The wands are threaded together. The sections are sealed by O-rings in the connectors.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

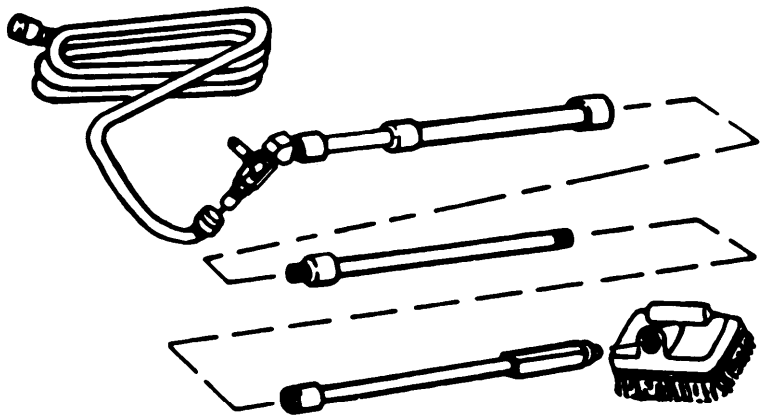
- Sealing compound
- Pressure sensitive tape

7-6. M13 DECONTAMINATING APPARATUS BDAR PROCEDURES - CONT.

Procedural Steps:

1. Separate wand connectors and apply sealing compound (31, appx C) to the threads.

2. Screw connectors together.



3. Wrap connectors with pressure sensitive tape (37, appx C).

4. Record the BDAR action taken when the mission is completed, as soon as practicable, repair the M13 Decontaminating Apparatus using standard maintenance procedures.

c. Decontamination Unit Becomes Inoperative.

General Information:

WARNING

Wear proper protective clothing when using DS2, which may cause severe burns to exposed skin and eyes.

Decontamination can be continued by disassembling the M13 and applying DS2 manually.

Limitations:

• The use life of DS2 is approximately 48 hours when exposed to air.

Personnel/Time Required:

• 1 soldier
• 0.1 hour

7-6. M13 DECONTAMINATING APPARATUS BDAR PROCEDURES - CONT.

Materials/Tools:

- Push broom or brush
- Combination wrench 11/16-inch

Procedural Steps:

1. Disconnect hose from container and the wand.

2. Remove the quick connect plug from the fluid container.

3. Pour DS2 onto unit being decontaminated.

4. Use the M13 brush or push broom type brush to scrub unit being decontaminated.

5. Whenever possible, rinse unit with water after scrubbing with DS2.

6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M13 Decontaminating Apparatus using standard maintenance procedures.

CHAPTER 8

M3A4 SMOKE GENERATOR

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

8-1. SCOPE .

This chapter describes BDAR procedures applicable to the M3A4 Smoke Generator.

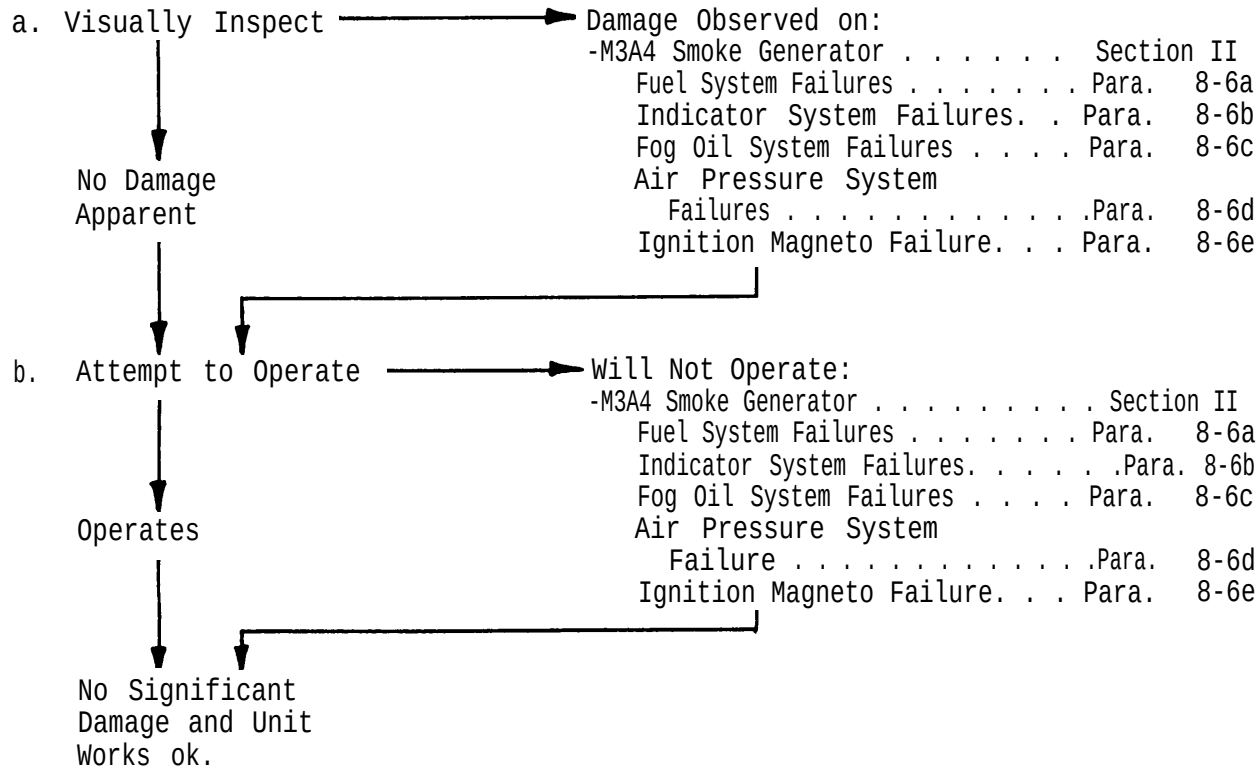
8-2. DESCRIPTION.

The M3A4 Smoke Generator is a self-contained unit using a pulse-jet engine to generate large area smoke screens that will reduce direct visual observation and conceal troops, vehicles, or installations from enemy view.

NOTE

If the M3A4 Smoke Generator cannot be repaired using a BDAR fix, combine parts from other damaged units to make an M3A4 Smoke Generator operational.

8-3. ASSESSMENT PROCEDURE.



8-4. REPAIR PROCEDURE INDEX. Para.

M3A4 Smoke Generator

Section II. M3A4 SMOKE GENERATOR

8-5. GENERAL.

This section contains BDAR procedures applicable to the M3A4 Smoke Generator.

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES.

a. Fuel System Failures.

(1) Fuel tank leaking.

General Information:

If the fuel tank is leaking, it may be repaired until a replacement can be installed.

WARNING

The M3A4 Smoke Generator is extremely hot while operating. Any leakage could result in a destructive fire causing serious burns to personnel.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 1.5 hours

Materials/Tools:

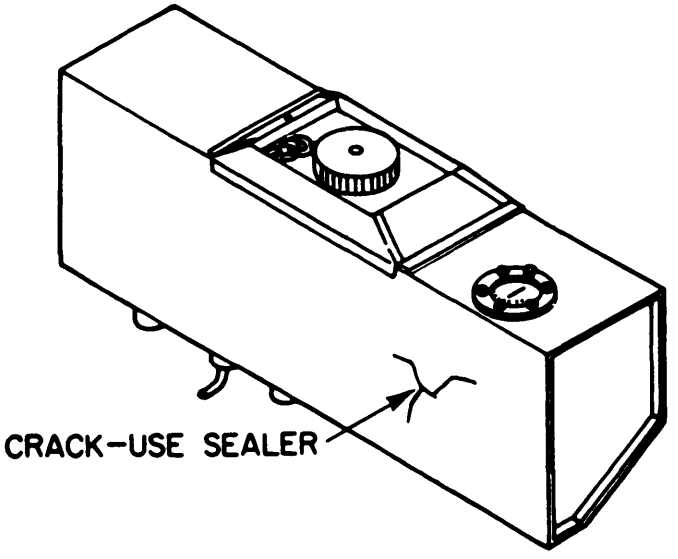
- Adhesive sealant

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

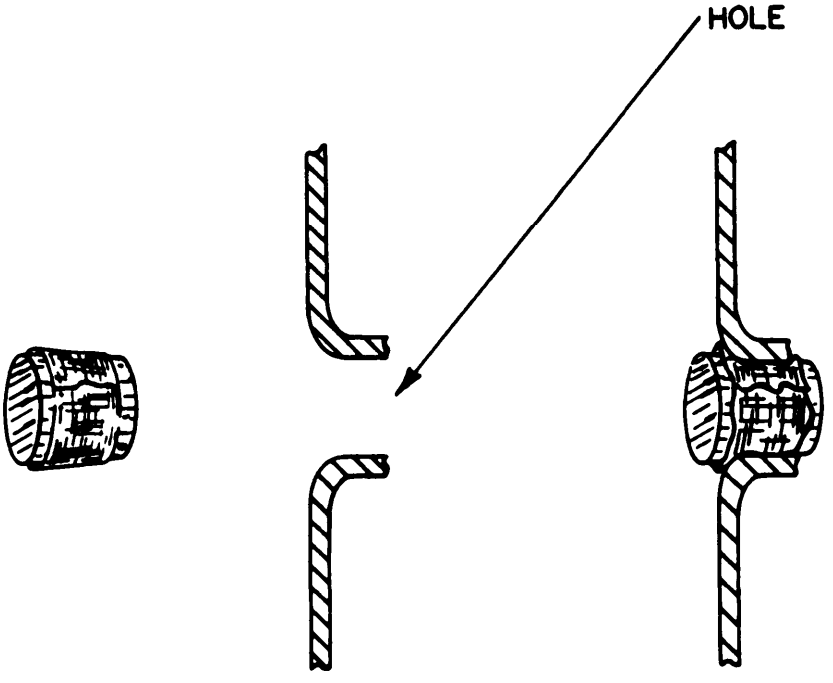
Procedural Steps:

1. Remove fuel tank, if required.

2. Clean area around holes or cracks and fill with adhesive sealant (2, appx C), Permatex II, or any metal filler available.



3. If hole is too large to be filled, make a wooden peg and cover outside of peg with sealer and place in hole.



4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

(2) Fuel filter bowl leaking or broken.

General Information:

If the fuel filter bowl is leaking and no replacement is available, it can be bypassed.

Limitations:

- None

Personnel/Time Required:

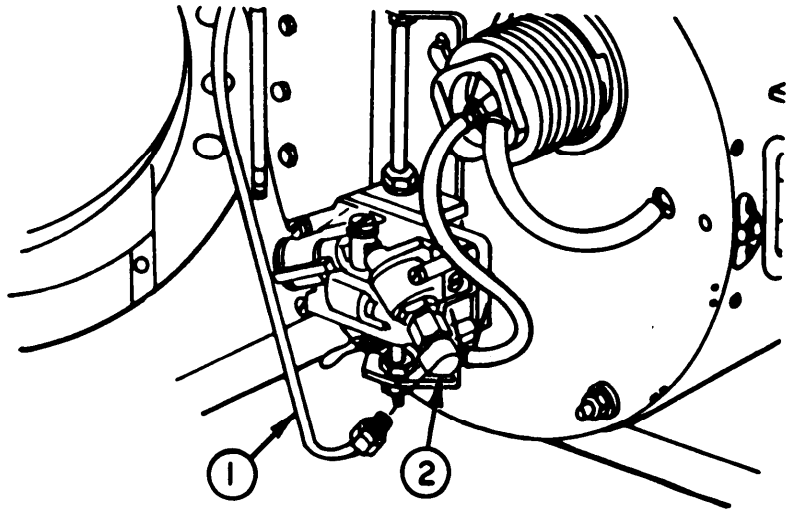
- 1 soldier
- 0.5 hour

Materials/Tools:

- Open end wrench 7/16-inch (2 required)
- Open end wrench 9/16-inch
- Open end wrench 5/8-inch
- Screwdriver

Procedural Steps:

1. Turn off fuel shut off valve.
2. Disconnect fuel hose (1) from elbow (2) on carburetor.



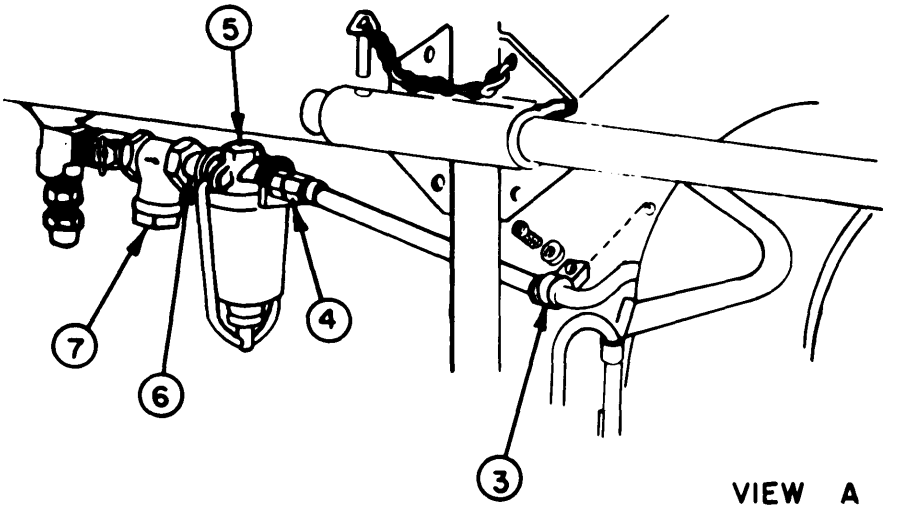
8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

3. Remove screw from clamp (3) (view A), securing the fuel hose.

4. Disconnect bushing (4) with fuel line attached, from fuel filter assembly (5).

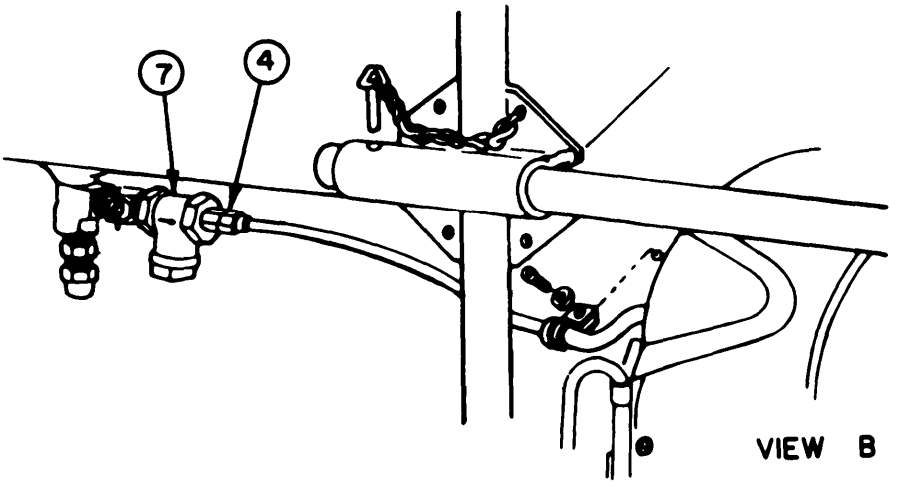
5. Swing fuel filter assembly away from main frame of smoke generator.

6. Remove pipe nipple (6), with fuel filter assembly (5) attached, from sediment strainer (7).



VIEW A

7. Connect bushing (4) with fuel line attached to sediment strainer (7) and swing assembly to original position (view B).



VIEW B

8. Reinstall clamp removed in step 3, on fuel hose.

9. Reconnect fuel hose to elbow on carburetor that was disconnected in step 2 above.

10. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

(3) Fuel shut off valve handle broken.

General Information:

The fuel shut off valve can be operated with a pair of pliers

Limitations:

- None

Personnel/Time Required:

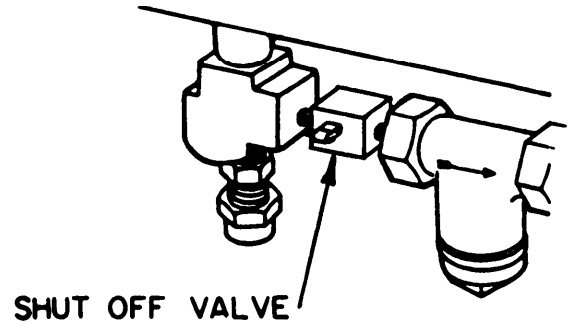
- 1 soldier
- 0.1 hour

Materials/Tools:

- Pliers

Procedural Steps:

1. Use pliers to turn remaining part of broken valve handle.



2. Place valve handle in the desired position.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

(4) Carburetor reservoir toggle valve handle broken.

General Information:

The carburetor reservoir toggle valve can be altered without affecting the operation of the Smoke Generator.

Limitations:

• To turn generator off, hose must be pulled from metering jet.

Personnel/Time Required:

• 1 soldier
• 0.1 hour

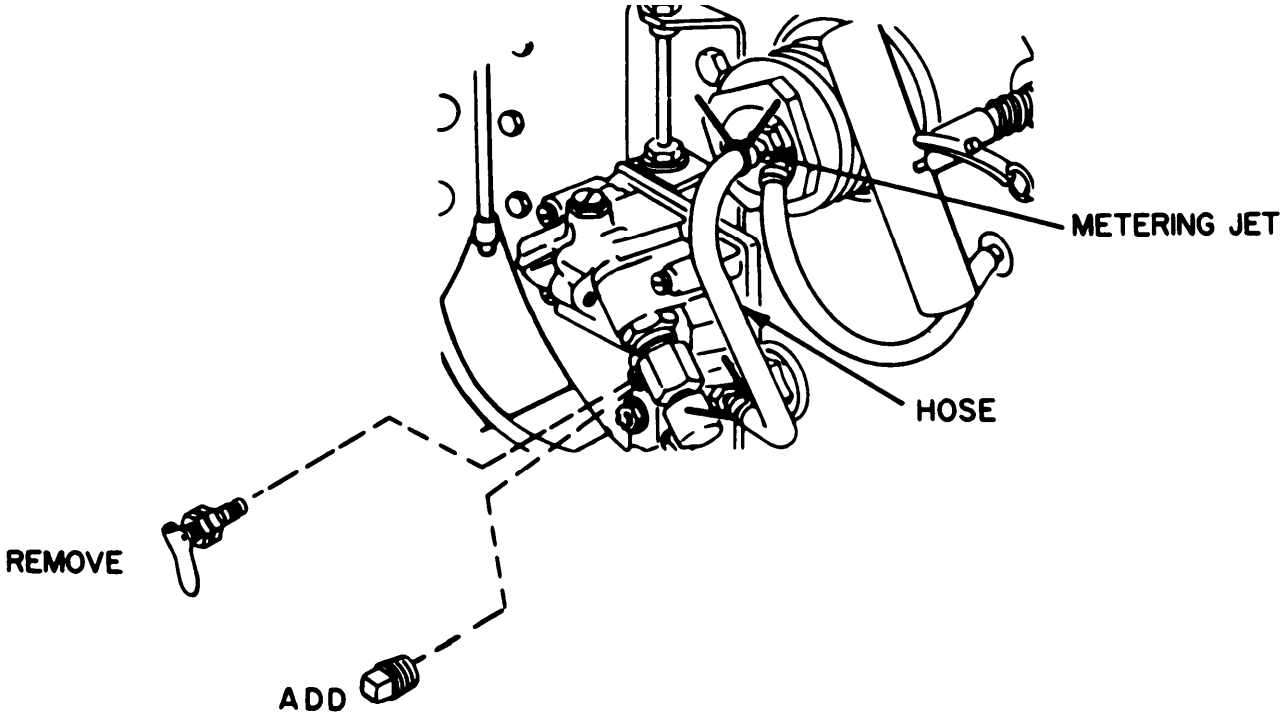
Materials/Tools:

• Open end wrench 9/16-inch
• l/4-inch pipe plug
• Antiseizing tape

Procedural Steps:

1. Remove part of defective valve from valve body.

2. Wrap antiseizing tape (35, appx C) around pipe plug (29, appx C) and install plug in valve body.



3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

8-6 l M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

b. Indicator System Failures.

(1) Fuel tank gage defective.

NOTE

The M3A4 Smoke Generator can be operated with a defective fuel gage.

(2) Air pressure gage defective.

NOTE

The M3A4 Smoke Generator can be operated with a defective air pressure gage.

c. Fog Oil System Failures.

(1) Fog oil line from fog oil pump to engine defective.

General Information:

The fog oil line can be repaired.

Limitations:

- None

Personnel/Time Required:

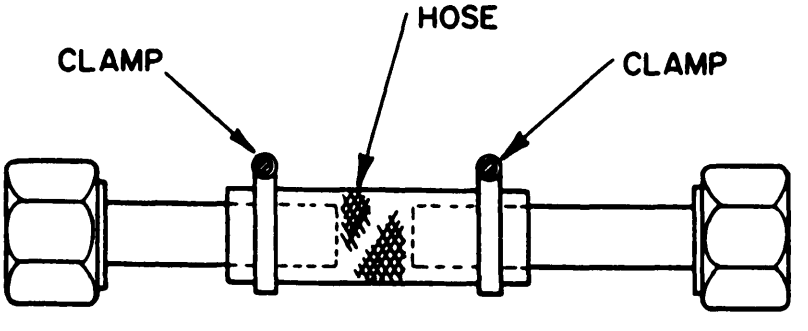
- 1 soldier
- 1.0 hour

Materials/Tools:

- Rubber hose (inside diameter of hose same as outside diameter of fog oil line)
- Hose clamps
- Sealing compound

Procedural Steps:

1. Cut out the damaged section of line.



2. Cut proper length of correct diameter rubber hose (21, appx C).
3. Spread a light coat of sealing compound (31, appx C) inside of hose ends.
4. Position hose over ends of line and secure in place with two or more hose clamps (6, appx C).
5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

(2) Fog oil inlet or fog oil exhaust hose defective.

General Information:

The fog oil hoses can be repaired.

Limitations:

- None

Personnel/Time Required:

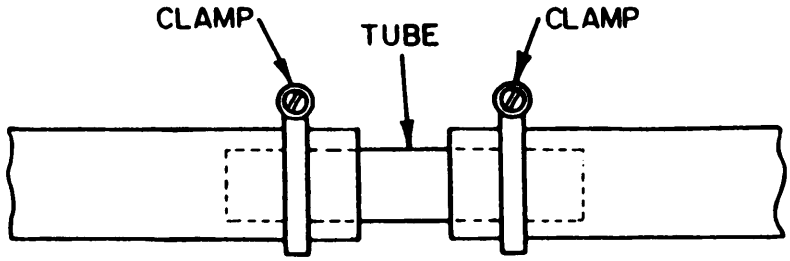
- 1 soldier
- 1.0 hour

Materials/Tools:

- Metal tube (outside diameter of tube same as inside diameter of hose)
- Hose clamps

Procedural Steps:

1. Cut out damaged section of hose. Clean loose particles from cut ends of hose.
2. Cut tightly fitting metal tube (26, appx C) to proper length.



3. Install metal tube inside cut ends of damaged hose.
4. Secure with two or more hose clamps (6, appx C).
5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

(3) Fog oil pump drain broken off.

