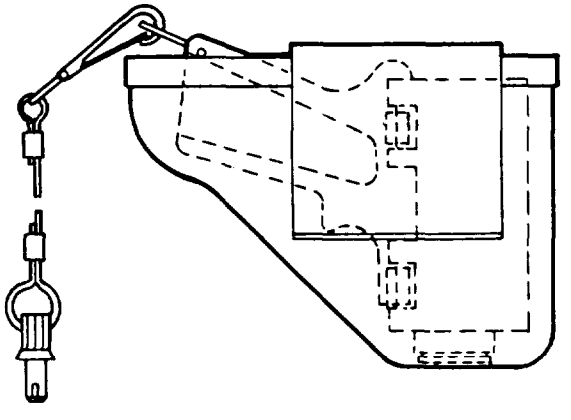
TM 9-1265-371-14&P

Technical Manual

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER



HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 1982

WARNING

Although the laser light emitted by MILES equipment transmitters is considered eye safe by the Bureau of Radiological Health, suitable precautions must be taken to avoid possible damage to the eye from overexposure to this radiated energy. Precautionary measures include the following:

- Avoid viewing the laser emitter at close range (less than 12 meters). Increasing the distance from the eye to the laser source greatly reduces the risks of overexposure.

- Avoid viewing the emitter directly along the optical axis of radiated beam.

- Especially avoid viewing the emitter directly along the optical axis of the beam through stabilized optics such as binoculars, telescopes or periscopes, at ranges less than 75 meters.

- While using the controller's gun to test MWLD laser detectors on a person NEVER AIM TOWARD THE EYES.

TECHNICAL MANUAL
No. 9-1265-371-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *22 January 1982*

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

Current as of 29 August 1981

REPORTING OF ERRORS

You can help improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2, located in the back of this manual, and mailing the form direct to Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS-SE, Rock Island, IL 61299. A reply will be furnished direct to you.

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. SCOPE. This manual contains operating and maintenance instructions for the Controller's Gun, Simulator System, Laser, which is part of the Multiple Integrated Laser Engagement System (MILES). Maintenance instructions are for operator/crew, organizational, direct support, and general support maintenance levels.

Appendix A contains a list of references applicable to operation and maintenance of the controller's gun. Appendix B outlines the Maintenance Allocation Chart (MAC). Appendix C contains the Repair Parts and Special Tools List (RPSTL).

1-2. FORMS AND RECORDS. Maintenance forms, records, and. reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

Section 11. DESCRIPTION AND DATA

1-3 DESCRIPTION. The controller's gun (figure 1-1) is a lightweight, hand-held device capable of interrogating MILES man-worn and vehicle-mounted laser detection systems to determine proper operation in the field. The controller's gun assembly has a green controller key and a standard small weapon battery-powered laser transmitter. The gun is carried in a holster attached to the service belt.

The controller's gun transmits three codes to cause (1) a man "kill"; (2) a universal "kill" (man or vehicle); or (3) a "near miss" (man or vehicle). The desired codes for (1) and (2) are selectable by pressing a pushbutton switch on the rear and pulling the trigger at the same time. The selected code is continually transmitted as long as the trigger and switch are pressed. The near miss code need not be selected; pressing the trigger alone selects "near miss."

The encoder for the controller's gun is designed as a microprocessor base unit. Inputs to the encoder are:

- Trigger activation
- Man hit switch input
- Universal hit switch input

Outputs from the encoder are:

- Laser load pulse
- Laser fire pulse
- Light emitting diode (LED) trigger

The microprocessor is programmed to an idle mode between encoder operations to conserve power.

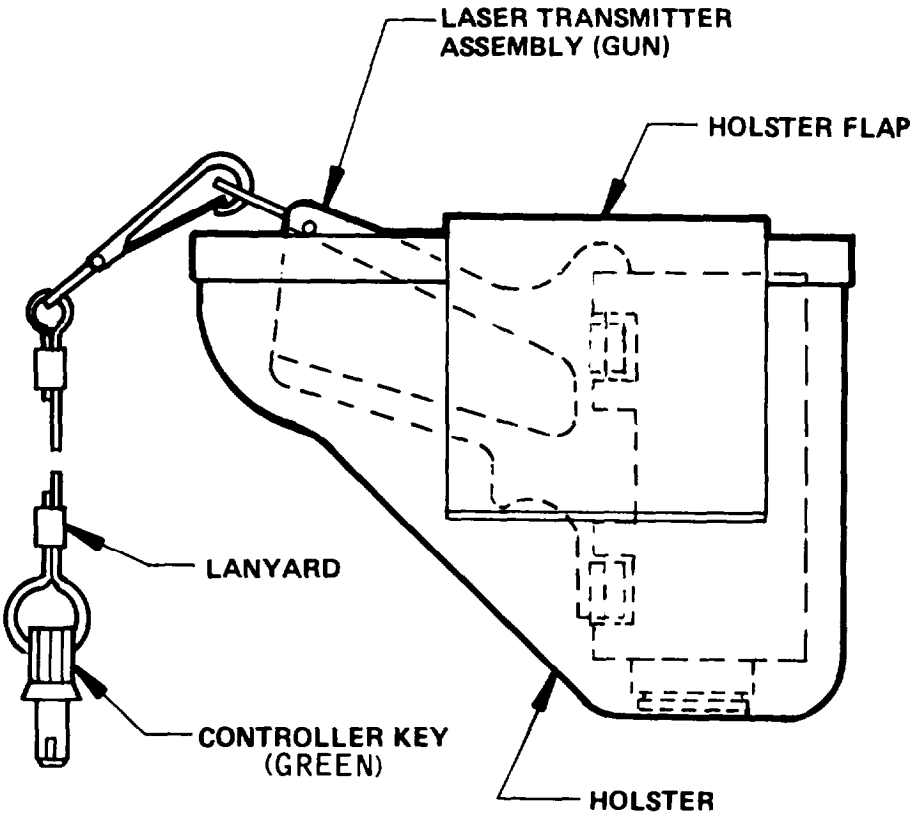


Figure 1-1. Controller's Gun, Simulator System, Laser

Laser transmission is at 3 kHz bit rate for the 11-bit code words used in MILES. The encoder controls and generates one laser load pulse to charge the laser load capacitor, and one laser fire pulse to fire the laser. The firing indicator LED is triggered from the encoder laser fire pulses.

The green controller key is inserted into receptacles located on the various MILES simulators. Depending on which MILES-equipped item is being used, the controller key performs one or more of the following actions:

- Initializes the simulator.
- Turns off audio (vehicle intercom tone) and the visual alarm associated with the combat vehicle kill indicator (CVKI).
- Resets weapon or system for operation.
- Restores a basic ammunition load to a weapon.
- Resets the man worn laser detector (MWLD) when the key is inserted and turned in the MWLD harness key receptacle.

The controller's gun is not rounds-limited, but has a continuous supply of ammunition. When the trigger is pulled, continuous pulses are emitted until the trigger is released, A light-emitting diode (LED) lights during firing.

The controller universal kill code is unique in the MILES because the controller's gun can kill any MILES-equipped man or vehicle.

All electronic components required for providing signals to the laser driver

and laser tube assembly are contained on two printed wiring board assemblies. A hinged door provides access to a 9-volt battery which powers the laser transmitter.

Front and rear sights are factory-aligned to the laser beam; therefore, there is no need for field alignment.

1-4 TABULATED DATA. Technical data for the Controller's Gun,Simulator Systern, Laser, are listed in table 1-1.

1-5 DEFINITIONS

Ki11 - Successful transmission of the weapon simulator kill code that results in the deactivation or "kill" of the target. An audio or visual alarm at the target signifies the kill.

MILES - Multiple Integrated Laser Engagement System. The MILES injects realism of actual combat into battlefield training exercises.

Near Miss - Illumination of the target with the near miss laser message resulting in an audio indication of the target that it is under fire.

Round - A laser message that simulates the effects of a round from the weapon.

Table 1-1. Controller's Gun Technical Data

Laser radiation	Gallium arsenide (GaAs) in the range of 880 to 920 nanometers	
Weight.	1 lb, 10 oz (774 grams)	
Dimensions (less holster)	Height:	6.6 in.
	Width:	5.5 in.
	Depth:	3.0 in.
Battery (1)		
Power	9 volts Alkaline BA-3090/U for above 32°F	
Life	100 hours, constant use	
Range	500 meters	

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. PREPARATION FOR OPERATION

2-1. PRELIMINARY INSPECTION. When a new or reconditioned controller's gun is received, the using organization must determine whether the gun has been properly prepared for service.

a. Visual Inspection. Check general condition and appearance of the controller's gun. All lettering on identification plate and controls should be clearly defined and easily read.

A copy of this technical manual should accompany the controller's gun.

b. Inspection and Cleaning. To inspect and clean the controller's gun, perform the following steps:

(1) Remove any dirt or oil from the lens with a soft cloth. Use a wet cloth to remove stubborn dirt.

(2) Inspect trigger and code selection switches for proper operation.

(3) Inspect for any damage that would make the gun unserviceable.

(4) Inspect controller's gun holster for rips, tears, or any other damage that would make the holster unserviceable.

(5) Report any damage on DA Form 2404 and if necessary replace damaged item.

2-2. OPERATIONAL CHECKOUT. The controller's gun is used primarily to test MILES detector systems. Operational procedures consist of verifying that the gun is able to perform that function.

a. Battery Installation. Before operating the controller's gun, a 9-volt battery must first be installed. To install a battery, perform the following steps:

(1) Flip the latch and open the battery door.

(2) Install the proper 9-volt battery.

- For temperatures above 0°C (32°F) use BA-3090/U, 9-volt alkaline battery.
- For temperatures below 0°C (32°F) use PCI-400-9, g-volt lithium organic battery. (The clips in the battery compartment prevent improper installation of the battery).

(3) Close the door and fasten the clamp.

(4) The controller's gun is now ready for use.

b. Controller Key. Be sure that the green controller key is attached to the gun.

C. Operational Checkout. Verify that the gun is operating by pressing the trigger and pushbutton switches. Observe that the FIRING light comes on in all three modes, MAN KILL, UNIVERSAL KILL, and NEAR MISS. If the gun does not operate, refer to troubleshooting procedures in chapter 5.

Section II. OPERATION OF CONTROLLER'S GUN

2-3. PREOPERATIONAL PROCEDURES
(Refer to paragraph 2-2).

2-4. OPERATIONAL PROCEDURES. Functions or operating modes of the controller's gun and key are to:

- Interrogate a MILES target to determine its status.
- Disqualify, or "kill," soldiers and eliminate vehicles from an exercise.
- Reset MILES simulators and restore basic ammunition loads by use of the controller key.

Operating procedures for these modes are as follows:

a. Interrogation Mode. In the interrogation mode, a near-miss beam, created by pressing the trigger (figure 2-1), is aimed at the MILES target. The beam is formed by a l-watt laser diode with an optical beam divergence of approximately 5 milliradians. This gives the controller's gun an interrogation range greater than 500 meters. The transmitter will fire continuously as long as the trigger is depressed. The firing is limited only by the life of the battery.

Audio or visual signals at the MILES target (man or vehicle) indicate the target is working properly.

b. Disqualification or KILL Mode, This mode is used to put any man or vehicle out of action,

Examples are:

- Disqualify a soldier or vehicle,
- A man or vehicle determined to be crossing a "minefield."
- A vehicle going over a "demolished bridge."
- Check a detector system for proper operation.

(1) MAN KILL - Press MAN KILL pushbutton switch (figure 2-2) with thumb and pull trigger at the same time. The switch and trigger must be pressed at the same time. This mode is used when it is desirable to kill infantrymen located close to vehicles without destroying vehicles.

(2) UNIVERSAL KILL (Man or Vehivle) - Press UNIVERSAL KILL pushbutton switch (figure 2-2) with thumb and pull trigger at the same time. The switch and trigger must be pressed at the same time. This mode is used when it is desirable to kill infantrymen and destroy vehicles.

c. Reset MILES Simulators and Restore Basic Ammunition Loads. Three keys are used in the operation of MILES, Each key is configured differently and is of a different color. Figure 2-3 shows the differences in physical configuration of the key slots. Also shown is a typical independent (battery-powered) transmitter\ and its weapon key receptacle.

The controller key, when inserted in the control console weapon key receptacle of a "killed" vehicle or in the weapon key receptacle of a "killed" man-worn laser detector (MWLD), will cause the system to reset to its normal state. The weapon key and controller reset key, as well as their mating guides, are configured to prevent incorrect insertion and to prevent the key from falling out of the receptacle during operation.

2-5. FUNCTIONS OF KEYS. MILES keys and their functions are as follows:

a. Weapon key - Yellow (Man Systems). Used with the following systems or assemblies, and for the purposes listed:

- M16A1 rifle simulator - weapon enable/disable
- M60 machine gun simulator - weapon enable/disable
- Man-worn laser detector (MWLD) - alarm disable
- DRAGON missile simulator - weapon enable/disable

