TECHNICAL MANUAL

No. 9-1270-212-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 10 JULY 1981

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS)

FOR

FIRE CONTROL SUBSYSTEM, HELMET-DIRECTED
XM128
P/N 2277716-00
NSN 1270-00-122-9449
AND
FIRE CONTROL SUBSYSTEM, HELMET-DIRECTED
XM136
P/N 2277716-01
NSN 1270-01-041-3767

CURRENT AS OF 10 JULY 1981

REPORTING OF ERRORS

You can help improve this manual by calling attention to errors and by recommending improvements and stating your reasons for the recommendations. Your letter of DA Form 2028, Recommended Changes to Publications, should be mailed directly to Commander, U.S. Army Armament Material Readiness Command, ATTN: DRSAR-MAS, Rock Island, Illinois 61299. A reply will be furnished directly to you.

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*This publication supersedes TM 9-1270-212-14, dated April 1975, in its entirety

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.

This manual is for your use in operating and maintaining Helmet-Directed Fire Control Subsystem XM128, utilized in the AII-1S (Mod) Cubra Helicopter, and HeImet-Directed Fire Control Subsystem XM136, utilized in the configuration of the AH-1S Cobra Helicopter (fig. 1-1). Designator symbols such as P (Production), E (Enhanced Cobra Armament System) and M (Modernized Cobra) will be used in conjunction with text contents, text headings, and illustration titles to show limited effectivity of the material. One or more designator symbols may follow a text heading or illustration title to indicate proper ffectivity, unless the material applies to all series and configurations within the manual. If' the material applies to all series and configurations, no designator symbols will be used. Where practical, descriptive information is condensed and combined for all models to avoid duplication. The common nomenclature for either Helmet-Directed Fire Control Subsystem is the helmet sight subsystem, or HSS.

1-1.1. Introduction.

a. This manual is divided into six chapters and three appendixes. Chapter 1 contains general information, the description and use of the equipment, identification plates, theory of operation, and electrical schematics. Chapter 2 describes the applicable helicopter panel controls and indicators and provides operating instructions. Chapter 3 contains operator/crew and organizational maintenance instructions. Chapter 4 provides direct-support and general-support (DS/GS) maintenance instructions, and Chapter 5 provides DS/GS repair instructions. Chapter 6 contains instructions for final inspection. Appendix A is a list of associated manuals and references; Appendix B contains repair parts and special tool lists; Appendix C provides the maintenance allocation chart.

b. The word "he", when used in this publication, represents both the masculine and feminine genders, unless otherwise specificeIly stated.

1-2. Maintenance Forms and Records.

Maintenance forms, records. and reports which are to be used by maintenance personnel at all maintenance levels are, listed and prescribed by TM 38-750, The Army Maintenance Management Systems (TAMMS).

1-3. Equipment Serviceability Criteria (ESC).

The equipment serviceability criteria (ESC) for the helmet sight subsystem are included in TM 9-1090-203 ESC.

1-4. Administrative Storage.

Administrative storage of the HSS shall be accomplished in accordance with the provisions of TM 740-90-1.

1-5. Destruction of Army Materiel to Prevent Enemy use

Refer to TM 750-244-2 for procedures to be used in destruction of helmet sight subsystem materieI to prevent use by the enemy.

1-6. Calibration.

There are no caiibration instructions for the HSS.

1-7. Quality Assurance/Quality Control (QA/QC).

There are no QA/QC requirements for the HSS.

1-8. Reporting Equipment Improvement Recommendations (EIRs).

If your Helmet Sight Subsystem Manual needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't Iikc the design. Tell us why it procedure is hard to perform. PUI it on an SF 368 (Quality Deficiency Report). Mail it to Commander. U.S. Army Armament Materiel Readiness Command. ATTN: DRSAR-MAO, Rock Island, Illinois 61299. Well send you a reply.

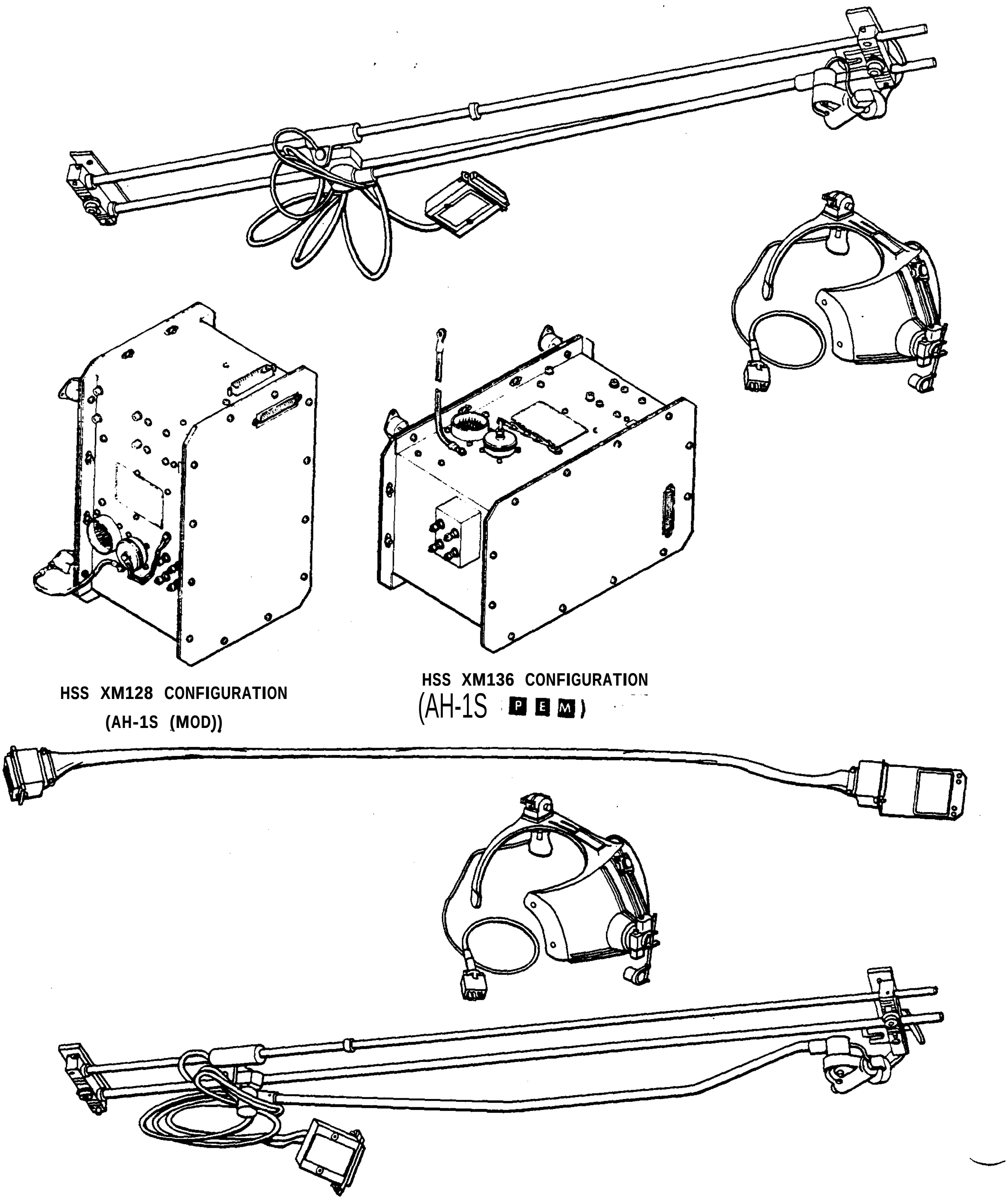


Figure 1-1. Helmet-direct fire control subsystem (HSS)

Section II. DESCRIPTION AND DATA

1-9. Subsystem Description.

The HSS is a helmet-directed sighting subsystem that interfaces with the gun turret and the telescopic sight unit (TSU) of the TOW missile subsystem in the AH-1S(Mod) and AH-1S P E M helicopters(fig. 1-2). The HSS operates from power supplied by the helicopter and consists of the following assemblies:

Helmet sight (2)

Pilot linkage

Gunner linkage

Electronic interface

Extension cable.

a. The HSS enables the helicopter pilot and copilot/gunner (hereinafter referred to as gunner) to rapidly acquire visible targets and to direct either the gun turret or the TSU to those targets. The helmet-mounted optical sight extends over the operator's right eye, and an illuminated reticle pattern is projected into the optical sight. Electromechanical linkages sense the helmet position and generate sight-line signals, which are processed by the electronic interface assembly (EIA) and used to control the angular position of the turret or the TSU.

b. Either operator can command the gun turret or TSU by means of operator-selectable cockpit switches. When necessary, the gun turret and TSU can be commanded simultaneously by the pilot and gunner, respectively.

1-10. Differences Between Models.

a. There are two models of the HSS, HSS XM128 (used in the AH-1S(Mod) helicopter) and HSS XM136 (used in the AH- 1S P E M helicopters). All of the differences, mechanical and electrical, between the two models result from differences in HSS installation in the helicopters. The only major item that differs between the two models is the EIA. The helmet sight assemblies, pilot and gunner linkage assemblies, and extension cable are identical and interchangeable between models.

b. In the HSS XM128 installation (fig. 1-2, view A), the EIA is mounted vertically, and the pilot and gunner linkage assemblies are mounted at a 0-degree azimuth angle. For HSS XM128, the pilot linkage has a down pitch angle of 4 degrees and the gunner linkage assembly has a down pitch angle of 8 degrees. In the HSS XMl36 installation (fig. 1-2, view B), the EIA is mounted horizontally, the gunner linkage assembly is mounted at a 0-degree azimuth angle, and the pilot linkage assembly is mounted at a 5.5-degree left-azimuth angle. For HSS XM136, the pilot linkage has a pitch angle of 0 degrees and the gunner linkage has a down pitch angle of 11.5 degrees.

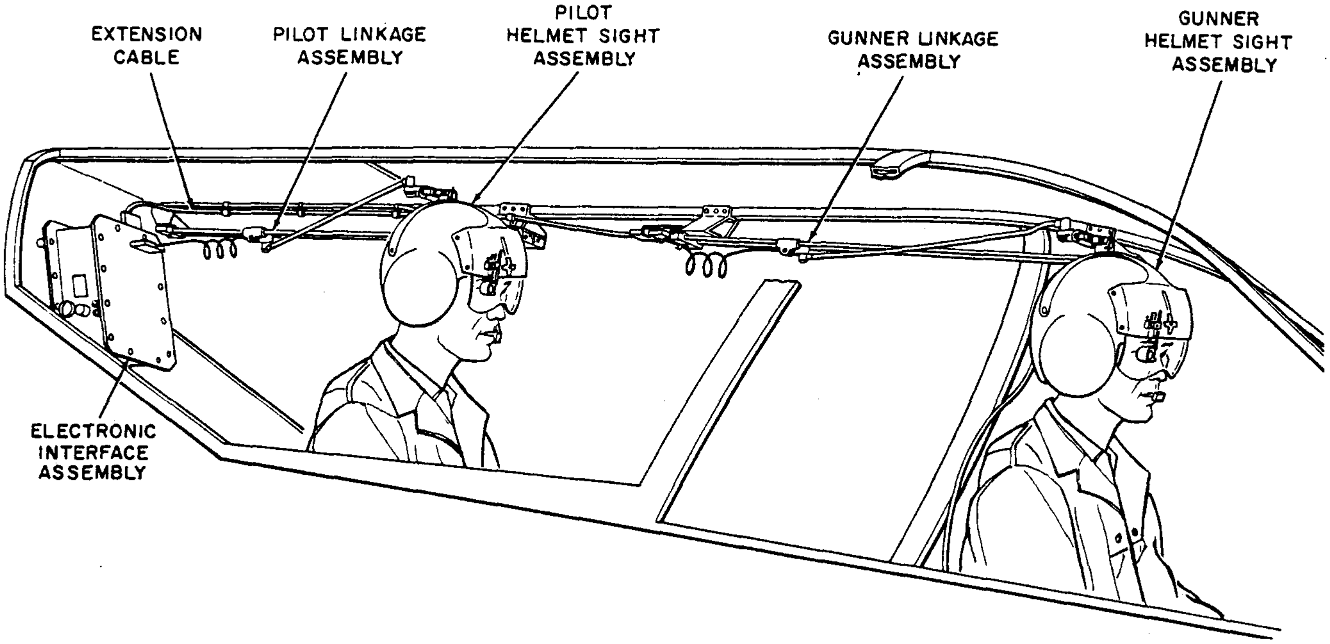
c. The four potentiometers (used for boresighting adjustments) are on the right side of the EIA used in HSS XMl28 and in a smaJl housing on the end of the EIA used in HSS XMl36. The bonding jumper on the EIA used in the HSS XM136 is approximately twice as long as that on the EIA used in HSS XMl28. The EIA used in HSS XM136 has an azimuth bias circuit which compensates for the 5.5-degree offset of the HSS XM136 pilot linkage.

1-11. Helmet Sight Assembly.

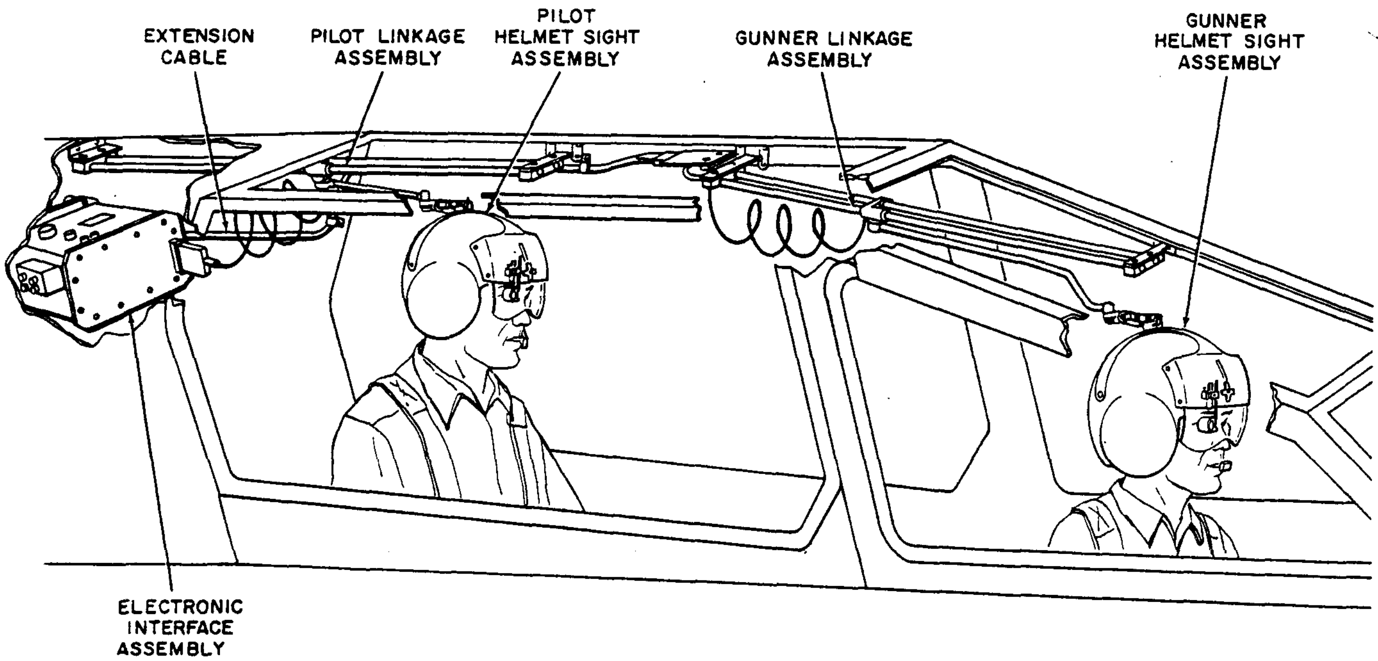
The helmet sight assembly (fig. 1-3) is a lightweight aluminum visor housing with a magnetic receptacle containing a reed switch attached near the top rear and a sight assembly attached to the front. The aluminum visor housing is precision attached to the SPH-4 helmet when the existing visor cover is removed. For initial installation, an installation kit containing special fasteners and tools and a small visor knob is furnished with each helmet sight assembly.

a. The magnetic receptacle holds the steel fastener on the front of the arm assembly (fig. 1-4) in place and a latch insures against inadvertent separation. In an emergency, the latch allows separation of the steel fastener and magnet at an axial force of approximately 20 pounds. The magnetic receptacle contains a reed switch that senses the presence of the steel fastener. The reed switch closes when the steel fastener is attached and opens when separation occurs.

b. The sight assembly consists of a sight housing and an eyepiece. The sight housing contains a lamp assembly (containing three 5-volt lamps), a reticle, and a lens system. Th sight housing projects the reticle pattern, focused at infinity, into a beam splitter within the eyepiece. The beam splitter superimposes the reticle pattern on the normal eyepiece image. A detent in the sight housing holds the eyepiece down in the sighting position over the right eye.



VIEW A. HSS XM128 INSTALLED IN AH-1S(MOD)



VIEW B. HSS XM136 INSTALLED IN AH-1S P E M

AR 401059A

Figure 1-2. HSS helicopter installation

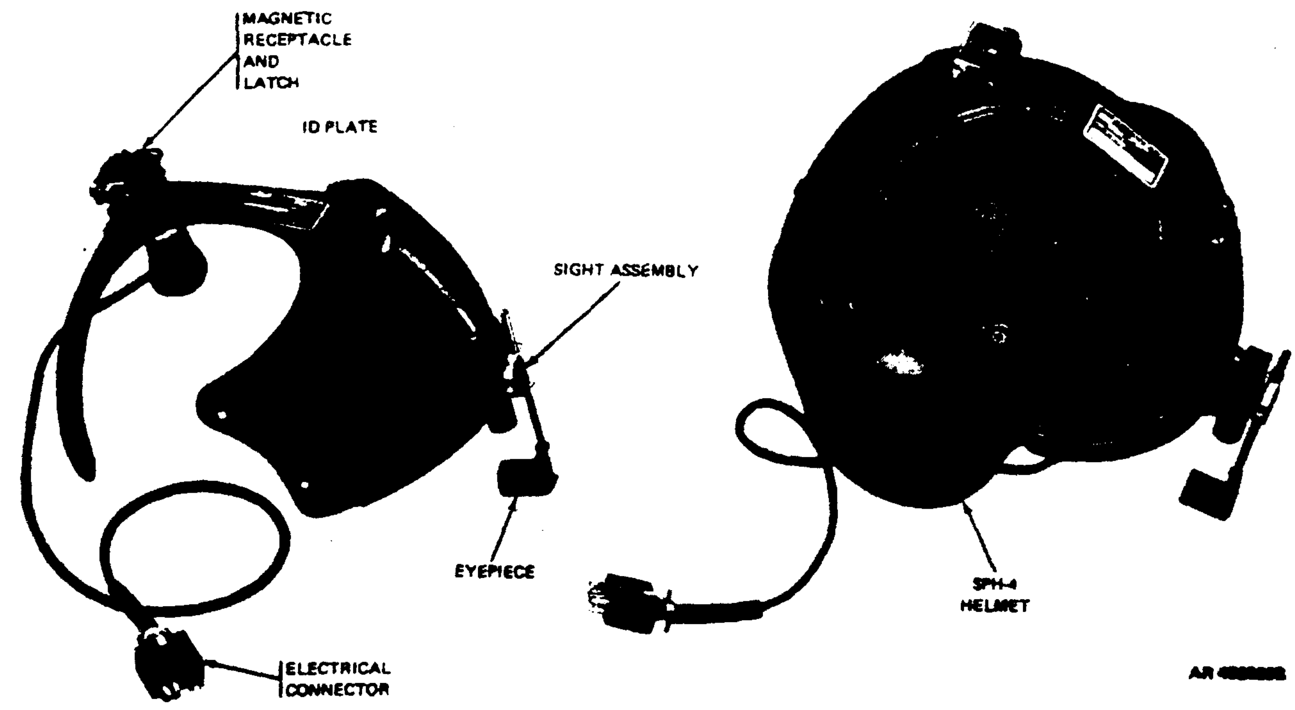


Figure 1-3. Helmet sight assembly-before and after installation

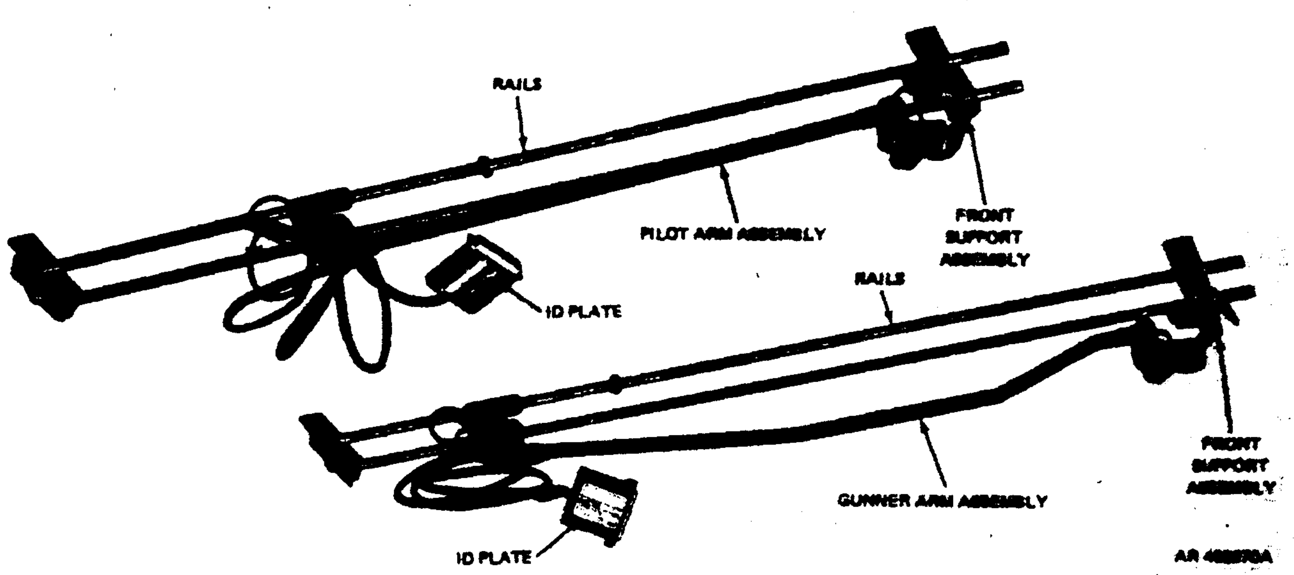


Figure 1-4. Pilot and gunner linkage assemblies

The eyepiece can be adjusted vertically and laterally to obtain eye coincidence and is spring-loaded to retract to the horizontal position when the detent is released. The eyepiece can be retracted either electrically by activating a solenoid in the sight assembly or manually by pressing a button on the sight housing.

c. The electrical connector (AlPI) on the helmet sight assembly connects to a plug in the helicopter.

1-12. Linkage Assemblies (Pilot and Gunner).

Each linkage assembly consists of an arm assembly, a rear support, two rails, a front support assembly, and two mounting brackets (fig. 1-4). The carriage end of each arm assembly travels on the rails and contains ball bushings for almost frictionless movement. A stowage bracket in each front support assembly holds the arm in an overhead position when the arm is not in use. In addition, the front support of each linkage assembly contains a magnetic fixture into which the steel-fastener end of the arm assembly is placed for a built-in-test (BIT) of the linkage assembly and the EIA: this fixture is called the BIT bracket.

a. The forward end of each tubular arm asssembly contains a round steel fastener that attaches to the magnetic receptacle at the top of the helmet sight assembly. A pair of precision resolvers at the steel-fastener end of each arm and another pair at the carriage end provide for measuring the angular position of the helmet. Thus. with the steel fastener attached to the helmet, the linkage assembly can accurately determine the direction, both in elevation and azimuth, its which the operator is looking, i.e., the sight line to a target. Because of installation considerations, the pilot arm is 18 inches long and the gunner arm is 24 inches long. The gunner arm is bent slightly to provide clearance within the helicopter cockpit. The resolvers are connected to the EIA by a coiled cable that allows free movement of the carriage along the rails. The pilot-arm-assembly cable connects directly to the EIA; the gunner arm assembly requires an extension cable to reach the EIA. The resolvers require precision trimming resistors, which must be mounted close to the resolvers to maintain system accuracy. These resistors are mounted on a rectangular terminal board attached to the backshell of the connector (inside the connector) at the end of each coiled cable.

b. The two precision stainless steel rails are each 34 inches long. The rear and front supports are secured to the mounting brackets, which secure the steel rails to the helicopter overhead-canopy support members. The supports are adjustable, to permit alignment of the rails during system boresighting.

1-13. Electronic Interface Assembly (EIA).

NOTE

Except as otherwise stated in the discussion below, the contigurations of the EIAs used in HSS XM128 and HSS XM136 are identical.

The EIA (fig. 1-5) contains most of the electronic components, except for the helicopter-mounted controls and displays, necessary for the operation of the HSS. The ElA is the point of interface between the HSS and the helicopter interface control unit and contains a power supply module, a power supply circuit card, eight buffer amplifier modules, four boresight potentiometers that connect to an amplifier circuit card, and circuit cards for BIT capability. The EIA used in HSS XM136 also contains an azimuth bias circuit card containing the components necessary to compensate for the 5.5-degree left-azimuth angle at which the pilot linkage is mounted in the AH-1S helicopter.

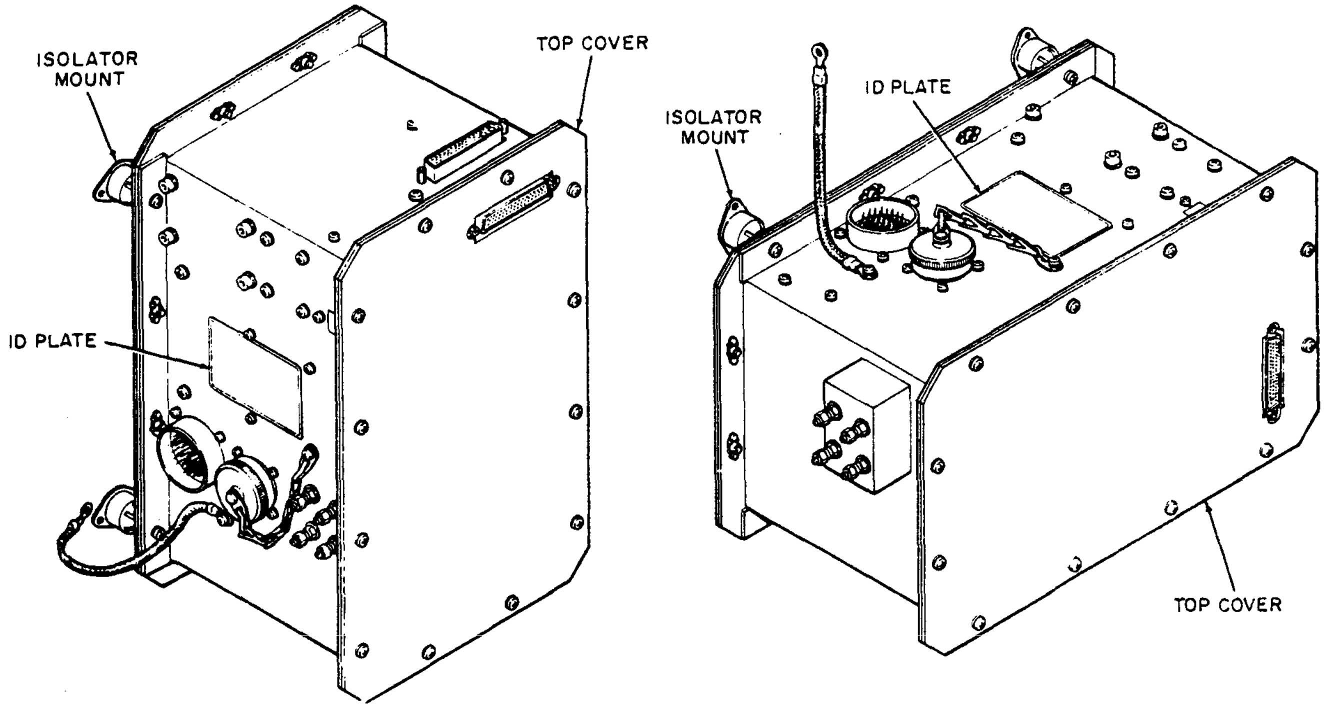
a. The power supply module is a dc-to-dc converter that uses 28 volts dc from the helicopter prime 28-volt dc power source to produce regulated 28 volts dc for the buffer amplifiers and BIT circuitry.

b. The power supply circuit card functions with an input transformer to change 115-volt, 400-Hz ac to ac and dc vohagcs of various amplitudes.

c. The buffer amplifier plug-in modules are used with the winding-compensated resolvers in each linkage assembly to provide stable transformation ratios and phase shift despite variations in temperature frequency.

d. The four boresight potentiometers provide a means of varying the amplitude and phase of small ac voltages for correcting small system misalignments. These potentiometers are mounted on the side of the EIA used in HSS XM128 and in a small housing on the end of the EIA used in HSS XM136; as mounted in the helicopters, the potentiometers are in approximately the same location. One of these potentiometers is used for azimuth adjustment of the pilot linkage; one, for elevation adjustment of the pilot linkage; one, for azimuth adjustment of the gunner linkage; and one, for elevation adjustment of the gunner linkage.

e. BIT circuitry includes logic. sequencing, and comparator circuits, as well as relays, reference voltage sources, and external control switches. When externally commanded, the circuitry tests each linkage assembly, its respective buffer amplifiers, and the power supply. Proper



VIEW A. EIA FOR XM128
AH-1S (MOD)

VIEW B. EIA FOR XM136
AH-1S P E M

AR 401060B

Figure 1-5. Electronic interface assemblies

operation results in the display of a go signal. Failures are indicated for the gunner linkage, the pilot linkage, and the EIA. The logic circuits differ between the two EIAs and the logic circuit cards are not interchangeable and have different unit designators (A10 in the EIA for XM128 and Al5 in the EIA for XM136). The electrical difference between A10 and Al5 is in the resistor network used during test of the linkages. Logic card Al5 also has separate test inputs for the gunner and pilot linkages.

1-14. Extension Cable.

An extension cable is required between the aft end of the gunner linkage assembly and the EIA (fig. 1-2). The cable is secured to the overhead canopy supports and has a mounting bracket at the forward end and a rectangular cable connector at the aft end.

1-15. Tabulated Data.

a. Dimensions and Weights. The dimensions and weights of the HSS components are given in table 1-1.

Table 1-1. Dimensions and Weights of HSS Components

Component (assembly)	Width (in.)	Depth (in.)	Length (in.)	Wt. (lb)
Gunner helmet sight	5	6	10	0.75
Pilot helmet sight	5	6	10	0.75
Pilot linkage	5	3	36	4.00
Gumer linkage	5	3	36	4.00
Electronic interface:				
From XM128	7.5	6.5	12	15.00
From XM136	7.5	6.5	13	15.00
Extension cable	3	–	50	2.00
			Total	26.50

b. Power.

(1) Operating power required by the HSS is 115 (-7.5, +4.S) volts, 400 (±20) Hz, single phase at 50 volt-amperes nominal, or 75 volt-amperes peak; and +28 (-3. +0.5) volts dc at 3 amperes nominal, or 5 amperes peak. Operational stability is assured after a 5-minute warmup.

(2) Reference input power required by the HSS consists of two ac voltages, both 0.5 volt, 400 Hz; one is at phase angle 0 degrees and one is at phase angle 180 degrees.

1-16. Identification Plates.

Identification plates and their locations are described in table 1-2.

Table 1-2. Identification Plates – HSS Assemblies

Name	Location	Fig. ref
Helmet sight	Helmet sight strap	1-3
Pilot linkage	Connector backshell	1-4
Gunner linkage	Connector backshell	14
Electronic interface	Side of assembly	1-5
Extension cable	Bracket assembly	1-2

Section III. THEORY OF OPERATION

1-17. General.

a. This section provides the mechanical, electrical, and electronic theory of HSS operation. The theory is intended primarily as a maintenance tool for fault isolation at both the system and the subsystem levels.

a. 1. Where XM128 differs from XM136, the differences are discussed in this section. If no difference is mentioned, the two models are identical.

(1) The schematic diagram for the EIA used in XM128 is foldout FO-4 and the schematic diagram for the EIA used in XMl36 is foldout FO-5; where reference is made to "foldout FO-4 or FO-5," consult the schematic diagram applicable to the EIA in your HSS.

(2) Although the logic card in the EIA used in XMl28 is designated A10 and the logic card in the EIA used in XM136 is designated Al5 and separate schematic diagrams are provided (foldout FO-7 for card Al0 and foldout FO-10.1 for card Al5), these cards perform the same functions in the EIA and have identical circuitry in most areas. Therefore, where a discussion is equally applicable to both card Al0 and card Al5, both designators have been shown, separated by a slash (for example, "card Al0/Al5" and "XA10/XAl5-5"), and the same method has been used to reference the two schematic diagrams. (There is no Al5 in the EIA used in XM128 and no A10 in the EIA used in XM136.)

b. The HSS contains no operating controls but is operated and tested from controls and indicators mounted on the helicopter cockpit panels and is powered by the helicopter. HSS cockpit controls and indicators consist of a brightness control for the reticle in each helmet sight; a test switch for testing the lamps that light the reticle in each helmet sight; a switch that initiates a built-in-test (BIT) of the electronic interface assembly (EIA) and pilot and gunner linkages; and four indicators that indicate the results of the BIT.

c. The theory discussions are arranged, by function, in the following order: HSS and helicopter interconnect, HSS power and reticle power, helmet sight theory and reticle lamp test, linkage and EIA theory, and BIT theory. Appropriate functional diagrams are provided to simplify the presentation. Detailed schematics are located together at the end of the section (figs. 1-11 through 1-13) except for foldouts (FO-3 through FO-10 and FO-10.1), located at the end of the manual.

1-18. HSS and Helicopter Interconnect.

The parts of the HSS are interconnected mechanically and electrically as shown in figure 1-6. The HSS interfaces with the helicopter by means of three connectors. A helicopter comector behind the pilot's seat mates with J1 on the EIA; this helicopter connector is P261 in the AH1S(Mod) helicopter and 17A1P1 in the AH-lS P E M helicopter. A helicopter connector at the left of the pilot's seat mates with helmet sight connector A1P1 for the pilot, and another helicopter connector at the right of the gunner's seat, with helmet sight connector A1P1 for the gunner. In the AH-1S(Mod) helicopter, the connector to which A1P1 for the pilot mates is P260 and the mating connector for A1P1 for the gunner is P247; in the AH-1S P E M helicopter, the pilot's helicopter connector is 17P2 and the gunner's, 17P1. The signals carried by the HSS connectors are identified on the detailed schematics.

1-19. HSS Power and Reticle Power.

a. HSS Power. Unregulated 28-volt dc power to operate the HSS is provided from the helicopter through the turret power circuit breaker and through the MASTER ARM switch set to STBY to J1-L of the EIA, and 115-volt, 400-Hz ac power is provided through the HSS power circuit breaker to J1-J of the EIA. (This control and these circuit breakers are shown in figures 2-1, 2-6, and 2-7.) Within the EIA, the 28-volt dc power is distributed to PS1-1, to TB1-6, and to XAl0/XAl5-6; and the 115-volt ac power is distributed to Ml-1, to T1-1, to T2-5, and to T3-5. Refer to foldout FO-4 or FO-.5.

(1) Power supply module PS1 receives unregulated 28-volt dc helicopter power and converts it to 28-volt dc regulated power for use in the EIA. Refer to foldout F04 or FO-5, sheet 2. Components C2, C3, FL1, and FL2 are connected to the power supply to allow the EIA to meet the electromagnetic interference (EMI) requirements of the helicopter. The regulated 28-volt output is distributed as listed for electrical common point 3 (ECP3) on the schematic.

(2) The items connected to the PSI 28-volt regulated output are protected from PSI overvoltage by a crowbar circuit located on TB1 (refer to foldout FO-4 or FO-5,

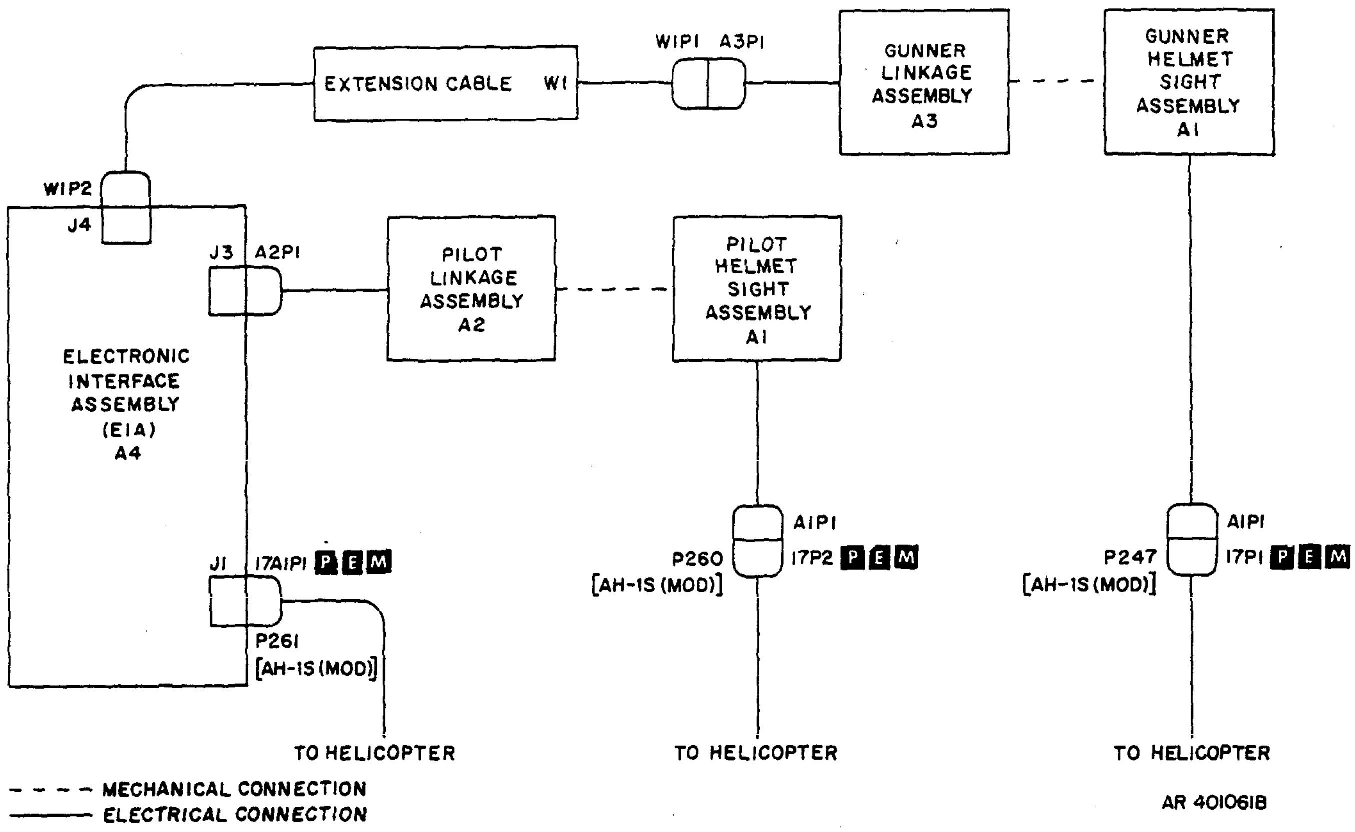


Figure 1-6. HSS and helicoptar interconnect diagram

sheet 1). The 28-volt output is comected across gated diode Q1 and zener diode CR4. The gated diode does not break down unless it is triggered at the gate input, and, once triggered, it trips to a near short-circuit condition and does not automatically reset. The gated diode can only be reset by turning off power momentarily. Zener diode CR4 does not conduct unless the supply voltage exceeds 36 volts. If the voltage exceeds 36 volts, CR4 cortducts and the voltage dropped across R1 is sufficient to triger Q1. PS1 is not damaged if the crowbar circuit shorts the output, because it contains automatic current limiting protection.

(3) The 115-volt, 400-Hz ac input power is distributed as listed for ECP5 on foldout FO-4 or FO-5. T1 provides a pair of 10-volt and a pair of 20-volt inputs to power supply card A12 through T1 pins 3 and 4,9 and 10, 5 and 6, and 7 and 8. Refer to foldout FO-9. These inputs energize four full-wave bridge rectifiers, the outputs of which are connected to solid-state regulators AR1 through AR5. The regulators are current limited and thermally protected against overload. The remaining circuitry is used during a BIT and is discussed in paragraph 1-22c(2)(i).

b. Reticle Power. Power to light the pilot and gunner reticles in the helmet sights is provided by T3. The outputs of T3-1 and T3-4 provide 8 volts ac, which is attenuated to 5 volts ac by R5 and R6 on TB1 when the reticles are connected. There will be no drop across R5 and R6 in a no-load condition. R5 provides power for the pilot reticle through J1-d, and R6 provides power for the gunner reticle through J1-e. J1-d is connected to the reticle brightness control on the pilot armament control panel in the helicopter. The 0- to 5-volt ac output of the brightness control is connected to the interface control unit (IFCU) in the helicopter. The IFCU applies the ac power to pins 1 and 3 of pilot helmet sight plug A1P1, lighting the three helmet sight lamps in parallel (refer to fig. l-11). J1-e is connected to the brightness control on the gunner armament control panel, to the IFCU, and to pins 1 and 3 of gunner helmet sight plug AlP1; the gunner reticle is lighted in the same manner as the pilot reticle. For specific helicopter wiring information and IFCU location, refer to: TM 55-1520-234-23 for the AH-1S(Mod) helicopter, and TM 55-1520-236/239-23 for the AH-1S helicopter.

1-20. Helmet Sight Theory (fig. 1-7).

a. Wiring. The helmet sight assembly contains a 30-inch cable with 8-pin connector AlP1 at the end. Inside the helmet, the eight wires change to a flat cable for minimum height. Two tires are connected to reed switch S1 in the magnetic connector and six wires are connected to the sight housing, two to retract solenoid L1 and the remaining four to the lamp assembly. The flat part of the cable is taped to the aluminum visor.

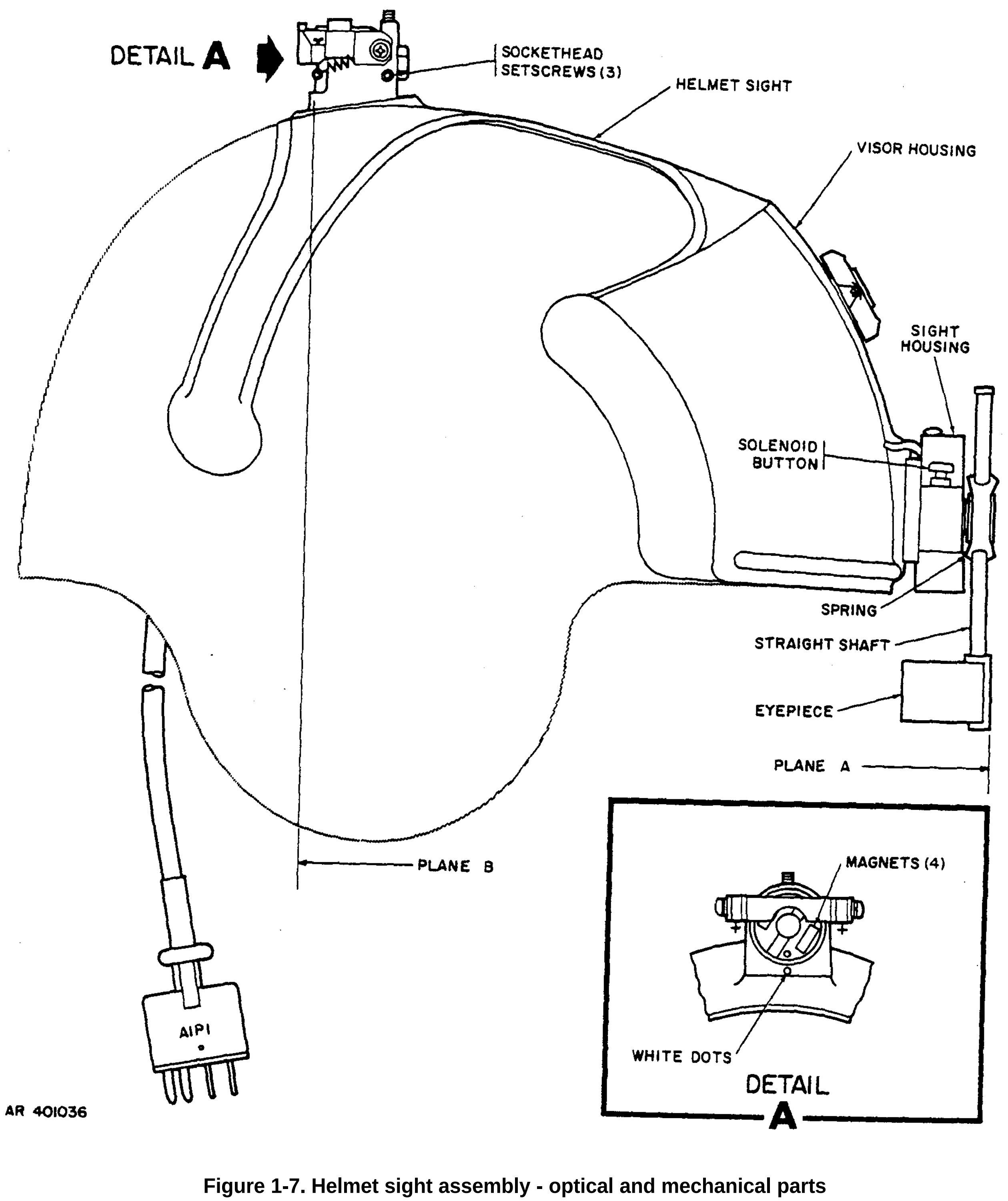


Figure 1-7. Helmet sight assembly - optical and mechanical parts

b. Operation. For operation, connector A1P1 is connected to the helicopter helmet sight connector in the pilot's compartment or the gunner's compartment. Only the gunner's connector has wires to pins 7 and 8; therefore, the retract-solenoid feature is operative only in the gunner's compartment. The solenoid is mechanically operated by pressing a button on the top of the sight housing; it is electrically operated in the gunner's compartment as the ACQ TRK STOW switch (refer to figure 2-5) is moved from ACQ to TRK. Actuating the solenoid allows a spring in the sight housing to drive the eyepiece counterclockwise to the horizontal position; the eyepiece must be manually returned to the vertical position. The spring-loaded solenoid engages a detent to hold the eyepiece in its previously set position.

c. Eyepiece Adjustment. The eyepiece can be moved up and down by compressing the spring on the straight shaft, and the whole sight assembly can be adjusted laterally by manually rotating the sight housing. Vertical security is controlled automatically as the spring contacts the shaft. Lateral security is controlled by the tightness of the screw inside the helmet that secures the sight housing to the helmet.

d. Boresighting. The helmet sight transfers the plane A line of sight provided by the reticle in the eyepiece to the plane B surface of the four-section magnet in the receptacle. Therefore, the vertical and lateral position of the eyepiece has negligible effect on helmet sight alignment. The alignment of these two reference planes is accomplished by adjusting three sockethead setscrews to move the magnet in its receptacle. For helmet boresighting, the plane of the magnet is established by the use of the helmet boresight tool (fig. 2-16), and the two lines of sight are then brought into coincidence by adjusting these sockethead screws. Two operators are required for this adjustment, one to sight through the reticle while the other sights through the helmet boresight tool and adjusts the setscrews as required.

e. Power. During normal operation, 0- to 5-volt ac power is provided on pins 1 and 3 of A1P1 from the IFCU through the mating helicopter connector (17P1 or 17P2). Returns are connected to pins A1P1-2 and -4. This arrangement connects the three lamps in the lamp assembly in parallel. However, thc return circuit is provided through the helicopter pilot and gunner action disconnect relays, K83 and K84, when they are energized. These relays are energized when the reed switch in the helmet sight is closed and deenergized when the reed switch is open. The return circuit for the lamps is complete only when the linkage steel fastener (or helmet boresight tool) is connected to the magnetic receptacle. Thus, a reticle is visible only after a linkage steel fastener has been connected to the helmet. The lamps in the helmet sight are so wired that they can be tested in series. The series test bypasses the action disconnect relays. The three lamps in the sight assembly are potted into a single replaceable lamp assembly with unit designator DS1.

f. Reed Switch. Reed switch S1 in the magnetic receptacle on top of the helmet sight senses the presence of the steel fastener on the end of the linkage arm. The reed switch is open when no fastener is connected and closes when the fastener contacts the magnet. Proper magnet position in the housing is important for correct operation of the reed switch. White dots on the housing and magnet must be aligned for the reed switch to sense the presence of the steel fastener.

NOTE

White dots on the housing and magnet may have to be slightly offset for reed switch to sense the presence of the steel fastener.

g. Reticle Lamp Test. The reticle lamps in each helmet sight are tested by actuating the reticle-lamp test switch on the related armament control panel. Actuating this switch on the pilot or gunner armament control panel energizes a relay in the IFCU; this disconnects the ac power and ac returns from the related helmet sight and applies 15-volt dc power between pins 1 and 4 of the helmet-sight connector. The series-connected dc power checks for a burned-out lamp (which may not otherwise be detected). Thus, if the reticle disappears when the reticle-lamp test switch is actuated, one or more of the lamps in the sight is inoperative and the lamp assembly must be replaced. The 15-volt dc power for the pilot lamp test is supplied from dropping resistor R7 on TB1 in the EIA through J1-HH to the IFCU; 15-volt dc power for the gunner lamp test is supplied from dropping resistor R8 on TB1 through J1-GG.