General Information:

The drain cock hole can be plugged with a bolt or screw.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.3 hour

Material/Tools:

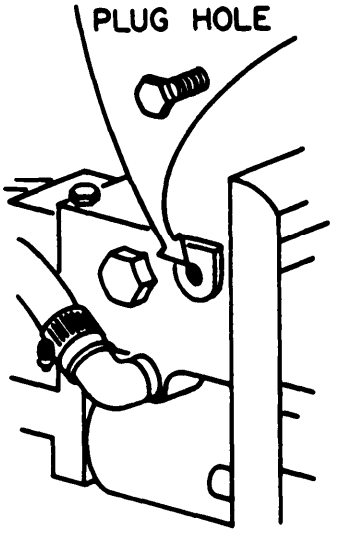
- Screw or bolt
- Screwdriver or adjustable wrench

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove remaining part of broken drain cock.

2. Install a screw or bolt with the same size threads as drain cock.



3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

d. Air Pressure System Failure.

Air pump mounting brackets broken.

General Information:

Mounting brackets can break due to vibration or rough handling.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 1.0 hour

Materials/Tools:

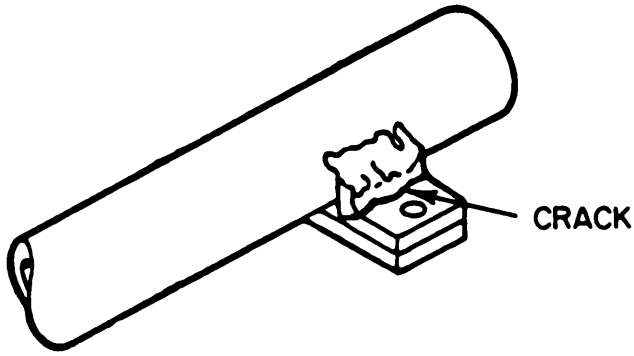
- Welding equipment
- Solid wire or rope

8-6. M3A4 SMOKE GENERATOR BDAR PROCEDURES - CONT.

Procedural Steps:

1. If the bracket is broken at the base metal, reweld in place. Mounting holes may be elongated to compensate for misalignment.

2. If bracket cannot be welded, tie the pump in place using rope (30, appx C) or wire.



3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M3A4 Smoke Generator using standard maintenance procedures.

e. Ignition Magneto Failure.

The M3A4 Smoke Generator contact set (points) is interchangeable with the contact set (points) from the M2 heater of the M12A1 Decontaminating Apparatus.

CHAPTER 9

GAS-PARTICULATE FILTER UNITS: M7A1, M8A2, M8A3, M13, M13A1, and M14

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

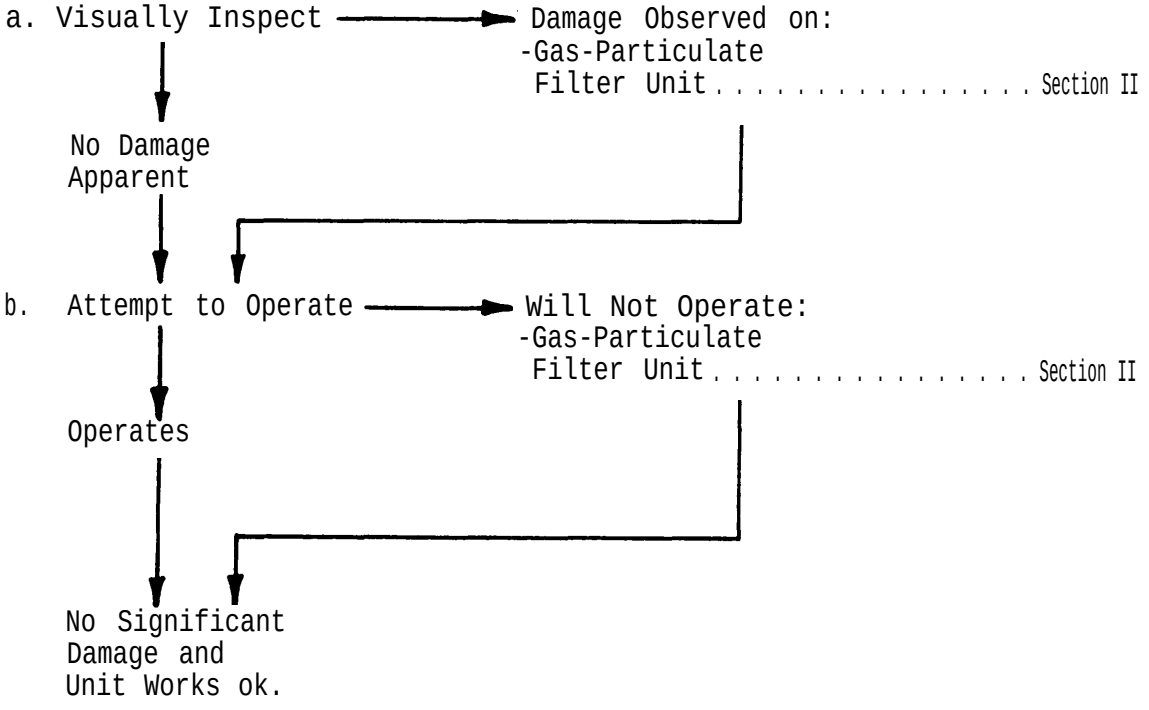
9-1. SCOPE .

This chapter contains BDAR procedures applicable to the Gas-Particulate Filter Units M7A1, M8A2, M8A3, M13, M13A1 and M14.

9-2. DESCRIPTION.

The Gas-Particulate Filter Units provide NBC protection to hospital patients, armored ambulance patients, and combat vehicle personnel.

9-3. ASSESSMENT PROCEDURE.



9-4. REPAIR PROCEDURE INDEX. Para.

SECTION II. GAS-PARTICULATE FILTER UNITS: M7A1, M8A2, M8A3, M13, M13A1, AND M14

9-5. GENERAL .

This section contains BDAR procedures applicable to the Gas-Particulate Filter Units M7A1, M8A2, M8A3, M13, M13A1, and M14.

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES.

NOTE

Each BDAR fix pertains only to the model of the Gas-Particulate Filter Units listed in parenthesis.

a. Headpiece Torn or Punctured (M7A1 and M14).

General Information:

The tom area of the headpiece must be completely free of foreign matter in order to perform this BDAR fix.

Limitations:

• Moisture may need to be removed for this procedure to be effective

Personnel/Time Required:

• 1 soldier
• 0.1 hour

Materials/Tools:

• Pressure sensitive tape

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Wipe all dirt, grease, and foreign matter from the torn area on the headpiece.

2. Cut a piece of pressure sensitive tape (37, appx C) 2 inches longer than the tear in the headpiece.

3. Center the pressure sensitive tape over the tear in the headpiece and press firmly in place.

4. Repeat steps 1 thru 3 on the other side of tear.

5. Record the BDAR action taken. when the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

b. Eyepiece Punctured (M7A1 and M14).

General Information:

The damaged area of the eyepiece must be completely free of foreign matter in order to perform this BDAR fix.

Limitations:

• The patient’s view will be partially blocked by this BDAR fix.

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Personnel/Time Required:

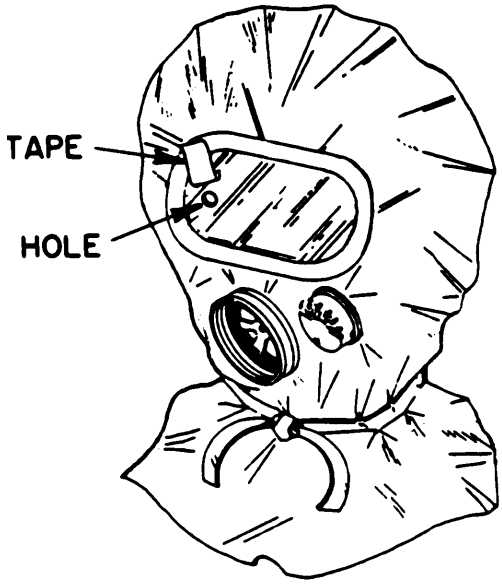
- 1 soldier
- 0.1 hour

Materials/Tools:

- Pressure sensitive tape

Procedural Steps:

1. Wipe all dirt, grease, and foreign matter from the damaged area on the eyepiece.



2. Cut a piece of pressure sensitive tape (37, appx C) large enough to cover the damaged area by at least 1 inch on all four sides.

3. Center the pressure sensitive tape over the damaged area in the eyepiece and press firmly in place.

4. Repeat steps 1 thru 3 on the other side of the hole.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

c. Headpiece Strap Assembly Missing (M7A1 and M14).

General Information:

The strap assembly allows the patient (if capable) to tighten the headpiece around his neck. This BDAR fix may require another person to tighten and loosen the headpiece.

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Limitations:

• This BDAR fix may slow down installation and removal of the headpiece.

Personnel/Time Required:

• 1 soldier
• 0.1 hour

Materials/Tools:

• Footwear laces, small cord, or similar items

Procedural Steps:

1. Tie the neck of the headpiece with a footwear lace (23, appx C) or similar item.

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

d. Ratchet Clamp Broken or Missing (M7A1, M8A2, M8A3, M13, M13A1, and M14).

General Information:

This BDAR fix should be performed even if the hose remains firmly attached to the adapters.

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Limitations:

• None

Personnel/Time Required:

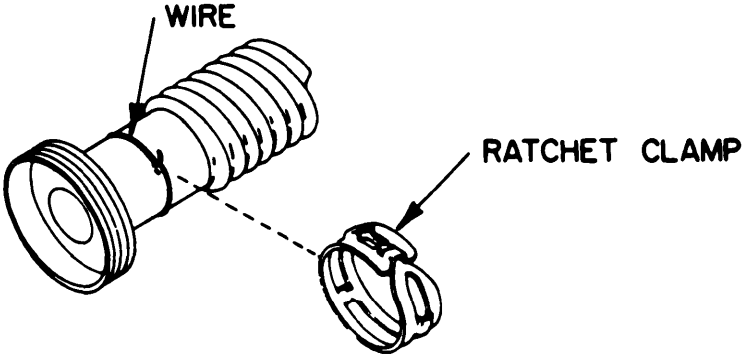
• 1 soldier
• 0.1 hour

Materials/Tools:

• Pliers or similar tool
• Solid wire (12 AWG or larger)

Procedural Steps:

1. Wrap solid wire (42, appx C) around the hose and twist ends as shown. Ensure wire ends are pressed against the hose.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

e. Airduct Hose Punctured. (Small Holes) (M7A1, M8A2, M8A3, M13, M13A1, and M14).

General Information:

Nonpliable or hardening type adhesive sealants will not work on this BDAR fix.

Limitations:

• The adhesive sealant must be allowed time to dry. See label on container for drying instructions.

Personnel/Time Required:

• 1 soldier
• 0.2 hour

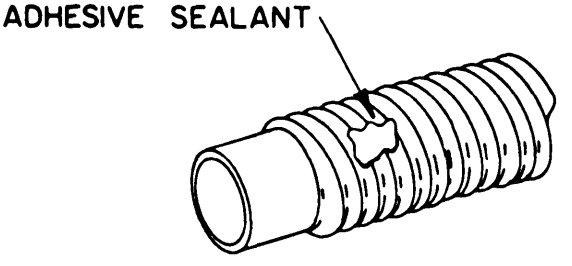
9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Materials/Tools:

- Adhesive sealant

Procedural Steps:

1. Apply a liberal amount of adhesive sealant (2, appx C) over the hole in the hose.



2. Allow the adhesive sealant to dry per information on the container.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

f. Airduct Hose Punctured (Large Holes) or Cut (M7A1, M8A2, M8A3, M13, M13A1, and M14).

General Information:

Nonpliable or hardening type adhesive sealants will not work on this BDAR fix.

Limitations:

- The adhesive sealant must be allowed time to dry. See label on container for drying instructions.

Personnel/Time Required:

- 1 soldier
- 0.2 hour

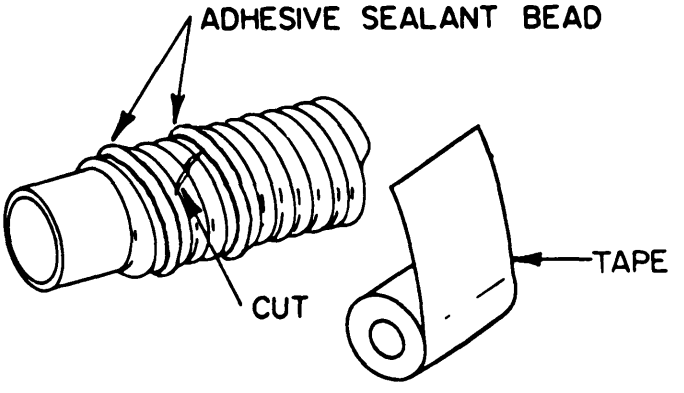
Materials/Tools:

- Adhesive sealant
- Pressure sensitive tape

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Spread a bead of adhesive sealant (2, appx C) in the grooves of the hose on each side of the damaged area. The bead shall circle the hose at least one full turn.



2. Allow the adhesive sealant to skin dry, then wrap the adhesive sealant and damaged area with several layers of pressure sensitive tape (37, appx C).

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

g. Quick Disconnect Coupling "O" Ring Missing (M7A1, M8A2, M8A3, M13, M13A1, and M14).

General Information:

The “O” rings in the quick disconnect couplings provide an air tight seal for the plug connections.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.1 hour

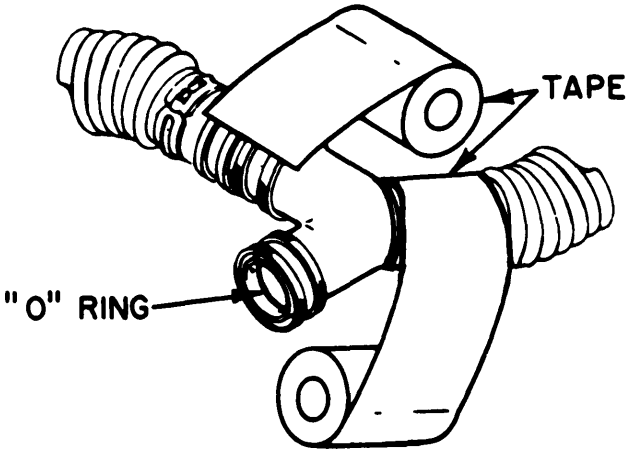
Materials/Tools:

- Pressure sensitive tape

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Wrap several layers of pressure sensitive tape (37, appx C) over the quick disconnect coupling connection.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

h. Electrical Wire Defective (M7A1, M8A2, M8A3, M13, M13A1, and M14).

General Information:

Any broken electrical wire can be repaired by the following BDAR fix.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.1 hour

Materials/Tools:

- Electrical tape
- Pliers
- Soldering iron
- Solder

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove sufficient insulation from the broken wire ends to allow a minimum of four turns of the wire ends.

2. Twist the wire ends together a minimum of four turns.
3. Solder the twisted wire ends, if possible.
4. Wrap electrical tape (36, appx C) around the exposed wire ends.
5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

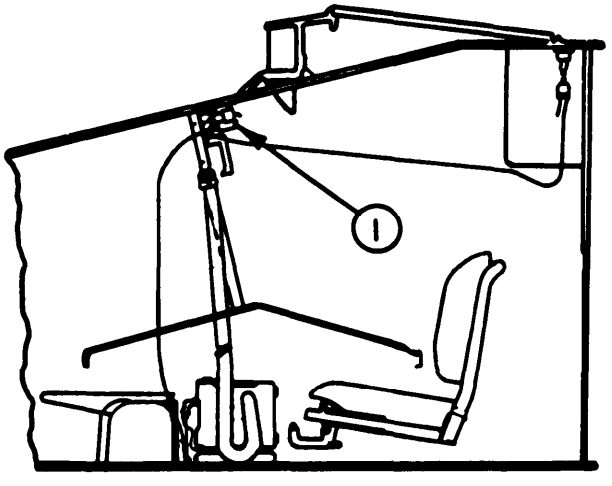
i. Circuit Breaker Defective (M8A2, M8A3, M13, M13A1, and M14).

General Information:

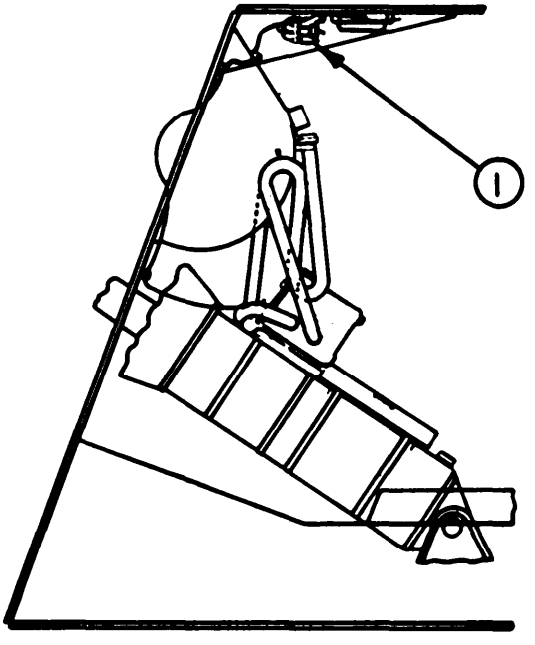
CAUTION

This BDAR fix will eliminate the circuit breaker as a safety device.

For typical location of the circuit breaker and switch assembly (l), refer to the following drawings.



DRIVER'S COMPARTMENT INSTALLATION



CAB INSTALLATION

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Limitations:

- None

Personnel/Time Required:

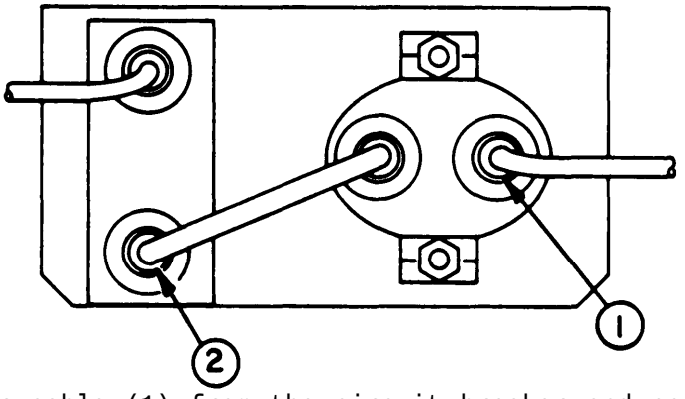
- 1 soldier
- 0.1 hour

Materials/Tools:

- None

Procedural Steps:

1. Remove the end of the jumper cable (2) from the air purifier switch.



2. Remove power cable (1) from the circuit breaker and connect to the air purifier switch.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

j. ON/OFF Switch Defective (M7A1).

General Information:

This BDAR will bypass the ON/OFF switch. To reenergize the M2A2 Air Purifier, remove the 115 volt ac plug from the power source.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.1 hour

Materials/Tools:

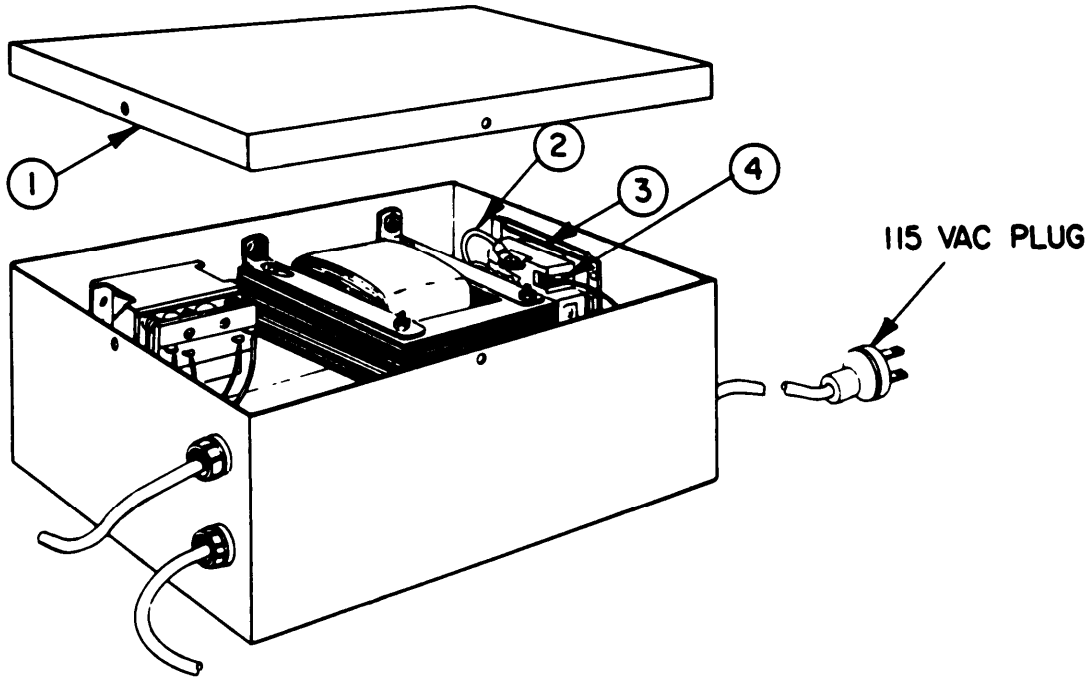
- Screwdriver

9-6. GAS-PARTICULATE FILTER UNIT BDAR PROCEDURES - CONT.

Procedural Steps:

1. Disconnect power cord from outlet.

2. Remove the cover (1) from the transformer unit.



3. Remove ON/OFF switch (3).

4. Remove the three wires from the three right side terminals (4) and connect directly across to the three left side terminals (2).

5. Reinstall ON/OFF switch (3).

6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Gas-Particulate Filter Unit using standard maintenance procedures.