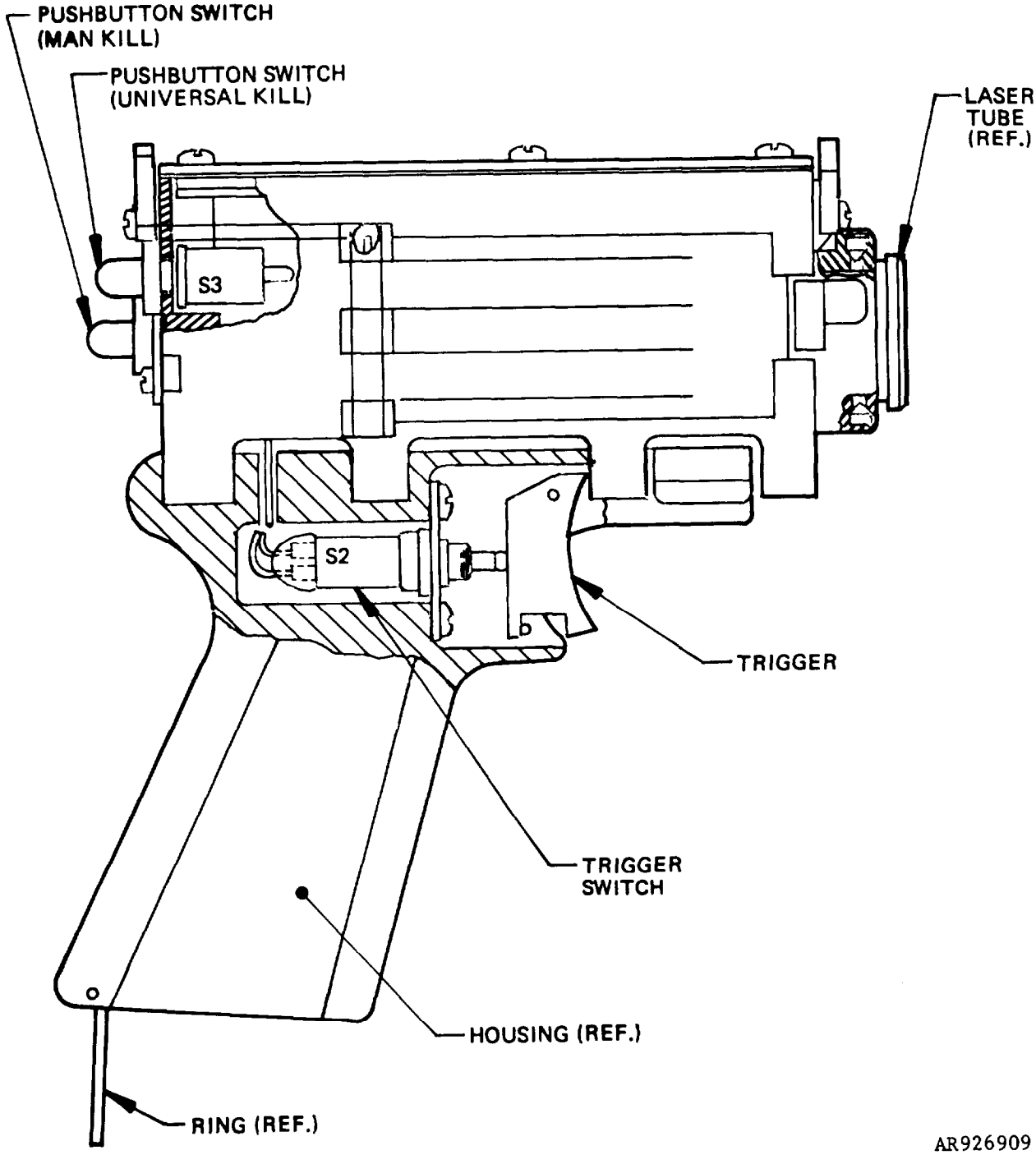


Figure 2-1. Controller's Gun Trigger and Switches

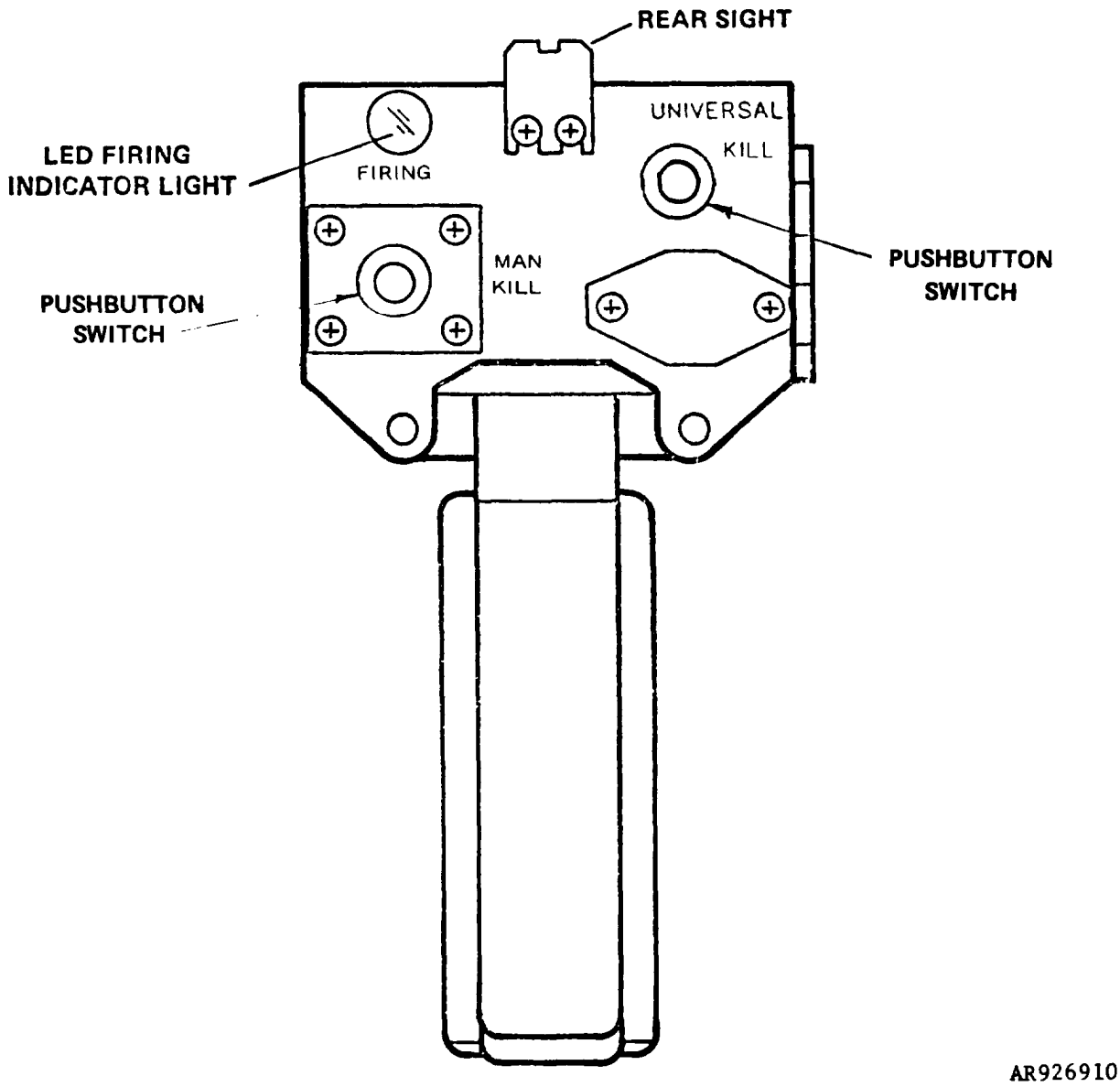
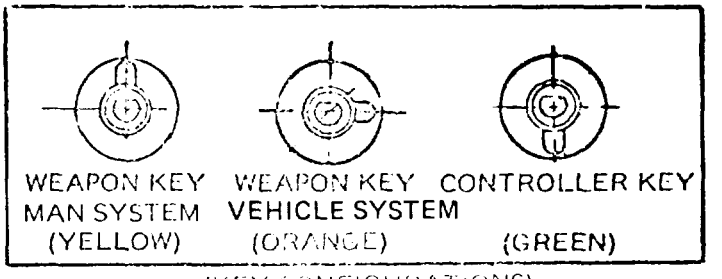


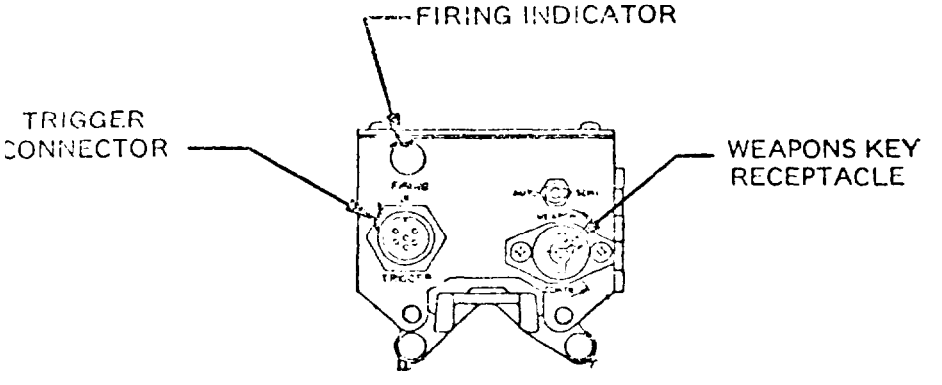
Figure 2-2. Controller's Gun Controls and Display

b. Weapon key - Orange (Vehicle Systern). Used with the following systems or assemblies, and for the purposes listed:

- M113APC simulator system
  - M2 machine gun simulator - weapon enable/disable
  - Console - alarm disable
- M60A1/A3 tank simulator system
  - M85 machine gun simulator - weapon enable/disable
  - Console - alarm disable
- M551 vehicle simulator system
  - M2 machine gun simulator - weapon enable/disable
  - Console - alarm disable



(KEY CONFIGURATIONS)



(SMALL ARMS [illegible] TRANSMITTER)

NOTE

For man-carried systems, key receptacles will accept yellow or green keys, but not the orange (vehicle) key. For vehicle systems, key receptacles will accept orange or green keys, but not the yellow key. No weapon transmitter, except VIPER, will operate without the weapon key installed.

Figure 2-3. MILES Key Configurations

c. Controller key - Green. The controller key is attached to the lanyard of the controller's gun (figure 1-1) and is used with all the above-listed systems. Basic uses of the controller key are to:

- Enable (turn-on) transmitters in the dry fire mode and supply them with a basic Load of ammunition
- Enable the control console and supply it with a basic Load of ammunition
- Reset the MWLD from a "kill" condition to an active state
- Enable DRAGON, TOW, and VIPER simulators for ATWESS fire and dry fire.

The controller key is not used or needed for:

- M16A1 rifle in blank fire mode
- M2, M60, and M85 machine guns in blank fire mode

2-6. ENABLING TRANSMITTERS AND RESETTING DETECTORS. Keys are required to enable and reset independent (battery-powered) transmitters, consoles, and man-worn Laser detectors.

2-7. ENABLING INDEPENDENT TRANSMITTERS - DRY FIRE MODE. A controller key is required to enable independent transmitters (battery-powered M16, M60, M2, M85, VIPER, and DRAGON) and supply them with ammunition. The controller key is inserted into the weapon key receptacle on the laser transmitter. For M16A1, M60, M2, or M85, the key is turned to CONTROLLER. The controller key is then removed. The weapon key (yellow for M16A1, M60, and DRAGON; orange for M2 and M85) is then inserted and turned to "on."

For the DRAGON or VIPER, the controller key is inserted and rotated to SET, held momentarily at SET, rotated to either DRY FIRE or ATWESS; and then removed. Figure 2-4 shows the slot configurations for VIPER and DRAGON which help to explain the weapon key/controller key operation.

There is no weapon key for the VIPER transmitter. VIPER is ready to fire in DRY FIRE or ATWESS mode after the controller key operation.

2-8. ENABLING CONSOLES. A controller key is required to enable dependent transmitters (105 mm/coax, 152 nun/ SHILLELAGH/coax) and restore basic ammunition Loads by enabling the console. This is accomplished by inserting the controller key in the weapon key receptacle on the control console or control indicator (figures 2-5 and 2-6). The key is turned as shown for CONTROLLER, returned to the insert position, and removed. All console-dependent transmitters are now ready for action and have a basic Load of ammunition.

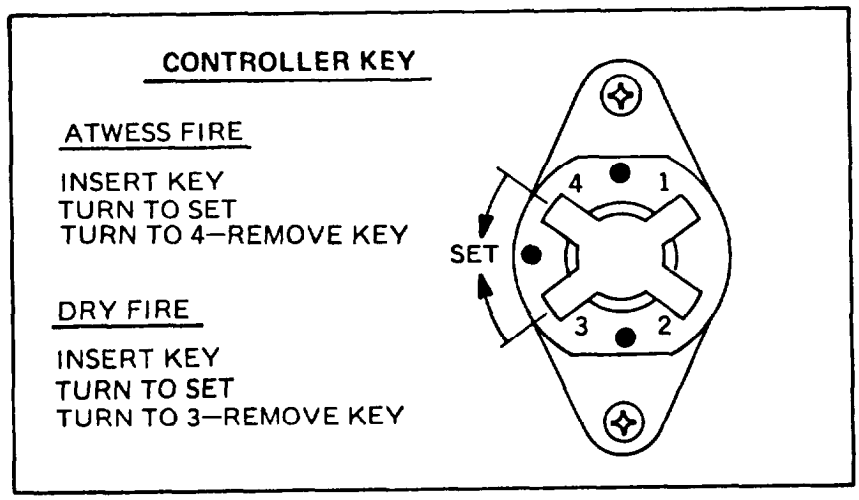
When the vehicle is killed, dependent transmitters are all automatically disabled by the control console. The orange weapon key from the cupola gun (either M2 or M85 depending upon the vehicle) is removed and inserted into the weapon receptacle of the control console and rotated to shut down the vehicle intercom. Removal of the weapon key from the cupola gun disables it. If the orange weapon key is removed from the control console, the audio alarm will again be activated. This condition remains until the system is reset by the controller key.

The yellow weapon keys associated with the MWLDs for use by vehicle crewmen cannot be used for this function. They cannot be inserted. If an orange key is used in the consoles before a vehicle kill alarm, a "self kill" of the vehicle results.

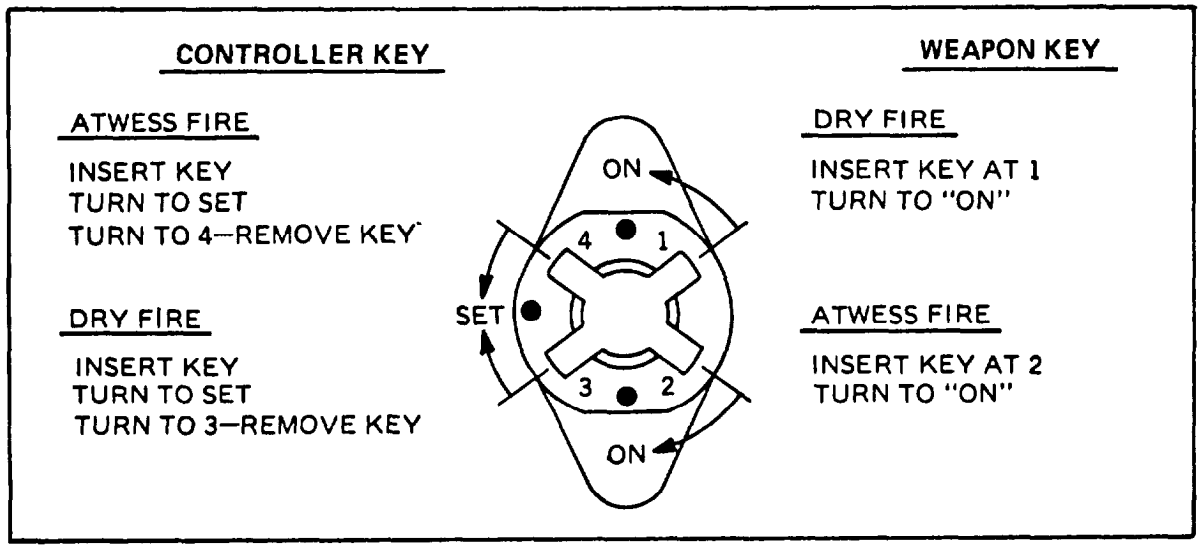
2-9. RESETTING MAN-WORN LASER DETECTORS (MWLD). When the infantryman first checks out the MWLD for use and installs batteries in the torso harness, the kill indicator alarm will go off. This must be shut off with the controller key. The controller key is inserted into the weapon key receptacle on the Left front strap of the harness, turned clockwise to CONTROLLER, then returned to the initial position and removed. The MWLD is now "alive" and is ready for action. The weapon key also can be used to silence the alarm, but upon removal of the key, the alarm again goes off and the MWLD remains "killed."

When the infantryman is "killed" by an opposing MILES weapon, the alarm on his MWLD sounds continuously. His weapon key must be removed from his weapon, inserted into the weapon key receptacle on the harness, and rotated to shut off the alarm. Removal of the key deactivates his weapon and shuts down the MWLD alarm. If the infantryman removes the weapon key, the alarm goes off again, and the MWLD remains killed. The MWLD remains in the killed state until reset by the controller key.

2-10. RESETTING VEHICLE DETECTION SYSTEMS. When battery power is first applied, vehicle systems are in a standby state which requires the controller key for initialization. The control console will indicate this by displaying the number "00" in all positions



VIPER DECAL
(NO WEAPON KEY FOR VIPER)



DRAGON DECAL

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Figure 2-4. VIPER and DRAGON Decals for Weapon and Controller Key Operation

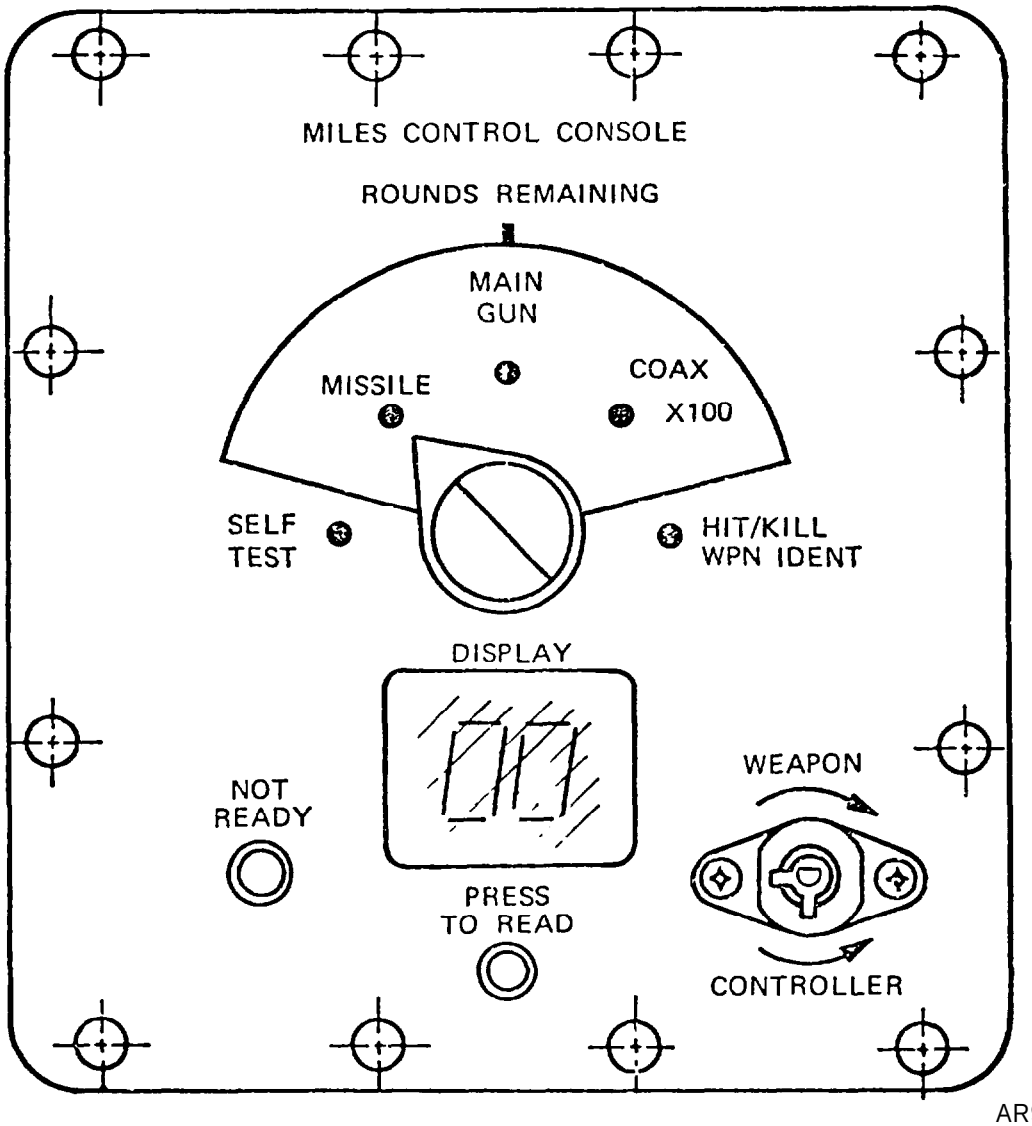

Figure 2-5. Front Panel, Control Console (M60 Tanks/M551 Vehicle)

when PRESS TO READ button is pressed. To clear this condition and ready the vehicle for action, the controller key is inserted into the weapon key receptacle on the control console, turned in the direction marked CONTROLLER, then returned to its insert position and removed. The detector belts are now alive and ready for action. All of the vehicle's dependent transmitters have also been reset and supplied with basic loads of ammunition by this action.

