

TM 9-1440-250-20/1

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE
GUIDED MISSILE LAUNCHING SET
(NIKE-HERCULES AND IMPROVED NIKE-HERCULES AIR
DEFENSE GUIDED MISSILE SYSTEM)

This copy is a reprint which includes current
pages from Changes 1 through 5.



HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1965

WARNING



RA PD 404264

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections or 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

EXTREMELY DANGEROUS POTENTIALS

greater than 500 volts exist in the following unit:
Flight Simulator Group

Warning: Potentials less than 500 volts may cause death under certain conditions. Reasonable precautions should be taken at all times.

For artificial respiration, refer to FM 21-11.

W A R N I N G



RA PD 461690

8500 PSI AIR PRESSURE is used in the operation of this equipment.

DEATH

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

SAFETY MEASURES FOR HANDLING HIGH-PRESSURE AIR

1. The handling of large volumes of high-pressure compressed air, as with liquid propellants, is relatively new in the armed forces. Many new safety problems are introduced because of air systems that are subject to explosive leakage if improperly handled. Personnel must be selected for mechanical competence and should be thoroughly trained in the use and maintenance of the equipment and the existing safety hazards.
2. All systems using high-compression air should be inspected before, during, and after use, with particular concern for leaks, defective lines, improperly adjusted valves, malfunctioning regulators, and the presence of foreign materials in the systems. Oil or other lubricants should never be used in a pressurized system unless they are specifically called-out and detailed instructions are provided. No substitute lubricants should be used.
3. All repairs should be made by qualified personnel, who should clear all air lines and valves at regular intervals. Pressure must be released before all repairs through bleeder valves, never by loosening line connections.
4. When pressurizing a system, personnel operating the valves should stand to one side and turn the valve slowly. Valves should never be subjected to sudden shock loading. The pressurization of a system at such a high rate will cause pressure surges which damage lines or components. Only the minimum manual force should be used to stop the flow of air and valves should never be excessively tightened since they will be damaged by the use of wrenches or other improperly applied tools.
5. Safety will best be promoted if certain precautionary measures are practiced. All operating and maintenance personnel should be trained in these procedures.
 - a. A minimum tolerance of bending radius exists for each size of flexible air hose. These limitations should not be exceeded: 4-inch bending radius for 1/4-inch ID (inside diameter); 4-inch radius for 3/8-inch ID; 7-inch radius for 1/2-inch ID; and 9-1/4-inch radius for 3/4-inch ID hoses.
 - b. Air hoses will display a normal breathing tendency in ordinary use, which should never be impaired by coating or painting.
 - c. All flexible hoses should be depressurized and protected from the sun when not in use.
 - d. Hoses should not be kinked, twisted, struck sharply, walked on, run over, pulled, jerked, or otherwise subjected to severe abuse.
 - e. When using long lengths of hose, 2 feet of slack should be allowed for each 100 feet of hose to compensate for contraction during pressurization.

W A R N I N G



RADIATION HAZARD

RA PD 461691

This equipment contains the following radioactive tubes:

395A, OA2WA, 427A, 5829WA, OB2.

Refer to TM 38-250, AR 755-380, and AR 55-55 for safety information relative to shipping, storage, handling, and disposal of radioactive tubes.

FIRST AID FOR RADIOACTIVE CONTACT

The following first aid procedure for wounds caused by a radioactive particle represents the only reasonable first aid treatment which would possibly be available.

a. Stimulation of mild bleeding by normal pressure about the wound and by use of suction cups.

Warning: Do not suck the wound by mouth. The wound must be washed with soap and flushed with plenty of clear water.

b. If the wound is of the puncture type, or the opening is quite small, an incision should be made to promote free bleeding and to facilitate cleaning and flushing of the wound.

c. Evacuate patient to a medical facility where monitoring of the wound can be accomplished. All such wounds should be examined by a medical officer.

d. For wounds involving the extremities, pending medical attention, place a lightly constricting band (tourniquet) 2 to 4 inches closer to the heart than the site of the wound. The band should be tight enough to halt the flow of blood in superficial blood vessels but not tight enough to stop the pulse (arterial flow).