CHAPTER 10

M51 COLLECTIVE PROTECTION SHELTER SYSTEM

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

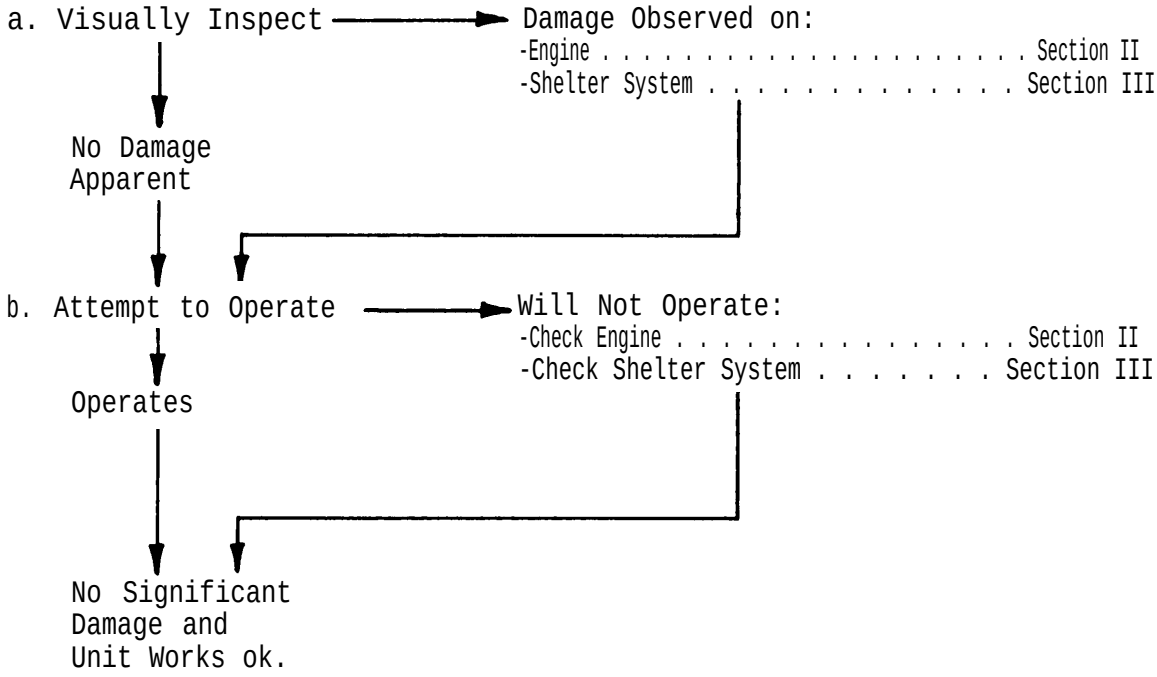
10-1. SCOPE .

This chapter contains BDAR procedures applicable to the M51 Collective Protection Shelter System.

10-2. DESCRIPTION.

The M51 Collective Protection Shelter System is a self-contained unit designed to provide collective protection for up to 10 occupants against all known chemical-biological (CB) agents.

10-3. ASSESSMENT PROCEDURE.



10-4. REPAIR PROCEDURE INDEX. Para.

SECTION II. ENGINE

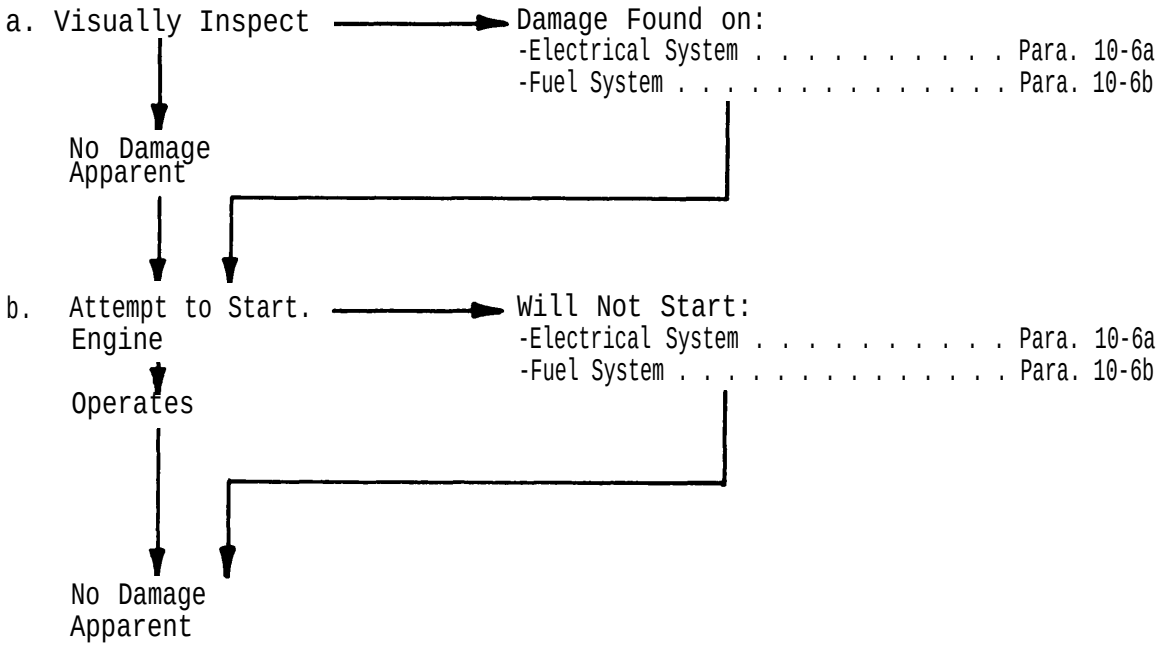
10-5. GENERAL .

NOTE

The M12A1 Decontaminating Apparatus uses the same engine as the M51 Shelter System. The engine or parts of the engine from the M12A1 Decontaminating Apparatus can be cannibalized and used on the M51 Shelter System.

This section contains BDAR procedures applicable to the engine.

10-5. GENERAL - CONT.



10-6. ENGINE BDAR PROCEDURES.

a. Electrical System Failures.

(1) Cracked battery.

General Information:

The battery can be repaired without affecting the operation of the engine.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Epoxy

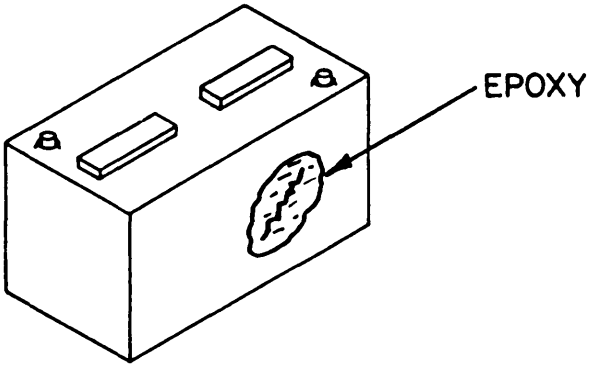
10-6. ENGINE BDAR PROCEDURES - CONT.

Procedural Steps:

WARNING

Disconnect ground cable first before removing the battery. Always wear eye protection when working with the battery to prevent injury to eyes.

1. Remove battery to a suitable work area.



BATTERY

2. Liberally coat the cracked area of the battery with epoxy (15, appx C) and allow to cure.

3. Fill battery with acid solution, if necessary.

4. Reinstall battery.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the engine using standard maintenance procedures.

(2) Electrical wire defective.

General Information:

Any broken electrical wire can be repaired by the following BDAR fix.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.2 hour

Materials/Tools:

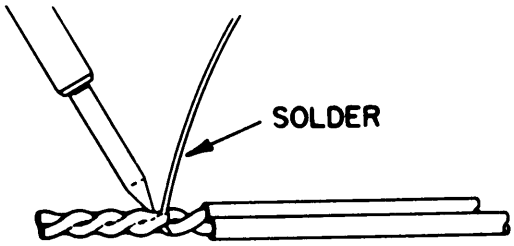
- Electrical tape
- Electrician's pliers
- Soldering iron
- Solder

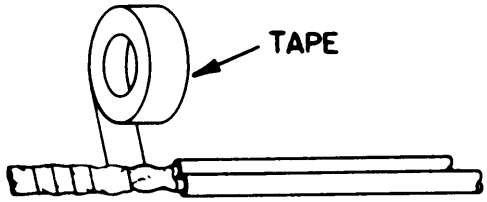
10-6. ENGINE BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove sufficient insulation from the broken wire ends to allow a minimum of four twists of the wire ends.

2. Twist the wire ends together a minimum of four twists.





3. Solder the twisted wired ends, if possible.

4. Wrap electrical tape (36, appx C) around exposed wire ends.

5. Record the BDAR action taken. When the mission is completely as soon as practicable, repair the engine using standard maintenance procedures.

(3) Low oil pressure switch (S16) defective.

CAUTION

With a defective low oil pressure switch you have no low oil pressure light, check the oil level frequently.

NOTE

The engine can be operated with a defective low oil pressure switch.

b. Fuel System Failures.

(1) Fuel fitting leaking.

General Information:

A leaking fitting can be repaired without affecting the operation of the engine. The fitting should be tightened first to attempt to stop the leak.

10-6. ENGINE BDAR PROCEDURES - CONT.

Limitations:

- None

Personnel/Time Required:

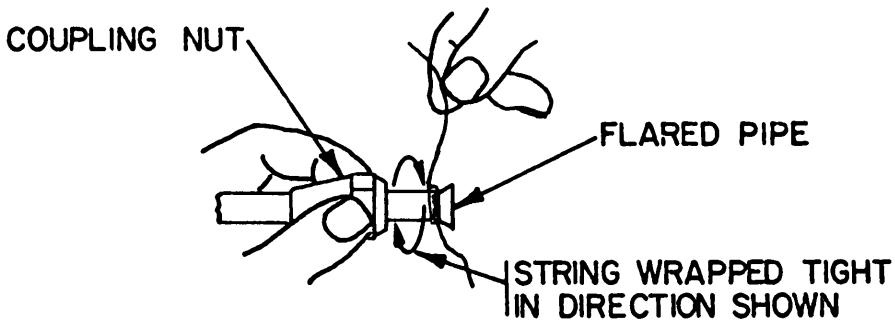
- 1 soldier
- 0.3 hour

Materials/Tools:

- Fuel resistant sealant (silicone, rubber, or similar material)
- Twine or light tie cord

Procedural Steps:

1. Remove coupling flange nut.
2. Slide coupling flange nut up and away from flared end.



3. Clean grease, oil, and fuel from flared end.
4. Wrap twine (39, appx C) around flared end of line.
5. Liberally coat twine, with fuel resistant sealant (33, appx C).
6. Reinstall line and tighten coupling flange nut securely.
7. Check for leaks.
8. Record the BDAR action taken. When the mission is complated, as soon as practicable, repair the engine using standard maintenance procedures.

10-60 ENGINE BDAR PROCEDURES - CONT.

(2) Fuel tank leaking.

General Information:

Stopping of fuel leakage due to holes can be attempted without removing tank. If the fuel leak is inaccessible, remove the fuel tank.

Limitations:

- None

Personnel/Time Required:

- 2 soldiers
- 1.0 hour

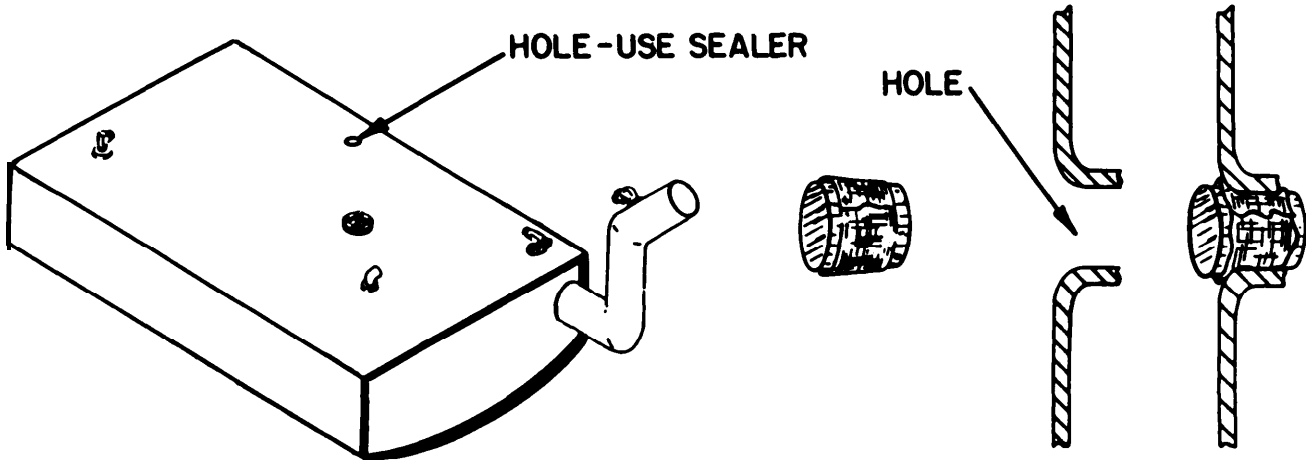
Materials/Tools:

- Wooden peg
- Adhesive sealant
- synthetic rubber sealant

Procedural Steps:

1. Remove-fuel tank, if required.

2. Clean area around holes and fill with adhesive sealant (2, appx C).



3. If hole is too large to be filled, use a wooden peg, cover outside of peg with sealant, (33, appx C) and place in the hole.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the engine using standard maintenance procedures.

SECTION III. SHELTER

10-7. SHELTER BDAR PROCEDURES.

a. Electrical System Failures.

(1) AUXILIARY 120 VAC circuit breaker (CB1) defective.

General Information:

CAUTION

Circuit breaker (CB1) can be bypassed with a 10 amp fuse. In the absence of a fuse, use regular wire. The use of regular wire will eliminate the 10 amp safety factor.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

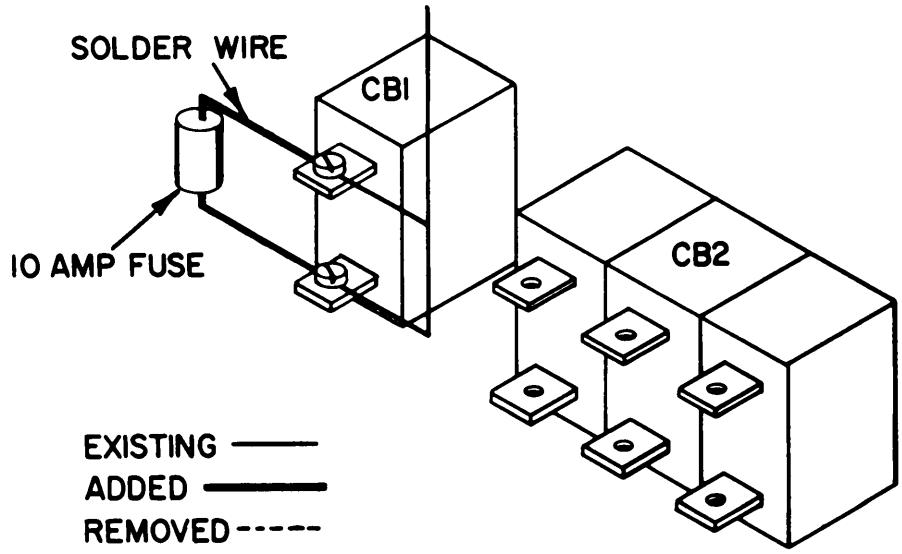
Materials/Tools:

- 10 amp fuse
- Soldering iron
- Electrical wire (16 AWG or larger)
- Solder

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.

2. Cut two pieces of electrical wire (43, appx C) 2 inches in length and remove l/2-inch of insulation from each end.



10-7. SHELTER BDAR PROCEDURES - CONT.

3. Solder a 2 inch long piece of electrical wire (43, appx C) to both ends of a 10 amp fuse (16, appx C).

4. Solder the fuse or a straight piece of regular wire between the two terminals on the back of the circuit breaker (CB1).

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

(2) GENERATOR FREQUENCY meter defective.

NOTE

The M51 Shelter System can be operated with a defective GENERATOR FREQUENCY meter. The engine is governed to keep the engine at a speed of 3600 rpm.

(3) RECIRCULATION FAN circuit breaker (CB2) defective.

General Information:

CAUTION

Circuit breaker (CB2) can be bypassed by using the CONDENSER FAN circuit breaker (CB3). The use of CB3 which is a 15 amp circuit breaker will eliminate the 10 amp safety factor.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.5 hour

Materials/Tools:

- Screwdriver
- Electrical wire (18 or 20 AWG)

10-7. SHELTER BDAR PROCEDURES - CONT.

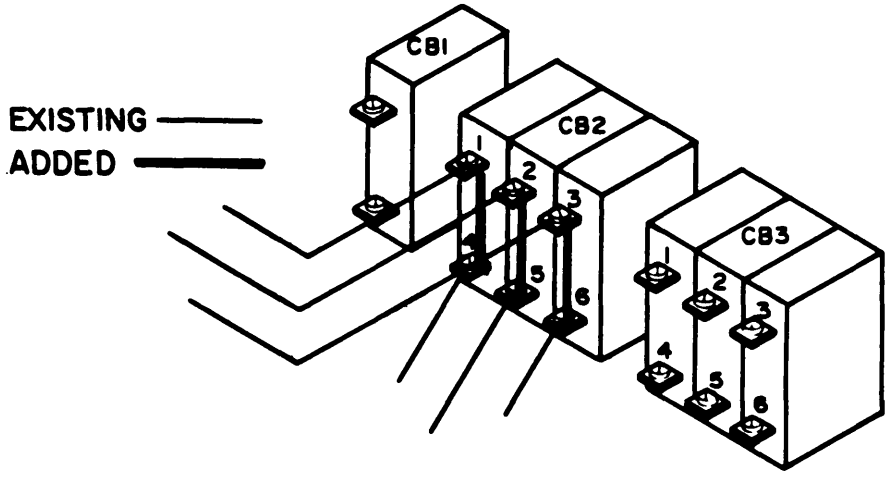
Procedural Steps:

1. Cut three pieces of electrical wire (41, appx C) 6 inches in length and remove l/2-inch of insulation from each end,

2. Connect a wire between pin 1 and pin 4 of circuit breaker (CB2).

3. Connect a wire between pin 2 and pin 5 of circuit breaker (CB2).

4. Connect a wire between pin 3 and pin 6 of circuit breaker (CB2).



5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

(4) CONDENSER FAN circuit breaker (CB3) defective.

General Information:

The circuit breaker (CB3) can be bypassed by using the recirculation fan circuit breaker (CB2).

Limitations:

- None

10-7. SHELTER BDAR PROCEDURES - CONT.

Personnel/Time Required:

- 1 soldier
- 0.3 hour

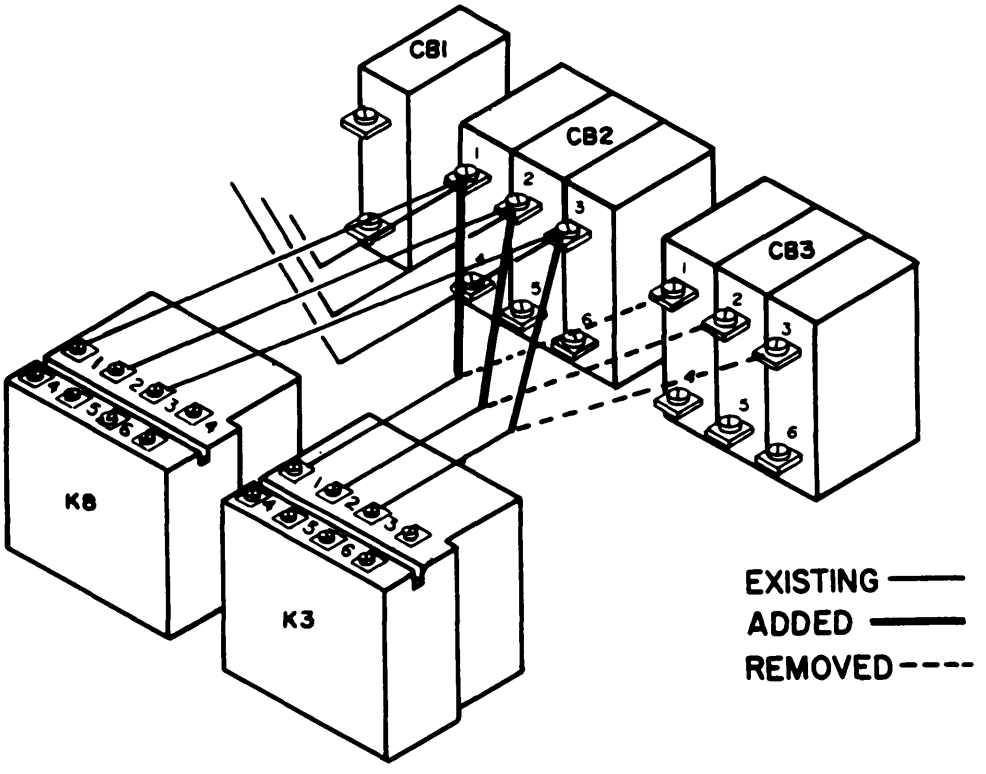
Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.

2. Disconnect the wire from pin 1 of circuit breaker (CB3) and connect to pin 1 of circuit breaker (CB2).



3. Disconnect the wire from pin 2 of circuit breaker (CB3) and connect to pin 2 of circuit breaker (CB2).

4. Disconnect the wire from pin 3 of circuit breaker (CB3) and connect to pin 3 of circuit breaker (CB2).

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(5) PRESS TO INFLATE switch (S3) defective.

General Information:

The Shelter will inflate without PRESS TO INFLATE switch (S3).

Limitations:

• It will take slightly longer to inflate shelter.

Personnel/Time Required:

• 1 soldier
• 0.3 hour

Materials/Tools:

. Screwdriver

(6) ENGINE START switch (S17) defective.

General Information:

The ENGINE START switch (S17) can be bypassed by using the PANEL LIGHT switch (S24) .

Limitations:

• The panel light will not operate.

Personnel/Time Required:

• 1 soldier
• 0.3 hour

Materials/Tools:

• Screwdriver

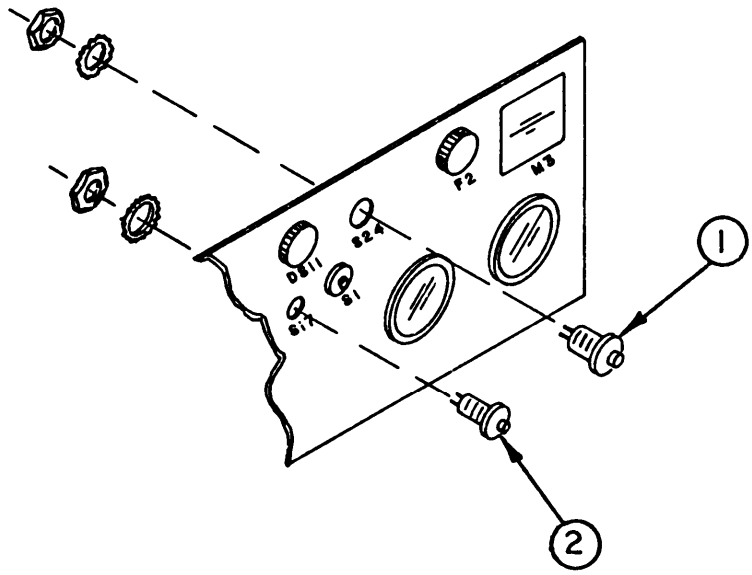
Procedural Steps:

NOTE

- To prevent switch identification confusion, the following BDAR fix exchanges switches.
- If time does not permit, it is not necessary to exchange switches, just exchange wires. To start engine, press PANEL LIGHT switch.

1. Remove main control indicator access cover by releasing the three fasteners.
2. Disconnect the wires to switch (S17) (2) and mark the wires.

10-7. SHELTER BDAR PROCEDURES - CONT.



3. Mark and disconnect the wires to switch (S24) (l).

4. Remove switch (S17) (2) and lay aside.

5. Remove push switch (S24) (1) and install in the hole where switch (S17) was removed.

6. Reconnect the wires marked S17 to the switch installed in step 5.

7. Install the switch removed in step 4 in the remaining hole.

8. Reconnect the wires marked S24 to the switch.

9. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

(7) ENGINE CONTROL switch (S15) defective.