2-11. ENABLING DRAGON, TOW, AND VIPER SIMULATORS. The controller key is required to enable the DRAGON, TOW, and VIPER simulators for ATWESS fire and dry fire. Refer to figure 2-4 for DRAGON and VIPER key settings. The TOW simulator missile guidance system (MGS) contains the TOW controller key receptacle. TOW key settings are the same as for DRAGON or TOW.

2-12. POST-OPERATIONAL PROCEDURES. Post-operational procedures include cleaning, inspection, and storage. Actions include:

a. Clean the lens with a clean cloth.
b. Replace gun in its holster.
c. Check that the controller key is attached to the controller's gun and that the system is complete before storage.

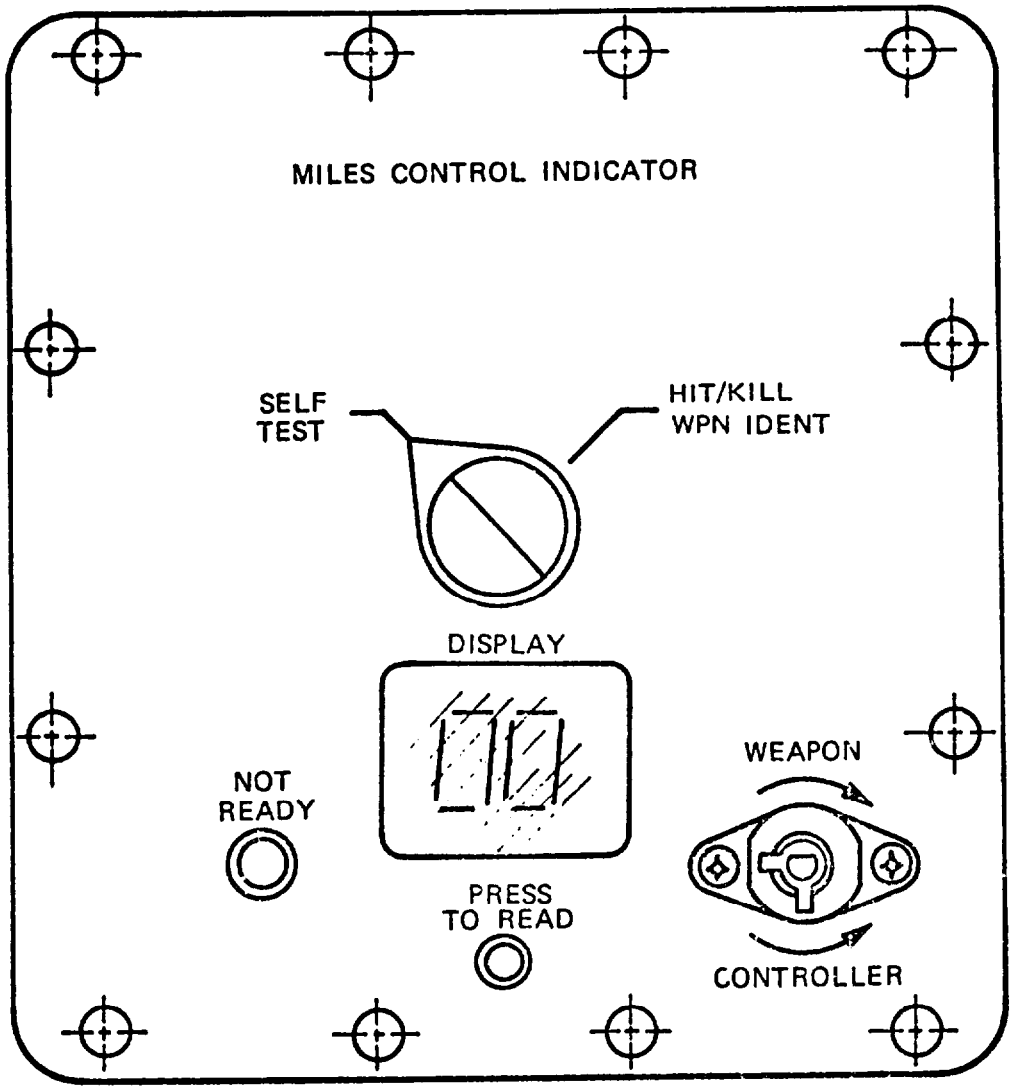

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Figure 2-6. Front Panel, Console, M113 APC

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-1. OPERATOR/CREW PREVENTIVE MAINTENANCE. The purpose of preventive maintenance is to ensure that the controller's gun is always ready for operation. The operator must perform a systematic inspection to discover defects before they result in operational failure of equipment. Defects or malfunctions discovered by the operator during use, or as a result of performing daily maintenance checks and services, will be reported to organizational maintenance for inspection and correction.

Operator/crew preventive maintenance checks and services are outlined in table 3-1. Tasks to be performed before operating the controller's gun appear in the "B" column under the heading Interval and Sequence No. The work time for each task is given in man hours, to one decimal place, in the work time (M/H) column.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services, Controller's Gun

B - Before Operation Time Required: 0.5 M/H | D - During Operation Time Required: 0.1 M/H | A - After Operation Time Required: 0.4 M/H

Interval and Sequence No.			ITEM TO BE INSPECTED PROCEDURE	Work Time (M/H)
B	D	A		
1			Battery - open battery door, remove/replace, close battery door	0.1
2	6	7	Lens - visual inspection, clean as required	0.1
3		8	Lanyard - visual inspection, replace as required	0.1
4		9	Key and lanyard - visual inspection, replace as required	0.1
5		10	Holster - visual inspection, replace as required	0.1

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

4-1. INSPECTION, SERVICE, INSTALLATION, AND SETUP INSTRUCTIONS. Refer to paragraph 2-1.

Section II. PARTS, SPECIAL TOOLS, AND EQUIPMENT

4-2. PARTS, SPECIAL TOOLS, AND EQUIPMENT. Tools and repair parts, including bulk materials, required for organizational maintenance are contained in the maintenance allocation chart (MAC), appendix B, and the repair parts and special tools list (RPSTL), appendix C. No special tools are required for controller's gun organizational maintenance.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-3. ORGANIZATIONAL PREVENTIVE MAINTENANCE. Preventive maintenance is necessary to ensure that MILES equipment is always ready for operation. Organizational maintenance personnel must perform a systematic inspection to discover and correct defects before they result in operational failure of the equipment. Defects or malfunctions discovered by the operator during use, or as a result of performing daily maintenance checks and services, will be reported to organizational maintenance for inspection and correction as authorized.

4-4. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. Organizational (before, during, and after operation) preventive maintenance checks and services are outlined in table 4-1. If any part is defective or missing, other than those parts authorized for replacement or repair at organizational maintenance, refer the equipment to the next higher category of maintenance.

Table 4-1. Organizational Preventive Maintenance Checks and Services

B - Before Operation Time Required:	D - During Operation Time Required:	A - After Operation Time Required:		
Interval and Sequence No.			ITEM TO BE INSPECTED PROCEDURE	Work Time (M/H)
B	D	A		
			NOTE Organizational preventive maintenance checks and services as of the publication date are the same as at operator/crew maintenance level, refer to table 3-1.	

Section IV. TROUBLESHOOTING

4-5. ORGANIZATIONAL TROUBLESHOOTING. There are no organizational troubleshooting procedures. If the controller's gun does not operate properly, deliver the gun to the next higher level of maintenance.

Section V. MAINTENANCE OF CONTROLLER'S GUN

4-6. ORGANIZATIONAL MAINTENANCE OF CONTROLLER'S GUN. Organizational maintenance for the controller's gun consists of inspections and checks discussed above. If the controller's gun is inoperable, deliver the gun to the next higher level of maintenance.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

5-1. SPECIAL TOOLS AND EQUIPMENT. The only special tool required is the laser tube removal tool (see appendix C).

5-2. REPAIR PARTS. Direct support and general support maintenance repair parts are listed and illustrated in the repair parts and special tools list (RPSTL), appendix C.

Section II. TROUBLESHOOTING

5-3. SCOPE OF DIRECT AND GENERAL SUPPORT TROUBLESHOOTING. During system test (chapter 8), if a malfunction of the MILES equipment occurs, troubleshooting procedures are performed in order to locate the source of trouble and to return the equipment to normal operating condition. Table 5-1 provides procedures for troubleshooting at the direct and general support maintenance levels.

NOTE

The troubleshooting table and logic tree (fig. 5-1) are designed to be used with system tests described in chapter 8.

When a malfunction indicates the need for troubleshooting, it is important to note the following points:

a. This section contains troubleshooting or malfunction information and tests for locating and correcting most of the troubles which may develop in the controller's gun. Each malfunction or trouble symptom for an individual component, unit, or system is listed along with probable causes and suggested corrective actions to remedy the malfunction.

b. This manual cannot list all possible malfunctions that may occur or all tests, inspections, and corrective act ions. If a malfunction is not listed or is not corrected by listed corrective actions, report it on DA Form 2028-2 located in the back of this manual.

C. Table 5-1 lists the common malfunctions that you may find during the operation or maintenance of the controller's gun or its components. You should perform the tests/inspections and corrective actions in the order listed.

d. Whenever a malfunction is noted, the first action to take is a visual inspection of the equipment. Carefully inspect electrical cables and connectors, battery box, and mounting hardware. Look for broken or frayed wires, loose connectors, damaged equipment, and unsecure mountings.

5-4. LOGIC TREE DIAGRAMS, The CORRECTIVE ACTION column of table 5-1 contains references to logic trees and/or direct actions that present a solution.

Each logic tree begins with the assumption that the initial condition identified in the system test (chapter 8) has been established before troubleshooting activity is started. Each logic tree must be used from the beginning.

Table 5-1. Controller's Gun Direct Support and General Support Troubleshooting

NOTE

Before you use this table, be sure you have performed all normal operational checks. Use figure 5-3 for electrical connection information. Refer to chapter 6 for removal and replacement instructions. If you have a malfunction which is not listed in these tables, report it on DA Form 2028-2 in the back of this manual.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. FIRING LED CR2 DOES NOT LIGHT WHEN TRIGGER SWITCH S2 IS SQUEEZED; HO OUTPUT.	Step 1. Inspect for defective wiring/solder connections between battery clips and PWB A1.	Refer to fig. 5-1.
	Step 2. Inspect for defective battery clips.	Refer to fig. 5-1.
	Step 3. Inspect for defective trigger switch S2.	Refer to fig. 5-1.
	Step 4. Inspect for defective PWB A1 or LED.	Refer to fig. 5-1.
	*Step 5. Inspect for defective laser tube A3.	Replace laser tube (see chapter 6). Retest per system test (see chapter 8).
	*Step 6. Inspect for defective PWB A2. *Both should be replaced if either is defective.	Replace PWB A2 (see chapter 6). Retest per system test (see chapter 8).
2. REGISTER DOES NOT READ CORRECTLY; NEAR MISS CODE IS TRANSMITTED WHEN EITHER MAN KILL, OR UNIVERSAL KILL, IS SELECTED; EXCESSIVE CURRENT DRAIN.	Step 1. Inspect for defective pushbutton switches S1 and S3.	Refer to fig. 5-2.
	Step 2. Inspect for defective wiring/solder connections between switches S1, S3, and PWB assembly A1.	Refer to fig. 5-2.
	Step 3. Inspect for defective PWB A1.	Refer to fig. 5-2.

Figure 5-1. Controls troubleshooting logic tree.

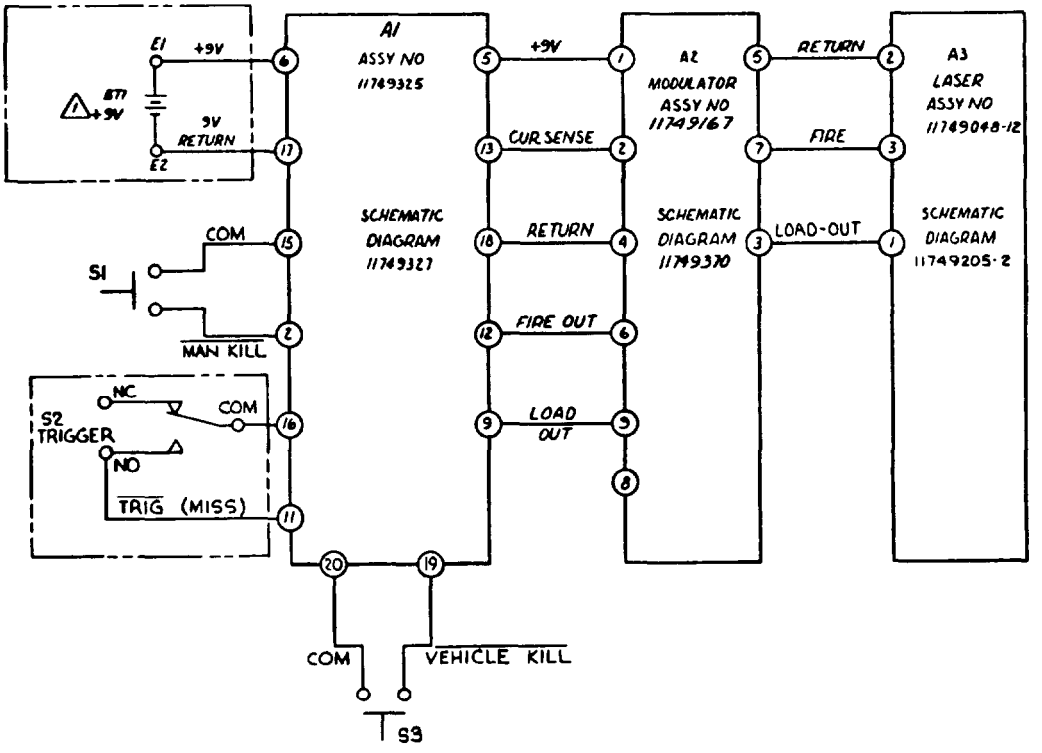
(Located in back of manual)

Figure 5-2. Code/output energy troubleshooting logic tree. (Sheet 1 of 2)

(Located in back of manual)

Figure 5-2. Code/output energy troubleshooting logic tree. (Sheet 2 of 2)

(Located in back of manual)



WIRE LIST						
WIRE CODE NUMBER	FROM			TO		
	SYM NO.	PIN	TERM. LUG	SYM NO.	PIN	TERM. LUG
14A	A3	2		A2	5	
16A	A3	3		A2	7	
12A	A3	1		A2	3	
4	A2	1		A1	5	
5	A2	2		A1	13	
6	A2	4		A1	18	
7	A2	6		A1	12	
8	A2	9		A1	9	
9	A1	6				E1
10	A1	17				E2
11	A1	15		S1		COM
1	A1	2		S1		NO
13	A1	16		S2		COM
2	A1	11		S2		NO
3	A1	20		S3		COM
15	A1	19		S3		NO

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Figure 5-3. Controller's Gun Connection Diagram and Wire List

Following fault isolation and repair, the logic tree directs the user to return to the system test in chapter 8 to perform system test from the beginning to validate the troubleshooting and repair activity. An electrical connection diagram is provided to assist in troubleshooting.

Section III. GENERAL MAINTENANCE

5-5. CONTROLLER'S GUN GENERAL MAINTENANCE. This section contains general repair instructions (not specific to one component or assembly) which would otherwise have to be repeated several times. These instructions relate to cleaning of components, lubricants, sealing and insulating compounds, soldering, and workmanship.

5-6. CLEANING OF COMPONENTS

a. Lens Surfaces. Clean the exposed lens surface of the transmitter by removing loose dirt with a lens brush, lens paper, or clean cloth. Saturate a clean cloth with water to remove stubborn dirt or mud from lens.

b. Metal Surfaces. Clean all exposed metal surfaces with a lint-free cloth. If necessary, dampen the cloth with water. Allow these surfaces to dry thoroughly before storing.

C. Cloth and Canvas Material. The holster should be brushed free from dirt and allowed to dry before storing to avoid mildew.

5-7. LUBRICATION. All O-rings and laser tube cavities should be lubricated with MIL-S-8660 type lubricants.

5-8. SEALING AND INSULATING. Apply primer (MIL-S-22473, Grade T) and locking compound (MIL-S-22473, Grade C) to threads of all fastener screws and threaded components. Apply sealing compound, CLA-½, (MIL-S-8802) between heads of cover screws and cover,

Insulating compound (Part No. 11749371) should be applied to all new solder connections. (Refer to NOTE below).

5-9. SOLDERING. All soldering operations should comply with MIL-STD-454, Requirement 5. Comply with MIL-STD-454, Requirement 1, for grounding and safety instructions.

5-10. BONDING. Apply primer MIL-A-46106 (clear) and adhesive MIL-A-46106 (black) to battery ejector springs before placing springs in battery cavity.

5-11. WORKMANSHIP. Comply with MIL-STD-454, Requirement 9, for workmanship.

NOTE

To obtain accurate voltage and current readings, use a needle point probe because of insulating compound on solder connections. Cure time for insulating compound is 2 hours at 60°C ±5° or 24 hours at room temperature.

CHAPTER 6

REPAIR OF CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

Section I. REPAIR

6-1. TECHNICAL DESCRIPTION. The controller's gun is a lightweight hand-held device used by a controller to interrogate MILES man-worn and vehicle-mounted laser detection systems to determine proper operation in the field. The controller's gun assembly consists of a laser transmitter, a green controller key, and a holster. The gun transmits three codes to cause (1) a man "kill"; (2) a universal "kill" (man or vehicle); or (3) a "near miss" (man or vehicle). The desired codes for (1) and (2) are selectable by pressing a pushbutton switch on the rear and pulling the trigger at the same time. Pressing the trigger alone selects "near miss."