1-21. Linkage and EIA Theory.

a. General.

(1) The pilot and gunner linkages operate with part of the EIA circuitry to provide error signals that drive the TSU or turret servo system into coincidence with the HSS linkage position. (The remaining EIA circuitry provides the BIT capability and is discussed in paragraph 1-22.) The linkages operate with independent but highly similar EIA circuitry and, thus, for example, the gunner is able to direct the TSU with his helmet sight while the pilot directs the gun turret with his helmet sight.

(2) As explained in paragraph 1-20, the helmet sight reticle defines the line of sight to the target. When a linkage is magnetically connected to a helmet sight, the linkage converts, by means of its four resolvers, the helmet sight angular position to a set of electrical signals. These signals

represent the errors in azimuth and elevation between the helmet line of sight (LOS) and the TSU line of sight or turret gun line. The four resolvers accomplish this conversion by measuring the elevation and azimuth angular position of the steel fastener on the end of the tubular arm in relation to the helicopter armament-system axes.

(3) The resolvers in the linkage arm gimbals measure the azimuth angle and the elevation angle at each end of the arm. The rails must be properly aligned to the armament-system axes.

b. Simplified Block Analysis (fig. 1-8).

(1) The diagmm shows a linkage (either one) connected to the TSU and the turret. A pair of resolvers in the TSU and the turret, one attached to the elevation gear train and the other attached to the azimuth gear train, provide a three-signaI indication of where the TSU or turret is pointing. A 10-volt rms signal provides the resolver excitation reference. The three signals, which represent elevation and azimuth coordinates, are connected to elevation resolver B1 and azimuth resoiver B2, both of which are on the carriage end of the linkage arm. The signals are transformed by this pair of resolvers and connected to azimuth resolver B3 and elevation resolver B4, both of which are on the helmet end of the arm. The signals are again transformed by this pair of resolvers. The total transformation is dependent on the positions of the four resolvers. The original three-signal inputs, plus the arm-resolver transformations, produce three signals that represent the difference (or error) between the linkage position and the turret or TSU position. These error signals are directed back to the turret or TSU elevation and azimuth drive amplifiers, where the signals cause elevation and azimuth movement until the error signals from the linkage are nulled.

(2) The range component from a linkage connected. to the TSU, which is available at winding R2 of resolver B4, is terminated in a 200K resistor, since the TSU is a line-of-sight device. The range component from a linkage connected to the turret is terminated in a 200K potentiometer, from which the gunner can select three outputs, representing ranges of 500, 1000, and 1500 meters. The selected signal is routed to the turret elevation drive circuit as a range correction signal.

c. Functional Block Analysis.

(1) To obtain system accuracy, the transformation ratio within the resolvers of the linkages must be kept uniform over the wide range of temperatures encountered in military operating environments. Resolver design and construction cannot remove all amplitude and phase variations caused by fluctuations in temperature, especially the copper losses which occur as temperature rises, Therefore, the resolvers in the linkages are winding-compensated resolvers. As compared to a standard resolver, a winding-compensated resolver contains an auxiliary winding compensator inserted within the stator slots. This winding, similar to the stator winding, effectively adjusts output voltage so that it is almost in phase with rotor voltage. Because primary copper-loss effects are reflected equally to both compensator and rotor windings, the complementary compensator-winding voltage remains in phase despite frequency and temperature changes. In the HSS, the compensator windings supply feedback voltages to a dual-channel buffer amplifier. Unity gain from amplifier input to resolver output is achieved by selection of two external resistors for each resolver. These resistors, located in the linkage connector, are factory selected and must not be interchanged. Because compensator and rotor voltages vary simiIarly when temperature and frequency change, the feedback loops automatically adjust to compensate for these variations.

(2) A dual-channel buffer amplifier is associated with each winding-compensated resolver, so that there are four buffer amplifiers for each linkage. The eight buffer amplifiers are located in the EIA. (Refer to foldout FO-4 or FO-5, sheet 2.) Buffer amplifier A1, A3, A5, and A7 are associated with the resolvers in the pilot linkage, and buffer ampiifiers A2, A4, A6, and A8, with the resolvers in the gunner linkage. The eight buffer amplifiers are identical and interchangeable. The pilot linkage is connected to EIA external connector J3, and the gunner linkage, through the extension cable, to EIA external connector J4. Connectors J5 through J12 and XA9 through XA13 are internal to the EIA.

NOTE

The theory and connections provided in paragraphs (3), (4), and (5) apply to the pilot linkages. Use the connector, pin designator, and reference designator to the right of each slash (/) in foldout FO-1 and apply the same theory for the gunner linkages, omitting paragraph (5).

(3) Refer to the linkage and EIA functional block diagram (foldout FO-1) and read the notes. The position inputs to J1-A, -B, and -C can be from the turret or the TSU. This discussion assumes the inputs are from the turret. The three 400-Hz signals between 0 and 10 volts rms that represent the position of the turret are designated k, i, and j. The k signal represents the vertical, or elevation, component; the j signal represents the wing, or left and

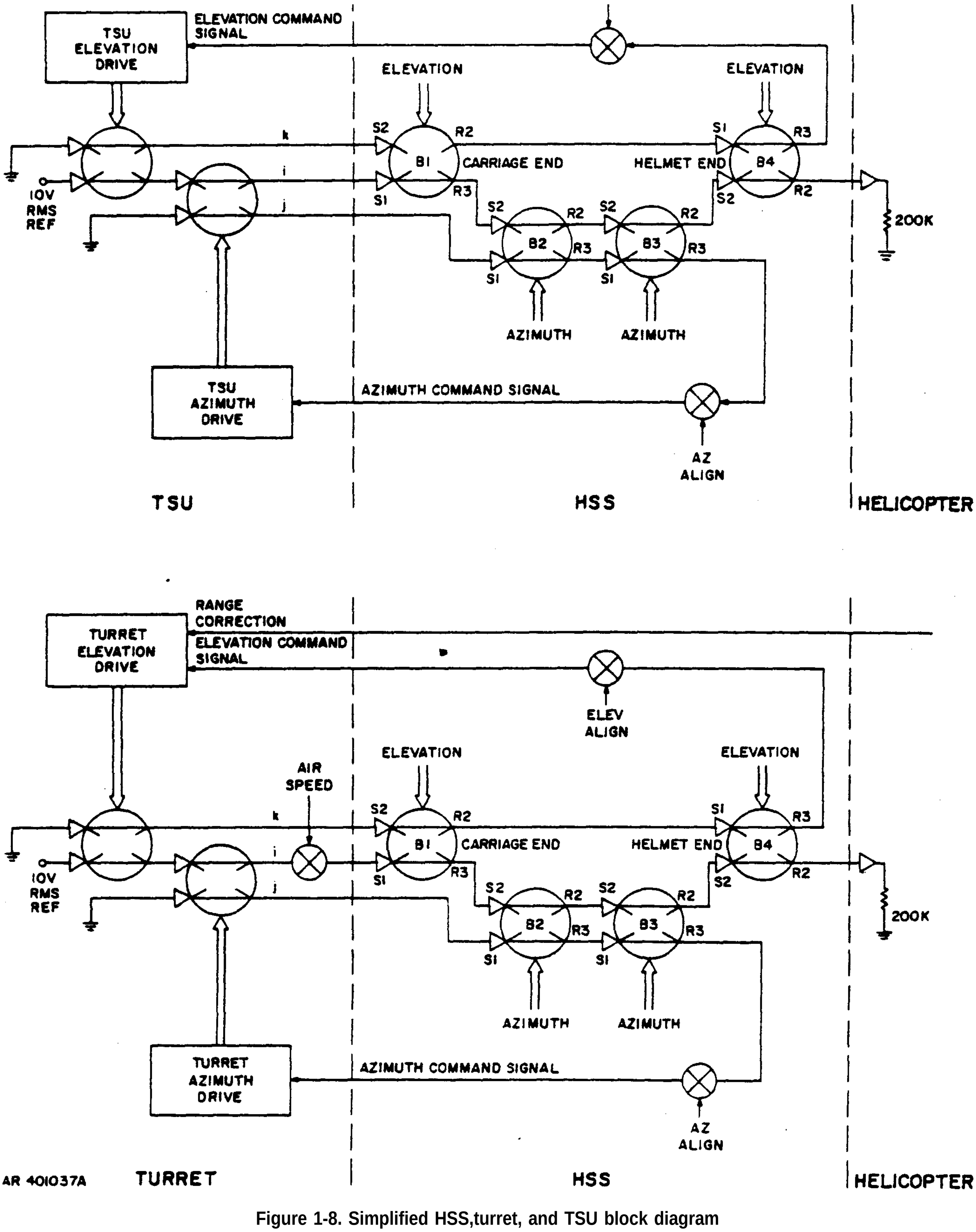


Figure 1-8. Simplified HSS,turret, and TSU block diagram

right, component; and the i signal is a reference signal representing the centerline of the helicopter. When the turret is straight ahead at zero elevation, the k signal is 0 volts, the i signal is 10 volts rms, and the j signal is 0 volts. Turret movement up and to the left generates k and j signals that are in phase with the reference signal. Turret movement to the right and down generates k and j signals that are out of phase with the reference signal.

NOTE

Relays K1, K2, and K3 in the EIA are only energized during HSS tests.

(4) This discussion applies only to the pilot linkage and EIA in HSS XM 128. The k signal is connected through J1-A, BIT relay K1, and J5-16 to channel 2 of buffer amplifier A1 in the EIA. The i signal is connected through J1-B, BIT relay K1 and J5-23 to channel 1 of buffer amplifier A1. The k and i signals are then routed from buffer omplifier A 1 to resolver B1 -S2 and -S1, respectively. The output of resolver B1 at J3-45 is connected through J7-16 to channel 2 of buffer amplifier a3 and to resolver B2. At the same time, the j signal is connected through J1-C, BIT relay K1, and J7-23 to channel 1 of buffer amplifier A3. The output of resolver B1 at J3-49 is connected through J11-23 to channel 1 of buffer amplifier A7 and to resolver B4. The output of resolver B2 at J3-44 is connected through J9-23 to channel 1 of buffer amplifier A5 and to resolver B3. The output of resolver B2 at J3-48 is connected through J9-16 to channel 2 of buffer amplifier A5 and to resolver B3. The output of resolver B3 at J3-43 is connected through XA13-37 and amplifiers AR1 and AR2 to XA13-33, and through relay K3 to J1-E as an azimuth error signal. The output of resolver B3 at J3-47 is connected through J11-16 to channel 2 of buffer amplifier A7 and to resolver B4. The output of resolver B4 at J3-46 is connected through XA13-23 and amplifiers AR5 and AR6 to XA13-13, and through relay K3 to J1-Z as an elevation error signal. The output of resolver B4 at J3-42 is connected through K3 to J1-s as the range correction signal.

(5) This discussion applies only to the pilot linkage and EIA in HSS XM136. The k signal is connected through Jl-A, BIT relay K1, and J5-16 to channel 2 of buffer amplifier Al. The i signal is connected through J1-B and BIT relay K1 to azimuth bias circuit card A14, and the j signal is connected through J1-C and BIT relay Kl to card A14. Unity-gain, cross-coupled, operational amplifiers and trimming resistors in Al4A1 send out i apd j signals of the relative values indicated in note 2 on foldout FO-1. (For the schematic of A14, see foldout FO-5, sheet 1.) The i signal from Al4 is applied through J5-23 to channel 1 of buffer amplifier Al. The k and i signals are then routed from buffer amplifier Al to resolver B1-S2 and -S1, respectively. The output of resolver B1 at J3-45 is connected through J7-16 to channel 2 of buffer amplifier A3 and to resolver B2. At the same time, the j signal from A14 is connected through J7-23 to channel 1 of buffer amplifier A3. The output of resolver B1 at J3-49 is connected through J11-23 to channel 1 of buffer amplifier A7 and to resolver B4. The output of resolver B2 at J3-44 is connected through J9-23 to channel 1 of buffer amplifier A5 and to resolver B3. The output of resolver B2 at J3-48 is connected through J9-16 to channem 2 of buffer amplifier A5 and to resolver B3. The output of resolver B3 at J3-43 is connected through XA13-37 and amplifiers AR1 and AR2 to XA13-33, and through relay K3 to J1-E as an azimuth error signal. The output of resolver B3 at J3-47 is connected through J11-16 to channel 2 of buffer amplifier A7 and to resolver B4. The output of resolver B4 at J3-46 is connected through XA13-23 and arnplifiers AR5 and AR6 co XA13-13, and through relay K3 to J1-Z as an elevation error signal. The output of resolver B4 at J3-42 is connected through K3 to J1-s as the range correction signal.

(6) The phase and amplitude shift of the operating signals from linkage input to linkage output is shown in Figure 1-9. The signals of four typical turret positions are provided across the top and resolver outputs for each position are shown below. The linkage is positioned to look straight ahead by placing the LOD on the rails and connecting the linkage steel fastener to the magnetic receptacle on the LOD. Thus, as shown in the first vertical Column, with the turret pointing straight ahead, no error signals are generated by resolvers B3 and B4 at TPl5 and P7 on A13. The second column depicts the waveforms with the turret pointing 45 degrees left of center while the linkage points straight ahead. Thus, an in-phase error signal is generated by the linkage, as shown in the Al3TP15 waveform. As the turret drives right in response to the error signal, the amplitude of the error signal decreases until the turret is positioned straight ahead. At this position, the Al3TP15 output is again a null. The third column depicts the waveforms with the turret pointing 45 degrees right of center while the linkage points straight ahead. Thus, an out-of-phase error signal is generated by the linkage, as shown in the Al3TP15 waveform. As the turret drives left in response to the error signal, again the amplitude of the error signal decreases until the turret is positioned straight ahead. The fourth column depicts the waveforms with the turret straight ahead and 45 degrees down while the linkage remains straight ahead. Thus, an out-of-phase signal is generated by the linkage, as shown in the Al3TP7 waveform. As the turret drives up in response to the error signal, the amplitude of the error signal decreases until the turret is again positioned straight ahead. Thus, the linkage drives the turret into coincidence with the sight line represented by the position of the steel fastener attached, during operation, to the helmet magnetic receptacle.

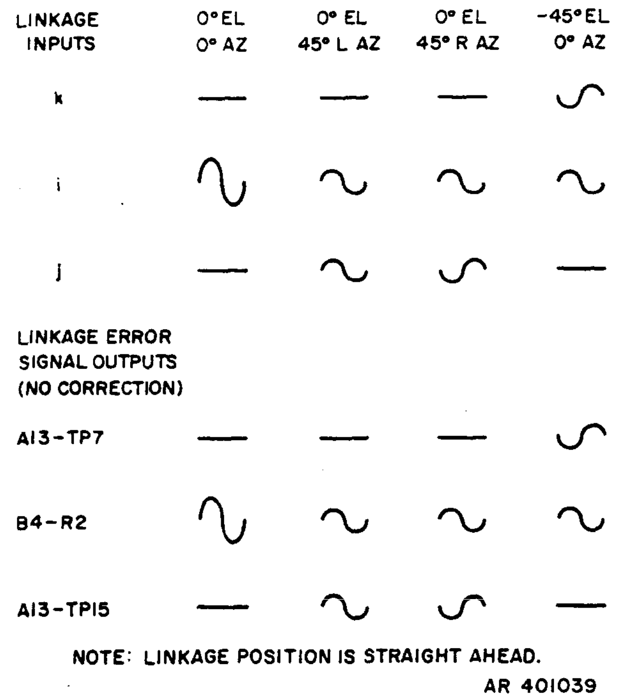


Figure 1-9. Typical HSS operating signals

(7) The phase of the B4-R2 output signal at J3-42 remains constant, although the amplitude may vary from a null at 90 degrees left to maximum amplitude straight ahead and to a null at 90 degrees right. If the 90-degree positions are exceeded, the phase on either side is inverted.

NOTE

A mechanical alignment of the rails in azimuth, roll, and pitch must be made at installation and at major overhaul. The alignments of the rails in azimuth and roll are accomplished by means of the adjustable rail supports. This alignment of the rails in the helicopter also aligns azimuth resolvers B2 and B3 to the armament coordinate reference axes. Alignment in pitch of elevation resolvers B1 and B4 to the armament coordinate reference axes is accomplished by adjustment of the B1 resolver by means of the fine-adjustment worm gear and worm wheel during system boresighting.

(8) Resolvers B2, B3, and B4 in the linkages are prezeroed at the factory and are not adjustable. Both the bodies and the shafts of these resolvers are securely mount ed in the linkage arms. Pitch resolver B1 may require field adjustment during system boresighting. The shaft of this resolver is factory adjusted and securely fastened; however, the body is fitted with a fine-adjustment worm gear and worm wheel. The worm wheel is attached to the resolver body. When the worm-gear locking screw is released, the worm gear can be rotated to cause the resolver body to turn within the linkage to obtain adjustment of the resolver elevation output. The worm wheel provides for a minimum of ±20 degrees of body travel. In each linkage, the shaft of B1 is factory-set to take into account the depression angle at which the linkage is mounted in the AH-1S(Mod) helicopter, so adjustment of this resolver at installation will normally be minimal in this helicopter and fairly great in the AH-1S helicopter P E M. In the AH-1S(Mod) helicopter, the pilot linkage is depressed 4 degrees and the gunner linkage is depressed 8 degrees; in the AH-1S helicopter, the pilot linkage is at 0 degrees and the gunner linkage is depressed 11-1/2 degrees. Final adjustment of these B1 resolvers is made during boresighting.

(9) The elevation and azimuth fine-adjustment potentiometers on the EIA allow exact coincidence to be obtained between the helmet line of sight and the turret line of sight. Refer to foldout FO-4 or FO-5, sheet 1, and observe that these potentiometers (Rl, R2, R3, and R4) are connected to 0.5-volt reference signals, with the pin-3 clockwise end to the in-phase signal and the pin-1 counterclockwise end to the out-of-phase signal. A voltage null occurs at the center of each potentiometer. The R3 outputs of resolvers B3 and B4 at J3-43 and J3-46 are connected to the non-inverting pins of amplifiers AR1, AR2, and AR5, AR6 (see foldout FO-1), and thus no phase shift occurs through these amplifiers. The signals at TP6, TP7, and TP15, TP13 on A13 are in phase. The potentiometer wipers, however, are connected to the inverting inputs of these amplifiers (see foldout FO-10), and thus the fine-adjust potentiometer outputs are inverted through amplifiers AR1 and AR5.

1-22. Linkage and EIA BIT Theory.

a. General. When the HSS BIT switch on the gunner armament control panel in the helicopter is momentarily actuated, the HSS automatically initiates an EIA and linkage self-test. If both linkages have been placed in their BIT brackets, the special BIT circuitry insures correct subsystem operation, or it isolates between an EIA failure, including a defective buffer amplifier, and a linkage failure. The status of the system at the end of the test is indicated by means of four indicators on the gunner armament control panel. The indicators are marked Go INTFC (in the AH-lS(Mod) helicopter) or EIA (in the AH-1S helicopter P E M), PLT and GNR. After the BIT is initiated, it the EIA and linkages operate normally, the green GO indicator lights within 0.3 second and remains on for 5 to 10 seconds. When the indicator lights, the system returns to normal operation. A failure is indicated if

the amber INTFC (or EIA), PLT, or GNR indicator lights. If the test is to be repeated for verification of the failure, momentarily reactuate the HSS BIT switch. If the failure is to be cleared to enable partial operation of the system, momentarily interrupt EIA power by setting the helicopter MASTER ARM switch to OFF and then back to STBY.

b. Basic Operation.

(1) To accomplish a BIT, the EIA contains a network of relays and digital and analog logic that, when triggered, tests EIA power, buffer amplifiers, linkages, and the signal output amplifiers as a system. If the test parameters are met, the green GO indicator is lighted. If a power failure is detected, the test sequence stops immediately and lights the EIA fail (INTFC or EIA) indicator. If a linkage failure is detected, the logic systematically tests the related buffer amplifiers, one at a time, and then lights the appropriate fail indicator (INTFC or EIA, PLT, or GNR).

(2) Figure 1-10 illustrates the BIT logic sequence. The time delay from BIT initiate through the logic sequence shown on the left side of the figure is about 0.3 second. A worst-se failure logic sequence is completed in 2.3 seconds.

(3) The BIT circuitry is located entirely within the EIA and consists of the following: relays K1, K2, K3 in each of the eight buffer amplifiers (see fig. 1-12) and, in the EIA chassis, relays K1, K2, and K3 (foldout FO-4 or FO-5), test resolver B1, sequencer printed circuit (PC) card A9 (foldout FO-6), logic card A10/A15 (foldout FO-7/FO-l0.1), and comparator card Al1 (foldout FO-8). The logic is arranged to check power first, then the pilot linkage, and lastly, the gunner linkage. After the power check, the BIT operates by connecting, with the relays, known voltage inputs to the linkages and checking for known outputs from the amplifiers on amplifier card A13. If the pilot linkage fails, the logic tests buffer amplifiers Al, A3, A5, and A7 one at a time, stores the results, and then tests the gunner linkage. If the gunner linkage fails, the logic tests buffer amplifiers A2, A4, A6, and A8 one at a time and stores the results. The results are displayed. An EIA failure takes precedence over a pilot or gunner linkage failure; however, the BIT circuitry is capable of indicating a failure in both pilot and gunner linkages if, for example, both linkages were left in the stow position at the time BIT was initiated.

c. Detailed Circuit Analysis.

(1) Hardwired BIT signals are discussed below. Refer to foldout FO-1. To enable a BIT, a number of hardwired reference signals that simulate turret or amplifier inputs are connected within the EIA (foldout FO-4 or FO-5).

(a) All eight buffer amplifiers have common connections as follows: pin 17 – in-phase 5 volts ac (test signal C on foldout FO-4 and test signal TR on foldout FO-5); pin 22 – in-phase 10 volts ac; pin 18 – B1-S2 (test resolver); pin 14 – B1-S6; pin 25 – B1-S1; and pin 21 – B1-S5. The in-phase 5-volt ac signal originates at XA10/XA15-3 from a divider network on the A10/A15 card. The in-phase 10-volt ac signal originates at T2-1,

NOTE

The discussion in *(b)* below applies to the EIA used in XMl28 (foldout FO-4) and the discussion in *(c)* below applies to the EIA used in XM136 (foldout FO-5). A comparison of these two foldouts will show that the basic difference in the test circuits for the two EIAs is that there are three more test circuits in the EIA used in XM136; these circuits can be traced from J1-t, -u, and -v. These circuits are required because of the azimuth bias compensation applied by card A14 to the signals for the pilot linkage in XM136; this compensation makes it impossible to use the same circuits for both the pilot linkage and the gunner linkage. In the EIA used in XMl28, the linkages use the same test circuits.

(b) This discussion applies only to the EIA used in XM 128. Relay terminals Kl-Al and K2-A1 are connected to out-of-phase 10 volts ac from T2-4, and relay terminals K1-Bl and -F1 and K2-B1 and -F1 are grounded. Relay terminals K1-Cl and K2-C1 are connected to out-of-phase 5 volts ac from XA10-7. Relay terminals K1-El and K2-E1 are connected to in-phase 2.5 volts ac from XAl0-2. When relays K1, K2, and K3 are energized during the BIT test, relay terminals Al, Cl, and El of relays K1 and K2 provide the following test signals: the k signal is out-of-phase 10 volts; the i signal is out-f-phase 5 volts; and the j signal is in-phase 2.5 volts. At the same time, relay terminals B1 and F1 of relays K1 and K2 substitute grounds for the wipers of elevation and azimuth potentiometers R1 through R4.

(c) This discussion applies only to the EIA used in XM136. When relays KI, K2, and K3 are energized for the BIT test, relay K1 transfers the pilot test signals and relay K2, the gunner test signals. The test-signal outputs from logic card Al5 (see foldout FO-10.1) differ in value between the gunner linkage and the pilot linkage and use

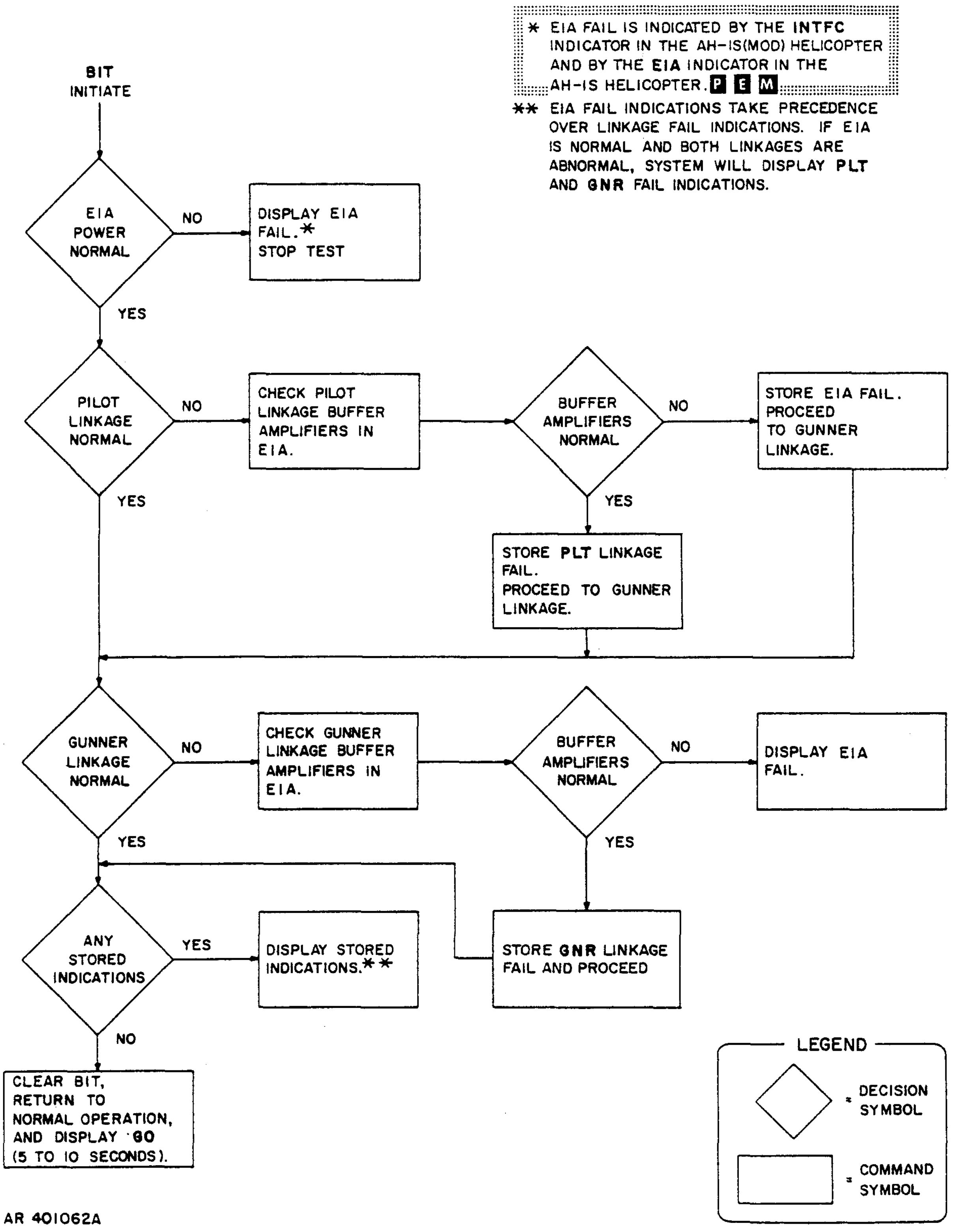


FIGURE 1-10. BIT logic diagram

different sets of pins instead of sharing common pins. Relay terminals K1-B1 and -F1 and K2-B1 and -F1 are grounded and substitute grounds for the wipers of elevation and azimuth potentiometers R1 through R4 when the relays are energized. Relay terminal K1-Al is connected to out-of-phase 10 volts ac. representing the pilot k signal, but relay terminal K2-A1 is connected to out-of-phase 9.29 volts ac (test signal Gk) from XA15-5. Relay terminal K1-C1 is connected to out-of-phase 4.19 volts ac (test signal Pi) from XAl5-7: K2-C1 is connected to out-of-phase 5.83 volts ac (test signal Gi) from XAl5-17. Relay terminal K1-El is connected to in-phase 2.01 volts ac (test signal Pj) from XAl5-2; relay terminal K2-E1 is connected to in-phase 2.81 volts ac (test signal Gj) from XA15-15. When the relays are energized, these test signals are applied as stated in subparagraph *(d)* below, with the exception that the pilot i and j signals (test signals Pi and Pj) are routed through azimuth bias circuit card Al4 as for normal operation of XMl36.

(d) This discussion applies to both EIAs. Then, to allow the error signals generated within the linkages and Al3-card amplifiers to be measured, relay terminals K3-A1, .B1, and -C1 transfer the pilot linkage outputs to XA9-29, .37, and -38 of sequencer card A9 (foldout FO-6), and relay terminals K3-D1, -El, and -F1 transfer the gunner linkage outputs to XA9-28, -35, and -39. Deenergized relays A9K1 and K2 transfer the pilot linkage outputs to XA11-38,-39, and -40 (foldout FO-8) by way of XA9-27, -33, and -40. Energized relays A9K1 and K2 transfer the gunner linkage outputs to comparator card Al1 in the same way.

(e) In both EIAs, the individual buffer amplifiers are tested when buffer-amplifier relays K1, K2, and K3 are energized. The energized relays connect 5 volts ac and 10 volts ac to the amplifier inputs and connect the four amplifier outputs to test resolver B1 by means of the connections listed in subparagraph *(a)*. Thus, during the BIT, the relays substitute the test resolver for the linkage resolver and cause one buffer amplifier at a time to be tested.

(f) Test-resolver B1 inputs (foldout FO-4 or FO-5) are connected through the relay to the buffer-amplifier outputs as explained in *(e)*. The 28-volt dc excitation for the test resolver is connected to B1 -S3 and -S4. Returns are connected to B1 -S7 and -S8 and to -R1 and -R4. The buffer-amplifier outputs are applied to B1 -S1 and -S2, and to B1 -S5 and -S6 through resolver external resistors R9 and R10, mounted on TB1 between terminals 9 and 10 and 11 and 12. The B1 -R2 and -R3 outputs are connected to comparator card Al1 through A11-24 and 26.

(2) Steady-state BIT logic is discussed below.

(a) Refer to foldout FO-1. When BIT is initiated, the two outputs for each linkage from amplifier card Al3 and the one output directly from B4-R2 are connected to pins 38, 39, and 40 of comparator card Al1 (foldout FO-8). On Al1, impedance matching and scaling networks AR1, Rl, and R4; AR3, R15, and R18; and AR5, R29, and R32 provide a 200K load and reduce the amplitude of the input signals to one-ninth of their original value. The signals are also inverted. Attenuation is required to meet the input requirements of dual comparators AR2, AR4, and AR6. The low tolerance level of the dual comparators is connected to pin 6 of the amplifier, and the upper tolerance level is connected to pin 3; the input signal is divided equally between the low-impedance inputs at pins 4 and 7. The out-of-phaae tolerances to the dual-channel comparators are divided from the out-of-phase 10 volts ac connected to XAl1-12 through dropping resistors R36, R40, R50, R54, R64, and R68. The in-phase tolerances are divided from in-phase 10 volts ac connected to XAl1-32 through dropping resistors R8, R12, R22, and R26. If the signal applied to each comparator is in phase with and between the upper and lower tolerances, the comparator generates a train of 4-volt, 400-Hz square waves which is connected to retriggerable dual one-shots U11 and U12. The period of the string of pulses is shorter than the time constant of the one-shots; therefore, the output at pin 10 or 6 remains high. If no signal is applied to each comparator or if the signal applied is out of the tolerances set, the comparator generates a low and the output of the one-shots remains low.

(b) Pins XA11-19, -16, and -14 are connected to four-input NAND gate U9 on logic card A10/A15 through pins XA10/XAl5-40, -38, and -36. If, for example, all three signals are high, the signals provide three of the four high inputs required to activate the NAND gate. Enable A is the fourth signal.

(c) If a linkage assembly (buffer amplifier, linkage, and A13-card amplifiers) produces an improper output, the BIT logic tests each buffer amplifier in the failed linkage assembly by connecting the amplifiers, one at a time, to test resolver B1 and checking for known test-resolver outputs. The resolver outputs connected to XA11-24 and -26 are attenuated on card Al1 by impedance matching and scaling networks AR7, R43, and R46; and AR9, R57, and R60. The upper and lower tolerances for dual comparators AR8 and AR410 receive power as explained in *(a)*. The lower tolerances are set by dropping resistors R54 and R68 and the upper tolerances,

are set by dropping resistors R50 and R64. If the buffer amplifier connected to test resolver B1 produces a normal output, dual comparators AR8 and AR10 generate a train of pulses and dual one-shot U13 produces highs at XA11-8 and XA11-6.

(d) Pins XA11-8 and -6 are connected to three-input NAND gate U9 on logic card A10/A15 through pins XA10/XAl5-35 and -33. If both signals are high, they provide two of the three inputs required to activate the NAND gate. When the BIT function is not active, inputs to, four-input and three-input NAND gates U9 are lows.

(e) On logic card A10/A15, when BIT is not initiated, pin 9 is open. Twenty-eight volts dc is connected through K2-7 and -5, CR9, K6-2 and -4, and R16 to the base of Q8, and through R10 to XA10/XA15-9 and Jl-f. The high at the base of Q8 causes the transistor to saturate, causing the collector at XA10/XAl5-25 to go low. The low at the collector is also connected to NAND gates U1, U4, U5, and U7. Thus, when BIT is not initiated, the reset signal at XA10/XAl5-25 is low.

(f) Since the inputs to NAND gates U9 are high only during BIT, the NAND-gate outputs are high. At U9-6, the high is maintained by pullup resistor R22, and at U9-8, by pullup resistor R24. The high at U7-10 allows U7-8 to be low. The low reset signal at U7-4 insures this state of the flip-flop. The low at U7-8 is coupled to U7-5. With two low inputs, the U7-6 output is high. The low at U7-8 is connected to pin 29 and is called skip. The low at U7-8 is also connected to U2-9, where it causes U2-8 to be high: the high is inverted at U3-10 to a low. This low keeps transistor Q3 cut off and K2 is deenergized. Pullup resistor R23 applies a high to U7-13, allowing U7-11 to go low. The low reset signal at U7-2 insures this state of the flip-flop. This low is connected to U2-10 and to XA10/XAl5-30, where it is called go latch. The low is connected through XA9-13 to A9U10-19, where it acts as one enable for decoder U10.

(g) Deenergized relay contacts A10/Al5K2-2 and -4 apply -6 volts to FET switch Q1, opening the switch. With Q1 open, Q2 is cut off and its collector is high (through pullup resistor R1). The high is connected to U1-13, where it allows U1-11 to go low. The additional reset-signai low at U1-9 causes U1-8 to be high.

(h) The high at U9-8 is connected to U5-1, allowing U5-3 to go low. The low reset signal at U5-5 insures this state of the flip-flop. The low at U5-3 is connected to U2-5, causing U2-6 to go high. The high is inverted at U3-4, keeping Q4 cut off and K3 deenergized. Pullup resistor R25 provides a high at U5-13, applying a low at U5-11. The low reset signal at U5-9 insures this state of the tlip-flop. The low at U5-11 is connected to U2-13. causing U2-12 to go high. The high is inverted at U3-8, keeping Q5 cut off and K4 deenergized. Deenergized relays K3 and K4 keep the helicopter pilot linkage (PLT) and gunner linkage (GNR) fail indicators off. Relay K5 can be energized by either Q6 or Q7. The power fail enable signal at XA10/XAl5-41 is low, (This low is generated by inverter U2-6 on sequencer card A9 through XA9-23.) The low at XA10/XA15-41 is connected to U6-5, where it causes U6-6 to be high. This high is connected to U4-12, where it allows U4-11 to go low. The low reset signal at U4-2 insures this state of the flip-flop. The low at U4-11 is connected to XA10/XA15-32, where it is called the power fail latch. This low is connected through XA9-11 to U10-18, where it is a second enable for decoder U10. On the logic card, the U4-11 low is also connected to U4-1, causing U4-3 to go high. This high is connected to U8-4 and -5. U8-1 and -2 are held high by pullup resistor R6. With the four inputs high, U8-6 is low, keeping Q7 cut off and K5 deenergized. The enable B signal at XA10/XAl5-34 is low at this time. (This low is generated by inverter U8-6 on sequencer card A9 through XA9-8.) The low at XA10/XA15-34 is connected to U6-10, causing U6-8 to go high. This high is connected to U4-9, where it allows U4-8 to go low. The low reset signal at U4-4 insures this state of the flip-flop. The low at U4-8 is connected to U1 -5, causing U1-6 to go high. This high is inverted at U3-6, keeping Q6 cut off and K5 deenergized. The go latch not signal at XA10/XA15-26, connected to U7-3, is high and is connected to U3-4 on sequencer card A9 through XA9-25. U3-5 is high. The resulting low at U3-6 is connected through XA9-26 and XA10/XA15-24 to U2-3, U2-2, and U1-4.

(i) Power supply card Al2 (foldout FO-9). contains test logic that indicates the status of EIA power. The 18-volt dc output of AR1 is attenuated across divider, network R1 and R2 and connected as a high to U1-2. The 12-volt dc output of AR2 is attenuated across divider network R3 and R4 and connected as a high to U1-4. The 28-volt dc input from chassis-mounted PS1 at A12-22 is attenuated across divider network R5 and R6 and connected as a high to U1-1. The 10-volt ac input from chassis-mounted T2 at XAl2-12 and -14 is rectified by diodes CR17 and CR18; is attenuated and filtered by R9, R10, and C16; and is applied as a high to U1-5. The three U2 inverters connected to XA12-6 form a wired OR gate. If the output of any inverter goes low, it pulls the other outputs low also. Thus, if any input to U1 is low, U1-6 is high and U2-2 is low. The -6-volt and -18-volt dc outputs are monitored by divider CR19, R7, and CR20, and CR21, R8, and CR22. The voltage at U2-3 and U2-5 is the diode

junction drop, or about -0.7 volt. R7 and R8 limit the current through 5.1-volt zener diodes CR19 and CR32. The lows at U2-3 and U2-5 are inverted to highs. The 5-volt dc power is checked on the logic card. Since a 5-volt failure could disable all logic circuitry and prevent a failure indication, the circuitry attached to A10/Al5Q7 does not require 5 volts for operation. A10/Al5U8 receives its excitation from a divider consisting of 5.1-volt zener diode CR6 and R8, which is connected to 28-volt dc input power. If the 5-volt power fails, U8-1 and -2 go to ground through R7, and the low inputs provide a high at U8-6; this turns on Q7 and energizes K5. The 28 volts dc connected to K5-3 is connected through XA10/XAl5-23 and J1-w to the EIA fail indicator in the helicopter.

NOTE

The EIA fail indicator in the AH-lS(Mod) helicopter is labeled INTFC; in the AH-1S helicopter P E M, this indicator is labeled EIA.

(j) The reset signal at XA10/XAl5-25 is connected through XA9-6 to U11, U9, and U4 of sequencer card A9 and also to flip-flop U3. At U11, U9, and U4, the low inhibits operation, respectively, of the oscillator, the clocked flip-flop, and the four-bit binary counter. At U3, the low sets the flip-flop; this cuts off transistor Q5, causing its output to go high through relay coils K1 and K2 and X49-18 to 28 volts.

(3) BIT operation is discussed in the following paragraphs.

(a) Power to initiate BIT comes from the BIT switch in the helicopter to J1-f of the EIA and to XAl0-9. When the BIT switch is actuated, 28-volt dc aircraft power is connected through XAl0XAl5-9 and R10 to the base of Q8 and through CR7 to K6. K6 energizes and the 28 volts dc on K6-2 is transferred to K6-3, latching the relay in the energized condition. When the BIT switch is released, the 28 volts dc is removed from the base of Q8, and R11 pulls the base to near ground potential; this cuts off Q8, causing the reset signal to go high. On card A10/Al5, this high becomes one enabling signal to NAND gates U1, U4, U5, and U7. Refer to foldout FO-2 and note that, as the BIT switch is released, the reset signal at XA10/XA15-25 goes high.

(b) When K6 energizes, relay contacts K6-7 and -6 apply 28 volts dc through XAl0/XAl5-10 to energize chassis relays K1, K2, and K3. Refer to foldout FO-1 and observe that this action applies fixed inputs to both the pilot and gunner linkages and transfers the linkage outputs to the comparator circuits. The linkages should be in their magnetic BIT brackets.

(c) On sequencer card A9, the high reset signal at XA9-6 acts as an enabling signal for oscillator U11, clocked flip-flop U9, and four-bit counter U4. At U3-13, the high has no immediate effect except to enable a change of state when the high on U3-9 changes.

(d) The high on A9U11-4 causes this oscillator to generate 5-ms-wide pulses at 100-ms intervals at U11-3; this is a pulse rate of 10 Hz (foldout FO-2). The 10-Hz signal is connected to U9-2 and to U5-1. U9 is a clocked flip-flop that is triggered on the trailing edge (down slope) of each oscillator pulse. The result is a 5-Hz square wave (clock) at U9-6 (foldout FO-2). At U5-1, the 10-Hz pulses act as momentary enables to the NAND gate.

(e) The square-wave output at A9U9-6 is connected to the clock input at U4-2 and to NAND gate U5-2. At the NAND gate, coincidence only occurs between the oscillator pulses at U5-1 and the clock pulses at U5-2 before the down slope of the clock pulses. The negative-going pulses at U5-3 are inverted at U8-2 and appear as a positive-going train of 5-ms strobe pulses (foldout FO-2). The strobe pulses are connected to U5-12 and U5-10.

(f) A9U4 is a four-bit binary counter with a master reset at pin l; a preset at pins 3, 4, 5, and 6; a preset enable at pin 9; and outputs at pins 11 through 14. The counter can be stopped, started, reset, and preset. The four outputs, each with two states (high and low), provide 16 different outputs (2^4). In this application, the presets are used to jump the output count to a binary 6 if certain logic conditions are met. The 5-Hz square-wave input at U4-2 causes the counter to provide binary outputs on pins 11 through 14. These outputs are connected to 1-in-16 decoder U10 and drive the decoder to produce negative-going, 200-ms-wide sequential pulses at pins U10-1 through U10-13 (foldout FO-2). The inputs at U10-18 and -19 must remain low for the decoder to operate. If either input goes high, the decoder stops decoding.

(g) As indicated in *b*, the first test checks power. At time zero, when the reset pulse goes high (foldout FO-2), A9U10-1 (foldout FO-6) is already low. The low, inverted to a high, is connected through XA9-23 and XA10/XAl5-41 (foldout FO-7/FO-10.1) to provide one high at U6-5. If EIA power is normal, XA10/XA15-31 will be high; this high is inverted at U6-3 to provide a low at U6-4. The output at U6-6 remains high and U4-11 remains

low, allowing the U10 decoder on sequencer card A9 to continue operating. If EIA power is abnormal, XA10/XA15-31 will be low; this low is inverted to a high. With. U6-4 and -5 high, U6-6 is low, changing the state of flip-flop U4. U4-11 goes high, causing U4-3 to go low; this low is connected to U8-4 and -5. The resulting high at U8-6 turns on Q7, producing an EIA fail signal. The high at U4-11 is also connected through XA10/XA15-32 to U10-18 on sequencer card A9. The high stops the operation of decoder U10. The system remains in the stopped condition until the power is turned off momentarily, to reset the circuitry, or the BIT switch is reactuated.

(h) If EIA power is normal, at 0.1 second (foldout FO-2), A9U10-1 goes high and U10-2 goes low. The low at U10-2 is connected to inverter U2-3; the resulting high at U2-4 is comected to U3-1. The skip input at XA9-24 is low, so no change takes place. The low at U10-2 is also connected to U5-5, causing U5-6 to go high. The next strobe from U8-2 to U5-12 causes U5-11 to go low for 5 ms. The pulse is inverted at U8-8 to become a positive-going, 5-ms pulse called enable A. XA9-10 is connected to XA10/XAl5-37 and the pulse provides the fourth enabling signal to U9 on logic card A10/Al5.

(i) As soon as A10/A15K6 was energized, the pilot linkage was connected to the comparator circuits, and if all three outputs were normal, pins 5, 4, and 2 of A10/Al5U9 were high. The enable A pulse causes U9-6 to go low. This low is connected through K1-2 and 4 to U7-10. The low changes the state of the flip-flop and causes U7-8 to go high. The high skip signal is connected through XA10/XAl5-29 and XA9-24 to U3-2 on the comparator card. The two highs at U3 cause U3-3 to go low, activating the parallel enable not (PE) at U4-9 and the preset inputs at U4-3, -4, -5, and -6. The signals are respectively low, high, high, low (0110, or a binary 6). The preset causes the U10 count to jump (or skip) to binary count 6, causing U10-7 to go low (foldout FO-2).

(j) The low at A9U10-7 is connected to U3-9 and to U5-4. The low at U3-9 causes U3-8 to go high; this causes U3-12 to be high and U3-11 to go low. The low is inverted to a high at U2-10, causing Q5 to conduct and energize relays K1 and K2; this, in turn, connects the gunner linkage to the three comparator circuits. The low at the collector of Q5 is also connected through XA9-22 and XAl0/XAl5-28 as relay drive 5 to K1 on the logic card. K1 energizes and transfers the comparator U9 logic to the gunner flip-flop. If all inputs to U9 are high, the low output at U9-6 is connected to U7-13, where it causes U7-11 to go high. This high is connected through XA10/XA15-30 and XA9-13 to decoder U10-19, where it stops the decoder. The high at U7-11 is also connected as the third enable to U2-10, causing U2-8 to go low. The low is inverted to a high at U3-10, turning on Q3 and energizing K2. K2-7 removes the 28 volts from K6, which deenergizes. When K6 deenergizes, K6-6 goes low and chassis relays K1, K2, and K3 deenergize. The helmet sight subsystem is again operative.

(k) While A10/A15K2 was deenergized, resistor R4, connected to -6 volts, kept Q1 pinched off. When K2 energizes, it removes -6 volts from R4 and capacitor Cl begins to charge slowly toward +5 volts. In the meantime, K2-7 has applied 28 volts to K2-6, lighting the GO indicator in the helicopter through XAl0/XAl5-13 and J1-x. After 5 to 10 seconds, the voltage at Al0/Al5Q1-G reaches about -1 volt and Q1 conducts. The high at the base of Q2 causes the collector to go low. This low is connected to U1-13 and causes the flip-flop to change state. The high at U1-11 causes U1-8 to go low. The low at U2-11 causes Q3 to cut off and K2 deenergizes. K2 and K6 again apply a high to the base of Q8 and the reset signal goes low. All circuits are now back to steady-state conditions. The helmet sight system is operative as soon as K6 deenergizes, which occurs when the helicopter GO indicator lights; that is, the circuitry associated with Q1, Q2, and Q3, which turns on the GO indicator, has no effect on system operation.

(l) If desired, the BIT switch can be reactuate as soon as the GO indicator lights. The high BIT initiate signal will turn on Q8 and cause the reset signal at XA10/XAl5-25 to go low; this low resets the previously discussed circuitry on the logic card and sequencer card A9. On the logic card, the low at U2-9 from reset flip-flop U7 turns off Q3, deenergizing K2 and turning off the GO indicator. Of course, if system operation is normal, the GO indicator will light again in 0.3 second. This operation can be used to observe waveforms, which, in this system, are not continuous.

(4) BIT failure isolation is discussed below.

(a) Refer to foldout FO-7/FO-10.1. When the enable A signal is applied through XAl0/XAl5-37 to U9-1, if one or more of the comparator inputs to U9 is low, the output at U9-6 remains high and the output at U7-8 remains low. Something is wrong with the pilot linkage outputs. The low at XA10/XA15-29, which is connected through XA9-24 to the skip logic, disables the skip logic, and the decoder continues generating gates at its outputs (foldout FO-2). Note on this timing diagram that all U10 outputs are high except for the short time when they go low in sequence. Refer to foldout FO-6 and observe that U10 output pins 3 through 6 and 8 through 11 are connected to NAND gate U6 or to extender gate U7. If all

eight inputs are high, U6-8 is low, and the low disables NAND gate U5: that is, a strobe pulse on U5-10 has no effect at U5-8. At counts Q_0, Q_1, Q_6, and Q_{11}, all eight inputs are high and, as shown at A9-8 on the diagram, no enable B pulses are generated. At counts Q_2 through Q_5 and Q_7 through Q_{10}, one of the eight inputs is low, causing U6-8 to be high. The high at U5-9 enables U5-10, to cause a change at U5-8. Thus, when the next four strobe pulses appear at U5-10, four negative-going pulses are generated at U5-8; these pulses are inverted at U8-6 to become enable B pulses. These pulses are shown at A9-8 on foldout FO-2. These four enable B pulses are used to check the four pilot buffer amplifiers. If the gunner linkage outputs are abnormal, four additional enable B pulses will be generated in Iikc manner at counts Q_7 through Q_{10} to test the four gunner buffer amplifiers.

(b) At count Q_2, when U10-3 goes low, the low is inverted to a high at U2-12, turning on Q1 to generate a low at XA9-17. As can be seen on foldout FO-4 or FO-5, XA9-17 is connected to relays K1, K2, and K3 in buffer amplifier A1 through J5-2. The relays energize and connect the fixed inputs to buffer amplifier A1 and connect the buffer-amplifier outputs to the test resolver, B1. The rest-resolver outputs (TR2 and TR3) are connected to the comparator circuits on comparator card A11. The comparator outputs (TR2 and TR3 compensated outputs) are connected to two inputs of three-input NAND gate A101A15U9 at pins 12 and 13 through XA10/XA15-33 and -35. The enable B signal is connected to U9-9 and -10. The enable B signal is also connected to U6-10. The comparator outputs, which enter on XA10/XAl5-35 and -33, are also connected to U6-12 and -13. If both inputs to U6-12 and -13 are high, the low at U6-11, connected to U6-9, prevents an enable B signal from affecting the high output at U6-8.