General Information:

The ENGINE CONTROL switch (S15) can be bypassed without affecting the operation of the engine. To shut off the engine, idle the engine downs and pull out the manual choke lever.

10-7. SHELTER BDAR PROCEDURES - CONT.

Limitations:

- None

Personnel/Time Required:

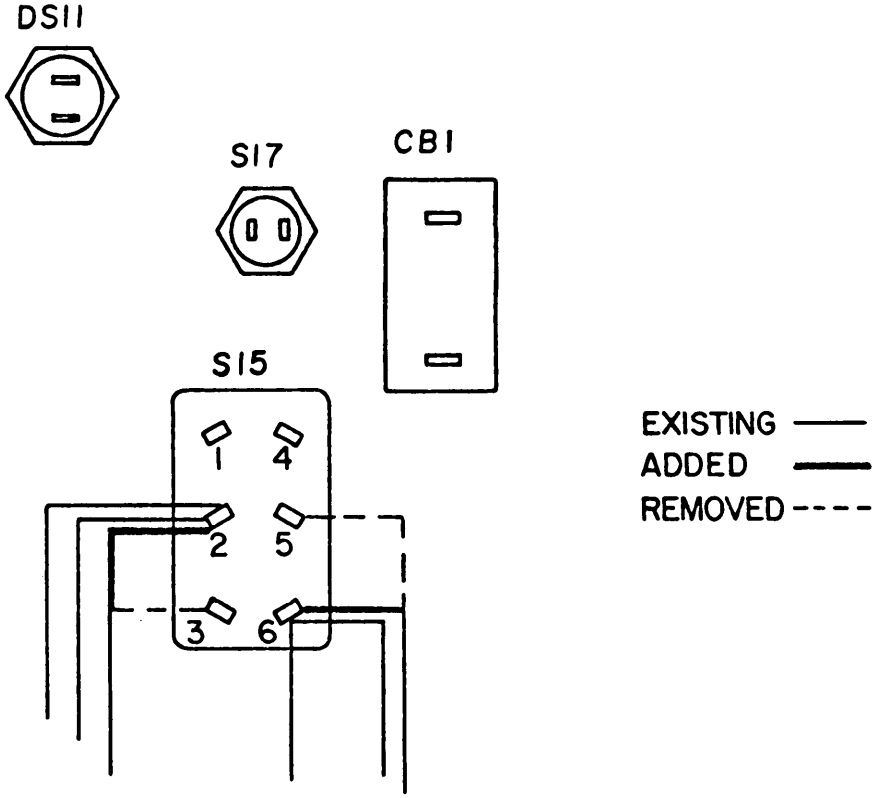
- 1 soldier
- 0.3 hour

Materials/Tools:

- Screwdriver
- Knife

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners
2. Remove ENGINE CONTROL switch (S15) for easy accessibility.
3. Disconnect the wire from terminal 3 of switch (S15) and connect to terminal 2.



4. Disconnect the wire from terminal 5 of switch (S15) and connect to terminal 6.
5. Reinstall switch (S15).
6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(8) Relay (K3) defective.

General Information:

The relay (K3) can be bypassed without affecting the operation of the shelter. This BDAR action is only needed if the air-conditioner is required.

Limitations:

- None

Personnel/Time Required:

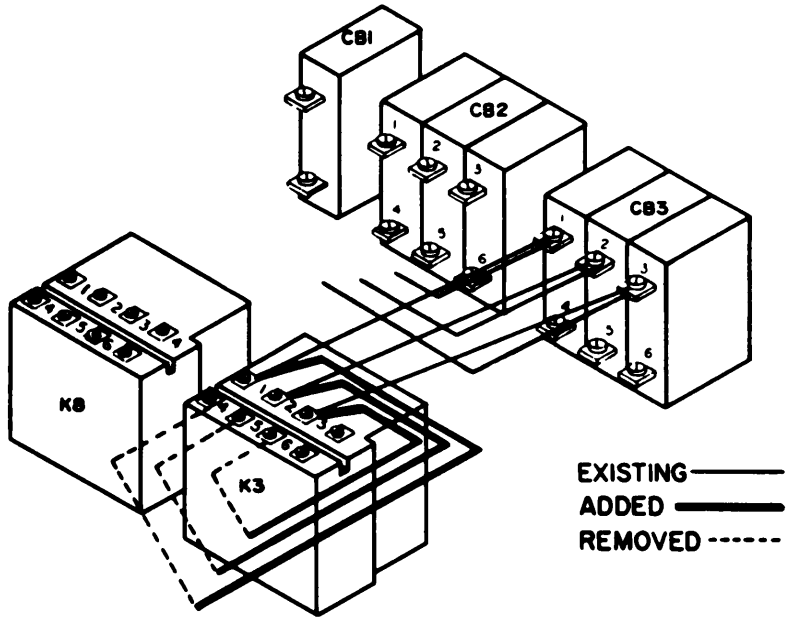
- 1 soldier
- 0.2 hour

Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.
2. Disconnect the wire from terminal 4 of relay (K3) and connect to terminal 1.



3. Disconnect the wire from terminal 5 of relay (K3) and connect to terminal 2.
4. Disconnect the wire from terminal 6 of relay (K3) and connect to terminal 3.
5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(9) Relay (K8) defective.

General Information:

The relay (K8) can be bypassed without affecting the operation of the shelter.

Limitations:

- None

Personnel/Time Required:

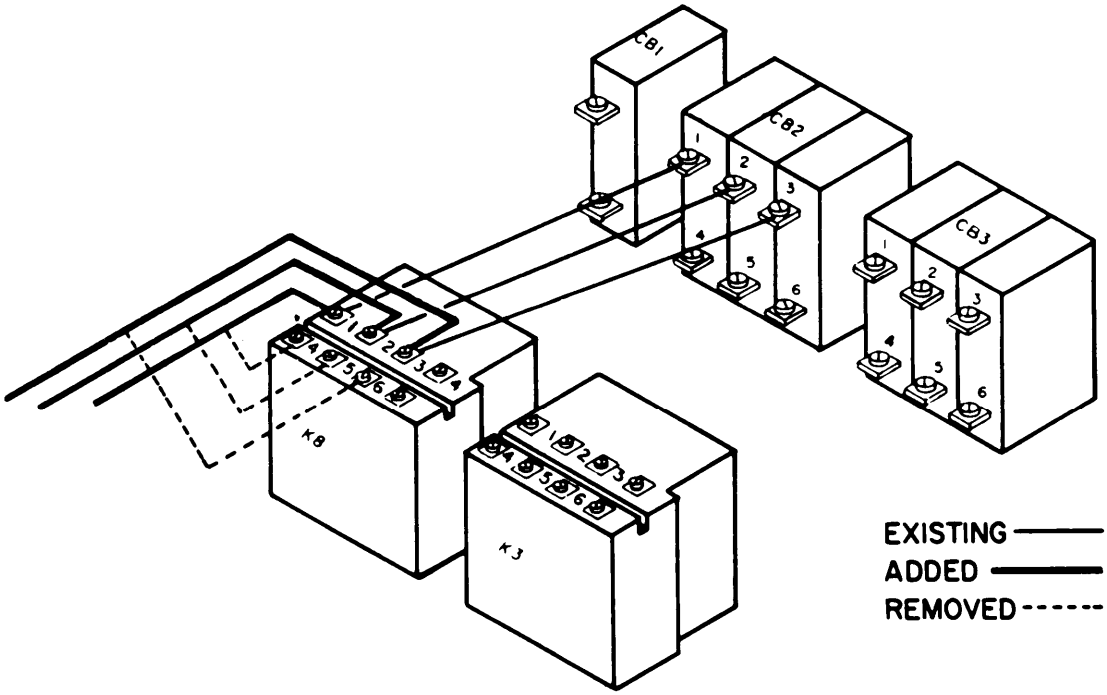
- 1 soldier
- 0.2 hour

Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.
2. Disconnect the wire from terminal 4 of relay (K8) and connect to terminal 1.



3. Disconnect the wire from terminal 5 of relay (K8) and connect to terminal 2.
4. Disconnect the wire from terminal 6 of relay (K8) and connect to terminal 3.
5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(10) Relay (K10) defective,

General Information:

The defective contacts in relay (K10) can be bypassed without affecting the operation of the shelter by using the spare contacts of relay (K10).

Limitations:

- None

Personnel/Time Required:

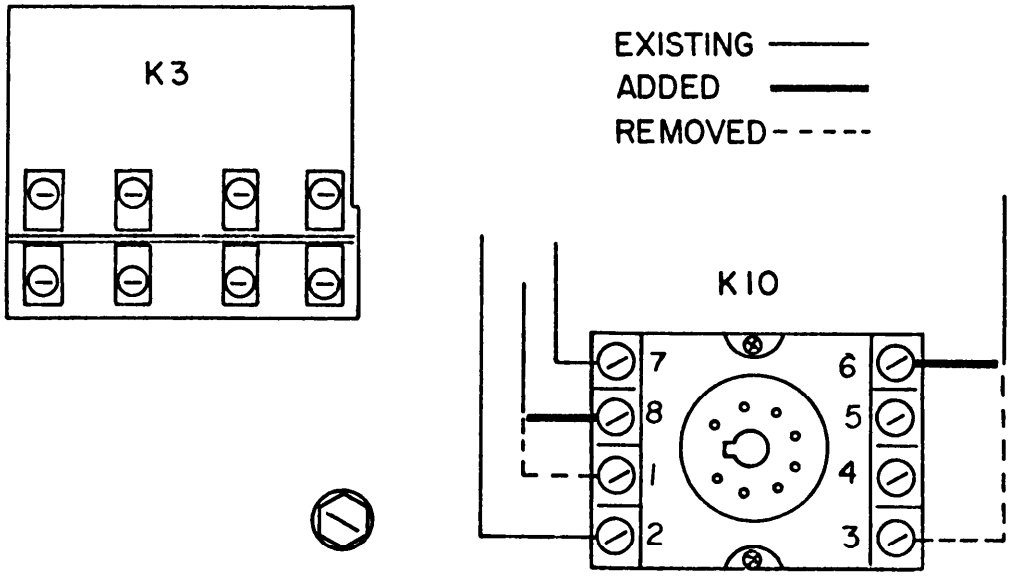
- 1 soldier
- 0.2 hour

Materials/Tools:

- Screwdriver
- Cross tip screwdriver

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.
2. Loosen the screw holding the angle bracket and move the angle bracket to the side; remove relay (K10) from socket.



3. Disconnect the wire from terminal 1 of relay (K10) socket and connect to terminal 8.
4. Disconnect the wire from terminal 3 of relay (K10) socket and connect to terminal 6.
5. Reinstall relay (K10) into socket.
6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(11) Relay (K1) defective.

General Information:

CAUTION

The time delay relay (K1) can be bypassed. In the absence of the time delay relay, there will be no delay in energizing relay (K3). Make sure COOL CIRCULATE HEAT switch (S4) is in the CIRCULATE position when setting RECIRCULATION FAN circuit breaker (CB2) to the ON position.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

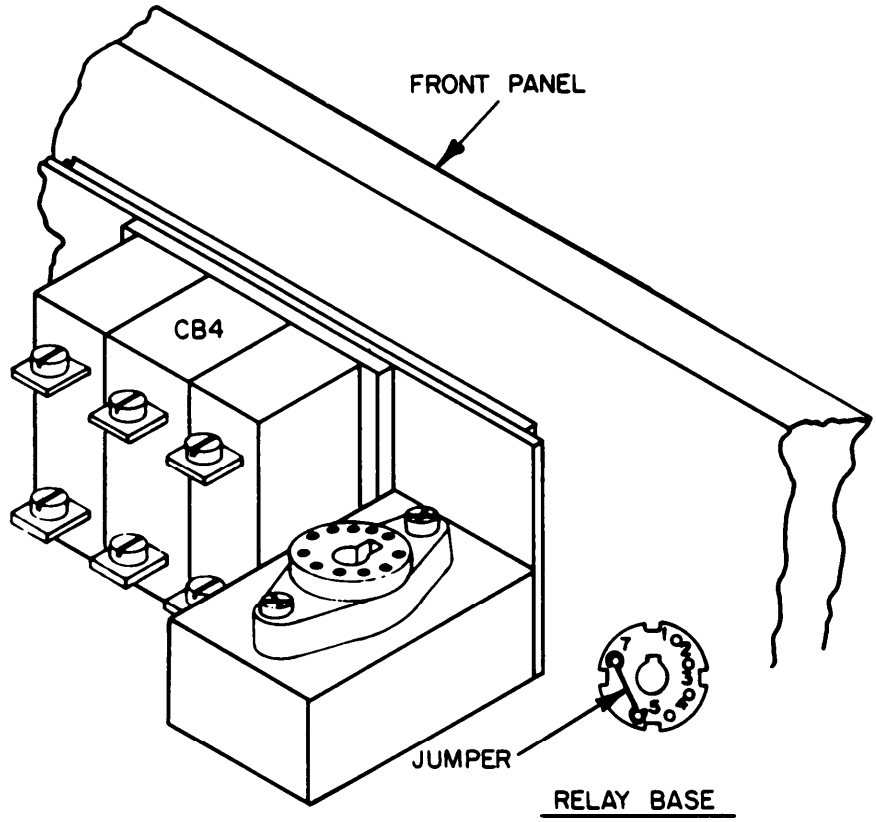
Materials/Tools:

- Electrical wire (20 AWG)
- Cross tip screwdriver

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.
2. Loosen screw holding the angle bracket and move bracket to the side.
3. Remove relay (K1).
4. Wrap a piece of electrical wire (41, appx C) between pins 5 and 7 of relay (K1).
5. Reinstall relay (K1).

10-7. SHELTER BDAR PROCEDURES - CONT.



6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

(12) Thermostat switch (S5) defective.

General Information:

NOTE

The thermostat switch (S5) can be bypassed without affecting the operation of the shelter. To control the heat and cooling, you must manually control the temperature. Put the COOL CIRCULATE HEAT switch in the HEAT position for heating. When desired temperature is met, move switch to the CIRCULATE position. Put the switch in the COOL position for cooling. When desired temperature is met, move switch to the CIRCULATE position.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

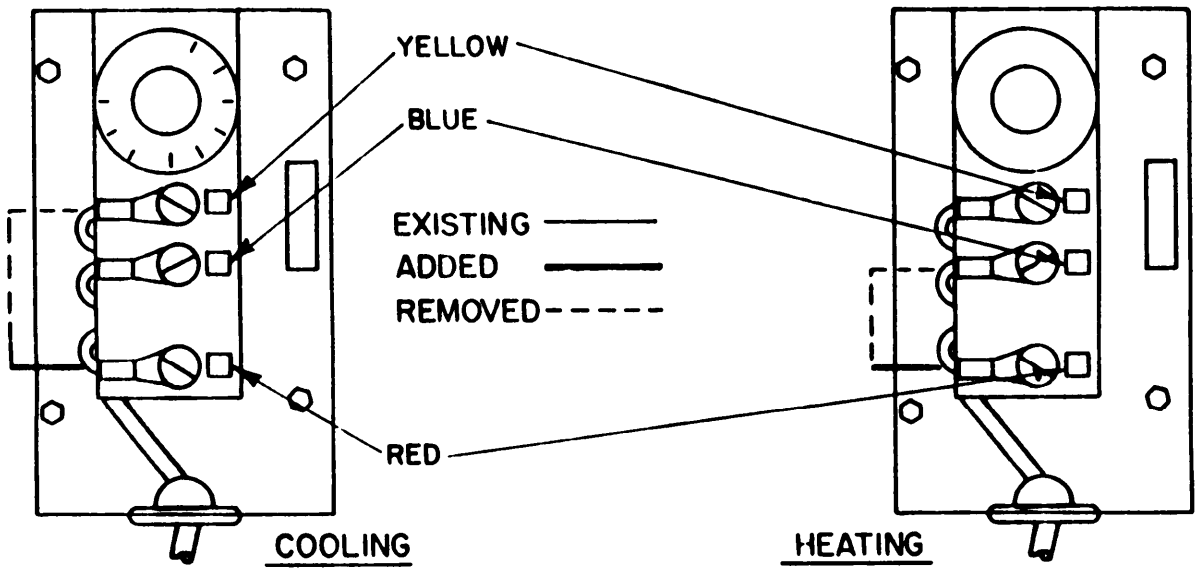
10-7. SHELTER BDAR PROCEDURES - CONT.

Materials/Tools:

- Screwdriver

Procedural Steps:

1. Remove the main access cover by releasing the three fasteners.
2. Remove the cover from thermostat switch (S5).
3. For heating, remove the wire from the blue terminal and connect to the red terminal. For cooling, remove the wire from the yellow terminal and connect to the red terminal.



4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

(13) LIGHT switch (S2) on the auxiliary control box defective.

General Information:

LIGHT switch (S2) can be bypassed without affecting the operation of the shelter.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Electrical wire (16 AWG or larger)
- Needle-nose pliers
- Electrical tape

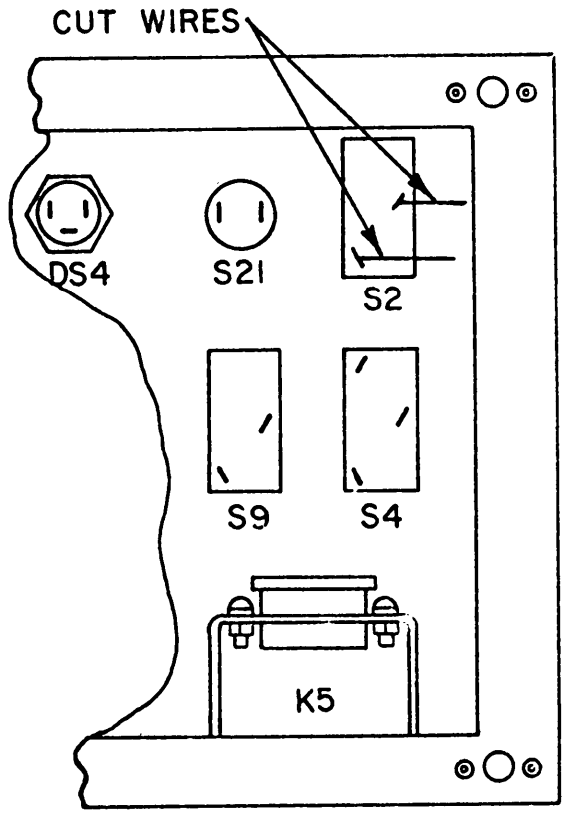
10-7. SHELTER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove the back cover from the auxiliary control box.

2. Remove one screw holding angle bracket which secures relay K5. Loosen other screw and move angle bracket to the side.

3. Remove relay (K5) and lay aside.



4. Cut wires to S2; remove sufficient insulation to allow a minimum of four twists to wire ends.

5. Twist wire ends together a minimum of four twists.

6. Wrap electrical tape (36, appx C) around exposed wire ends.

7. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(14) Switching relay (K11) on the auxiliary control box defective.

General Information:

NOTE.

The shelter can be operated with relay (K11) defective. This will eliminate the 8 minute purge cycle entry mode. When there is contamination around the shelter wait an extra 3 minutes. If either light remains lit, cover lights with a piece of tape.

(15) Entrance time delay relay (K5) on the auxiliary control box defective.

General Information:

NOTE

The shelter can be operated with relay (K5) defective. In the absence of relay (K5) use a watch to time entry and exit of the shelter.

(16) BUZZER SILENCER switch (S23) on the auxiliary control box defective.

General Information:

WARNING

This BDAR fix will silence the low-air buzzer. There will be no audio warning to indicate to personnel to don masks. You must rely on the visual indication of the MASK light.

Limitations:

- Mask audio warning will not operate.

Personnel/Time Required:

- 1 solder
- 0.2 hour

Materials/Tools:

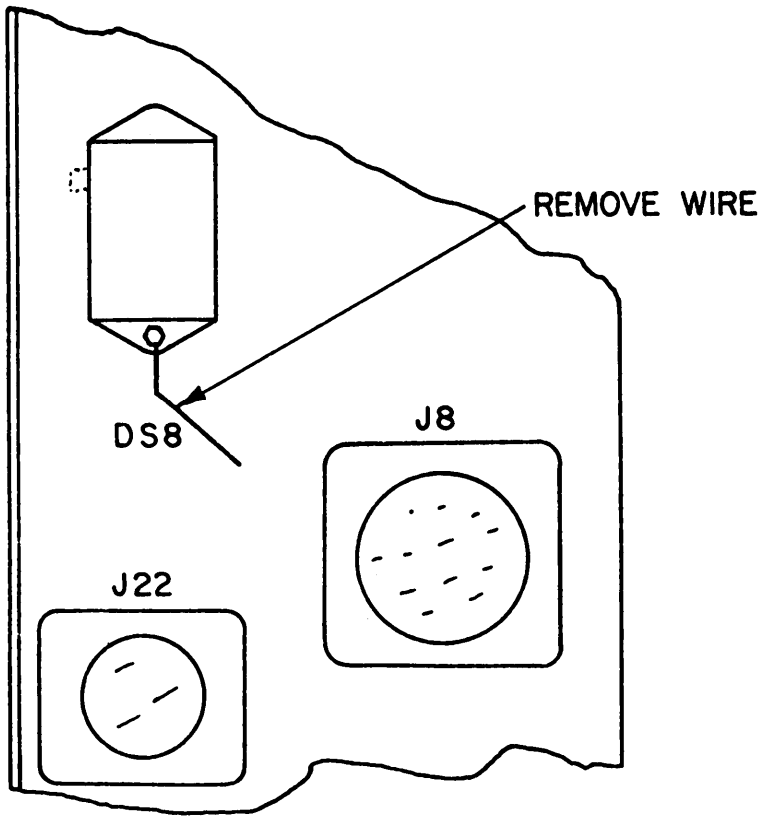
- Adjustable wrench

10-7. SHELTER BDAR PROCEDURES - CONT.

Procedural Steps:

1 Remove the back cover from the auxiliary control box.

2. Remove the bottom nut on the buzzer and disconnect the wire.



3. Reinstall the cover.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

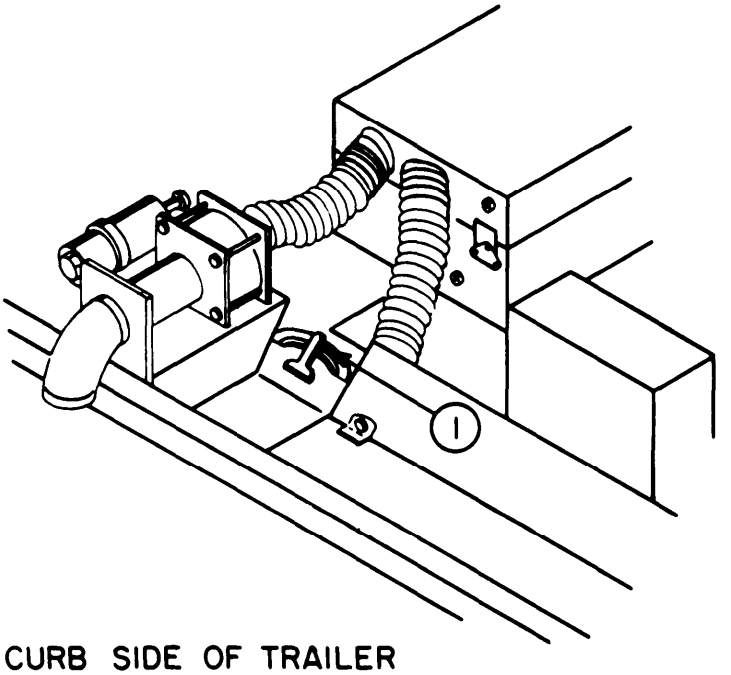
b. Pressurization System Failures.