6-2. REMOVAL AND REPLACEMENT OF CONTROLLER'S GUN COMPONENTS. The Controller's Gun, Simulator System, Laser (fig. C-1, appendix C) consists of the following:

	Part No.
Laser Transmitter Assy., Controller's Gun (fig. C-2)	11749279
Lanyard Assy., Controller Key (fig. C-1)	11749038
Holster, Controller's Gun (fig. C-1)	11749742

Procedures for removal and replacement of components are described in the following paragraphs. Refer to appendix C for illustration references. Also, pay particular attention to chapter 5, section III, which contains special instructions that apply to all removal, disassembly, and replacement of parts discussed in chapter 6.

NOTE

The key numbers shown in parentheses ( ) refer to figures in appendix C. Procedures are arranged in the same sequence as the Maintenance Allocation Chart (MAC), appendix B.

Section II. LASER TRANSMITTER ASSEMBLY, CONTROLLER'S GUN

6-3. REMOVAL AND REPLACEMENT OF LASER TRANSMITTER COMPONENTS. Procedures for removal and replacement of controller's gun laser transmitter parts are as follows:

a. Cover Assembly Removal (fig.C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14).

(2) Remove cover assembly and six rubber washers (3).

Cover Assembly Replacement (fig. C-2).

(1) Apply sealing compound (MIL-S-8802 A-½) between heads of screws (1) and cover (2). Apply primer, Grade T, and locking compound, Grade C, to threads of screws (1).

(2) Insert six screws (1) into cover. Install six rubber washers (3) on screws (1) between cover and PWB A1 (4). Secure cover. Torque to 55-70 in.-oz.

C. Laser Tube Assembly/Modulator Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14). Remove cover (2) and six rubber washers (3).

(2) Remove insulator (45). Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(3) Lift edge of PWB A1. Carefully fold over.

(4) Remove four screws (5) securing modulator A2 assembly (6) to transmitter housing.

(5) Lift modulator assembly A2 (6) out of transmitter housing. Position modulator so wiring terminals are accessible.

(6) Use a grounded soldering iron (25 watts). Carefully unsolder wires from terminals on modulator assembly A2. Tag each wire with its terminal number. Remove modulator assembly A2.

(7) Remove MIL-S-8802 adhesive from setscrews (13). Remove two setscrews securing laser tube (6) to transmitter housing.

(8) Using a laser tube removal tool, part No. 11835280, pull out laser tube assembly with wires attached.

d. Laser Tube Assembly/Modulator Replacement (fig. C-2).

(1) Apply a thin film of lubricant (MIL-S-8660) to area of laser tube (6) O-ring travel inside transmitter housing (14).

(2) Insert laser tube wiring through front of transmitter housing. Align laser tube setscrew (13) holes with holes in transmitter housing.

(3) Slide laser tube into transmitter housing. Tap tube lightly with a small block of wood to seat properly.

(4) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 locking compound, grade C, to setscrews (13) that secure laser tube. Insert two setscrews in transmitter housing. Torque to 2-4 in.-1b. Setscrews shall not exceed housing surface.

(5) Position modulator assembly A2 (6) near transmitter housing so wiring terminals are accessible.

(6) Refer to figure 6-1. Use a grounded soldering iron (25 watts). Solder wires to terminals on modulator A2.

(7) Install modulator A2 in transmitter housing. Apply MIL-S-22473 primer, grade T, and MIL-S-22743 locking compound, grade C, to four screws (5). Secure with four screws (5). Torque to 6-8 in.-1b.

(8) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 locking compound, grade C, to screws (5) and (1). Install screw (5) and washer (44) on PWR A1 (4). Install PWB A1 (4) in transmitter housing. Secure with screw (5) and washer (44). Torque to 6-8 in.-lb.

(9) Apply sealing compound (MIL-S-8802, class A-½) between heads of screws (1) and transmitter cover (2). Install insulator (45).

(10) Insert six screws (1) into cover (2). Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

e. Printed Wiring Board (PWB) A1 Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14).

(2) Remove cover assembly and six rubber washers (3). Remove insulator (45).

(3) Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(4) Pull PWB A1 out. Fold over to gain access to terminals.

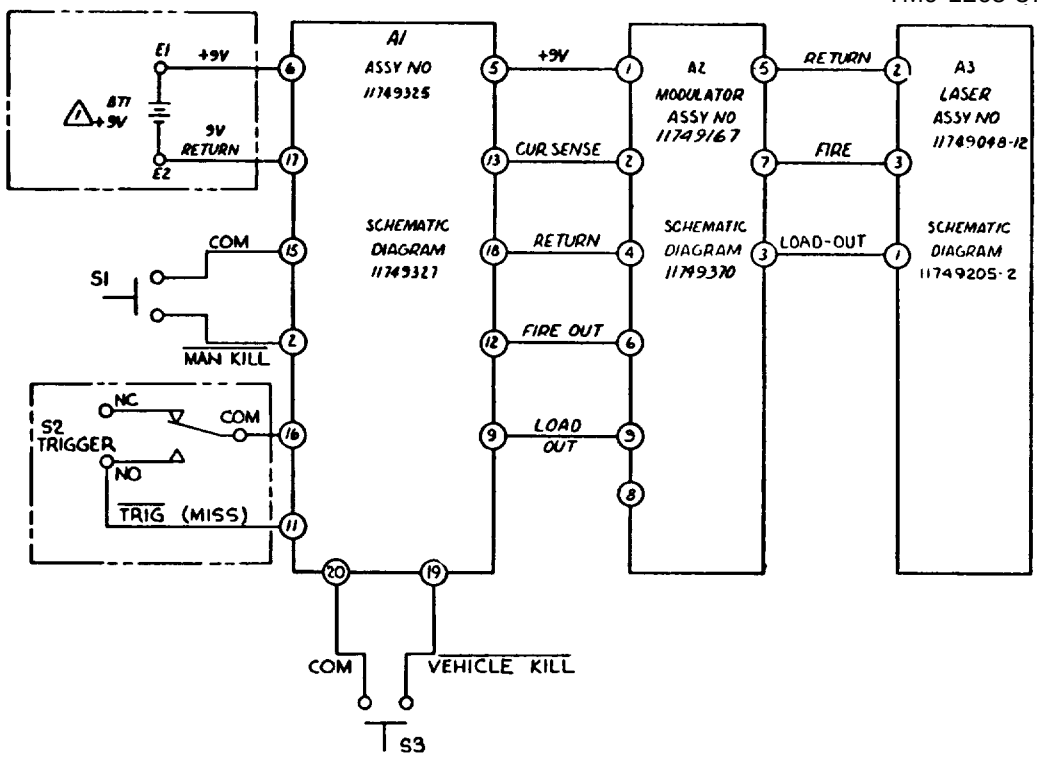
(5) Using a grounded soldering iron (25 watts), unsolder wires from terminals on PWB A1. Tag each wire with terminal numbers. Remove PWB A1.

f. Printed Wiring Board (PWB) A1 Replacement (fig. C-2).

CAUTION

Static charge protection must be used when soldering wires connected to PWB A1, because sensitive components may be damaged. The user and the soldering iron must be grounded.

(1) Refer to figure 6-1. Use a grounded soldering iron (25 watts). Solder wires to proper terminals on PWB A1 (4).



WIRE LIST

WIRE CODE NUMBER	FROM			TO		
	SYM NO.	PIN	TERM. LUG	SYM NO.	PIN	TERM. LUG
14A	A3	2		A2	5	
16A	A3	3		A2	7	
12A	A3	1		A2	3	
4	A2	1		A1	5	
5	A2	2		A1	13	
6	A2	4		A1	18	
7	A2	6		A1	12	
8	A2	9		A1	9	
9	A1	6				E1
10	A1	17				E2
11	A1	15		S1		COM
1	A1	2		S1		NO
13	A1	16		S2		COM
2	A1	11		S2		NO
3	A1	20		S3		COM
15	A1	19		S3		NO

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Figure 6-1. Controller's Gun Connection Diagram and Wire List

(2) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 locking compound, grade C, to screws (5) and (1). Install screw (5) and washer (44) on PWB A1 in transmitter housing (14). Secure with screw (5) and washer (44). Torque to 6-8 in.-1b.

(3) Install insulator (45).

(4) Apply sealing compound (MIL-S-8802, class A-½) between heads of screws (1) and transmitter cover (2).

(5) Insert six screws (1) into cover. Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

g. Front Sight Removal (fig. C-2).

(1) Remove two screws (9) securing front sight (8) to housing (14).

(2) Remove front sight (8) with spacer (7).

h. Front Sight Replacement (fig. C-2).

(1) Install front sight (8) with spacer (7), on housing (14).

(2) Align front sight.

(3) Insert two screws (9). Torque to 6-8 in.-1b.

i. Rear Sight Removal (fig. C-2).

(1) Remove two screws (9) securing rear sight (43) to housing (14).

(2) Remove rear sight (43) with spacer (7).

j. Rear Sight Replacement (fig. C-2).

(1) Install rear sight (43), with spacer (7), on housing (14).

(2) Align rear sight.

(3) Insert two screws (9). Torque to 6-8 in.-1b.

k. Trigger Switch Mounting Plate and Trigger Removal (fig. C-2).

(1) Remove two pins (26, 34) securing trigger (19) to housing. Remove trigger.

(2) Unscrew two screws (9) securing plate (17) to housing (14). Remove plate.

(3) Unscrew hex nut securing trigger switch (16) to plate.

1. Trigger Switch Mounting Plate and Trigger Replacement (fig. C-2).

(1) Screw in hex nut securing trigger switch (16). Torque to 12-14 in.-oz.

(2) Install mounting plate (17). Insert two screws (18). Torque to 6-8 in.-lb.

(3) Install trigger (19) into trigger cavity. Insert two pins (26, 34) into holes to fasten trigger to housing (14).

m. Trigger Switch Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14). Remove cover and six rubber washers (3).

(2) Remove two pins (26, 34) securing trigger (19) to housing. Remove trigger.

(3) Unscrew two screws (18) securing plate (17) to housing.

(4) Unscrew hex nut securing trigger switch (16) to plate.

(5) Remove plate and sealing compound.

(6) Pull trigger switch out to gain access to wiring if adequate service loop is provided. If adequate service loop is not provided, proceed as follows:

(a) Remove insulator (45). Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(b) Lift edge of PWH A1. Carefully fold over.

(c) Refer to figure 6-1. Use a grounded soldering iron (25 watts). Unsolder two trigger switch wires from PWB A1.

(d) Attach a new set of wires to be pulled through as old switch is removed. Pull out trigger switch with wires attached. Provide enough new wiring for a service loop at switch end.

(7) Refer to figure 6-1. Use a grounded soldering iron (25 watts). Unsolder two trigger switch wires. Remove trigger switch.

Trigger Switch Replacement (fig. C-2).

NOTE

If adequate service loop is provided to trigger switch, replace using steps (1) through (4) below. If no service loop is provided, follow steps (4a) through (4h) below.

(1) Refer to figure 6-1. Use a grounded soldering iron (25 watts). Solder two wires to trigger switch (16). Apply MIL-P-47298 black molding compound over solder connections.

(2) Install trigger switch. Screw in hex nut holding trigger switch. Torque to 12-14 in.-lb.

(3) Attach trigger switch to plate (17). Torque hex nut. Install plate. Insert two screws (18). Torque to 55-60 in.-oz.

(4) Install trigger (19) into trigger cavity. Insert two pins (26, 34) into holes to fasten trigger to housing.

(a) Refer to step (6d) paragraph m. above, (trigger switch wires were unsoldered from PWB A1 (4) and switch was pulled out with wires attached to new switch wiring with a service loop at switch end).

(b) Refer to figure 6-1. Adjust new wiring for a service loop at switch end. Use a grounded soldering iron (25 watts). Solder switch wires to proper terminals on PWB A1 and on new switch.

(c) Repeat steps (2), (3), and (4).

(d) Fill wiring access hole in housing with MIL-S-8802, class A-½, sealing compound.

(e) Apply MIL-S-22473 primer, grade T, and locking compound, grade C, to screws (5) and (1). Install screw (5) and washer (44) on PWB A1. Install PWB A1 in transmitter housing (14). Secure with screw (5) and washer (44). Torque to 6-8 in.-lb.

(f) Install insulator (45).

(g) Apply sealing compound (MIL-S-8802, class A-½) between heads of screws (1) and transmitter cover (2).

(h) Insert six screws (1) into cover (2). Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque screws to 55-70 in.-oz.

Light Emitting Diode (LED) Filter Window Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14). Remove cover and six rubber washers (3).

(2) Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(3) Lift edge of PWB A1. Carefully fold over with insulator (45).

(4) Press LED filter (38) out of transmitter housing by exerting continuout pressure on inside surface of LED filter to break bond of sealing compound.

(5) Remove any sealing compound residue from transmitter housing with a pointed knife blade.

p. Light Emitting Diode (LED) Filter Window Replacement (fig. C-2).

(1) Apply a fine bead of sealing compound (MIL-S-8802, class A-½) to LED counterbore surface of housing (14).

(2) Using an eraser-tipped pencil, press LED filter (38) firmly into counterbore of transmitter housing.

(3) Carefully remove excess sealing compound with a pointed knife blade. Clean with isopropyl alcohol after cure.

(4) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 locking compound, grade C, to screw (5). Install screw (5) and washer (44) on PWB A1 (4). Install PWB A1 in transmitter housing (14). Secure with screw (5) and washer. Torque to 6-8 in.-lb.

(5) Apply sealing compound (MIL-S-8802, class A-½) between heads of screws (1) and cover (2). Install insulator (45).

(6) Insert six screws (1) into cover. Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

Pushbutton Switch, S1 and S3, Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14). Remove cover and six rubber washers (3). Remove insulator (45).

(2) Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(3) Lift edge of PWB A1. Carefully fold over.

(4) Use a grounded soldering iron (25 watts). Carefully unsolder wires from pushbutton switch (10). Tag each wire with its terminal number.

(5) Remove hex nut with boot (37) securing pushbutton switch to transmitter housing.

(6) Remove pushbutton switch from inside.

Pushbutton Switch, S1 and S3, Replacement (fig. C-2).

(1) Refer to figure 6-1. Use a grounded soldering iron (25 watts). Solder wires to terminals of pushbutton switch, S1, (10).

(2) Apply MIL-S-22473 primer, grade T, and locking compound, grade C, to screws (5) and (1) and to face and threads of switch.

(3) Install switch in transmitter housing (14). Torque hex nut to 28 in.-oz.

(4) Install screw (5) and washer (44) on PWB A1 (4). Install PWB A1 in transmitter housing. Secure with screw (5) and washer (44). Torque to 6-8 in. -1b.

(5) Apply sealing compound (MIL-S-8802, class A-f) between heads of screws (1) and transmitter cover (2). Install insulator (45).

(6) Insert six screws (1) into cover. Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

s. Housing Removal (fig. C-2).

(1) Open battery door (31). Remove battery (32). Remove spring ejector (24).

(2) Remove six screws (1) securing cover (2) to housing (14).

(3) Remove cover with six rubber washers (3). Remove insulator (45).

(4) Remove screw (5) and washer (44) holding PWB A1 (4) to housing (14).

(5) Pull PWB A1 out. Carefully fold over.

(6) Unscrew four screws (5) securing PWB A2 (6) to transmitter housing. Carefully fold PWB A2 over.

(7) Unlace wiring.

(8) Using a grounded soldering iron (25 watts), unsolder three laser tube (6) wires from PWB A2. Tag each wire with terminal number.

(9) Using a grounded soldering iron (25 watts), unsolder two trigger switch (16) wires and four pushbutton switch (10) wires from PWB A1. Tag each wire with terminal number.

(10) Remove pin (33) securing battery door (31) to transmitter housing. Remove battery door.

(11) Remove two hex nuts (39) and washers (41, 42) securing battery connector housing (28) to transmitter housing. Remove two screws (25) and terminal lugs (40).

(12) Remove battery connector housing (28) and two battery contacts (30).

(13) Remove hex nuts securing pushbutton switches S1 and S3 (10) to transmitter housing.

(14) Remove pushbutton switches S1 and S3 with wires attached.

(15) Remove PWB A1 and PWB A2 with wires attached.

(16) Remove two setscrews (13) holding laser tube (6) to transmitter housing.

(17) Using a laser tube removal tool, part No. 11835280, pull out laser tube assembly with wires attached.

(18) Remove two pins (26, 34) securing trigger (19) to transmitter housing. Remove trigger. Unscrew hex nut holding trigger switch (16) to plate (17).

(19) Unscrew two screws (18) securing plate to transmitter housing. Remove plate .

(20) Refer to paragraph m. step (6) regarding adequate service loop. Pull out trigger switch.

(21) Extract battery door latch pin (33). Remove battery door latch (22) with catch attached.

(22) Using an eraser-tipped pencil, press out LED filter (38).

(23) Unscrew two screws (9) securing front sight (8) to transmitter housing. Remove front sight with spacer (7).

(24) Unscrew two screws (9) securing rear sight (43) to housing. Remove rear sight with spacer (7).

(25) Remove two screws (18) securing rear cover (35). Remove rear cover.

(26) Remove four screws (18) securing connector cap (36). Remove connector cap.

(27) Remove pin (29) securing ring (27). Remove ring.

t. Housing Replacement (fig. C-2).

(1) Bond LED filter (38) to transmitter housing (14) using sealing compound MIL-S-8802, class A-½.

(2) Thread two trigger switch (16) wires, with switch attached, through switch cavity into holes leading into electronics cavity. Fill wiring access hole in housing with MIL-S-8802, class A-½, sealing compound.

