

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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ORGANIZATIONAL  
MAINTENANCE MANUAL:

GUIDED MISSILE FLIGHT CONTROL  
TRAINING SETS DX-43 AND DX-44

(ENTAC ANTITANK GUIDED MISSILE  
SYSTEM AND M22 GUIDED MISSILE  
LAUNCHER HELICOPTER  
ARMAMENT SUBSYSTEM)

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*HEADQUARTERS, DEPARTMENT OF THE ARMY  
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**GUIDED MISSILE FLIGHT CONTROL TRAINING  
SETS DX-43 AND DX-44**

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## CHAPTER 1 INTRODUCTION

### Section I. GENERAL

#### 1. Scope

a. This manual describes the DX-43 and the DX-44 line-of-sight guided-missile flight-control trainers, and provides instructions for operating and maintaining them at the organizational level.

b. These instructions are based upon the responsibilities assigned to operators and organizational maintenance personnel by the maintenance allocation chart (appendix II). Repair, modification, or adjustment functions not specifically allocated to using personnel must be referred to the supporting maintenance unit.

c. Basic issue items and repair parts authorized to using personnel are listed in TM 9-6920461-12P.

#### 2. Nomenclature Cross-Reference

Table 1 contains a cross-reference between the official nomenclature and that used in this manual, and also includes the part numbers.

#### 3. Forms, Records, and Reports

For the forms, records, and reports required on the material covered in this manual, refer to TM 38-750.

#### 4. Errors and Omissions

The direct reporting of errors, omissions, and recommendations for improving this equipment manual by the individual user, is authorized and encouraged. DA Forms 2028 will be used for reporting these improvements. This form may be completed using pencil, pen, or typewriter. DA Forms 2028 will be completed by the individual using the manual and forwarded to: Commanding General, U. S. Army Missile Command, ATTN: AMSMI-SMPT, Redstone Arsenal, Alabama 35809.

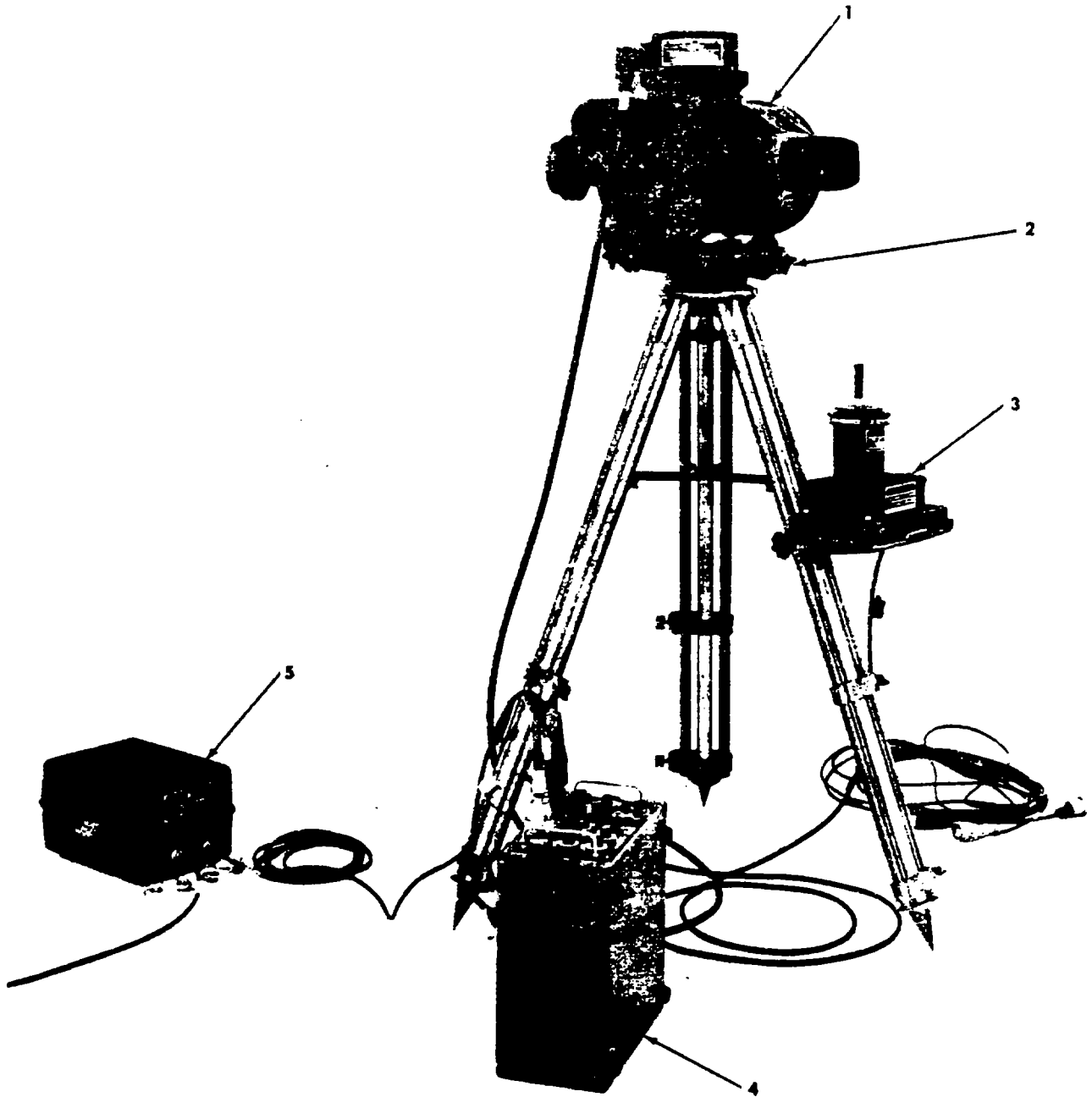
**Table 1. Nomenclature Cross Reference**

TM nomenclature	Approved nomenclature	Part no.
DX-43 trainer	TRAINING SET, GUIDED MISSILE FLIGHT CONTROL (DX-43) (ENTAC) (GROUND MOUNTED)	10173191
	TRAINING SET, GUIDED MISSILE FLIGHT CONTROL (DX-43) (SS-11)	10173200
DX-44 trainer	TRAINING SET, GUIDED MISSILE FLIGHT CONTROL (DX-44) (SS-11)	10173201
ENTAC GCTU	LAUNCHING AND GUIDANCE CONTROL TRAINING-UNIT	10173179
Power supply	POWER SUPPLY, REGULATED GC-24	10173181
M22 control stick with adapter	STICK, CONTROL, AIR	10173184
Computer	COMPUTER, TYPE CS.6	1017361

### Section II. DESCRIPTION AND DATA

#### 5. Purpose of the Trainers

The DX-43 and DX-44 trainers are used to train gunners to fire and control the flight of wire-guided antitank missiles. Using the flight control trainers for the preliminary training of inexperienced gunners teaches them the techniques of manually guiding and controlling anti-tank missiles before they practice fire the missiles. A safe and inexpensive method of training, the DX-43 and DX44 are also used by experienced gunners to maintain their marksmanship.



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- 1—Optical unit
- 2—Moveable platform
- 3—SS-11 control stick
- 4—Computer
- 5—24V Power Supply

Figure 1. DX-43 trainer with SS-11 stick.

## 6. Description of the DX-43 Training Set

a. *General.* The DX-43 training set (fig. 1) consists of a computer, a DX-43 optical unit, a dc power supply and an adaption kit.

b. *Optical Unit.*

- (1) For all practical purposes, the optical unit (1, fig. 1) for the DX-43 training set can be described as a large set of special-purpose binoculars. Short-distance targets are viewed directly through the unit's eyepiece which does not magnify the target area; long distance targets are viewed through the 8 X 30 binoculars (fig. 2) that are issued with the trainee.