(1) Makeup air solenoid defective.

General Information:

NOTE

If a rapid inflation is necessary, the makeup air solenoid can be bypassed by setting the makeup air damper (1) to the SHUT position. After inflation, set the damper in accordance with instructions in technical manual.



CURB SIDE OF TRAILER

10-7. SHELTER BDAR PROCEDURES - CONT.

(2) Hose clamp broken.

General Information:

If a replacement hose clamp is not available. wire can be used as a substitute.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.2 hour

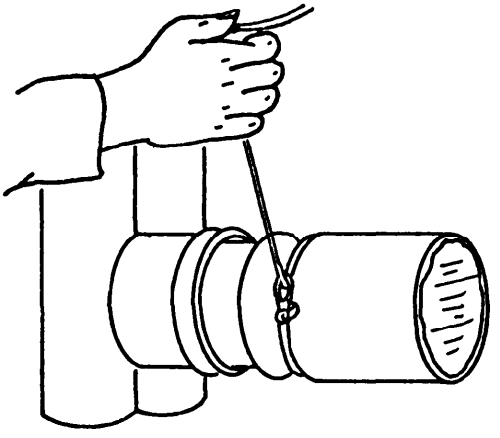
Materials/Tools:

- Solid wire, safety wire, or similar items

Procedural Steps:

1. Make a loop in one end of the wire (42, appx C). Twist the wire so that a permanent loop is formed.

2. Loosely wrap the wire once around the hose and pull the other end through the loop.



3. While pressing the loop tightly against the hose, pull the wire through the loop as tight as possible. Bend the wire back on itself, crimping it, so that the wrap will be tight and secure.

4. Secure the loose end by making one more wrap in the opposite direction of the first.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(3) Low air pressure switch (S13) defective.

General Information:

The low air pressure switch (S13) can be bypassed by using the makeup air pressure switch (S12). This will make the makeup air solenoid inoperative. Use the evacuation fan as the source of makeup air to the entrance and shelter ribs.

NOTE

The mask alarm will come on at a higher air pressure when using the makeup air pressure switch. The alarm will come on at the pressure set by switch (S12).

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Screwdriver

10-7. SHELTER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Remove main control indicator access cover by releasing the three fasteners.

2. Loosen the screws securing the covers on switches (S12) and (S13) and remove covers.

3. Disconnect the wires from switch (S12) and mark the wire.

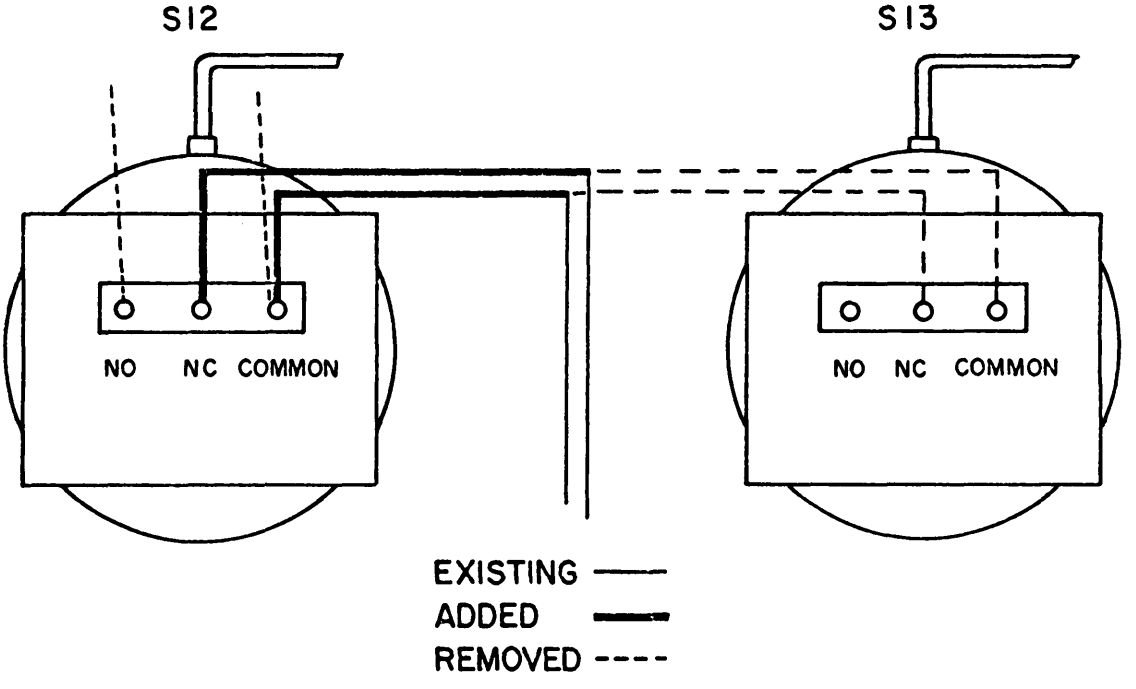
4. Disconnect the wire from the common terminal on switch (S13) and connect to the common terminal on switch (S12).

5. Disconnect the wire from the normally closed terminal on switch (S13) and connect to the normally closed terminal on switch (S12).

6. Turn adjustment screw full counter clockwise.

7. Reinstall the covers on switches (S12) and (S13).

8. Reinstall control indicator access cover.



8. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the shelter using standard maintenance procedures.

10-7. SHELTER BDAR PROCEDURES - CONT.

(4) Low air pressure buzzer defective.

NOTE

The shelter can be operated with a defective buzzer. There will be no audio warning. Visually check the red MASK light for low air pressure.

c. Environment Control System Failures.

(1) Heater unit defective.

CAUTION

Heaters that require the exhaust to be vented cannot be used with the shelter. Damage to the equipment will result.

NOTE

The shelter can be operated without a heater unit.

(2) HIGH LOW HEAT switch (S9) on the auxiliary control box defective.

NOTE

The shelter can be operated with a defective HIGH LOW HEAT switch (S9). If the switch is open, you are in the LOW HEAT switch. If the switch is closed, you are in the HIGH HEAT position.

(3) Cooling unit defective.

NOTE

The shelter can be operated with a defective cooling unit. The recirculation fan will help keep the shelter cool .

(4) COO1 CIRCULATE HEAT switch (S4) on the auxiliary control box defective.

General Information

The COOL CIRCULATE HEAT switch (S4) can be bypassed without affecting the operation of the shelter.

Limitations:

• Changing from HEAT to COOL will require switching the wires.

Personnel/Time Required:

• 1 soldier
• 0.3 hour

10-7. SHELTER BDAR PROCEDURES - CONT.

Materials/Tools:

- Adjustable wrench
- Pliers
- Electrical tape
- Screwdriver

Procedural Steps:

1. Remove the back cover from the auxiliary control box.

2. Remove one screw holding relay clip which secures relay (K5). Loosen other screw and move relay clip to the side.

3. Remove relay (K5) and lay aside.

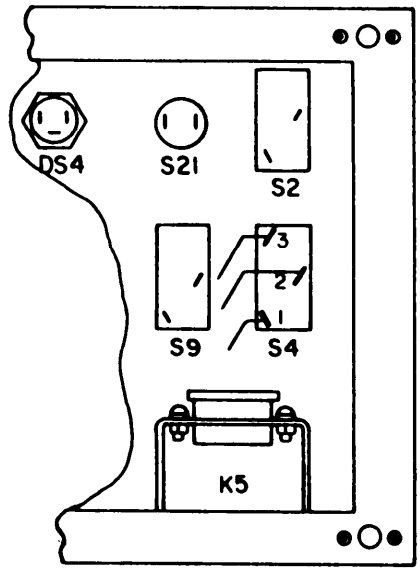
4. Remove switch (S4) from front panel.

5. Disconnect wire from terminal 1 of switch (S4) and label as "1".

6. Disconnect wire from terminal 2 of switch (S4) and label as "2".

7. Disconnect wire from terminal 3 of switch (S4) and label as "3".

8. Route the wires disconnected from switch (S4) thru the hole where switch (S4) was removed.



9. For HEAT, connect wires marked 1 and 2 to either terminal of switch (S4); for COOL, connect wires marked 3 and 2 to either terminal of switch (S4).

NOTE

Switch (S4) will be hanging on front of control box.

10. Reinstall relay (K5), move relay clip into position and secure with screw. Reinstall back cover.

11. Record the BDAR action taken. When the mission is complete, as soon as practicable, repair the Shelter using standard maintenance procedures.

CHAPTER 11

HOODS, CHEMICAL-BIOLOGICAL MASK: M5, M6A2, M7, M40, AND M42

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

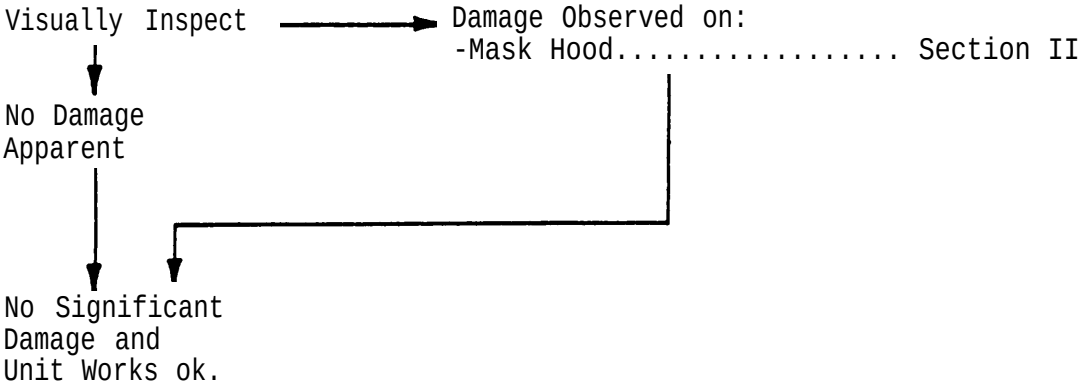
11-1. SCOPE.

This chapter contains BDAR procedures applicable to the Chemical-Biological Mask Hoods M5, M6A2, M7, M40, and M42.

11-2. DESCRIPTION.

The Chemical-Biological Mask Hood is a protective garment that is worn over your head and neck to protect you from toxic vapors or droplets.

11-3. ASSESSMENT PROCEDURE.



11-4. REPAIR PROCEDURE INDEX.

SECTION II. HOODS, CHEMICAL-BIOLOGICAL MASK: M5, M6A2, M7, M40 and M42

11-5. GENERAL.

This section contains BDAR procedures applicable to the Chemical-Biological Mask Hoods; M5, M6A2, M7, M40 and M42.

11-6. MASK HOOD BDAR PROCEDURES.

NOTE

Each BDAR fix pertains only to the Mask Hoods listed in parenthesis.

a. Hood Torn or Cut (M5, M6A2, and M7, M40 and M42).

General Information:

If no Chemical-Biological Mask Hood is available, use the hood of a poncho.

Limitations:

- Moisture may need to be removed for this procedure to be effective.

Personnel/Time Required:

- 1 or 2 soldiers
- 0.1 hour

Materials/Tools:

- Pressure sensitive tape

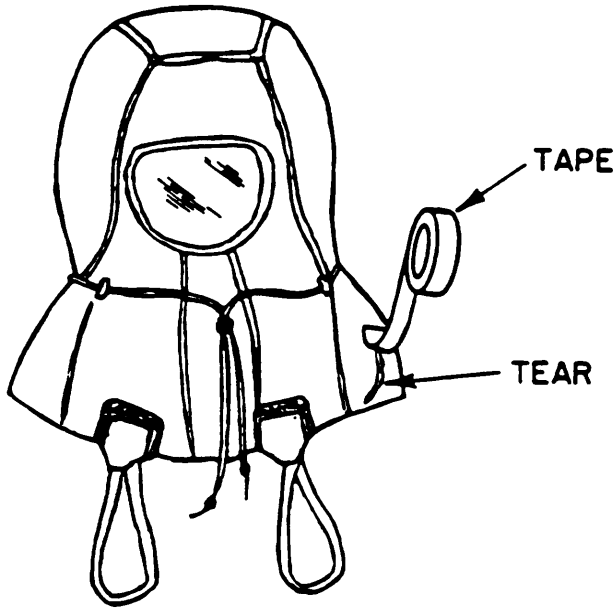
Procedural Steps:

NOTE

The assistance of another soldier may be required for this procedure.

1. Estimate size of hole or tear.
2. Cut a piece or pieces of pressure sensitive tape (37, appx C) at least 1 inch longer than the hole.
3. Cover outside torn area of mask hood with pressure sensitive tape.
4. Repeat steps 3 and 4 for inside of mask hood, if not wearing mask at the time repair is made.

11-6. MASK HOOD BDAR PROCEDURES - CONT.



5.Record the BDAR action taken. When the mission is completed, as soon as practicable, replace mask hood with a fully serviceable item.

b. Neck Cord Missing or Torn (M5, M6A2, M7, M40 and M42 .

General Information:

The neck cord is used to tighten the mask hood around the neck.

Limitations:

- None

Personnel/Time Required

- 1 soldier
- 0.1 hour

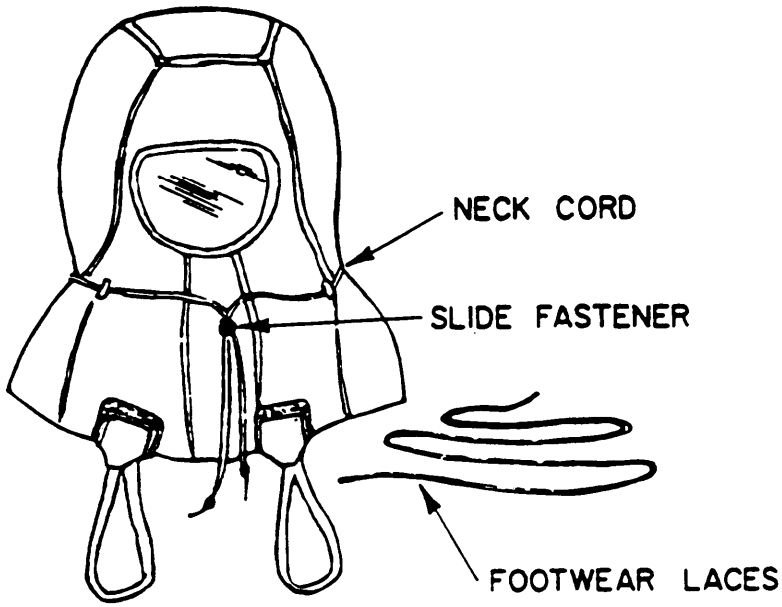
Materials/Tools:

- Footwear lace or similar item

11-6. MASK HOOD BDAR PROCEDURES - CONT.

Procedural Steps:

1. Place footwear lace (23, appx C) through loops on the mask hood and fasten with slide fastener. If the slide fastener is missing, tie the footwear lace in a bow.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace mask hood with a fully serviceable item.

c. Underarm Straps Torn or Missing (M5, M6A2, M7, M40 and M42).

General Information:

Underarm straps are used to hold the mask hood in place.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.1 hour

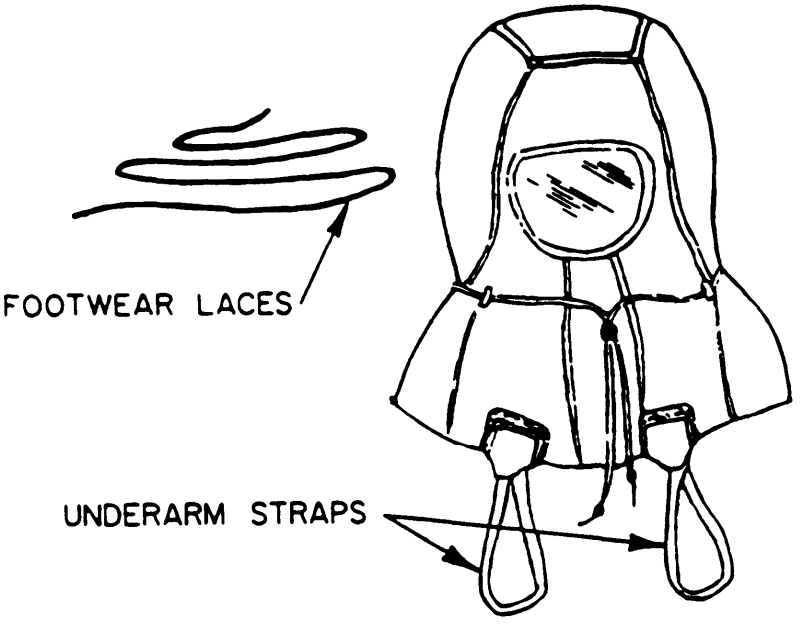
Materials/Tools:

- Footwear lace or similar item

11-6. MASK HOODS BDAR PROCEDURES - CONT.

Procedural Steps:

1. Tie footwear lace (23, appx C) between the torn ends of the straps. If strap is missing, tie footwear lace through hole in hood where strap originally was attached.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace mask hood with a fully serviceable item.

d. Hose Cord Torn or Missing (M5).

General Information:

The hose cord is used to draw the hood tight around eyelens.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.1 hour

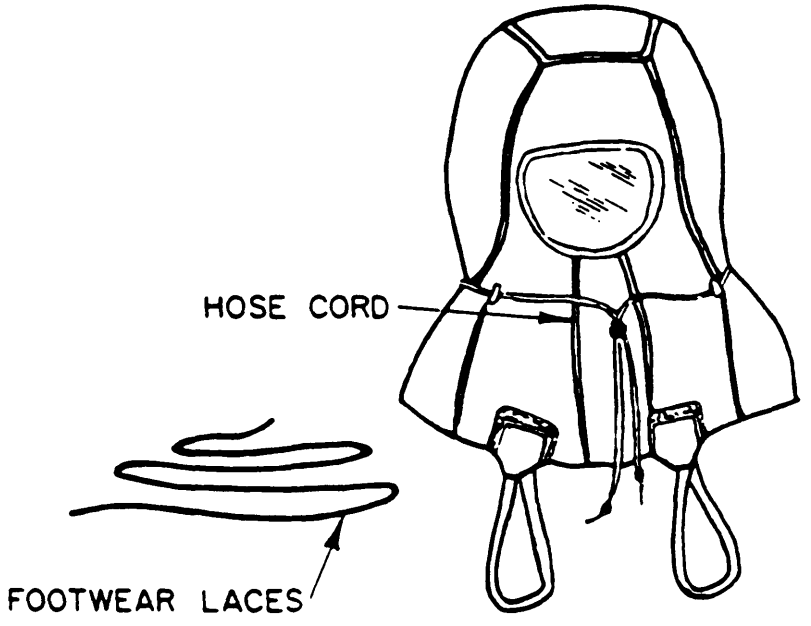
Materials/Tools:

- Footwear lace or similar item

11-6. MASK HOODS BDAR PROCEDURES - CONT.

Procedural Steps:

1. Tie footwear lace (23, appx C) to torn cord on mask hood. If cord is missing, replace it with a footwear lace.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace mask hood with a fully serviceable item.

e. Zipper Broken (M6A2, M40 and M42).

General Information:

The zipper permits opening of the hood for ventilation or closing for protection.

Limitations:

- Moisture may need to be removed for this procedure to be effective.

Personnel/Time Required:

- 2 soldiers
- 0.1 hour

Materials/Tools:

- Pressure sensitive tape

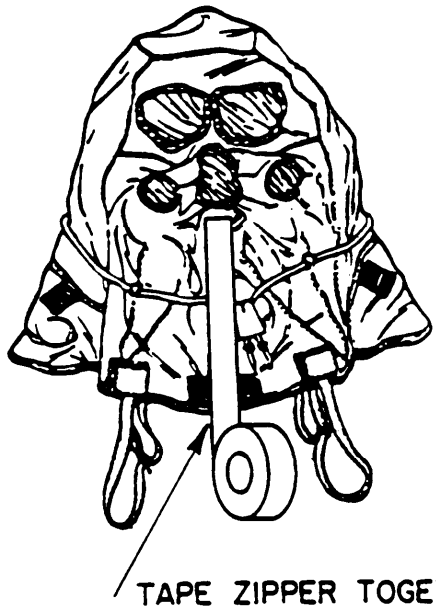
11-6. MASK HOODS BDAR PROCEDURES - CONT.

Procedural Steps:

NOTE

This procedure is always done while wearing hood.

1. Estimate the length of the zipper.



2. Cut a piece of pressure sensitive tape (37, appx C) at least 1 inch longer than the zipper.

3. Tape zipper together with pressure sensitive tape.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace mask hood with a fully serviceable item.

CHAPTER 12

CHEMICAL-BIOLOGICAL MASKS: M9, M9A1, M17A1, M17A2, M24, M25A1, M40, M42 and M43

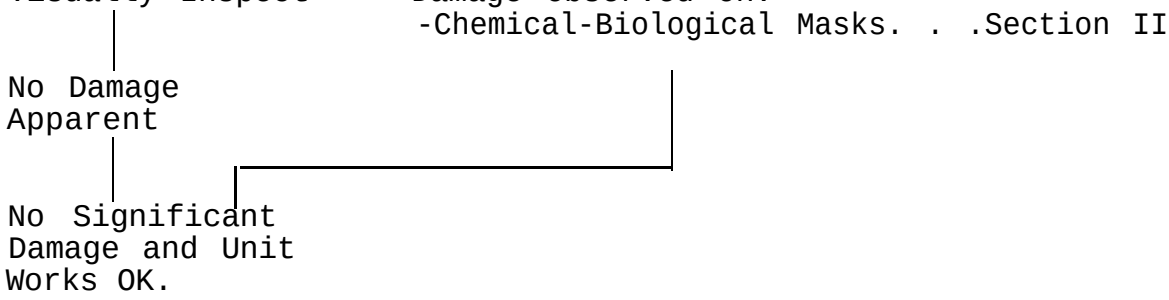
BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER AND
SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

12-1. SCOPE . This chapter contains BDAR procedures applicable to the Chemical-Biological Masks M9, M9A1, M17A1, M17A2, M24, M25A1, M40, M42 and M43.

12-2. DESCRIPTION. The chemical-biological masks protect the face, eyes and lungs from field concentrations of all known chemical-biological agents.

12-3. ASSESSMENT PROCEDURE.



12-4. REPAIR PROCEDURE INDEX.

SECTION II. CHEMICAL-BIOLOGICAL MASKS: M9, M9A1, M17A1, M17A2, M24, M25A1, M40, M42 and M43

12-5. GENERAL. This section contains BDAR procedures applicable to the Chemical-Biological Masks M9, M9A1, M17A1, M17A2, M24, M25A1, M40, M42 and M43.