(3) Install plate (17). Insert two screws (18). Torque to 6-8 in.-lb.

(4) Screw in hex nut securing trigger switch (16) to mounting plate. Torque to 12-14 in.-lb.

(5) Apply MIL-S-8802 sealing compound, class A-½, to contact surface between connector cap (36) and housing (14). Install connector cap. Insert four screws (18). Torque to 6-8 in.-lb.

(6) Install rear cover (35). Insert two screws (18). Torque to 6-8 in.-lb.

(7) Install rear sight (43) with spacer (7). Insert two screws (9). Torque to 6-8 in.-lb.

(8) Install front sight (8) with spacer (7). Insert two screws (9). Torque to 6-8 in.-lb.

(9) Insert battery door latch (22), with catch (23), into recess in transmitter housing.

(10) Insert latch pin (11) through housing and hole in latch (22).

(11) Install trigger (19) into trigger cavity. Insert two pins (26, 34) into holes to fasten trigger to housing.

(12) Apply a thin film of lubricant (MIL-S-8660) to area of laser tube (6) O-ring travel inside transmitter housing.

(13) Insert laser tube wiring through front of transmitter housing. Align laser tube setscrew (13) holes with holes in transmitter housing.

(14) Slide laser tube into transmitter housing. Tap tube lightly with a small block of wood to seat properly.

(15) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 compound, grade C, to setscrews (13) that secure laser tube. Insert two setscrews (13) in transmitter housing. Torque to 2-4 in.-lb. Setscrews shall not exceed housing surface.

(16) Align rear sight (43) and front sight (8). Torque screws (9) to 6-8 in.-lb.

(17) Apply MIL-S-22473 primer, grade T, and locking compound, grade C, to screws (5) and (1) and to face and threads of switches. Insert pushbutton switches S1 and S3 (10), with wires attached, into holes in housing. Torque switch nuts to 28 in.-oz.

(18) Refer to figure 6-1. Solder three laser tube wires to proper terminals on PWB A2 (6). Solder two trigger switch (16) wires to proper terminals on PWB A1 (4). Solder pushbutton switches S1 and S3 wires to proper terminals on PWB A1.

(19) Insert battery contacts (30) into battery housing (28).

(20) Install battery housing (28) with contacts (30) in battery cavity.

(21) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 locking compound, grade H, to screws (25). Insert two screws (25) to secure battery connector housing. Install washers (41, 42), terminal lugs (40) and hex nuts (39). Torque to 26-32 in.-oz.

(22) Press in hole plug (20). Apply MIL-A-46106 primer (clear) and adhesive, type I, to cavity behind plug.

(23) Lace wiring.

(24) Fold PWB A2 over into recess in housing. Insert four screws (5). Torque to 6-8 in.-lb.

(25) Install washer (44) on center post of housing. Fold PWB A1 over into recess in housing. Insert screw (5) with washer (44). Torque to 6-8 in. -lb.

(26) Apply sealing compound (MIL-S-8802, class A-f) between heads of screws (1) and cover (2). Install insulator (45).

(27) Insert six screws (1) into cover (2). Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

(28) Place battery door (31) hinge to housing.

(30) Apply MIL-A-46106 clear primer type I, and MIL-A-46106 adhesive, type I to bottom of battery cavity. Position ejector spring (24) at bottom of cavity and spot bond to housing.

(31) Install battery (32). Close battery door (31).

(32) Install ring (27). Secure with pin (29).

NOTE

For u,v,w,x,y, and z below secure gun in a small vise or clamp to hold gun steady while removing and replacing door pin, latch pin, and catch pin.

Battery Door Latch Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14).

(2) Remove cover with six rubber washers (3). Remove insulator (45).

(3) Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(4) Pull PWB A1 out. Fold over to gain access to latch pin (11).

(5) Extract battery door latch pin. Remove battery door latch (22) with catch (23).

(6) Remove catch pin (21) securing door catch to latch.

(7) Remove battery door latch.

Battery Door Latch Replacement (fig. C-2)

(1) Place battery door catch (23) in battery door latch (22). Align holes and insert pin (21).

(2) Place battery door latch in transmitter housing (14). Align holes for insertion of pin (11).

(3) Insert pin holding battery door latch to transmitter housing.

(4) Apply MIL-S-22473 primer, grade T, and locking compound, grade C, to screws (5) and (1). Install screw (5) and washer (44) on PWB A1 (4). Install PWB A1 in transmitter housing (14). Secure with screw (5) and washer (44). Torque to 6-8 in.-1b.

(5) Apply sealing compound (MIL-S-8802, class A-½) between heads of screws (1) and transmitter cover (2). Install insulator (45).

(6) Insert six screws (1) into cover. Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

Battery Door Catch Removal (fig. C-2).

(1) Remove catch pin (21) securing battery door catch (23) to latch (22).

(2) Remove battery door catch.

Battery Door Catch Replacement (fig. C-2)

(1) Insert battery door catch (23) into recess on door latch (22).

(2) Insert door catch pin (21) through holes in door latch.

y. Battery Door Assembly Removal (fig. C-2)

(1) Remove pin (33) securing door assembly (31) to transmitter housing (14).

(2) Remove door assembly.

Battery Door Assembly Replacement (fig. C-2).

(1) Place battery door (31) hinge on transmitter housing (14).

(2) Insert door pin (33) to fasten door (31) to transmitter housing.

aa. Battery Contacts and Connector Housing Removal (fig. C-2).

(1) Remove six screws (1) securing cover (2) to transmitter housing (14). Remove cover and six rubber washers (3). Remove insulator (45).

(2) Remove screw (5) and washer (44) holding PWB A1 (4) to transmitter housing.

(3) Lift edge of PWB A1. Carefully fold over.

(4) Remove two screws (25), two hex nuts (39), two terminals (40), and washers (41, 42) securing battery connector housing (28) to transmitter housing.

(5) Remove two battery contacts (30) from battery connector housing.

ab. Battery Contacts and Connector Housing Replacement (fig. C-2).

(1) Place two battery contacts (30) into connector housing (28).

(2) Apply MIL-S-22473 primer, grade T, and MIL-S-22473 locking compound, grade C, to screws (25).

(3) Secure connector housing (28) and contacts (30) to transmitter housing (14) using two screws (25), two washers, (41, 42), two terminals (40), and two hex nuts (39).

(4) Apply MIL-S-22473 primer, grade T, and locking compound, grade C, to screws (5) and (1). Install screw (5) and washer (44) on PWB A1 (4). Install PWB A1 in transmitter housing. Secure with screw (5) and washer (44). Torque to 6-8 in.-lb.

(5) Apply sealing compound (MIL-S-8802),(class A-½) between heads of screws (1) and transmitter cover (2). Install insulator (45).

(6) Insert six screws (1) into cover. Install six rubber washers (3) on screws (1) between cover and PWB A1. Secure cover. Torque to 55-70 in.-oz.

ac. Ejector Spring Removal (fig. C-2).

(1) Unscrew knob securing battery door (31). Open battery door. Remove battery (32).

(2) Remove ejector spring (24).

ad. Ejector Spring Replacement (fig. C-2).

(1) Apply MIL-A-46106 clear primer, type 1, and MIL-A-46106 adhesive, type I to bottom of battery cavity. Position ejector spring (24) at bottom of cavity and spot bond to housing (14).

(2) Install battery (32).

(3) Close battery door (31). Tighten door knob.

Section III. LANYARD ASSEMBLY, CONTROLLER KEY

6-4. LANYARD ASSEMBLY. The lanyard assembly is replaced if any part becomes unserviceable.

Section IV. HOLSTER

6-5. HOLSTER. The holster assembly is replaced if any part becomes unserviceable.

CHAPTER 7

MAINTENANCE OF MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

7-1. GENERAL. Related materiel used in conjunction with the controller's gun are the following MILES equipments:

a. Simulator System, Firing, Laser: M60 for M16A1 Rifle (Part No. 11749270)
b. Simulator System, Firing, Laser: M61 for M60 Machine Gun (Part No. 11749271)
C. Simulator System, Firing, Laser: M63 for M113APC (Part No. 11749272)
d. Simulator System, Firing, Laser: M65 for M60A1/A3 Tanks (Part No. 11749273)
e. Simulator System, Firing, Laser: M67 for M551 Vehicle (Part No. 11749275)
f. Simulator System, Firing, Laser: M62 for DRAGON Missile (Part No. 11749276)
g. Simulator System, Firing, Laser: M64 for TOW Missile (Part No. 11749277)
h. Simulator System, Firing, Laser: M68 for VIPER Rocket (Part No. 11748807)
i. Test Set, Electronic Systems: M144 for MILES Vehicles (Part No. 11835440)
j. Test Set, Decoder, Simulator System, Laser (Part No. 11835285)

Maintenance instructions for these items are contained in technical manuals listed in appendix A.

CHAPTER 8

FINAL INSPECTION

Section I. GENERAL

8-1. SCOPE. Final inspection includes visual inspections and system tests performed by intermediate maintenance personnel to detect malfunctions and to validate the system after troubleshooting and repair have been completed. A system test must be performed completely each time after identifying malfunctions or validating repair. Test configuration diagrams are provided. During system test, when a malfunction is identified, appropriate reference is made to troubleshooting procedures in chapter 5. Successful completion of controller's gun system test indicates that the equipment is acceptable for "return to user" or "return to stock." All MILES laser transmitters must conform to coding standards detailed in system tests in this chapter.

8-2. COMPLETION OF INSPECTION. Upon completion of final inspection and with the controller's gun restored to a completely serviceable condition, certification shall be made that the equipment is acceptable for "return to user" or for "return to stock."

Section II. CONTROLLER'S GUN FINAL INSPECTION

WARNING

Although the laser light emitted by MILES equipment transmitters is considered eye safe by the Bureau of Radiological Health, suitable precautions must be taken to avoid possible damage to the eye from overexposure to this radiated energy. Precautionary measures include the following:

- Avoid viewing the laser emitter at close range (less than 12 meters). Increasing the distance from the eye to the laser source greatly reduces the risks of overexposure.
- Avoid viewing the emitter directly along the optical axis of radiated beam.
- Especially avoid viewing the emitter directly along the optical axis of the beam through stabilized optics such as binoculars, telescopes or periscopes, at ranges less than 75 meters.

8-3. VISUAL INSPECTION. Check the controller's gun for completeness and general appearance. Painted surfaces will be free from bare spots, scratches deep enough to expose bare metal, and chipped or loose paint.

There will be no signs of corrosion. Check all surfaces for nicks, burrs, dents, or deformities. Surfaces will be free from all foreign matter. Inspect sealed portions of the laser transmitter, and electronics assemblies to determine whether sealing is complete. Dirt or moisture on optical parts will

indicate incomplete sealing or insufficient cleanliness precautions during assembly. All lettering on identification plates and controls will be clearly defined and easily read.

NOTE

Test procedures steps with an * indicate probable malfunctions. Troubleshooting references are provided.

8-4. CONTROLLER'S GUN SYSTEM TEST

a. Test Equipment Requirement. The following test equipment is required:

(1) MILES decoder test set (fig. 8-1).

(2) Power supply, 0 to 15V dc (min), 500 mA (min).

(3) Milliammeter (or VOM)

(4) Dummy battery

(5) Radiometer with 550 attenuator/adapter (EG&G Model 460).

b. System Test. System tests consist of the following:

(1) Control/coding

(2) Current drain

(3) Energy measurement

(c) Equipment Initial Conditions. Set up the following initial conditions on MILES decoder:

(1) Connect decoder to 110V ac.

(2) Set AC POWER IN toggleswitch to ON.

(3) Set DC POWER OUT toggleswitch to OFF.

(4) Set TRIGGER toggleswitch to OFF.

(5) Set BORESIGHT MODE toggleswitch to OFF.

(6) Set COUNTER RESET toggleswitch to MANUAL.

(7) Set HIT CODE SELECT thumbwheel to reflect 00.

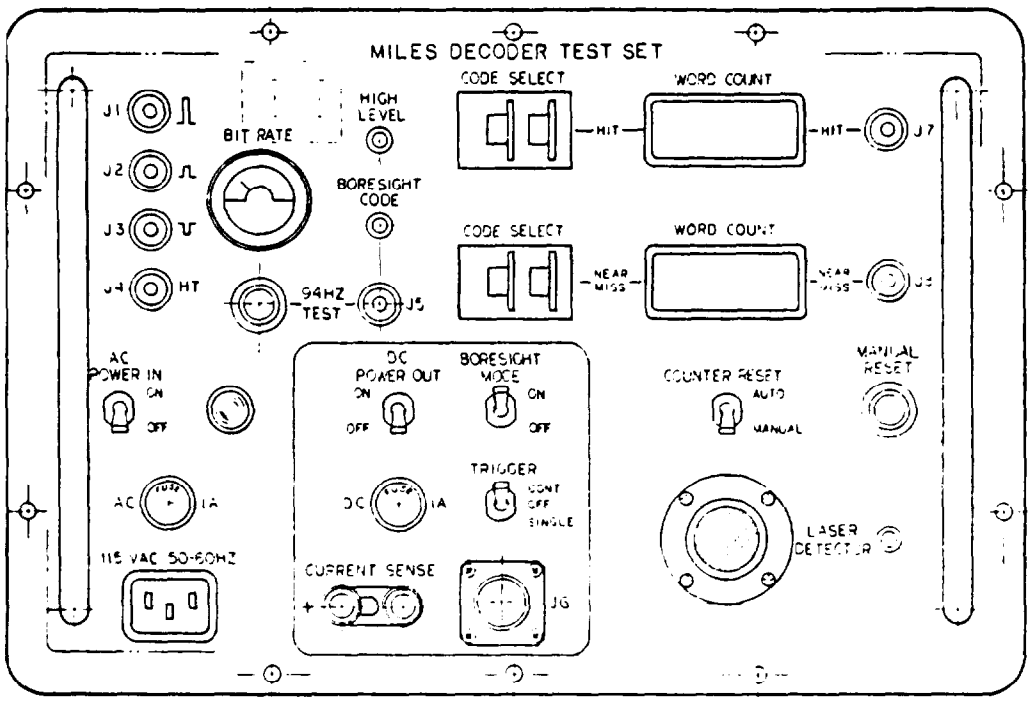

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Figure 8-1. MILES Decoder Test Set, Front Panel

(8) Set NEAR MISS CODE SELECT thumbwheel to reflect 28.

(9) Remove battery from gun. Insert dummy battery.

8-5. CONTROL/CODING TEST. Continue the system test procedure by conducting the control/coding test as follows:

(10) Set up test equipment as shown in figure 8-2.

(11) Turn on and adjust power supply to 7.5v dc.

*(12) Squeeze gun trigger switch S2. Hold for 10 seconds. Gun FIRING indicator should light for 10 seconds. (If FIRING indicator does not light, go to chapter 5, table 5-1, item 1.)

(13) Press MILES decoder MANUAL RESET pushbutton switch to "zero" (clear) HIT/NEAR MISS WORD COUNT register.

*(14) Place gun laser tube directly in front of and close to MILES decoder LASER DETECTOR. Press UNIVERSAL KILL pushbutton switch and squeeze trigger switch S2 at same time. MILES decoder HIT WORD COUNT register should read 0016 or some multiple of 16; NEAR MISS register should read 0000. (If either register does not read correctly, go to chapter 5, table 5-1, item 1.)

(15) Press MILES decoder MANUAL RESET pushbutton switch to "zero" (clear) HIT/NEAR MISS WORD COUNT register.

(16) Set MILES decoder HIT CODE SELECT thumbwheel to reflect 27.

*(17) Place gun laser tube directly in front of and close to MILES decoder LASER DETECTOR. Press MAN KILL pushbutton switch and squeeze trigger switch S2 at same time. MILES decoder HIT WORD COUNT register should read 0016 or some multiple of 16; NEAR MISS COUNT

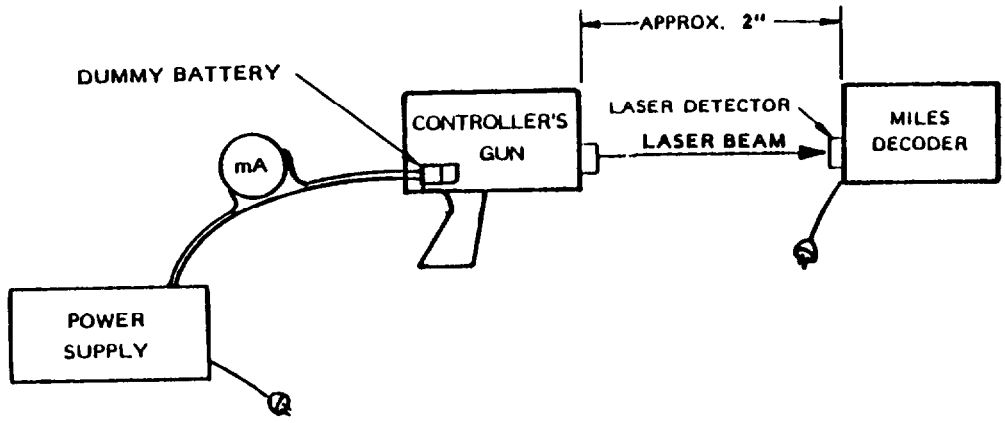

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Figure 8-2. Control/Coding and Current Drain Test Setup

register should read 0000. (If either register does not read correctly, go to chapter 5, table 5-1, item 1.)

(18) Depress MANUAL RESET push-button switch to "zero" HIT/NEAR MISS WORD COUNT registers.