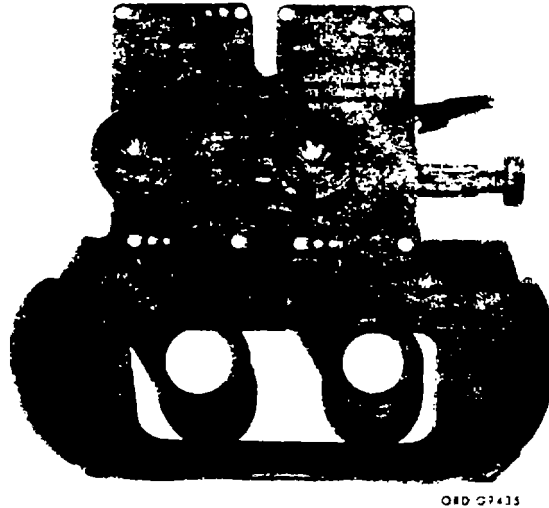


Figure 2. 8x30 binoculars

- (2) After a target has been selected and a simulated missile fired, a three-dimensional spot-of-light becomes visible to the operator. Because of the special optics within the optical unit, this spot actually appears to be maneuvering downrange between the trailing set and the target. To the operator, this spot of light represents the flare of an n-flight missile. When first seen, the spot appears rather large and bright; as the flight progresses, the relative size and brightness of the spot diminish simulating the increasing distance between the operator and the missile as the missile speeds toward the target. At the end of a predetermined amount of time, representing the distance traveled by the missile, the spot "explodes" and disappears, simulating warhead detonation when the missile impacts. This simulated missile impact occurs whether or not the spot of light is on the target when the flight ends.
- (3) The spot of light (simulated missile) is guided by the operator using a control stick. Basic commands from the control stick are first applied to the computer which converts them to simulated missile-guidance signals for the electro-mechanical devices in the optical unit that control the action of the simulated missile.
- (4) Located on the left side of the optical unit as it faces the target is an instructor's eyepiece that permits the monitoring of the student's simulated firings.

**Note**

**The light-spot seen by the instructor moves in the opposite direction in yaw to the one viewed by the gunner as he manipulates the control stick. Pitch movements are in the same direction.**

c. *Computer* (4, fig. 1).

- (1) The computer is the control center of the training set. Its primary functions are: to receive the basic commands from the control stick; determine how a missile should respond to these commands; then send signals to the optical unit to make the simulated missile maneuver accordingly. These actions are instantaneous and continuous throughout the flight of the missile. Any time delay between the movement of the control stick and the corresponding response of the simulated missile is not the computer's fault. Real missiles cannot make sharp turns or react instantly to guidance commands; the simulated missile won't either because the computer is designed to take this into consideration while computing the signals from the control stick.
- (2) In addition to providing the control signals for the simulated missile, the computer also allows a variety of different situations to be added to the basic: gunnery problem.

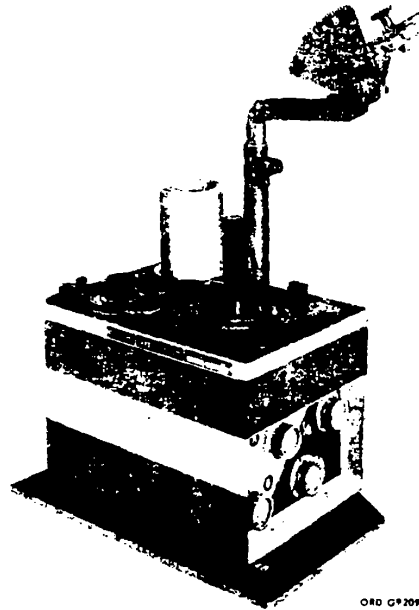


Figure 3. ENTAC GCTU.

For example, the effects of various intensity crosswinds and various launching sites can be set into the computer. It can also simulate missiles that respond quickly or sluggishly. By varying the time that the spot of light is visible to the operator, the compute simulates the minimum to maximum range of the missile system for which training is being provided.

d. *Power supply (5, fig.1).* The power supply provides 24 volts direct current for the operation of the trainer. This unit can be plugged directly into 110 or 220-volt power outlets or can be connected to a 24-volt battery.

e. *Adaption Kit.* There are two adaption kits that may be issued with the DX-43 training set; one for units training to fire ENTAC guided missiles and the other for units that will fire AGM22B missiles (M22 guided-missile-launcher helicopter-armament subsystem).

(1) *Adaption kit for ENTAC training.* This kit consists of a launching and guidance control training unit (ENTAC GCTU), a support stand, and an electrical cable to connect the GCTU to the computer. Although designed especially for use with the DX-43 training set, the operation of the ENTAC GCTU (fig. 3) is the same as a tactical GCU. The main purpose in using this unit is to develop the operator's "feel of the stick" and teach the firing procedures for firing tactical missiles.

(2) *M22 adaption kit.* This kit consists of an M22 control stick (fig. 4), modified to provide electrical command guidance signals to the computer and a cable for connecting it to the computer. The manner in which this control stick responds to movement by the student gunner, helps him make an easier transition from the trainer to a tactical control stick.

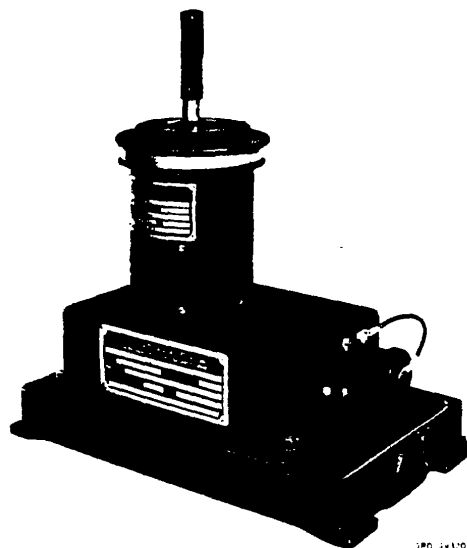
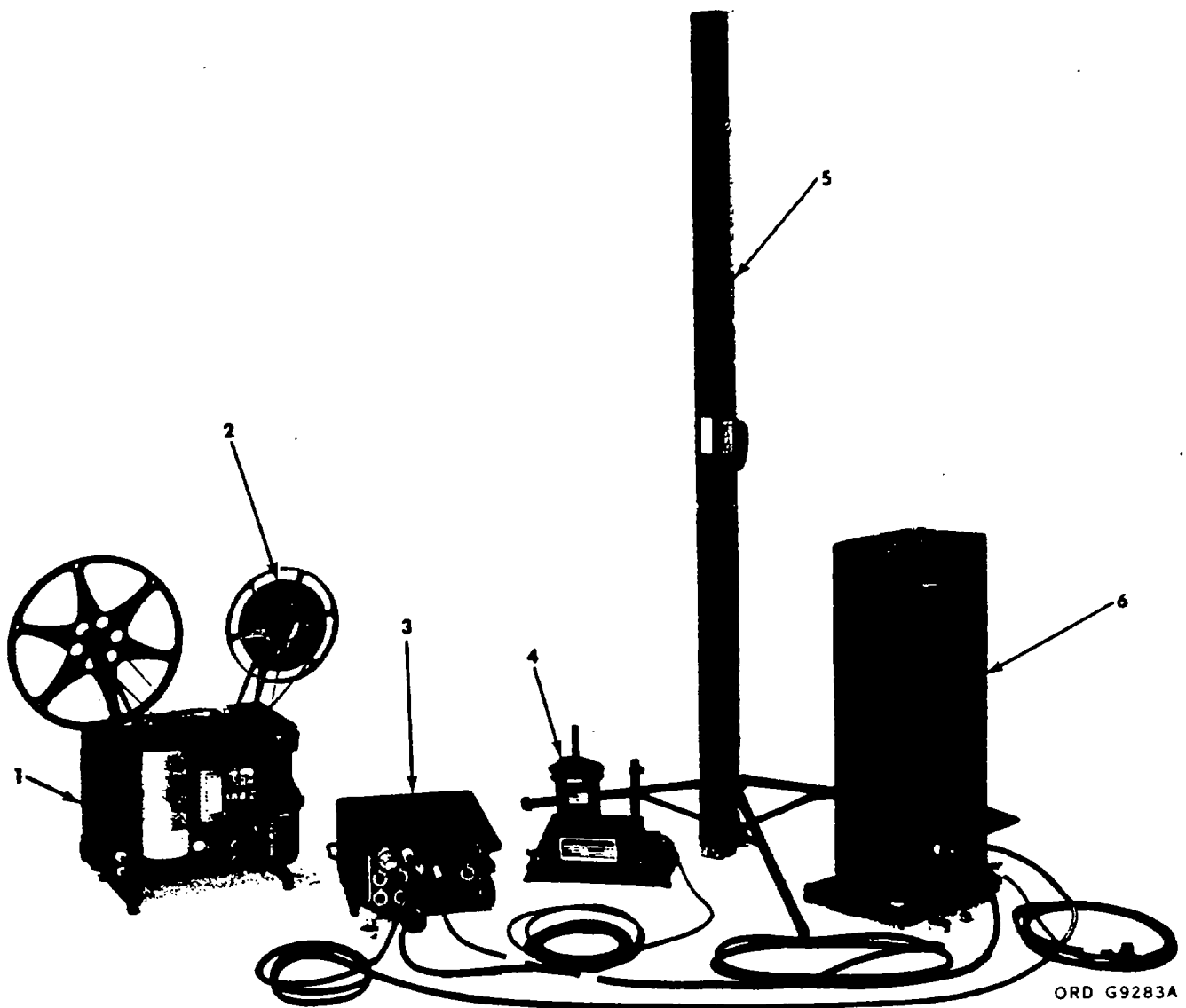