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES.

NOTE

Each BDAR fix pertains only to the model of the chemical-biological mask listed in parentheses.

a. Lens Cracked (M24 and M25A1).

General Information:

The cracked area of the lens must be completely free of foreign matter to perform this BDAR fix.

Limitations:

- The soldier's view will be partially obstructed by this BDAR fix.

Personnel\Time Required:

- 1 soldier
- 0.1 hour

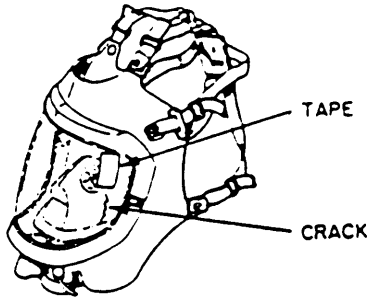
Materials/Tolls:

- Pressure sensitive tape

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES. (CONT)

Procedural Steps:

1. Wipe all dirt, grease and foreign matter from the area around the crack in the lens.



2. Cut a piece of pressure sensitive tape (37, App C) longer than the crack in the lens.

CAUTION

Care must be taken not to enlarge crack in lens.

3. Center the pressure sensitive tape over the crack on the outside of the lens, and press firmly in place.

4. Repeat steps 2 and 3 for the inside of the lens, if not wearing mask at the time repair is made.

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the chemical-biological mask using standard maintenance procedures.

b. Head Harness Torn (M9, M9A1, M17A1, M17A2, M24, M25A1, M40, M42 and M43).

General Information:

The head harness holds the faceblank tight against the face to form an airtight seal. Any BDAR fix must also provide an airtight seal.

Limitations:

o This BDAR fix may also slow down putting on and taking off mask.

Personnel/Time Required:

o 2 soldiers
o 0.1 hour

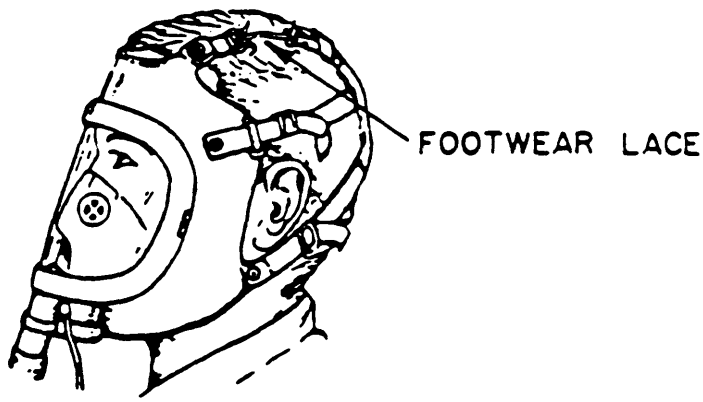
Materials/Tools:

o Knife
o Footwear lace, small cord or similar items

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Procedural Steps:

1. Mask wearer - place mask on head and hold faceblank firmly against face.



2. Second soldier - make hole in torn head harness strap. Thread one end of a footwear lace (23, appx C) through hole and tie. Put other end of the footwear lace through buckle on the faceblank, draw footwear lace tight and tie.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Chemical-Biological Mask using standard maintenance procedures.

c. Hose Punctured (Small Holes) (M24, M25A1, M42, and M43).

General Information:

Nonpliabile or hardening type adhesive sealants will not work on this BDAR fix.

Limitations:

• The adhesive sealant must be allowed time to dry. See label on container for drying instructions.

Personnel/Time Required:

• 1 soldier
• 0.2 hour

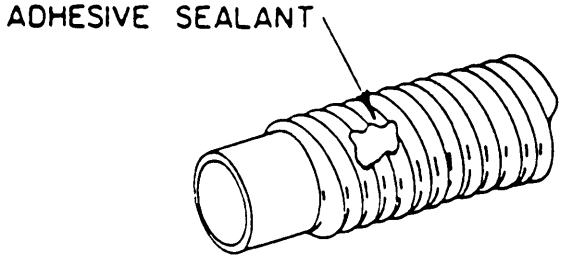
Materials/Tools:

• Adhesive sealant

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Procedural Steps:

1. Apply a liberal amount of adhesive sealant (2, appx C) over the hole in the hose.



2. Allow the adhesive sealant to dry per information on the container.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Chemical-Biological Mask using standard maintenance procedures.

d. Hose Punctured (Large Holes) or Cut (M24, M25A1, M42, and M43).

General Information:

Nonpliable or hardening type adhesive sealants will not work on this BDAR fix.

Limitations:

• The adhesive sealant must be allowed time to dry. See label on container for drying instructions.

Personnel/Time Required:

• 1 soldier
• 0.2 hour

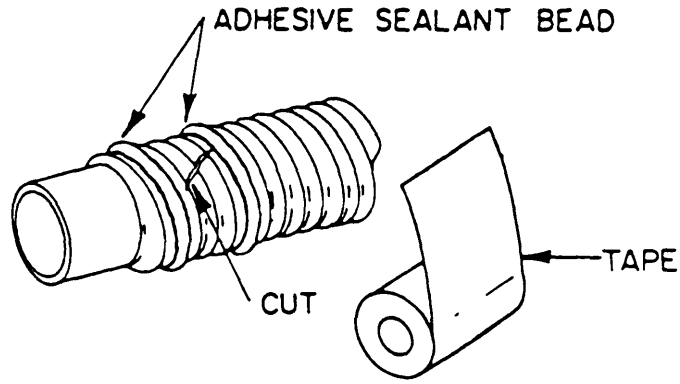
Materials/Tools:

• Adhesive sealant
• Pressure sensitive tape

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Procedural Steps:

1. Spread a bead of adhesive sealant (2, appx C) in the grooves of the hose on each side of the damaged area. The bead shall circle the hose at least one full turn.



2. Allow the adhesive sealant to dry until surface is dry to the touch, then wrap the adhesive sealant and damaged area with several layers of pressure sensitive tape (37, appx C).

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Chemical-Biological Mask using standard maintenance procedures.

e. Ratchet Clamp Broken or Missing (M24, M25A1, M42, and M43).

General Information:

This BDAR fix will not be required if the hose remains firmly attached to the adapter.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.1 hour

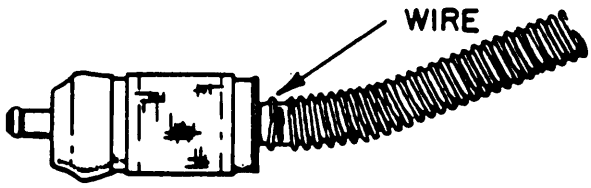
Materials/Tools:

- Pliers or similar tool
- Solid wire (12 AWG or larger)

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Procedural Steps:

1. Wrap solid wire (42, appx C) around the hose and twist ends as shown. Ensure wire ends are pressed against the hose.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Chemical-Biological Mask using standard maintenance procedures.

f. Hood Torn *or* Cut (M43).

General Information:

The hood protects the head and neck area from chemical-biological agents.

Limitations:

• Moisture may need to be removed for this procedure to be effective.

Personnel/Time Required:

• 1 or 2 soldiers
• 0.1 hour

Materials/Tools:

• Pressure sensitive tape

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Procedural Steps:

NOTE

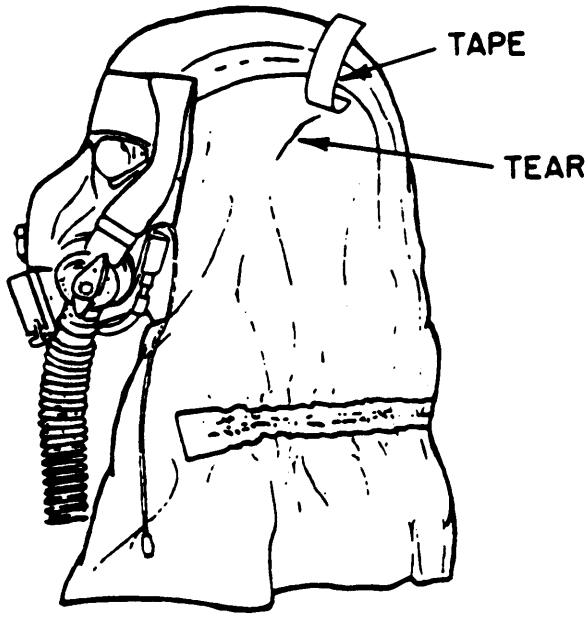
Assistance of another soldier may be required for this procedure.

1. Clean the torn area of the hood.

2. Estimate size of hole or tear.

3. Cut a piece of pressure sensitive tape (37, appx C) at least 1 inch longer than tear.

4. Apply pressure sensitive tape over the tear on the outside of the hood.



5. Repeat steps 1 thru 4 for the inside of the hood, if not wearing mask at the time repair is made.

6. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the Chemical-Biological Mask using standard maintenance procedures.

g. Hood Neck Closure Not Elastic (M43).

General Information:

The elastic holds the bottom of the hood firmly against the neck.

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Limitations:

• Securing the hood will require extra time after donning.

Personnel/Time Required

• 1 soldier
• 0.1 hour

Materials/Tools:

•Footwear lace, string, small cord, or similar items

Procedural Steps:

NOTE

When performing this BDAR fix, tie footwear lace in a bow to facilitate removal of the mask.

1. Install the mask on head, tie footwear lace (23, appx C) or similar item around the bottom of the hoold. The hood should be comfortably tight against the neck.

2. Record the BDAR action taken. the mission is completed, as soon as practicable, repair the Chemical-Biological Mask using standard maintenance procedures.

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

h. Blower Casing Cracked or Has Small Holes (M43).

General Information:

The blower pushes air into the canisters, hose and facepiece. Any BDAR fix must provide sufficient airflow to prevent the soldier from drawing in outside air under the hood.

Limitations:

The adhesive sealant must be allowed to dry. See label on container for drying instruction.

Personnel/Time Required:

1 soldier
0.2 hour

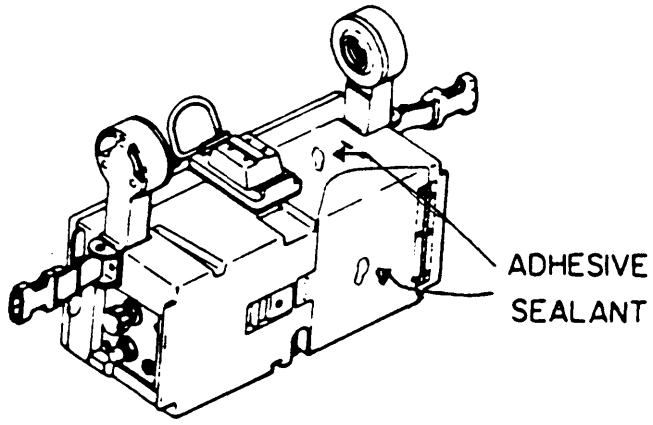
Materials/Tools:

Adhesive Sealant
Pressure Sensitive Tape

Procedural Steps:

1. Wipe all dirt, grease and foreign matter from the area around the crack or hole.

2. Apply a liberal amount of adhesive sealant (2, app C) over the hole or crack in the blowing case



12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

3. Allow the adhesive sealant to dry until surface is dry to the touch, then cover the adhesive sealant and damaged area with several layers of pressurized sensitive tape (37, app C).

4. Record the BDAR action taken. When the mission is completed, as soon as practicable repair the chemical-biological mask using standard maintenance procedures.

i. Blower Casing Has Large Holes (M43).

General Information:

The blower pushes air into the canisters, hose and facepiece. Any BDAR fix must provide sufficient airflow to prevent the soldier from drawing in outside air under the hood.

Limitations:

The adhesive sealant must be allowed time to dry. See label on container for drying instructions.

Personnel/Time Required:

1 soldier
0.2 hour

Materials/Tools:

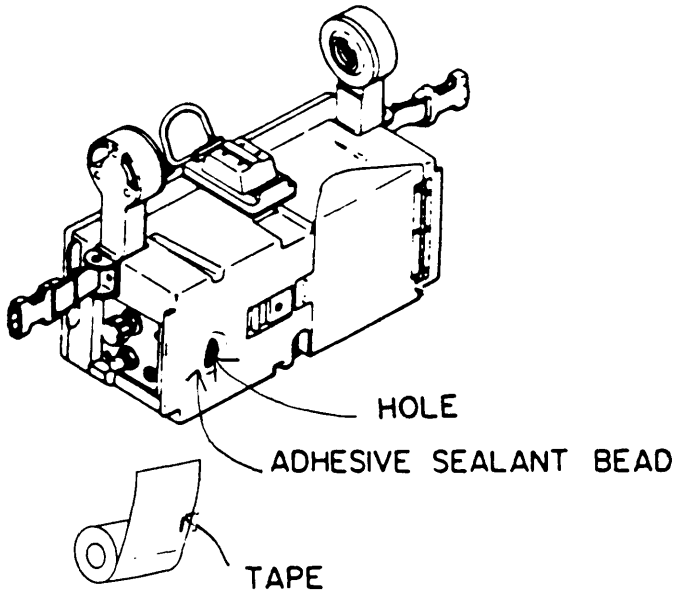
Adhesive Sealant
Pressure Sensitive

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Procedural Steps:

1. Wipe all dirt, grease and foreign matter from the area around the hole.

2. Apply a liberal amount of adhesive sealant (2, app C) around the hole. The bead shall circle the entire hole.



3. Allow the adhesive sealant to dry until the surface is dry to the trouch, then cover the adhesive sealant and damaged area with several layers of pressure sensitive tape (37, app C).

4. Record the BDAR action taken. When the mission is completed, as soon as practicable repair the chemical-biological mask using standard maintenance procedures.

j. Battery Door Hinges Broken or Latch Inoperable (M43).

General Information:

The battery door is used simply to hold the battery in its compartment and allow easy access to the battery compartment.

Limitations:

None

12-6. CHEMICAL-BIOLOGICAL MASK BDAR PROCEDURES - CONT.

Personnel/Time Required:

1 soldier
0.1 hour

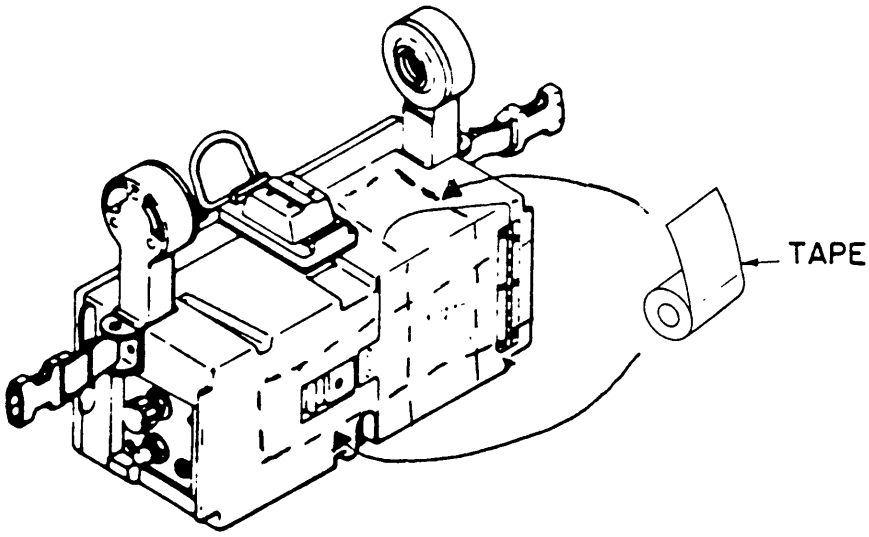
Materials/Tools:

Pressure Sensitive Tape

Procedural Steps:

1. Wipe all dirt, grease and foreign matter from the battery door and the blower casing near the door.

2. While holding the battery door in place, secure the door to the blower casing by placing pressure sensitive tape over the door and casing in a cross (+) pattern.



3. Record the BDAR action taken. When the mission is completed, as soon as practicable repair the chemical-biological mask using standard maintenance procedures.

CHAPTER 13

M8A1 AUTOMATIC CHEMICAL AGENT ALARM

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER
AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

13-1. SCOPE .

This chapter contains BDAR procedures applicable to the M8A1 Automatic Chemical Agent Alarm.

13-2. DESCRIPTION.

The M8A1 Automatic Chemical Agent Alarm provides a method of automatically detecting chemical nerve agents in the air and then sounds an alarm. The unit can be hand carried, vehicle mounted, backpacked, or ground emplaced.

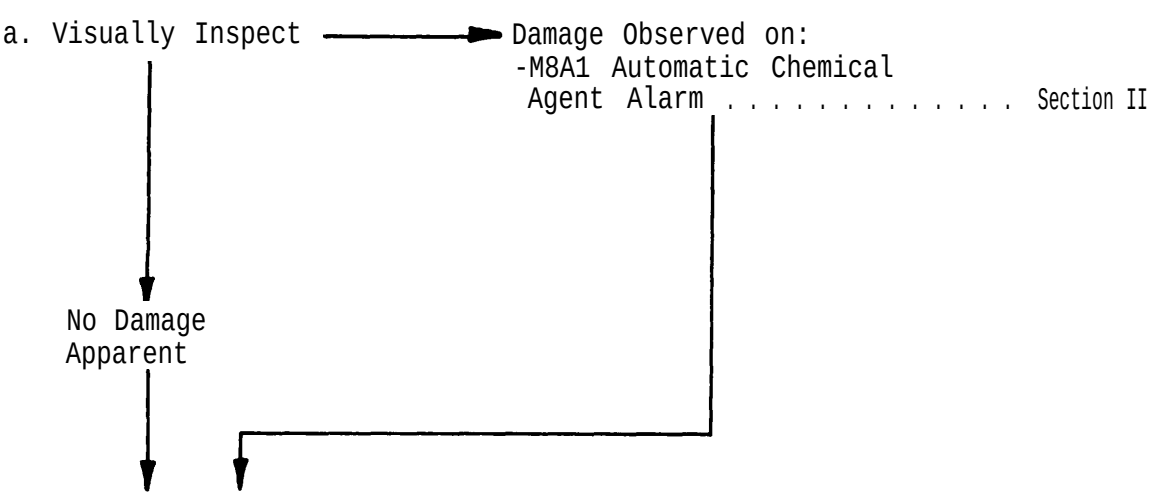
WARNING

Radiation danger. If cell module is removed, disposable gloves shall be used.

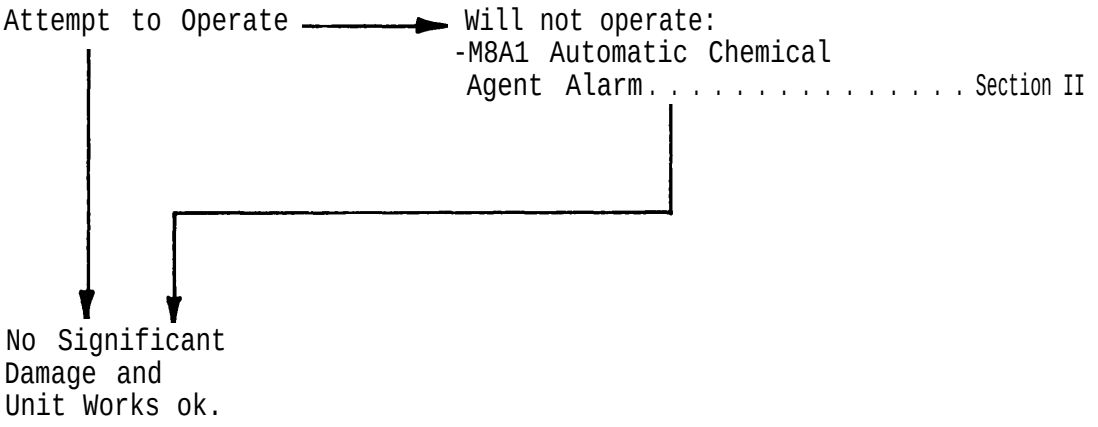
NOTE

Under normal operation conditions, the pump module and the cell module are not to be exchanged. However, under combat conditions, modules from more than one alarm can be combined to obtain a usable unit.

13-3. ASSESSMENT PROCEDURE.



13-3. ASSESSMENT PROCEDURE - CONT.



13-4. REPAIR PROCEDURE INDEX. Para.

SECTION II. M8A1 AUTOMATIC CHEMICAL AGENT ALARM

13-5. GENERAL.

This section contains BDAR procedures applicable to the M8A1 Automatic Chemical Agent Alarm.

13-6. M8A1 AUTOMATIC CHEMICAL AGENT ALARM PROCEDURES.

a. M43A1 Detector Horn Inoperative.

General Information:

The horn sounds when chemical agents are detected.

Limitations:

• The M43A1 will still detect chemical agents but no audio alert will sound

Personnel/Time Required:

• 1 soldier
• 0.2 hour

Materials/Tools:

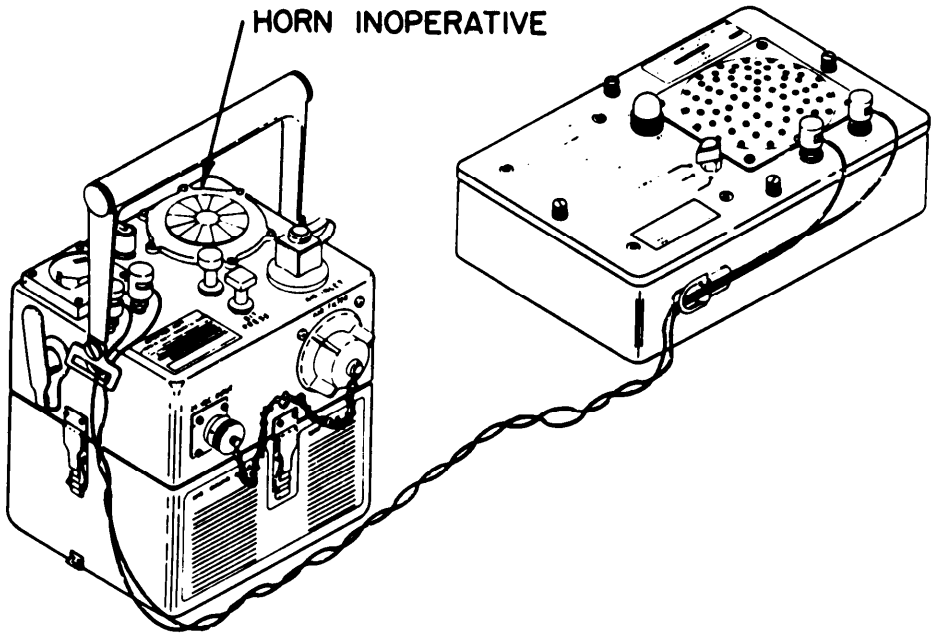
• Telephone cable or 2 conductor wire
• Wire strippers
• M42 alarm

13-6. M8A1 AUTOMATIC CHEMICAL AGENT ALARM PROCEDURES - CONT.

Procedural Steps:

1. Cut cable (45, appx C) to desired length and strip 1 inch of insulation from each end.

2. Connect wires to binding posts on M43A1 and M42.



3. Place M42 in desired position.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M8A1 Automatic Chemical Agent Alarm using standard maintenance procedures.

b. BA3517/U Battery Dead. No Power Adapters Available.