*(19) Leave MILES decoder setting as is. Squeeze trigger. MILES decoder HIT WORD COUNT register should read 0000; NEAR MISS COUNT register should read 0004 or some multiple of 4. (If either register does not read correctly, go to chapter 5, table 5-1, item 1.)

(20) Press MILES DECODER MANUAL RESET pushbutton switch to "zero" (clear) HIT/NEAR MISS WORD COUNT registers.

(21) Set MILES DECODER NEAR MISS CODE SELECT thumbwheel to reflect 29.

*(22) Place gun laser tube directly in front of and close to MILES decoder LASER DETECTOR sensor. Squeeze gun trigger switch S2. MILES decoder HIT WORD COUNT register should read 0000 and NEAR MISS WORD COUNT register should read 0004 or some multiple of 4. (If either register does not read correctly, go to chapter 5, table 5-1, item 1.)

(23) Press MILES DECODER MANUAL RESET pushbutton switch to "zero" (clear) HIT/NEAR MISS WORD COUNT register.

(24) Set MILES decoder HIT CODE SELECT thumbwheel to reflect 00 and NEAR MISS CODE SELECT thumbwheel to reflect 30.

(25) Repeat step (22).

(26) Set MILES DECODER NEAR MISS CODE SELECT thumbwheel to reflect 31.

(27) Repeat step (22).

8-6. CURRENT DRAIN TEST. Continue the system test procedure by conducting the current drain test as follows:

(28) Retain test equipment as shown in figure 8-2.

(29) Adjust power supply to 9V dc.

*(30) Verify gun current drain is 1.5 to 3.0 mA. (If current drain is greater than 3.0 mA, go to chapter 5, table 5-1, item 2.)

(31) Turn off power supply

(32) Remove dummy battery from gun battery chamber. Replace with a fresh 9V battery.

*(33) Squeeze gun trigger switch S2. Verify that gun FIRING indicator CR2 lights. (If FIRING indicator CR2 does not light, go to chapter 5, table 5-1, item 1.)

(34) Remove 9V battery from gun battery chamber.

8-7. ENERGY MEASUREMENT TEST. Continue the system test procedure by conducting the energy measurement as follows:

(35) Set up test equipment as shown in figure 8-3.

(36) Turn power supply on.

(37) Place radiometer adapter on laser tube lens.

(38) Set radiometer multiplier selector (fig. 8-4) to 10^{-8}. Set pick up head to 10^{4} at 904 nm w/550-11.

(39) Zero radiometer.

(40) Press gun trigger and hold.

(41) Record radiometer reading.

(42) Release trigger and turn off all power.

(43) Calculate energy using the following equation:

$$\text{Energy output (ergs)} = \frac{\text{Radiometer Reading (energy/s)} \times 10^{7} \times .094}{1636 \text{ pulses/sec}}$$

*(44) Verify gun output energy is greater than 0.2 erg. (If calculated energy is less than 0.2 erg, go to chapter 5, table 5-1, item 2.)

NOTE

If a controller's gun passes the above tests, a certification should be made that it is fully operable and may be returned to user or returned to stock.

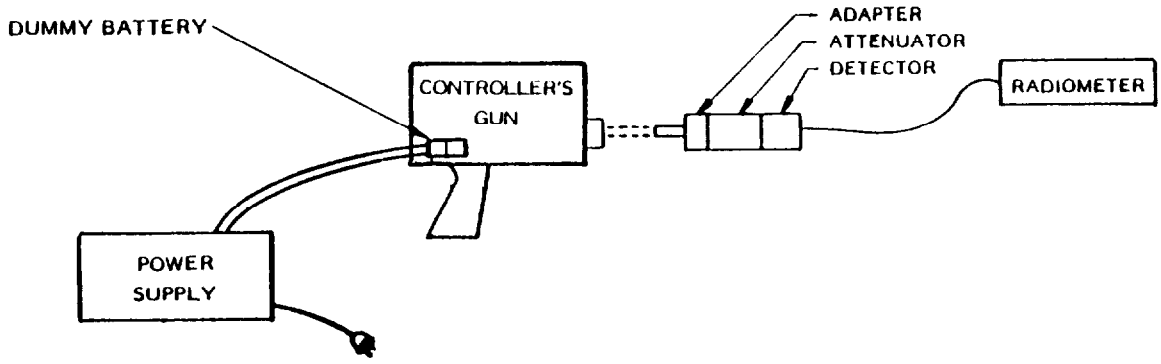

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Figure 8-3. Energy Measurement Test Setup.

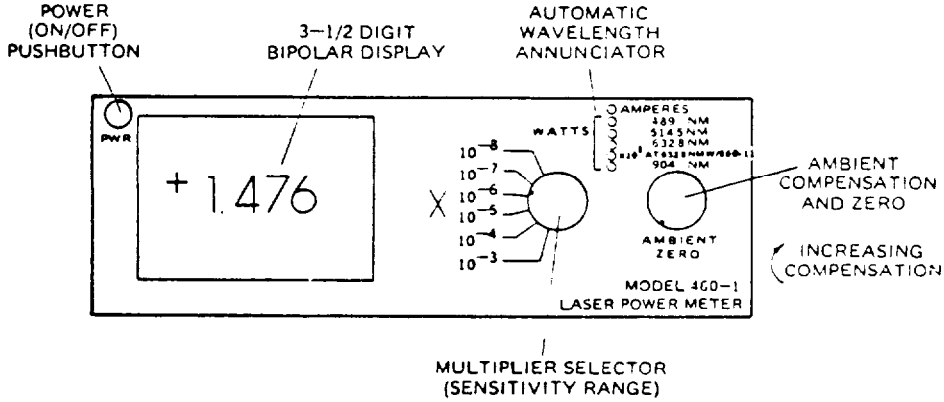

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Figure 8-4. Radiometer (with 550 Attenuator), EG&G Model 460 (Typical Panel)

APPENDIX A

REFERENCES

TM9-1265-368-10-1	Operator's Manual for Simulator System, Firing, Laser: M62 for DRAGON Missile.
TM9-1265-368-10-2	Operator's Manual for Simulator System, Firing, Laser: M64 for TOW.
TM9-1265-368-10-3	Operator's Manual for Simulator System, Firing, Laser: M68 for VIPER Rocket.
TM9-1265-368-24&P	Organizational, Direct Support, and General Support Maintenance Manual w/RPSTL for Simulator Systems, Firing, Laser: M62, M64, and M68.
TM9-1265-369-10-1	Operator's Manual for Simulator System, Firing, Laser: M65 for M60A1/A3 Tank.
TM9-1265-369-10-3	Operator's Manual for Simulator System, Firing, Laser: M67 for M551 Vehicle.
TM9-1265-369-24&P	Organizational, Direct Support, and General Support Maintenance Manual w/RPSTL for Simulator System, Firing, Laser: M65 and M67.
TM9-1265-370-10-1	Operator's Manual for Simulator System, Firing, Laser: M60 for M16A1 Rifle.
TM9-1265-370-10-2	Operator's Manual for Simulator System, Firing, Laser: M61 for M60 Machine Gun.
TM9-1265-370-10-3	Operator's Manual for Simulator System, Firing, Laser: M63 for M113APC.
TM 9-1265-370-24&P	Organizational, Direct Support, and General Support Maintenance Manual w/RPSTL for Simulator Systems, Firing, Laser: For M60, M61, and M63.
TM9-6625-3102-14&P	Operator, Organizational, Direct Support, and General Support Maintenance Manual for Test Set, Decoder, Simulator System, Laser.
TM9-6625-3105-14&P	Operator, Organizational, Direct Support, and General Support Maintenance Manual for Test Set, Electronic Systems: M144 for MILES Vehicles.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/ operational condition as prescribed by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree

of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/ components.

B-3. Explanation of Columns in the MAC, Section II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component /Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn (s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C . . . . . Operator or crew.
O . . . Organizational maintenance.
F . . . Direct support maintenance.
H . . General support maintenance.
D . . . . . Depot maintenance.

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column, when applicable, contains a letter code, in alphabetic order, which is keyed to the remarks contained in section IV.

B-4. Explanation of Columns in Tool and Test Equipment Requirements, Section III

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. Explanation of Columns in Remarks, Section IV

a. Column 1, Reference Code. The code recorded in column 6, section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

SECTION II . MAINTENANCE ALLOCATION CHART

FOR

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT. FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	REMARKS
			C	O	F	H	D		
10	CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER	Inspect Replace	0.1 0.1						A A
10A	LASER TRANSMITTER ASSY, CONTROLLER'S GUN	Test			1.5			12,13, 14,15,16	C
		Replace			0.2				B,D
10A01	COVER ASSY, LASER	Inspect			0.1				
		Replace			0.2			5,10	
10A02	LASER TUBE ASSY/ MODULATOR	Test			0.4			12,14,15	C
		Replace			0.8			1,2,5,8, 10,11	B,D,E
10A04	PRINTED WIRING BOARD ASSY, A1	Test			0.2			14	C
		Replace			0.4			1,8,10	B,D
10A05	SIGHT, FRONT	Inspect			0.1				
		Replace			0.1			5,10	B,D
10A06	SIGHT, REAR	Inspect			0.1				
		Replace			0.1			5,10	B,D
10A07	MOUNTING PLATE, SWITCH	Inspect			0.1				
		Replace			0.2			5,10	B,D
10A08	SWITCH, TRIGGER	Test			0.4			14	C
		Replace			0.3			1,2,4,5 8,10	B,D
10A09	TRIGGER	Inspect			0.1				
		Replace			0.2			4,6,7,10	B,D
10A10	FILTER, LED	Inspect			0.1				
		Replace			0.4			3,5,10	B,D
10A11	SWITCH, PUSHBUTTON	Test			0.2			14	
		Replace			0.4			1,2,4,5 8,,10	B,D
10A12	HOUSING, CONTROLLER'S GUN	nspect			0.1				
		Replace			1.0			1,2,3,4, 5,6,7,8, 10,11	B,D,E
10A13	LATCH, DOOR, BATTERY	Inspect			0.1				
		Replace			0.2			6,7	B,D

SECTION II . MAINTENANCE ALLOCATION CHART

FOR

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT. FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	REMARKS
			C	O	F	H	D		
10A14	CATCH, DOOR, BATTERY	Inspect Replace			0.1 0.2			6,7	B,D
10A15	DOOR ASSY, BATTERY	Inspect Replace			0.1 0.2			6,7	B,D
10A16	HOUSING, BATTERY CONNECTOR	Inspect Replace			0.2 0.3			4,5,10	B,D
10A17	SPRING, BATTERY EJECTOR	Inspect Replace			0.1 0.1				
10A18	CONTACT, ELECTRICAL	Inspect Replace			0.2 0.3			4,5,10	B,D
10A19	BATTERY, WARM WEATHER BATTERY, COLD WEATHER	Test Replace			0.1 0.1			15	
10B	LANYARD ASSY, CONTROLLER KEY	Inspect Replace	0.1 0.1						A A
10C	HOLSTER, CONTROLLER'S GUN	Inspect Replace	0.1 0.1						A A

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

FOR

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/ NATO STOCK NUMBER	TOOL NUMBER
1	F	SOLDERING IRON (25 WATTS)	3439-00-294-9009	WA570
2	F	PLIERS, DIAGONAL CUT, 6"	5110-00-239-8253	GGG-P-468
3	F	KNIFE, POCKET, OR XACTO	5110-00-240-5943	GGG-K-484
4	F	WRENCH, TORQUE	5120-00-230-6380	GGG-W-686
5	F	SCREWDRIVER, CROSS-TIP, NO. 2, 4"	5120-00-060-2004	GGG-S-121
6	F	PUNCH, DRIVE PIN, 1/16"	5120-00-240-6082	GGG-P-831
7	F	HAMMER	5120-00-243-2985	GGG-H-86
8	F	PLIERS, NEEDLE NOSE	5120-00-293-3481	GGG-P-471
9	F	SOCKET, SOCKET WRENCH	5120-00-761-1732	TM18
10	F	TORQUE SCREWDRIVER KIT	5180-01-007-8999	
11	F	LASER TUBE REMOVAL TOOL		11835280
12	F	TEST SET, DECODER		11835285
13	F	RADIOMETER, WITH 550 ATTENUATOR		EG&G 460-1
14	F	VOLT-OHMMETER	6625-00-649-3290	7904729
15	C,F	POWER SUPPLY, 0 TO 15V DC (MIN), 500 mA (MIN)		4005
16	F	BATTERY, DUMMY		

SECTION IV. REMARKS

Reference Code	Remarks
A	Operator/crew and organizational maintenance personnel inspect for any damage and replace if not operable.
B	Direct support maintenance personnel only are authorized to replace an inoperable component, or to repair a repairable component.
C	See chapter 8 for test procedures.
D	See chapter 6 for replace procedures.
E	The laser tube and modulator assembly are replaced as a matched pair.

APPENDIX C

ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE), and other special support equipment required for performance of organizational, direct support, and general support maintenance of the Controller's Gun, Simulator System, Laser. The appendix authorizes the requisitioning and issue of spares and repair parts as indicated by the source andmaintenance codes.

C-2. General

This Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in numeric sequence, with the parts in each group listed in figure and item number sequence. Bulk materials are listed in NSN sequence.

b. Section III. Special Tools List. A list of special tools, special TMDE, and other special support equipment authorized for the performance of maintenance.

c. Section IV. National Stock Number and Part Number Index. A list, in National item identification number (NIIN) sequence, of all National stock numbers (NSN) appearing in the listings, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross referenced to each illustration figure and item number appearance. This index is followed by a cross reference list of reference designators to figure and item numbers.

C-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown.

(2) Item Number. The number used to identify item called out in the illustration.

b. Source, Maintenance, and Recoverability (SMR) Codes.

(1) Source Code. Source codes indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the uniform SMR Code format as follows:

Code	Definition
PA	Item procured and stocked for anticipated or known usage.
PB	Item procured and stocked for insurance purpose because essentiality dictates that a minimum quantity be available in the supply system.
PC	Item procured and stocked and which otherwise would be coded PA except that it is deteriorative in nature.
PD	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent

Code	Definition
	or additional initial issues or outfittings. Not subject to automatic replenishment.
PE	Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities.
PF	Support equipment which will not be stocked but which will be centrally procured on demand.
PG	Item procured and stocked to provide for sustained support for the life of the equipment. It is applied to an item peculiar to the equipment which, because of probable discontinuance or shut down of production facilities would prove uneconomical to reproduce at a later time.
KD	An item of depot overhaul/ repair kit and not purchased separately. Depot kit defined as a kit that provides items required at the time of overhaul or repair.
KF	An item of a maintenance kit and not purchased separately. Maintenance kit defined as a kit that provides an item that can be replaced at organizational or intermediate levels of maintenance.
KB	Item included in both a depot overhaul/repair kit and a maintenance kit.
MO	Item to be manufactured or fabricated at organizational level.
MF	Item to be manufactured or fabricated in the direct support maintenance level.
MH	Item to be manufactured or fabricated at the general support maintenance level.
MD	Item to be manufactured or fabricated at the depot maintenance level.
AO	Item to be assembled at organizational level.
AF	Item to be assembled at direct support maintenance level.
AH	Item to be assembled at general support maintenance level.
AD	Item to be assembled at depot maintenance level.
XA	Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
XB	Item is not procured or stocked. If not available through salvage, requisition.
XC	Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.
XD	A support item that is not stocked. When required, item will be procured through normal supply channels.

NOTE

Cannibalization of salvage may be used as a source of supply for any items coded above except those coded XA and aircraft support items as restricted by AR 700-42.

(2) Maintenance Code. Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance.

Code	Application/Explanation
C	Crew or operator maintenance performed within organizational maintenance.
O	Support item is removed, replaced, used at the organizational level.
F	Support item is removed, rep laced, used at the direct support level.
H	Support item is removed, rep laced, used at the general support level.
D	Support items that are removed, replaced, used at depot, mobile depot, or specialized repair activity only.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes.

Code	Application/Explanation
O	The lowest maintenance level capable of complete repair of the support item is the organizational level.
F	The lowest maintenance level capable of complete repair of the support item is the direct support level.
H	The lowest maintenance level capable of complete repair of the support item is the general support level.
D	The lowest maintenance level capable of complete repair of the support item is the depot level.
L	Repair restricted to (enter applicable designated specialized repair activity), Specialized Repair Activity.
Z	Nonreparable. No repair is authorized.
B	No repair is authorized. The item may be reconditioned by adjusting, lubricating, etc., at the user level. No parts or special tools are procured for the maintenance of this item.

(3) Recoverability Code. Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recover - ability code is entered in the fifth position of the Uniform SMR Code format as follows :

Recoverability Codes	Definition
2	Nonreparable item. When unserviceable, condemn and dispose at the level indicated in position 3.
O	Reparable item. When uneconomically reparable, condemn and dispose at organizational Level.
F	Reparable item. When uneconomically repar - able, condemn and dispose at the direct support level.
H	Reparable item. When uneconomically reparable, condemn and dispose at the general support level.
D	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal not authorized below depot level.
L	Reparable item. Repair, condemnation, and dis - posal not authorized below depot/specialized repair activity level.

Recoverability Codes	Definition
A	- Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/ directives for specific instructions.

c. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When a stock numbered item is requisitioned, the item received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code listed in 708-41/42 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item. The physical security classification of the item is indicated by the parenthetical entry (e.g., Phy Sec C1 (C)-Confidential, Phy Sec C1 (S)-Secret, Phy Sec C1 (T)-Top Secret). Items that are included in kits and sets are listed below the name of the kit or set with the quantity of each item in the kit or set indicated in the quantity incorporated in the unit column. When the part to be used differs between serial numbers of the same model, the effective serial numbers are shown as the last line of the description. In the Special Tools List, the initial basis of issue (BOI) appears as the last line in the entry for each special tool, special TMDE, and other special support equipment. When density of equipments supported exceeds density spread indicated in the basis of issue, the total authorization is increased accordingly.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, whifch is prepared for a functional group, subfunctional group, or an assembly. A “V” appearing in this column in lieu of a quantity indicates that no specific quantity is applicable (e.g., shims, spacers, etc.).