Figure 4. M22 control stick.



1—16mm film projector  
 2—Training film  
 3—Computer

4—Modified M22 control stick  
 5—Movie screen  
 6—DX-44 projection unit

Figure 5. DX-44 trainer with projector and screen.

## 7. Description of the DX-44 Training Set

a. *General.* The DX44 training set (fig. 5), consists of a computer set, a DX-44 projection unit, an M22 adaption kit, and nine 16mm cinemascope films.

b. *Projection Unit* (6, fig. 5).

- (1) The DX-44 projection unit serves the same purpose of preliminary gunner training as the DX-43. Major differences in the two trainers are that the DX-44 is designed for indoor training, and projects the simulated missile on a movie screen surface. Because the DX-44 is designed for indoor training, the need for optical sighting equipment does not exist. The gunner sights on his target with the unaided eye.
- (2) Targets for the gunner are projected onto a movie screen with a 16mm film projector. Nine cinemascope films, each depicting a different combat situation, are used for this purpose. Once the light spot "missile" is projected on the screen,



the student gunner controls it using an M22 control stick. When the time of flight for the "missile" ends, it increases in brilliance and goes out, simulating the impact of a missile on target. The missile will "impact" whether or not it is on the target when its flight ends.

- (3) The projection unit for this trainer is mounted on the upper part of a rigid frame and enclosed in a metal case. Two doors on the upper front and rear of the case protect the mechanical focusing mechanism of the projection unit. The sliding door on the upper front of the case protects the focusing lens in transit. The rear door on the upper case swings out to reveal the mechanical focusing mechanism, and is fastened with a setscrew when closed.
- (4) The power supply for the DX-44 trainer is also enclosed in the lower part of the same case as the projection unit. A door on the lower left-hand side of the case opens to reveal controls, indicators, and connectors to the power supply.

c. *Computer.* See paragraph 6c.

d. *Adaption Kit.* The M22 control stick in paragraph 6 is used with the DX-44 training set.

**8. Physical Data**

a. *Computer.*

(1) Height .....	6.28 in.
(2) Depth .....	11.82 in.
(3) Width .....	13.78 in.
(4) Weight .....	33.07 lb

b. *Optical Unit-DX-43.*

(1) Height .....	14.57 in.
(2) Depth .....	17.53 in.
(3) Width .....	17.53 in.
(4) Weight .....	55.12 lb

c. *Power Supply.*

(1) Height .....	7.07 in.
(2) Depth .....	11.42 in.
(3) Width .....	8.67 in.
(4) Weight .....	30.87 lb.

d. *Projection Unit-DX-44.*

(1) Height .....	29.9 in.
(2) Depth .....	13.8 in.
(3) Width .....	9.8 in.
(4) Weight .....	50.0 lb

**9. Differences Between Trainer Models**

Only one model of each trainer is in use. Equipment modifications are authorized only by official modification work orders (MWO's).

**10. Modification Work Orders**

As of the date of this publication, there are no modification work orders applicable to either trainer.

**CHAPTER 2**  
**OPERATING INSTRUCTIONS**  
**Section I. SERVICE UPON RECEIPT**

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**11. Services**

When a trainer is received, the using organization must determine whether the material is complete and serviceable. Use the following checklist to make this determination.

a. Remove the lids from all of the shipping containers. Inventory the contents of each container against the equipment listing in TM 9-6020-461-12P.

**Note**

**Retain all of the bolts that fasten the container halves together. Store them inside the container for future use.**

- b. Report any missing parts, tools, or equipment to the officer in charge.
- c. Note all tags, stencils, and envelopes since they may contain important operating or maintenance information.
- d. Emplace and operate the equipment as specified in section III (DX-43) or section IV (DX-44).
- e. Learn and obey the operating and handling precautions listed in paragraph 12 below.

**12. Operating and Handling Precautions**

a. When not in use, always replace and store the trainers in the shipping and storage containers. These containers are especially designed for these units and will provide adequate protection during storage or shipment.

b. Do not attempt to adjust or repair the equipment unless specifically authorized in appendix II. Refer other needed adjustment or repair to the support maintenance unit.

c. Do not force the rotation of any control beyond its normal stop limits.

d. Keep the trainers and associated equipment and cables clean and dry.

**Section II. CONTROLS, CONNECTORS, AND INDICATORS**

**13. General**

This section illustrates and describes the controls, connectors, and indicators on both of the trainers. Operators and organizational maintenance personnel should become thoroughly familiar with this information.

**14. Computer**

Table 2 explains each control, connector, and indicator on the panel of the computer. The table is keyed to figure 6.

**Note**

**The computer set is used with both the DX-43 and DX-44 training sets. The controls serve the same purpose when used with either set.**

**15. DX44 Projection Unit**

a. The controls located behind the upper-rear door of the DX-44 projection unit are explained in table 3 and illustrated in figure 7.

b. The controls behind the lower door of the DX-44 projection unit are explained in table 4 and shown in figure 8.

c.

**16. ENTAC GCTU**

Refer to table 5 and figure 9 for the controls and indicators of the ENTAC GCTU.

**17. M22 Control Stick with Adapter**

The only control on this unit is the control stick used by the operator to guide the missile. The red lamp on the side of the base indicates that power has been applied to the unit.