(c) If buffer amplifier Al is normal and both comparator outputs are high, the enable B signal at Al0/Al5U9-9 and -10 causes U9-8 to go low; this low is connected to U5-1. The low at U5-1causes US-3 to go high, and the high is connected as one enable to U2-5. The decoder continues to count, and, when U10-4 goes low, Q1 cuts off and disconnects buffer amplifier Al, while Q2 conducts and energizes the relays in buffer amplifier A3. The same sequence repeats for amplifier A3 at count Q_3.

(d) Assume that the pilot linkage failed and that one of the four buffer ampliilers is abnormal. When the defective buffer amplifier is tested, one or both of the inputs at A10/Al5U9-12 and -13 will be low. The enable B signal will have no effect at U9-8, but the high at U6-11 will enable U6-8 to go low when the enable B signal reaches U6-10. The low at U4-9 causes U4-8 to go high, and this high is connected to U1-5. At U1-5, the high has no immediate effect but is stored as a buffer-amplifier failure; that is, the testing sequence continues. Assume also that the gunner linkage is normal. At count Q_6 (foldout FO-2), the gunner linkage is connected for test. When the relay drive 5 signal energizes K1 on the Al0/Al5 card, it connects U9-6 to U7-13. When the enable A pulse provides the fourth enable, U9-6 goes low, and this low is connected to U7-13. U7-11 goes high, causing U7-3 to go low. The low at U7-3 removes the high from the go latch not input connected through XA9-25 to A9U3-4. With U3-4 low, U3-6 goes high; this high is connected through XA9-26 and XA10/XA15-24 to U2-3, U2-2, and U1-4. The high has no effect at U2-3 and U2-2, but at U1-4, the high causes U1-6 to go low. The high at U3-6 turns on Q6, which energizes K5, K5, in turn, provides 28 volts to display an EIA failure. The system remains inoperative in this condition until power is momentarily removed to reset the circuitry; however, the BIT switch can be reactuate to repeat the test as many times as desired without interrupting power. Actuating the BIT switch resets the circuitry, but if the failure remains, the failure indication will also remain. Note that only one buffer-amplifier flip-flop is provided, the U4 flip-flop, with inputs at pins 4, 5, 9, and 10. Thus, the circuitry provides the same EIA fail indication if a buffer amplifier fails, whether the buffer amplifier is associated with the pilot or gunner linkage. This explains why an EIA failure takes precedence over a linkage failure.

NOTE

In the AH-1S(Mod) helicopter, the EIA fail indicator is labeled INTFC; in the AH-1S helicopter P E M, this indicator is labeled EIA

(e) Assume that both linkages are not in their BIT brackets at the time BIT in initiated. With a high from U9-6 for both linkages and a high at U9-8 for all eight buffer amplifiers, the low at U7-8 inhibits the skip logic and also inhibits a GO indication with a low at U2-9. The low at U7-11 enables the decoder to continue operation. The highs from all buffer amplifiers provide lows at U5-1 (pilot buffer-amplifier logic) and at U5-13 (gunner buffer-amplifier logic). The resulting high at U5-3 provides one enable at U2-5. The high at U5-11 provides one enable at U2-13. With no buffer-amplifier failures, U4-8 remains low and the high at U1-6 provides a second enable at U2-1 and at U2-4. At count Q_{11} (foldout FO-2), U10-13 on the A9 card goes low, causing U3-6 to go high. The high is connected through XA9-26 and XA10/XA15-24 to U2-3, U2-2, and U1-4. The high has no effect at U1-4 but it provides a third enable at U2-3 and U2-2, U2-6 and U2-12 go low, and the low is inverted at U3-4 and U3-8.

Transistors Q4 and Q5 turn on, energizing K3 and K4. The relays connect 28 volts to light the helicopter PLT (pilot linkage failure) and GNR (gunner linkage failure) indicators. If the linkages are placed in their BIT brackets and system operation is normal, reactuating the BIT switch will clear the failure and display a GO.

(5) Added fault isolation is discussed in this paragraph. The BIT test, performed in the helicopter, insures normal system operation and performs limited automatic isolation. However, additional testing is required to isolate, for example, a defective buffer amplifier, since the BIT test only indicates that one of the eight is defective. The added testing is accomplished with fire-control subsystem test set AN/GSM-249, which individually tests all the printed circuit cards and the buffer amplifiers within the EIA as well as the pilot and gunner linkages and the helmet sight. The test set is available at intermediate maintenance and enables repair within the EIA. The use of the test set is detailed in the maintenance sections of this manual.

1-23. HSS Boresighting Theory. AH-IS(Mod), P .

a. In the helicopter, the turret weapons are boresighted to the telescopic sight unit (TSU). Since the HSS drives the TSU, boresighting of the HSS line of sight (LOS) to the TSU LOS assures optimum sighting accuracy. To obtain the required accuracy, the HSS must be mechanically aligned to the helicopter and then its electrical outputs must be adjusted to bring the HSS LOS into alignment with the TSU LOS.

b. The first step in boresighting is to set up three targets: a center target placed at 0 azimuth with reference to the helicopter, one 90 degrees left, and one 90 degrees right. The TSU has mounting accommodations for a tool called the TSU boresight device. This device has three tapered holes that receive a standard Army borescope and is used to accurately locate the three targets in relation to the helicopter centerline and roll axis. The borescope is inserted mto the forward-looking hole in the TSU borescope device and the center target (foldout FO-11, sheet 3) is moved until the intersection of the crosshairs in the borescope reticle is coincident with the intersection of the crosshairs of the TSU borescope device target. The boresight device target is located vertically the same distance above the TSU optics target (foldout FO-11, sheet 3) as the TSU boresight device is above the center of the TSU lens. This location insures an accurate placement of all three targets (foldout FO-11, sheet 3). The borescope is placed in the left tapered hole and then in the right tapered hole in the TSU borescope device; the 90-degree left target and the 90-degree right target are located in the same way.

c. For boresighting, degrees of arc are measured in mils. A mil is the 6400th part of a circle; thus, 1 degree equals 6400 divided by 360, or 17.77 mils. The targets must be placed 1000 units of measure from the helicopter, so that a deviation of one unit of measure at 1000 units of measure distance equals 1 mi1 of angular displacement. The targets described in this manual are dimensioned for a 1-inch unit of measure. Therefore, the targets must be located 1000 inches, or 83 feet 4 inches, forward, left and right of the TSU boresight device.

d. To allow accurate azimuth bearing measurements, the three targets must be aligned to the plane of the TSU boresight device on the front of the helicopter within ±1/2 degree, or ±8.9 mils. Since the degree may therefore not be at true vertical, a plumb bob cannot be used to make the targets vertical; rather, a gunner's quadrant is placed on the TSU boresight device, with the bubble perpendicular to the centerline of the helicopter. The bubble is leveled and the gunner's quadrant is transferred to the center target, where the target is adjusted until the bubble is level when it parallels the horizontal line of the TSU optics target. The gunner's quadrant is then placed on the TSU boresight device with the bubble parallel to the centerline of the helicopter. The bubble is again leveled and the gunner's quadrant is transferred to the right target and then to the left target, and each target is adjusted until the bubble is level when it parallels the horizontal line of the TSU optics target.

e. The next boresighting step is to mechanically align the linkage rails in azimuth. The LOD upper plate (the rail clamp base) is rotated until the 0-degree position is obtained and locked (the 0° line on the rail clamp base is aligned with the notch on the swivel pad under this rail clamp base and secured in this position by inserting the alignment pin through the hole in the rail clamp base and into the mating 0-degree hole in the swivel pad); the LOD azimuth locking knob is then tightened. .This action parallels the borescope adapter to the indentations for the gunner linkage rails. Then the LOD is attached to the forward end of the gunner rails, with the bubble level forward, and the T-bars are tightened. The borescope adapter is now parallel to the gunner rails. The borescope is inserted in the adapter and LOD elevation is adjusted until only the gunner HSS target is visible. The vertical crosshairs of the target and the borescope must coincide. To adjust the linkage in azimuth and provide coincidence, the nut on the bottom of each of the mounting-bracket studs must be

loosened so the serrated cuts in the rail support can be moved in relation to the serrations in the square washers. The choice of which support to adjust should be made so as to keep the slots in the rail supports centered. The serrations provide adjustments in 1-mil increments. The mechanical azimuth should be made as accurate as possible to minimize crosscoupling in subsequent electrical azimuth adjustments. Use care when tightening the nuts to insure that the serrations are matched. Check the alignment with the borescope before removing the LOD. The pilot rails are adjusted in like manner, using the borescope to sight on the pilot HSS target, except that the LOD rail clamp base is secured in the 5.5-degree position for alignment of the pilot linkage in XM136.

f. The next boresighting step is to align the rails to the roll axis of the helicopter. The bubble level on the LOD is used to accomplish this alignment. The bubble level has a 5-minute bubble; that is, each mark on the bubble represents 5 minutes of a degree; 5/60ths equal 1/12th degree, which equals 1.48 mils. The LOD is used to transfer the roll position of the TSU boresight device to the linkage rails. The LOD is placed on the TSU boresight device, with the bubble facing forward, and the thumbscrews are adjusted to carefully center the bubble. The LOD is carefully attached to the forward and then the aft end of the gunner and pilot rails, and the rails are adjusted at each end to center the bubble. (The LOD rail clamp base is secured to the 5.5degree position for the pilot linkage in HSS XM136 and in the 0-degree position for the other linkages.) The mechanical adjustments are now complete.

NOTE

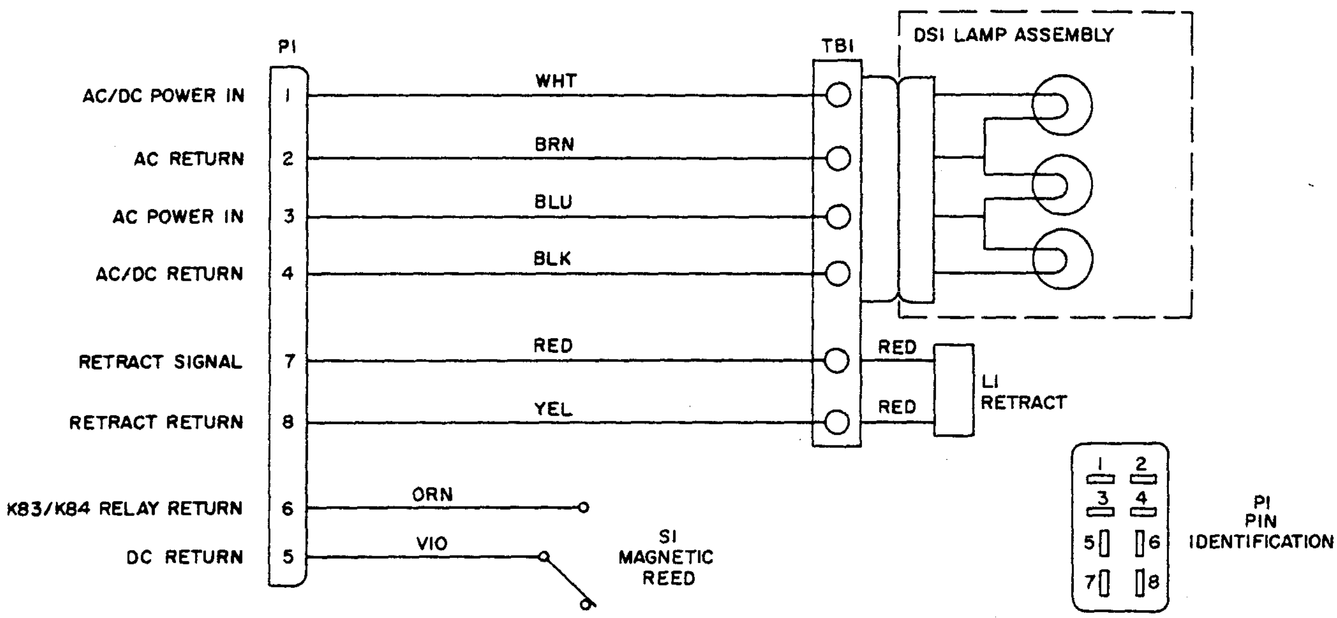
Before power is applied, each of the four boresight potentiometers on the EIA must be set to the approximate midpoint of its limits.

g. The remaining boresighting adjustments are accomplished with the HSS operating. The LOD is carefully attached to the forward end of the gunner rails with the level forward, and the gunner linkage is attached to the magnet on the LOD. The LOD elevation and azimuth locks are slightly loosened and the borescope is inserted in the LOD adapter. The LOD is moved as required to center the borescope crosshairs on the gunner HSS target of the center target. When the borescope is centered on the target, the LOD elevation and azimuth locks are tightened, and the borescope is removed. An operator sighting through the TSU and setting the ACQ TRK STOW switch to ACQ should see the TSU crosshairs centered on the TSU optics target. If the TSU crosshairs are not aligned, the electrical output signals of the HSS must be altered slightly to provide coincidence.

h. Refer to figure 4-7. Step A shows a typical plot of the elevation discrepancies recorded at the two 90-degree positions. Note that a straight line between the 90-degree positions does not pass through the center point. This example represents a composite of roll error (the ends are not parallel to the reference lines established by the targets) and the pitch error (the three points are not in the same plane). The goal of the adjustments is to make corrections until the sighting points plot as shown in step D of figure 4-7. The roll adjustment is made first by rotating the roll adjustment screws at each end of the linkage rails in l/4-turn (90-degree) increments. It is important to turn the screws at each end in equal amounts to maintain the rail ends parallel to each other while flattening the roll plane to bring the sightings level, as shown in step B of figure 4-7. Note that the three sightings are not yet in the same plane. Adjustment of resolver B1 in the linkage affects only the center sighting and is called the pitch adjustment. Therefore, the next adjustment is to raise the center sighting point by adjusting the worm sector attached to the body of resolver B1. The worm sector provides a l-in-l7 gear reduction and a resolver body travel of ±20 degrees minimum. When the pitch error has been corrected, the typical pattern should look like step C in figure 4-7. The next step is to correct the elevation of all three by adjusting the EL potentiometer on the EIA until the three sightings are in the same plane, as shown in step D in figure 4-7. The final step is to correct azimuth (if necessary) by adjusting the AZ potentiometer on the EIA. The methods for the pilot linkage are the same except that the LOD rail clamp base is secured in the 5.5-degree position for the pilot's rails in HSS XM136.

1-24. HSS Boresighting Theory. AH-1S E M.

Refer to TM 9-1090-206-30, Aviation Intermediate Maintenance Manual for Armament Subsystem, Helicopter: 20-mm Automatic Gun, XM97E1, for composite boresighting procedures.



NOTES:

1. XM128
REFERENCE DESIGNATIONS ARE ABBREVIATED. WHEN IDENTIFYING COMPONENTS, PREFIX THE COMPONENT DESIGNATION WITH THE UNIT DESIGNATION. THE UNIT DESIGNATION FOR THIS DRAWING IS A1 (AH-1S (MOD)).

2. XM136
REFERENCE DESIGNATIONS ARE ABBREVIATED. WHEN IDENTIFYING COMPONENTS, PREFIX THE COMPONENT DESIGNATION WITH THE UNIT DESIGNATION. THE UNIT DESIGNATION FOR THIS DRAWING IS 17A1 (AH-1S P E M).

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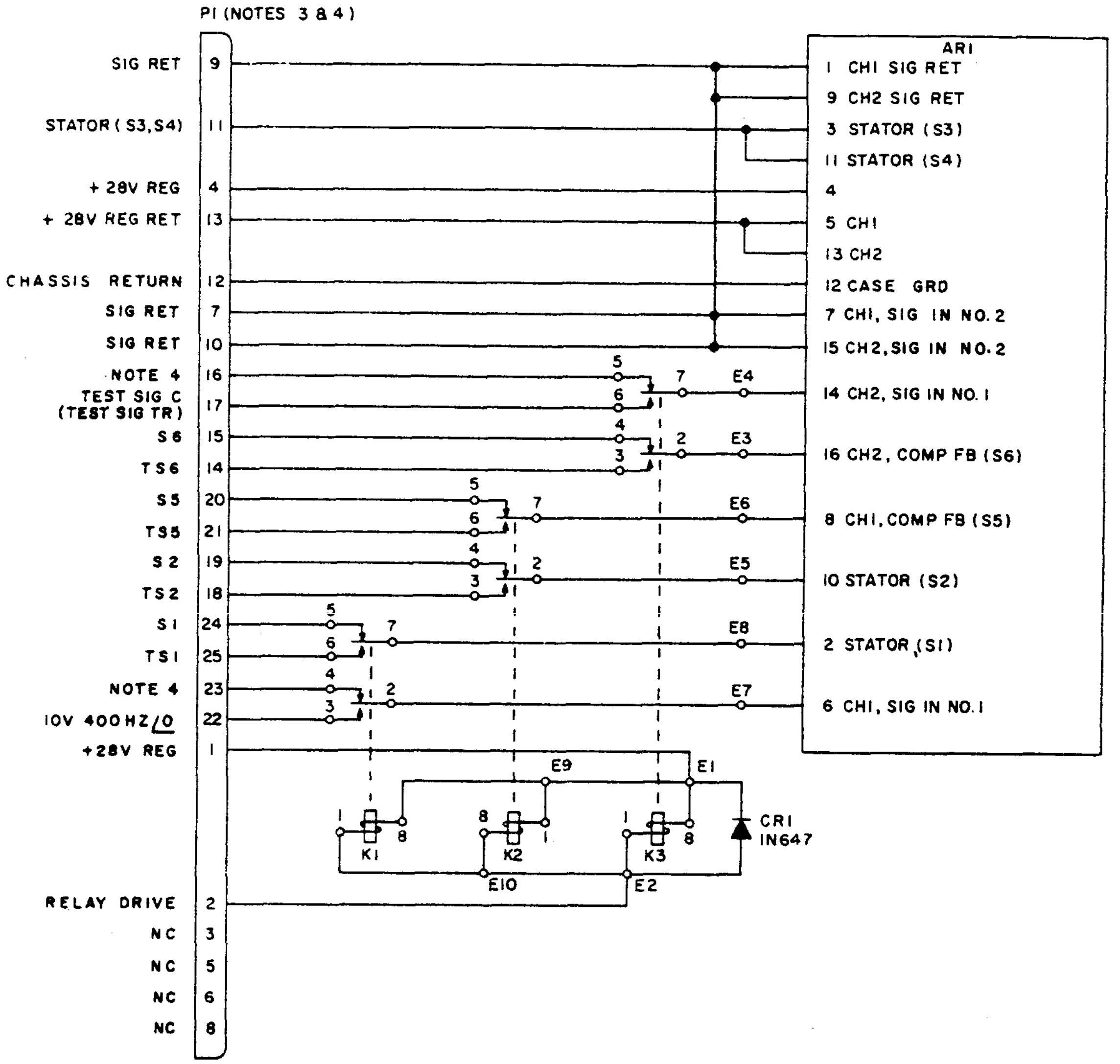
Figure 1-11. Helmet sight assembly - schematic diagram



NOTES:
1. ALL RELAYS ARE SHOWN IN THE DEENERGIZED POSITION.

2A. XM128
REFERENCE DESIGNATIONS ARE ABBREVIATED. WHEN IDENTIFYING COMPONENTS, PREFIX THE COMPONENT DESIGNATION WITH THE UNIT DESIGNATION. ALL UNIT DESIGNATIONS FOR THIS DRAWING ARE A4A1 THROUGH A4A8.

2B. XM136
REFERENCE DESIGNATIONS ARE ABBREVIATED. WHEN IDENTIFYING COMPONENTS, PREFIX THE COMPONENT DESIGNATION WITH THE UNIT DESIGNATION. THE UNIT DESIGNATIONS FOR THIS DRAWING ARE 17A1A1 THROUGH 17A1A8.

3. THIS IS A MULTI-USE SUBASSEMBLY. MATING CONNECTOR DESIGNATIONS VARY WITH EACH DIFFERENT LOCATION IN WHICH THE SUBASSEMBLY IS USED. THE CONNECTOR DESIGNATIONS FOR EACH LOCATION ARE J5, J6, J7, J8, J9, J10, J11, AND J12, EACH PREFIXED BY THE UNIT DESIGNATION STATED IN NOTE 2.

4. SIGNAL INFORMATION FOR THIS SUBASSEMBLY VARIES WITH EACH LOCATION IN WHICH THE SUBASSEMBLY IS USED. SEE APPROPRIATE EIA SCHEMATIC FOR SPECIFIC NOMENCLATURE.

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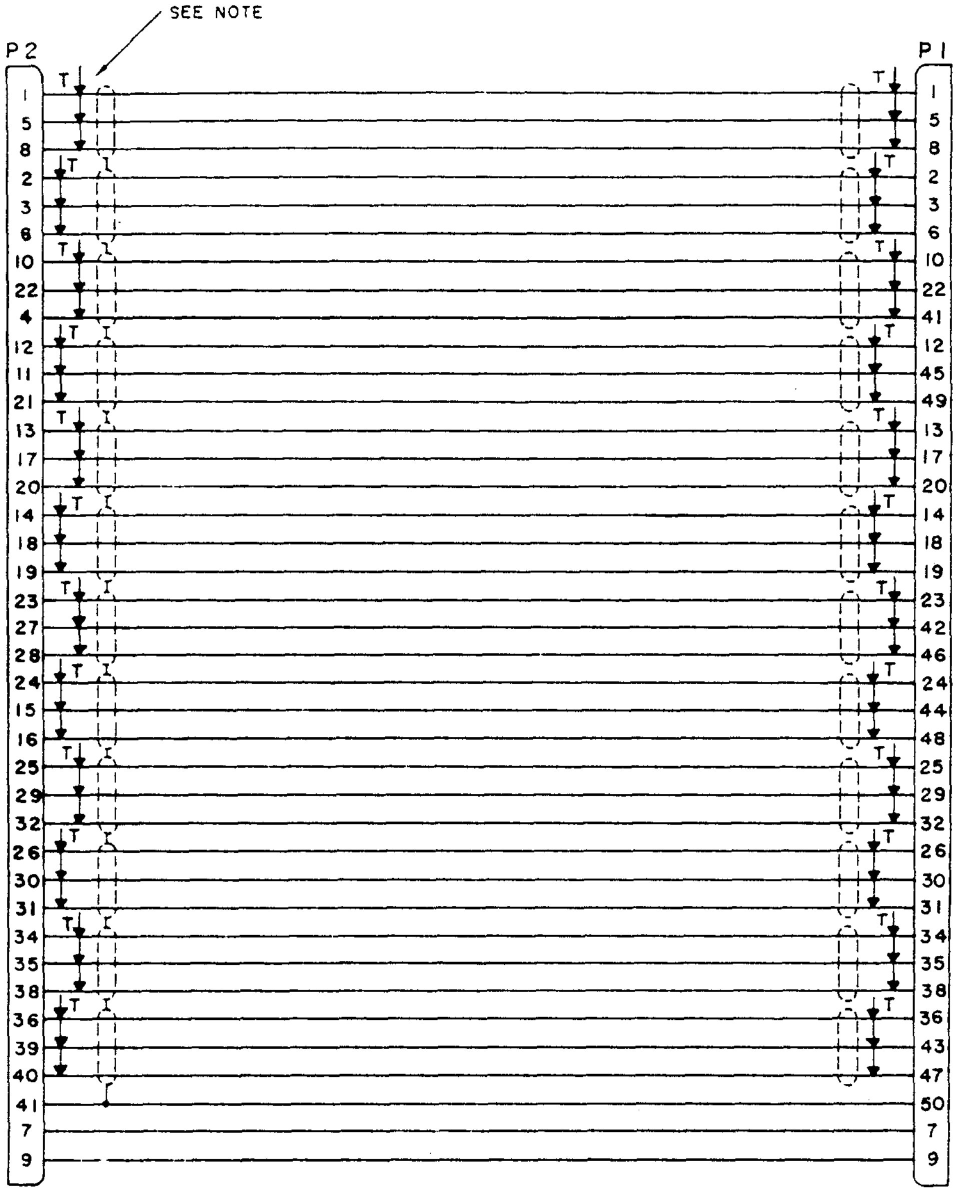
Figure 1-12. Buffer amplifier assembly A1 through A8 - schematic diagram



NOTE:

THIS SYMBOL INDICATES A TWISTED GROUP WITH A COMMON SHIELD OVER THE THREE INTERNAL WIRES.

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Figure 1-13. Extension cable W1 - schematic diagram

CHAPTER 2

OPERATING INSTRUCTIONS

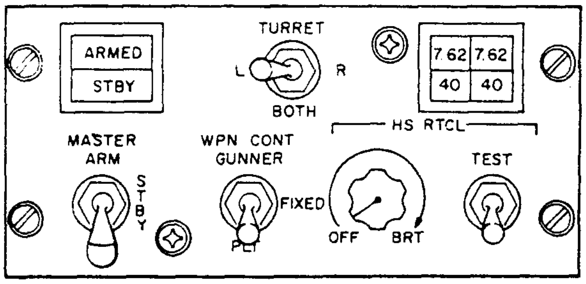
Section I. CONTROLS AND INDICATORS

2-1. General

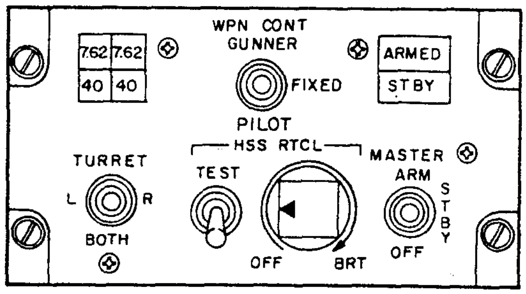
This section contains descriptions and illustrations of the helicopter controls and indicators used for HSS operation. None of the controls and indicators are part of the HSS, but they are directly associated with it. Although illustrations show complete groups of controls, only the applicable controls and indicators are described. Refer to TM 55-1520-234-10 for the location of the controls in the AH-lS(Mod) helicopter, and to TM 55-1520-236/239-10 for the location of the controls in the AH-1S P E M helicopters

2.2. Controls and Indicators.

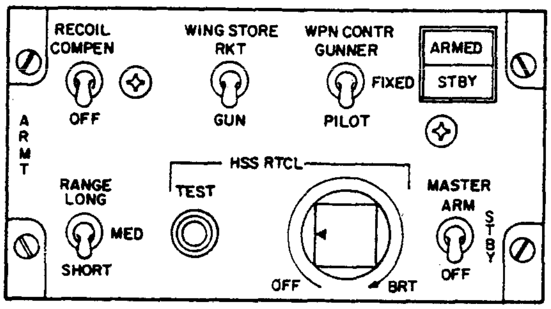
Each group of controls (for example, a control panel or control stick) is described in a separate table (tables 2-1 through 2-9) that gives the nomenclature and function of the controls and indicators that relate to HSS operation. An illustration of the group of controls (figs. 2-1 through 2-9) accompanies each table. Some of the groups of controls are identical in the AH-1S(Mod) helicopter and in the AH-1S P E M helicopter; where this is the case, the figure illustrating that group, and the supporting table, do not mention the helicopter models. The other groups of controls are very similar in both helicopter, differing only slightly in nomenclature or in location of identical controls, for each of these cases, the figure shows both the group for the AH-1S(Mod) helicopter and the group for the AH-1S P E M helicopter and the supporting table has a separate control-nomenclature column for each helicopter.



VIEW A. AH-1S (MOD)



VIEW B. AH-1S P



VIEW C. AH-1S E M

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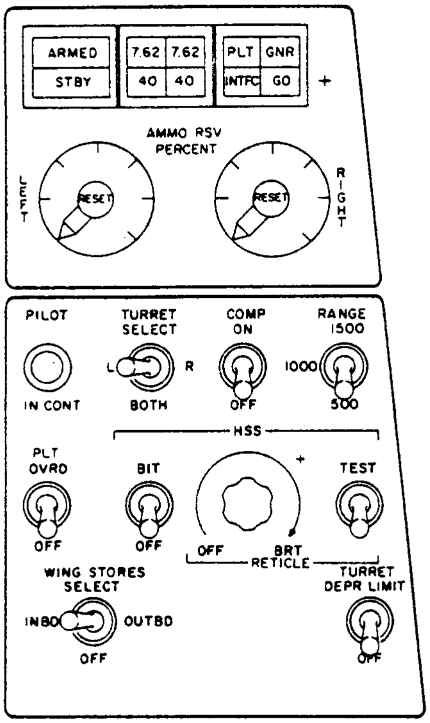
Figure 2-1. Pilot armament control panel

Table 2-1. Pilot Armament Control Panel – HSS Controls and Indicators

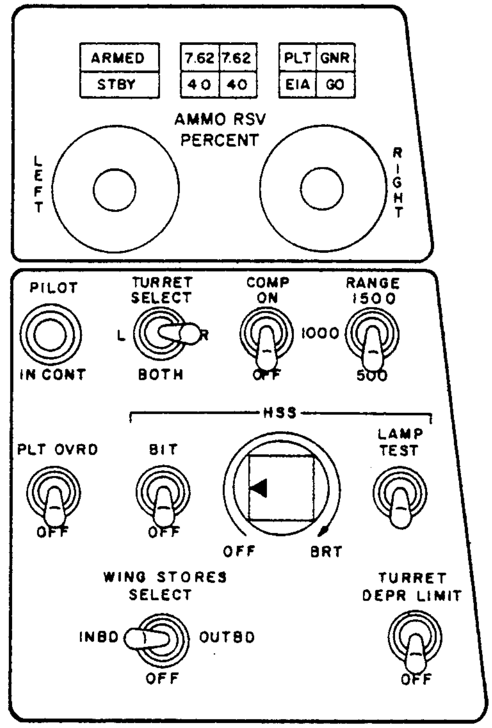
Nomenclature		Function
AH-1S(Mod) helicopter	**AH-1S helicopter P**	
MASTER ARM switch	MASTER ARM switch	Provides helicopter power to HSS.
HS RTCL OFF BRT control	HSS RTCL OFF BRT control	Varies intensity of reticle lighting from off to maximum brightness.
HS RTCL TEST switch	HSS RTCL TEST switch	In TEST, tests reticle lamps, changing the reticle lamp assembly from three lamps in parallel to series operation.
WPN CONT selector switch	WPN CONT selector switch	Gives control of weapon to pilot or gunner or keeps weapon in fixed position.
ARMED STBY indicator	ARMED STBY indicator	Indicates whether MASTER ARM switch is set to ARM or STBY. Pressing the indicator tests the lamps.

Table 2-1.1. Pilot Armament Control Panel – HSS Controls and Indicators E M

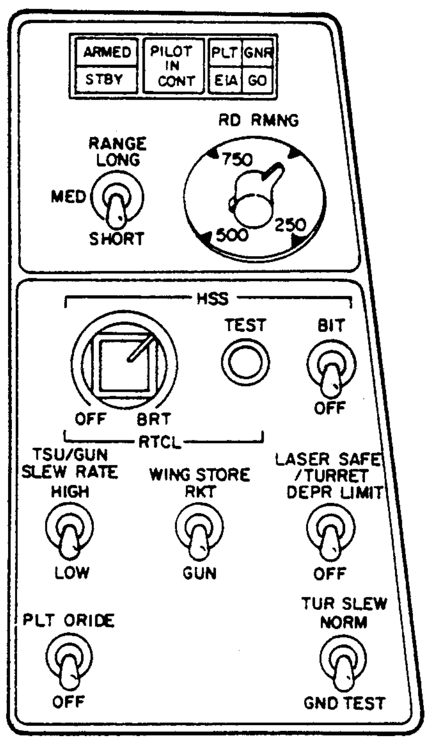
Nomenclature	Function	
MASTER ARM switch	OFF	– Deactivates all sights and weapon control/firing circuits.
	STBY	– Actuates all sights, turret, and TOW missile control circuits. Charges wing gun pod battery.
	ARM	- Activates all sights and weapon control/firing circuits. Charges wing gun pod battery.
WPN CONTR switch	PILOT	- Permits pilot to fire turret using HS and wing store (not TOW) using reflex sight.
	FIXED	– Permits pilot to fire turret and wing stores (not TOW) using reflex sight.
	GUNNER	– Permits gunner to fire turret using helmet sight or TSU and TOW using TSU.
HSS RTCL OFF BRIGHT switch	OFF	– Deactivates pilot HS reticle lamps.
	REMOTE	– Varies intensity of pilot HS reticle lamps.
HSS RTCL TEST switch	TEST	– Tests pilot HS reticle.
ARMED STBY indicator	ARMED	- Indicates MASTER ARM switch in ARM (amber light).
	STBY	– Indicates MASTER ARM switch in STBY (green light).
	Press	– Tests indicator lights.



VIEW A. AH-1S (MOD)



VIEW B. AH-1S P



VIEW C. AH-1S E M

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Figure 2-2. Gunner armament control panel.

Table 2-2. Gunner Armament Control Panel - HSS Controls and Indicators

Nomenclature		Function
AH-1S(Mod) helicopter (See view A, fig 2-2)	AH-1S helicopter P (See view B, fig 2-2)	
HSS BIT switch	HSS BIT switch	Initiates HSS built-in-test sequence.
PLT GNR INFO GO indicator	PLT GNR EIA GO indicator	Off during normal operation. For BIT test: PLT or GNR indicates linkage failure, INTFC (or EIA) indicates EIA failure, and GO indicates normal HSS operation. GO indicator is green; failure indicators, amber. When indicator is pressed for test, all four sections light.
PILOT IN CONT indicator	PILOT I N CONT indicator	Indicates pilot has control of turret.
PLT OVRD switch	PLT OVRD switch	In PLT OVRD position, pilot has been overridden and gunner has control of turret. Right hand grip switches are activated.
HSS TEST switch	HSS LAMP TEST switch	When held in TEST (or LAMP TEST), tests reticle lamps by changing from parallel to series power.
HSS RETICLE OFF BRT	HSS OFF BRT control	Varies intensity of gunncr helmet-sight reticle image.
TURRET DEPR LIMIT switch	TURRET DEPR LIMIT switch	Permits turret travel between minimum depression and maximum elevation.

Table 2-2.1. Gunner Armament Control Panel – HSS Controls and Indicators E M

(See view C, fig 2-2)

Nomenclature	Function
ARMED STBY indicator	ARMED - Indicates pilot MASTER ARM switch in ARM (amber light). STBY – Indicates pilot MASTER ARM switch in STBY (green light). Press – Tests indicator lights.
PILOT IN CON indicator	Indicates pilot has control of turret.
PLT GNR EIA CO indicators	PLT – Indicates failure in pilot HSS. GNR – Indicates failure in gunner HSS. EIA - Indicates failure in electronics interface assembly. GO - Indicates HSS operating properly. Press – Tests indicator lights.
HSS RETICLE OFF BRT switch	Varies intensity of gunner helmet-sight reticle image.
HSS BIT switch	Initiates HSS built-in-test sequence.
HSS RTCL TEST switch	Tests gunner HSS reticle.
LASER SAFE/TURRET DEPR LIMIT switch	Permits turret travel between minimum depression and maximum elevation.
PLT ORIDE switch	Overides pilot armament control panel. Permits gunner to fire turret using HSS, and wing stores (not TOW) without sight.

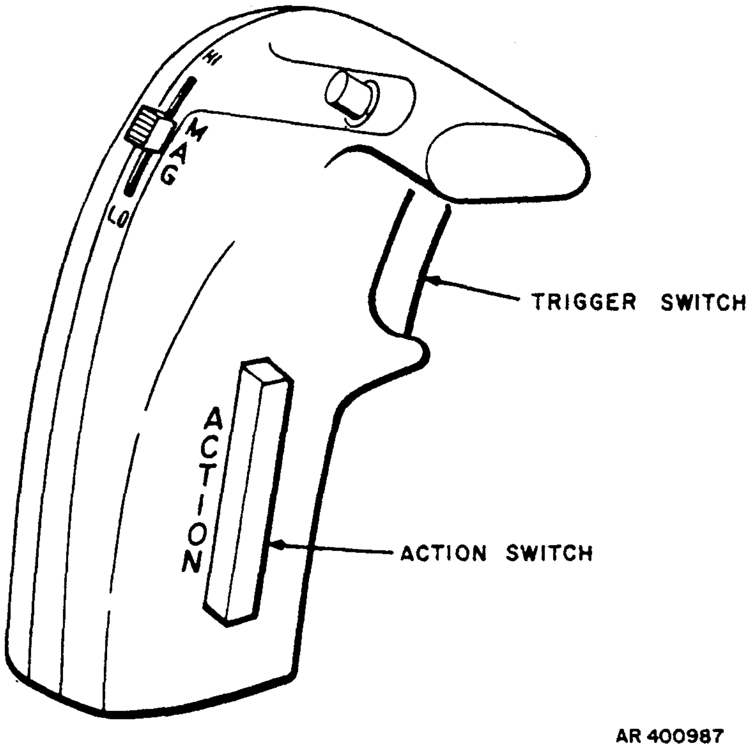
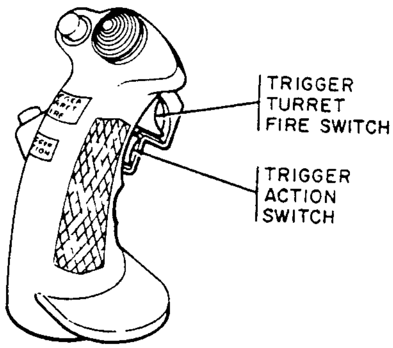


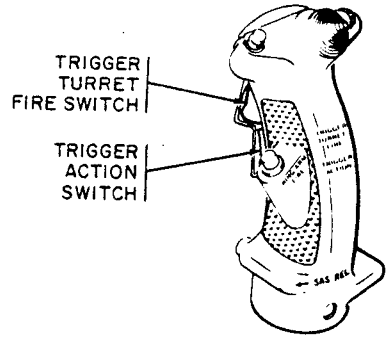
Figure 2-3. TSU left hand grip

Table 2-3. TSU Left Hand Grip – HSS-Associated Controls

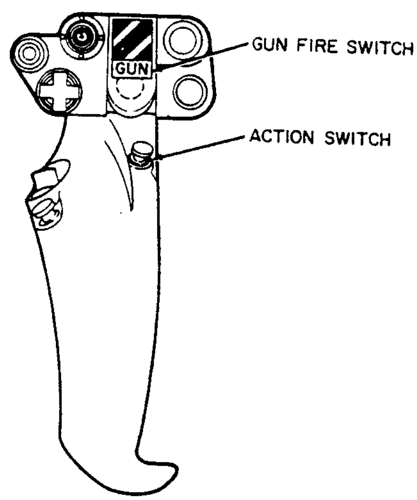
Nomenclature	Function
ACTION switch	Enables gunner to control turret.
TRIGGER switch	Fires turret weapon.



VIEW A. AH-1S(MOD)



VIEW B. AH-1S P E



VIEW C. AH-1S M

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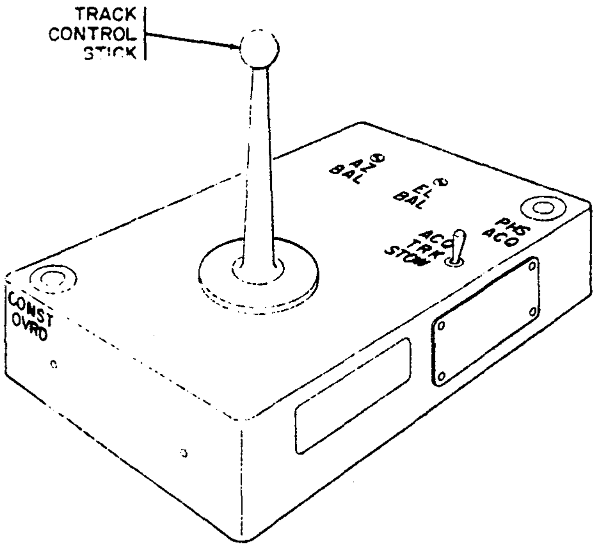
Figure 2-4. Cyclic stick grip

Table 2-4. Cyclic Stick Grip - HSS-Associated Controls

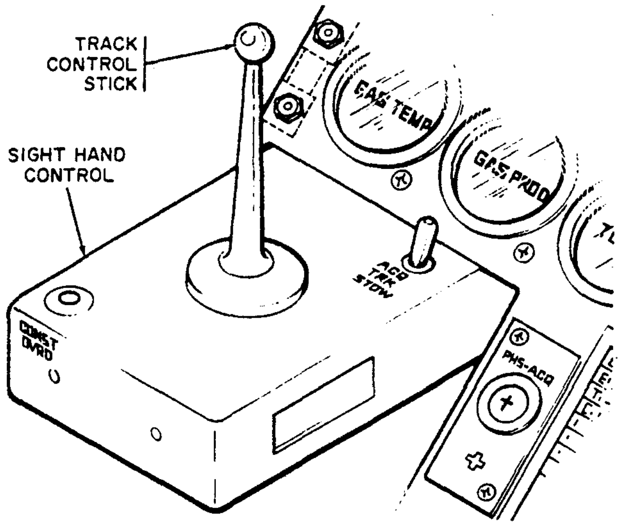
Nomenclature	Function
Pilot Grip	
TRIGGER ACTION switch	Enables pilot to control turret.
TRIGGER TURRET FIRE switch	Fires turret weapon.
Gunner Grip	
TRIGGER ACTION switch	Enables gunner to control turret in pilot override mode.
TRIGGER TURRET FIRE switch	Enables gunner to fire weapon in pilot override mode.

Table 2-4.1. Cyclic Stick Grip - HSS-Associated Controls

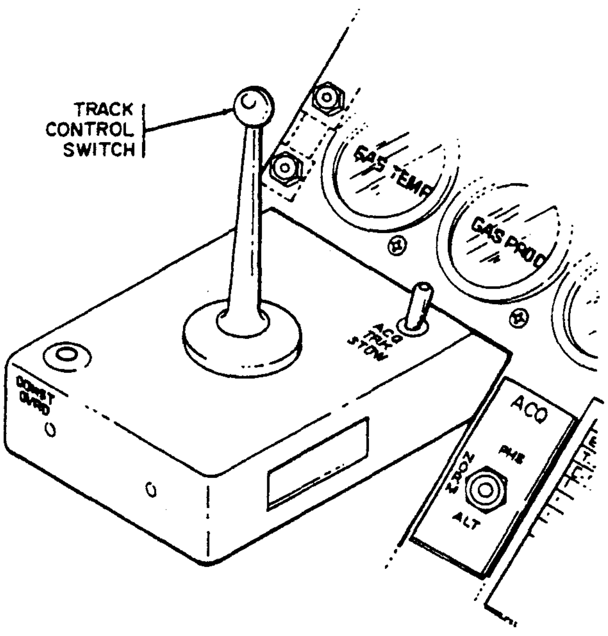
Nomenclature	Function
Pilot Grip	
ACTION switch	Enables pilot to control turret
GUN FIRE switch	Fires turret weapon
Gunner Grip	
ACTION switch	Enables gunner to control turret
GUN FIRE switch	Fires turret weapon



VIEW A. SIGHT HAND CONTROL, AH-1S(MOD)



VIEW B. GUNNER INSTRUMENT PANEL, AH-1S P E



VIEW C. GUNNER INSTRUMENT PANEL, AH-1S M

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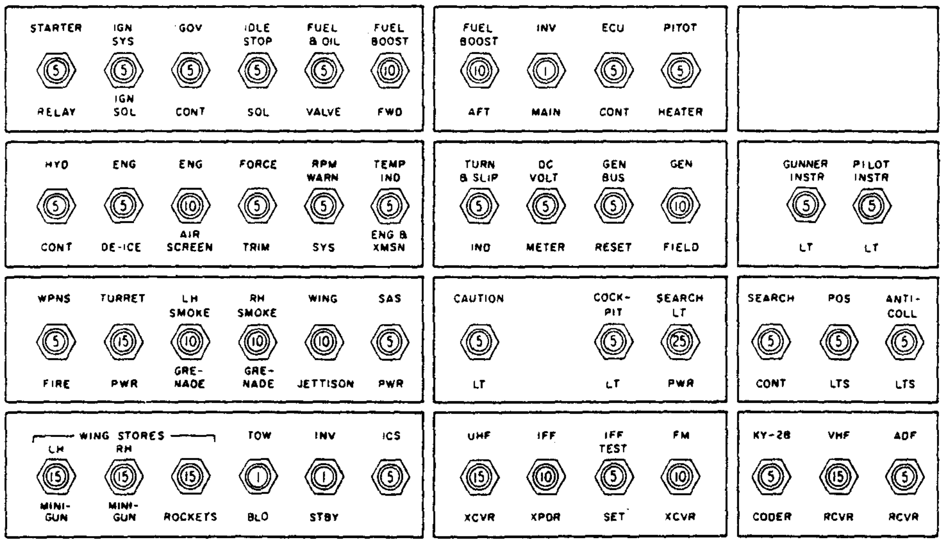
Figure 2-5. Sight hand control and phs ACQ swict

Table 2-5. Sight Hand Control and PHS ACQ Switch (AH-1S Helicopter (Mod)) P E
(See views A and B, fig 2-5)

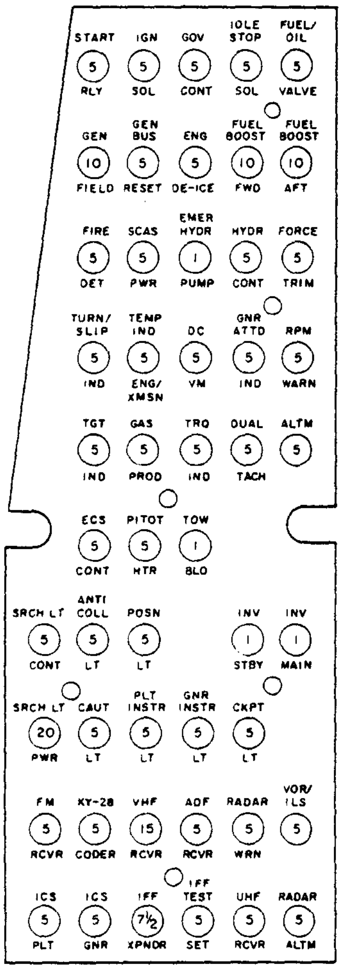
Nomenclature	Function
ACQ TRK STOW switch	In ACQ, slaves TSU to gunner helmet sight for target acquisition. In TRK, enables track control stick to position TSU and permits pilot to perform target acquisition. In STOW, stows TSU dead ahead.
PHS ACQ switch	When pressed, slaves TSU to pilot helmet sight for target acquisition.
Track control stick	When enabled, positions TSU in azimuth and elevation.

Table 2-5.1. Sight Hand Control and PHS ACQ Switch M
(See view C, fig 2-5)

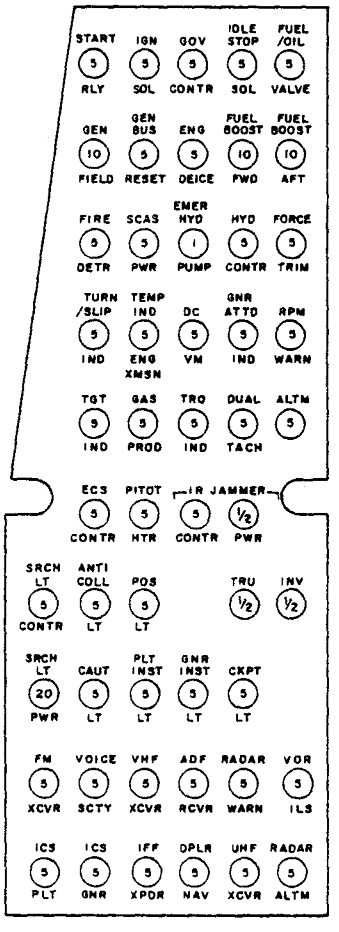
Nomenclature	Function
ACQ TRK STOW switch	In ACQ, slaves TSU to gunner helmet sight for target acquisition. In TRK, enables track control stick to position TSU and permits pilot to perform target acquisition. In STOW, stows TSU dead ahead.
ACQ switch	When pressed, slaves TSU to pilot helmet sight for target acquisition.
Track control stick	When enabled, positions TSU in azimuth and elevation.



VIEW A. AH-1S (MOD)



VIEW B. AH-1S P



VIEW C. AH-1S E M

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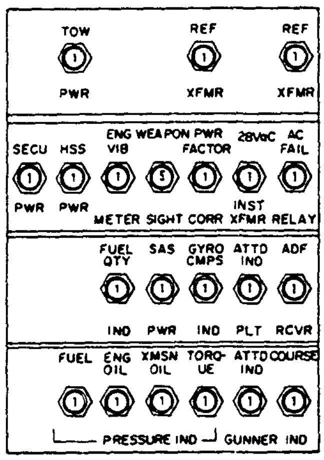
Figure 2-6. DC circuit breaker panel

Table 2-6. DC Circuit Breaker Panel – HSS-Associated Controls

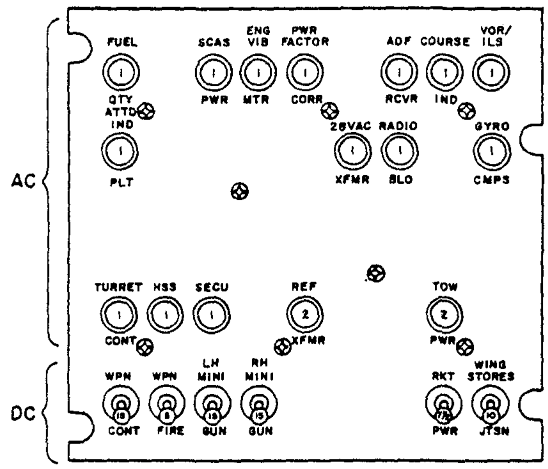
Nomenclature		Function
AH-lS(Mod) helicopter (See view A, fig 2-6)	AH-lS helicopter P (See view B, fig 2-6)	
INV MAIN circuit breaker	INV MAIN circuit breaker	Applies 400-Hz power from inverter and protects circuits.
DC VOLT METER circuit breaker	DC VM circuit breaker	Applies power to dc voltmeter and protects circuits.
GEN BUS RESET circuit breaker	GEN BUS RESET circuit breaker	Applies basic helicopter power and protects circuits.
GEN FIELD circuit breaker	GEN FIELD circuit breaker	Applies basic helicopter power and protects circuits.
CAUTION LT circuit breaker	CAUT LT circuit breaker	Applies power to caution light and protects circuit.
WPNS FIRE circuit breaker	See WPN FIRE circuit breaker on figure 2-7.	Applies helicopter power used to fire weapons and protects circuits.
TURRET PWR circuit breaker	See WPN CONT circuit breaker on figure 2-7.	Applies helicopter power to maneuver turret and protects circuits.