C-4. SPECIAL INFORMATION

a. Detailed assembly instructions for items source coded to be assembled are found in chapter 6, of this manual. Assembly components are listed immediately following the item to be assembled.

C-5. HOW TO LOCATE REPAIR PARTS

a. When National Stock Number or Part Number is Unknown:

(1) First. Using the table of contents, determine the subgroup within which the item belongs. This is necessary since illustrations are prepared for subgroups, and listings are divided into the same groups.

(2) Second. Find the illustration covering the subgroup to which the item belongs.

(3) Third. Identify the item on the illustration and note the illustration figure and item number of the item.

(4) Fourth. Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National Stock Number or Part Number is Known :

(1) First. Using the Index of National Stock Numbers and Part Numbers, find the pertinent National stock number or part number. This index is in NIIN sequence followed by a list of part numbers in alphanumeric sequence, cross referenced to the illustration figure number and item number.

(2) Second. After finding the figure and item number, locate the figure and item number in the repair parts list.

C-6. Abbreviations

Abbreviations	Explanation
ASSY	assembly
CL	class
CR	grade
HD	head
HEX	hexagon
HDW	hardware
LED	light emitting diode
LG	long

Section II. REPAIR PARTS LIST

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

(1) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	17) U/M	(6) QTY INC. IN UNIT
						GROUP: 10		
C-1		PECHH	1265-01-092-0891	11748811	19200	CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER	EA	1
						GROUP: 10A		
C-1	1	PBCHH	*	11749279	19200	LASER TRANSMITTER ASSY, CONTROLLER'S GUN	EA	1
						GROUP: LOB		
C-1	2	PBCZZ	*	11749038	19200	LANYARD ASSY, CONTROLLER KEY	EA	1
						GROUP: 10C		
C-1	3	PACZZ	*	11749742	19200	HOLSTER,CONTROLLER'S GUN	EA	1
						CROUP : 10A LASER TRANSMITTER ASSY, CONTROLLER'S GUN		
C-2	1	PAHZZ	5305-00-242-7275	MS51957-15B	96906	SCREW, MACHINE, PAN HD	EA	6
C-2	2	PBHZZ	1265-01-076-2020	11749064	19200	COVER ASSY, LASER	EA	1
C-2	3	PAHZZ	5330-01-078-8078	11749364	19200	WASHER, FLAT, RUBBER	EA	6
C-2	4	PAHZZ	*	11749325	19200	PRIMED WIRING BOARD ASSY, AI	EA	1
C-2	5	PAHZZ	5305-00-054-5647	MS51957-13	96906	SCREW,MACINE, PAN ED	EA	5
C-2	6	PAHZZ	*	11835695	19200	LASER TUBE ASSY/MODULATOR	EA	1
C-2	7	XBHZZ	*	11749136	19200	SPACER, SIGHT	EA	2
C-2	8	PAHZZ	*	11749492	19200	SIGHT, FRONT	EA	1
C-2	9	PAHZZ	5305-00-459-4687	MS51957-14B	96906	SCREW, PAR HD	EA	4
C-2	10	PAHZZ	*	11749745	19200	SWITCH, PUSHBUTTON	EA	2
C-2	11	PAHZZ	*	11749289-2	19200	PIN, SPRING, 1.00 LG	EA	1
C-2	12	PAHZZ	9905-01-078-4566	11748863-1	19200	PLATE, IDENTIFICATION	EA	1
C-2	13	PAHZZ	5305-01-081-9468	MS51038-111	96906	SET SCREW, HEX SOCKET	EA	2
C-2	14	PBHZZ	*	11749141	19200	HOUSING, CONTROLLER'S GUN	EA	1
C-2	15	PAHZZ	5340-00-855-1116	NAS820-18A	00756	PLUG, PROTECTIVE	EA	1
C-2	16	PAHZZ	*	11749138	19200	SWITCH, TRIGGER	EA	1
C-1	17	XBHZZ	*	11749139	19200	MOUNTING PLATE, SWITCH	EA	1
C-2	18	PAHZZ	5305-00-494-7333	MS51957-13B	96906	SCREW, MACHINE, PAN HD	EA	8
C-2	19	XBHZZ	*	11749140	19200	TRIGGER	EA	1
C-2	20	PBHZZ	5340-01-081-1718	11749552	19200	PLUG, HOLE	EA	1
C02	21	PAHZZ	5315-00-844-3942	MS16562-6	96906	PIN, SPRING, 0.5 LG	EA	1

*NOT AVAILABLE ON PUBLICATION DATE

Section II. REPAIR PARTS LIST

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	(7) U/M	(8) QTY INC. IN UNIT
C-2	22	PBHZZ	1265-01-076-2013	11749074	19200	LATCH, DOOR, BATTERY	EA	1
C-2	23	PBHZZ	1265-01-076-2014	11749075	19200	CATCH, DOOR, BATTERY	EA	1
C-2	24	XBHZZ	*	11749148	19200	SPRING, BATTERY EJECTOR	EA	1
C-2	25	PAHZZ	5305-00-054-5639	MS51957-5	96906	SCREW, MACHINE, PAN HD	EA	2
C-2	26	PAHZZ	5315-00-844-3943	MS16562-10	96906	PIN, SPRING, 0.75 LG	EA	1
C-2	27	PAHZZ	*	11835949	19200	RING, KEY	EA	1
C-2	28	PBHZZ	1265-01-078-3933	11749155	19200	HOUSING, BATTERY CONNECTOR	EA	1
C-2	29	PAHZZ	5315-00-840-0907	MS171497	96906	SPRING, PIN	EA	1
C-2	30	PAHZZ	*	11749743	19200	CONTACT, ELECTRICAL	EA	2
C-2	31	PBHZZ	1265-01-080-0845	11749184	19200	DOOR ASSY, BATTERY	EA	1
C-2	32	PACZZ	6135-01-063-1978	BA-3090/U	88058	BATTERY, WARM WEATHER	EA	1
C-2	33	PAHZZ	*	11749289-1	19200	PIN, SPRING, 1.25 LG	EA	L
C-2	34	PAHZZ	*	MS16562-18	96906	PIN, SPRING, 0.75 LG	EA	1
C-2	35	XBHZZ	1265-01-077-1996	11749265	19200	COVER, REAR	EA	1
C-2	36	XBHZZ	*	11749494	19200	CAP, CONNECTOR	EA	1
C-2	37	PAHZZ	*	11749629	19200	BOOT	EA	2
C-2	38	PAHZZ	1265-01-080-2534	11749070	19200	FILTER, LED	EA	1
C-2	39	PAHZZ	5310-00-938-2013	MS35649-224	96906	NUT, HEX	EA	2
C-2	40	PAHZZ	5940-01-081-5446	11749132	19200	TERMINAL	EA	2
C-2	41	PAHZZ	5310-00-595-6761	MS15795-802	96906	WASHER, FLAT	EA	2
C-2	42	PAHZZ	5970-01-077-1918	11749328	19200	WASHER, FLAT, NYLON	EA	2
C-2	43	PAHZZ	*	11749493	19200	SIGHT, REAR	EA	1
C-2	44	PAHZZ	5310-01-081-4695	11749052	19200	WASHER, NYLON	EA	1
C-2	45	PAHZZ	*	11835970	19200	INSULATOR	EA	1
C-2	46	PAHZZ	*	11835963	19200	LABEL, CAUTION	EA	1
						GROUP: 10X TOOLS		
		*	3439-00-294-9009	WS57D	81348	SOLDERING IRON	EA	1
		*	5110-00-239-8253	GGG-P-468	81348	PLIERS, DIAGONAL CUT, 6"	EA	1
		*	5110-00-240-5943	GGG-K-484	81348	KNIFE, POCKET	EA	1
		*	5120-00-230-6380	GGG-W-686	81348	WRENCH, TORQUE	EA	1

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Section II. REPAIR PARTS LIST

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

(1) ILLUSTRATION (a) FIG. NO.	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	(7) U/M	(8) QTY INC. IN UNIT
		*	5120-00-060-2004	GGG-S-121	81348	SCREWDRIVER, CROSS-TIP, NO. 2, 4"	EA	1
		*	5120-00-240-6082	GGG-P-831	81348	PUNCH, DRIVE PIN, 1/16"	EA	1
		*	5120-00-243-2985	GGG-H-86	81348	HAMMER	EA	1
		*	5120-00-293-3481	GGG-P-471	81348	PLIERS,NEEDLE NOSE	EA	1
		*	5120-00-761-1732	TM118	81348	SOCKER, SOCKET WRENCH	EA	1
		*	5180-01-007-8999	*	81348	TORQUE SCREWDRIVER KIT	EA	1
						GROUP: 10Y TEST EQUIPMENT		
		*	*	11835285	19200	TEST SET,DECODER	EA	1
						RADIOMETER. WITH 550 ATTENUATOR, EG&G 460	EA	1
		*	6625-00-649-3290	7904729	18876	VOLT-OHMMETER	EA	1
		*	*	4005	18042	POWER SUPPLY, 0 TO 15V DC (MIN), 500mA (MIN)	EA	1
		*	*	*	*	BATTERY,DUMMY	EA	1
						GROW: 10Z BULK MATERIAL		
BULK		PAHZZ	3439-00-163-4347	Q-Qs-571	81348	SOLDER		AR
BULK		PAHZZ	*	11749371	19200	INSULATING COMPOUND		AR
BULK		PAHZZ	*	MIL-A-46106	81349	PRIMER, CLEAR, TYPE I		AR
BULK		PAHZZ	*	MIL-A-46106	81349	ADHESIVE, TYPE I		AR
BULK		PAHZZ	*	MIL-I-19166	81349	INSULATING TAPE, GLASS .010 THICK K .38-.50 WIDE		AR
BULK		PAHZZ	*	MIL-P-47298	81349	MOLDING COMPOUND, BLACK POLYURETHANE, TYPE I OR II		
BULK		PAHZZ	6850-00-295-7685	MIL-S-8660	81349	LUBRICANT		AR
BULK		PAHZZ	4020-00-998-4423	MIL-S-8802	81349	COMPOUND, SEALING, CLASS A-½		AR
BULK		PAHZZ	8030-00-081-2338	MIL-S-22473	81349	PRIMER,GRADE T		AR
BULK		PAHZZ	8030-00-823-7917	MIL-S-22473	81349	LOCKING COMPOUND,GRADE C		AR
BULK		PAHZZ	030-00-81-2325	MIL-S-22473	81349	LOCKING COMPOUND,GRADE H		AR
BLUK		PAHZZ	*	MIL-T-43435	81349	TAPE, LACING, TYPE I. FINISH B, SIZE 3		AR
BULK		PAHZZ	*	MIL-W-16878/1	81349	WIRE, INSULATED, TYPE B24		AR

*NOT AVAILABLE ON PUBLICATION DATE

Section III. SPECIAL TOOLS LIST

CONTROLLER'S GUN, SIMULATOR SYSTEM, LASER

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	(7) U/M	(8) QTY INC. IN UNIT
						GROUP: SPECIAL TOOLS		
C-3	1	PBHZZ	*	11835280	19200	LASER TUBE REMOVAL TOOL	EA	11

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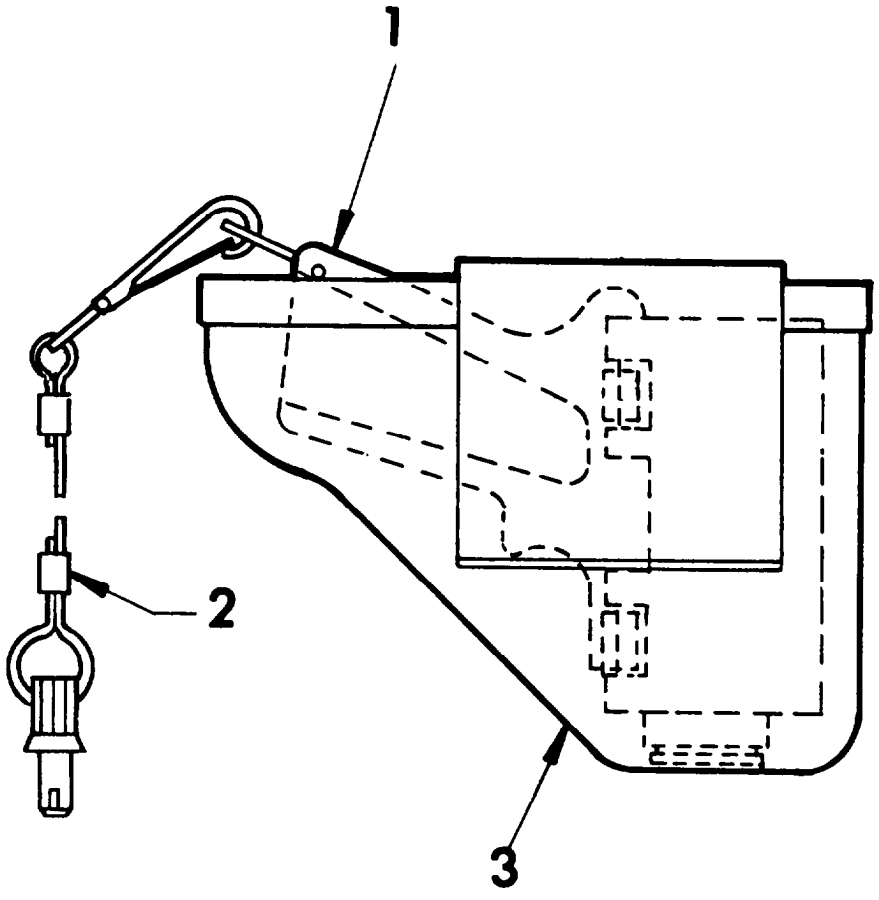

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Figure C-1. Controller's Gun, Simulator System, Laser

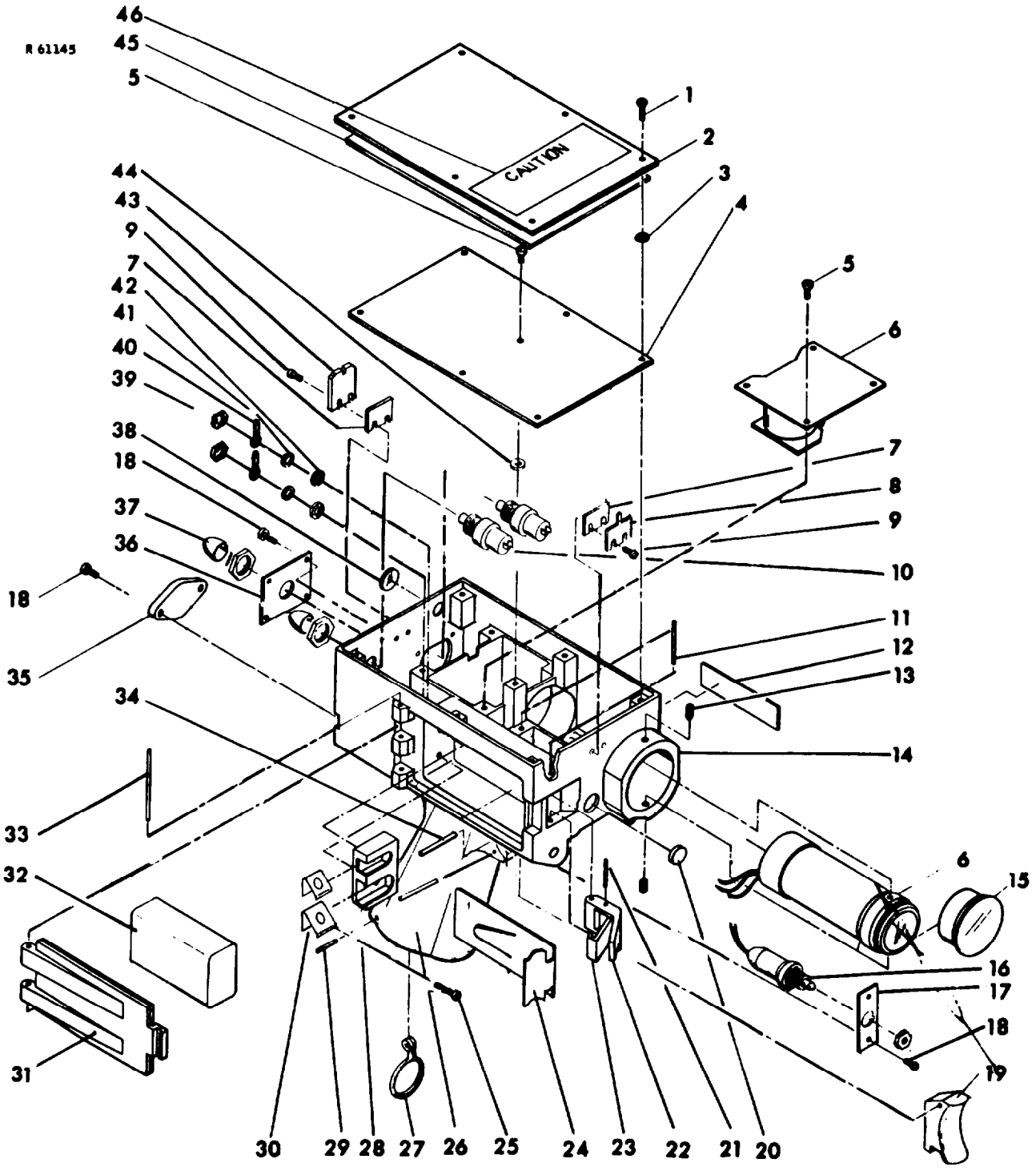

Figure C-2. Laser Transmitter Assy, Controller's Gun.