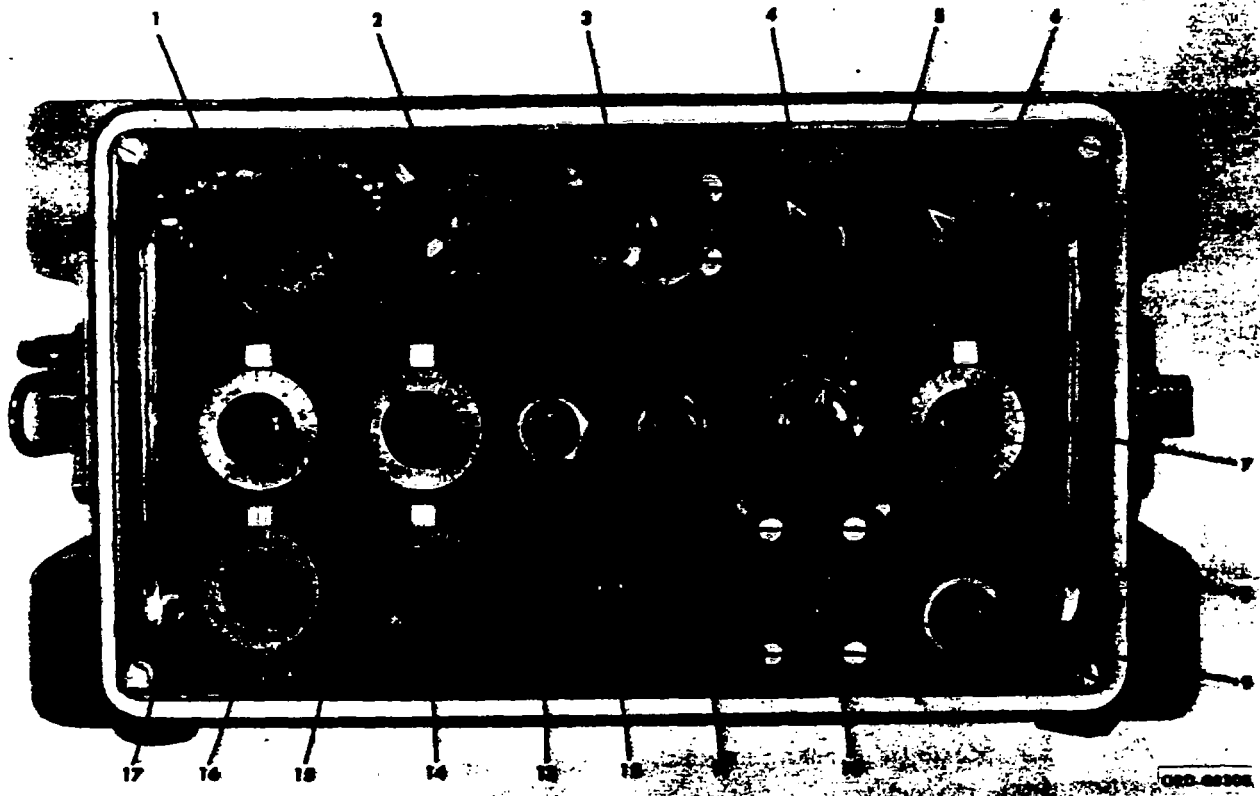


Figure 6. Computer - controls, indicators, and connectors.

Table 2. Computer-Controls, Indicators, and Connectors (fig. 6)

Key	Control. indicator or connector	Purpose
1	OPTICAL UNIT connector	The cable from the optical unit attaches to this connector.
2	24V SUPPLY connector	The cable from the 24V power supply attaches to this connector.
3	STICK connector	Cable from the modified M22 control stick or the ENTAC GCTU attaches to this connector.
4	TURBULENCE control	Simulates the atmospheric conditions that can affect a missile in flight. The conditions simulated are as follows: NORMAL - calm day, no wind TURBULENCE - slight winds GUSTS - strong, gusty winds
5	SPOT BRILLIANCE control	Turning this control increases or decreases the spot brilliance to contrast with the background. Normally, the control is set so that the arrow on the control knob points to the orange dot painted on the panel.
6	TYPES OF MISSILES control	Selects one of four types of missiles that can be simulated by the trainer. The four types of missiles are as follows: 1. Normal missile 2. More sensitive missile 3. More sluggish missile 4. Difficult to monitor missile (small phase-lead).
7	TIME OF FLIGHT control	Used to adjust the time, in seconds, that the missile is in flight. Time can be set from 3 to a maximum of 29 seconds.
8	FIRE OFF lamp	Lights up to indicate that it is all right to fire a missile, and goes out during a flight.

Table 2. Computer-Controls, Indicators, and Connectors (Fig. 6)-Continued

Key	Control. indicator or connector	Purpose
9	FIRE OFF button	Fires the missile to start the simulated flight.
10	FIRINGS counter	This counter keeps a record of the number of firings that have been made with the simulator.
11	FUSE	Keeps the computer from drawing more than 2.5 amperes from the power supply.
12	POWER SUPPLY indicator	Lights up when power has been supplied to the trainer.
13	POWER ON switch	Applies primary operating power to all units of the training set.

**Note**

Key-numbered controls 14, 15, 18, and 17 are used to simulate the INITIAL CONDITIONS of the missile and launcher. The INITIAL CONDITIONS simulate the placement of the missiles and launcher in relation to the gunner and speed with which a missile comes into or crosses, the gunner's line-of-sight when it is fire. Once the gunner gains control of the missile, the effects of the INITIAL CONDITIONS setting are canceled.

14	ANGULAR OFFSETS in Control	This control is used to simulate missiles that are emplaced to the AZIMUTH left of or to the right of the gunners position. Increasing the control setting in either the LEFT or RIGHT direction, increases the simulated distance between the gunner and the missile.
15	SPEEDS in AZIMUTH Control	This control establishes the horizontal angle of the emplaced missile in relation to the gunner-to-target line of sight and sets the speed of the simulated missile as it comes into the gunners field of vision. If the ANGULAR OFFSETS in AZIMUTH control is turned to the LEFT side, the SPEEDS in AZIMUTH control should be turned to the RIGHT side. This simulates an initial condition of a missile emplaced to the left of the gunner and angled to the right toward a target in front of the gunner. When the missile is fired it will enter the gunner's field of vision from left to right and will be moving rather rapidly. As the setting on the SPEEDS control is increased-the simulated emplacement angle and the speed of the missile increases.

**Note**

The SPEEDS in AZIMUTH control and the ANGULAR OFFSETS in AZIMUTH control usually complement each other. Ordinarily when one is turned to the RIGHT. the other should be turned to the LEFT. Turning both to extremes in the Demo direction is unrealistic and would keep the missile from entering the gunner's field of vision. However, leaving the SPEEDS control at zero, and turning the ANGULAR OFFSETS in AZIMUTH Control slightly to the left or the right is practical since ENTAC missiles can be fired from within 10-meters of the gunner and AGM22B missiles within about 12-feet of the gunners position. In both of these cases, the emplaced missiles are oriented parallel to the gunner-to-target line of sight and when fired will travel this line until corrected by the gunner.

16	ANGULAR OFFSETS in ELEVATION Control	This control is used to simulate missiles/launchers that are emplaced above or below the position of the gunner. Increasing the control setting in the UP or DOWN direction increases the simulated elevation difference between the missile and the gunners position.
17	SPEEDS in ELEVATION Control	This control establishes the vertical angle of the emplaced missile in relation to the relation to the gunner-to-target line of sight and sets the speed of the simulated missile as it comes into the gunner's field of vision. For example, if the ANGULAR OFFSETS in ELEVATION control is turned to the DOWN side, the SPEEDS in ELEVATION control should be turned to the UP side. This simulates an initial condition of a missile that is emplaced below the gunner and elevated in an upwards attitude. When the missile is fired, it will be in a climb and will be moving rapidly. As the setting on the SPEEDS control is increased, the simulated initial elevation of and the speed of the missile increases.

**Note**

The SPEEDS in ELEVATION control and the ANGULAR OFFSETS in ELEVATION control usually complement each other. Ordinarily. when one is turned in one direction the other is turned in the opposite direction. Turning both to extremes in the same direction is unrealistic and would prevent the missile from entering the gunner's field of vision.