Table 2-6.1. DC Circuit Breaker Panel – HSS-Associated Controls E M
(See view C, fig 2-6)

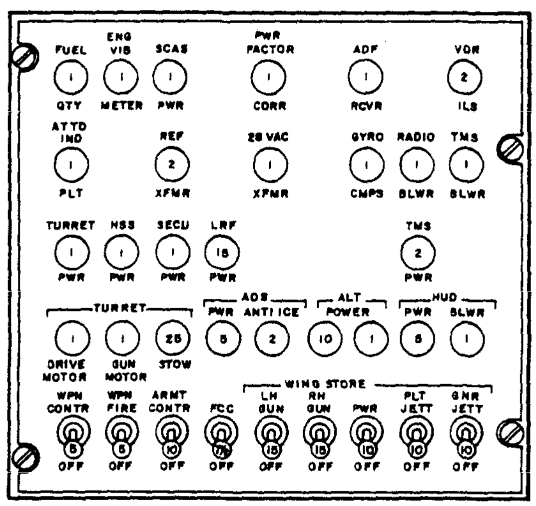
Nomenclature	Function
IV circuit breaker	Applies 400-Hz power from inverter and protects circuits.
DC VM circuit breaker	Applies power to dc voltmeter and protects circuits.
GEN BUS RESET circuit breaker	Applies basic helicopter power and protects circuits.
GEN FIELD circuit breaker	Applies basic helicopter power and protects circuits.
CAUL LT circuit breaker	Applies power to caution light and protects circuit.
See WPN FIRE circuit breaker on figure 2-7.	Applies helicopter power used to fire weapons and protects circuits.
See WPN CONT circuit breaker on figure 2-7.	Applies helicopter power to maneuver turret and protects circuits.



VIEW A. AH-1S (MOD)



VIEW B. AH-1S P



VIEW C. AH-1S E M

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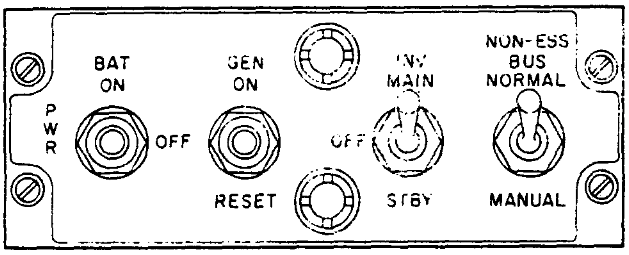
Figure 2-7. AC circuit breaker panel/AC and armament circuit breaker panel

Table 2-7. AC Circuit Breaker Panel (AH-1S(Mod) Helicopter) and AC and Armament Circuit Breaker Panel (AH-1S Helicopter) - HSS-Associated Controls

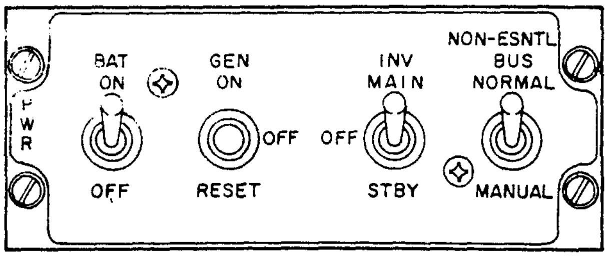
Nomenclature		Function
AH-1S(Mod) helicopter	**AH-1S** helicopter P	
TOW PWR circuit breaker	TOW PWR circuit breaker	Applies TOW missile power and protects circuits.
REF XFMR circuit breakers (2)	REF XFMR circuit breaker	Applies boresight voltage to electronic interface assembly and protects circuits.
HSS PWR circuit breaker	HSS circuit breaker	Applies power to HSS and protects circuits.
WEAPON SIGHT circuit breaker	TURRET CONT circuit breaker	Applies ac helicopter power to maneuver turret and protects circuits.
See WPNS FIRE circuit breaker on figure 2-4.	WPN FIRE circuit breaker	Applies dc helicopter power used to fire weapons and protects circuits.
See TURRET PWR circuit breaker on figure 2-6.	WPN CONT circuit breaker	Applies dc helicopter power to maneuver turret and protects circuits.

Table 2-7.1. AC and Armament Circuit Breaker Panel (AH-1S E M helicopter) - HSS-Associated Controls

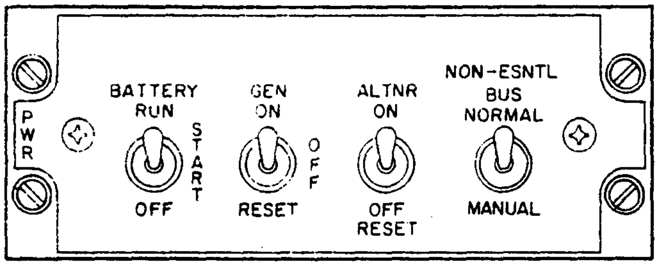
Nomenclature	Function
TMS PWR circuit breaker	Applies TOW missile power and protects circuits.
REF XFMR circuit breaker	Applies boresight voltage to electronic interface assembly and protects circuits.
HSS PWR circuit breaker	Applies power to HSS and protects circuits.
TURRET PWR circuit breaker	Applies ac helicopter power to maneuver turret and protects circuits.
WPN FIRE circuit breaker	Applies dc helicopter power used to fire weapons and protects circuits.
WPN CONTR circuit breaker	Applies dc helicopter power to maneuver turret and protects circuits.



VIEW A. AH-1S (MOD)



VIEW B. AH-1S P



VIEW C. AH-1S E M

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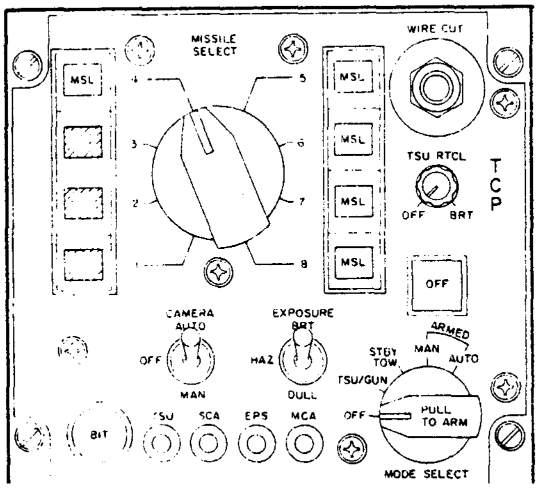
Figure 2-8. Electrical power control panel

Table 2-8. Electrical Power Control Panel – HSS-Associated Controls

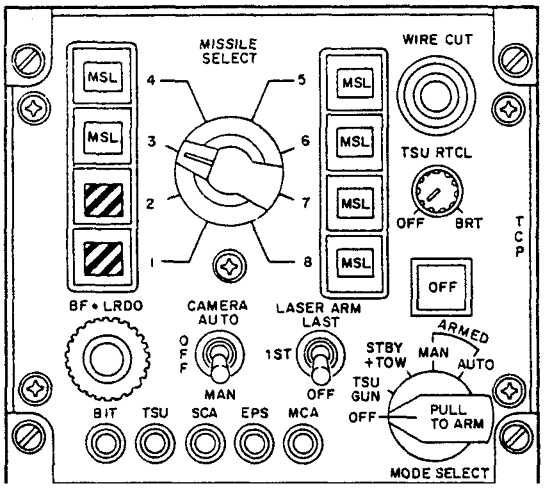
Nomenclature: AH-1S(Mod) helicopter	Nomenclature: AH-1S helicopter P	Function
BAT switch	BAT switch	Applies battery power.
INV switch	INV switch	Actuates inverter, which supplies 400-Hz power for armament subsystem.
NON-ESS BUS switch	NON-ESNTL BUS switch	Controls power for all armament subsystems.

Table 2-8.1. Electrical Power Control Panel – HSS-Associated Controls E M
(See view C, fig 2-8)

Nomenclature	Function
BATTERY switch	Applies battery power.
ALTNR switch	Applies power to alternator.
NON-ESNTL BUS switch	Controls power for all armament subsystems.



VIEW A. AH-1S (MOD), P E



VIEW B. AH-1S M

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Figure 2-9. TOW control panel (located on gunner instrument panel)

Table 2-9. TOW Control Panel - HSS-Associated Controls

Nomenclature	Function
MODE SELECT switch	Selects TSU mode.

Section II. OPERATIONAL CHECKS

2-3. General.

The operational checks test the HSS and the associated armament subsystem. Refer to figures 2-1 through 2-15 for locations of switches, circuit breakers, and other controls.

2-4. Preliminary Switch Settings.

Before turning on the armament subsystem, set the associated panel switches as follows:

a. On the electrical power panel, set the INV switch to MAIN or STBY (AH-1S(Mod) and AH-IS P helicopters) or ALTNR to ON (AH-1 S E M helicopters).

b. On the dc circuit breaker panel, press the following circuit breakers:

AH-1Q/AH-lS(Mod) helicopter	AH-1S P helicopter
INV MAIN	INV MAIN
DC VOLT METER	DC VM
GEN BUS RESET	GEN BUS RESET
GEN FIELD	GEN FIELD
WPNS FIRE	CAUT LT
TURRET PWR	
CAUTION LT	

AH-1S(E M) helicopter
INV
DC VM
GEN BUS RESET
GEN FIELD
CAUT LT

c. On thc ac circuit breaker panel (in the AH-lS(Mod) helicopter) or ac and armament circuit breaker panel (in the AH-1S P E M helicopters), press the following circuit breakers.

AH-1S(Mod) helicopter	AH-1S P helicopter
TOW PWR	TOW PWR
REF XFMR (2)	REF XFMR
HSS PWR	HSS
WEAPON SIGHT	TURRET CONT
	WPN CONT
	WPN FIRE

AH-1S(E M) helicopter
REF XFMR
TURRET PWR
HSS PWR
TMS PWR
WPN CONTR
WPN FIRE

d. Connect an external 28-volt power and hydraulic supply to the helicopter. Refer to TM 55-1520-234-10 for the AH-1S(Mod) helicopter. and to TM 55-1 520-236/239-10 for the AH-1S P E M helicopters.

2-5. Built-in-Test (BIT) Procedures.

NOTE

The procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-lS(Mod) and AH-1S P E M helicopters, the basic nomenclature used is that for the AH-1 S(Mod) heli - copter and the nomenclature for the AH-1S P E M helicopters follows, in parentheses and prefixed with an "or;" for example, "HS RTCL OFF BRT (or HSS RTCL OFF BRT)" in a below.

a. On the pilot armament control panel, set the switches as follows:

MASTER ARM to OFF

WPN CONT (or WPN CONTR) to GUNNER

TURRET to BOTH

HS RTCL OFF BRT (or HSS RTCL OFF BRT) to midpoint.

b. On the gunner armament control panel, set the switches as follows:

TURRET DEPR LIMIT (or LASER SAFE/TURRET DEPR LIMIT) to TURRET DEPR LIMIT

PLT OVRD (or PLT ORIDE) to OFF

HSS RETICLE OFF BRT (HSS RTCL OFF BRT or HSS OFF BRT) to midpoint.

c. Set the MODE SELECT switch on the TOW control panel to OFF.

d. On the electrical power control panel, set the switches as follows:

INV to MAIN (or ALTNR to ON)

BAT to ON (or BATTERY to RUN).

NON-ESS BUS (or NON-ESNTL BUS) to NORMAL.

e. Check that the ELEC PWR EMER OFF switch on the gunner left pedestal panel (or gunner's miscellaneous panel), just forward of the collective stick, is set to ELEC PWR.

f. Press the stow position latches and remove the pilot and gunner linkage arm assemblies from the stow brackets as shown in figure 2-10. Place the linkage arm assemblies in the BIT stow positions by attaching the linkage arm assembly connectors to the magnetic BIT stow receptacles as shown in figure 2-11.

g. Set the MASTER ARM switch on the pilot armament control panel to STBY.

h. Press the ARMED STBY indicator on the pilot armament control panel and the gunner armament control panel and press the PLT GNR INTFC GO (or PLT GNR EIA GO) indicator on the gunner armament control panel. All sections of the indicator light.

i. Allow 15 seconds for warmup, and then actuate the HSS BIT switch on the gunner armament control panel. The GO indicator lights for 5 to 10 seconds. If a failure indicator lights, insure that the linkage assemblies are properly attached to the BIT magnets, check all cable

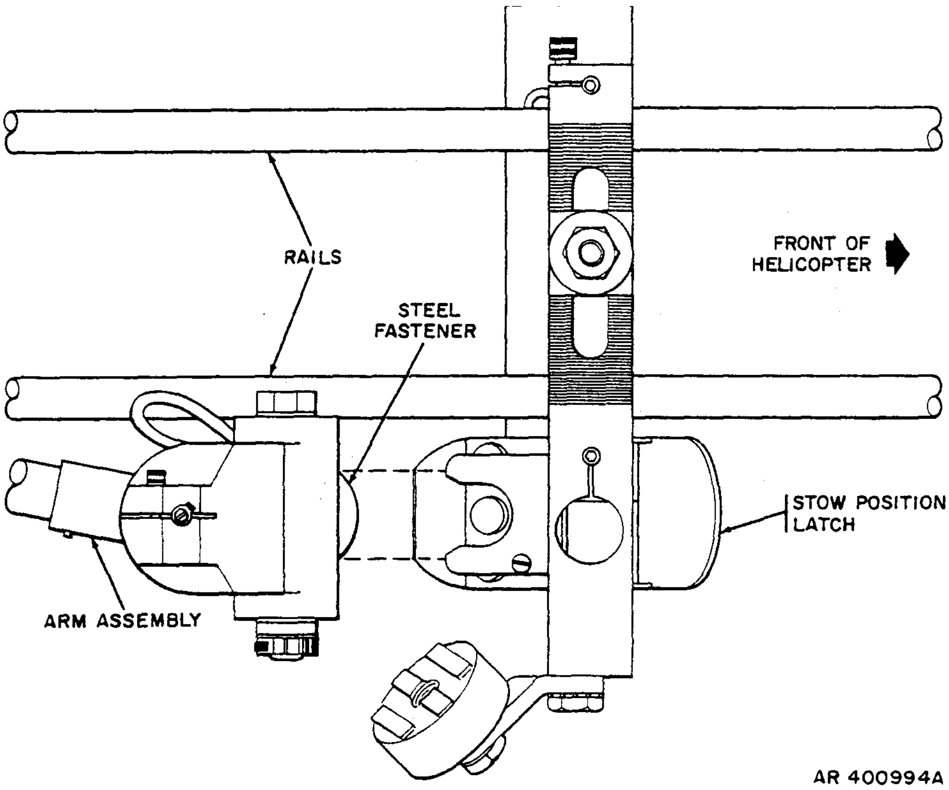

Figure 2-10. Linkage assembly - use of stow position

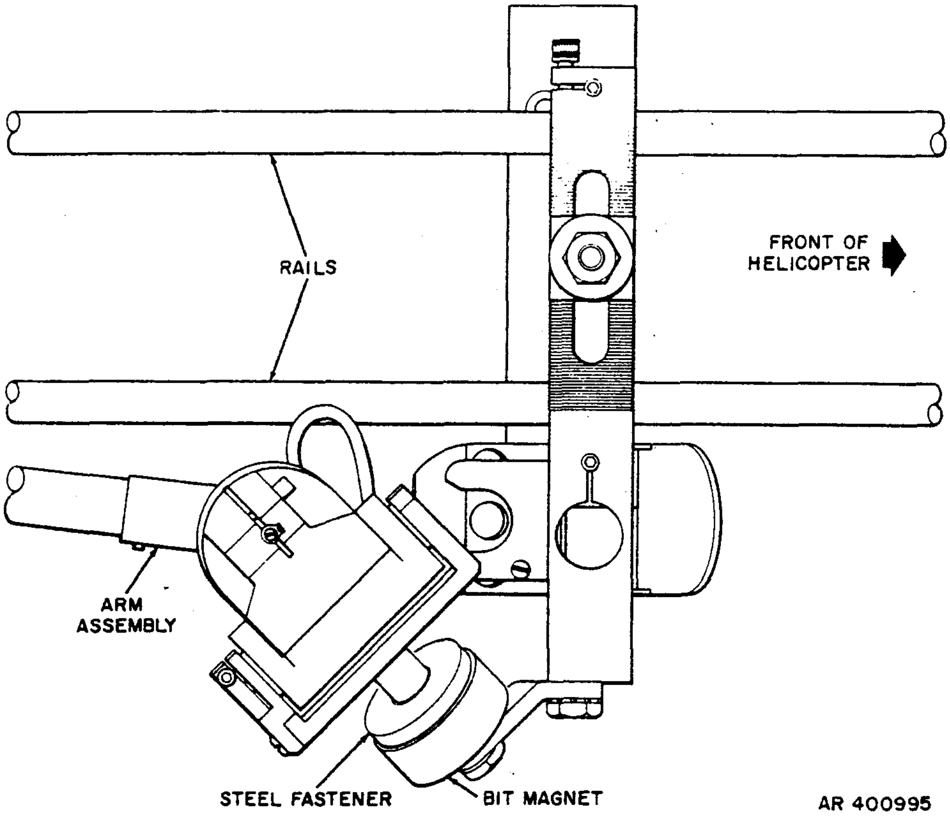

Figure 2-11. Linkage assembly - use of BIT position

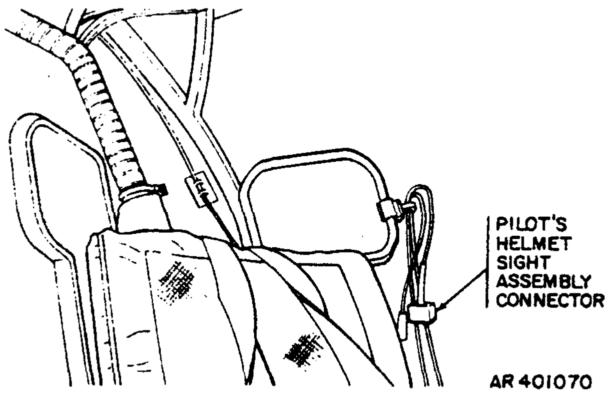

Figure 2-12 Locatoin of pilot's connector for helmet sight assembly cable

connections, and actuate the HSS BIT stitch again. If the failure persists, perform the corrective action given in table 3-4.

NOTE

A factory replacement linkage or arm installed in an XM136 system will probably not pass a BIT test until after boresighting is complete.

2-6. HSS Operational Checks.

NOTE

In the procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-lS(Mod) and the AH-1S P E M helicopters, the basic nomenclature used is that for the AH-IS(Mod) helicopter and the nomenclature for the AH-1S P E M helicopters follows, in parentheses and prefixed with an "or;" for example, "HS RTCL OFF BRT (or HSS RTCL OFF BRT)" in a(4) below.

a. *Reparation of Pilot and Gunner Helmet Sights.*

(1) The helmet sight assembly has a cable that terminates in an eight-pin connector. Attach this connector to the connector jack on the side of the seat (pilot, left side; gunner, right side) in the same clip as the communications connector, as shown for the pilot in figure 2-12.

(2) Put on the helmet, making sure it is positioned comfortably and the chin strap is securely fastened.

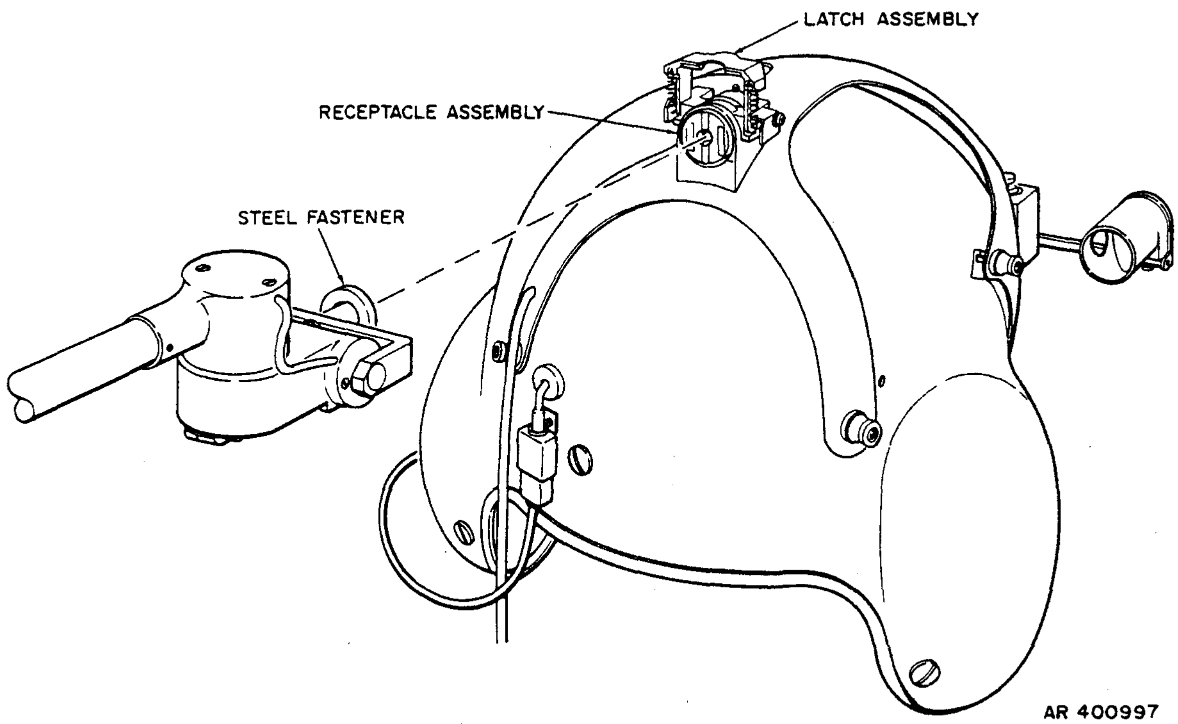

Figure 2-13. Attaching arm assembly to helmet sight assembly

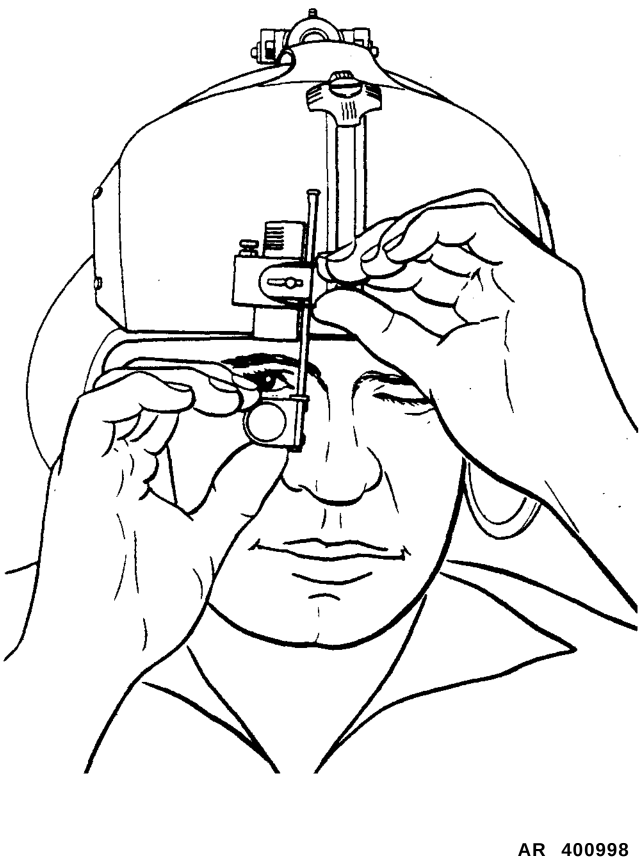

Figure 2-14. Adjusting eyepiece vertically

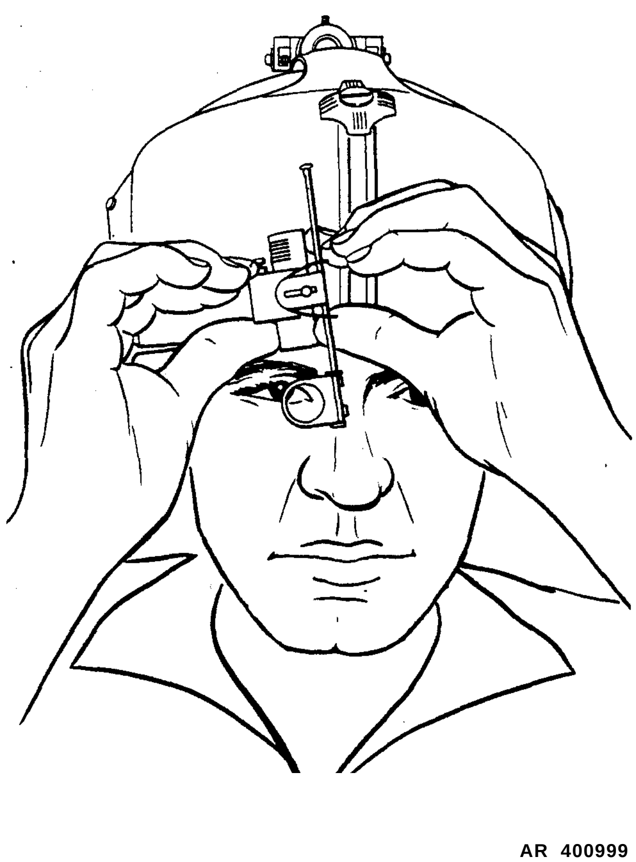

Figure 2-15. Adjusting eyepiece laterally

(3) Disconnect the linkage assembly fastener from the BIT position, or stow position, and attach it to the helmet sight assembly receptacle magnet as shown in figure 2-13. Close the latch around the fastener by pushing the mechanism back and down.

NOTE

The linkage must be connected to the helmet sight receptacle before the reticle will light or the gun turret will leave the stow position.

(4) Turn the HSS RTCL OFF BRT (or HSS RTCL OFF BRT) control on the pilot armament control panel (fig. 2-1) or the HSS RETICLE OFF BRT (HSS RTCL OFF BRT or HSS OFF BRT) control on the gunner armament control panel (fig. 2-2) to BRT (fully clockwise), rotate the sight into the field of view, and adjust the eyepiece laterally and vertically until the full reticle, including the outer ring, can be seen centered in the eyepiece outline. To adjust the eyepiece vertically (fig. 2-1.4), compress the ends of the spring lock with the left hand and move the eyepiece up or down with the right hand. To adjust the eyepiece laterally (fig. 2-15), grasp the sight housing firmly and apply enough rotational force to overcome the effect of the friction disk and cause the housing to rotate.

(5) Actuatc the HSS RTCL TEST (or HSS RTCL TEST) switch on thc pilot armament control panel (fig. 2-1) or the HSS RETICLE TEST (HSS RTCL TEST or HSS LAMP TEST) switch on the gunner armament control panel (fig. 2-2). The reticle remains lighted. If the reticle goes out, one or more of thc reticle lamps may have failed. For corrective action, refer to paragraph 3-10.

b. Checkout With Turret.

(1) Set the WPN CONT (or WPN CONTR) selector switch on the pilot armament control panel (fig. 2-1) to PLT (or PILOT) The pilot presses the ACTION switch on the cyclic stick grip and moves the helmet sight. The turret follows the pilot's head movements.

WARNING

Clear all personnel from gun turret area before proceeding.

(2) The pilot makes a rapid rotational head movement with the ACTION switch on the cyclic stick grip (fig. 2-4) pressed. The reticle flashes until the commanded gun line is coincident with the helmet line of sight.

(3) Set the WPN CONT (or WPN CONTR) selector switch on the pilot armament control panel (fig. 2-1) to GUNNER. Set the MODE SELECT switch on the TOW control panel (fig. 2-9) to OFF. The gunner presses the ACTION switch on the TSU left hand grip and moves the helmet sight. The turret follows the gunner's head move-movements.

(4) The gunner makes a rapid rotational head movement with the ACTION switch pressed. The reticle flashes until the commanded gun line is coincident with the helmet line of sight.

c. Checkout With TSU

(1) Set the MODE SELECT switch on the TOW control panel (fig. 2-9) to TSU/GUN (or TSU GUN). Wait for the PWR ON display to appear.

(1) Set the MODE SELECT switch on the TOW control panel (fig. 2-9) to TSU/GUN. Wait for the PWR ON display to appear.

(2) Hold the ACQ TRK STOW switch on the sight hand control (fig. 2-5) in ACQ.

(3) Move the helmet sight to sight on a target.

(4) Release the ACQ TRK STOW switch to TRK. The eyepiece retracts. Look into the TSU and observe that the same target is in the field of view.

(5) The gunner extends his helmet sight eyepiece.

(6) The pilot selects a target with his helmet sight and identifies the target for the gunner.

(7) The gunner presses and holds the PHS ACQ pushbutton (fig. 2-5). The gunner eyepiece retracts and the TSU slews to the pilot's target.

(8) The gunner releases the PHS ACQ pushbutton, and observes the pilot's target in the TSU field of view.

(9) Set the ACQ TRK STOW switch to STOW, the MODE SELECT switch to OFF. the MASTER ARM switch to OFF, the INV (or ALTNR) switch to OFF and the BAT (or BATTERY) switch to OFF. Disconnect hydraulic power and electrical power in accordance with TM 55-1520-234-23 (for the AH-1S(Mod) helicopter), or TM 55-1520-236/239-23 (for the AH-1S P E M helicopters).

Section III. BORESIGHTING THE HELMET SIGHT ASSEMBLY

2-7. General.

This section contains a description of the HSS organizational boresight kit and the procedures for boresighting the helmet sight assembly. These procedures cover boresighting with helicopter power and boresighting with the helmet boresight cable.

2-8. HSS Organizational Boresight Kit.

The HSS organizational boresight kit (fig. 2-16) consists of a container, a helmet boresight tool, and a helmet boresight cable. The complete kit weighs 10 pounds.

a. Container. The container is a lightweight, waterproof case for transporting and storing the items.

b. Helmet Boresight Tool. The helmet boresight tool has two functions:

(1) To test the magnetically operated reed switch in the helmet receptacle.

(2) To align the helmet receptacle with the reticle line of sight.

The helmet boresight tool consists of a tube with an eyepiece at one end and an aperture and magnetic connector at, the other. The connector mates with the helmet receptacle so that the line of sight of the tool is perpendicular to the mating surface of the receptacle magnet.

NOTE

If the boresight tool has been dropped or bent, misalignment may result. Refer to TM 9-4931-363-14&P for inspection and test procedure to verify accuracy of the boresight tool.

c. Helmet Boresight Cable. The helmet boresight cable is 12 feet long and connects the helmet sight assembly connector in the helicopter connector A1P1 on the helmet sight assembly. The cable allows the operators to boresight a helmet sight assembly outside the helicopter.

d. Socket-Head Screw Keys. Two 1/16-inch socket-head screw keys are provided to adjust the three socket-head screws in the helmet sight receptacle during helmet boresighting.

2-9. Helmet Boresighting.

NOTE

In the procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-1S(Mod) and the AH-1S P E M helicopters, the basic nomenclature used is that for the AH-1S(Mod) helicopter and the nomenclature for the AH-1S P E M helicopters follows, in parentheses and prefixed with an "or;" for example, "HSS RETICLE TEST (HSS RTCL TEST or HSS LAMP TEST)" in *d* below.

a. Perform the procedures of paragraph 2-4, except for the connection of hydraulic power. Insure that the MASTER ARM switch on the pilot armament control panel is set to STBY.

b. Connect the helmet cable connector (paragraph 2-6a(1)) and put on the helmet. Fasten the chin strap.

c. Attach the helmet boresight tool to the helmet magnetic receptacle.

d. Set the HSS RETICLE TEST (HSS RTCL TEST or HSS LAMP TEST) switch on the gunner armament control panel or the HS RTCL TEST (or HSS RTCL TEST) switch on the pilot armament control panel to TEST and observe that the reticle (fig. 2-17) is lighted. Adjust the appropriate OFF BRT control for the desired reticle brightness.

WARNING

In the step below, the second man must wear safety glasses while looking through the helmet boresight tool.

e. The operator, while seated in the gunner or pilot seat, sights on a distant target (1000 meters or more) through the helmet sight eyepiece; a second man stands by the open door and sights through the helmet boresight tool at the same target.

f. If the view through the helmet boresight tool is above, below, left, or right of the target (first column of table 2-10), loosen and then tighten the three adjustment

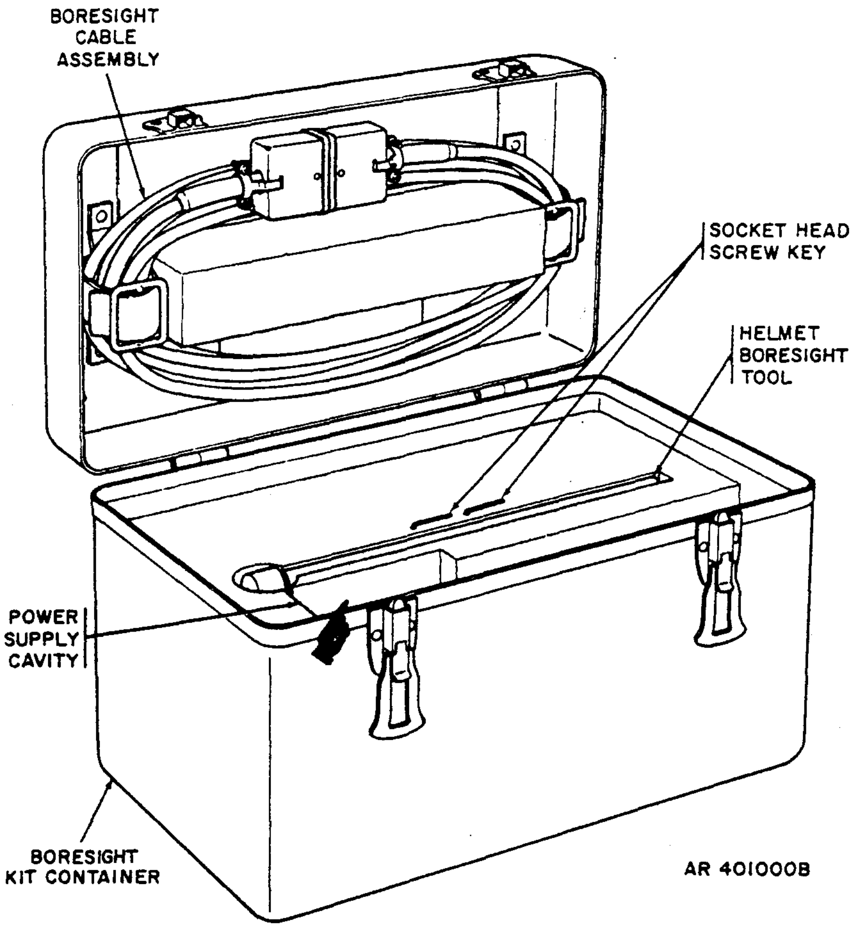

Figure 2-16. HSS organizational boresight kit

screws on the receptacle as specified in the second and third columns. Use a 1/16-inch socket-head screw key.

g. When the target seen through the helmet boresight tool is in line with the target seen through the helmet sight eyepiece, secure the adjustment screws and remove and store the helmet boresight tool.

Table 2-10. Helmet Boresight Adjustments

Position of view relative to target	Loosen	Tighten
Above	Top, left, and right	Top
Below	Top	Left and right
Left	Right	Left
Right	Left	Right

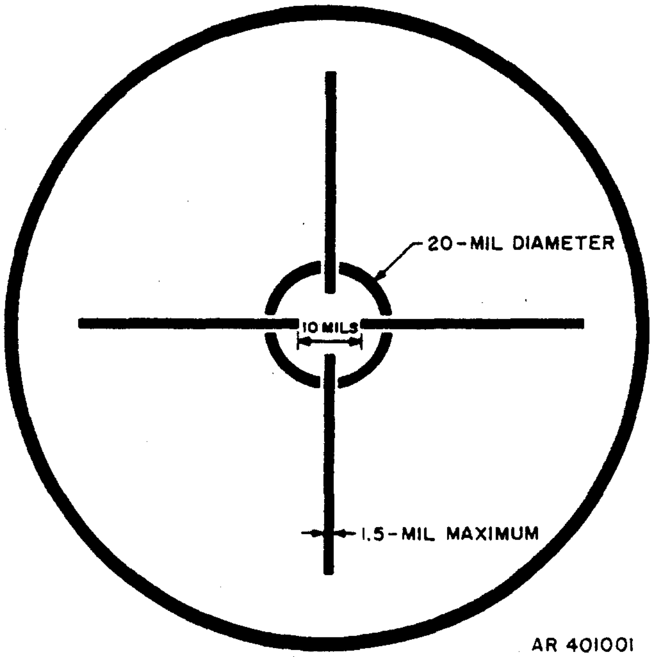

Figure 2-17. Reticle pattern

2-10. Helmet Boresighting Using the Helmet Boresight Cable.

This procedure allows boresighting of the helmet sight assembly by personnel seated outside the helicopter. The helmet wearer can sit on a chair or other convenient item.

Perform the procedures given in paragraph 2-9, except connect the helmet boresight cable between connector A1P1 of the helmet sight assembly and the mating connector (17P2 or 17P1).

Section IV. OPERATION UNDER USUAL CONDITIONS

2-11. General.

This section covers normal operation of the HSS for firing the gun turret.

2-12. Pilot's Operating Procedure.

NOTE

In the procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-1S(Mod) and AH-1S P E M helicopters, the basic nomenclature used is that for the AH-1S(Mod) helicopter and the nomenclature for the AH-lS P E M helicopters follows, in parentheses and prefixed with an "or;" for example, "PLT (or PILOT)" in d below.

a. Set the helicopter controls as stated in paragraph 24. Then set the MASTER ARM switch on the pilot armament control panel (fig. 2-1) to STBY.

b. Connect the helmet sight cable connector to the connector shown in figure 2-12.

c. Attach the linkage assembly steel fastener to the helmet sight receptacle as shown in figure 2-13, close the latch, and adjust the reticle lighting to the desired intensity.

WARNING

Do not engage a cyclic stick armament switch during any switching action on the armament control panels.

d Set the WPN CONT (WPN CONTR) switch on the pilot armamcnt control panel (fig. 2-1) to PLT (or PILOT).

e. Set the MASTER ARM switch to ARM.

WARNING

When firing a 40-mm, 20-mm, or 7.62-mm weapon, keep the sight on the target and the ACTION switch closed after trigger release until the gun stops firing.

When firing the turret weapon with the helmet sight, hold the sight steady on the target, press the TRIGGER ACTION (or ACTION) switch and then the TRIGGER TURRET FIRE (or GUN FIRE) switch on the cyclic stick grip (fig. 2-4). Holding the helmet sight reticle on the target causes the turret to continue to point at the target until one of the turret limits is reached (±110 degrees in azimuth +18 degrees, -60 degrees in elevation). At that point, the gun will cease to fire and the reticle will begin to flash, indicating an out-of-coincidence condition.

g. Set the MASTER ARM switch on the pilot armament control panel to STBY or to the off position.

h. After landing, set the WPNS FIRE and TURRET PWR circuit breakers on the dc circuit breaker panel (or the WPN FIRE and WPN CONT (or WPN CONTR) circuit breakers on the ac and armament circuit breaker panel) to the off position.

2-13. Gunner's Operating Procedure.

a. Direct the pilot to set the WPN CONT (or WPN CONTR) selector switch on the pilot armament control panel (fig. 2-1) to GUNNER and to set the MASTER ARM switch to STBY.

b. Connect the helmet sight cable connector to the gunner's connector (right side of seat).

c. Attach the linkage assembly to the helmet sight receptacle as shown in figure 2-13, close the latch, and adjust the reticle lighting to the desired intensity.

WARNING

Do not engage the TSU left hand grip ACTION switch during any switching action on the armament control panels.

d. Electrically bypass the TSU by setting the MODE SELECT switch on the TOW control panel to OFF or by setting the ACQ TRK STOW switch (fig. 2-5) to STOW.

e. Insure that the MASTER ARM switch is set to ARM.

f. Hold the sight steady on target.

g. Press the ACTION switch on the TSU left hand grip (fig. 2-3). The turret follows the sight.

WARNING

When firing a 40-mm, 20-mm or 7.62-mm weapon, keep the sight on the target and the ACTION switch closed after trigger release until the gun stops firing.

h. Press the TRIGGER switch. The turret continues to follow the sight, firing as desired, until one of the turret limits is reached (±110 degrees in azimuth; +18 degrees, -60 degrees in elevation). At that point, the gun will cease to fire and the reticle will begin to flash, indicating an out-of-coincidence condition.

i. Set the MASTER ARM switch on the pilot armament control panel to STBY or to OFF and the INV (or ALTNR) and BAT (or BATTERY) switches to OFF.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-14. General.

The only precautions necessary when operating the HSS under unusual environmental conditions pertain to operating in extreme cold or in sand or dust.

2-15. Operation Under Unusual Conditions.

a. Operation in Extreme Cold. When operating in extreme cold, avoid breathing on the optical sights. Condensation or freezing moisture on the optical sights can obstruct vision and interfere with proper use of the instruments.

b. Operation in Sand or Dust. When operating in sand or dust, clean the linkage rails frequently with a clean cloth and alcohol or other solvent that will not leave a residue. If the linkage arm assembly becomes hard to operate along the rails, the linkage assembly may require replacement. See Chapter 5, paragraphs 5-13 through 5-19, for removal and installation instructions.

CHAPTER 3

OPERATOR/CREW AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

3-1. Repair Parts.

Repair parts issued to the using organization for operating and maintaining the HSS are listed in Appendix B, Section IV.

3-2. Speciad Tools and Equipment.

Special tools and equipment issued to the using organization for operating and maintaining the HSS are listed in table 3-1 and in Appendix B, Section II.

Table 3-1. Special Tools and Equipment

Item	NSN or reference	Reference		Use
		Figure	Paragraph	
Boresight kit, HSS organizational	4931-00-124-5453	2-16	2-8	Boresight helmet sight assembly
Tool, helmet boresight	4931-01-005-2827	2-16	2-9	Test reed switch and align helmet receptacle
Cable assembly, boresight	4931-01-013-4223	2-16	2-10	Lights reticle outside helicopter
Sockethead screw keys (2)		2-16	2-8	Adjust receptacle alignment screws

Section II. SERVICE UPON RECEIPT OF MATERIEL

3-3. General.

a. When new, used, or reconditioned materiel is first received by the using organization, it is the responsibility of the officer in charge to determine whether the materiel has been properly prepared for service by the supplying organization to be sure it is in condition to perform the function.

b. Make a record of any missing parts, tools, and equipment and of any malfunctions. Correct any deficiencies as quickly as possible.

3-4. Duties.

The organizational mechanic performs the inspection to determine whether the materiel has been prepared for service and is in condition to perform its assigned mission. It is the duty of the operator to assist the organizational mechanic in the performance of these services.

3-5. Services.

Upon receipt of the HSS by a using organization, the following operations will be performed.

a. Unpacking. Unpack the HSS assemblies carefully and check for identification tags, serial number, and any information that may be contained on paper tags which may be attached to the packing boxes.

b. Inspection and Cleaning.

(1) Upon receipt of the HSS assemblies, make a visual inspection for obvious physical damage, such as cracked, damaged, loose, bent or broken parts; dented surfaces; nicks, burns, scratches, or chips; loose, missing, or binding knobs; corrosion; fungus growth; moisture; and missing parts.

(2) Clean the pilot and gunner linkage rails with a soft cloth and alcohol or other solvent that will not leave a residue.

(3) Check that mechanical components operate smoothly without binding or rough motion.

(4) Inspect the assemblies for missing components, screws, nuts, washers, and pins; loose rivets; and parts insecurely fastened.

Section III. LUBRICATION INSTRUCTIONS

3-6. Lubrication Instructions.

Lubrication maintenance is not required for any part of the HSS. Where lubrication is required (joint bail bearings), it has been sealed in. Do not lubricate linkage parts.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-7. General.

Visual checks should be made of the equipment each day of expected service, and appropriate action should be taken as required. Special attention should be given suspect areas after periods of inactivity or when other maintenance has been performed in or near the cockpit (or storage) area housing the HSS. Paragraph 2-4 gives the preliminary switch settings. Tables 3-2 and 3-3 provide checklists of mechanical and electrical maintenance inspection points to be inspected each day of operation. No special maintenance inspection is required during periods of storage or inactivity.

3-8. Linkage Rails.

It is imperative that the linkage rails be kept free from foreign material (such as paint-spray residue, sprayed insecticides, window cleaners, oils, or tape residue) and surface damage (such as nicks or corrosion) that might impair free movement of the carriage over the rails. Keep the rails clean by wiping them with a lint-free cloth soaked with alcohol or an equivalent solvent conforming to MIL-A-6091. Small nicks and light damage can often be satisfactorily removed by rubbing with a crocus cloth meeting Federal Specification P-C-458c. Wipe the rails clean before running the carriage along them.

Table 3-2. Preventive Maintenance Checks and Services - Mechanical

B - Before operation time required: 0.5			D - During operation time required: 0.1	A - After operation time required: 0.1
Interval and sequence number			Item to be inspected procedure	Work time (M/H)
B	D	A		
1			Helmet sight assemblies	
			Inspect for damage (bent or broken parts). Inspect for evidence of misalignment. Inspect for dirty optics. Perform sight unit retract test (fig. 3-1).	0.2
2			Linkage assemblies	
			Inspect for damage (bent or broken parts). Inspect rails for nicks, foreign material, or corrosion. Wipe rails with lint- and dust-free cloth.	0.2
3			Electronic interface assembly and cabling	
			Inspect for physical damage to cabling and insure that connectors are secure.	0.1
	4		Linkage assemblies	
			Check for unusual feel or binding when linkage is attached to helmet.	0.1
		5	Linkage assemblies	
			Remove linkage arm assemblies from helmet receptacle and place in stow position (fig. 2-10).	0.1

Table 3-3. Preventive Maintenance Checks and Services – Electrical

B - Before operation time required: 0.0			D – During operation time required: 0.2	A – After operation time required: 0.0
Interval and sequence number			Item to be inspected procedure	Work time (M/H)
B	D	A		
	1		Helmet sight assemblies	
			Perform reticle illumination check (paragraph 3-10). Perform sight unit retract test (paragraph 3-10).	0.1
	2		Subsystem BIT test	
			Place linkage arm assemblies in BIT position (fig. 2-11). Actuate BIT switch (paragraph 2-5).	0.1

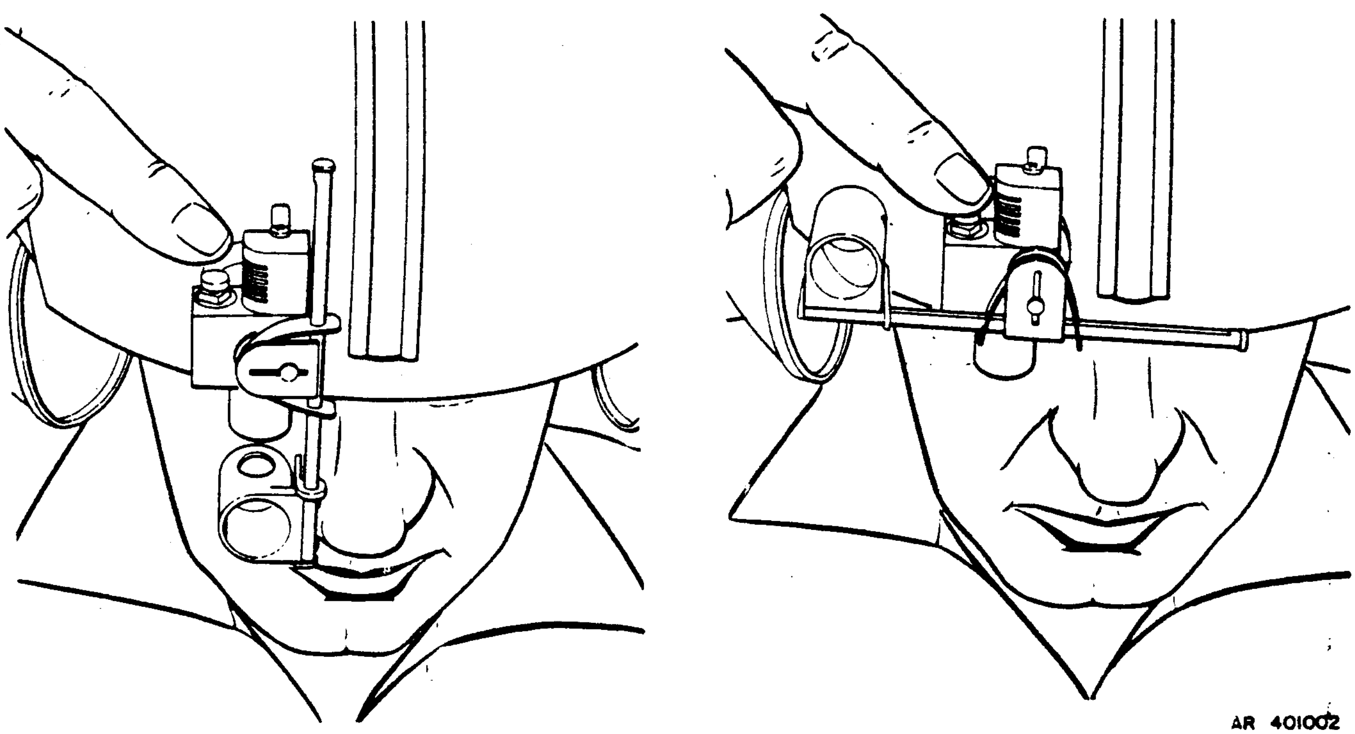

Figure 3-1. Eyepiece retraction

Section V. TROUBLESHOOTING

3-9. BIT Test.