General Information:

A 24-volt vehicle battery can be substituted.

CAUTION

If the battery is in the vehicle, do not attempt to start or operate vehicle. Damage will result to the alarm.

13-6. M8A1 AUTOMATIC CHEMICAL AGENT ALARM PROCEDURES - CONT.

Limitations:

- None

Personnel/Time Required:

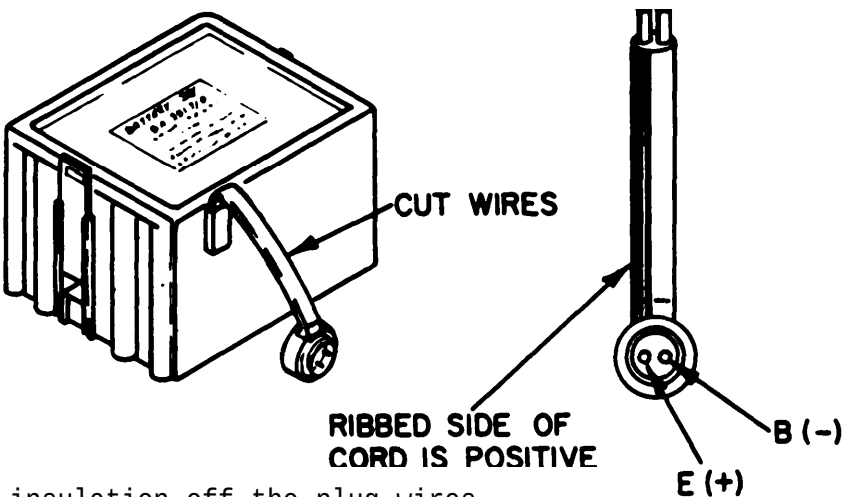
- 1 soldier
- 0.1 hour

Materials/Tools:

- 24-volt battery or 24-volt system (vehicle)
- BA3517/U battery (defective)
- Wire strippers

Procedural Steps:

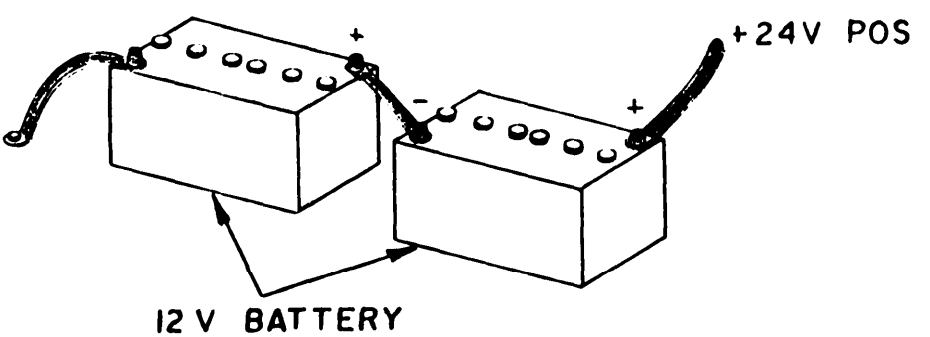
1. Cut the plug off the defective BA3517/U battery, as close to battery as possible.



2. Strip the insulation off the plug wires.

CAUTION

Connect + side of battery to the + side of plug or damage will result to alarm. Ribbed side of cord is positive.



13-6. M8A1 AUTOMATIC CHEMICAL AGENT ALARM PROCEDURES - CONT.

3. Attach the plug wires to the 24-volt battery or 24-volt system. If the wires are too short, splice additional wire between the battery and the plug.

4. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M8A1 Automatic Chemical Agent Alarm using standard maintenance procedures.

c. Test Buttons Broken Off the M43A1 Detector.

General Information:

The detector will operate without the test buttons.

Limitations:

o None

Personnel/Time Required:

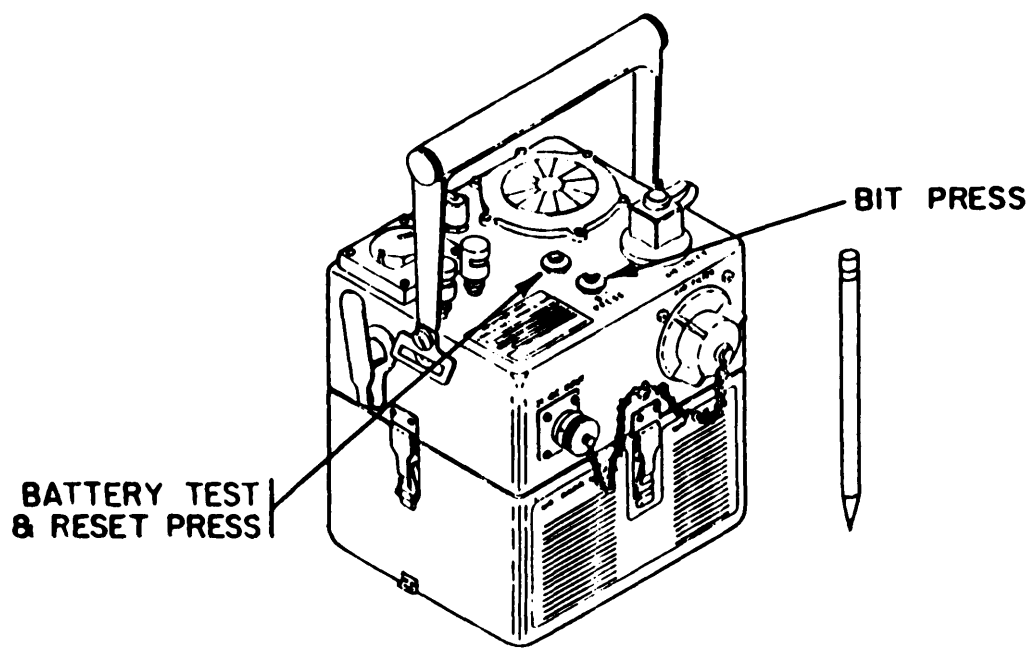
o 1 soldier
o 0.1 hour

Materials/Tools:

o Thin pencil or similar object (wooden or plastic)

Procedural Steps:

1. Insert a thin pencil or similar object into the button holes to activate the test switches.



2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M8A1 Automatic Chemical Agent Alarm using standard maintenance procedures.

13-6. M8A1 AUTOMATIC CHEMICAL AGENT ALARM PROCEDURES - CONT.

d. Clamping Catches Broken on the M43A1 Detector Case.

General Information:

The detector case must be sealed to operate properly.

Limitations:

- None

Personnel/Time Required:

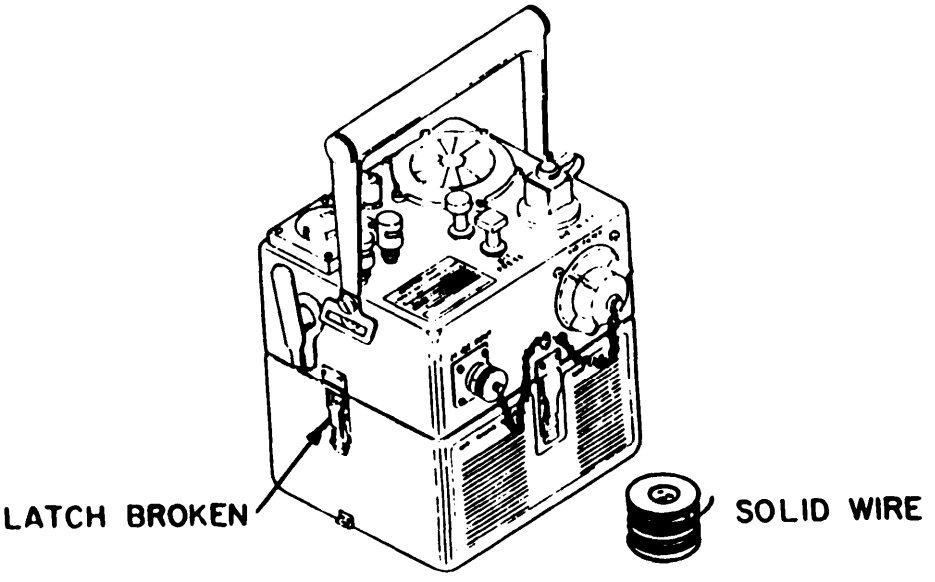
- 1 soldier
- 0.1 hour

Materials/Tools:

- Solid wire
- Pliers

Procedural Steps:

1. Wrap solid wire (44, appx C) around the broken catch.



2. Use pliers to twist the wire tight.

NOTE

The top case must be sealed tight to the bottom case for the detector to operate properly.

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M8A1 Automatic Chemical Agent Alarm using standard maintenance procedures.

13-6. M8A1 AUTOMATIC CHEMICAL AGENT ALARM PROCEDURES - CONT.

e. M43A1 Detector Case Punctured or Cracked.

General Information:

The detector case must be sealed to operate properly.

Limitations:

- None

Personnel/Time Required:

- 1 soldier
- 0.2 hour

Materials/Tools:

- Epoxy adhesive
- Metal plate

Procedural Steps:

1. Seal the crack or small hole with epoxy adhesive (15, appx C) and allow time to cure.

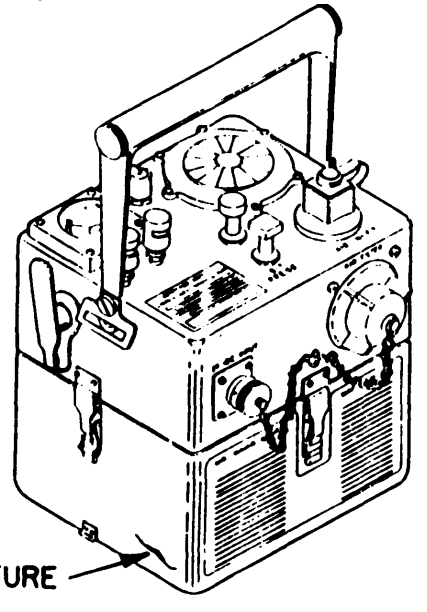
NOTE

If the hole is too large to be sealed, perform the following steps.

2. Cut a piece of metal plate large enough to cover the hole.

3. Apply a continuous bead of epoxy adhesive around the hole.

4. Press metal plate over hole and allow epoxy adhesive to cure.



5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the M8A1 Automatic Chemical Agent Alarm using standard maintenance procedures.

M157 SMOKE GENERATOR

BDAR FIXES SHALL BE USED ONLY IN COMBAT
AT THE DISCRETION OF THE COMMANDER AND
SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES
AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION 1. INTRODUCTION

14-1. SCOPE . This chapter describes BDAR procedures for the M157 Smoke Generator.

14-2. DESCRIPTION. The M157 Smoke Generator is a self-contained unit using a pulse-jet engine to generate large-area smoke screens that will reduce direct visual observation and conceal troops, vehicles or installations from enemy view.

NOTE

If the M157 Smoke Generator cannot be repaired using a BDAR fix, combine parts from other damaged units to make an M157 Smoke Generator operational.

14-3. ASSESSMENT PROCEDURE.

a. Visually Inspect ------- Damage Observed on:
M157 Smoke Generator . . . . . .Section II
Electrical System Failure... 14-6a
Fuel System Failure l4-6b
Fog Oil System Failure l4-6c

No Damage Apparent

b. Attempt to Operate ----- Will Not Operate:
M157 Smoke Generator . . . . . .Section II
Electrical System Failure. . .14-6a
Fuel System Failure l4-6b
Fog Oil System Failure l4-6c

Operates

No Significant Damage and Unit Works OK

14-4. REPAIR PROCEDURE INDEX.

M157 Smoke Generator

SECTION II. M157 SMOKE GENERATOR

14-5. GENERAL. This section contains BDAR procedures for the M157 Smoke Generator.

14-6. M157 SMOKE GENERATOR BDAR PROCEDURES.

a. Electrical System Failure.

General Information:

Any broken electrical wire can be repaired by the following BDAR fix.

Limitations:

o None

Personnel/Time Required:

o 1 soldier
o 0.2 hour

Materials/Tools:

o Electrical tape
o Pliers
o Soldering iron
o Solder

Procedural Steps:

1. Remove sufficient insulation from the broken wire ends to allow a minimum of four twists of the wire ends.

2. Twist the wire ends together a minimum of four turns.

3. Solder (34, App C) the twisted wire ends,

4. Wrap electrical tape (36, App C) around soldered wire ends

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the wire using standard maintenance procedures.

b. Fuel System Failure.

General Information:

A leaking fuel hose can be repaired without affecting operation of the engine.

Limitations:

o None

Personnel/Time Required:

o 1 soldier
o 0.3 hour

Materials/Tools:

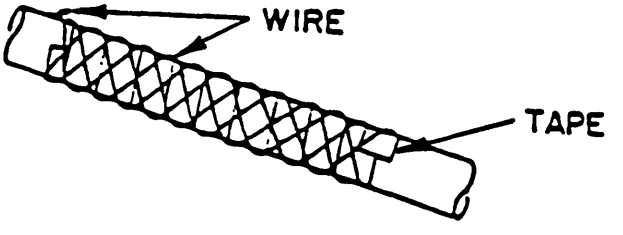
o Patch (from repair kit)
o Sealant
o Pressure sensitive tape
o Solid wire (20 AWG or larger)

Procedural Steps:

1. Remove all dirt and grease around the leak.

2. Coat the leaking area with sealant (33, App C) .

3. Wrap the hose with patching material.



4. Wrap the patched area with pressure sensitive tape (37, App C).

5. Wrap wire (41, App C) around the pressure sensitive tape as reinforcement.

6. Wrap an additional coating of pressure sensitive tape over the wire.

7. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the engine using standard maintenance procedures.

M157 SMOKE GENERATOR PROCEDURES. (CONT)

c. Fog Oil System Failure.

General Information:

A defective fog oil line from fog oil pump to engine can be repaired.

Limitations:

o None

Personnel/Time Required:

o 1 soldier
o 1.0 hour

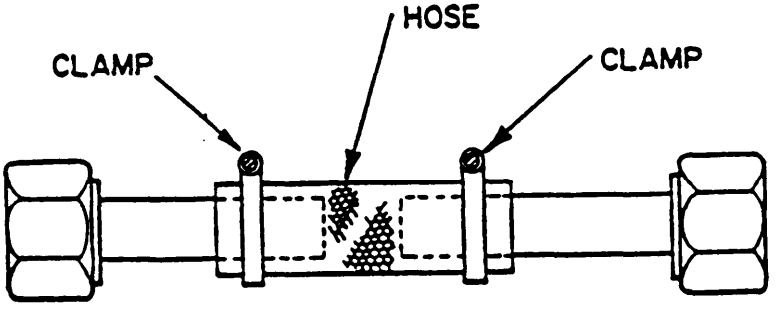
Materials/Tools:

o Rubber hose (ID of hose same as OD of fog oil line)
o Hose clamps
o Sealing compound

Procedural Steps:

1. Cut out the damaged section of line.

2. Cut proper length of correct diameter rubber hose (21, App C).



3. Spread a light coat of sealing compound (31, App C) inside both hose ends.

4. Position hose over ends of line, and secure in place with two or more hose clamps (6, App C).

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair the fog oil line using standard maintenance procedures.

CHAPTER 15

M33A1 RIOT CONTROL AGENT (RCA) DISPERSER

BDAR FIXES SHALL BE USED ONLY IN COMBAT AT THE DISCRETION OF THE COMMANDER AND SHALL BE REPAIRED BY STANDARD MAINTENANCE PROCEDURES AS SOON AS PRACTICABLE AFTER THE MISSION IS COMPLETED.

SECTION I. INTRODUCTION

15-1. SCOPE . This chapter contains BDAR procedures applicable to the M33A1 RCA Disperser.

15-2. DESCRIPTION. The M33A1 RCA Disperser contains portable riot agent control equipment. It is designed to spray bulk CR agent solution or CS agent solid, under pressure, toward or on disorderly crowds, rioters or prisoners of war personnel.

15-3. ASSESSMENT PROCEDURE.

a. Visually Inspect
   - No Damage Apparent
   - Damage Observed on:
     - Hose Assembly 15-6a
     - Frame and Harness Assembly 15-6b
     - Agent Tank 15-6c

b. Attempt to Operate
   - Operates
     - No Significant Damage and Units Work OK
   - Will Not Operate:
     - Check Hose Assembly 15-6a
     - Check Frame and Harness Assembly 15-6b
     - Check Agent Tank 15-6c

15-4. REPAIR PROCEDURE INDEX.

SECTION II. M33A1 RIOT CONTROL AGENT (RCA) DISPENSER

15-5. GENERAL .

This section contain BDAR procedures applicable to the M33A1 RCA Disperser.

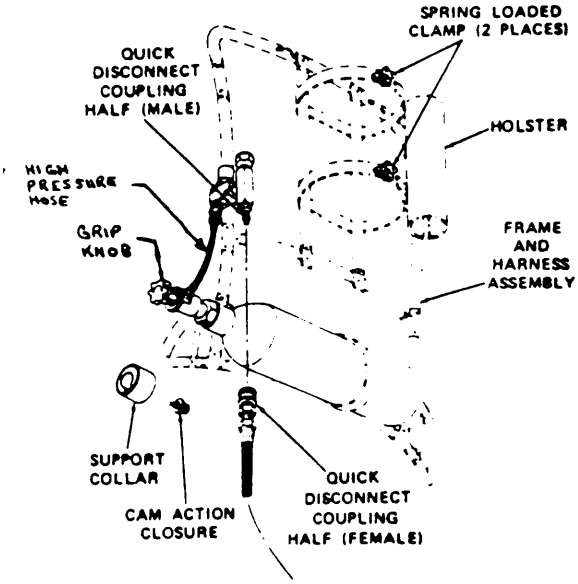
15-6. M33A1 RCA DISPENSER BDAR PROCEDURES.

a. Hose Assembly Failures

(1) High Pressure Hose Assembly.

General Information:

If the high pressure hose is leaking, it can be repaired to complete the mission until a replacement can be installed.



Limitations:

o None

Personnel/Time Required:

o 1 soldier
o 0.5 hour

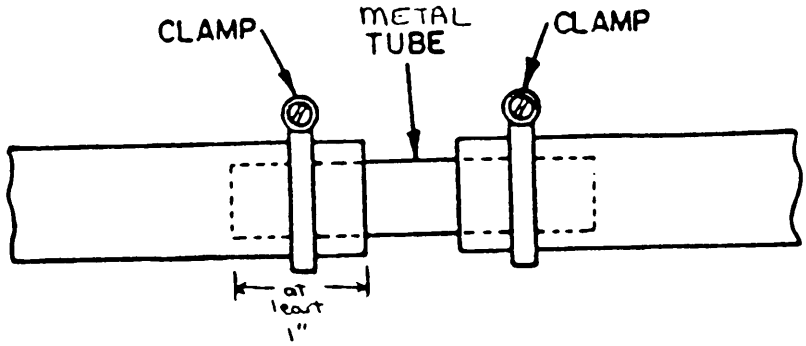
Materials/Tools:

o Metal tube (outside diameter of tube same as inside diameter of hose)
o hose clamps

Procedural Steps:

1. Cut out damaged section of hose. Clean loose particles from cut ends of hose.

2. Cut tightly fitting metal tube (26. appx C) to proper length.



15-6. M33A1 RIOT CONTROL AGENT (RCA) BDAR PROCEDURES - CONT.

3. Install metal tube inside cut ends of damaged hose.

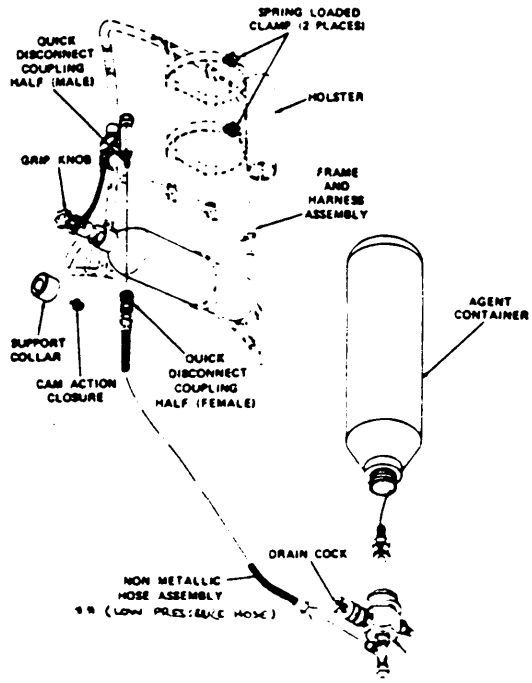
4. Secure with two or more hose clamps (6, appx C).

5. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace the high pressure hose using standard maintenance procedures.

(2) Low Pressure Hose Assembly.

General Information:

If the low pressure hose is leaking, it can be repaired to complete the mission until a replacement can be installed.



Limitations:

o None

Personnel/Time Required:

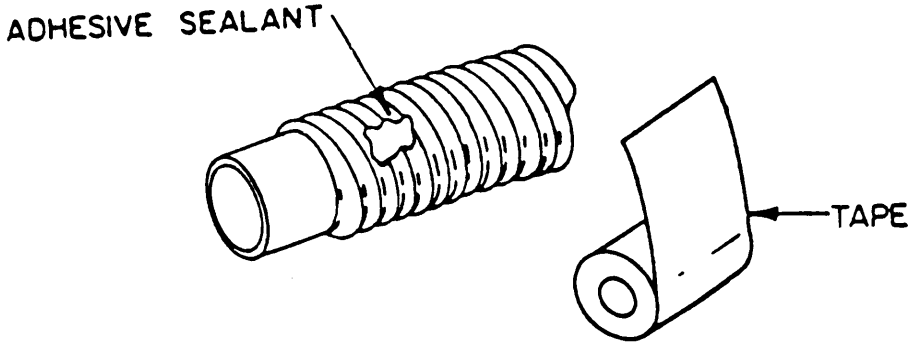
o 1 soldier
o 0.25 hour

Materials/Tools:

o adhesive sealant
o pressure sensitive tape

Procedural Steps:

1. Apply a liberal amount of adhesive sealant (2, appx C) over the hole in the hose.



15-6. M33A1 RCA DISPERSER BDAR PROCEDURES - CONT.

2. Allow the adhesive sealant to skin dry, then wrap the adhesive sealant and damaged area with several layers of pressure sensitive tape (37, appx C).

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace the low pressure hose using standard maintenance procedures.

(3) Discharge Hose.