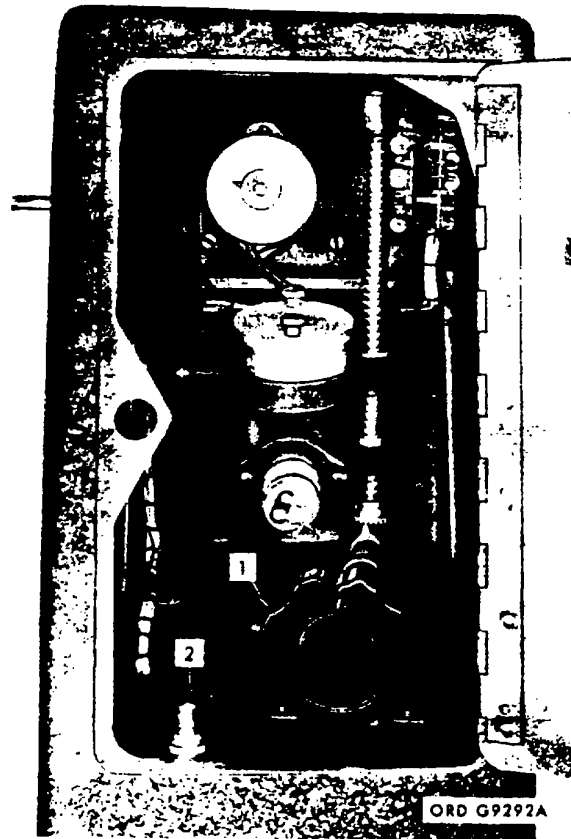


Figure 7. DX-44 projection unit-upper rear door - controls and indicators.

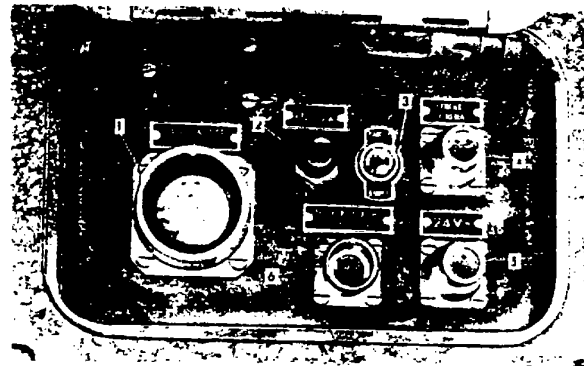


Figure 8. DX-44 projection unit door - controls and indicators.

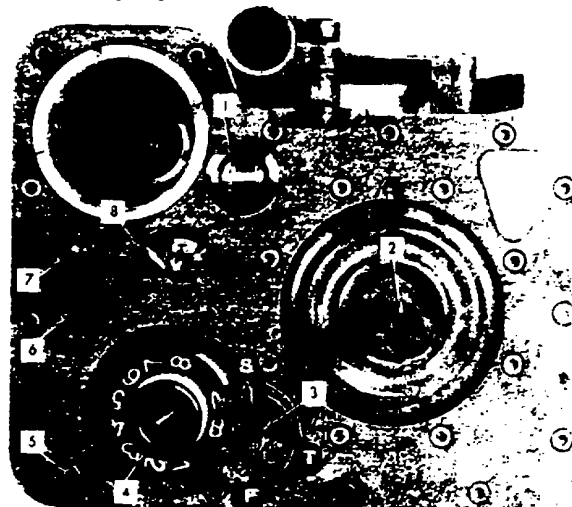


Figure 9. ENTAC GCTU - Controls and indicators.

**Table 3. Projection Unit, DX-44, Upper-Rear Door--Controls and Indicators (fig. 7)**

Key	Control. indicator or connector	Purpose
1	Focusing crank knob	After pressing the light-spot button, this knob is turned to focus the light spot to the desired brilliance .
2	Light-spot button	When pressed down, a light-spot is projected on the viewing screen.

**Table 4. Projection unit, DX-44 Lower Door-Controls, Indicators, and Connectors (fig. 8)**

Key	Control. indicator or connector	Purpose
1	COMPUTER connector	Makes the connection to the computer.
2	FUSE 2A	Protects the power supply from having too much current drawn from it.
3	Power ON-OFF switch	Energizes the optical unit.
4	Movie projector connector	Not used.
5	24V connector	Serves as the connector for the 24V power supply in the optical unit to the computer.
6	110V or 220V input	Serves as the connector between the power supply in the optical unit and the 110 or 220-volt power source.

**Table 5. ENTAC Guidance Control Training Unit-Controls and indicators (fig. 9)**

Key	Control. indicator or connector	Purpose
1	Flare switch	Cuts out the flare on a missile to be fired. (This does not affect trainer operation.)
2	Control stick	Controls pitch and yaw guidance signals generated by the GCTU. Varies pitch voltage amplitude and yaw voltage polarity.
3	Safety switch	Sets the GCTU for SAFE (S), TEST (T), or FIRE (F) operations.
4	Missile selector switch	Selects missile for firing (this control is set at A or B for trainer use).
5	Firing switch	Fires the missile selected by the missile selector switch when the safety switch is in the FIRE position.
6	Missile-on-line indicator	Indicates that a simulated missile is connected to the GCTU at the position indicated by the missile selector switch. With the trainer, this indicator operates only when the selector is on A or B.
7	Battery-test button	Connects the battery to the battery test meter for a voltage reading.
8	Battery-test meter	Indicates the voltage output of the battery.

### Section III. OPERATING PROCEDURES - DX-43

#### 18. Emplacement

a. Selection of Site. The DX-43 can be used indoors or out in the open field. If it's placed indoors, it must be positioned by a window or door that allows a view of the target area. When used outside, select a fairly level spot that will allow the tripod to be firmly emplaced.

b. Emplacement Procedures.

- (1) Remove the tripod from the storage case, extend and lock the legs, and set it up in the operating location.

**Note**

**Perform step (2) below if the DX43 is to be used for M22 training. If it is to be used for ENTAC training proceed to step (3).**

- (2) Attach the M22 control stick as follows:
  - (a) Remove the cover from the M22 control stick case.
  - (b) Slide the control stick case into the control unit platform so that the arrow on the control stick (while folded) is pointing toward the hinged fastener on the platform.

- (c) Place the platform against one of the tripod legs and fasten it firmly with the captive screw.
- (d) Rearrange the tripod so that the arrow on the control stick is pointing toward the target area.
- (e) Snap the control stick back to the straight up position.
- (3) Attach the ENTAC GCTU as follows:
  - (a) Remove the cover from the GCTU.
  - (b) Slide the base plate GD945 into the control unit platform.
  - (c) Place the platform against one of the tripod legs and fasten it with the captive screw.
  - (d) Fit the GCTU onto the base plate.
  - (e) Rearrange the tripod, if necessary, so that the arrow on the GCTU is pointing toward the target area.
- (4) Place the movable platform (fig. 10) on the tripod. Turn the locking knob on the tripod to fasten the platform to the tripod.

**Caution**

**At least two men are required to perform step (5). The optical unit is not too heavy, but it is expensive. Be careful and don't drop it.**

- (5) Remove the optical unit from its case and set it on the movable platform on the tripod. Fasten the unit to the platform with the two knobs.



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**Figure 10. Moveable platform.**

- (6) Place either the hooded eyepiece or the 8-power binoculars onto the optical unit.
- (7) Remove the computer and the power supply (if being used) from the shipping containers and place them near the tripod on their container lid.

**19. Connection of Cables (fig. 11)**

**Caution**

**Before connecting the cables, make certain the power switch on the computer is set to the off (down) position.**

- a. *Connect Computer to Optical Unit.* Connect cable 10173152 (774.233) between the OPTICAL UNIT connector on the computer and the connector on the optical unit.
- b. *Connect Computer to Control Unit.*
  - (1) **For ENTAC training,** connect cable (GD942) between either the A or B connectors on the ENTAC GCTU and the CONTROL STICK connector on the computer.
  - (2) **For M22 training,** connect cable 10021921 (714.761) between the connector on the M22 control stick adapter and the STICK connector on the computer.
- c. *Connect Computer to Power Source.*
  - (1) **When using the stabilized power supply,** connect cable 10173182 (774.237) between the 24V connector on the power supply and the 24V SUPPLY connector on the computer. Then connect the power supply cord to the 120 220 VOLT connector on the power supply. Connect the power cord to a 120 or 220 volt outlet.
  - (2) **When using a 24-volt battery,** connect cable (GD941) to the 24V SUPPLY connector on the computer. Next, connect the negative lead (black) of the cable to the negative terminal of the battery and the positive lead (red) to the positive terminal.