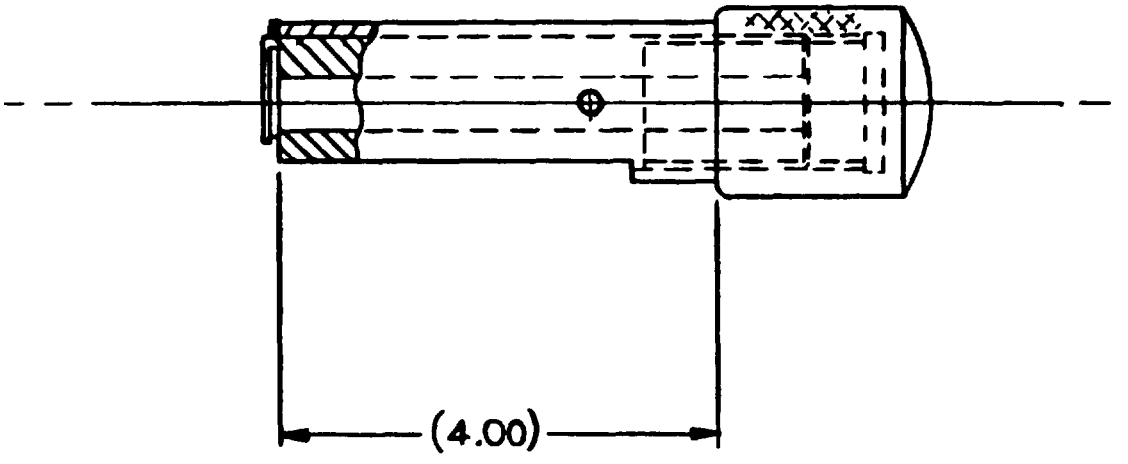

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Figure C-3. Laser Tube Assembly Removal Tool

SECTION IV. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

Stock Number	Figure No.	Item No.	Stock Number	Figure No.	Item No.

(To be supplied after NSNs are assigned)

Part Number	FSCM	Fig. No.	Item No.	Part Number	FSCM	Fig. No.	Item No.
BA-3090/U	88058	C-2	32	11749139	19200	C-2	17
MS15795-802	96906	C-2	41	11749140	19200	C-2	19
MS16562-6	96906	C-2	21	11749141	19200	C-2	14
MS16562-10	96906	C-2	26	11749148	19200	C-2	24
MS16562-18	19200	C-2	34	11749155	19200	C-2	28
MS171497	96906	C-2	29	11749184	19200	C-2	31
MS35649-224	96906	C-2	39	11749265	19200	C-2	35
MS51038-111	96906	C-2	13	11749279	19200	C-1	1
MS51957-5	96906	C-2	25	11749289-1	19200	C-2	33
MS51957-13	96906	C-2	5	11749289-2	19200	C-2	11
MS51957-13B	96906	C-2	18	11749325	19200	C-2	4
MS51957-14B	19200	C-2	9	11749328	19200	C-2	42
MS51957-15B	96906	C-2	1	11749364	19200	C-2	3
NAS820-18A	00756	C-2	15	11749492	19200	C-2	8
PCI-400-9	88058	C-2	32	11749493	19200	C-2	43
11748811	19200	C-1		11749494	19200	C-2	36
11748863-1	19200	C-2	12	11749552	19200	C-2	20
11749038	19200	C-2	2	11749629	19200	C-2	37
11749052	19200	C-2	44	11749742	19200	C-1	3
11749064	19200	C-2	2	11749743	19200	C-2	30
11749070	19200	C-2	38	11749745	19200	C-2	10
11749074	19200	C-2	22	11835280	19200	C-3	1
11749075	19200	C-2	23	11835695	19200	C-2	6
11749132	19200	C-2	40	11835949	19200	C-2	27
11749136	19200	C-2	7	11835963	19200	C-2	46
11749138	19200	C-2	16	11835970	19200	C-2	45

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INDEX - continued

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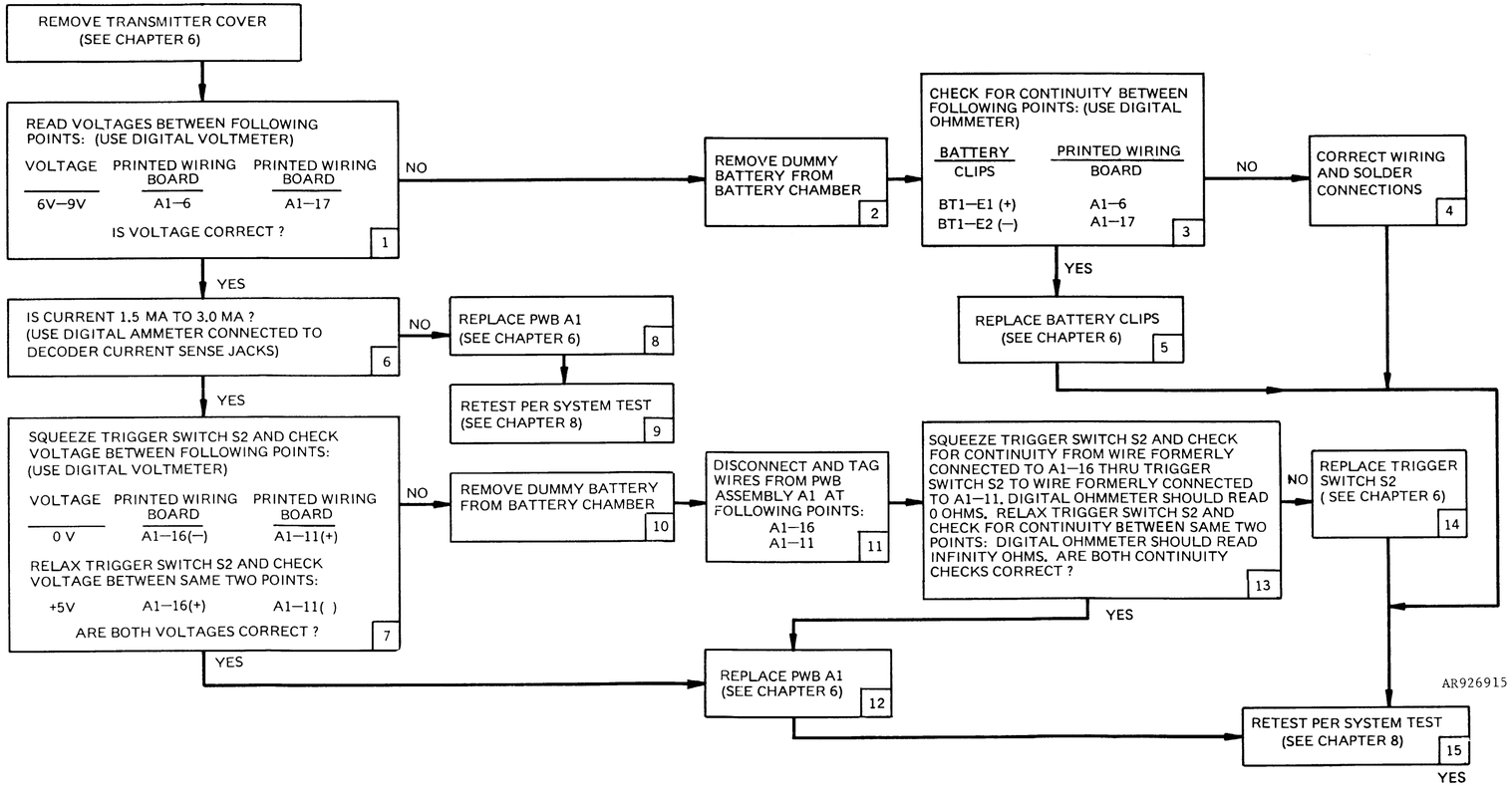

Figure 5-1. Controls Troubleshooting Logic Tree

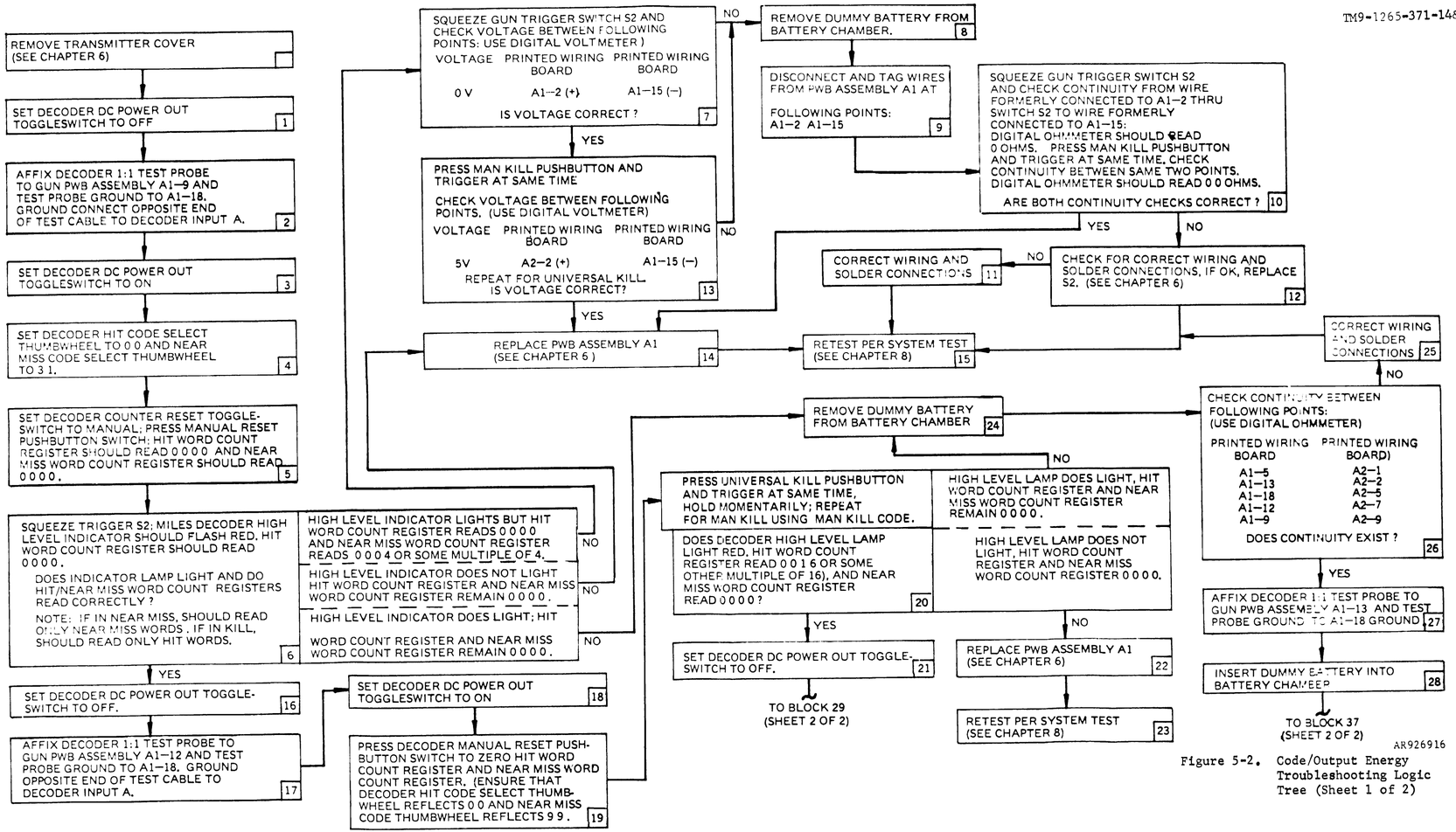

Figure 5-2. Code/Output Energy Troubleshooting Logic Tree (Sheet 1 of 2)

B 64230

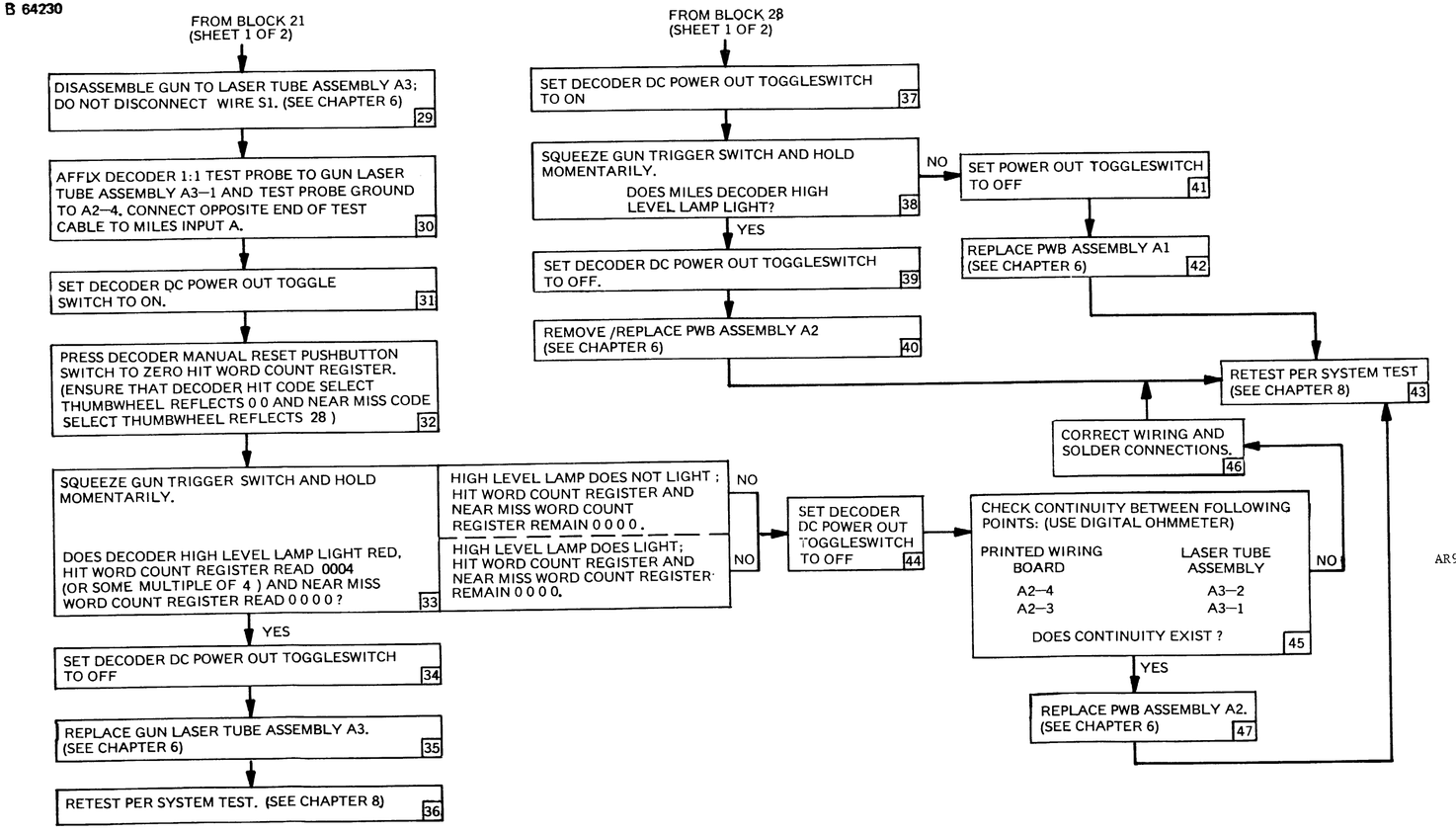

Figure 5-2. Code/Output Energy Troubleshooting Logic Tree (Sheet 2 of 2)

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PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
50				Step 5; Revise: Swing plate beneath the cooling jacket and tighten the knob securely with your hand.
51				Inside Box; insert comma: If no light, remove and reinsert the same battery.
55				Line 1: If you are wearing suspenders, remove them from your web gear.
58				Step 2; Revise: Ask the controller to reset the system by inserting his green key into the key receptacle on control console.

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DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

REVERSE OF DA FORM 2028-2

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 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

WEIGHTS

1 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

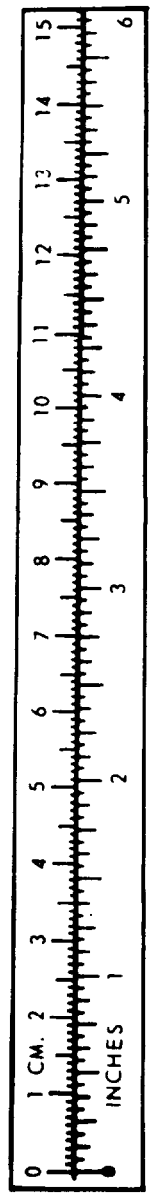
TEMPERATURE

$5/9\ (^0F - 32) = {}^0C$
212^0 Fahrenheit is equivalent to 100^0 Celsius
90^0 Fahrenheit is equivalent to 32.2^0 Celsius
32^0 Fahrenheit is equivalent to 0^0 Celsius
$9/5\ C^0 + 32 = F^0$

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
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	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
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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