CLEANING SURFACES ON WHICH TUBES HAVE BEEN BROKEN

Wet method. Put on rubber or plastic gloves. Pick up large fragments with forceps; then, using a wet cloth, wipe across the area. Make one wipe at a time and fold cloth in half, using the clean side for wiping each time. When cloth becomes too small, discard and start again with a clean piece of cloth. Care must be taken not to rub the radioactive particles into the surface being cleaned by using a back and forth motion. All debris and cloths used for cleaning should be sealed in a container such as a plastic bag, heavy waxed paper, ice cream carton, or glass jar for disposal.

TECHNICAL MANUAL }
No. 9-1440-250-20/1 }

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D. C.,
22 March 1965

GUIDED MISSILE LAUNCHING SET

	Paragraphs	Pages
CHAPTER 1. INTRODUCTION		
Section I. General	1-4	3
II. Repair parts, organizational tools and test equipment	5, 6	6
CHAPTER 2. SERVICING AND ADJUSTMENTS		
Section I. Introduction	7-9	7
II. Launching control group	10, 11	7
III. Launching-section selector	12-15	9
IV. Launcher control-indicator	16, 17	15
V. Launcher and launching-handling rail checks and adjustments	18-30	18
CHAPTER 3. CORRECTIVE MAINTENANCE		
Section I. Introduction	31, 32	47
II. Corrective maintenance of the flight simulator group	33-42	47
III. Corrective maintenance of the launching-control console and power distribution box	43-47	57
IV. Corrective maintenance of the section control-indicator		61
V. Corrective maintenance of the section simulator group		61
VI. Corrective maintenance of the launcher control-indicator		61
VII. Corrective maintenance of the launcher and associated equipment	48, 49	61
VIII. Corrective maintenance of the test station hydraulic pumping unit (USARAL and USAREUR)	50, 51	62
APPENDIX I. REFERENCES		65
APPENDIX II. ABBREVIATIONS		69
INDEX		71

*This manual supersedes TM 9-1440-250-20, 23 June 1960, including C1, 27 September 1960; C2, 16 January 1961; C3, 6 February 1961; C4, 21 June 1961; C5, 22 June 1961; C6, 23 June 1961; C7, 10 August 1961; C8, 18 January 1962; C9, 19 January 1962; C10, 16 August 1962; C11, 10 September 1962; C12, 14 January 1963; C13, 7 August 1963; C14, 14 October 1963; C15, 18 June 1964.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. The instructions in this technical manual (TM) are published for the information and guidance of the organizational maintenance technicians who are responsible for maintaining the launching set of the NIKE-HERCULES and Improved NIKE-HERCULES Air Defense Guided Missile Systems.

b. This is one of a series of TM's on operation, emplacement, and maintenance of the NIKE-HERCULES and Improved NIKE-HERCULES Air Defense Guided Missile Systems.

c. Appendix I of TM 9-1400-250-10 gives a list of TM's covering the NIKE-HERCULES System and Type 4 equipment. Appendix I of TM 9-1400-250-10/2 gives a list of TM's covering the Improved NIKE-HERCULES System and Type 4 equipment. Appendix II of this TM lists and defines all abbreviations used herein.

2. Forms, Records, and Reports

Refer to TM 38-750 for instructions on the use and completion of all forms required for operating and maintaining this equipment.

3. Reporting of Equipment Manual Improvements

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

4. Modification Work Orders (MWO's)

This manual is technically correct for all launching sets provided that all of the outstanding MWO's listed below have been incorporated.

a. MWO ORD Y28-W10, Y79-W1, and Y90-W2 eliminates the 400-cps noise and increases equipment capabilities (section simulator groups 1001 through 1514).

b. MWO ORD Y75-W1 protects the taillight receptacles on the launcher from the rocket motor cluster blast (launchers 1021 through 1252).

c. MWO ORD Y75-W2 adds an aiming circle mount tube to the launcher erecting beam to facilitate mounting of the aiming circle (launchers 1021 through 1637 and 50001 through 50038).

d. MWO ORD Y75-W3 protects the cables on the launcher from the rocket motor cluster blast (all launchers using the launcher basic accessory kit).

e. MWO ORD Y75-W4 modifies the launcher down-latch limit switch bracket and cover (launchers 1021 through 1044).

f. MWO ORD Y75-W5 incorporates a de-loader valve into the launcher hydraulic pumping unit to prevent damage (launchers 1021 through 1492 and 50001 through 50038).