**Caution**

**While in use, the batter. must not be under charge.**

**20. Pre-Fire Adjustments and Procedures**

**a. Computer.**

- (1) Turn the TIME OF FLIGHT control to the desired setting. This simulates

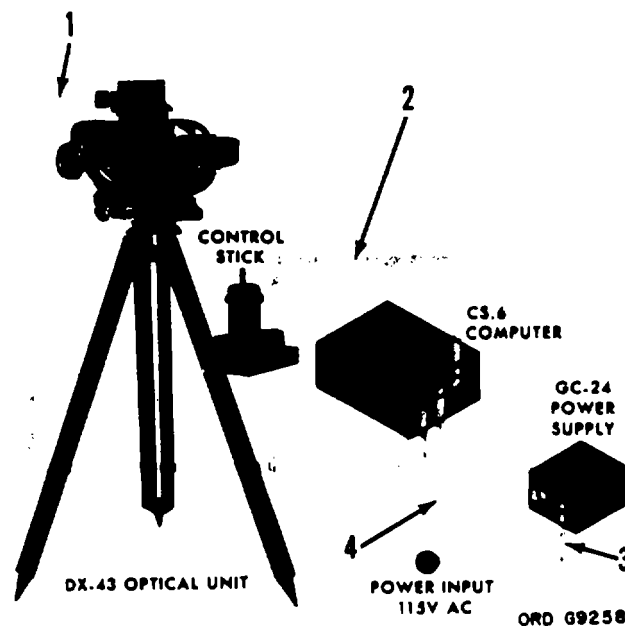
the flight distance in seconds of flight.

- (2) Adjust the light-spot brilliance by turning the BRILLIANCE control to the orange dot on the computer panel.
- (3) Set the TYPES OF MISSILES switch to the type of missile that will be simulated. (Types: normal, more sensitive, more sluggish, and highly sensitive.) (4) Set the TURBULENCE switch to the desired simulated atmospheric conditions.
- (5) Set the initial conditions for the missile with the INITIAL CONDITIONS controls. Refer to table 6 or 7 for typical settings.

b. *Optical Set.* Make sure that the proposed target is in the field of vision and that the binoculars (if used) are adjusted as required.

c. *ENTAC GCTU.*

- (1) Make sure the security switch is in the S position.
- (2) Install the battery in the GCTU.
- (3) Operate the security switch to the T (test) position and the missile selection switch to the A or B position (must agree with cable connection made on side of GCTU). The missile-on-line indicator should operate and the voltmeter should indicate 12 volts when the battery test switch is pressed.



- 1-Cable 10173152 (774.233)
- 2-Cable 10021921 (714.761)
- 3-Cable 10173183 (747.238)
- 4-Cable 10173182 (774.237)

Figure 11. Connection of cables, DX-43.



## 21. Energizing

When all connections have been properly made, the trainer is energized at the computer power switch. The red warning light, indicating that the power is on, will light up. The green light, indicating that it is all right to fire, also goes on.

### Caution

**Continuous operation in extremely hot weather may cause over-heating. Shade the equipment from direct sunlight in temperatures exceeding 90°. For indoor operation in 90° and above, provide adequate ventilation and allow one-half hour cooling off period for each three hours of operation.**

## 22. Firing Procedures

a. Simulated ENTAC missiles are fired from the GCTU. To fire the missile, set the safety switch to the F position and press and release the firing switch. The missile is now in simulated flight and will respond to guidance commands from the control-stick.

b. Simulated M22 missiles are fired by pressing the FIRE OFF button on the computer.

## 23. Deenergizing

To deenergize the trainer, turn the computer power switch to the off (down) position. If the ENTAC GCTU is being used, operate the security switch to the S (off) position and remove the battery.

### Note

**When training exercises are completed, replace all covers and put the equipment in the storage came to protect it from dust and moisture. During transit, the storage cases should be lashed securely to the vehicle.**

**Table 6. Typical Initial Missile Conditions for ENTAC Training**

<b>Missile start</b>	<b>From the left</b>	<b>Head on</b>	<b>From the right</b>
Position	D.40 L.40	D.40 0	D.40 R.40
Speeds	U.50 R.50	U.60 0	U.60 L.50

**Table 7. Typical Initial Missile Conditions for Mfg Training**

<b>Missile start</b>	<b>From the left</b>	<b>Head on</b>	<b>From the right</b>
Position	D.15 L.15	D.15 0	D.15 R.15
Speeds	U.75 R.30	U.75 0	U.75 L.30

Section IV. OPERATING PROCEDURES-DX-44

24. Emplacement

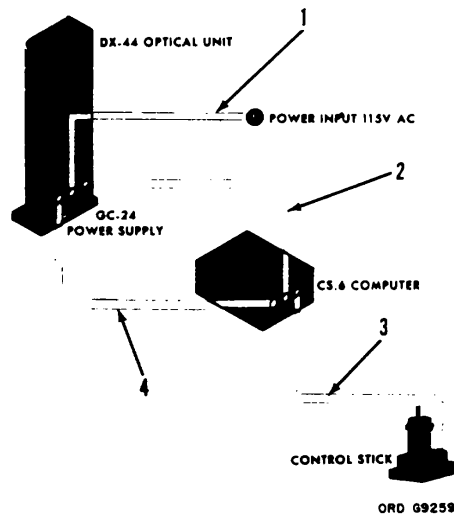
There is no special area required for the operation of the DX-44 training set. The only requirement is that it be placed in a darkened area so the projected spot of light can be seen. Any fair sized room or tent will do.

25. Connection of Cables (fig. 12)

**Caution**

**Before connecting the cables, make certain that the power switch on the computer is set to the off (down) position.**

a. *Connect Computer to Projection Unit.* Connect cable 10173192 (774.232) between the OPTICAL UNIT connector on the computer and the COMPUTER connector on the projection unit.



- 1-Cable 10173183 (774.238)
- 2-Cable 10173182 (774.237)
- 3-Cable 10021921 (714.761)
- 4-Cable 10173192 (774.232)

Figure 12. Connection of cables, DX-43.

b. *Connect Computer to M22 Control Stick Adapter.* Connect cable 10021921 between the STICK connector on the computer and the connector on the control stick.

c. *Connect Computer to Power Source.*

- (1) **When using the power supply in the projection unit**, connect cable 10173182 (774.237) between the 24V connector and the 24V SUPPLY connector on the computer. Then connect the power supply cord to the 120/220 VOLT connector on the power supply. Connect the power cord to a 120 or 220 volt outlet.
- (2) **When using a 24-volt battery**, connect cable GD941 to the 24V SUPPLY connector on the computer. Next, connect the negative lead (black) of the cable to the negative terminal of the battery and the positive lead (red) to the positive terminal.

**Caution**

**While in use, the battery must not be under charge.**

26. Pre-Firing Adjustments and Procedures

a. *Projection Unit.*

- (1) Turn all the controls on the computer front panel to zero.
- (2) Open the front and rear doors of the projection unit. Press the button located inside the rear door. This projects the light-spot on the screen independently of the computer.
- (3) Turn the focusing crank, inside the rear door compartment, to focus the light spot as desired.

b. *Computer.*

- (1) Turn the TIME OF FLIGHT control to the desired simulated flight time.
- (2) Adjust the light-spot brilliance by turning the BRILLIANCE control to the orange dot on the panel.
- (3) Set the TYPES OF MISSILES switch to the type of missile to be simulated.
- (4) Set the TURBULENCE switch to the desired simulated atmospheric conditions.
- (5) Set the initial conditions for the missile with the INITIAL CONDITIONS controls. Refer to table 7 for typical settings.

## 27. Energizing

- a. *Projection Unit.* Place the power switch in the ON (up) position.
- b. *Computer.* The computer is energized by setting the power switch on its front panel to the ON (up) position.