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a. Perform the BIT test as follows:

(1) Insure that the circuit breakers and switches are set as specified in paragraph 2-4 for proper helicopter configuration.

(2) Place both the gunner and pilot linkage assemblies in the BIT position (fig. 2-11).

(3) Actuate the BIT switch on the gunner armament control panel.

b. When the failure indication occurs, insure that the linkages are properly attached to the BIT magnets and check all cable connections. Then repeat the BIT test as follows:

(1) Cycle the MASTER ARM switch on the pilot armament control panel from STBY to OFF and back to STBY.

(2) Actuate the BIT switch on the gunner armament control panel. If the failure still exists, refer to table 3-4 for the assembly to be replaced.

3-10. Helmet Sight Assembly Troubleshooting.

NOTE

In the procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-1S(Mod) and the AH-1S P E M helicopters, the basic nomenclature used is that for the AH-1S(Mod) helicopter and the nomenclature for the AH-1S P E M helicopters follows, in parentheses and prefixed with an "or" for example, “HSS RETICLE TEST (HSS RTCL TEST or HSS LAMP TEST)” in *a(3)* below.

The troubleshooting consists of a test of the reticle light using helicopter power and an electrical eyepiece retraction test.

a. Reticle Light Test Using Helicopter Power. Perform the reticle light test using helicopter power as follows:

(1) Insure that the MASTER ARM switch on the pilot armament control panel is in the STBY position. -

Table 3-4. BIT Test Troubleshooting Procedures

BIT failure indication	Probable cause of failure	Corrective action
1. PLT	a. Electronic interface assembly	Replace the EIA (paragraph 3-15).
	b. Pilot linkage assembly	Notify DS/GS maintenance personnel.
2. GNR	a. Electronic interface assembly	Replace the EIA (paragraph 3-15).
	b. Gunner linkage assembly	Notify DS/GS maintenance personnel.
	c. Extension cable	Notify DS/GS maintenance personnel.
3. INTFC (or EIA)	Electronic interface assembly	Check connectors, then replace the EIA (paragraph 3-15).

(2) Insure that the pilot and gunner helmet sight assemblies are properly attached to their respective linkage assemblies, and that the helmet sight cable connectors for both pilot and gunner are connected.

(3) For the gunner helmet sight assembly, place the HSS RETICLE TEST (HSS RTCL TEST or HSS LAMP TEST) switch on the gunner armament control panel to TEST (or LAMP TEST) and insure that the reticle remains lighted. If the reticle goes out, refer to paragraph 3-12 for procecdures to replace the failed lamp assembly.

NOTE

If the reticle light goes out while performing step (3) check the position of the magnet in the receptacle before replacing lamp assembly. The white alignment dots may have to be offset slightIy for reticle to light.

(4) For the pilot helmet sight assembly, place the HS RTCL TEST (or HSS RTCL TEST) switch on the pilot armament control panel to the TEST position and insure that the reticle remains lighted. If the reticle goes out, refer to paragraph 3-12 for procedures to replace the failed lamp assembly.

NOTE

If the reticle light goes out while performing step (3), check the position of the magnet in the receptacle before replacing lamp assembly. The white alignment dots may have to be offset slightly for reticle to light.

b. Electrical Eyepiece Retraction Test. Perform the eyepiece retraction test as follows:

(1) Insure that the MASTER ARM switch on the pilot armament control panel is in the STBY position.

(2) Set the MODE SELECT switch on the TOW control panel (fig.2-9) to the STBY TOW, ARMED MAN, or ARMED AUTO position.

(3) Momentarily move the ACQ TRK STOW switch (fig. 2-5) to ACQ and release it to TRK to insure that the eyepiece automatically retracts (rotates upward) out of the field of view.

(4) Leave the ACQ TRK STOW switch in the TRK position.

(5) Manually return the eyepiece to the operating position.

(6) Press the PHS ACQ switch (fig. 2-5) and observe that the gunner's eyepiece automatically retracts.

(7) Manually return the eyepiece to the operating position.

If a failure occurs in any part of the eyepiece retraction test, notify higher maintenance personnel.

Section VI. MAINTENANCE OF HELMET SIGHT ASSEMBLY

3-11. General.

The maintenance performed on the helmet sight assembly at this level consists of

a Cleaning the eyepiece

b. Cleaning the lens assembly

c. Replacing the lamp assembly.

3-12. Replacement of Lamp Assembly (fig. B-3).

a. Remove machine screw (9) holding lamp cover (10) to the sight assembly.

b. Carefully slide lamp cover (10) from sight housing (36).

c. Hold component board assembly (35) in place with a small screwdriver and remove lamp assembly (11).

d. Inspect the sight assembly for damage. Insure that the optical sights are free from visual obstruction.

e. Inspect new lamp assembly (11) for damage.

f. Carefully plug new lamp assembly (11) into the mating connector on component board assembly (35).

Caution

Extreme care must be taken when replacing the lamp cover, to prevent damage to the electrical wiring.

g. Replace lamp cover (10) and secure with machine screw (9).

Section VII. MAINTENANCE OF LINKAGE ASSEMBLY

3-13. General.

Organizational level maintenance of the linkage assemblies is limited to cleaning of the rails.

3-14. Rail Assembly Cleaning.

a. Wipe any paint or insecticide spray, window cleaner, oil, or other residue from the rails with a lint-free cloth soaked in alcohol or other solvent conforming to MIL-A-6091.

b. If small nicks or light damage is detected, rubbing with a crocus cloth meeting Federal Specification P-C-458c should satisfactorily return the rails to good condition. Wipe the rails clean before ruining the carriage along them.

Section VIII. MAINTENANCE OF ELECTRONIC INTERFACE ASSEMBLY

3-15. General.

Organizational level maintenance of the electronic interface assembly (EIA) consists of removal, installation, and electrical adjustment procedures.

3-16. Removal (fig. 3-2).

a. AH-1S(Mod) Helicopter.

(l) Loosen the captive screws and disconnect cable connectors A2P1, W1P2, and 17A1P1 from the EIA.

(2) Remove the screw and washer that secure the bonding jumper to the isolator mount. Retain the screw and washer.

(3) Remove the four mounting screws that secure the EIA to the isolator mounts and remove the two cable clamps secured by two of the mounting screws.

(4) Remove the other seven screws and washers that secure the isolator mounts to the airframe. Retain the screws and washers.

(5) Secure the isolator mounts to the EIA, using the hardware removed in (3) above except for the cable clamps.

b. AH-1S Helicopter. P E M

(1) Remove the nut, screw, and washer that secure the bonding jumper to the helicopter airframe. Replace the nut. screw, and washer in the airframe hole.

(2) Loosen the captive screws and disconnect cable connectors A2P1, W1P2, and 17A1P1 from the EIA.

(3) Remove the screw and washer that secure the EIA to each of the four isolator mounts and remove the EIA. Retain the four screws and washers.

(4) Remove each of the four isolator mounts by removing the two screws and washers. Retain these eight screws and washers.

(5) Using the hardware retained in (3), install the isolator mounts on the EIA.

3-17. Installation (fig. 3-2).

a. AH-1S(Mod) Helicopter.

(1) Inspect the EIA for dents, scratches, missing hardware, and bent connector pins.

(2) Remove the four screws and washers that secure the isolator mounts to the EIA.

(3) Install the isolator mounts to the airframe, using the seven screws and washers retained in paragraph 3-16a(4).

(4) Install the EIA on the isolator mounts, using the four screws and washers removed in (2) and securing the two cable clamps with two of the screws.

(5) Using the screw and washer retained in paragraph 3-16a(2), secure the bonding jumper to the isolator mount, with the bonding-jumper lug between the washer and the screwhead.

(6) Connect cable connectors A2P1, W1P2, and 17A1P1 to the EIA and tighten the captive screws.

(7) Perform the electrical adjustment procedures in paragraph 3-18.

b. AH-1S Helicopter. P E M

(1) Inspect the EIA for dents, scratches, missing hardware, and bent connector pins.

(2) Remove each of the four isolator mounts by removing the screw and washer that secures the mount to the EIA. Retain the four screws and washers.

(3) Install the EIA to the airframe, using the eight screws and washers retained in paragraph 3-16b(4).

(4) Install the EIA on the isolator mounts, using the screws and washers retained in (2).

(5) Connect cable connectors 17A1P1, A2P1, and W1P2 to the EIA and tighten the captive screws.

(6) Using the screw, washer, and nut retained in paragraph 3-16b(1), secure the bonding jumper to the airframe, with the bonding-jumper lug between the screwhead and the washer and with the washer next to the airframe.

NOTE

The airframe hole into which the bonding-jumper screw is inserted is almost directly above the point at which the other end of the bonding jumper is secured to the EIA

(7) Perform the electrical adjustment procedures in paragraph 3-18.

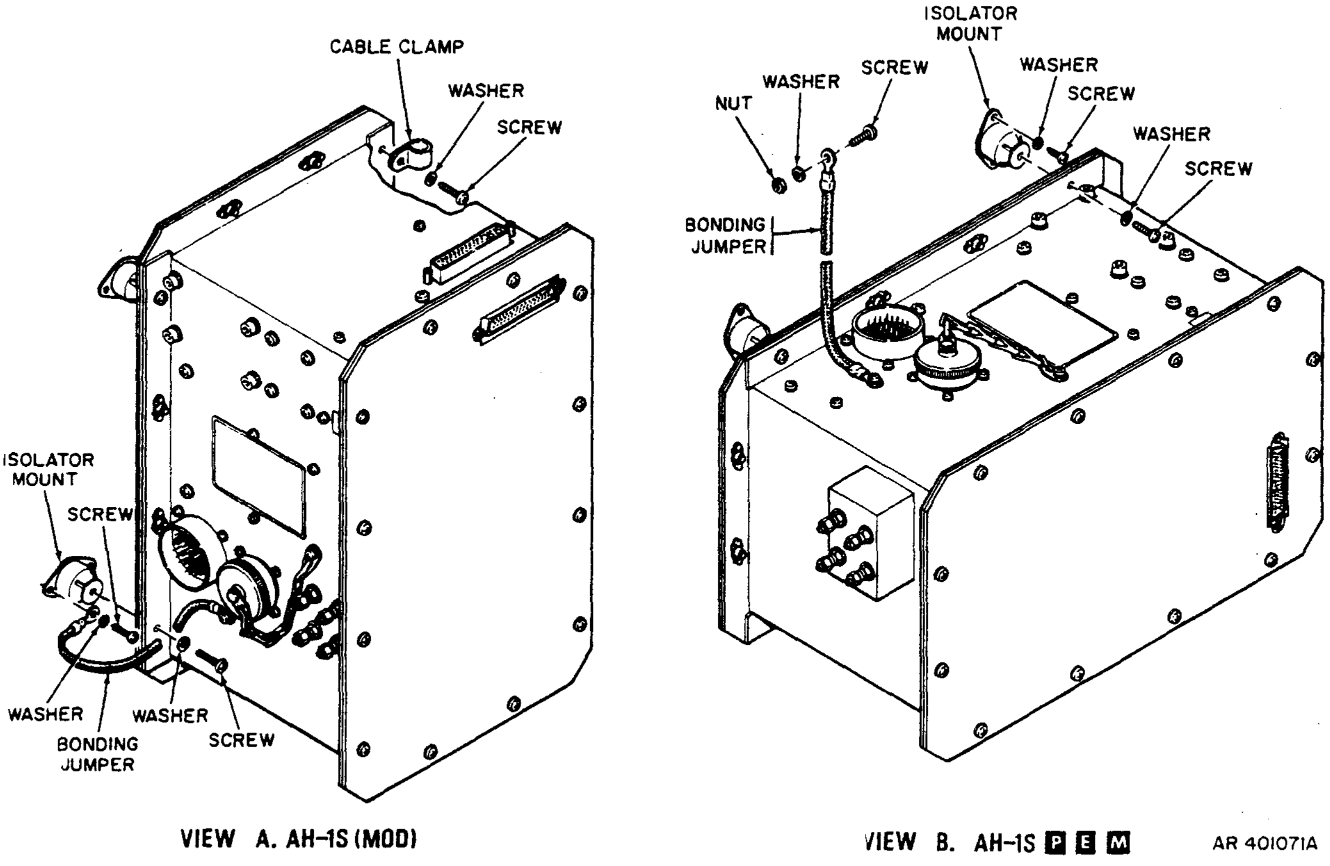


Figure 3-2. EIA - removal and installation

3-18. Electrical Adjustment procedures.

NOTE

In the procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-1S(Mod) and AH-1S P E M helicopters, the base nomenclature used is that for the AH-1S(Mod) helicopter and the nomenclature for the AH-1S P E M helicopter follows, in parentheses and prefixed with an "or;" for example, "HSS RETICLE OFF BRT (HSS RTCL OFF BRT or HSS OFF BRT)" in *c* below.

a. Except for connecting the hydraulic power to the helicopter, perform the preliminary switch settings in paragraph 2-4 and the BIT procedures in paragraph 2-5.

b. The first man enters the gunner compartment, connects the gunner helmet sight assembly cable, puts on the helmet, fastens the chin strap, and connects the linkage assembly fastener to the helmet sight assembly receptacle magnet.

c. The first man turns the HSS RETICLE OFF BRT (HSS RTCL OFF BRT or HSS OFF BRT) control on the gunner armament control panel fully clockwise, rotates the eyepiece into the field of view, and adjusts the eyepiece laterally and vertically until the reticle, including the outer ring, can be seen centered m the eyepiece.

d. The first man sets the MODE SELECT switch on the TOW control panel to TSU/GUN (or TSU GUN), holds the ACQ TRK STOW switch to ACQ, and views a distant target, minimum distance of 1000 meters, in front of the helicopter.

e. The second man leans into the gunner compartment, looks into the TSU, and observes how close to the distant target the TSU crosshairs fall.

f. The second man gives instructions to the third man to loosen the locknuts and adjust R2 GUNNER AZ and R4 GUNNER EL on the EIA to bring the TSU crosshairs over the distant target.

g. The third man tightens the locknuts.

h. The first man releases the ACQ TRK STOW switch to TRK, disconnects and stows the gunner linkage assembly, disconnects the helmet sight assembly cable, removes the helmet, and remains in the gunner seat.

i. The second man enters the pilot compartment and puts on and adjusts the helmet as detailed in steps *b* and c.

j. The second man views a distant target in front of the helicopter through the helmet sight eyepiece.

k. The first man presses and holds the PHS ACQ button (fig. 2-5) and looks into the TSU to observe how close to the distant target the TSU crosshairs fall.

l. The first man gives instructions to the third man to loosen the locknuts and adjust R1 PILOT AZ and R3 PILOT EL potentiometers on the EIA to bring the TSU crosshairs over the distant target.

m. The third man tightens the locknuts.

n. The first man releases the PHS ACQ pushbutton.

o. Set the ACQ TRK STOW switch to STOW, the MODE SELECT switch to OFF, the MASTER ARM switch to OFF, the INV (or ALTNR) switch to OFF, and the BAT (or BATTERY) switch to OFF.

Section IX. MAINTENANCE OF EXTENSION CABLE

3-19. General.

Organizational level maintenance of the extension cable is limited to inspecting and servicing the item.

3-20. Maintenance Procedure.

Inspect the extension cable for any loose, missing, or damaged hardware. If discrepancies are found, notify higher maintenance personnel. Periodically wipe any dirt or other foreign material from the extension-cable jacket with a soft cloth.

CHAPTER 4

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, TOOLS, AND EQUIPMENT

4-1. General.

The repair parts, tools, test, and support equipment are listed in Appendix B. Additional information on fabricated items, special tools, and test equipment needed for direct and general support maintenance, troubleshooting, and repair of the HSS is given in paragraph 4-2. Refer to TM 9-493l-363-14&P for maintenance and repair parts for test set AN/GSM-249.

4-2. Special Tools and Test Equipment.

The special tools and test equipment and their identifying numbers and usage are given in table 4-1. Target assembly fabrication procedures are given in foldout FO-11.

Table 4-1. Special Tools and Test Equipment

Item	NSN reference	Reference		Use
		Figure	Paragraph	
Boresight device, TSU	1045948	B-15	4-4	HSS alignment and boresighting
Test set, fire control sub-system, AN/GSM-249, consisting of	22017364-05	4-1,4-8 B-15	4-12	HSS assembly and subassembly test
Subassembly test set	2202201-01	41	4-12	HSS assembly and subassembly test
Container	2278899-00	4-1	–	Storing AN/GSM-249 items
Chassis assembly	2202198-00	4 8	–	HSS assembly and subassembly test
Tool helmet boresight	4931-01-005-2827	4-1	4-16	Boresighting helmet sight assembly
Device, linkage orientation (LOD)	2202202-00	4-1,44	4-5,4-14, 4-18	Linkage assembly test and HSS boresighting
Cable, test, W2	2202209-00	4-1	4-13	HSS assembly and subassembly test
Cable, power, W3	4931-01-007-5877	4-1	4-13	HSS assembly and subassembly test
Cable, power, W4	4931-01-007-6878	4-1	4-13	HSS assembly and subassembly test

TABLE 4-1. SPECIAL TOOLS AND TEST EQUIPMENT-CONTINUED

ITEM	NSN REFERENCE	REFERENCE FIGURE	PARAGRAPH	USE
TEST SET-CONTINUED				
CABLE,POWER ADAPTER, W5	4931-01-007-6879	4-1	4-13	HSS ASSEMBLY AND SUBASSEMBLY TEST
PLUG,SHORTING	4931-01-007-0135	4-1	4-4	CONNECTS TO 17P1 OR 17P2 IN HELICOPTER TO PARTIALLY SIMULATE HELMET SIGHT ASSEMBLY
EXTRACTOR,CIRCUIT CARD	5999-01-012-9179	4-1	4-19,5-20	REMOVING CIRCUIT CARDS FROM EIA
DEVICE,HOLDING	4931-01-005-9011	5-1	5-10	INSTALLATION OF HELMET SIGHT ASSEMBLY TO SPH-4 HELMET
TARGET ASSEMBLIES(3)	FABRICATED	FO-11	4-4	HSS ALIGNMENT AND BORESIGHTING PROCEDURES

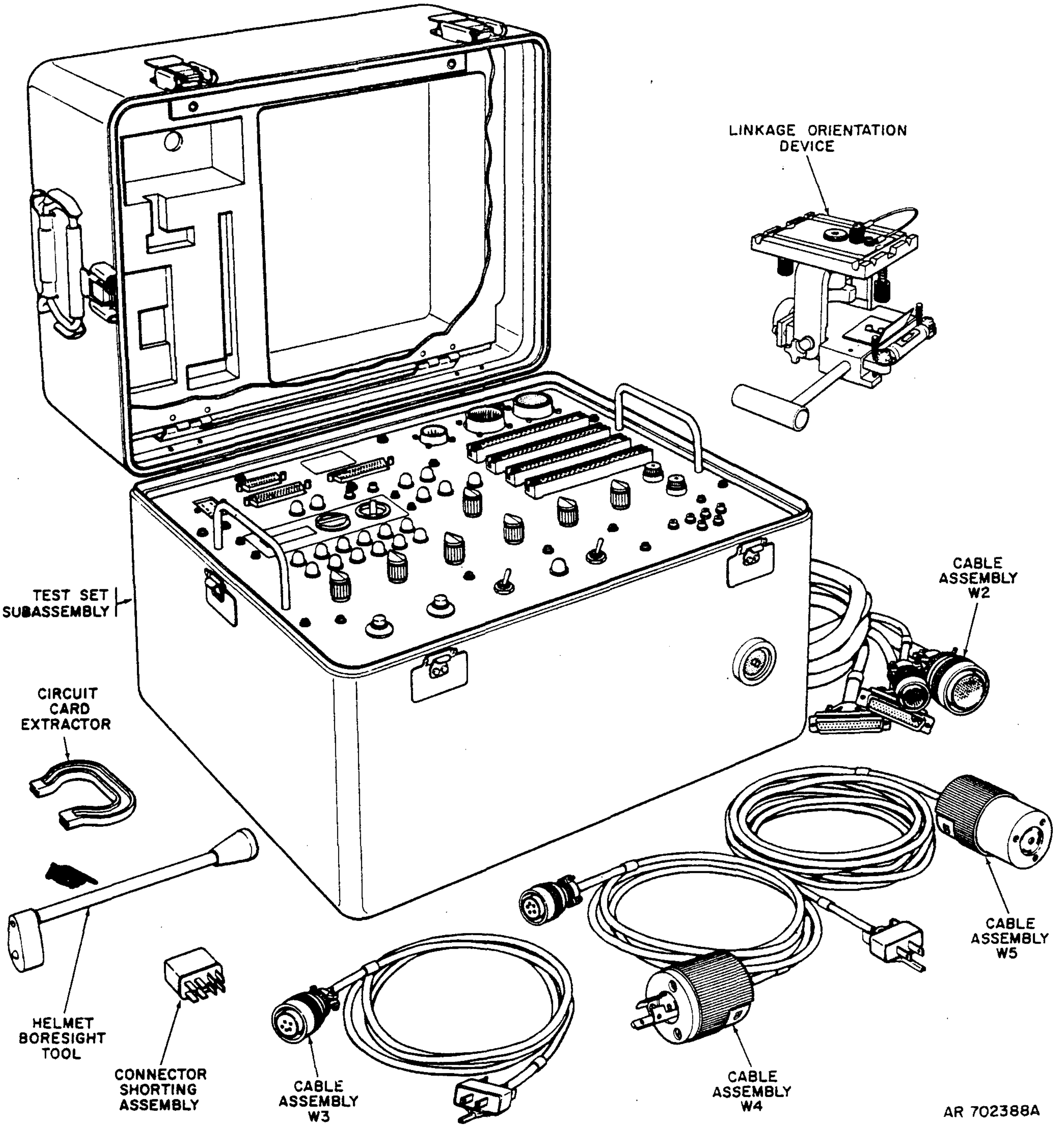


Figure 4-1. Fire control subsystem test set AN/GSM-249

Section II. ALIGNMENT AND BORESIGHTING PROCEDURES

4-3. Scope.

The procedures in this section establish the requirements for aligning and boresighting the helmet-directed fire control sub system (HSS) to the telescopic sight unit (TSU) for XM128, AH-l S (Mod) and XM136, AH-l S . **P**.

For boresighting procedures for XM 136, AH-1S and **M** , refer to TM9-1090-206-30, Aviation Intermediate Maintenance Manual for Armament Subsystem, Helicopter: 20-mm Automtitic Gun, XM97E1/E2.

4-4. Alignment Preparation.

Prepare for the system alignment by performing the procedures listed in the following paragraphs:

a. Position the fairly leveled helicopter in an area that will accommodate the equipment, as shown in figure 4-2.

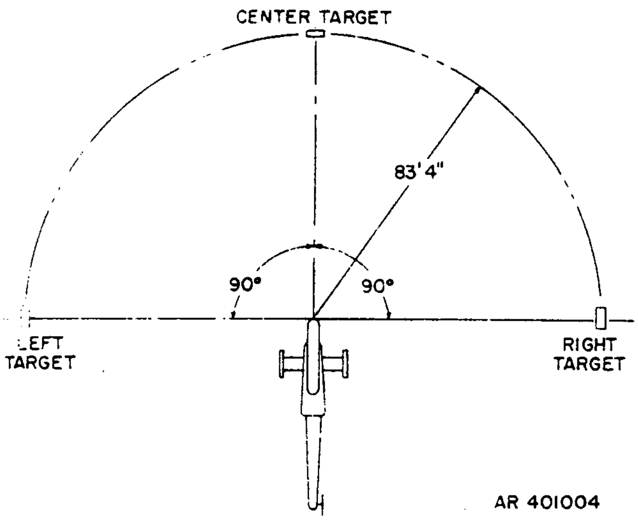


Figure 4-2. Helicopter and target emplacement

WARNING

Unload the turret weapon subsystem and all wing stores weaponry to prevent injury to personnel through accidental firing of a weapon.

h Verity that all the components of the HSS, except the helmet sight assemblies, and the associated components and panels are installed and are functionally operational. Connect the shorting plug to the connector for the helmet sight assembly in the gunner's compartment (17P1**P** or P247, AH-IS (MOD)).

c. Remove the fairing covering the TSU mounting pad located on the TSU upper turret support assembly.

d. Place the TSU boresight device onto the TSU reference pads (fig. 4-3) and lock into place with the screw fastener.

NOTE

Do not remove or adjust the factory-set TSU reference pads.

e. Using a steel tape, measure 1000 ±6 inches (83 feet 4 inches, ±6 inches) in front of the TSU from the plumb mark directly below the pivot point of the TSU.

NOTE

Technicians should now assume the gunner's and pilot's positions and remain there for the remainder of the alignment and boresighting. Do not lean on or stand on the aircraft skids during this operation.

f. Place the center target assembly (foldout FO-11 sheet 3) forward of the helicopter and at a distance of 1000 ±6 inches (83 feet 4 inches, ±6 inches), keeping the target perpendicular to the imaginary centerline of the helicopter as much as possible on initial placement.

g. Place the borescope in the center hole of the TSU boresight device. Sight through the borescope at the TSU boresight device target.

h. With the assistance of a second person to move the center target assembly in azimuth and elevation as directed by the person viewing the target through the borescope, adjust the center target assembly so that the intersection of the TSU boresight device target is coincident with the intersection of the crosshairs within the small circle of the borescope reticle.

NOTE

If there is insufficient height adjustment in the targets, the helicopter or the target assemblies may need to be shimmed in order to align the target assemblies properly.

i. Insert the borescope in the right tapered hole of the TSU boresight device. The borescope should be either, vertical or horizontal for best sighting results.

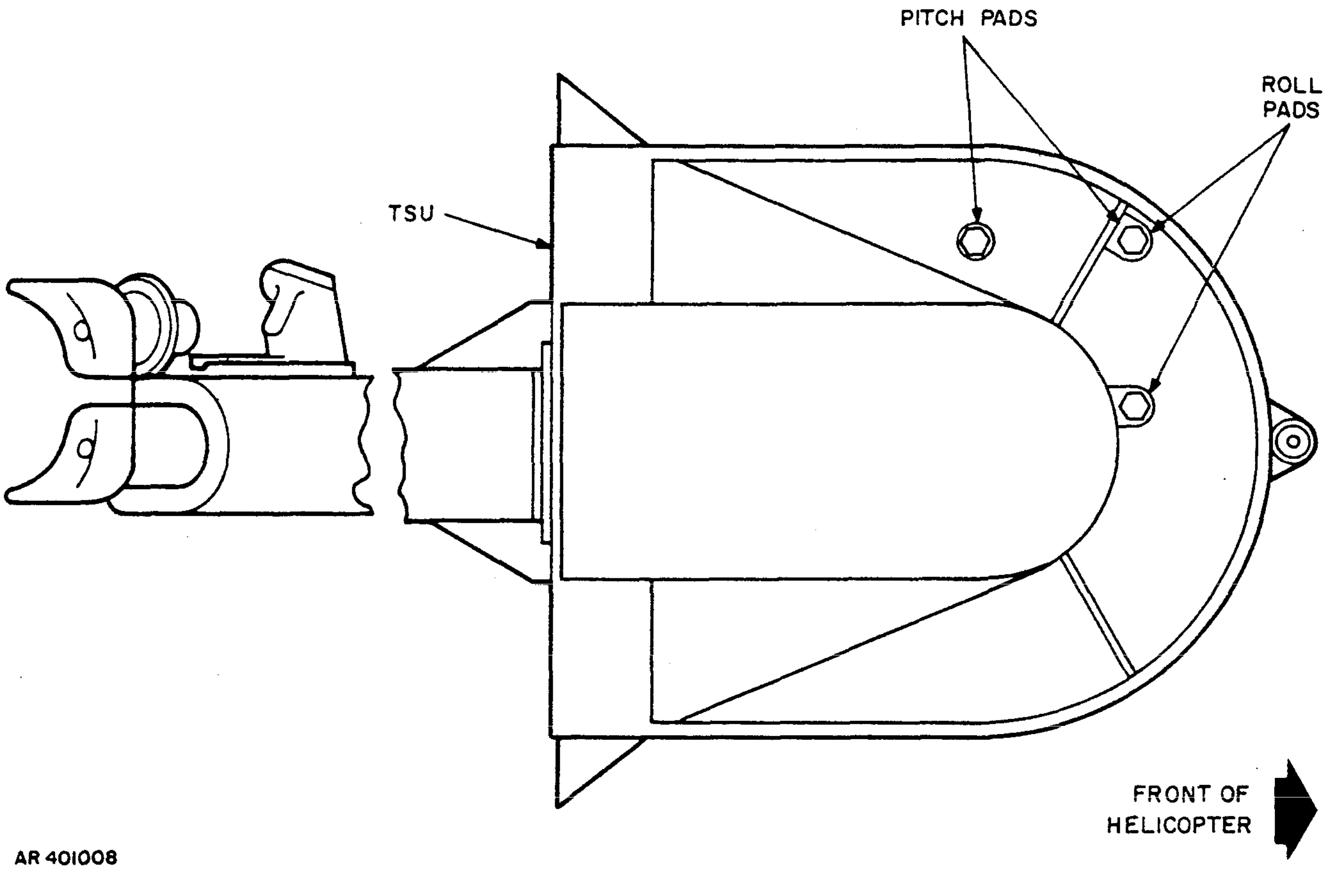


Figure 4-3. Top view of TSU pitch and roll pads

j. Place the right target assembly (foldout FO-11, sheet 3) to the right side of the helicopter and at a distance of 1000 ±6 inches (83 feet 4 inches, ±6 inches) from the reference point marked on the ground, keeping the viewing face of the target assembly parallel with the imaginary centerline of the helicopter as much as possible on initial placement.

k. Sight through the borescope at the TSU borescope device target.

1. With the assistance of a second person to move the right target assembly in azimuth and elevation as directed by the person viewing the target through the borescope, adjust the right target so that the intersection of the TSU boresight device target is coincident with the intersection of the crosshairs of the borescope reticle.

m. Insert the borescope in the left tapered hole of the TSU boresight device. Place the left target (foldout FO-11, sheet 1) to the left of the helicopter by performing procedures parallel to those in *i* through *l.*

n. Check that all target assemblies are plumb to the TSU boresight device plane within 1/2 degree (±8.9 mils) as defined by the alignment pads. This is done by placing a gunner's quadrant on the TSU boresight device, leveling the bubble, and then transferring the quadrant to the target. For the left and right targets, the gunner's quadrant will be placed on the TSU boresight device so that it is parallel to the centerline of the helicopter. For the forward target, the gunner's quadrant will be placed on the TSU boresight device so that it is perpendicular to the centerline of the helicopter. When transferring the gunner's quadrant from the TSU boresight device to the target, maintain the same orientation of the quadrant.

o. Once all three target assemblies have been initially placed and aligned, insert the borescope in each of the three holes in the TSU boresight device again, to verify that each target is properly aligned in azimuth and elevation as specified in the preceding procedures. These conditions locate the left and right target assemblies at 90 degrees from the center target assembly and align the center target assembly with the 0-degree azimuth position of the TSU.

4-5. Rail Alignment (Azimuth).

For HSS XM128 (an HSS in an AH-lS(Mod) helicopter), perform the procedures in *a* and *b* below; for HSS XM136 (an HSS in an AH-lS **P** helicopter), perform the procedures in *a* and *c* below.

a. Gunner's Rail A Alignment.

(1) Lock your LOD in the O-degree position as follows (fig. 4-4): Loosen the azimuth locking knob, and rotate the rail clamp base until the 0° line on the rail clamp base is aligned with the notch in the swivel plate (mounted on top of the swivel frame). Insert the alignment pin in the hole in the rail clamp base, making sure that the alignment pin is firmly seated in its hole in the swivel plate. Firmly tighten the azimuth locking knob.

(2) With the bubble of the LOD facing forward, place the LOD on the TSU boresight device and center the bubble. Lock the bubble in place.

NOTE

Take care not to bump the bubble level assembly after it has been adjusted on the TSU boresight device.

(3) Attach the LOD to the forwardmost end of the gunner's rails. Insure that the LOD bubble is at the forward end.

(4) Tighten the T-locks on the T-bars of the LOD until the LOD is firmly attached to the rails.

(5) Insert the borescope in the LOD borescope bracket future and adjust the LOD in elevation until the gunner's HSS target on the center target is visible. Check that the intersection of the vertical crosshairs of the borescope reticle coincides with the intersection of the vertical crosshairs of the gunner's HSS target.

(6) If azimuth adjustment is required, loosen the nuts on the linkage rail mounting-bracket studs (the nut below each of the linkage supports).

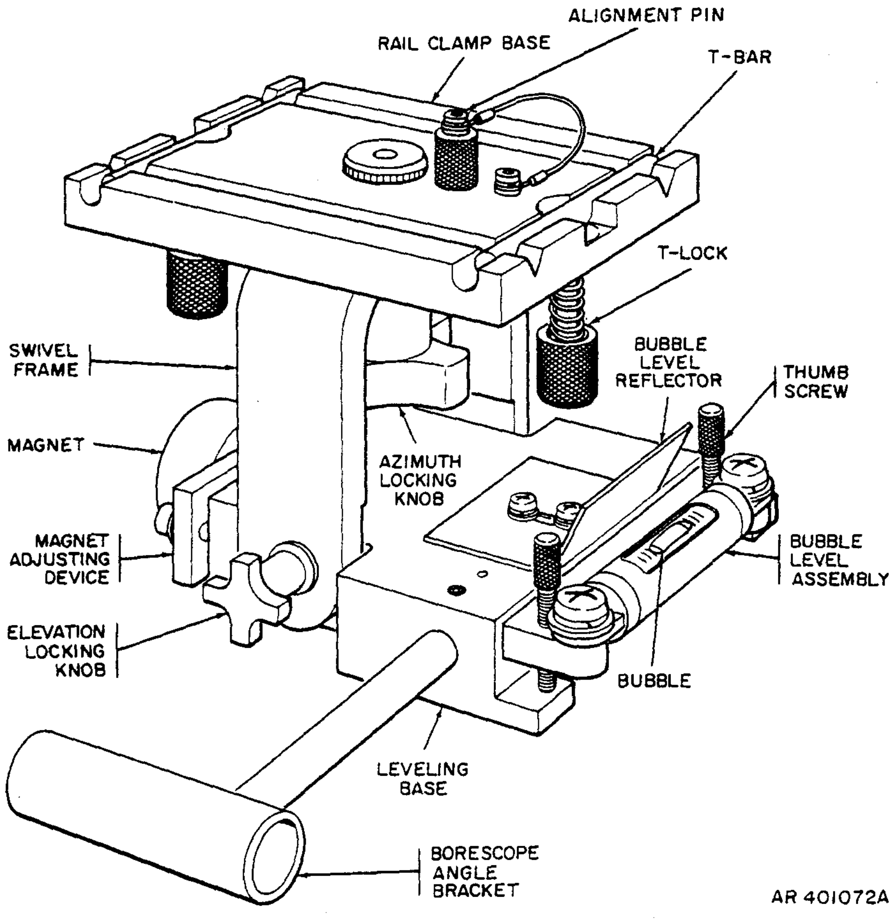


Figure 4-4. Linkage orientation device

(7) Using the serrated cuts in the supports (forward and aft), move the rails to align the borescope reticle with the gunner's target.

(8) Adjust the position of each support as follows: Making certain that the serrations in the key washer are aligned with the serrations in the support, tighten the nut on the end of the mounting-bracket stud until it is snug. Compress the quick-release plunger (12, figure B-7) by pressing on the support and continue to tighten the nut on the stud until the spring tension of the plunger will not return the support to its original position. Then loosen the nut enough to have proper operation of the spring plunger.

(9) With the borescope in the LOD, recheck the azimuth alignment. Remove the borescope.

b. XM128 Pilot's Rail Alignment. Transfer the LOD to the forwardmost end of the pilot's rails. Insure that the LOD bubble is at the forward end. Repeat steps *a(4)* through (9) above for pilot's rail azimuth adjustment.

c. XM136 Pilot's Rail Alignment.

(1) Remove the LOD from the gunner's rails. Loosen the LOD azimuth locking knob. Remove the alignment pin from the rail clamp base, and rotate the rail clamp base (approximately 180 degrees) until the 5.5° line on the rail clamp base is aligned with the notch in the swivel plate. Insert the alignment pin through the hole in the rail clamp base, making sure that the alignment pin is firmly seated in its hole in the swivel plate. Firmly tighten the azimuth locking knob.

(2) Attach the LOD to the forwardmost end of the pilot's rails. Insure that the LOD bubble is at the forward end.

(3) Perform steps *a(4)* through (9).

4-6. Rail Alignment (Roll).

a. Gunner's Rail Alignment.

NOTE

> Step (1) below may be omitted if the LOD bubble has not been disturbed since it was locked in paragraph *4-5a(2)* and if the LOD is locked in the 0-degree position.

(1) With the LOD locked in the 0-degree position (paragraph *4-5a(1))* and with the bubble of the LOD facing forward, place the LOD on the TSU boresight device and center the bubble. Lock the bubble in place.

NOTE

> Take care not to bump the bubble level assembly after it has been adjusted on the TSU boresight device.

(2) Attach the LOD to the forward end of the gunner's rails so that the LOD bubble is forward.

(3) Tighten the T-locks on the LOD T-bars until the LOD is firmly attached to the rails.

(4) Loosen the roll adjustment locking screw (fig. 4-5) and adjust the roll adjustment screw in the support until the LOD bubble is again centered. Tighten the roll adjustment locking screw and recheck the bubble.

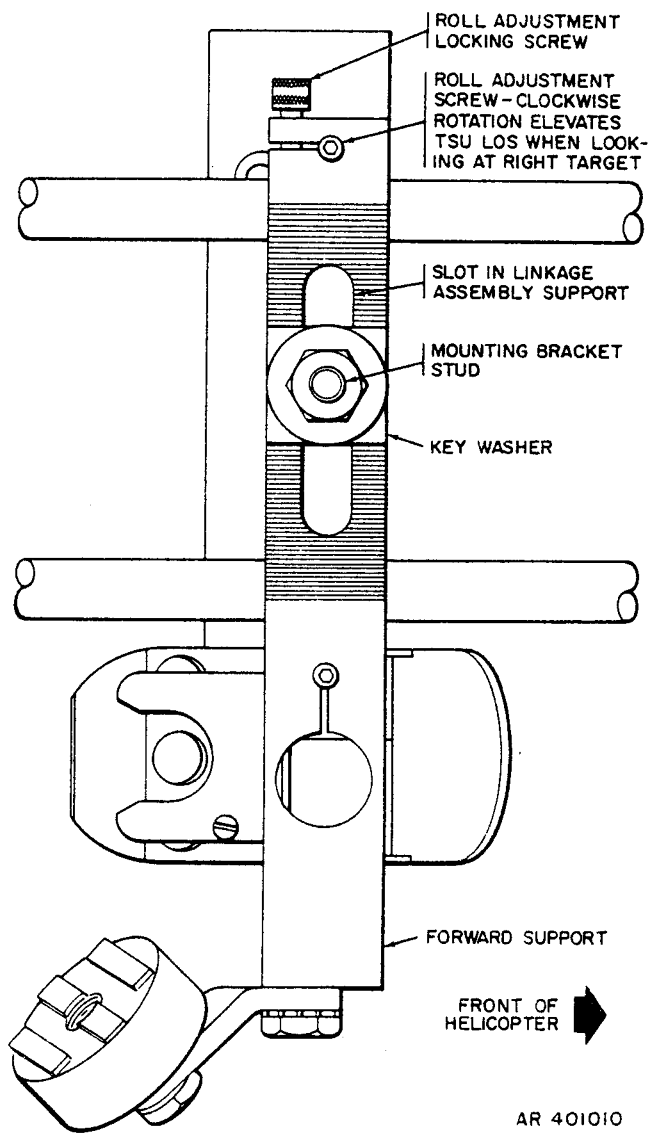


Figure 4-5. HSS roil adjustment locations

(5) Attach the LOD to the aft end of the gunner's rails behind the arm assembly. Insure that the LOD bubble is forward.

(6) Repeat steps (3) and (4).

b. Pilot's Rail Alignment.

(1) For HSS XM128 (in an AH-lS(Mod) helicopter), leave the LOD rail clamp base locked in the O-degree position. For the HSS XM136 (in an AH-1S **P** helicopter), lock the LOD rail clamp base in the 5.5-degree position (paragraph 4-5c(1)). Attach the LOD to the forward end of the pilot's rails. Insure that the bubble is forward.

(2) Tighten the T-locks on the LOD T-bars until the LOD is firmly attached to the rails.

(3) Loosen the roil adjustment locking screw and adjust the roll adjustment screw in the support until the LOD bubble is again centered. Tighten the roll adjustment locking screw and recheck the bubble.

(4) Transfer the LOD to the aft end of the pilot's rails, behind the arm assembly. Insure that the bubble is forward.

(5) Repeat steps (3) and (4).

4-7. System Boresighting Procedures.

This procedure establishes the requirements for boresighting the helmet-directed fire control subsystem (HSS) to the telescopic sight unit (TSU). Verify that the HSS system alignment procedures (paragraphs 4-3 through 4-6) have been completed and that the targets and helicopter are still in the alignment-procedure positions.

4-8. Boresighting Preparation.

NOTE

In the procedures below, where the nomenclature of a control, control position, or indicator differs between the AH-1S(Mod) and AH-1S **P** helicopters, the basic nomenclature used is that for the AH-1S(Mod) helicopter and the nomenclature for the AH-1S **P** helicopters follows, in parentheses and prefixed with an "or," for example, "STARTER RELAY (or START RLY)" IN *a* below.

a. Set circuit breakers as follows:

STARTER RELAY (or START RLY) to open (off)

IGN SYS IGN SOL (or IGN SOL) to open (off)

RPM WARN SYS (or RPM WARN) to open (off)

WING JETTISON (or WING STORES JTSN) in the pilot's compartment to open (off)

WING JETTISON (or WING STORE GNR JTSN and PLT JTSN) in the battery compartment to open (off).

NOTE

Before power is applied, each of the four boresight potentiometers on the EIA must be set to the approximate midpoint of its limits.

b. Set the pilot armament control panel switches as follows:

MASTER ARM to OFF

WPN CONT (or WPN CONTR) to GUNNER

TURRET to R.

c. Set the gunner armament control panel switches as follows:

PLT OVRD (or PLT ORIDE) to OFF

TURRET SELECT to R

COMP to OFF

WING STORES SELECT to OFF

TURRET DEPR LIMIT (or LASER SAFE/TURRET DEPR LIMIT) to DEPR LIMIT.

d. Verify that the helicopter battery is connected, and apply 28-volt external power to the helicopter.

e. Set the HSS PWR (or HSS) and TOW PWR (or TMS PWR) circuit breakers on the ac circuit breaker panel (or ac and armament circuit breaker panel) to closed (on) position.

f. Set the circuit breakers on the dc breaker panel as follows:

GEN FIELD to closed (on)

DC VOLT METER (or DC VM) to closed (on)

CAUTION LT (or CAUT LT) to closed (on)

INV MAIN (or [NV) to closed (on)

GEN BUS RESET to closed (on).

g. Check that the ELEC PWR EMER OFF switch on the gunner's left pedestal panel (or gunner's miscellaneous panel) is set to ELEC PWR.

h. Set the electrical power control panel switches as follows:

INV (or ALTNR) to MAIN (or ON)

BAT (or BATTERY) to ON (RUN)

NON-ESS BUS (or NON-ESNTL BU) to NORMAL.

4-9. Boresighting Procedures (Gunner's Station).

a. Turn the MODE SELECT switch on the TOW control panel to STBY TOW, and set the MASTER ARM switch on the pilot armament control panel to STBY and the left-hand-grip MAC switch to HI.

b. Position the gunner and pilot linkage assemblies in their respective BIT brackets.

c. Push BIT switch and confirm that the HSS GO light illuminates.

d. Insure that the LOD rail clamp base is locked in the O-degree position. Attach the LOD to the forward end of the gunner's rails with the bubble forward. Tighten the T-locks on the LOD T-bars until the LOD is firmly attached to the rails.

e. Attach the gunner linkage assembly to the magnet on the LOD.

f. Slightly loosen the azimuth locking knob and the elevation angle locking knob.

g. Insert the borescope in the LOD.

NOTE

The weight of the borescope in the LOD bracket can cause the rails to flex and provide inaccurate sightings. Therefore, when sighting, support the weight of the borescope while making sure the tapered pin is in full contact with the borescope bracket.

h. View through the borescope and adjust the LOD in azimuth and elevation until the intersection of the crosshairs of the borescope reticle coincides with the intersection of the crosshairs of the gunner's HSS target on the center target.

i. Tighten the azimuth locking knob and the elevation angle locking knob.

j. Being careful not to pull or push against the borescope in the LOD, recheck the center target alignment of step *h.* Remove the borescope.

k. Slightly loosen the setscrew on the B 1 resolver (fig. 4-6).

NOTE

The B1 resolver is very sensitive to adjustment. A very slight adjustment results in a large displacement in the TSU LOS.

l. While viewing through the TSU, hold the ACQ TRK STOW switch to ACQ. The technician viewing through the TSU shall verbally inform the technician in the pilot's compartment to adjust the B1 resolver worm gear to bring the TSU reticle crosshairs over the TSU optics target elevation crosshair.

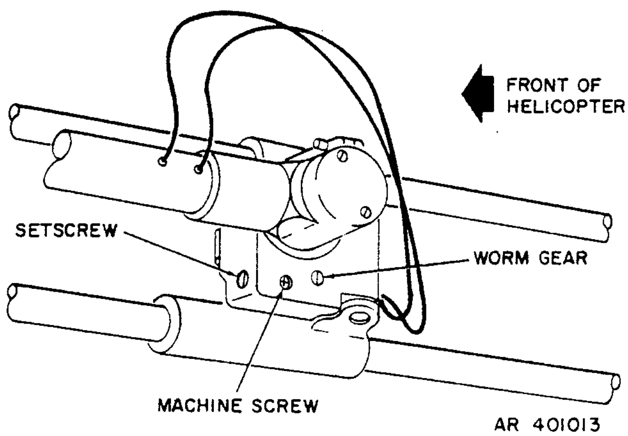


Figure 4-6. 61 resolver adjustment

in. Return the ACQ TRK STOW switch to STOW.

NOTE

Step *n* below is not necessary for HSS XM136

n. For HSS XM128 in an AH-1S(Mod) helicopter, move the LOD 4 inches aft of the original position in *d* and tighten the T-locks.

o. Slightly loosen the azimuth locking knob and the elevation locking knob.

NOTE

Do not lean or stand on the helicopter during the operations below.

p. Rotate the LOD to approximately 90 degrees right and insert the borescope.

q. View through the borescope and adjust the LOD in azimuth and elevation until the intersection of the crosshairs of the borescope reticle coincides with the intersection of the crosshairs of the gunner's HSS target on the right target.

r. Tighten the azimuth locking knob and the elevation angle locking knob.

s. Being careful not to pull or push against the borescope, in the LOD, recheck the alignment of step *q*. Remove the borescope.

t. Hold the ACQ TRK STOW switch to ACQ.

u. The technician viewing through the TSU shall record the elevation discrepancy between the TSU horizontal crosshair and the TSU optics target horizontal crosshair. Return the ACQ TRK STOW switch to STOW.

v. Slightly loosen the azimuth locking knob and elevation angle locking knob.

w. Rotate the LOD approximately 180 degrees left and insert the borescope.

x. Repeat steps *q* through *u* for the gunner's HSS target on the left target.

y. Review the two TSU elevation discrepancies to determine if roll misalignment exists (see fig. 4-7, step A).