g. MWO ORD Y75-W6, Changes 1 and 2, modifies the launcher base frame to provide clearance for the wheels of the USARAL carriage (launchers 1021 through 1636 and 50000 through 50087).

h. MWO ORD Y75-W7 reduces the voltage drop in the hydraulic pumping unit stop and start circuits (launcher control-indicators 1021 through 1844 and 50001 through 50029).

i. MWO ORD Y75-W8 adds a handling drawbar to the launcher transport modification kit to facilitate handling of the launcher (kits 1021 through 1068).

j. MWO ORD Y75-W9 modifies the launcher control-indicator circuits so that the prepared signal can be obtained (launcher control-indicators 1021 through 1352).

k. MWO ORD Y75-W10 modifies the launcher control-indicator warhead monitor circuits to coordinate with the revised circuits in the warhead (launcher control-indicators 1021 through 2396 and 50001 through 50023).

l. MWO ORD Y75-W13 removes the 25-ohm resistor and revises the circuits in the launcher control-indicator to coordinate with the revised circuits in the warhead (launcher control-indicators 1021 through 1844 and 50000 through 50029).

m. MWO ORD Y75-W16 removes AC-DC missile selector switch S7K from the relay panel (launcher control-indicators 1020 through 3324 and 50041 through 50087).

n. MWO ORD Y75-W19 modifies the launcher interlock circuits to permit operating missile hydraulics without disabling the AJAX rail-safe switch (launchers 1021 through 2396 and 50001 through 50023).

o. MWO ORD Y75-W20 waterproofs the launcher power distribution box and incorporates the circuit breaker panel in place of the fuseholder panel in the distribution box (launchers 1021 through 4085 and 50000 through 50087).

p. MWO ORD Y75-W23 modifies the forward and rear wedgelock assemblies to reduce operational friction (launchers 1021 through 1252).

q. MWO ORD Y75-W24 modifies the launcher sub-surface three-rack modification kit to provide four-rack spacing between the launchers (kits 6 through 271).

r. MWO ORD Y75-W32 replaces the fuses with circuit breakers (launcher control-indicators 1021 through 1252).

s. MWO ORD Y75-W36 modifies the APS alternator sensing circuits to assure APS start during launch (launcher control-indicators 1021 through 3084 and 50000 through 50069).

t. MWO ORD W75-W37 adds a guard to the relay panel to prevent breakage of the battery charge lights (launcher control-indicators 1021 through 1352 and 50000 through 50030).

u. MWO ORD Y75-W41 provides additional output voltage required for operation of the

missile guidance set (all launcher control-indicators).

v. MWO ORD Y75-W42 adds improved flexible conduits to the launcher (launchers 1021 through 1161 and 50000 through 50043).

w. MWO ORD Y75-W47 and Y86-W15 provides additional output voltage required for operation of the missile guidance set (launcher control-indicators 1021 through 3084 and 50000 through 50087; launchers 1021 through 3084 and 50000 through 50087; and launching-handling rails 1081 through 4895 and 50000 through 50351).

x. MWO ORD Y75-W49 transfers the launcher control-indicator APS stop-start circuits from the unregulated to the regulated power supply to reduce marginal voltage conditions (launcher control-indicators 1021 through 2318 and launchers 50000 and subsequent having wire 2908CC16 on relay K2BU).

y. MWO ORD Y75-W54 eliminates the ground wire on the low-altitude relay (launcher control-indicators 1021 through 3084 and 50000 through 50087).

z. MWO ORD Y75-W57 eliminates the false ground from the test stations (launcher control-indicators 1021 through 3084 and 50000 through 50087).

aa. MWO ORD Y75-W58, Y81-W8, and Y86-W17, Changes 1 and 2, provides the launcher and launching section winterization kits (area commander's responsibility).

ab. MWO ORD Y75-W66 removes the voltage from unused wiring (all launchers).

ac. MWO ORD Y75-W67, Y81-Y9, and Y90-W3, Changes 1, 2, 3, 4, and 5, adds two safety relays and revises the wiring of the squib circuits (launcher control-indicators 1021 through 3862 and 50000 through 50087; launchers 1021 through 3862 and 50000 through 50087; section control-indicators 1001 through 1856; and section simulator groups 1001 through 1856).