### Caution

**Continuous operation in extremely hot weather may cause overheating. Shade the equipment from direct sunlight in temperatures exceeding 90°. For indoor operation in 90° and above, provide adequate ventilation and allow one-half hour cooling off period for each three hours of operation.**

## 28. Firing Procedures

Simulated M22 missiles are fired from the computer. To fire the missile, press the FIRE OFF button on the computer- the missile is now in simulated flight and will respond to guidance commands from the control stick. After a flight has ended, there is a short delay while the computer resets itself. When the computer is ready for another firing, the FIRE OFF lamp comes ON.

## 29. Deenergizing

To deenergize the trainer, set the power switch on the computer and the projection unit to the off (down) position.

### Note

**When training exerciser are completed, replace all covers and put the equipment in the storage cases to protect it from dust and moisture. During transit, the storage cam should be lashed securely to the vehicle.**

## CHAPTER 3

## MAINTENANCE INSTRUCTIONS

**30. Repair Parts, Tools, and Equipment**

Repair parts supplied to the using organization for replacement of unserviceable parts are listed in TM 9-6920-461-12P. No special tools or equipment are required for organizational maintenance of the trainer.

**31. Cleaning**

- a. Clean rubber parts with soap and water. Apply a coating of powdered technical talcum to preserve the rubber.
- b. Remove dust, lint, or other foreign matter from dial faces and control surfaces using soft cloth or brush.
- c. Wash glass surfaces with lens-tissue paper lightly moistened with alcohol. Avoid excessive amounts of alcohol on dial faces, since alcohol may injure the sealing compound around the edges of the dial face.

**32. Painting**

The using organization is authorized to spot paint only. When painted surfaces have bare spots or scratches that expose metal, spot paint in accordance with TM 9-213.

**33. Preventive Maintenance**

- a. *General.* Preventive maintenance is the responsibility of the using organization. Each organization having this equipment will train personnel to do preventive maintenance.
- b. *Preventive Maintenance Services.* Refer to tables 8 and 9.

**Table 8. Preventive Maintenance Services-DX-43**

Operator and Organizational		Daily	
Sequence no.	Item to be Inspected	Operation	Reference
1	Computer	<ol style="list-style-type: none"> <li>a. Clean.</li> <li>b. Tighten all loose controls.</li> <li>c. Replace missing or damaged connector dust covers.</li> <li>d. Spot paint as required.</li> </ol>	Para. 31
2	Optical unit	<ol style="list-style-type: none"> <li>a. Clean.</li> <li>b. Replace missing connector dust covers.</li> <li>c. Spot paint as required.</li> </ol>	Para. 32 Para. 31
3	Power supply	<ol style="list-style-type: none"> <li>a. Clean.</li> <li>b. Replace missing or damaged connector dust covers.</li> </ol>	Para. 32 Para. 31
4	M22 control stick or ENTAC GCTU	<ol style="list-style-type: none"> <li>a. Clean.</li> <li>b. Spot paint as required.</li> </ol>	Para. 31 Para. 32
5	Cables	<ol style="list-style-type: none"> <li>a. Clean.</li> <li>b. Replace if frayed or broken.</li> <li>c. Replace missing or damaged connector dust covers.</li> </ol>	Para. 31
6	Shipping containers	<ol style="list-style-type: none"> <li>a. Clean.</li> <li>b. Spot paint as required.</li> <li>c. Check web straps for security and that buckles are on them.</li> </ol>	Para. 31 Para. 32

**Table 9. Preventive Maintenance Services-DX-44**

Operator and Organizational		Daily	
Sequence no.	Item to be Inspected	Operation	Reference
1	Computer	<ul style="list-style-type: none"> <li>a. Clean.</li> <li>b. Tighten all loose controls.</li> <li>c. Replace missing or damaged connector dust covers.</li> <li>d. Spot paint as required.</li> </ul>	Para. 31
2	Projection unit	<ul style="list-style-type: none"> <li>a. Clean.</li> <li>b. Replace missing connector dust covers.</li> <li>c. Spot paint as required.</li> </ul>	Para. 32 Para. 31
3	M22 control stick	<ul style="list-style-type: none"> <li>a. Clean.</li> <li>b. Replace missing or damaged connector dust covers.</li> <li>c. Spot paint as required.</li> </ul>	Para. 32 Para. 31
4	Cables	<ul style="list-style-type: none"> <li>a. Clean.</li> <li>b. Replace if frayed or broken.</li> <li>c. Replace missing or damaged connector dust covers.</li> </ul>	Para. 32 Para. 31
5	Shipping containers	<ul style="list-style-type: none"> <li>a. Clean.</li> <li>b. Spot paint as required.</li> <li>c. Check web straps for security and that buckles are on them.</li> </ul>	Para. 31 Para. 32

## CHAPTER 4

**SHIPMENT, STORAGE, AND DEMOLITION TO PREVENT ENEMY USE**

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**34. Shipment**

a. The shipping and storage containers that the training sets are issued in are completely satisfactory for both land and air transport. These containers are designed to protect the equipment against normal shocks that are inherent in shipping.

b. For long distance shipment or when the trainers are to be transported over rough terrain, the shipping container halves should be bolted together.

c. For air transport, the vent screw on the container should be tightened to prevent pressure loss at high altitudes.

**35. Storage**

Store the trainers in their shipping and storage containers and in a dry, well-protected place, preferably in a warehouse.

**36. Demolition to Prevent Enemy Use**

a. Each using unit will have a standing operating procedure (SOP) for destroying the trainer. The SOP will give the priority of items to be destroyed, methods of destruction, and, if explosives are to be used, the quantities of explosives needed, with the instructions for placement and detonation.

b. The trainer will be destroyed only upon orders of the unit commander, when such action becomes necessary in accordance with orders or established policy.

c. The following information is for guidance only. The equipment must be so thoroughly destroyed that it would be useless to the enemy. If conditions prevent complete destruction, priority should be given to destroying the equipment in the following order:

- (1) Computer.
- (2) Power supply.
- (3) Optical unit.
- (4) External guidance equipment.

d. The trainer may be destroyed by smashing, burning, or with explosives or gunfire. If burned, the equipment should first be smashed, then saturated with flammable liquids before igniting.



**APPENDIX I**

**REFERENCES**

**1. Publication Indexes**

Consult the following indexes frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this technical manual. Military Publications:

Index of Administrative Publications .....	DA Pam 310-1
Index of Army Motion Pictures, Film Strips, Slides and Phono-Recordings .....	DA Pam 108-1
Index of Blank Forms.....	DA Pam 310-2
Index of Graphic Training Aids and Devices.....	DA Pam 310-5
Index of Supply Manuals, Ordnance Corps .....	DA Pam 310-29
Index of Tables of Organization and Equipment, Tables of Organization, Type Tables of Distribution, and Tables of Allowances . .....	DA Pam 310-7
Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubri- cation Orders, and Modification Work Orders .....	DA Pam 310-4
Index of Training Publications .....	DA Pam 310-3

**2. Forms and Reports**

In addition to the forms required by the Department of the Army Equipment Record System (TM 38-750), the following forms pertain to this materiel:

Recommended Changes to DA Technical Manuals, Parts Lists, or Supply Manual 7, 8, or 9 .....	DA Form 2028
Report of Damaged or Improper Shipment .....	DD Form 6
Requisition for Initial Distribution of Publications-.....	DA Form 12-32
Requisition of Publications Blank Forms .....	DA Form 17

**3. Shipment and Storage Publications**

Preparation for Shipment.....	AR 740-20
Preservation, Packaging, and Packing.....	AR 700-15
Requisitioning, Receipt, and Issue System.....	AR 725-50
Standards for Oversea Shipment and Domestic Issue of Ordnance Materiel other than Ammunition and Army Aircraft .....	TB ORD 385
Storage and Materials Handling .....	TM 743-200-1

**4. Miscellaneous Publications**

Army Equipment Record System and Procedures: Operation TAPER.....	TM 38-750
Army Safety Program .....	AR 385-10
Authorized Abbreviations and Brevity Codes .....	AR 320-60
Chemical, Biological, and Radiological (CBR) Decontamination .....	TM 3-220
Dictionary of United States Army Terms .....	AR 320-5
First Aid for Soldiers .....	FM 21-11
Guided. Missile Systems: Corrosion Control and Treatment .....	TB 9-337
Painting Instructions for Field Use.....	TM 9-213
Safety: Accident Reporting and Records .....	AR 385-40

## APPENDIX II MAINTENANCE ALLOCATION CHART

### 1. General

This appendix contains the maintenance allocation chart (MAC) which prescribes, for all levels of maintenance, the lowest level authorized to perform each maintenance operation (columns A through K). This MAC also includes the tools required and remarks which further explain the maintenance operations.