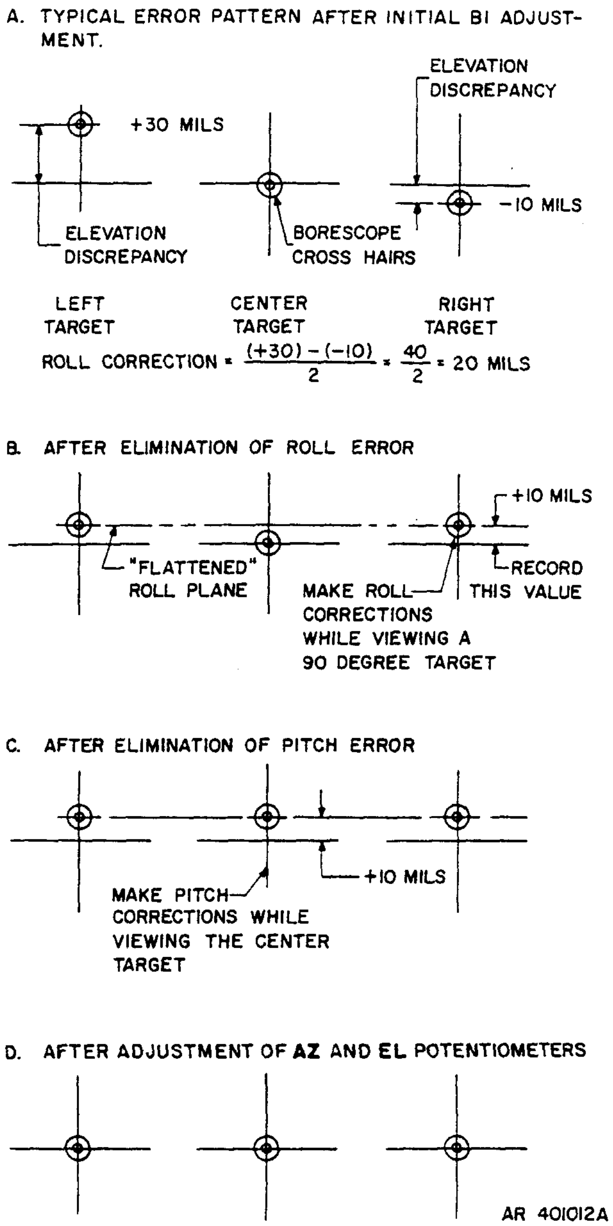


Figure 4-7. Examples of pitch and roll adjustment procedures

z. If the total difference between the two TSU discrepancies exceeds 4 mils, readjust the helmet sight rails as given in *aa* and *ab.*

aa. To eliminate the roll error (fig. 4-7), loosen the rol adjustment locking screws (fig. 4-5) and readjust the rails by turning both the fore and aft roll adjustment screws in equal amounts in the proper direction, as stated below:

(1) To raise the TSU LOS, sight through the orescope and, using the roll adjustment screws, lower the

sighting point the number of roils computed as the error. Then readjust the borescope elevation sighting.

(2) To lower the TSU LOS, sight through the borescope and, using the roll adjustment screws, raise the sighting point the number of roils computed as the error. Then readjust the borescope elevation sighting.

ab. Tighten the roll adjustment locking screws, view through the borescope, and adjust the LOD in azimuth and elevation until the borescope crosshairs coincide with the crosshairs on the gunner's HSS target. Repeat steps *t* and *w.* Then repeat steps *o* through *z* until the roll plane is "flattened" (elevation discrepancies on the left and right targets have approximately the same value as shown in figure 4-7, step B).

ac. Once the roll plane is "flattened," record the target elevation discrepancy. This value will be used during pitch error corrections (see steps *ag* through *ai).*

ad. Reposition the LOD to the forwardmost point of the gunner's rail, and tighten the T-bars.

ae. Repeat steps *h, t,* and *u* for the center target and compare the value in step u with the value obtained in step *ac.* If the total difference between these values exceeds 4 roils, make pitch corrections as given in steps *af through ah.*

af. Hold the ACQ TRK STOW switch to ACQ.

ag. The technician viewing through the TSU shall inform the technician in the pilot's compartment of the correction to be made at the B1 resolver.

ah. Adjust the B1 resolver worm gear until the elevation discrepancy between the TSU crosshair and the TSU target crosshair is equal to the elevation discrepancy which was recorded in step *ac* (see fig. 4-7, step C).

ai. Return the ACQ TRK STOW switch to STOW.

aj. Carefully tighten the setscrew on the B1 resolver and then recheck the adjustment by repeating steps *af* through *ai.*

ak. While viewing the center target (see fig. 4-7, step D), adjust the GUNNER AZ and EL potentiometers on the HSS EIA until the TSU reticle crosshairs coincide with the TSU optics target crosshairs.

al. As a final check, direct the LOD on the TSU to the three targets to recheck boresight readings at each one.

4-10. Boresighting Procedures (Pilot's Station).

Boresighting of the pilot's station will be done in the same manner as that for the gunner's station with the following exceptions: The ACQ TRK STOW switch (fig. 2-5) shall be in TRK and the PHS ACQ switch must be pressed in order to slave the TSU to the pilot's helmet sight. Connect the shorting plug to 17P2. For HSS XM136, as installed in the AH-1S P helicopter, lock the LOD in the 5.5-degree position. Furthermore, do not move the LOD aft 4 inches for any of the pilot's station checks. Adjust the PILOT AZ and EL potentiometers on the EIA and view the pilot's HSS target on the three targets.

4-11. Post-Alignment and Post-Boresighting Procedures.

a. Remove borescope and TSU boresight device.

b. Remove LOD from rails, insure that the rail clamp base is secured in the 0-degree position, and store the LOD in the test set.

c. Place the linkage assembly connectors in the stow positions.

d. Return control switches to OFF or inactive positions.

e. Reenergize circuit breakers used.

j. Remove 28-volt external power.

g. Install TSU fairing.

Section III. HSS TROUBLESHOOTING

4-12. General.

NOTE

Before removing any HSS LRU, use the AN/GSM-249 fire control subsystem test set to perform an HSS subsystem test (paragraph 4-14) with the HSS mounted in the helicopter.

a. This section provides direct and general support troubleshooting procedures for the HSS by using the AN/GSM-249 fire control subsystem test set. Readings and procedures differ in some cases between XM128 items and XM136 items. Specific details on differing procedures and readings are given in the applicable paragraphs (paragraphs 4-14, 4-20, 4-23, and 4-26.1); where no difference is stipulated, the procedures and readings for XM128 items and XM136 items are identical.

b. The tests can be performed on the bench or in the helicopter with the HSS line replaceable units (LRUs) electrically isolated from the helicopter. Each step in the tables for HSS and HSS LRU troubleshooting provides suggested corrective actions if abnormal indications are seen. For the troubleshooting of some printed circuit cards, adjustment procedures are provided. Where no adjustments are provided, the card should be considered defective and should be replaced. The "Point of test" column in each troubleshooting table tells where external test leads are to be connected. Where external connections are not necessary, the column indicates the pin numbers that are being monitored on the unit under test. When repair procedures are necessary, refer to the proper section of Chapter 5 and disassemble and repair the assembly as necessary.

4-13. Test-Set Preliminary Procedures.

NOTE

Refer to TM 9-4931-363-14&KP for test-set self-test procedures.

a. Set all switches with an off position to off (fig. 4-8).

b. If a 115-volt, 60-Hz power source is used from a bench for the test set, connect cable W3 between J3 on the test set and the power source (fig. 4-9). If a 115-volt, 400-Hz power source is used from a bench for the test sei connect cable W4 between J3 on the test set and the power source. If the 115-volt, 400-Hz power source in the helicopter is used, connect cables W4 and W5 in series; cable W4 connects to J3 on the test set and cable W5 connects to the helicopter power source.

4-14. HSS Troubleshooting Procedures.

NOTE

Procedures for checking out XM128 and XM136 are identical, but multimeter readings differ between models in some steps in the test table. Determine which HSS model is being tested from figures B-1 and B-10, foldouts FO-4 and FO-5, and the identification plate on the EIA. (The only difference in the two models is the differing EIA.)

a. After the test-set preliminary procedures in paragraph 4-13 have been performed, connect the HSS, with the exception of the helmet sight assemblies, as shown in figure 4-9.

NOTE

When a test is performed on a bench, the linkage assemblies must be placed on a level surface with the mounting brackets and rails also leveled. With the LOD locked in 0-degree position, use the LOD bubble and adjust the swivel pad, if necessary. This insures that the rails are not twisted.

b. Place the steel fasteners on the arms of the linkage assemblies in the BIT positions.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

d. Set the multimeter range switch to 10 and the function switch to AC V.

e. Perform the procedures in table 4-2.

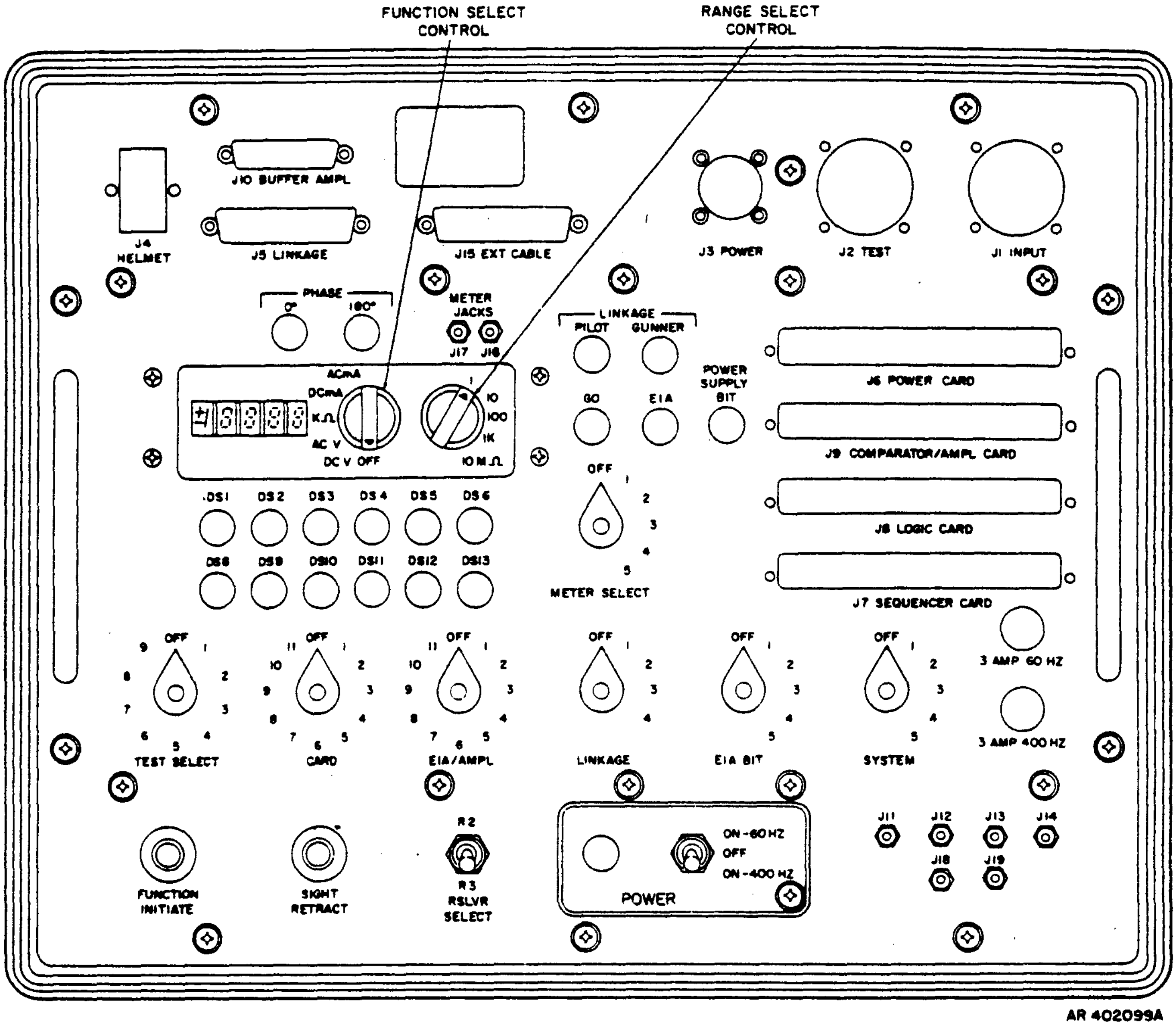


Figure 4-8. Fire control subsystem test set - control panel

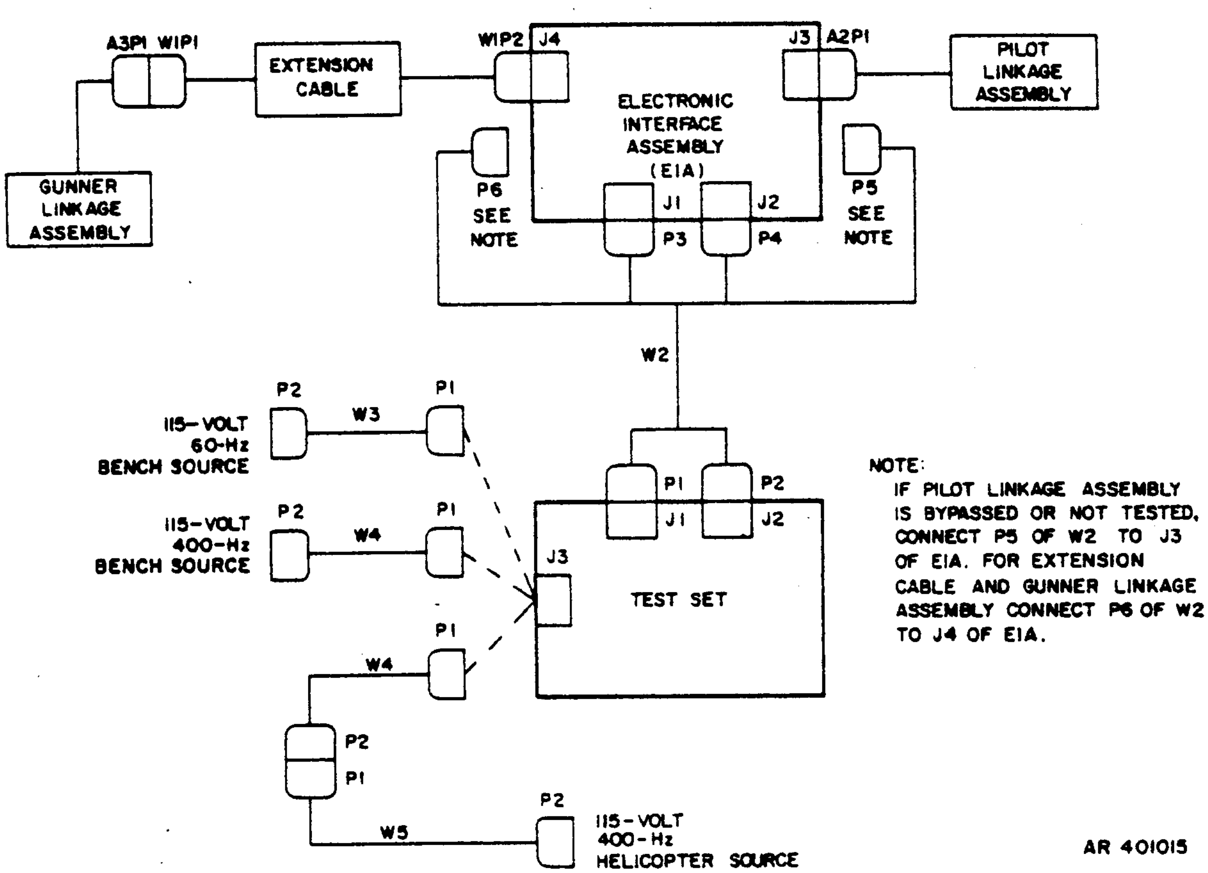


Figure 4-9. HSS test configuration

Table 4-2. HSS Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 5 and SYSTEM switch to 1. Press and hold FUNCTION INITIATE pushbutton. **NOTE** If a failure occurs in any of steps 2 through 4, the test-set multimeter will not display readings (in later steps) until test-set power is turned off and then back on.	EIA (J2-K)	POWER SUPPLY BIT indicator lights. If indicator does not light, check EIA (paragraph 4-20).
2	Set the SYSTEM switch to 2. If a linkage assembly is bypassed (fig. 4-9), set EIA BIT switch to 2. Wait 15 seconds; press and release FUNCTION INITIATE pushbutton.	EIA (J1-x)	GO indicator lights for 5 to 10 seconds after FUNCTION INITIATE pushbutton is released. If indication is normal and a linkage assembly has not been bypassed, proceed to step 13. If indication is abnormal or if it is normal and a linkage has been bypassed, proceed as indicated below:
		EIA (J1-h)	If PILOT LINKAGE indicator lights, disconnect linkage connector A2P1 and connect P5 of W2 to J3 of the EIA. Perform step 3.
		EIA (J1-g)	If GUNNER LINKAGE indicator lights, disconnect W1P2 of extension cable and connect P6 of W2 to J4 of the EIA. Perform step 4.
		EIA (J1-w)	If EIA indicator lights, check EIA (paragraph 4-20).

Table 4-2. HSS Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
3	Set EIA BIT switch to 2. Press and release FUNCTION INITIATE pushbutton.	EIA (J1-h)	If PILOT LINKAGE indicator lights, check EIA (paragraph 4-20). If GO indicator lights as in step 2, disconnect P5 of W2 from J3 of the EIA, connect A2P1 to J3, and proceed to step 9. If steps 9 through 12 do not isolate the problem, check pilot linkage assembly (paragraph 4-18). If procedures of paragraph 4-18 do not isolate the problem, check EIA (paragraph 4-20).
4	Set EIA BIT switch to 2. Press and release FUNCTION INITIATE pushbutton. **NOTE** If gunner linkage assembly is bypassed, do not perform steps 5 through 8. If a pilot linkage assembly is bypassed, do not perform steps 9 through 12. When performing steps 5 through 7, take and record all three readings before proceeding to step 8.	EIA (J1-g)	If GUNNER LINKAGE indicator lights, check EIA (paragraph 4-20). If GO indicator lights as in step 2, check extension cable (paragraph 4-28 or 4-29). If procedures of paragraphs 4-28 and 4-29 do not isolate the problem, disconnect P6 of W2 from J4 of the EIA, connect W1P2 to J4, and proceed to step 5. If steps 5 through 8 do not isolate the problem, check gunner linkage assembly (paragraph 4-18). If procedures of paragraph 4-18 do not isolate the problem, check EIA (paragraph 4-20).

Table 4-2. HSS Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
5	Set EIA BIT switch to OFF, SYSTEM switch to 4, RSLVR SELECT switch to R2, METER SELECT switch to 2, and CARD switch to 10.	EIA (J1-P)	PHASE 0° indicator lights. For XM128, multimeter indicates 5.450 ±0.850. For XM136, multimeter indicates 4.400 ±0.850. If indications are abnormal, refer to step 8.
6	Set METER SELECT switch to 3.	EIA (J1-p)	PHASE 180° indicator lights. For XM128, multimeter indicates 9.150 ±1.000. For XM136, multimeter indicates 9.800 ±1.000. If indications are abnormal, refer to step 8.
7	Set METER SELECT switch to 4.	EIA (J1-j)	PHASE 180° indicator lights. For XM128, multimeter indicates 5.650 ±0.700. For XM136, multimeter indicates 5.650 ±0.700. If indications are normal, proceed to step 9. If indications are abnormal, refer to step 8.
8	Set METER SELECT switch to 2, 3, and 4 as necessary. **NOTE** When performing steps 9 through 11, take and record all three readings before proceeding to step 12.	EIA (J1-j, -p, -P)	Loosen machine bolt (fig. B-8) that fastens gunner angle bracket to front support. Adjust bracket until multimeter indications in steps 5, 6, and 7 are within tolerance. Apply a few drops of sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, to threads of machine bolt to hold bracket in place. Repeat step 2.

Table 4-2. HSS Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
9	Verify that SYSTEM switch is set to 4. Set RSLVR SELECT switch to R3, METER SELECT switch to 2, and CARD switch to 10.	EIA (J1-E)	PHASE 0° indicator lights. For XM128, multimeter indicates 5.450 ±0.850. For XM136, multimeter indicates 6.250 ±0.850. If indications are abnormal, refer to step 12.
10	Set METER SELECT switch to 3.	EIA (J1-Z)	PHASE 180° indicator lights. For XM128, multimeter indicates 9.150 ±1.000. For XM136, multimeter indicates 8.900 ±1.000. If indications are abnormal, refer to step 12.
11	Set METER SELECT switch to 4.	EIA (J1-s)	PHASE 180° indicator lights. For XM128, multimeter indicates 5.650 ±0.700. For XM136, multimeter indicates 5.400 ±0.700. If indications are normal, proceed to step 13. If indications are abnormal, refer to step 12.
12	Set METER SELECT switch to 2, 3, and 4, as necessary.	EIA (J1-s, -Z, -E)	Loosen machine bolt (fig. B-5) that fastens pilot angle bracket to front support. Adjust bracket until multimeter indications in steps 9, 10, and 11 are within tolerance. Apply a few drops of sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, to threads of machine bolt to hold bracket in place. Repeat step 2.
13	Set test set switches used to OFF and disconnect LRUs and test set.		

Section IV. HELMET SIGHT ASSEMBLY TROUBLESHOOTING

4-15. General.

This section provides troubleshooting procedures for the helmet sight assembly by using the test set. The tests are performed on the bench or in the helicopter with the helmet sight assembly electrically isolated from the helicopter.

4-16. Helmet Sight Assembly Checkout Procedures.

a. Verify that the helmet sight assembly is installed on the SPH-4 helmet (paragraph 5-10,5-11, or 5-12).

b. Place the helmet on the operator's head and fasten the chin strap.

c. Manually position the eyepiece to the down position. Adjust the eyepiece vertically and laterally to desired position (figs. 2-14 and 2-1 5).

d. Perform the test-set preliminary procedures (paragraph 4-1 3).

e. Connect helmet sight assembly electrical connector A1P1 to the J4 HELMET receptacle on the test set.

f. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

g. Perform the procedures in table 4-3.

Table 4-3. Helmet Sight Assembly Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 1.	P1-1, -4	Observe that the reticle lights. If reticle does not light, replace DS1 lamp assembly (paragraph 3-12).
2	Press and hold FUNCTION INITIATE pushbutton.	P1-4	Reticle light goes out. If light remains on, check magnet position in receptacle. White dots should be adjacent to each other. Check switch S1 and associated circuitry.
3	Attach helmet boresight tool to receptacle magnet. Press and hold FUNCTION INITIATE pushbutton. **Caution** Do not hold SIGHT RETRACT pushbutton depressed more than 1 second, as this can cause overheating of the retract solenoid.	P1-1, -4, -5, -6	Reticle light remains lighted. If light goes out, check magnet position in receptacle. White dots should be adjacent to each other. **NOTE** If reticle light remains out, offset the white dots slightly to determine if lamp has failed or if magnet is not aligned properly.
4	Press SIGHT RETRACT pushbutton momentarily.	P1-7, -8	Eyepiece retracts (rotates upward). If eyepiece does not retract, check wiring in connector A1P1. If problem cannot be isolated, replace the helmet sight assembly.

Table 4-3. Helmet Sight Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
5	Position eyepiece to down position. Sight on a distant target (1000 meters or more) through the helmet sight eyepiece, while a second man sights through the helmet boresight tool at the same target. If the view through the helmet boresight tool is above, below, left, or right of the target (first column of "Performance standards"), loosen and then tighten the three adjustment screws on the receptacle as specified in the second and third "Performance standards" columns.		**Position of view relative to target** / **Loosen** / **Tighten** Above / Top, left, and right / Top Below / Top / Left and right Left / Right / Left Right / Left / Right If adjustment cannot be made, check alignment of helmet boresight tool, then check position of receptacle assembly.
6	Set test set switches used to OFF and disconnect helmet boresight tool, helmet sight assembly, and test set.		

Section V. LINKAGE ASSEMBLY TROUBLESHOOTING

4-17. General.

This section provides troubleshooting procedures for the gunner and pilot linkage assemblies by using the test set. The tests should be performed on the bench. The tests are identical for the two linkage assemblies.

4-18. Linkage Assembly Checkout Procedures.

a. Perform the test-set preliminary procedures (paragraph 4-13).

NOTE

> When the test is performed on a bench, the linkage assembly must be placed on a level surface with the mounting brackets and rails also leveled. Lock the LOD in the 0-degree position. Use the LOD bubble and adjust the swivel frame if necessary; this insures that the rails are not twisted.

b. Connect the test set, LOD, and linkage assembly as shown in figure 4-10.

c. Adjust the LOD azimuth angle and elevation angle with a combination square (fig. 4-10).

d. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

e. Set the multimeter range switch to 10 and function switch to AC V.

f. Perform the procedures in table 4-4.

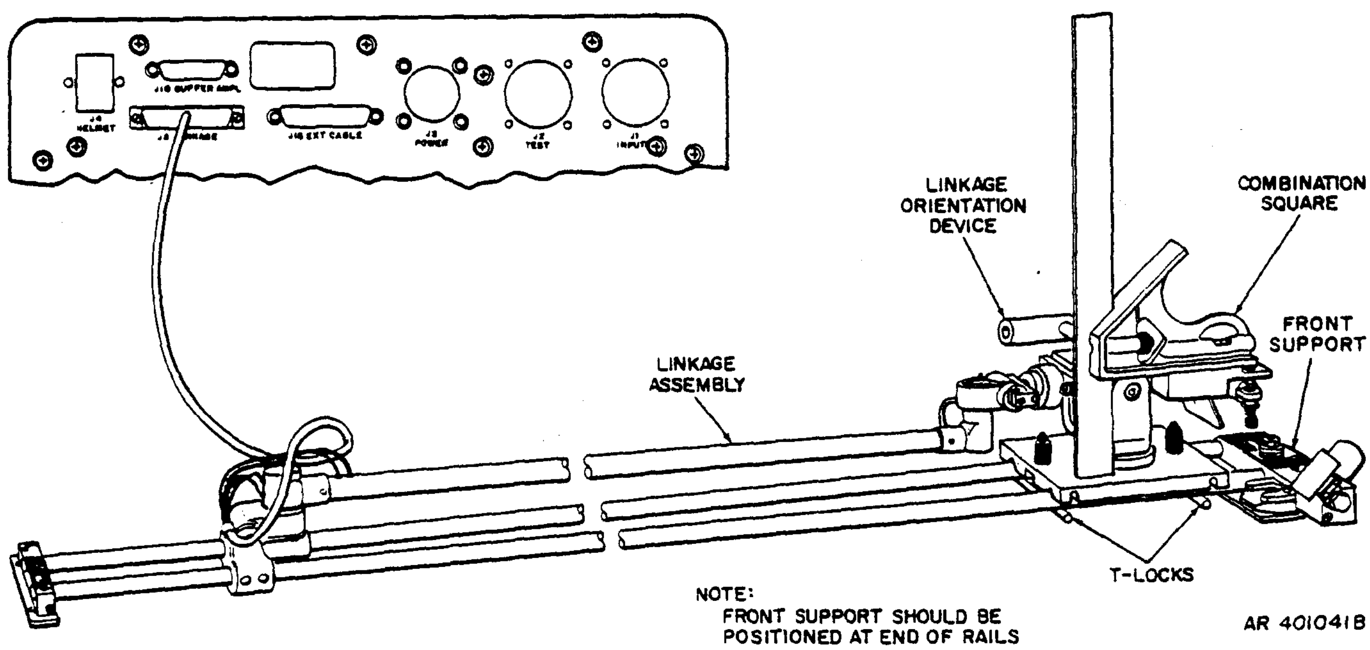


Figure 4-10. Linkaga assembly test setup

Table 4-4. Linkage Assembly Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 4, LINKAGE switch to 1, METER SELECT switch to 1, RSLVR SELECT switch to R2.	A2P1/A3P1-49	PHASE 0° indicator lights. Multimeter indicates 6.600 ±0.825. If indication is abnormal, replace arm assembly.
2	Set RSLVR SELECT switch to R3.	A2P1/A3P1-45	PHASE 0° indicator lights. Multimeter indicates 9.690 ±1.211. If indication is abnormal, replace arm assembly.
3	Set LINKAGE switch to 2 and RSLVR SELECT switch to R2.	A2P1/A3P1-48	PHASE 0° indicator lights. Multimeter indicates 5.300 ±0.663. If indication is abnormal, recheck azimuth alignment of LOD. Then replace arm assembly.
4	Set RSLVR SELECT switch to R3.	A2P1/A3P1-44	PHASE 0° indicator lights. Multimeter indicates 10.450 ±1.306. If indication is abnormal, recheck azimuth alignment of LOD. The replace arm assembly.
5	Set LINKAGE switch to 3 and RSLVR SELECT switch to R2.	A2P1/A3P1-47	PHASE 0° indicator lights. Multimeter indicates 5.300 ±0.663. If indication is abnormal, recheck azimuth alignment of LOD. Then replace arm assembly.
6	Set RSLVR SELECT swith to R3	A2P1/A3P1-43	PHASE 0° indicator lights. Multimeter indicates 10.620 ±1.328. If indication is abnormal, recheck azimuth alignment of LOD. Then replace arm assembly.

Table 4-4. Linkage Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
7	Set LINKAGE switch to 4 and RSLVR SELECT switch to R2.	A2P1/A3P1-42	PHASE 0° indicator lights. Multimeter indicates 5.840 ±0.730. If indication is abnormal, recheck elevation alignment of LOD. Then replace arm assembly.
8	Set RSLVR SELECT switch to R3.	A2P1/A3P1-46	PHASE 0° indicator lights. Multimeter indicates 10.170 ±1.271. If indication is abnormal, recheck elevation alignment of LOD. Then replace arm assembly.
9	Set test set switches used to OFF. Disconnect linkage assembly and test set.		

Section VI. ELECTRONIC INTERFACE ASSEMBLY TROUBLESHOOTING

4-19. General.

This section provides troubleshooting procedures for the EIA by using the test set. The tests are performed on the bench or in the helicopter with the EIA disconnected from the helicopter and other HSS LRU connectors. Individual tests of the buffer amplifiers and the plug-in circuit cards follow the EIA checkout procedures.

4-20. EIA Checkout Procedures.

NOTE

Where the procedures for checking out an EIA used in XMl28 differ from those for an EIA used in XMl36, these differences are spelled out in detail in the test table in this paragraph. Refer to figure B-10, foldouts FO-4 and FO-5, and the identification plate on the EIA to determine which EIA is being tested.

a. Perform the test-set preliminary procedures (paragraph 4-13).

b. Connect PI and P2 of test cable W2 to J1 and J2 of the test set.

c. Connect the other connectors of test cable W2 to the EIA as follows:

P3 to Jl

P4 to J2

P6 to J4

P5 to J3.

d. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

e. Set the multimeter range switch to 100 and the function switch to DC V.

f. Perform the procedures in table 4-5.

NOTE

Where reference is made in the table to “card Al 0 or Al 5,” check card Al 0 if the EIA is from XMl28 and card Al 5 if the EIA is from XM136.

NOTE

If all suggested corrective action procedures and all circuit card tests do not correct abnormal indications, check the EIA wiring (see foldout FO-4 or FO-5). To check the wiring, use a separate multimeter.

4-21. Troubleshooting Buffer Amplifier Modules A1 Through A8.

Modules Al through A8 are identical. Test each module by the following procedure:

a. Perform the test-set preliminary procedures (paragraph 4-13).

b. Connect the module to be tested to the J10 BUFFER AMPL jack on the test set.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to 0N-400 HZ if a 400-Hz power source is used.

d. Set the multimeter range switch to 10 and the function switch to AC V.

e. Perform the tests in table 4-6. If a failure occurs, the buffer amplifier is defective and should be replaced.

4-22. Troubleshooting Sequencer Card A9.

a. Perform the test-set preliminary procedures (paragraph 4-13).

b. Connect card A9 to the J7 SEQUENCER CARD receptacle on the test set.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used and to ON-400 HZ if a 400-Hz power source is used.

d. Perform the tests in table 4-7. If any of the tests fail, sequencer card A9 is defective and should be replaced.

Table 4-5. Electronic Interface Assembly Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 2 and EIA BIT switch to 1.	J2-K	POWER SUPPLY BIT indicator lights. If indicator does not light, first check card A12 (paragraph 4-25). To further isolate the problem, check the following components and their associated circuitry: transformer T2-1, -2, -3, and -4; power supply module PS1; and filter FL1 and capacitor C2 (for shorts).
2	Set EIA BIT switch to 2; press and release FUNCTION INITIATE pushbutton.	J1-x	GO indicator lights for 5 to 10 seconds after release of pushbutton. If indicator does not light, check card A9 (paragraph 4-22), card A10 (paragraph 4-23) or A15 (paragraph 4-26.1), and card A11 (paragraph 4-24).
3	Set EIA BIT switch 3; press and release FUNCTION INITIATE pushbutton	J1-g	GUNNER LINKAGE indicator comes on after approximately 3 seconds and stays on. If neither GUNNER LINKAGE nor EIA indicator comes on, check card A9 (paragraph 4-22) and card A10 (paragraph 4-23) or A15 (paragraph 4-26.1). If EIA indicator comes on, continue to step 14; then perform steps 44 and 45 to check the test resolver. Repeat step 3.
4	Set EIA BIT switch to 4; press and release FUNCTION INITIATE pushbutton.	J1-h	PILOT LINKAGE indicator comes on after approximately 3 seconds and stays on. If indicator does not light, check card A10 (paragraph 4-23) or A15 (paragraph 4-26.1).
5	Set EIA BIT switch to 5; press and release FUNCTION INITIATE pushbutton.	J1-w	EIA indicator lights after approximately 3 seconds and stays on. If indicator does not light, check card A10 (paragraph 4-23) or A15 (paragraph 4-26.1). If either LINKAGE indicator lights, relay K1, K2, or K3 is faulty and EIA should be replaced.

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
6	Set EIA BIT to OFF, TEST SELECT switch to 2, METER SELECT switch to 5, and CARD switch to 4.	J1-HH	Multimeter indicates +14.000 ±1.8000 If indication is abnormal, check R7 on TB1 and associated circuitry.
7	Set CARD switch to 5.	J1-GG	Multimeter indicates +14.000 ±1.800. If indication is abnormal, check R8 on TB1 and associated circuitry.
8	Set CARD switch to 6.	J2-W	Multimeter indicates +28.000 ±1.000. If indication is abnormal, remove cap and adjust ADJ POT on PS1 module (bottom of EIA). If adjustment cannot be made, replace PS1 module.
9	Set CARD switch to 7.	J2-b	Multimeter indicates –18.000 ±1.050. If indication is abnormal, check A12 card (paragraph 4-25), T1 pins 5 and 6, and associated circuitry.
10	Set CARD switch to 8.	J2-a	Multimeter indicates +18.000 ±1.050. If indication is abnormal, check A12 card (paragraph 4-25), T1 pins 7 and 8, and associated circuitry.
11	Set CARD switch to 9.	J2-X	Multimeter indicates +12.000 ±0.700. If indication is abnormal, check A12 card (paragraph 4-25), T1 pins 7 and 8, and associated circuitry.
12	Set CARD switch to 10.	J2-Y	Multimeter indicates +5.000 ±0.300. If indication is abnormal, check A12 card (paragraph 4-25), T1 pins 9 and 10, and associated circuitry.

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
13	Set CARD switch to 11.	J2-Z	Multimeter indicates–6.000 ±0.360. If indication is abnormal, check A12 card (paragraph 4-25), T1 pins 3 and 4, and associated circuitry.
14	Set CARD switch to OFF, METER SELECT switch to 1, RSLVR SELECT switch to R3, and EIA/AMPL switch to 1. Set multimeter function switch to AC V and range switch to 10.	J2-A	PHASE 0° indicator lights. Multimeter indicates 10.600 ±0.600. Record value. If indications are abnormal, check T2 pins 1 and 2, and associated circuitry.
15	Set EIA/AMPL switch to 2.	J2-B	PHASE 180° indicator lights. Multimeter indicates 10.600 ±0.600. Record value. If indications are abnormal, check T2 pins 3 and 4, and associated circuitry.
16	Set EIA/AMPL switch to 3.	J2-C	PHASE 0° indicator lights. For EIA from XM128, multimeter indicates 2.650 ±0.200. For EIA from XM136, multimeter indicates 2.100 ±0.200. If indications are abnormal, check card A10 (paragraph 4-23) or A15 (paragraph 4-26.1).
17	Set EIA/AMPL switch to 4.	J2-D	PHASE 180° indicator lights. For EIA from XM128, multimeter indicates 5.300 ±0.400. For EIA from XM136, multimeter indicates 4.450 ±0.400. If indications are abnormal, check card A10 (paragraph 4-23) or A15 (paragraph 4-26.1). Also, if your EIA is from XM136, check A14C1 and A14C2 and, if malfunction still exists, replace A14A1 (foldout FO-5 and paragraph 5-21).

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
18	Set EIA/AMPL switch to 5.	J2-E	PHASE 0° indicator lights. Multimeter indicates 5.300 ±0.400. If indications are abnormal, check card A10 (paragraph 4-23) or A15 (paragraph 4-26.1). When this step is successfully completed: If EIA is from XM128, omit steps 19 and 20 and proceed to step 21. (J1-t and -u are not connected in XM128 EIA.) If EIA is from XM136, proceed to step 19.
19	Set EIA/AMPL switch to 6.	J1-t (EIA from XM136 only)	PHASE 180° indicator lights. Multimeter indicates 9.850 ±0.700. If indications are abnormal, check card A15 (paragraph 4-26.1); also check A14C1 and A14C2 and, if malfunction still exists, replace A14A1 (foldout FO-5 and paragraph 5-21).
20	Set EIA/AMPL switch to 7.	J1-u (EIA from XM136 only)	PHASE 180° indicator lights. Multimeter indicates 6.200 ±0.500. If indications are abnormal, check card A15 (paragraph 4-26.1).
21	Set EIA/AMPL switch to 8	J1-d	PHASE 0° indicator lights. Multimeter indicates 5.000 ±0.650. If indications are abnormal, check R5 on TB1, T3 pins 1 and 2, and associated circuitry.

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
22	Set EIA/AMPL switch to 9.	J1-e	PHASE 180° indicator lights. Multimeter indicates 5.000 ±0.650. If indications are abnormal, check R6 on TB1, T3 pins 3 and 4, and associated circuitry. When this step is successfully completed: If EIA is from XM128, omit step 23 and proceed to step 24. (J1-v is not connected in XM128 EIA.) If EIA is from XM136, proceed to step 23.
23	Set EIA/AMPL switch to 10.	J1-v (EIA from XM136 only)	PHASE 0° indicator lights. Multimeter indicates 2.950 ±0.250. If indications are abnormal, check card A15 (paragraph 4-26.1).
24	Set TEST SELECT switch to 3, RSLVR SELECT switch to R2, CARD switch to 2, and METER SELECT switch to 2.	J1-P	Loosen locknut and zero GUNNER AZ (R2) so that PHASE 0° and PHASE 180° indicators are not lighted and multimeter indicates 0 ±0.100. Tighten locknut. If indications are abnormal, check R2 and associated circuitry or A13 card (paragraph 4-26).
25	Set METER SELECT switch to 3 and CARD switch to 1.	J1-p	Loosen locknut and zero GUNNER EL (R4) so that PHASE 0° and PHASE 180° indicators are not lighted and multimeter indicates 0 ±0.100. Tighten locknut. If indications are abnormal, check R4 and associated circuitry or A13 card (paragraph 4-26).

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
26	Set EIA/AMPL switch to 10 and RSLVR SELECT switch to R3.	J1-Z	Loosen locknut and zero PILOT EL (R3) so that PHASE 0° and PHASE 180° indicators are not lighted and multimeter indicates 0 ±0.100. Tighten locknut. If indications are abnormal, check R3 and associated circuitry or A13 card (paragraph 4-26).
27	Set METER SELECT switch to 2 and CARD switch to 2. **NOTE** Refer to figure 5-4 for locations of buffer amplifiers.	J1-E	Loosen locknut and zero PILOT AZ (R1) so that PHASE 0° and PHASE 180° indicators are not lighted and multimeter indicates 0 ±0.100. Tighten locknut. If indications are abnormal, check R1 and associated circuitry or A13 card (paragraph 4-26).
28	Set CARD switch to OFF, EIA/AMPL switch to 1, RSLVR SELECT switch to R2, and METER SELECT switch to 1.	J3-1, -2, -5, -6	PHASE 0° indicator lights. Multimeter indicates 9.800 ±1.00.
29	Set RSLVR SELECT switch to R3.	J3-1, -2, -5, -6	PHASE 0° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A1 (paragraph) 4-21).
30	Set EIA/AMPL switch to 2 and RSLVR SELECT switch to R2.	J3-13, -14, -17, -18	PHASE 0° indicator lights. Multimeter indicates 9.800 ±1.000. If indications are abnormal, check buffer amplifier A3 (paragraph 4-21).

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
31	Set RSLVR SELECT switch to R3.	J3-13, -14, -17, -18	PHASE 0° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A3 (paragraph 4-21).
32	Set EIA/AMPL switch to 3 and RSLVR SELECT switch to R2.	J3-25, -26, -29, -30	PHASE 0° indicator lights. Multimeter indicates 9.800 ±1.00. If indications are abnormal, check buffer amplifier A5 (paragraph 4-21).
33	Set RSLVR SELECT switch to R3.	J3-25, -26, -29, -30	PHASE 0° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A5 (paragraph 4-21).
34	Set EIA/AMPL switch to 4, and RSLVR SELECT switch to R2.	J3-22, -34, -38, -41	PHASE 0° indicator lights. Multimeter indicates 9.800 ±1.000. If indications are abnormal, check buffer amplifier A7 (paragraph 4-21).
35	Set RSLVR SELECT switch to R3.	J3-22, -34, -38, -41	PHASE 0° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A7 (paragraph 4-21).

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
36	Set EIA/AMPL switch to 5 and RSLVR SELECT switch to R2.	J4-1, -2, -5, -6	PHASE 180° indicator lights. Multimeter indicates 9.800 ±1.00. If indications are abnormal, check buffer amplifier A2 (paragraph 4-21).
37	Set RSLVR SELECT switch to R3.	J4-1, -2, -5, -6	PHASE 180° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A2 (paragraph 4-21).
38	Set EIA/AMPL switch to 6 and RSLVR SELECT switch to R2.	J4-13, -14, -17, -18	PHASE 180° indicator lights. Multimeter indicates 9.800 ±1.000. If indications are abnormal, check buffer amplifier A4 (paragraph 4-21).
39	Set RSLVR SELECT switch to R3.	J4-13, -14, -17, -18	PHASE 180° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A4 (paragraph 4-21).
40	Set EIA/AMPL switch to 7 and RSLVR SELECT switch to R2.	J4-25, -26, -29, -30	PHASE 180° indicator lights. Multimeter indicates 9.800 ±1.000. If indications are abnormal, check buffer amplifier A6 (paragraph 4-21).

Table 4-5. Electronic Interface Assembly Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
41	Set RSLVR SELECT switch to R3.	J4-25, -26, -29, -30	PHASE 180° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A6 (paragraph 4-21).
42	Set EIA/AMPL switch to 8 and RSLVR SELECT switch to R2.	J4-4, -22, -34, -38	PHASE 180° indicator lights. Multimeter indicates 9.800 ±1.000. If indications are abnormal, check buffer amplifier A8 (paragraph 4-21).
43	Set RSLVR SELECT switch to R3.	J4-4, -22, -34, -38	PHASE 180° indicator lights. Multimeter indicates 6.470 ±0.750. If indications are abnormal, check buffer amplifier A8 (paragraph 4-21).
44	Set TEST SELECT switch to 1, METER SELECT switch to 1, RSLVR SELECT switch to R2, and CARD switch to 11.	J2-R	PHASE 0° indicator lights. Multimeter indicates 93.3 percent of step 14 value ±1.5 percent. If indications are abnormal test buffer amplifiers A1 through A8 using the procedures given in para. 4-21. If no problem is found in the buffer amplifiers, adjust Bl. Loosen set screw and adjust resolver shaft until readings for steps 44 and 45 are within tolerance.
45	Set RSLVR SELECT switch to R3.	J2-S	PHASE 0° indicator lights. Multimeter indicates 61.6 percent of step 14 value ±1 percent. If indications are abnormal test buffer amplifiers Al through A8 using the procedures given in para. 4-21. If no problem is found in the buffer amplifiers, adjust B1. Loosen set screw and adjust resolver shaft until readings for steps 44 and 45 are within tolerance.
46	Set test set switches used to OFF and disconnect EIA and test set.		

Table 4-8. Buffer Amplifier Modules A1 through A8 Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set the TEST SELECT switch to 3, EIA/AMPL switch to 11, METER SELECT switch to 1, and RSLVR SELECT switch to R2.	P1-23	PHASE 0° indicator lights. Multimeter indicates 9.800 ±1.000.
2	Press and hold FUNCTION INITIATE pushbutton.	P1-17	PHASE 180° indicator lights. Multimeter indicates 9.800 ±1.000.
3	Set RSLVR SELECT switch to R3.	P1-16	PHASE 0° indicator lights. Multimeter indicates 6.470 ±0.750.
4	Press and hold FUNCTION INITIATE pushbutton.	P1-22	PHASE 180° indicator lights. Multimeter indicates 6.470 ±0.750.
5	Set test set switches used to OFF and disconnect the module and the test set.		

Table 4-7. Sequencer Card A9 Test

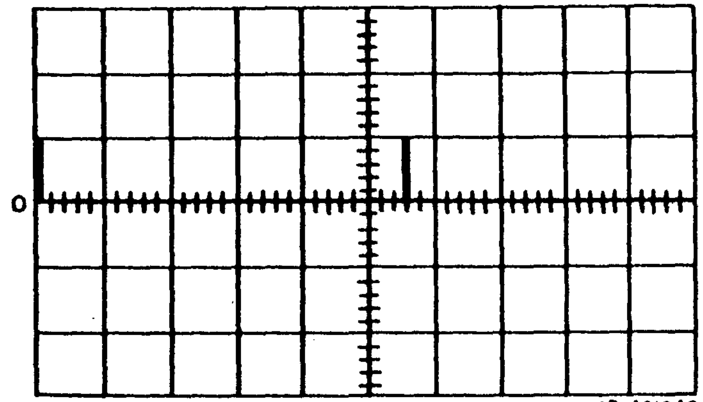
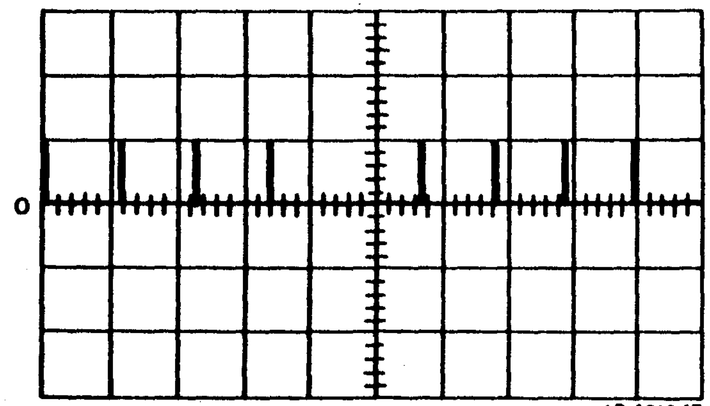
Operation of test equipment	Point of test	Performance standards
Set TEST SELECT switch to 6, CARD switch to 5, and METER SELECT switch to 1. Set oscilloscope to observe enable A pulses: Trigger: EXT + (connect to J12) Time: 0.2 sec. Voltage: 5 volts/div. Press and release FUNCTION INITIATE pushbutton.	Scope high to J12. Return to J18.	 AR 401046 Observe that there are two 5-volt pulses spaced 1125 ±125 ms apart when pushbutton is released. Ignore the blinking indicators.
Set METER SELECT switch to 2. Set oscilloscope same as in step 1 and observe enable B pulses. Press and release FUNCTION INITIATE pushbutton.	Scope high to J12. Return to J18	 AR 401047 Observe that second group of four pulses start 450 ±50 ms after last pulse of first group; pulses within each group are 225 ±25 ms apart. Ignore the blinking indicators.

Table 4-7. Sequencer Card A9 Test – Continued

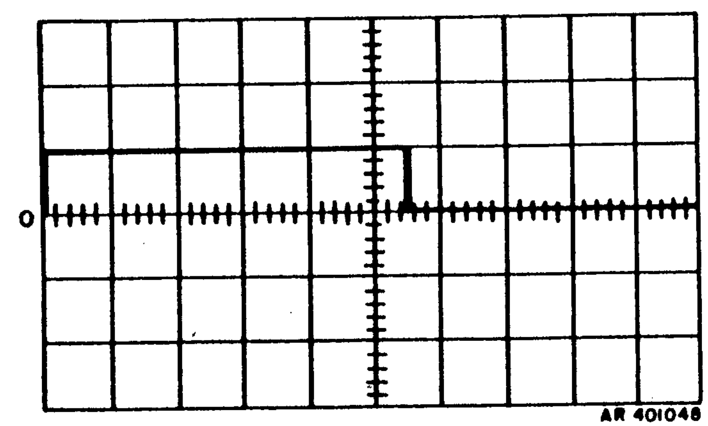
Step	Operation of test equipment	Point of test	Performance standards
3	Set oscilloscope to measure pulse width. Trigger: EXT + (Connect to J12) Time: 1 ms Voltage: 5 volts/div Press and release FUNCTION INITIATE pushbutton.	Same as step 1	 Pulse width shall be 5.5 ±1 ms.
4	Disconnect oscilloscope. Set METER SELECT switch to OFF.	P1-22, -26	DS8 and DS13 indicator lights.
5	Press and hold FUNCTION INITIATE pushbutton.	P1-23	DS1 indicator lights.
6	Release FUNCTION INITIATE pushbutton. Press and release to repeat test.	P1-23, -17, -16, -15, -12, -22, -21, -19, -14, -9, -26	DS1 indicator goes out; DS3, DS4, DS5, DS6, DS8, DS9, DS10, DS11, DS12, and DS13 light in sequence mentioned; DS8 and DS13 remain lighted.

Table 4-7. Sequencer Card A9 Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
7	Set CARD switch to 6. Press and hold FUNCTION INITIATE pushbutton.	P1-23	DS1 indicator lights.
8	Release FUNCTION INITIATE pushbutton. Press and release to repeat test.	P1-23, -22, -21, -19, -14, -9, -26	DS1 indicator goes out; DS8, DS9, DS10, DS11, DS12, and DS13 light in sequence mentioned; DS8 and DS13 remain lighted.
9	Set CARD switch to 7.	P1-31, -39, -22	DS3, DS4, and DS8 indicators light.
10	Press and hold FUNCTION INITIATE pushbutton.	P1-31, -39, -22	DS3, DS4, and DS8 indicators go out.
11	Release FUNCTION INITIATE pushbutton.	P1-17, -16, -22	DS3, DS4, and DS8 indicators remain out.
12	Set test set switches used to OFF and disconnect card and test set.		

4-23. Troubleshooting Logic Card A10.