ad. MWO ORD Y75-W76 changes circuitry to correct the failure of thermal switch S48A and the APS stop relay (launcher control-indicators 1021 through 4085 and 50000 through 50087).

ae. MWO ORD Y75-W78 replaces bleed plugs with bleeder valves for improved control during air bleeding of the power and equilibra-

tor cylinders, hydraulic uplock and hydraulic downlock assemblies. Also adds bleeder valves to facilitate air bleeding of the locking wedge system (launchers 1021 through 4085 and 50000 through 50087).

af. MWO ORD Y75-W82 provides additional circuits to allow monitoring of the missile temperature at a test station (launcher control-indicators 1021 and subsequent).

ag. MWO ORD Y75-W84 and Y86-W5, Changes 1, 2, and 3, adds the guidance set cooling system to the launcher and associated equipment (all launching-handling rails).

ah. MWO ORD Y79-W2 replaces and relocates the centrifugal fan in the launching control console and replaces fuses with circuit breakers in the console and the distribution box of the trailer-mounted launching control station (stations 1001 through 1125).

ai. MWO ORD Y79-W3 installs a filter assembly in the alert status circuits in the trailer-mounted launching control station (stations 1001 through 1044).

aj. MWO ORD Y79-W6 adds the 28-volt dc regulated power supply and modifies the blower in the trailer-mounted launching control station (stations 1126 through 1242).

ak. MWO ORD Y81-W6 restricts voltage feedback when the section control-indicator power is turned off (section control-indicators 1001 through 1584).

al. MWO ORD Y81-W7 modifies missile switch S42A in order to delete the low altitude capabilities for guided missile MIM-14A and MIM-14B (launcher control-indicators 1001 through 1475).

am. MWO ORD Y86-W1, Changes 1, 2, and 3, reduces the voltage drop in the launching-handling rail hydraulic power unit start and stop circuits (launching-handling rails 1081 through 2714 and 50000 through 50076).

an. MWO 9-1400-250-30/22 replaces the MANUAL ORDERS-LAUNCH switch with a 2-1/4 second delay timer, provides a heat moni-

tor indication for each launcher and separate heat monitor indicator lights for missiles at the test stations, and changes the firing circuitry to improve reliability (launcher control-indicators 1021 through 4085 and 50000 through 50087, and section control-indicators 1001 through 1957).

ao. MWO 9-1400-251-30/4 and 9-1440-253-30/3 interlocks the reject and fire-command circuits, and disconnects APS glow-coil switch S9A to eliminate the possibility of firing the missile battery squibs under certain test conditions (launcher control-indicators 1021 through 4085 and 50000 through 50087, and section control-indicators 1001 through 1932).

ap. MWO 9-1440-251-30/5 adds an ac voltmeter for more accurate remote adjustment of line voltage (section simulator groups 1001 through 1946).

aq. MWO 9-1440-251-34/2 adds terminal covers to protect operating personnel from high-voltage terminals (section simulator groups 1001 through 1926).

ar. MWO 9-1440-252-30/11 modifies circuitry to prevent dropout of the warhead prepared relay because of transient voltage drop (launcher control-indicators 1021 through 4085 and 50000 through 50087).

as. MWO 9-1440-252-30/18 adds higher rated circuit breakers in the power distribution box to compensate for the additional current required by new circuits (launchers 1021 through 4085 and 50000 through 50087).

at. MWO 9-1440-252-30/32 provides the capability for operation of the missile and rocket motor cluster heaters from a 60-cps commercial power source (launchers 1021 through 4085 and 50000 through 50087).

au. MWO 9-1440-253-30/1 changes the name of the HPU switch to APS and adds a switch guard to the APS switch (launcher control-indicators 1021 through 4085 and 50000 through 50087).

Section II. REPAIR PARTS, ORGANIZATIONAL TOOLS, AND TEST EQUIPMENT

5. Repair Parts

a. Repair parts, organizational tools, and test equipment are issued to the using organization for operating and maintaining the launching set. These parts, tools, and equipment should not be used for purposes other than prescribed and, when not in use, should be returned to the proper storage location.

b. Repair parts are supplied to the using organization for replacement of those parts most likely to become worn, broken or otherwise unserviceable. Repair parts supplied for organizational maintenance use are listed in TM's 9-1440-250-15P/1/1, 9-1440-250-15P/2/1, 9-1440-250-15P/3/1, and 9-1440-250-15P/4/1.