### 2. Explanation of Maintenance Allocation Chart

a. *Heading.* Self explanatory.

b. *Nomenclature.* This column contains the item names assigned to assemblies and piece parts which are susceptible to maintenance.

c. *Maintenance Operations.* (Columns A through K). These columns list the lowest level of maintenance authorized to perform the action indicated. The level of maintenance is indicated by the numbers 1 (operator/crew), 2 (organizational maintenance), 3 (direct support), 4 (general support), or 5 (depot). The maintenance operations are designated in Columns A through K as follows:

- (1) *A-Service.* Those operations which are required periodically to keep the item in proper operating condition.
- (2) *B-Clean.* Removal of dirt, rust, impurities, or foreign matter, by the use of proper cleaning materials and equipment.
- (3) *C-Inspect and test.* Determination of serviceability of an item by measuring its functional, mechanical or electrical characteristics with the authorized standards.
- (4) *D-Lubricate.* Application of proper lubricants to specified points of the item.
- (5) *E-Adjust.* Regulation periodically to prevent malfunction.
- (6) *F-Aline.* Adjustment of two or more variable items for proper functional relationship: to adjust two or more parts of an electrical system so that their functions are properly synchronized.
- (7) *G-Paint.* Restoring of painted surfaces to the original finish.
- (8) *H-Replace.* The substitution of serviceable components for unserviceable components.
- (9) *I-Repair.* To restore to a serviceable condition by replacing unserviceable parts, or by employing any other action requiring tools, equipment and skills.
- (10) *J-Overhaul.* To restore an item to a completely serviceable condition as prescribed by serviceable standards.
- (11) *K-Rebuild.* Restoration of an unserviceable item to a condition comparable to new by disassembling the item to determine the condition of each of its parts and then reassembling it, using serviceable, rebuilt, or new -components, assemblies, sub-assemblies, and parts.

d. *Tools Required.* The tools required to perform all maintenance operations for any one item have been coded by the use of a number. This number is entered in column L.

e. *Remarks.* The remarks required to further explain all maintenance operations for any one item have been coded by the use of an alphabetical letter. This letter is entered in column M.

### 3. Explanation of the Tools Page

a. *Tools Required.*

- (1) *Nomenclature.* This column lists the item names assigned to the tools and test equipment required to perform maintenance on the item.

(2) *Tool number.* This column contains the stock numbers assigned to the tools and test equipment listed.

b. *Tools Code.* The tools code consists of a number and a letter separated by a dash. The tools required to perform all maintenance operations for any one item have been coded with a number. This coded number is listed in column L. The letter represents the maintenance operation (columns A through K).

**4. Explanation of Remarks Page**

The remarks required to further explain maintenance operations are listed on the remarks page and coded by the use of alphabetical letters. The second letter in the code represents the maintenance operation (columns A through K) to which the remarks applies. The alphabetical code letters are listed in column M of the maintenance allocation chart.

**MAINTENANCE OPERATION**

**MAINTENANCE ALLOCATION CHART FOR  
TRAINING SETS, GUIDED MISSILE FLIGHT CONTROL  
10173191, 10173200, AND 10173201**

NOMENCLATURE	PART NO	MAINTENANCE OPERATION											M	
		A	B	C	D	E	F	G	H	I	J	K		L
		S	C	I	L	A	A	P	R	R	O	R	T	R
		E	L	N	U	D	L	A	E	E	V	E	O	E
		R	E	S	B	J	R	P	P	P	E	B	O	R
		V	S	T	R	U	A	L	A	A	R	U	L	E
		I	T	E	C	S	I	I	I	I	H	I	R	S
		C	A	S	A	T	N	N	N	N	A	L	Q	A
		E	N	T	T	T	G	T	C	R	U	D	D	R
														K
Adaption kit (ENTAC)	10173190		2	3		3	3	2	2	2	5	5		A
Adapter	10173203		2			3		2	2	5	5	5		
Cable	10173180		2	3		3			2	2				B
Launching and guidance control training unit	10173179		2	3		3	3	2	2	3	5	5		
Adaption kit (SS-11)	10173189		2	3		3	3	2	2	2	5	5		
Electrical cable	10021921		2	3		3			2	2				
Air control stick	10173184		2	3		3	3	2	2	3	6	5		
Computer	10173194		2	3		3	3	2	2	2	5	5	1	C
Optical set	10173148		2	3		3	3	2	2	2	5	5		
Electrical cable	10173152		2	3		3			2	2				
Electrical cable	10173162		2	3		3			2	2				
Tinted glass	10173150		2	2		3			2					
Headrest	10173187		2	2		3			2	2				
Optical unit	10173149		2	3		3	3	2	2	2	5	5		
Moveable platform	10173160		2	2		3	2	2	3	5	5			
Sighting system	10173186		2	2		3	2	5	5	5				
Tripod	10173185		2	2		3	2	2	3	5	5			
Power supply set	10173195		2	3		3	3	2	2	2	5	5		
Electrical cable	10173182		2	3					2	2				
Electrical cable	10173183		2	3					2	2				
Regulated power supply	10173181		2	3		3	3	2	2	2	5	5		
Projection set	10173188		2	3		3	3	2	2	2	5	5		
Electrical cable	10173192		2	3					2	2				
Electrical cable	10173182		2	3					2	2				
Electrical cable	10173183		2	3					2	2				
Projection unit	10173193		2	3		3	3	2	2	2	5	5		

**MAINTENANCE ALLOCATION CHART  
TOOL PAGE**

<b>TOOL CODE</b>	<b>ECH</b>	<b>NOMENCLATURE</b>	<b>TOOL NUMBER</b>
1-I	2	MOS 427 Basic tool kit	4935-987-9816

**MAINTENANCE ALLOCATION CHART  
REMARKS PAGE**

<b>CODE</b>	<b>REMARKS</b>
A-G	Limited to spot painting at organizational level (para. 32).
B-B	Cable repair limited to replacement of dust caps.
C-I	Repair limited to replacement of fuses and front panel knobs.

By Order of the Secretary of the Army:

Official:

J. C. LAMBERT,  
*Major General, United States Army,  
The Adjutant General*


HAROLD K. JOHNSON,  
*General, United States Army,  
Chief of Staff.*

Distribution:

To be distributed in accordance with DA Form 1232, Sec II, (Unclas) requirements for ENTAC-TM-Training Devices (all) and 12-31, Sec I (b and c), (Unclas) requirements for G.M.L. M22-TM.

☆U. S. GOVERNMENT PRINTING OFFICE: 1975-490/2105

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

 <p style="font-size: small; margin: 0;"><i>THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.</i></p>		SOMETHING WRONG WITH PUBLICATION	
		FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)	
		DATE SENT	
PUBLICATION NUMBER		PUBLICATION DATE	PUBLICATION TITLE
IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.			
BE EXACT PIN-POINT WHERE IT IS			
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER		SIGN HERE	

## The Metric System and Equivalents

### Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

### Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 decagram = 10 grams = .35 ounce  
 1 hectogram = 10 decagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

### Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

### Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

### Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

### Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	------------------------	----------------------------	---------------------	----