NOTE

These procedures check out a logic card Al O from the EIA used in XM128. Refer to figure B-10, foldout FO-7, the part number on the logic card, and the identification plate on the EIA to determine that the correct logic card is being tested.

a. Perform the test-set preliminary procedures (paragraph 4-13)

b. Connect card Al0 to the J8 LOGIC CARD receptacle on the test set.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to 0N-400 HZ if a 400-Hz power source is used.

d. Set the multimeter range switch to 10 and the function switch to AC V.

e. Perform the teats in table 4-8. If any of the teats fail, logic card Al0 is defective and should be replaced.

4-24. Troubleshooting Comparator Card A11.

a. Perform the test-set preliminary procedures (paragraph 4-13).

b. Connect card A11 to the J9 COMPARATOR/AMPL CARD receptacle on the test set.

c. Sat the POWER switch to 0N-60 HZ if a 60-Hz power source is used or to 0N-400 HZ if a 400-Hz power source is used.

d. Set the TEST SELECT switch to 6 and the CARD switch to 4, and observe that the following indicators are lighted: DS2, DS3, DS4, DS5, and DS6. If any of the indications are abnormal, replace the card.

e. Set the teat set switches used to OFF and disconnect the card and the test set.

4-25. Troubleshooting Power Supply Card A12.

a. Perform the test-set preliminary procedures (paragraph 4-13).

b. Connect card Al2 to the J6 POWER CARD receptacle on the test set.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

d. Set the multimeter range switch to 100 and the function switch to DC V.

e. Perform the tests in table 4-9. If any of the tests fail, power supply card Al2 is defective and should be replaced.

4-26. Troubleshooting Amplifier Card A13.

a. Perform the teat-set preliminary procedures (paragraph 4-13).

b. Connect card A13 to the J9 COMPARATOR/AMPL CARD receptacle on the test set.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

d. Set the multimeter range switch to 10 and the function switch to AC V.

e. Perform the procedures in table 4-10. If any of the steps fail and the associated adjustments do not remedy the failure, replace the circuit card.

4-26.1. Troubleshooting Logic Card A15.

NOTE

These procedures check out a logic card Al 5 from the EIA used in XM136. Refer to figure B-10, foldout FO-10.1, the part number on the logic card, and the identification plate on the EIA to determine that the correct logic card is being tested.

a. Perform the test-set preliminary procedures (paragraph 4-13).

b. Connect card Al5 to the J8 LOGIC CARD receptacle on the test set.

c. Set the POWER switch to ON-60 HZ if a 60-Hz power source is used or to ON-400 HZ if a 400-Hz power source is used.

d. Set the multimeter range switch to 10 and the function switch to AC V.

e. Perform the tests in table 4-11. If any of the tests fail, logic card Al 5 is defective and should be replaced.

Table 4-8. Logic Card A10 Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 6, METER SELECT switch to 1, and CARD switch to 1. Press and hold FUNCTION INITIATE pushbutton.	P1-13, -14, -20, -23	PILOT LINKAGE, GUNNER LINKAGE, EIA, and GO indicators do not light.
2	Release FUNCTION INITIATE pushbutton.	P1-13, -23	GO and EIA indicators light. GO indicator goes out after 5 to 10 seconds. EIA indicator stays on.
3	Set RSLVR SELECT switch to R2.	P1-2	PHASE 0° indicator lights, and multimeter indicates 2.600 ±0.200.
4	Set RSLVR SELECT switch to R3.	P1-3	PHASE 0° indicator lights, and multimeter indicates 5.200 ±0.400.
5	Set CARD switch to 2. Press and hold FUNCTION INITIATE pushbutton.	P1-13, -14, -20, -23	PILOT LINKAGE, GUNNER LINKAGE, EIA, and GO indicators do not light.
6	Release FUNCTION INITIATE pushbutton.	P1-13, -14	GO and GUNNER LINKAGE indicators light. GO indicator goes out after 5 to 10 seconds. GUNNER LINKAGE indicator stays on.
7	Set RSLVR SELECT switch to R2.	P1-7	PHASE 180° indicator lights, and multimeter indicates 5.200 ±0.400.
8	Set RSLVR SELECT switch to R3.	P1-5	PHASE 180° indicator lights, and multimeter indicates 5.200 ±0.400.
	NOTE Disregard PILOT LINKAGE indicator if it lights when CARD switch is set from 2 to 3.		
9	Set CARD switch to 3. Press and hold FUNCTION INITIATE pushbutton.	P1-13, -14, -20, -23	PILOT LINKAGE, GUNNER LINKAGE, EIA, and GO indicators do not light.
10	Release FUNCTION INITIATE pushbutton.	P1-20, -23	EIA and PILOT LINKAGE indicators light.
11	Set test set switches used to OFF and disconnect the card and test set.		

Table 4-9. Power Supply Card A12 Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 7, CARD switch to 7, and METER SELECT switch to 5.	P1-10	Multimeter indicates -18.00 ±1 volt.
2	Set CARD switch to 8.	P1-30	Multimeter indicates +18.000 ±1 volt.
3	Press and hold FUNCTION INITIATE pushbutton.	P1-6	POWER SUPPLY BIT indicator lights.
4	Set CARD switch to 9.	P1-34	Multimeter indicates +12.00 ±0.7 volt.
5	Press and hold FUNCTION INITIATE pushbutton.	P1-6	POWER SUPPLY BIT indicator does not light.
6	Set CARD switch to 10.	P1-32	Multimeter indicates +05.00 ±0.30 volt.
7	Set CARD switch to 11.	P1-18	Multimeter indicates -06.00 ±0.36 volt.
8	Set the test set switches used to OFF, and disconnect the card and the test set.		

Table 4-10. Amplifier Card A13 Test

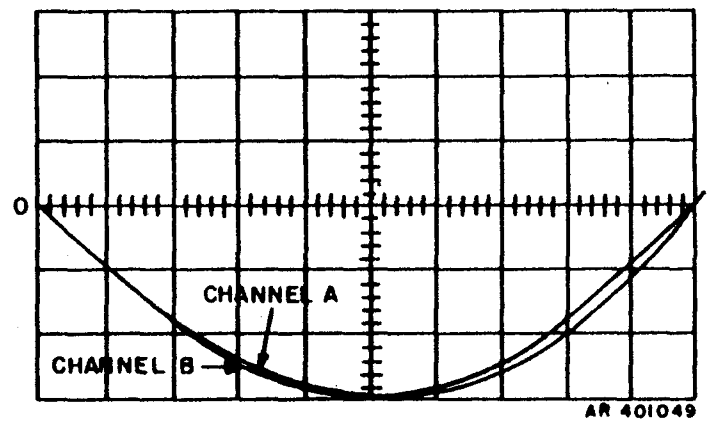
Step	Operation of test equipment	Point of test	Performance standards
1	Set METER SELECT switch to 1, TEST SELECT switch to 2, EIA/AMPL switch to 4, and RSLVR SELECT switch to R2.		Multimeter indicates approximately 5.200 and PHASE 180° indicator lights. Record value.
2	Set EIA/AMPL switch to 6.		Multimeter indicates approximately 9.000 and PHASE 180° indicator lights. Record value.
3	Set EIA/AMPL switch to OFF, TEST SELECT switch to 9, LINKAGE switch to 3, CARD switch to 8. Connect scope to observe waveforms: Trigger: EXT -- (Connect to J13) Time: 0.1 ms/div Voltage: 5 volts/div (Both channels) Center channel A waveform between horizontal lines and adjust trigger level to trigger at zero reference. Then adjust oscilloscope variable sweep speed to spread one phase (180 degrees) of channel A waveform over 10 divisions, as shown. Each division now represents 18 degrees.	Channel A to J14 Channel B to J11 Return to J18	 Adjust R52 so channel B waveform crosses zero reference same as channel A ±5 degrees (one-third division). Observe multimeter and adjust R44 to same value, ±0.050, as recorded in step 2. Recheck R52 and R44 adjustments for any interaction.

Table 4-10. Amplifier Card A13 Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
4	Set RSLVR SELECT switch to R3. Set oscilloscope same as step 3.	Same as step 3	Same waveform indications as step 3, but adjust R50. Observe multimeter and adjust R33 to same value, ±0.050, as recorded in step 2. Recheck R50 and R33 adjustments for any interaction.
5	Set TEST SELECT switch to 8, LINKAGE switch to 4, CARD switch to 9, and RSLVR SELECT switch to R2. Set oscilloscope same as step 3. NOTE Channel A waveform amplitude will be about 4 volts greater than channel B. Reduce channel A amplitude to match channel B to enable accurate phase adjustment.	Same as step 3	Same waveform indications as step 3, but adjust R48. Observe multimeter and adjust R22 to same value, ±0.025, as recorded in step 1. Recheck R48 and R22 adjustments for any interaction.
6	Set RSLVR SELECT to R3. Set oscilloscope same as step 5.	Same as step 3	Same waveform indications as step 3, but adjust R46. Observe multimeter and adjust R11 to same value, ±0.025, as recorded in step 1. Recheck R46 and R11 adjustments for any interaction.
7	Set CARD switch to OFF and LINKAGE switch to 2. Disconnect oscilloscope.	P1-33	Multimeter indicates 3.800 ±0.420 volt.

Table 4-10. Amplifier Card A13 Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
8	Set RSLVR SELECT switch to R2.	P1-27	Multimeter indicates 3.800 ±0.420.
9	Set TEST SELECT switch to 9 and LINKAGE switch to 1.	P1-3	Multimeter indicates 3.800 ±0.420.
10	Set RSLVR SELECT switch to R3.	P1-13	Multimeter indicates 3.800 ±0.420.
11	Set test set switches used to OFF and disconnect card and test set.		

Table 4-11. Logic Card A15 Test

Step	Operation of test equipment	Point of test	Performance standards
1	Set TEST SELECT switch to 6, METER SELECT switch to 1, and CARD switch to 1. Press and hold FUNCTION INITIATE pushbutton.	P1-13, -14, -20, -23	PILOT LINKAGE, GUNNER LINKAGE, EIA, and GO indicators do not light.
2	Release FUNCTION INITIATE pushbutton.	P1-13, -23	GO and EIA indicators light. GO indicator goes out after 5 to 10 seconds. EIA indicator stays on.
3	Set RSLVR SELECT switch to R2.	P1-2	PHASE 0° indicator lights, and multimeter indicates 2.100 ±0.200.
4	Set RSLVR SELECT switch to R3.	P1-3	PHASE 0° indicator lights, and multimeter indicates 5.150 ±0.400.
5	Set CARD switch to 2. Press and hold FUNCTION INITIATE pushbutton.	P1-13, -14, -20, -23	PILOT LINKAGE, GUNNER LINKAGE, EIA, and GO indicators do not light.
6	Release FUNCTION INITIATE pushbutton.	P1-13, -14	GO and GUNNER LINKAGE indicators light. GO indicator goes out after 5 to 10 seconds. GUNNER LINKAGE indicator stays on.
7	Set RSLVR SELECT switch to R2.	P1-7	PHASE 180° indicator lights, and multimeter indicates 4.450 ±0.400.
8	Set RSLVR SELECT switch to R3.	P1-5	PHASE 180° indicator lights, and multimeter indicates 9.850 ±0.700.
	NOTE Disregard PILOT LINKAGE indicator if it lights when CARD switch is set from 2 to 3.		
9	Set CARD switch to 3. Press and hold FUNCTION INITIATE pushbutton	P1-13, -14, -20, -23	PILOT LINKAGE, GUNNER LINKAGE, EIA, and GO indicators do not light.
10	Release FUNCTION INITIATE pushbutton.	P1-20, -23	EIA and PILOT LINKAGE indicators light.

Table 4-11. Logic Card A15 Test – Continued

Step	Operation of test equipment	Point of test	Performance standards
11	Set RSLVR SELECT switch to R2.	P1-15	PHASE 0° indicator lights, and multimeter indicates 2.950 ± 0.250.
12	Set RSLVR SELECT switch to R3.	P1-17	PHASE 180° indicator lights, and multimeter indicates 6.200 ± 0.500.
13	Set test set switches used to OFF and disconnect the card and test set.		

Section VII. EXTENSION CABLE TROUBLESHOOTING

4-27. General.

This section provides troubleshooting procedures for the extension cable by using the fire control subsystem test set. The tests are performed on the bench or in the helicopter.

4-28. Extension Cable Bench Checkout Procedures.

Connect the extension cable between A3P1 or A2P1 of a known-good linkage assembly and the J15 EXT CABLE receptacle on the test set. Perform the linkage assembly test (paragraph 4-18). If a failure occurs, use a separate multimeter and check for continuity, opens, or shorts (shields also). Refer to the extension cable schematic diagram (fig. 1-13). Repair the extension cable, if possible. Replace the extension cable if the problem cannot be remedied.

4-29. Extension Cable Helicopter Checkout Procedures.

Disconnect W 1 PI from the gunner linkage. Connect W1P1 to A2P1 on the known-good pilot linkage. Perform steps 1, 2, and 3 of table 4-2 in paragraph 4-14. If a failure occurs, use a multimeter and check for continuity, opens, or shorts (shields also). Refer to the extension cable schematic diagram (fig. 1-13). Repair the extension cable, if possible. Replace the extension cable if the problem cannot be remedied.

Section VIII. PREEMBARKATION INSPECTION OF MATERIEL IN UNITS ALERTED FOR OVERSEAS MOVEMENT

4-30. General.

This inspection is conducted on materiel in alerted units scheduled for overseas duty *to* insure that such materiel will not become unserviceable in a relatively short time. The inspection prescribes a higher percentage of remaining usable life in serviceable materiel to meet a specific need beyond minimum serviceability.

4-31. Inspection Points.

a. Screwheads must be in serviceable condition, and threads must not be stripped. Internal threads must not be stripped.

b. Cable assemblies must not have loose or damaged connections, cut or worn insulation, broken wires, kinks, or sharp bends.

c. Material must be free of burrs, particularly those on functional surfaces.

d. Parts must not be cracked, bent, distorted, or damaged and must be free of detrimental wear.

e. Rivets must be tight.

f. Painted surfaces must be free of bare spots.

g. Operating controls must function smoothly.

h. Identification plates must be present and secure.

i. Inspect electrical components for improper functioning, physical damage, and missing parts.

j. Inspect optical parts for cracks, scratches, and moisture on the inside of the optical cell.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT REPAIR INSTRUCTIONS

Section I. GENERAL

5-1. Scope.

This chapter provides instructions for repair that IS authorized at direct and general support levels. The instruct ions are for removal. disassembly, cleaning. in-process inspection, repair or replacement. assembly, and installation. No Iubrication instructions are required. After maintenance and repair. perform final inspection as instructed in Chapter 6.

5-2. Repair Illustrations.

The components in the illustrations in Appendix B (figs. B.1 through B-14) to this manual are numbered in the sequence of disassembly. When assembling, the reverse order of disassembly will he followed unless otherwise instructed. Supplementary illustrations are included in this chapter to aid in the performance of repair procedures. The illustrations should not be construed as authority to disassemble the materiel beyond the point required to perform operations authorized in the Maintenance AIIocation Chart (MAC) m Appendix C or to replace parts other than those authorized in the applicable columns in Appendix B. Repair Parts List.

5-3. General Repair and Replacement Istructions.

TM 9-254 presents general maintenance procedures that are often encountered m preparing fire control materiel.

a. Use of Tools.

(1) Care must be exercised to use tools that are suitable for the task. to avoid mutilation of parts and/or damage to tools.

(2) Keep tools clean and work with clean parts. The rules of good housekeeping must be observed.

b. Replacement* of *Parts.

(1) During assembly of components, replace all small parts, such as springs, pins, screws, bolts, and nuts, that show signs of wear or damage and which might fail before the next scheduled maintenance.

(2) if a required new part is not available, reconditioning of the old part is necessary. Such parts should be examined carefully after reconditioning to determine that they will function properly.

(3) Replace metal components that cannot be made serviceable by cleaning, fitting, or refinishing.

(4) Replace damaged wiring and connectors. Correct faulty soldered connections.

(5) Replace optical elements which are damaged beyond shop repair as prescribed in TM 9-254.

5-4. Cleaning.

a. Cleaning Mechanical Components. Wipe metal components of the sight with a cloth moistened with alcohol or other solvent conforming to MIL-A-6091; then dry with a clean, dry cloth. Clean optical components in accordance with TM 9-254.

b. Cleaning Electrical Components. Clean all electrical parts in accordance with TM 9-254.

5-5. In-process Inspections.

a Inspect ail metal components for dirt, grease or oil, metal filings, solder waste, or other foreign matter. Check all mating parts for fit and/or damage which would cause faulty operation.

b. Inspect wiring for fraying, cracked insulation, and signs of hot spots. Examine connectors for loose, missing, or bent pins. Check soldered connections.

c. Inspect optical elements for objectionable scratches, digs, fungus growth, chips, fractures, and/or cement separations.

5-6. Painting.

The finishes of LRUs can be touched up and/or painted when frequent handling and exposure to the elements have caused deterioration. Apply paint only as required.

a. Helmet Sight Assembly. Apply lusterless alkyd enamel TT-E-527, color green, 34087, FED-STD-595, to the outside of the aluminum housing.

b. Linkage Assemblies. Touch up surfaces with semigloss enamel, TT-E-529, color black, 27038, FED-STD-595. Protect rails from paint spray.

c. EIectronic Interface Assembly. Touch up surfaces with semigloss enamel TT-E-529, color black, 27038, FED-STD-595.

Section II. REPAIR OF HELMET SIGHT ASSEMBLY

5-7. Removal (fig.5-1).

a. Hold the threaded pins with a hex key wrench; with a visegrip or an equivalent wrench, remove the six pin collars and washers that secure the back straps and sides of the helmet sight assembly to the SPH-4 helmet.

b. Depress the back strap area and back out the two threaded pins on the back straps with a hex key wrench. Back out the remaining four threaded pins.

c. Loosen the visor lock knob; rotate the visor 90 degrees and remove the visor and the two nylon gaskets from the helmet sight assembly.

d. Position the visor lock at the top position and secure the lock.

e. Retain the visor and nylon gaskets for reinstallation.

Tag the helmet sight assembly with the size of the SPH-4 helmet from which it was removed.

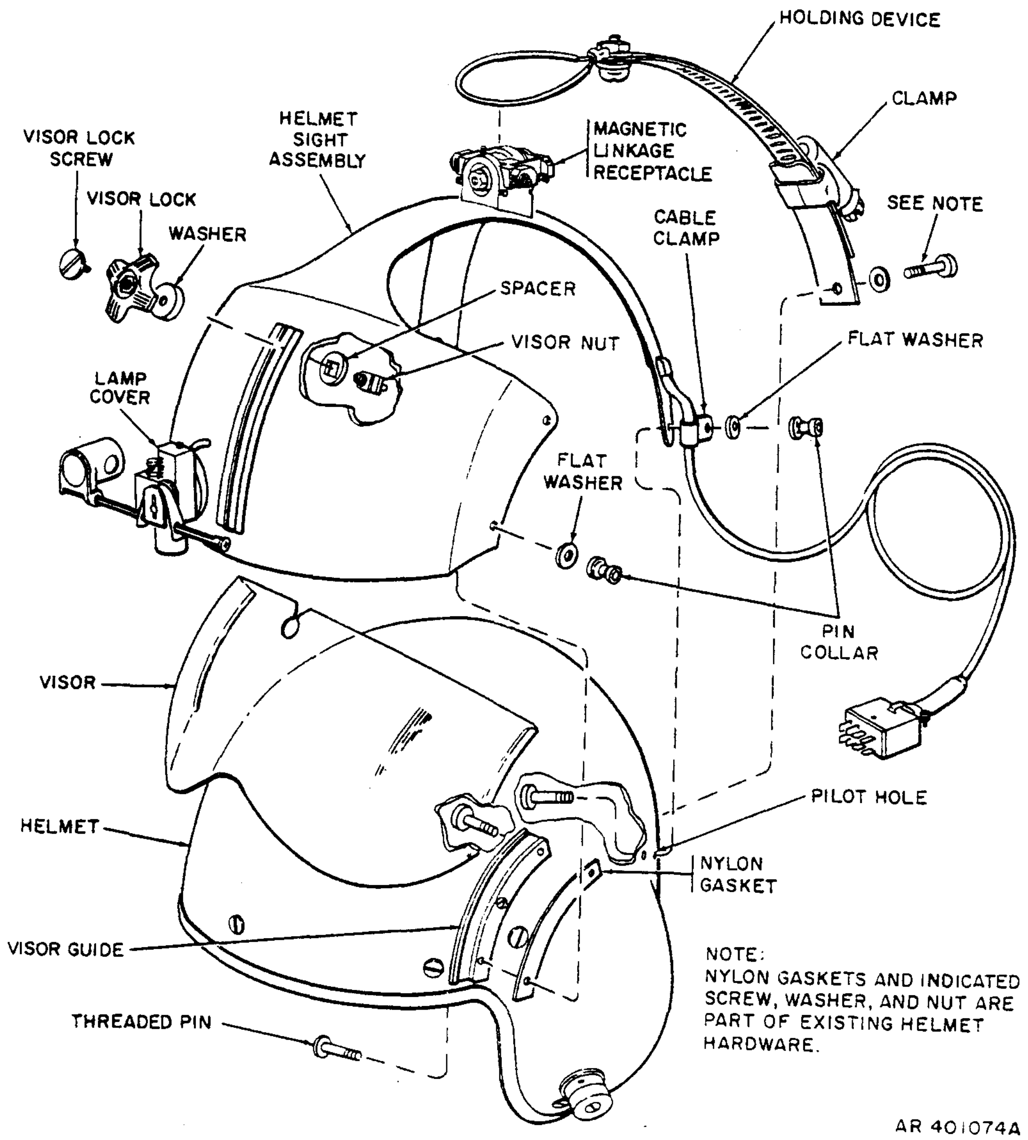


Figure 5-1. Helmet sight assembly - removal and installation

5-8. Disassembly and Assembly.

NOTE

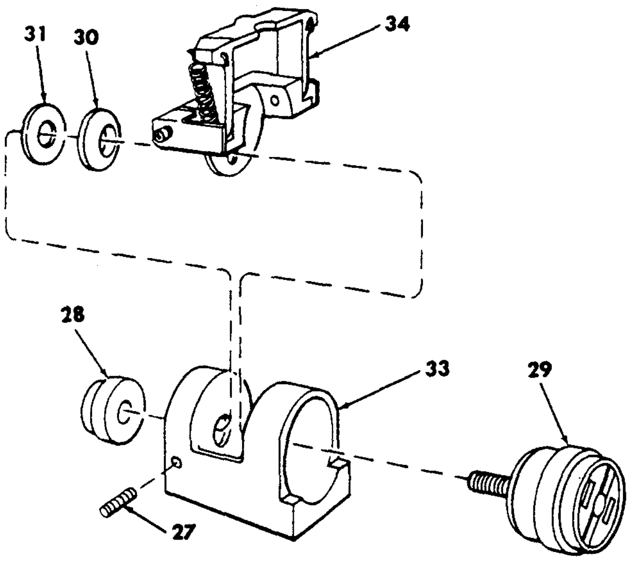
Disassemble only items necessary to complete repair procedures.

a. Remove items (16, fig. B-2) through (49). Refer to paragraph 5-9 for sight assembly repairs.

b. Assemble in reverse order, referring to *c* through *i*.

c. Assemble latch assembly (34) as shown.

d. Refer to figure 5-2. Install setscrews (27) loosely so that they will not touch the shaft on magnet (29). Assemble” convex washer (30), flat washer (31), latch assembly (34), and magnet (29) into helmet receptacle (33). Rotate the magnet to align the white dots. If a new magnet is being installed, rotate the magnet so that continuit y exists between A1Pl-5 and -6 with a linkage arm assembly steel fastener (or the helmet boresight tool) attached to the magnet (29) and so that an open circuit exists when the steel fastener is disconnected.



NOTE: FOR PROCEDURAL CLARITY AND FOR PURPOSES OF THIS FIGURE ONLY, SPECIFIC ITEMS FROM FIGURE B-2 ARE IDENTIFIED.

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27 – Setscrew (3)
28 – Swivel nut
29 – Magnet
30 – Convex washer
31 - Flat washer
33 – Helmet receptacle
34 – Latch assembly

Figure 5-2. Helmet sight receptacle - assembly

e. Apply a drop of sealing compound conforming to MIL-S-22743, grade T (primer) and grade H, to the threads of the shaft and nut. Install swivel nut (28) and tighten to a torque value of 5 inch-pounds with a torque wrench.

f. Tighten three setscrews (27) to hold magnet in position.

g. If a new magnet is installed, mark a spot in the epoxy of magnet (29) closet to the white mark on receptacle (33).

h. Drill a 1/8-inch-diameter hole, 0.010 inch deep, in the marked spot in the epoxy, being careful not to hit the magnet.

i. Fill the hole with white epoxy conforming to MS18038-91.

5-9. Sight Assembly Disassembly and Assembly (fig. B-3).

Caution

Do not disturb or remove the flathead screw at the falter-assembly (5) end of straight shaft (8). The screw is a part of the filter assembly and is bonded in place.

a. Remove items (1) through (14) and assemble reverse order.

b. Apply a drop of sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, to bond the cap (12) to the sight housing (36).

5-10. Installation of New Helmet Sight Assembly onto New SPH-4 Helmet (fig. 5-l).

NOTE

Installation items called out in this paragraph are furnished with a new helmet sight assembly.

a. Remove the visor housing and visor from the helmet by removing the four mounting screws and mounting nuts.

NOTE

The visor housing will not be reinstalled and it and its mounting screws and mounting nuts do not appear on figure 5-1. Dispose of the visor housing according to local instructions.

b. Remove the two screws (also not shown in figure 5-1) at the pilot holes on the helmet. Each screw secures a head strap tab.

c. Drill out strap-tab holes with a number 12 drill bit.

d. Remove the two visor guides from the helmet by removing the screw from the center of each guide.

Caution

In step *e* below, be extremely careful not to change the existing centerline of any of the four holes. Be sure to use a hand drill, not an electric drill.

e. Install a number 12 bit in a tap handle or hand chuck and use this tool to hand-drill out the top and bottom holes in each of the two visor guides.

f. Using the screws removed in *d* above, reinstall the visor guides on the helmet.

g. Turn the visor 90 degrees to the helmet sight assembly and slide the visor over the visor nut. Turn the visor back to the original position (horizontal), and secure the visor to the helmet sight assembly with the visor-lock spacer, visor-lock washer, visor lock, and visor-lock screw.

h. Secure the front of the helmet sight assembly and the nylon gaskets to the helmet with four threaded pins, using the two longest threaded pins (6, fig. B-2) in the two bottom holes and the two next-to-longest threaded pins (7) in the two top holes. Using your fingers only, install the flat washers and pin collars on the threaded pins. (Pin collars should be only tight enough to hold the pins at this time.)

i. Loosen the visor lock and check for free up and down movement of the visor.

j. Measure vertically from the front center edge of the helmet sight assembly to the lower edge of the helmet. This distance must not be more than 1/4 inch.

k. From the rear center of the helmet, remove the screw, washer, and nut that will be used to secure the holding device.

l. Adjust the holding device to near maximum length. Place the loop over the magnetic linkage receptacle and fasten the other end to the hole at the bottom back area of the helmet, using the screw, washer, and nut removed in step *k*.

Caution

Be sure not to overtighten the holding device. Turn the clamp only enough to insure that the rubber pieces in the back of the helmet are snug against the helmet and the helmet sight assembly is firmly in place.

m. Adjust the holding device to pull the back of the helmet sight assembly firmly into place.

n. Repeat step *j*. This measurement must still be 1/4 inch or less.

o. Place the helmet on an operator's head and fasten the chin strap. Insure that the internal webbing is adjusted so that the earpieces are comfortable.

p. Perform the boresighting procedures in Chapter 2, Section HI, or paragraph 4-16c and subsequent to verify that the new helmet and the new helmet sight assembly are compatible.

q. After successfully completing the boresighting procedures, remove the helmet from the operator's head.

r. Hold the helmet-sight-assembly strap tabs snugly against the helmet and mark the location of the helmet pilot holes on the tabs. (Mark from the inside of the helmet.)

s. Adjust the holding device to the near maximum length. Then remove the holding device by removing the screw, washer, and nut; replace the screw, washer, and nut that secured the holding device in the helmet.

t. Leaving the threaded pins in place, remove the pin collars installed in h above and remove the helmet sight assembly.

u. Center-punch the holes marked in *r*. Then, with a number 12 hand drill, drill holes through the pilot holes and through the heimet-sight-assembly strap tabs. Hold the back straps firmly.

v. Reinstall the helmet sight assembly with the pin collars removed in *t* above.

w. Secure the strap tabs inside the helmet and the back straps of the helmet sight assembly, using the shortest threaded pin (3, fig. B-2), a washer (2), and a pin collar (1) on the right back strap and the next-to-shortest threaded pin (5), loop clamp (4), a washer (2), and a pin collar (1) on the left back strap. Be sure the cable clamp is positioned as shown in figure B-2.

x. Permanently tighten all the pin collars (installed in *v* and *w* above).

NOTE

> The pin collars are tightened by holding the inner part of the threaded pin with a hex key wrench while turning the outer part of the pin collar until the outer part sheers off and only the inner collar remains.

y. Clean the metal filings and other debris from the helmet.

5-11. Installation of previously Drilled Helmet Sight Assembly onto new SPH-4 Helmet.

Perform the procedures of paragraph 5-10. The hole in the back strap of the helmet sight assembly may not line up with the pilot hole (step *u* of paragraph 5-10). In this case, drill a new hole in the back strap. Do not change the position of the hole in the helmet wall.

5-12. Installation of Previously Drilled Helmet Sight — Assembly onto Previously Drilled SPH-4 Helmet.

Perform steps 5-10h through 5-10y. In step 5-10u, a new hole may have to be drilled in the back strap of the helmet sight assembly. Do not change the position of the hole in the helmet wall.

5-13. Shim and Wedge Installation.

If shim 2202214-00 and wedge 2202213-00 have been installed on your helmet sight assembly, these items will have been installed as a set and must be maintained as a set. If the shim and wedge are not installed, gasket 2251744-00 is required in place of the wedge. See Appendix B, figure B-2.

Section III. REPAIR OF LINKAGE ASSEMBLIES (GUNNER AND PILOT)

5-13. Removal of Linkage Assemblies (fig. 5-3).

a. Place the linkage arm assembly in the stow position (fig. 2.10).

b. Loosen the captive screws and disconnect the cable connect or.

c. Remove the self-locking nut, concave washer, convex washer, and key washer that secure the front support to the bracket.

Caution

The front end of the linkage assembly must be supported while the mounting hardware is removed from the aft support.

d. Remove the self-locking nut. concave washer. convex washer. loop clamp (gunner linkage only), and key washer that secure the aft support to the bracket.

Caution

Do not tip the front end of the linkage assembly down or the front support and arm assembly will slide off the rails.

e. Carefully lower the assembly, two convex washers, and two concave washers from the two brackets.

f. Remove the two brackets from the airframe by removing four screws. Retain the screws.

g. If the assembly is not to be reinstalled in the helicopter at this time, reverse steps *c* through *e* to reassemble the assembly and avoid loss of hardware.

5-14. Pilot Linkage Disassembly and Assembly (fig. B-4).

NOTE

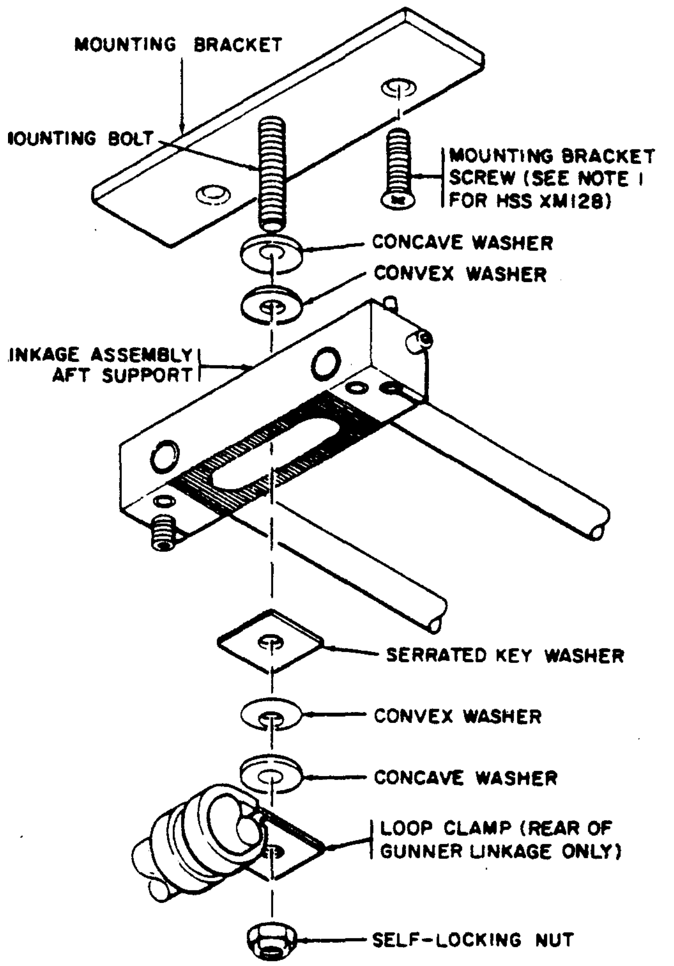
Disassemble only items necessary to complete repair procedures.

a. Remove items (2) through (11).

b. Remove two spring pins (12) by placing aft support (13) on a block and driving spring pins out with a 5/32 drift pin.

c. Remove rails (14) from arm assembly (15).

d. Assemble in reverse disassembly sequence. Place rails (14) in aft support (13) so that the grooves in the rails line up with the spring-pin holes. Drive. in new spring pins (12) so that the slots on the pins are opposite the grooves in the rails.



NOTES:

1. FOR HSS XM128, EXTENSION-CABLE BRACKET ASSEMBLY MUST BE INSTALLED AS SHOWN IN FIGURE 5-6.
2. REMOVAL AND INSTALLATION AT FRONT AND AFT SUPPORTS OF PILOT AND GUNNER LINKAGE ASSEMBLIES ARE IDENTICAL EXCEPT THAT GuNNER-LINKAGE AFT SUPPORT HAS LOOP CLAMP.

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Figure 5-3. Linkage assembly - removal and installation

e. Apply sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, to quick-release plunger (10) and position the plunger so that the threaded portion extends 1/20-inch beyond the Surface of the aft support.

f. Apply the same fluids as in e above to the locking screw (9) and tighten the screw. Socket-drive setscrew (11) and its locking screw are not secured with sealing compound.

5-15. Pilot Front Support Disassembly and Assembly (fig. B-5).

a. Remove items (1) through (14) and assemble in reverse disassembly sequence.

b. Perform final adjustment of angle bracket (7) during test (paragraph 4-14, table 4-2, step 12). At that time, sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, is applied to machine bolt (5).

c. Apply MIL-S-22473, grade T (primer) and grade H, sealing compound to quick-release plunger (12) and position the plunger so that. the threaded portion extends l/20-inch beyond the surface of the front support.

d. Apply the same fluids as in *c* above to locking screw (8) and tighten the screw. Socket-drive setscrew (13) and its locking screw (8) are not secured with sealing compound.

5-16. Arm Assembly Repair (figs. B-6 and B-9).

Repair or replace screwlock assembly (1).

5-17. Gunner Linkage Disassembly and Assembly (fig. B-7).

a. Remove items (2) through (13).

b. Remove two spring pins (14) by placing aft support (15) on a block and driving the spring pins out with a 5/32 drift pin.

c. Remove rails (16) and arm assembly (17).

d. Assemble in reverse disassembly sequence. Place rails (16) in aft support (15) so that the grooves in the rails line up with the spring-pin holes. Drive in new pins (14) so that the dots on the spring pins are opposite the grooves in the rails.

e. Apply MIL-S-22473, grade T (primer) and grade H, sealing compound to quick-release plunger (12) and position the plunger so that the threaded portion extends l/20-inch beyond the surface of the aft support.

f. Apply the same fluids as in *e* above to locking screw (11) and tighten the screw. Socket-drive setscrew (13) and its locking screw are not secured with sealing compound.

5-18. Gunner Front Support Disassembly and Assembly (fig. B-8).

a. Remove items (1) through (14) and assemble in reverse disassembly sequence.

b. Perform final adjustment of bracket (5) during test (paragraph 4-24, table 4-2, step 8). At that time, sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, is applied to machine bolt (1).

c. Apply sealing compound conforming to MIL-S-22473, grade T (primer) and grade H, to quick-release plunger (11) and position the plunger so that the threaded portion extends 1/20-inch beyond the surface of the front support.

d. Apply the same fluids as in *c* above to locking screw (8) and tighten the screw. Socket-drive setscrew *(12)* and its locking screw (8) are not secured with sealing compound.

5-19. Installation of Linkage Assemblies (fig. 5-3).

a. Remove the two self-locking nuts, four concave washers, four convex washers, loop clamp (gunner linkage only), and two key washers from the two mounting brackets.

b. Secure the front and aft mounting brackets to the helicopter airframe, using the four screws that were retained in 5-13f.

c. Place the concave washer (flat side up) and convex washer (flat side down) on each mounting bracket.

d. Place the linkage assembly on the mounting brackets.

Caution

The front end of the linkage assembly must be supported while the mounting hardware for the aft end is installed.

e. Place the key washer on the aft mounting bracket. . Mesh and align the washer with the mating surface of the aft support.

f. Place the convex washer (flat side up) and concave washer (flat side down) on the mounting bracket.

g. Secure the aft support with the self-locking nut.

h. Secure the front support assembly, using the key washer, convex washer, concave washer, and self-locking nut.

i. Connect the cable connector and secure the connectors with the captive screws.

j. Perform the alignment and boresighting procedures as described in paragraph 4-3.

NOTE

After completion of linkage assembly installation and alignment, wipe the rail clean with a soft cloth and alcohol or other solvent conforming to MIL-A-6091.

Section IV. REPAIR OF ELECTRONIC INTERFACE ASSEMBLY (EIA)

5-20. EIA Disassembly and Assembly

a. Remove items (2, fig. B-10) through (12).

b. Slice the circuit card extractor handle over the top lugs of each of circuit cards A12 (13), A13 (14), A11 (15), A10/A15 (16), and A9 (17) and remove the card by pulling it straight out.

When loosening the connector hold screws on the buffer-amplifier cable connectors, take care to prevent damage to the cable harness.

c. Remove items (18) through (21).

d. Assemble each of eight buffer amplifiers (21), including flat washer (20), lockwasher (19), and screw (18), as illustrated in figure 54.

c. Assemble circuit cards A9 (17, fig. B-10), A10/A15 (16), A11 (15). A13 (14), and A12 (13) by sliding the cards down the teflon guide and into the mating connector. The cards are keyed and marked to insure proper placement and should be firmly pressed into the mating connector.

f. Assemble items (12) through (2) in revers disassembly sequence.

5-21. Electronic Interface Subassembly Disassembly and Assembly.

a. XM128 EIA (fig. 5-5).

(1) Remove items (1) through (72), except items (6), (7), (8), (24), (27), (33), (40), (57), (58), (66), (67), and (69). Unsolder and mark leads where necessary.

NOTE

Resistors R9 and R10 mounted on TB1 (56) and resolver B1 (33) are a matched set. The resistors are furnished with the resolver.

(2) Carefully break the adhesive that anchors the wire bundles to the replaceable components.

(3) Assemble items (72) through (1) in revers disassembly sequence.

(4) Verify that replacement transformer T2 (16) has a soft-tempered, coated, AWG 24, uninsulated, solid bus wire, conforming to QQ-W-343, between terminals 2 and 3.

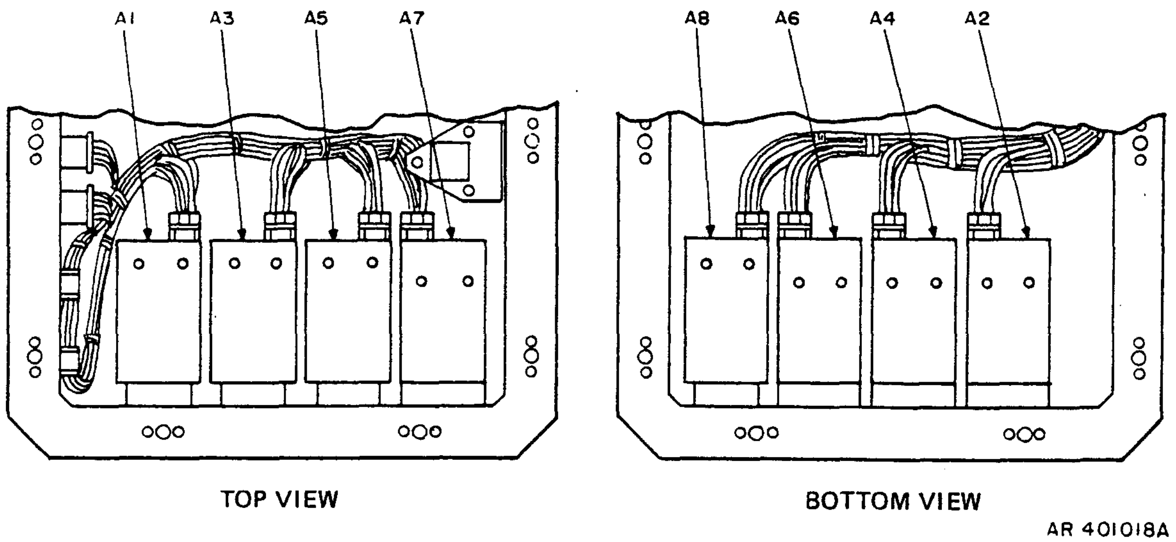

Figure 5-4. Buffer amplifier installation

(5) Verify that replacement transformer T3 (13) has a soft-tempered, coated, AWG 24, solid bus wire, conforming to QQ-W-343, between terminals 2 and 3 and between terminals 3 and 7. Verify that the bus wire between terminals 3 and 7 is sleeved.

(6) Spot bond the wire bundles with adhesive conforming to MIL-A-8623, type 1, in the same manner as they were originally anchored.

b. HSS XM136 EIA.

(1) Remove items (1, fig. B-11) through (82) except items (6), (7) (8). (28), (31). (39), (49), (67), (68), (76), (71), and (79). Unsolder and mark leads where necessary. Mounting hardware for variable resistors R1 through R4 (39) is bonded in place.

NOTE

Resistors R9 and R10 mounted on TB1 (64) and resolver B1 (39) are a matched set. The resistors are furnished with the resolver.

(2) Carefully break the adhesive seal that anchors the wire bundles to the replacement components.

(3) Disassemble and assemble azimuth bias circuit card A14 as shown in figure B-13.

(4) Assemble items (82, fig. B-11) through (1) in reverse disassembly sequence.

NOTE

There are two antirotation pinholes in potentiometer mounting chassis (43) for each resistor (44). The tangs on each resistor are pressed into these pinholes during installation.

(5) When installing resistors R1 through R4 (44) in potentiometer mounting chassis (43), coat the threads close to the chassis wall with sealing compound conforming to MIL-S-22473, grade T (primer) and grade A. Fill the antirotation pinholes with a mixture of Stycast®2651 and catalyst number 9.

(6) Verify that replacement transformer T2(17) has a soft-tempered, coated, AWG 24, uninsulated, solid bus wire, conforming to QQ-W-343, between terminals 2 and 3.

(7) Verify that replacement transformer T3 (13) has a soft-tempered, coated, AWG-W-343, solid bus wire, conforming to QQ-W-343, between terminals 2 and 3 and between terminals 3 and 7. Verify that the bus wire between terminals 3 and 7 is sleeved.

(8) Spot bond the wire bundles with adhesive conforming to MIL-A-8623, type 1 in the same manner as that in which they were originally anchored.

5-22. EMI Filter Disassembly and Assembly (fig. B-12).

Remove items (1) through (5). Unsolder and mark leads as necessary. Assemble in reverse disassembly sequence.

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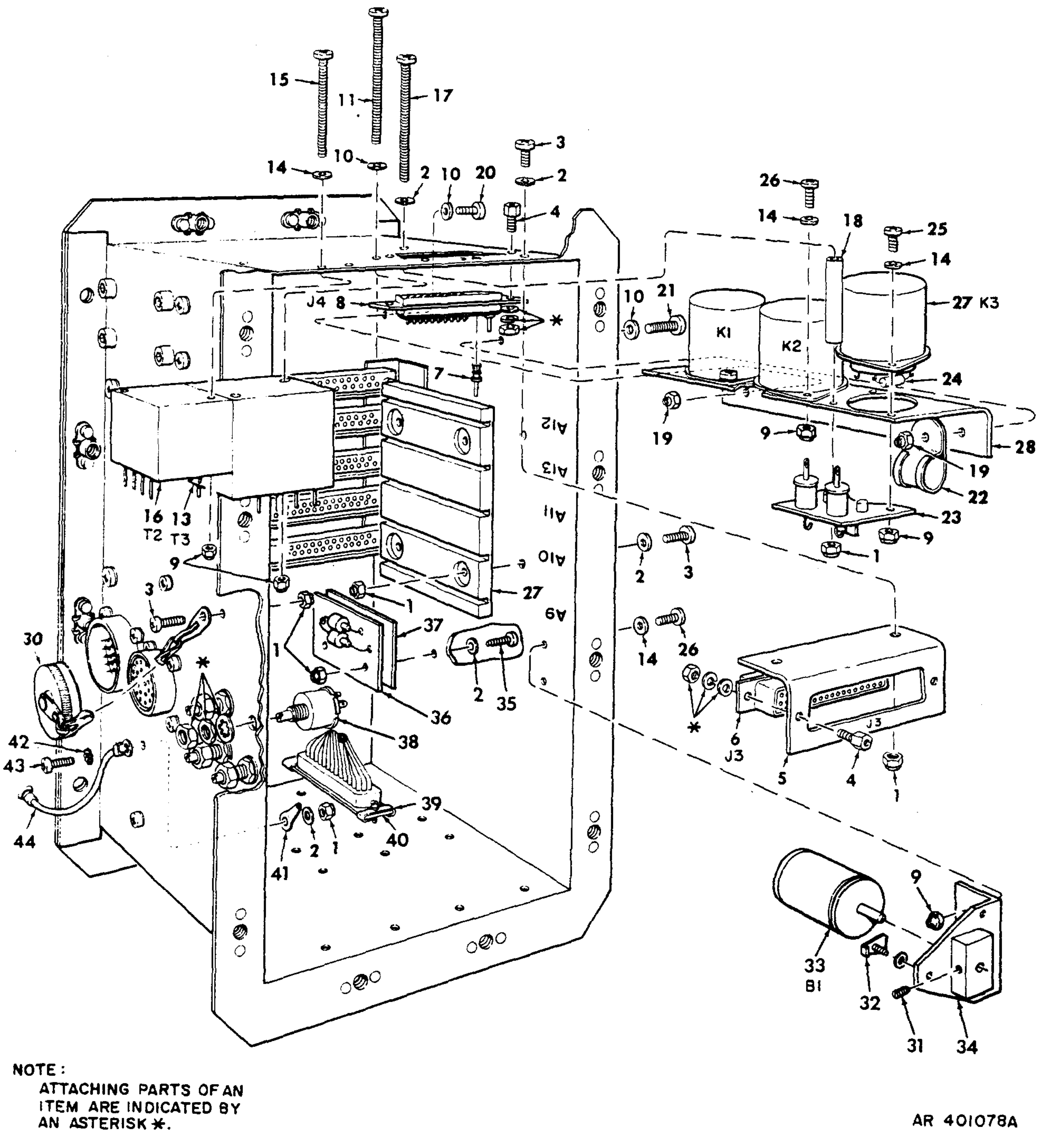


Figure 5-5. Electronic interface subassembly from HSSXM128 - exploded view (sheet 1 of 2)

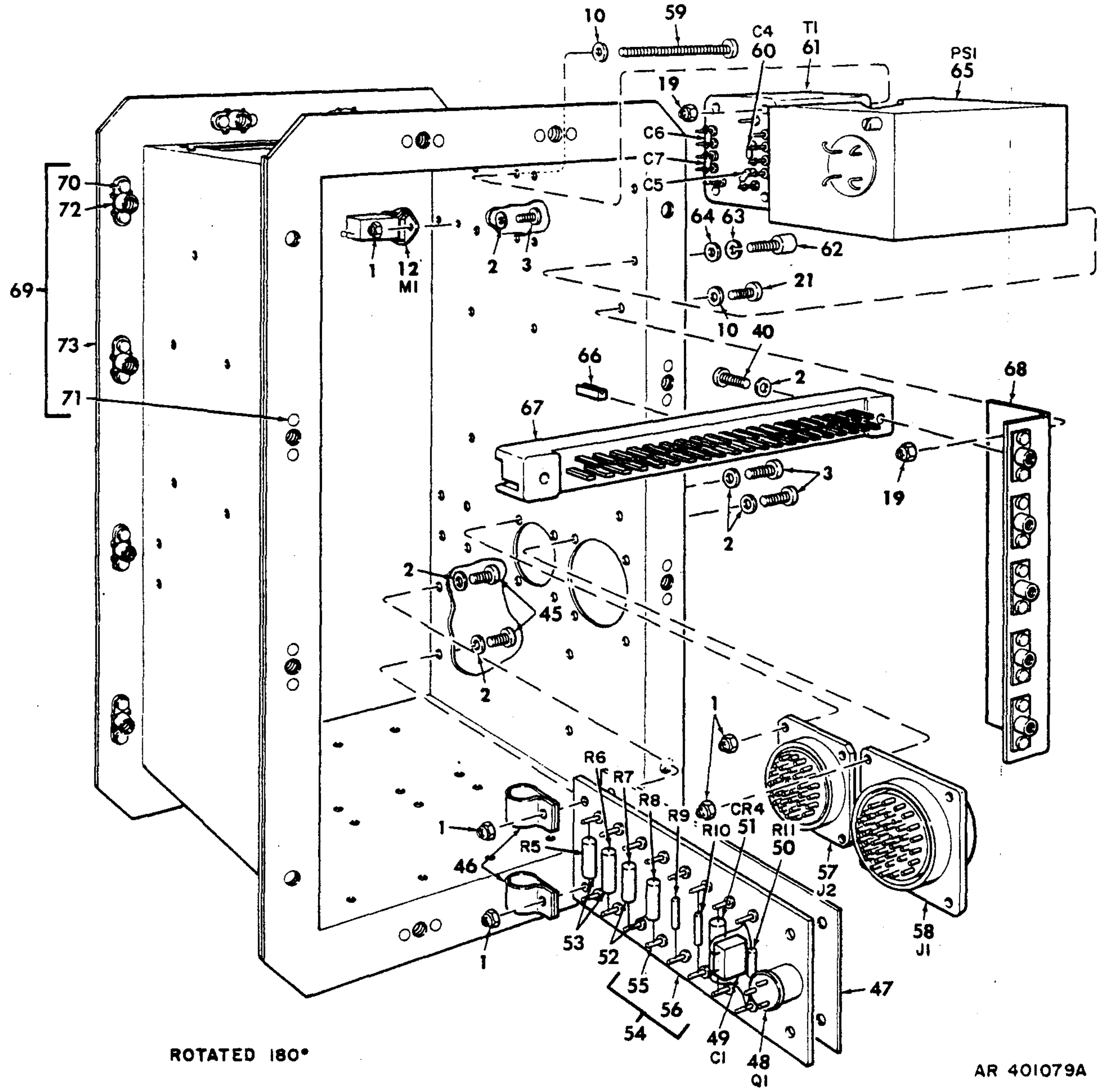


Figure 5-5. Electronic interface subassembly from HSS XM128 - exploded view (sheet 2 of 2)

Legend for figure 5-5

1 – Self-locking nut
2 – Flat washer
3 – Machine screw
4 - Screw lock assembly
5 – Connector bracket
6 – Electrical connector J3
7 –Receptacle
8 – Electrical connector J4
9 – Self-locking nut
10 – Flat washer
11 - Machine screw
12 – Time-totalizing meter M1
13 – Transformer T3
14 – Flat washer
15 – Machine screw
16 – Transformer T2
17 - Machine screw
18 - Spacer
19 - Self-locking nut
20 – Machine screw
21 – Machine screw
22 – Loop clamp
23- Filter assembly
24 - Diode
25 - Machine screw
26 – Machine screw
27 - Armature relay K3
28 - Relay bracket
29 – Guide
30 – Connector cover
31 – Setscrew
32 – Clamp
33 – Resolver B1
34 – Resolver bracket
35 – Machine screw
36 – Terminal board assembly Al6
37 – Insulator board
38 – Variable resistors R1, R2, R3, and R4
39 – Lock
40 – Electrical connector
41 – Lug terminal
42 – Lockwasher
43 – Machine screw
44 - Bonding jumper
45 Screw
46 – Loop clamp
47 – Spacer sheet
48 - Diode Ql
49 – Capacitor C 1
50 – Resistor R11
51 – Diode CR4
52 – Resistors R7 and R8
53 – Resistors R5 and R6
54 – Terminal board assembly
55 – Terminal
56 – Terminal board
57 – Electrical connector J2
58 – Electrical connector J1
59 – Machine screw
60 – Capacitors C4, C5, C6, and C7
61- Transformer T1
62 – Sockethead screw
63 – Lockwasher
64 – Flat washer
65 – Power supply PS1
66 – Polarizing key
67 – Electrical connector
68- Bracket assembly
69 – Chassis assembly
70 – Rivet
71 – Rivet
72 – Plate nut
73 – Chassis

Section V. REPAIR OF EXTENSION CABLE

5-23. Removal (fig. 5-6).

a. HSS XM128 (A H-1S(Mod) Helicopter).