6. Tools and Equipment

a. Common and special tools and equipment are issued to the using organization for operating and maintaining the launching set equipment.

b. Common tools and equipment required for operating and maintaining the launching set equipment are listed in Supply Catalogs (SC's) 4935-95-CL-A31, 4935-95-CL-A32, 4935-95-CL-A33, and 4935-95-CL-A42.

c. Special tools and equipment required for operating and maintaining the launching set equipment are listed in either SM 9-4-4935-NO1 or in the appropriate Tables of Organization and Equipment (TO & E), or in the Basic Issue Items List.

CHAPTER 2

SERVICING AND ADJUSTMENTS

Section I. INTRODUCTION

7. General

This chapter contains servicing and adjustment procedures for the launching set for the NIKE-HERCULES and Improved NIKE-HERCULES Air Defense Guided Missile Systems.

8. Requirements for Servicing and Adjustments

a. When a check is performed and the results are within the stated tolerance, no adjustment is required.

b. When a check is performed and the results are not within a stated tolerance, an adjustment

must be made. When adjustments are required more frequently than required by TM's 9-1440-250-12/1 and 9-1440-250-12/2, this is an indication of equipment malfunction, and troubleshooting should be performed. Troubleshooting procedures for the launching set are contained in TM 9-1440-250-20/2.

9. Preventive Maintenance and Lubrication

Preventive maintenance instructions for the launching set are covered in TM 9-1400-250-15/3. Lubrication instructions for the launching set are covered in LO 9-1400-250-20.

Section II. LAUNCHING CONTROL GROUP

10. Lightning Protector Plugs Check

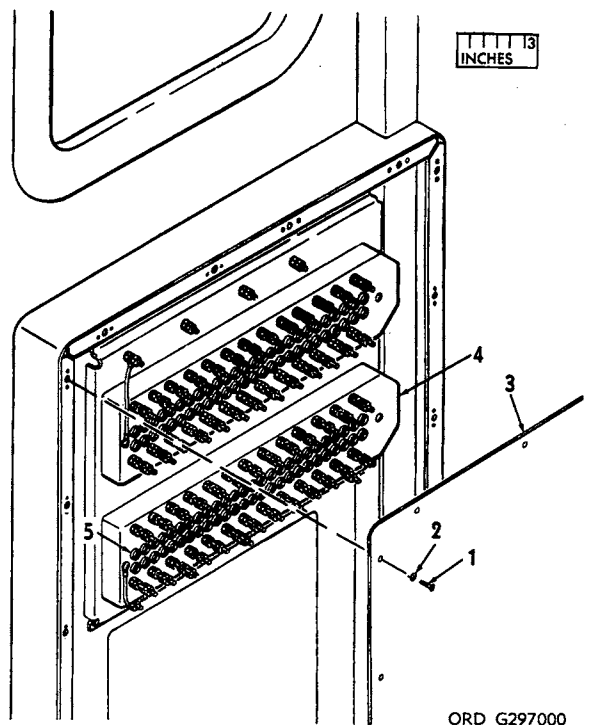
NOTE

The following check is to be accomplished in conjunction with troubleshooting.

- a. Remove the telephone protector box cover (fig. 1).
- b. Remove the lightning protector plug for the circuit being checked.
- c. Using multimeter TS-352/U, set the selector knob to the RX1 scale.
- d. Touch one test lead of the multimeter to the body of the protector plug, and touch the other test lead to the carbon block in the protector plug. If a continuity indication is obtained, the protector plug is defective and must be replaced.
- e. Install the protector plug.
- f. Install the telephone protector box cover, and secure with the 17 round-head screws and flat washers.

11. Inspection and Maintenance of the Air-Intake and Air-Exhaust Filters

The filters used in the launching control trailer are a permanent type. When the filters become dirty or clogged enough to restrict the flow of air, they must be cleaned and recharged. The normal service interval is monthly.



ORD G297000

- | | |
|---------------------------------|------------------------------------|
| 1 No. 6-32x5/8 rd-hd screw (17) | 4 Telephone protector assembly (2) |
| 2 No. 6 fl washer (17) | 5 Lightning protector plug (52) |
| 3 Telephone protector box cover | |

Figure 1. Lightning protector plugs—removal and installation.