General Information:

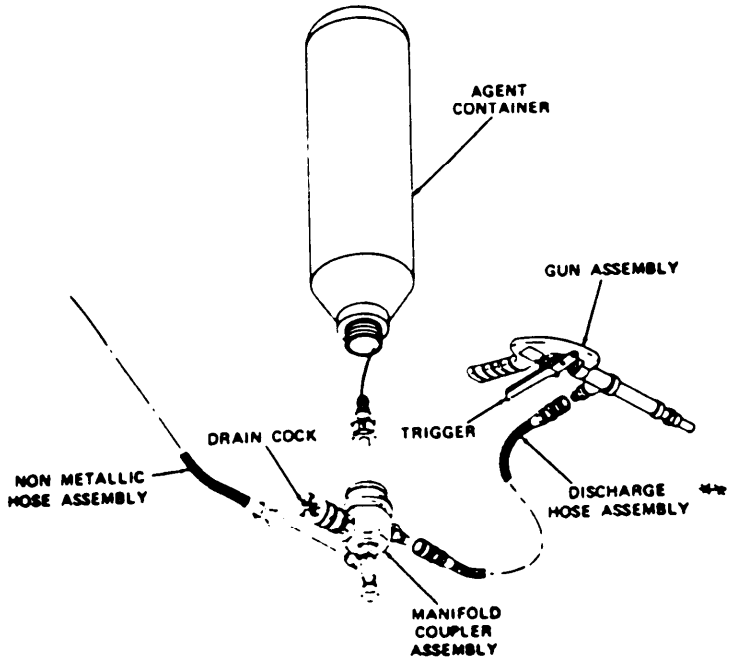
Discharge hose can be repaired.

Limitations:

o None

Personnel/Time Required:

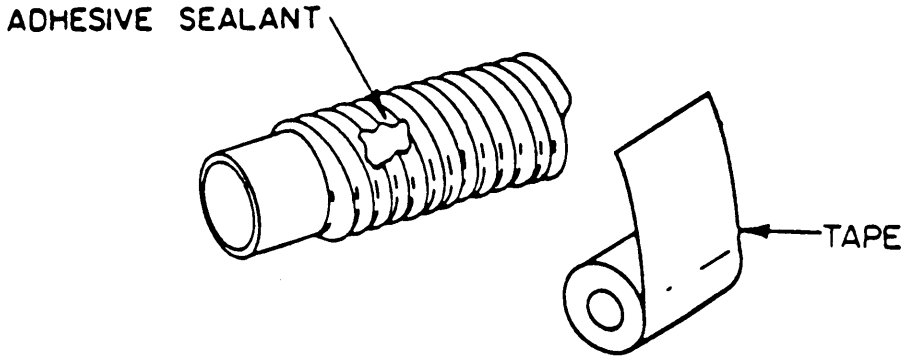
o 1 soldier
o 0.25 hour



15-6. M33A1 RCA DISPERSER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Apply a liberal amount of adhesive sealant (2, appx C) over the hole in the hose.



2. Allow the adhesive sealant to skin dry, then wrap the adhesive sealant and damaged area with several layers of pressure sensitive tape (37, appx C).

3. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace the low pressure hose using standard maintenance procedures.

b. Frame and Harness Assembly Failures.

(1) Harness Assembly.

General Information:

Harness assembly can be repaired.

Limitations:

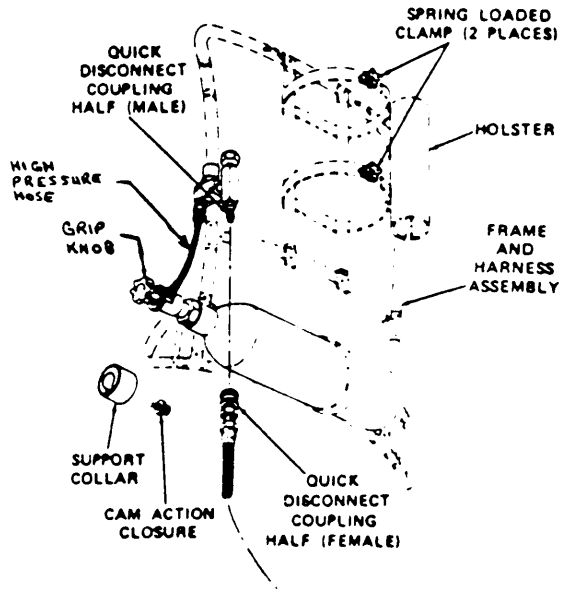
o None

Personnel/Time Required:

o 1 soldier
o 0.3 hour

Materials/Tools:

o rope



15-6. M33A1 RCA DISPERSER BDAR PROCEDURES - CONT.

Procedural Steps:

1. Replace the broken harness with rope (30, appx C).

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, repair/replace the harness using standard maintenance procedures.

(2) Frame Assembly.

General Information:

Frame assembly can be replaced.

Limitations:

o None

Personnel/Time Required:

o 1 soldier
o 0.5 hour

Materials/Tools:

o stick/pipe
o pressure sensitive tape

Procedural Steps:

1. Place adequate size stick/pipe in place of broken frame and tape (37, appx C) together.

2. Record the BDAR action taken. When the mission is complete, as soon as practicable, repair/replace the frame using standard maintenance procedures.

15-6. M33A1 RCA DISPENSER BDAR PROCEDURES - CONT

c. Agent Tank Failure

General Information:

Agent tank can be replaced.

Limitations:

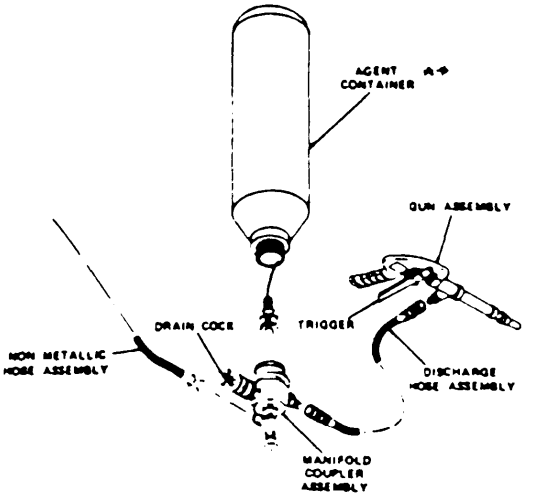
o None

Personnel/Time

o 1 soldier
o 0.1 hour

Materials/Tools:

o pressure sensitive tape



Procedural Steps:

1. Place tape (37, appx C) over leak and wrap around the entire tank several times.

2. Record the BDAR action taken. When the mission is completed, as soon as practicable, replace the tank using standard maintenance procedures.

APPENDIX A

REFERENCES

Publication Number	Title
DA PAM 738-750	The Army Maintenance Management System (TAMMS)
FM 3-5	NBC Decontamination
FM 21-11	First Aid for Soldiers
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities

APPENDIX B

SPECIAL OR FABRICATED TOOLS

There are no special fabricated tools or test equipment required for this TM.

APPENDIX C

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS

SECTION 1. INTRODUCTION

C-l. SCOPE .

This appendix equipment/system lists expendable supplies and materials you will need to make BDAR fixes on the Chemical Defensive Materiel. Items are listed alphabetically by the item name shown in the Description column. These items are authorized to you by CTA 50-970, Expendable/Durable items (Except Medical, Class V, Repair Parts, and Heraldic Items) or CTA-8-100.

C-2. EXPLANATION OF COLUMNS (SECTION II).

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., “Use cleaning compound, item 5, app C“).

b. Column (2)- National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

c. Column (3) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

d. Column (4) - Unit of Issue (U/I). Is the abbreviation of the types of units under which material is issued.

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) NSN	(3) DESCRIPTION	(4) U/I
1	8040-00-738-6429	Adhesive and sealing compound, epoxy, metal filled (81348) MMM-A-1754	KT
2	8040-00-851-0211	Adhesive sealant, silicone (71984) Silastic 732 RTV	TU
3	3030-00-224-8358	Belting, V, adjustable l/2-in. wide (24161) 7760-3102	FT
4	3030-00-233-9126	Belting, V, adjustable 3/4-in. wide (24161) 7760-3303	FT
5	4730-00-231-2424	Cap, pipe (81348) WWP521	EA

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - CONT.

(1) ITEM NUMBER	(2) NSN	(3) DESCRIPTION	(4) U/I
6	4730-00-908-3195	Clamp, hose 7/16 - 25/32-in. (96906) MS35842-10	EA
7	4730-00-908-3194	Clamp, hose 11/16 - 1-1/4 in. (96906) MS35842-11	EA
8	4730-00-908-3193	Clamp, hose 1-1/16 - 2 in. (96906) MS35842-12	EA
9	4730-00-909-8627	Clamp, hose 1-13/16 - 2-3/4 in. (96906) MS35842-13	EA
10	4730-00-908-6292	Clamp, hose 2-9/16 - 3-1/2 in. (96906) MS35842-14	EA
11	4730-00-908-6293	Clamp, hose 3-5/16 - 4-1/4 in. (96906) MS35842-15	EA
12	4730-00-908-6294	Clamp, hose 4-1/8 - 7 in. (96906) MS35842-16	EA
13	5350-00-192-5047	Cloth, abrasive, 80 grit (58536) A-A-1048	PG
14	5350-00-161-9066	Cloth, abrasive, 100 grit (58536) A-A-1048	PG
15	8040-00-831-3403	Epoxy (33564) EA901NA/Bl	KT
16	5920-00-284-6795	Fuse, 10 amp SB (81349) F02B25010A	EA
17	5920-01-027-8114	Fuse, 25 amp SB (81348) WF1814/23-036	EA
18	5330-00-756-1419	Gasket forming compound (77247) Formagasket lB	TU
19	8040-00-351-8211	Gasket shellac (77247) Indianhead gasket shellac compound	BT
20	4720-00-623-9178	Hose, rubber l/4-in. ID (81889) 5TS	FT
21	4720-00-169-5112	Hose, rubber l/2-in. ID (96906) MS39262-8	FT

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - CONT.

(1) ITEM NUMBER	(2) NSN	(3) DESCRIPTION	(4) U/I
22	2610-00-269-7383	Inner tube, pneumatic (96906) MS35392-13	EA
23	8335-01-058-9474	Laces, footwear (81348) V-L-61	PR
24	5330-00-233-5845	Paper, gasket 1/64-in., (W.O.G. resistant) (81348) HHP96	YD
25	5330-00-467-3615	Paper, gasket 1/32-in., (W.O.G. resistant) (81348) HHP96TYPE 1	YD
26	4710-00-162-1016	Pipe steel 1/4-in. ID (81346) ASTM 120	FT
27	4710-00-162-1018	Pipe steel (81346) ASTM 120	FT
28	4710-00-162-1019	Pipe steel (81346) ASTM A120	FT
29	4730-00-221-2136	Plug, pipe 1/8-in. (88044) AN913-lS	EA
30	4020-00-968-1352	Rope, polypropylene 1-1/2 in. circumference (80244) MIL-R-24049	RL
31	8030-00-252-3391	Sealing compound (77247) AgasketNO2	TU
32	8030-00-656-1426	Sealing compound (77247) Aviation Formagasket3	PT
33	8030-00-965-2004	Sealant, synthetic rubber (81349) MIL-S-8802	MT
34	3439-00-762-7105	Solder, tin alloy 0.63-in. (81348) QQS571	LB.
35	8030-00-889-3535	Tape, antiseizing 1/2-in. (81755) P5025-2R	EA
36	5970-00-419-4290	Tape, insulating, electrical, 3/4-in. (81349) MIL-I-24391	RO

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - CONT.

(1) ITEM NUMBER	(2) NSN	(3) DESCRIPTION	(4) U/I
37	7510-00-890-9874	Tape, pressure sensitive 2 in. (58536) A-A-1586	RO
38	4710-00-203-3171	Tube, copper 1/4-in. OD (81346) ASTM B280	CL
39	4020-00-231-5849	Twine (81348) T-T-871	CE
40	6145-00-062-4050	Wire, electrical 18 AWG (18876) EEU8U9	FT
41	6145-00-089-6570	Wire, electrical 20 AWG (18876) MPD1506TYPEEE20U9	FT
42	6145-00-660-8584	Wire, electrical 12 AWG (81348) QQW343S12S1T	FT
43	6145-00-865-6685	Wire, electrical 16 AWG (18876) EE16U9	FT
44	9525-00-529-0442	Wire, nonelectrical (81348) QQ-W-390	LB
45	6145-01-047-4345	Cable, telephone (80063) WP24-1-4MILE	RL

APPENDIX D

SUBSTITUTE MATERIALS/PARTS

SECTION I. INTRODUCTION

D-1. SCOPE,

This appendix lists parts which can be taken from other systems/items and used on the chemical defensive equipment addressed in this TM.

D-2. GENERAL .

Spares and repair parts are organized by NSN and therefore can be requisitioned throughout the military system. The NSN parts classification system is a reliable and quick method in which to identify parts. In a battlefield situation this system will be invaluable as time, maintenances and supply demands increase.

D-3. EXPLANATION OF COLUMNS (SECTION II).

a. Column (1) - Primary Part. This is the original part of the item.

b. Column (2) - Substitute/Alternate Part. This is the part that may be used in of the primary part. In some cases, the part will have the same National Number (NSN).

c. Column (3) - Remarks. Any limitations or degradation effected by use of substitutions will be listed in this column.

SECTION II. SUBSTITUTE MATERIALS/PARTS LIST

(1) PRIMARY PART	(2) SUBSTITUTE/ALTERNATE PART	(3) REMARKS
Contact set: P/N A2437AX NSN 2920-00-142-0888	Contact set: P/N W2437 NSN 2920-00-142-0888	The contact sets from the M3A4 Smoke Generator and the M2 Water Heater are the same.
Engine assembly: P/N 4A084-3 NSN 2805-00-872-5972	Engine assembly: P/N 13206E1000MARK3 NSN 2805-00-872-5972	The engines from the M51 Shelter and the M12A1 Decontaminating Apparatus are the same.

APPENDIX E

BDAR FIXES AUTHORIZED FOR TRAINING

BDAR TRAINING FIXES SHALL BE
USED ONLY AT THE DISCRETION OF THE COMMANDER.
DAMAGES SHALL BE REPAIRED BY STANDARD MAINTENANCE
PROCEDURES AS SOON AS PRACTICABLE.

The training officer or noncommissioned officer must exercise experienced judgment improvising realistic training that does not damage the equipment. For BDAR training fixes, use simulations which approximate conditions in this manual. See examples below.

a. Unscrew the fog oil pump drain cock instead of breaking it off (para 8-6c(3)).

b. Use chalk marks to simulate cuts in a hood or mask face-piece instead of actually cutting it.

c. Use a spare section of rubber hose to practice repairs instead of using the actual equipment hose.

REPAIR PROCEDURE	PARAGRAPH NO.
M12A1 DECONTAMINATING APPARATUS	
PUMP UNIT	
Fuel System Failures	
Fuel hose leaking or fuel shut off valve defective	4-6a(1)
Fuel pump defective	4-6a(2)
Indicator System Failures	
Tachometer defective	4-6b(l)
Pressure gage defective	4-6b(2)
Vacuum gage defective	4-6b(3)
Pumping System Failures	
Pump drain valve defective	4-6c(1)
Vacuum hose defective	4-6c(2)
Electrical System Failures	
Electrical wire defective	4-6d(2)
Low oil pressure switch (S4) defective	4-6d(3)

M12A1 DECONTAMINATING APPARATUS - Continued

WATER HEATER

Electrical System Failures

Temperature limit switch (S1) defective	4-8a(3)
Electrical wire defective	4-8a(5)

Fuel System Failures

Fuel hose defective	4-8b

Indicator System Failures

Water pressure gage or water temperature gage defective	4-8c

TANK UNIT

Water Holding System Failures

Drain valve defective	4-l0(1)

Mll DECONTAMINATING APPARATUS

Handle Failure	5-6a

TYPE A/E32U-8 DECONTAMINATING APPARATUS

Electrical System Failures

Spark plug defective	6-6a(2)

Fuel System Failures

Engine fuel pump defective	6-6b(l)

M13 DECONTAMINATING APPARATUS

Hose Cut	7-6a
Wands Leaking at Connectors	7-6b
Decontamination Unit Becomes Inoperative	7-6c

M3A4 SMOKE GENERATOR

Fuel System Failures

Fuel filter bowl leaking or broken	8-6a(2)
Carburetor reservoir toggle valve handle broken	8-6a(4)

M3A4 SMOKE GENERATOR - Continued

Indicator System Failures

Fuel tank gage defective	8-6b(l)
Air pressure gage defective	8-6b(2)

Fog Oil System Failures

Fog oil line from fog oil pump to engine defective	8-6c(1)
Fog oil inlet or fog oil exhaust hose defective	8-6c(2)
Fog oil pump drain cock broken off	8-6c(3)

Ignition Magneto Failure	8-6e

GAS-PARTICULATE FILTER UNITS:
M7A1, M8A2, M8A3, M13, M13A1 AND M14

NOTE

Care must be taken not to damage the items of equipment and that hoses and other items used in BDAR training fixes are not part of the actual equipment.

Headpiece Torn or Punctured (M7A1 and M14)	9-6a
Eyepiece Punctured (M7A1 and M14)	9-6b
Headpiece Strap Assembly Missing (M7A1 and M14)	9-6c
Ratchet Clamp Broken or Missing (M7A1, M8A2, M8A3, M13, M13A1 and M14)	9-6d
Airduct Hose Punctured (Small Holes) (M7A1, M8A2, M8A3, M13, M13A1 and M14)	9-6e
Airduct Hose Punctured (Large Holes) or Cut (M7A1, M8A2, M8A3, M13, M13A1 and M14)	9-6f
Quick Disconnect Coupling "O" Ring Missing (M7A1, M8A2, M8A3, M13, M13A1 and M14)	9-6g
Electrical Wire Defective (M7A1, M8A2, M8A3, M13, M13A1 and M14)	9-6h
Circuit Breaker Defective (M8A2, M8A3, M13, M13A1 and M14)	9-6i
ON\OFF Switch Defective (M7A1)	9-6j

M51 COLLECTIVE PROTECTION SHELTER SYSTEM

NOTES

Care must be taken not to damage the items of equipment and that items used in BDAR training fixes are not part of the actual equipment.

M51 COLLECTIVE PROTECTION SHELTER SYSTEM - Continued

It is not advisable to operate the M51 Shelter System with the electrical bypasses in place despite the fact that an experienced operator could install and remove the bypasses without danger to the integrity of the equipment.

ENGINE

Electrical System Failures

Cracked battery	10-6a(l)
Electrical wire defective	10-6a(2)
Low oil pressure switch (S16) defective	10-6a(3)

Fuel System Failures

Fuel fitting leaking	10-6b(l)
Fuel tank leaking	10-6b(2)

SHELTER

Electrical System Failures

AUXILIARY 120 VAC circuit breaker (CB1) defective	10-7a(l)
GENERATOR FREQUENCY meter defective	10-7a(2)
RECIRCULATION FAN circuit breaker (CB2) defective	10-7a(3)
CONDENSER FAN circuit breaker (CB3) defective	10-7a(4)
PRESS TO INFLATE switch (S3) defective	10-7a(5)
ENGINE START switch (S17) defective	10-7a(6)
ENGINE CONTROL switch (S15) defective	10-7a(7)
Relay (K3) defective	10-7a(8)
Relay (K8) defective	10-7a(9)
Relay (K10) defective	10-7a(10)
Relay (K1) defective	10-7a(ll)
Thermostat switch (S5) defective	10-7a(12)
LIGHT switch (S2) on auxiliary control box defective	10-7a(13)
Switching relay (K11) on the auxiliary control box defective	10-7a(14)
Entrance time delay relay (K5) on the auxiliary control box defective	10-7a(15)
BUZZER SILENCER switch (S23) on the auxiliary control box defective	10-7a(16)

Pressurization System Failures

Makeup air solenoid defective	10-7b(l)
Hose clamp broken	10-7b(2)
Low air pressure switch (S13) defective	10-7b(3)
Low air pressure buzzer defective	10-7b(4)

M51 COLLECTIVE PROTECTION SHELTER SYSTEM. (CONT)

Environment Control System Failures

Heater unit defective	10-7c(1)
HIGH LOW HEAT switch (S9) on the auxiliary control box defective	10-7c(2)
Cooling unit defective	10-7c(3)
COOL CIRCULATE HEAT switch (S4) on the auxiliary control box defective	10-7c(4)

MASK HOODS: M5, M6A2 AND M7

NOTE

All mask hood BDAR fixes can be simulated without damage to the equipment.

Hood Torn or Cut (M5, M6A2 and M7)	11-6a
Neck Cord Missing or Torn (M5, M6A2 and M7)	11-6b
Underarm Straps Torn or Missing (M5, M6A2 and M7)	11-6c
Hose Cord Torn or Missing (M5)	11-6d
Zipper Broken (M6A2)	11-6e

CHEMICAL-BIOLOGICAL MASKS: M9A1, M17A1, M17A2, M24, M25A1, M40, M42 AND M43

NOTES

Each BDAR fix pertains to models of chemical-biological masks listed in parentheses.

All mask BDAR fixes can be simulated without damage to the equipment.

Lens Cracked (M24 and M25A1)	12-6a
Head Harness Torn (M9A1, M17A1, M17A2, M24, M25A1, M40, and M42 ONLY)	12-6b
Hose Punctured (small holes) (M24, M25A1 ONLY)	12-6c
Hose Punctured (large holes) or Cut (M24, M25A1 ONLY)	12-6d
Ratchet Clamp Broken or Missing (M24, M25A1 ONLY)	12-6e
Hood Torn or Cut (M43)	12-6f
Hood Elastic Torn (M43)	12-6g

M8A1 AUTOMATIC CHEMICAL AGENT ALARM

M43A1 Detector Horn Inoperative	13-6a
Clamping Catches Broken on the M43A1 Detector Case	13-6d

M157 SMOKE GENERATOR

Electrical System Failure

Electrical Wire Defective 14-6a

Fog Oil System Failure

Fog Oil Line from Fog Oil Pump to Engine Defective 14-6c

INDEX

PARA

PARA

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BY ORDER OF THE SECRETARY OF THE ARMY:

CARL E. VUONO
General, United States Army
Chief of Staff

OFFICIAL:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6-14	6-8		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Step 3 does not specify the switch that terminal 1 should be loosened from. Add "of S2" after "Loosen the screw on terminal 1....".

PRINTED NAME. GRADE OR TITLE. AND TELEPHONE NUMBER

NAME, GRADE, PHONE NO.

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BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

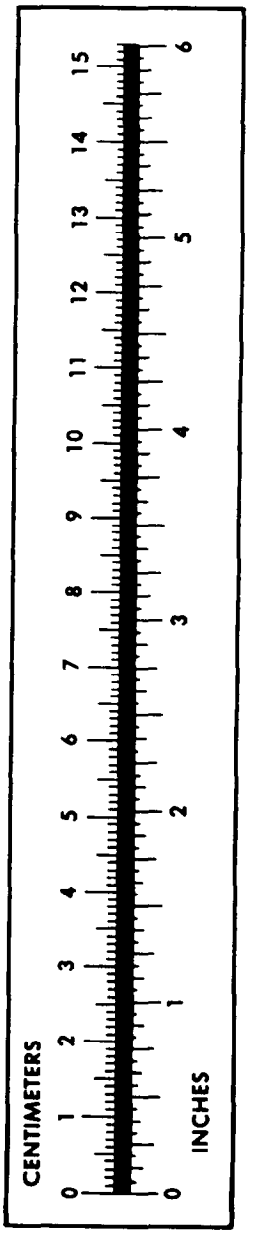
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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