NOTE

Before the extension cable can be removed from an AH-1S(Mod) helicopter, the gunner linkage assembly must be removed (paragraph 5-13).

(1) Disconnect connector W1P2 from the EIA.

(2) Disconnect the four cable clamps that secure the cable to the airframe. Retain the clamps and the screws and washers.

(3) Remove the two screws that secure the cable mounting bracket assembly and the gunner-linkage assembly aft mounting bracket to the airframe. Retain the screws.

b. HSS XM136 (AH-1S P E M Helicopter).

(1) Disconnect connector W1P2 from the EIA and connector W1P1 from A3P1 on the gunner linkage.

(2) Remove the screw which secures each of the three cable clamps to the airframe. Remove the clamps. Retain the clamps and screws.

(3) Remove the two screws that secure the cable mounting bracket assembly to the airframe. Retain the screws.

5-24. Disassembly and Assembly (fig. B-15).

Remove items (2) through (5). Assemble in reverse disassembly sequence.

5-25. Installation (fig. 5-6).

a. HSS XM128 (AH- 1S(Mod) Helicopter).

(1) Secure the cable mounting bracket assembly and the gunner-linkage-assembly aft mounting bracket to the airframe with the two mounting screws retained in paragraph 5-23a(3).

(2) Connect cable connector A3P1 from the gunner linkage assembly to W1P1 on the extension cable.

(3) Route the extension cable along the airframe and connect cable connector W1P2 to J4 on the EIA.

(4) Secure the cable to the airframe with the four cable clamps and their mounting screws and washers. These items were retained in paragraph *5-23a(2).*

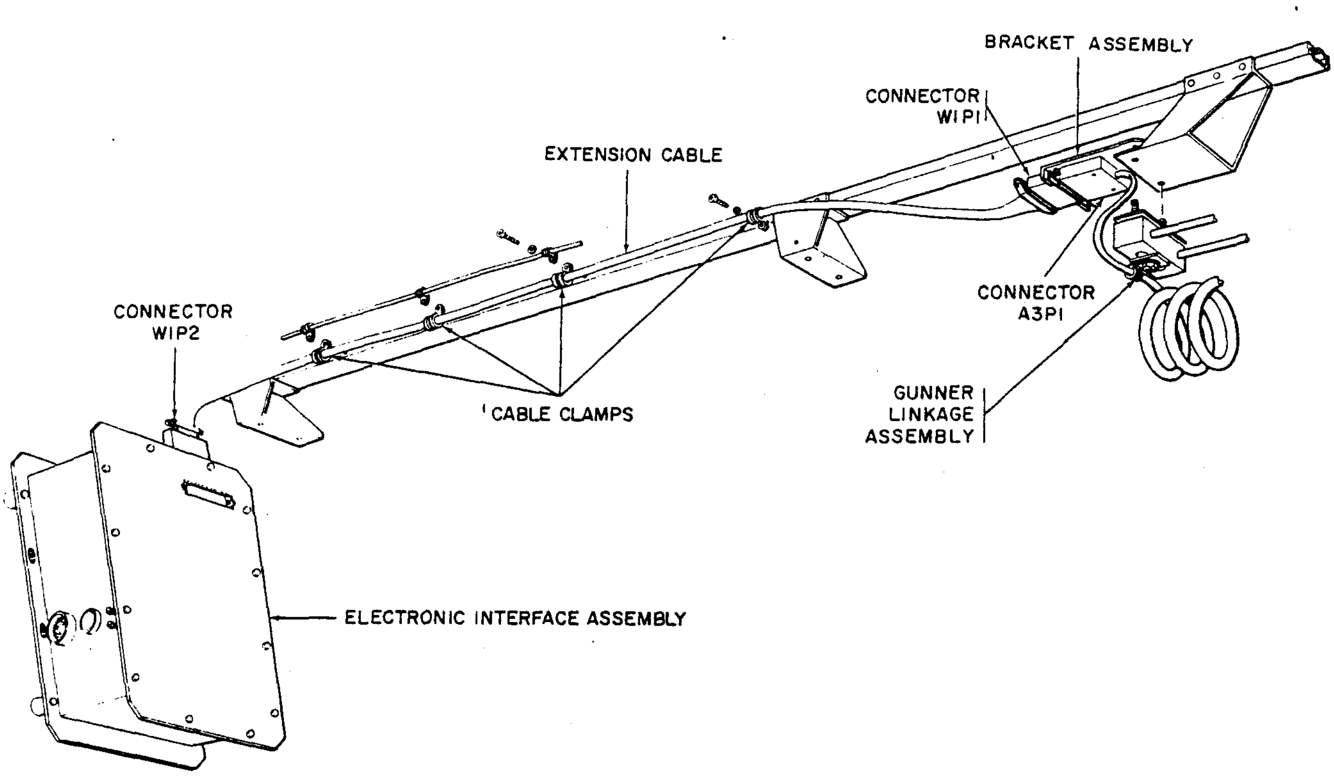
(5) Refer to paragraph 5-19 for the gunner linkage assembly installation procedures.

b. HSS XM136 (AH-1S P E M Helicopter).

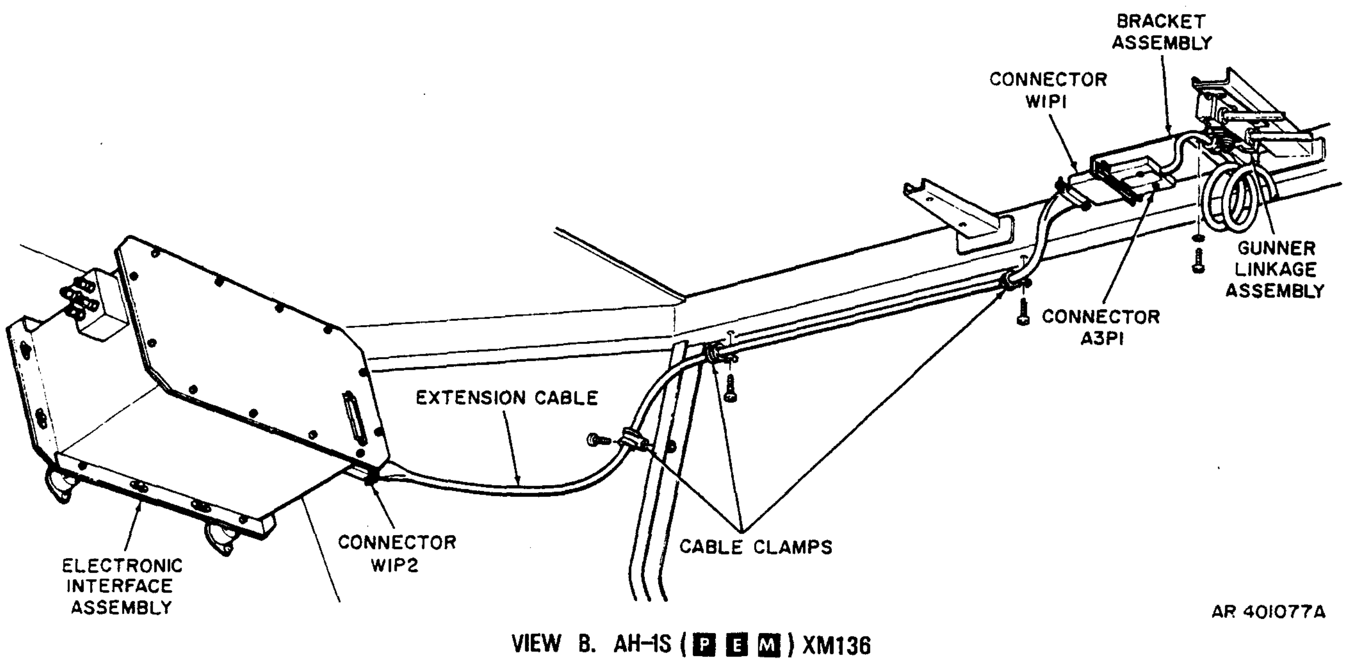
(1) Secure the cable mounting bracket assembly to the airframe with the two screws retained in paragraph 5-23b(3).

(2) Route the extension cable along the airframe and connect W1P1 to A3P1 on the gunner linkage and W1P2 to J4 on the EIA.

(3) Slip the three cable clamps on the cable and secure each cable clamp to the airframe with a screw. The clamps and screws were retained in paragraph *5-23b(2).*



VIEW A. AH-1S(MOD)-XM128



VIEW B. AH-1S (P E M) XM136

Figure 5-6. Extension cable - removal and installation

CHAPTER 6

FINAL INSPECTION

6-1. General

References to tests and procedures for the final inspection of the HSS major components are provided in this chapter. If no deficiencies are found, the assembly is ready to be returned to the user or to stock.

6-2. Helmet Sight Assembly.

a. Perform the helmet sight assembly test (paragraph 4-16).

b. Inspect the helmet sight assembly for damage, such as bent or broken parts. Pay particular attention to the cable jacket and connector pins. Also insure that the straight shaft is not bent, that the magnetic receptacle is free from corrosion and metal particles, and that the mounting hardware is clean and secure.

6-3. Linkage Assembly.

a. Perform the linkage assembly test (paragraph 4-18).

b. Remove the arm assembly from the BIT position. Slide it back and forth on the rails and check for freedom of movement.

c. Inspect the linkage assembly for damage, such as bent or broken parts, and for nicks, corrosion, or foreign substance on the rails. Insure that the magnetic receptacles are clean and free from metal particles.

d. Wipe the rails with a soft clean cloth; then return the arm assembly to the stow position.

e. Clean the BIT magnet face to remove any dirt or corrosion.

6-4. Electronic Interface Assembly.

a. Perform the electronic interface assembly (EIA) test (paragraph 4-20).

b. Inspect the EIA for damage, such as bent or broken parts. Insure that the unit is clean, that the connector pins are straight, and that the connectors are free from foreign material.

c. Insure that the isolator mounts are secure.

6-5. Extension Cables.

a. Perform the extension cable test (paragraph 4-28).

b. Inspect the extension cable for damage, such as cut cover, bent connector pins, and insulation abrasions. Insure that the cable is clean and that designator and identification markings are visible.

APPENDIX A

REFERENCES

A-1. Technical Manuals.

Operation and Maintenance of Army Materiel in Extreme Cold Weather	TM 9-207
Operator and Organizational Maintenance Manual – Armament Subsystem M28A1El.	TM 9-1090-203. 12-1
Aviation Unit Maintenance Manual – Armament Subsystem M28A1E2	TM 9-1090-203-12-2
Direct Support and General Support Maintenance Manual – Armament Subsystem M28A1E1	TM 9-1090-203-34-1
Aviation Intermediate Maintenance Manual – Armament System M28A1E2	TM 9-1090-203-34-2
Aviation Unit Maintenance Manual for Armament Subsystem, Helicopter: 20-MM Automatic Gun, XM97E1/E2	TM 9-1090-206-12
Aviation Intermediate Maintenance Manual for Armament Subsystem Helicopter: 20-MM Automatic Gun, XM97E1/E2	TM 9-1090-206-30
Aviation Unit and Intermediate Maintenance Manual with Repair parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Stores Management, XM138	TM 9-1090-207-13&P
Aviation Unit and Aviation Intermediate Maintenance Manual for Fire Control Computer Subsystem, XM22	TM 9-1270-218-13&P
Aviation Unit and Aviation Intermediate Maintenance Manual for Air Data Subsystem, XM143	TM 9-1270-219-13&P
Aviation Unit and Aviation Intermediate Maintenance Manual for Heads-Up Display Subsystem, XM76	TM 9-1270-220-13&P
Operator, Direct Support and General Support Maintenance (Including Repair Parts and Special Tools List and Depot Maintenance Repair Parts and Special Tools) for Fire Control Subsystem Test Set AN/GSM-249	TM 9-4931-363-14&P
Operator, Organizational, Direct Support, and General Support Maintenance Manual for Portable Hydraulic/Electric Power Supply	TM 9-4933-211-14
Operator's and Crew Member's Checklist – Army Model AH-1S(Mod) Helicopter	TM 55-1520-234-CL
Operator's Manual – Army Model AH-1S(Mod) Helicopter	TM 55-1520-234-10
Aviation Unit and Intermediate Maintenance Instructions - Army Model AH-1S(Mod) Helicopter	TM 55-1520-234-23
Operator's and Crew Member's Checklist – Army Model AH-lS Helicopter	TM 55-1520-236-CL
Operator's Manual – Army Model AH-1S Helicopter	TM 55-1520-236-1 0
Operator's and Crew Member's Checklist – AH-1S(MC) Helicopter	TM 55-1520-239-CL
Operator's Instructions – AH-1S(MC) Helicopter	TM 55-1520-239-10
Aviation Unit and Intermediate Maintenance Instructions, AH-lS(MC) Helicopter	TM 55-1520-239-23

A-2. Repair Parts and Special Tools Lists.

Organizational Maintenance Repair Parts and Special Tools List – Armament Subsystem M28A1El	TM 9-1090-203-20P-1
Aviationr Unit Maintenance Repair Parts and Special Tools List - Armament Subsystem M28A1E2	TM 9-1090-203-20P-2
Direct Support and General Support Repair Parts and Special Tools List Armament Subsystem M28A1El	TM 9-1090-203-34P-1
Aviation Intermediate Repair Parts and Special Tools List - Armament Subsystem M28A1E2	TM 9-1090-203-34P-2
Aviation Unit Maintenance Repair Parts and Special Tools List for Armament Subsystem, Helicopter; 20-MM Automatic Gun, XM97E1/E2	TM 9-1090-206-20P
Aviation Intermediate Maintenance Repair Parts and Special Tools List for Armament Subsystem, Helicopter; 20-MM Automatic Gun, XM97E1/E2	TM 9-1090-206-30P
Aviation, Unit and Intermediate Maintenance Repair Parts and Special Tools List -- Army Model AH-1S(Mod) Helicopter	TM 55-1520-234-23P
Aviation Unit and Intermediate Maintenance Repair Parts and Special Tools List – Army Model AH-1S Helicopter	TM 55-1520-236-23P
Aviation Unit and Intermediate Maintenance Repair Parts and Special Tools List – Army Model AH-1S(MC) Helicopter	TM 55-1520-23 23P

A-3. Technical Bulletins.

Calibration of Fire Control Subsystem Test Set AN/GSM-249	TB 94931-363-49

A-4. General Type Publications.

First Aid for Soldiers	FM 21-11
Chemical, Biological and Nuclear Defense	FM 2140
General Support Maintenance Activities	FM 29-24
The Army Maintenance Management System (TAMMS)	TM 38-750
Administrative Storage of Equipment	TM 740-90-1
Storage and Materiel Handling	TM 743-200-1
Procedures for Destruction of Aircraft and Associated Equipment to Prevent Enemy Use	TM 750-244- 1-5
Procedures for Destruction of Army Materiel to Prevent Enemy Use	TM 750-244-2

APPENDIX B
ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST (INCLUDING DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS)

Section I. INTRODUCTION

B-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 Helmet Directed Fire Control Subsystems XM128 and XMl36. It authorizes the requisitioning and issue of spares and repair parts as indicated by the source and maintenance codes.

B-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, specia1 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.

B-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 or additional initial issues or out fittings. Not subject to automatic replenishment.
PE	Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities.

Code	Definition
PF	Support equipment which will not be stocked but which will be centrally procured on demand.
PC	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 shutdown of production facilities, would prove uneconomical to reproduce at a later time.
KD	An item of a 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 at 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 or salvage may be used as a source of supply for 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, replaced, used at the direct support level.
H	Support item is removed, replaced, 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 recoverability code is entered in the fifth position of the Uniform SMR Code format as follows:

Recoverability Codes	Definition
Z	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 reparable, 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 disposal not authorized below depot/specialized repair activity level.
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 SB 708-42 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 (insert applicable physical security classification abbreviation, e.g., Phy Sec Cl (C) - Confidential, Phy Sec Cl (S) - Secret, Phy Sec Cl (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 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, which 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.).

B-4 Special Information.

a. Usable on codes are shown in the description column. Uncoded items are applicable to all models. Identification of the usable codes used in this publication are:

Code	Used on
A	Model XM128
B	Model XMl36

b. Bulk materials required to manufacture items are listed in the Bulk Material Group of this manual.

c. Detailed assembly instructions for items source coded to be assembled are found in TM 9-1270-212-14&P. Assembly components are listed immediately following the item to be assembled.

d. National stock numbers (NSN's) omitted in this appendix were not available at the time of printing. These items will be requisitioned by their assigned part number. Changes will be issued to the manual upon receipt of the applicable NSN's.

NOTE

New NSN's now entering the Federal Supply system are carrying an "01" rather than "00" for the country code identification. An NSN with "00" as the first two digits of the National Item Identification Number (NIIN) is not the same as an NSN with "01" even though the Federal Supply Class (FSC) and the last seven digits are the same. "The NIIN that is published is the NIIN that should be used." An item of supply has been assigned one unique NIIN and changing one digit of the NIIN will result in the receipt of the wrong item.

e. Action change codes indicated in the left-hand margin of the listing page denote the following:

N - Indicates an added item

C - indicates a change in data

R – Indicates a change in NSN only.

B-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 functional group within which the item belongs. This is necessary since illustrations are prepared for functional groups, and listings are divided into the same groups.

(2) Second. Find the illustration covering the functional group 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.

B-6. Abbreviations.

Abbreviations	Explanation
FIG.	Figure
HSS	Helmet sight subsystem
NHA	Next higher assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B-1		PEFDL	1270-00-122-9449	2277716-00	06401	FIRE CONTROL SUBSYSTEM,HELMET DIRECTED A	EA	1
B-1		PEFDL	1270-01-041-3767	2277716-01	06401	FIRE CONTROL SUBSYSTEM,HELMET DIRECTED B	EA	1
B-1	1	PAFDL	1270-00-578-0536	2251773-00	06401	HELMET SIGHT ASSEMBLY FOR BREAKDOWM, SEE FIG. B- 2	EA	2
B- 1	2	PAFDL	1270-00-573-5209	2277712-00	06401	LINKAGE ASSEMBLY,PILOT FOR BREAKDOWN, SEE FIG. B- 4	EA	1
B- 1	3	PAFDL	1270-00-573-4737	2277711-00	06401	LINKAGE ASSEMBLY,GUNNER FOR BREAKDOWN, SEE FIG. B- 7	EA	1
B- 1	4	PAODL	1270-00-578-0721	2278348-00	06401	ELECTRONIC INTERFACE ASSEMBLY A FOR BREAKDOWN, SEE FIG. B-10	EA	1
B-1	4	PAODL	1270-01-032-5123	2202190-00	06401	ELECTRONIC INTERFACE ASSEMBLY B FOR BREAKDOWN, SEE FIG. B-10	EA	1
B- 1	5	PAFDD	1270-00-578-0763	2278325-00	06401	CABLE ASSEMBLY,SPECIAL PURPOSE,ELECTRICAL FOR BREAKDOWN, SEE FIG. B-15	EA	1
C B- 1	6	PEFDL	1270-01-013-4240	2202215-00	06401	KIT,HELMET SIGHT ASSEMBLY	EA	1
B- 1	1					HELMET SIGHT ASSEMBLY	EA	1
B- 2	1					COLLAR,PIN	EA	6
B- 2	2					WASHER,FLAT	EA	6
B- 2	3					PIN,STRAIGHT,HEADED	EA	1
B- 2	4					CLAMP,LOOP	EA	1
B- 2	5					PIN,STRAIGHT,HEADED,THREADED	EA	1
B- 2	6					PIN,STRAIGHT,HEADED	EA	2
B- 2	7					PIN,STRAIGHT,HEADED	EA	2

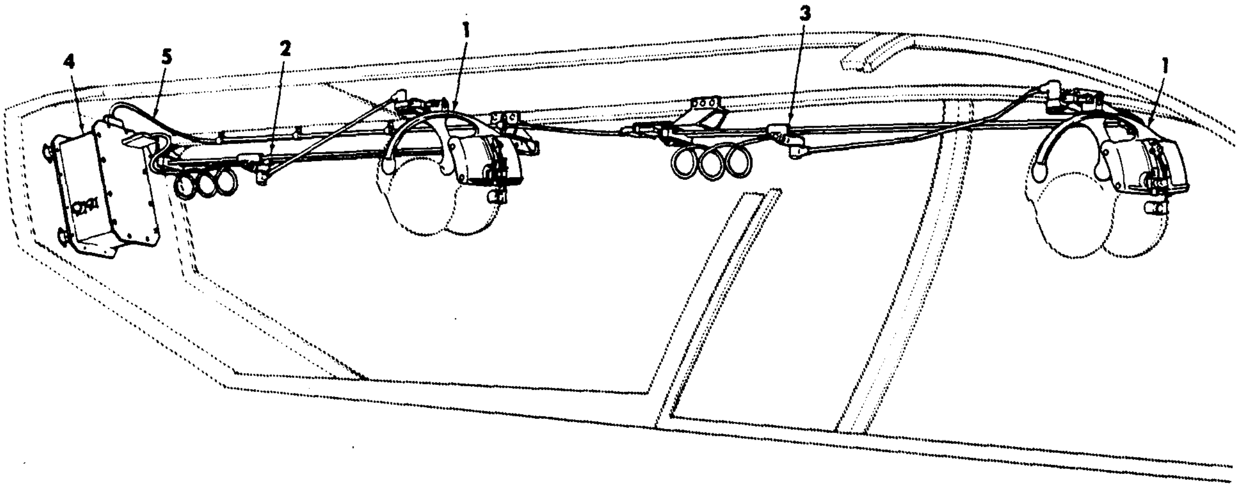


Figure B-1. Helmet directed fire control subsystem

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B- 2						GROUP: 2275.1 HELMET SIGHT ASSEMBLY FOR NHA,SEE FIG. B- 1		
C B- 2	1	PAFZZ	5320-00-972-3366	HL77-6	73197	COLLAR,PIN PART OF KIT,PART NUMBER 2202215-00	EA	6
C B- 2	2	PAFZZ	5310-00-619-1148	MS15795-808	96906	WASHER,FLAT PART OF KIT,PART NUMBER 2202215-00	EA	6
C B- 2	3	PAFZZ	5320-01-014-2626	HL22D6-2	73197	PIN,STRAIGHT,HEADED PART OF KIT,PART NUMBER 2202215-00	EA EA	1 1
C B- 2	4	PAFZZ	5340-00-619-7754	HP3N	09922	CLAMP,LOOP PART OF KIT,PART NUMBER 2202215-00	EA	1
C B- 2	5	PAFZZ		HL2206-3	73197	PIN,STRAIGHT,HEADED,THREADED PART OF KIT,PART NUMBER 2202215-00	EA	1
C B- 2	6	PAFZZ	5320-01-014-2626	HL22D6-8	73197	PIN,STRAIGHT,HEADED PART OF KIT,PART NUMBER 2202215-00	EA	2
C B- 2	7	PAFZZ	5320-01-014-4353	HL2204-7	73197	PIN,STRAIGHT,HEADED PART OF KIT,PART NUMBER 2202215-00	EA	2
B- 2	8	PADZZ	9905-00-411-7197	2278373-00	06401	PLATE,IDENTIFICATION	EA	1
B- 2	9	PADZZ	5305-00-054-5636	MS51957-2	96906	SCREW,MACHINE	EA	3
B- 2	10	PAFZZ	5310-00-928-2690	MS35338-134	96906	WASHER,LOCK	EA	3
B- 2	11	PADZZ	5310-00-595-6761	MS15795-802	96902	WASHER,FLAT	EA	3
B- 2	12	PADZZ	5305-00-054-5648	MS51957-14	96906	SCREW,MACHINE	EA	1
B- 2	13	PADZZ	5310-00-407-0576	2251743-00	06401	WASHER,SHOULDER	EA	1
B- 2	14	PADZZ	5310-00-379-4571	B0750-0285	83553	WASHER,SPRING TENSION	EA	1
C B- 2	15	PADZZ	5330-00-598-8445	2251744-00	06401	GASKET	EA	1
B- 2	15	PAFZZ		2202213-00	06401	WEDGE,SIGHT ASSEMBLY	EA	1
B- 2	16	PADZZ	5330-00-598-8445	2251744-00	06401	GASKET	EA	1
B- 2	17	PADDL	1270-00-573-4675	2277753-00	06401	SIGHT ASSEMBLY FOR BREAKDOWN, SEE FIG. B- 3	EA	1
B- 2	18	PAOZZ	5355-01-033-8645	2278799-00	06401	LOCK,VISOR	EA	1
B- 2	19	XA		2202156-00	066401	SPACER	EA	1
B- 2	20	XA		2202219-00	06401	WASHER,CLAMPING	EA	1
B- 2	21	XA		2278797-00	06401	VISOR LOCK,HELMET	EA	1
C B- 2	22	PAHZZ	5305-00-054-5647	MS51957-13	96906	SCREW,MACHINE	EA	2
C B- 2	23	PAHZZ	5310-00-782-1349	MS15795-804	96906	WASHER,FLAT	EA	3
B- 2	24	PAFZZ		MS51957-16	96906	SCREW,MACHINE	EA	1
B- 2	25	PAFZZ		2202214-00	06401	SHIM,HELMET RECEPTACLE	EA	1
B- 2	26	PAFDD	1270-00-573-4723	2278613-00	06401	RECEPTACLE ASSEMBLY,HELMET	EA	1
B- 2	27	PAFZZ	5305-00-716-7725	MS51981-18	96906	SETSCREW	EA	3
B- 2	28	PAFZZ	5310-00-410-5653	2278469-00	06401	NUT,SWIVEL	EA	1
B- 2	29	PAFZZ	1270-00-578-0717	2278467-00	06401	MAGNET	EA	1
B- 2	30	PAFZZ	5310-00-607-0580	2251741-00	06401	WASHER,CONVEX	EA	1
N B- 2	31	PAFZZ	5310-00-619-1148	MS15795-808	96906	WASHER,FLAT	EA	1
B- 2	32	PADZZ	5930-00-615-3936	MLCDT186	12617	SWITCH,REED	EA	1

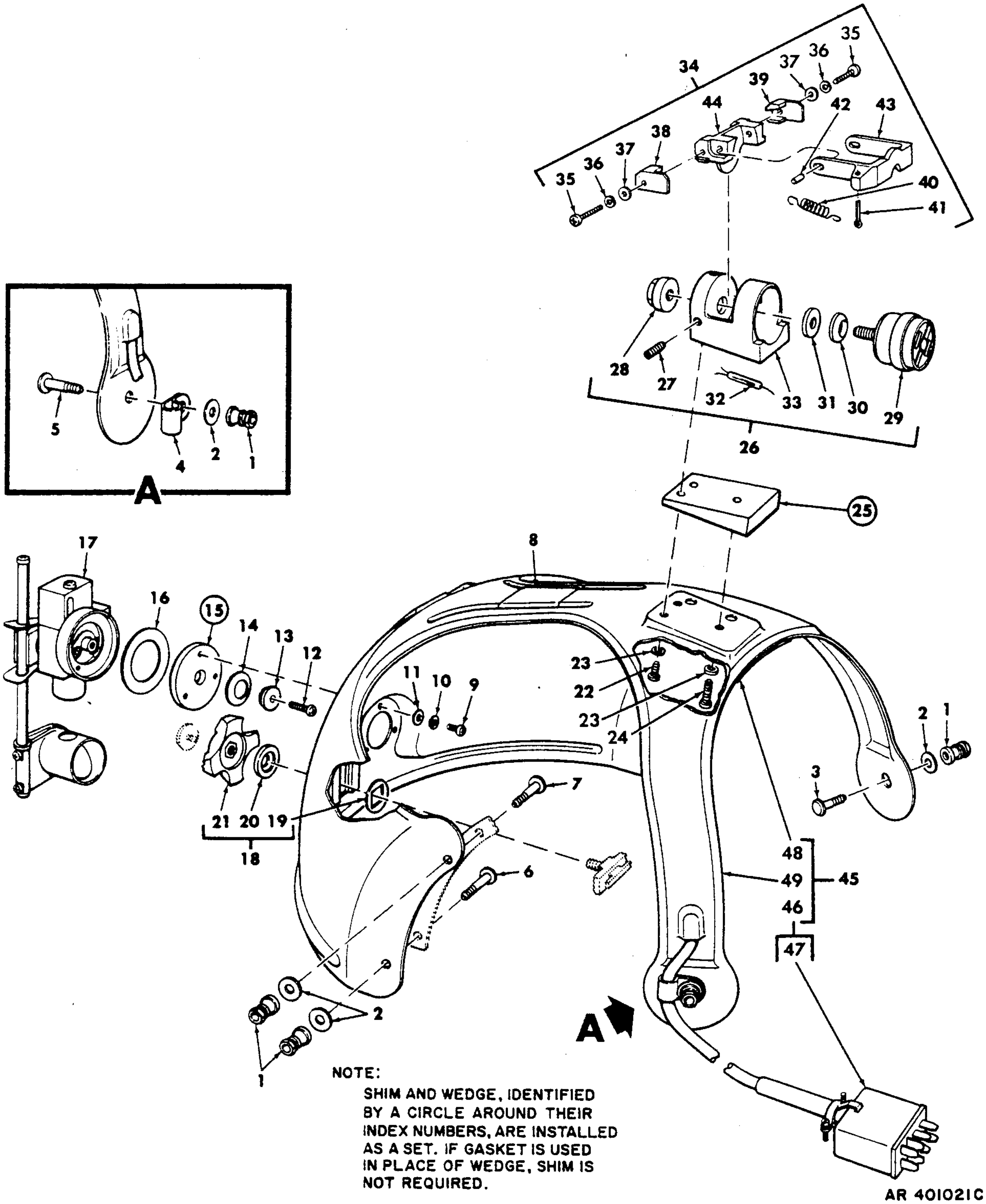


Figure B-2. Helmet sight assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 2	33	PADZZ	1270-00-573-4725	2278468-00	06401	RECEPTACLE,HELMET	EA	1
B- 2	34	PAFFF	1270-01-005-2849	2278742-00	06401	LATCH ASSEMBLY	EA	1
B- 2	15	PAFZZ	5305-00-054-5639	MS51957-5	96906	SCREW,MACHINE	EA	2
B- 2	36	PAFZZ	5310-00-928-2690	MS35338-134	96906	WASHER,LOCK	EA	2
B- 2	37	PAFZZ	5310-00-595-6761	MS15795-802	96906	WASHER,FLAT	EA	2
B- 2	38	XBFZZ		2278511-00	06401	COVER	EA	1
B- 2	39	XBFZZ		2278512-00	06401	COVER	EA	1
C B- 2	40	PAFZZ		EO120-020-06205	83553	SPRING,HELICAL,EXTENSION	EA	2
B- 2	41	XBFZZ		MS24665-1002	96906	PIN,COTTER	EA	2
B- 2	42	XBFZZ		D4-187	00141	PIN,STRAIGHT,HEADLESS	EA	2
B- 2	43	XBFZZ		2278510-00	06401	RETAINER	EA	1
B- 2	44	XBFZZ		2278509-00	064001	END PLATE	EA	1
B- 2	45	XBDDD		2251774-00	06401	VISOR HOUSING ASSEMBLY	EA	1
B- 2	46	PADZZ	1270-00-615-8983	2278685-00	06401	CABLE ASSEMBLY,SPECIAL PURPOSE,ELECTRICAL	EA	1
B- 2	47	PAHZZ	5935-00-878-3959	261-11-08-030	71785	CONNECTOR,PLUG,ELECTRICAL	EA	1
N B- 2	48	PADZZ		2278687-00	06401	SPACER	EA	3
B- 2	49	PBDZZ	1270-01-019-3422	2278478-00	06401	VISOR HOUSING	EA	1

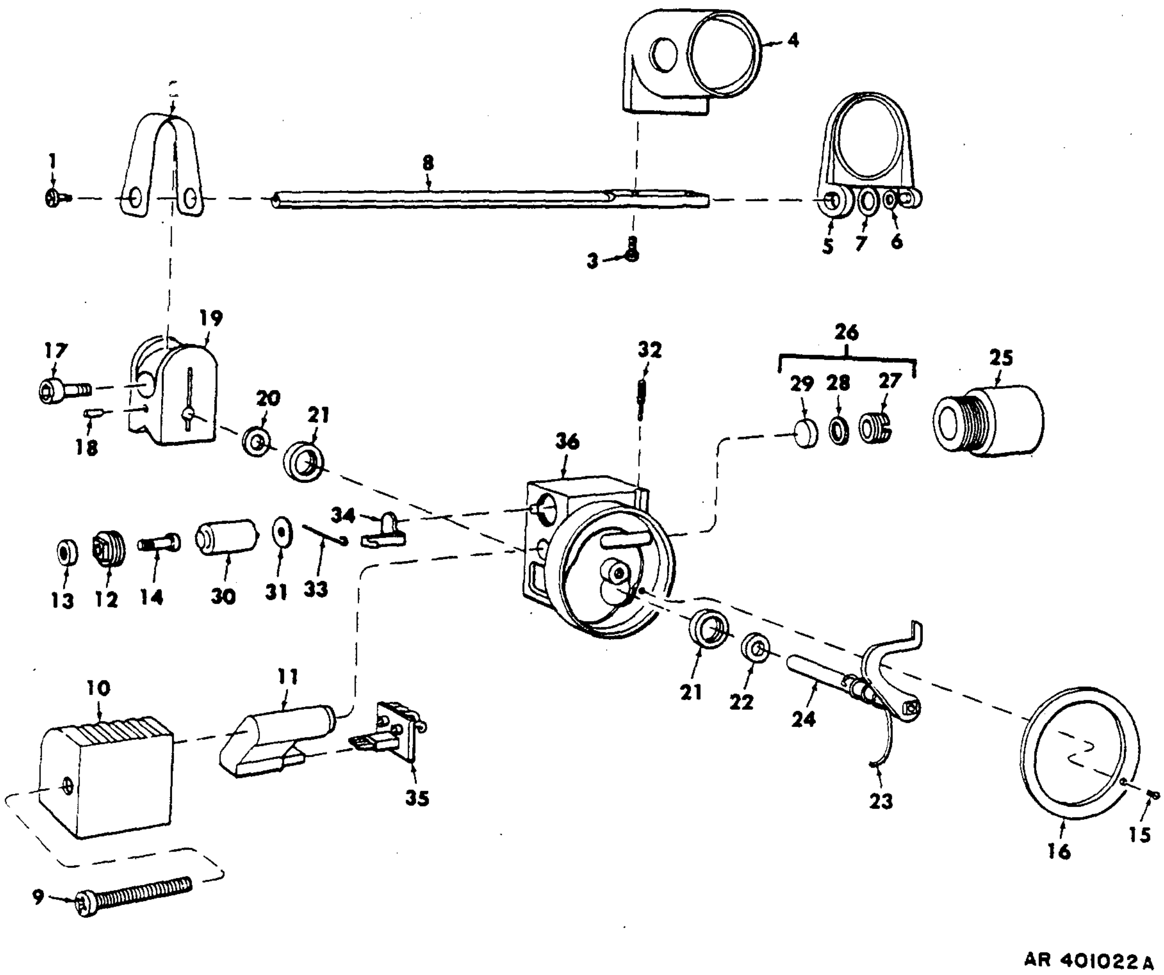


Figure B-3. Sight assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 3						GROUP: 2275-11 SIGHT ASSEMBLY FOR NHA,SEE FIG. B- 2		
B- 3	1	PAFZZ	5305-00-054-5649	MS51957-11	96906	SCREW,MACHINE	EA	1
B- 3	2	PAFZZ	5360-00-630-2365	2251733-00	06401	SPRING,FLAT	EA	1
B- 3	3	PAFZZ	5305-00-054-5638	MS51957-4	96906	SCREW,MACHINE	EA	2
B- 3	4	PAFZZ	1270-00-573-4695	2278614-00	06401	BEAMSPLITTER,OPTICAL	EA	1
B- 3	5	PAFZZ	1270-00-578-0542	2251765-00	06401	FILTER ASSEMBLY	EA	1
B- 3	6	PAFZZ	5365-00-610-4210	2215720-00	06401	WASHER,FLAT	EA	1
B- 3	7	PAFZZ	5365-00-630-2467	2215721-00	06401	SHIM	EA	1
B- 3	8	PAFZZ	3040-00-613-5845	2278317-00	06401	SHAFT,STRAIGHT	EA	1
B- 3	9	PAOZZ	5305-00-054-5654	MS51957-20	96906	SCREW,MACHINE	EA	1
B- 3	10	PAOZZ	1270-00-573-4693	2277729-00	06401	COVER,LAMP	EA	1
B- 3	11	PAOZZ	1270-00-571-4716	2251730-00	06401	LAMP ASSEMBLY	EA	1
B- 3	12	PAFZZ	1270-00-573-4689	2277738-00	06401	CAP	EA	1
B- 3	13	PAFZZ	1270-00-573-4681	2251747-00	06401	PUSH BUTTON	EA	1
B- 3	14	PAFZZ	5340-00-627-4351	2251731-00	06401	PLUNGER,QUICK RELEASE	EA	1
B- 3	15	PADZZ	5305-00-627-4287	MS21270A92	96906	SCREW,INSTRUMENT	EA	1
B- 3	16	PADZZ	5365-00-627-4748	2215713-00	06401	RING	EA	1
B- 3	17	PADZZ	5305-00-959-0382	MS16995-17	96906	SCREW,CAP,SOCKET HEAD	EA	1
C B- 3	18	PADZZ		MS171437	96906	PIN,SPRING	EA	1
B- 3	19	PADSS	1270-00-573-4696	2278316-00	06401	GUIDE	EA	1
B- 3	20	PADZZ	5365-00-812-0474	86-9	00141	SPACER,SLEEVE 0.063 IN. THICK	EA	1
C B- 3	21	PADZZ		SFR166LL3K25-7	83086	BEARING,BALL,FLANGED	EA	2
B- 3	22	PADZZ	5365-00-845-7667	B6-1	00141	SHIM, 0.004 IN.THICK	EA	1
B- 3	22	PADZZ	5365-00-052-8846	B6-2	00141	SHIM, 0.006 IN.THICK	EA	1
B- 3	22	PADZZ	5365-00-802-2360	B6-3	00141	SHIM, 0.008 IN.THICK	EA	1
B- 3	22	PADZZ	5365-00-804-0465	B6-4	00141	SHIM, 0.010 IN.THICK	EA	1
B- 3	22	PADZZ	5365-00-598-7868	B6-24	00141	SHIM, 0.002 IN.THICK	EA	1
B- 3	23	PADZZ	5360-00-610-4190	2251745-00	06401	SPRING,HELICAL,TORSION	EA	1
B- 3	24	PADZZ	1270-00-573-4722	2277736-00	06401	SHAFT ASSEMBLY,FLEXIBLE	EA	1
B- 3	25	PADZZ	1270-00-573-4721	2278615-00	06401	LENS ASSEMBLY	EA	1
B- 3	26	PADDL		7650446-00	06401	RETICLE ASSEMBLY	EA	1
B- 3	27	XBDZZ	5365-00-612-2947	2215709-00	06401	RING,EXTERNALLY THREADED	EA	1
B- 3	28	XBDZZ		2279787-00	06401	WASHER,NONMETALLIC	EA	1
B- 3	29	XBDZZ		M42176	01887	RETICLE,OPTICAL INSTRUMENT	EA	1
B- 3	30	PADZZ	1270-00-578-0677	2215710-00	06401	SOLENOID ASSEMBLY	EA	1
B- 3	31	PADZZ	5365-00-619-3610	G78-1	00328	SHIM, 0.003 IN.THICK	EA	1
B- 3	31	PADZZ	5365-00-619-3609	G78-2	00328	SHIM, 0.005 IN.THICK	EA	1

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 3	31	PADZZ	5365-00-598-8683	G78-3	00328	SHIM, 0.007 IN.THICK	EA	1
B- 3	31	PADZZ	5365-00-632-3169	G78-4	00328	SHIM, 0.010 IN.THICK	EA	1
B- 3	31	PADZZ	5310-00-180-8988	G78-5	00328	SHIM, 0.020 IN.THICK	EA	1
B- 3	32	PADZZ	1270-00-578-0627	2251746-00	06401	PIN,PIVOT	EA	1
B- 3	33	PADZZ	1270-01-011-3333	2201713-00	06401	SPRING,CANTILEVER	EA	1
B- 3	34	PADZZ	1270-00-573-4720	2277737-00	06401	LATCH	EA	1
B- 3	35	PADZZ	1270-00-573-4692	2215706-00	06401	COMPONENT BOARD ASSEMBLY	EA	1
B- 3	36	PADZZ	1270-00-573-4715	2277735-00	06401	HOUSING,SIGHT ASSEMBLY	EA	1

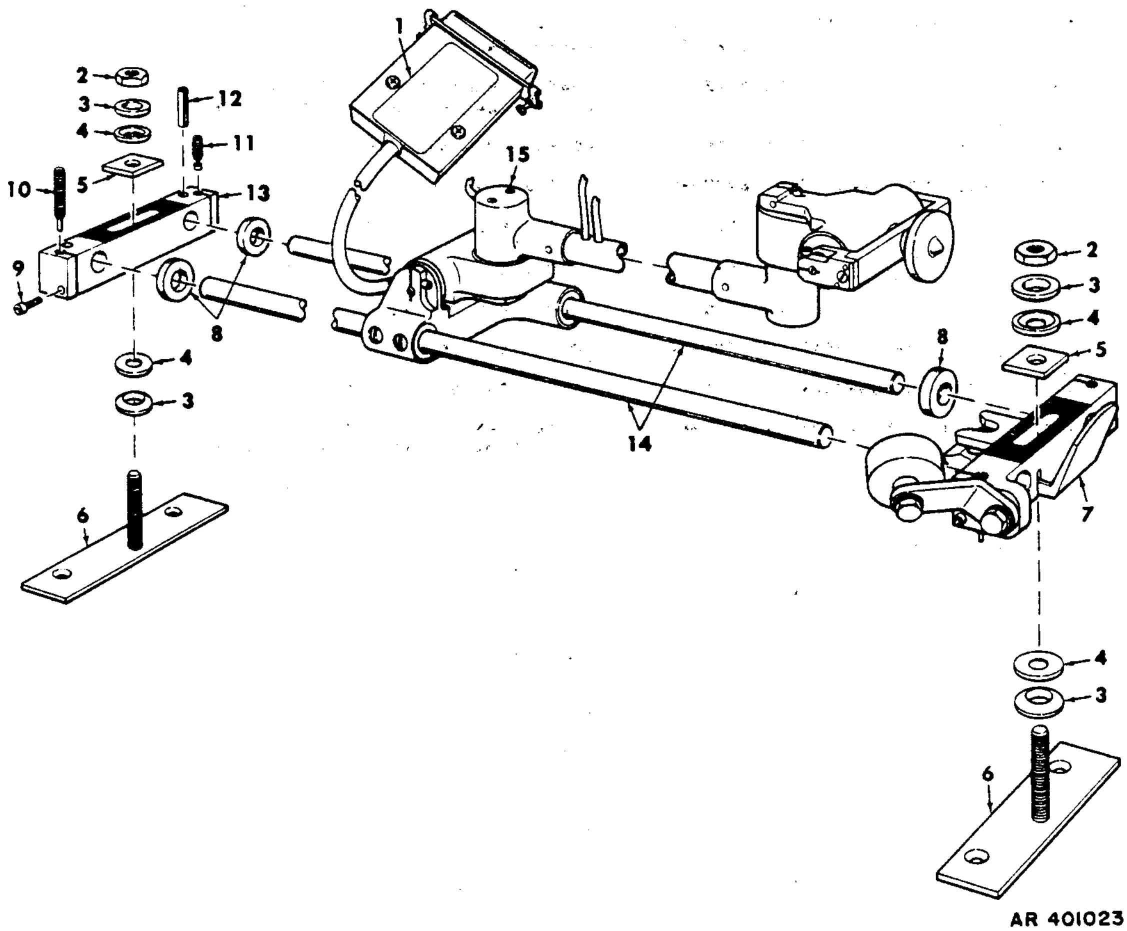


Figure B-4. Pilot linkage assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 4						GROUP: 2275.2 PILOT LINKAGE ASSEMBLY FOR NHA,SEE FIG. B- 1		
B- 4	1	PADZZ	9905-00-573-5211	2278373-01	06401	PLATE,IDENTIFICATION	EA	1
B- 4	2	PAFZZ	5310-00-897-6145	MS21083C4	96906	NUT,SELF-LOCKING,HEXAGON	EA	1
B- 4	3	PAFZZ	5310-00-610-5656	2251719-00	06401	WASHER,CONCAVE	EA	4
B- 4	4	PAFZZ	5310-00-607-0579	2251717-00	06401	WASHER,CONVEX	EA	4
B- 4	5	PAFZZ	5310-00-610-5655	2215734-00	06401	WASHER,KEY	EA	2
B- 4	6	XA		2251724-00	06401	BRACKET	EA	2
B- 4	7	PDFZZ		2278612-00	06401	FRONT SUPPORT ASSEMBLY,PILOT FOR BREAKDOWN, SEE FIG. B- 5	EA	1
B- 4	8	PAFZZ	5365-00-618-0063	2251718-00	06401	BUSHING,RUBBER	EA	3
B- 4	9	PAFZZ	5305-00-978-9347	MS16997-19	96906	SCREW,CAP,SOCKET HEAD	EA	2
B- 4	10	PAFZZ		S52-001-03	01226	PLUNGER,QUICK RELEASE	EA	1
B- 4	11	PAFZZ		7910040-00	06401	SETSCREW,SOCKET,DRIVE	EA	1
C B- 4	12	PAFZZ		MS171559	96906	PIN,SPRING	EA	2
B- 4	13	PAFZZ	1270-00-573-5047	2277727-00	06401	SUPPORT,AFT	EA	1
B- 4	14	PAFZZ	5340-00-603-2289	2251723-00	06401	ROD,GROOVED,HEADLESS	EA	2
B- 4	15	PAFDD	1270-00-573-5222	2277751-00	06401	ARM ASSEMBLY,PILOT FOR BREAKDOWN, SEE FIG. B- 6	EA	1

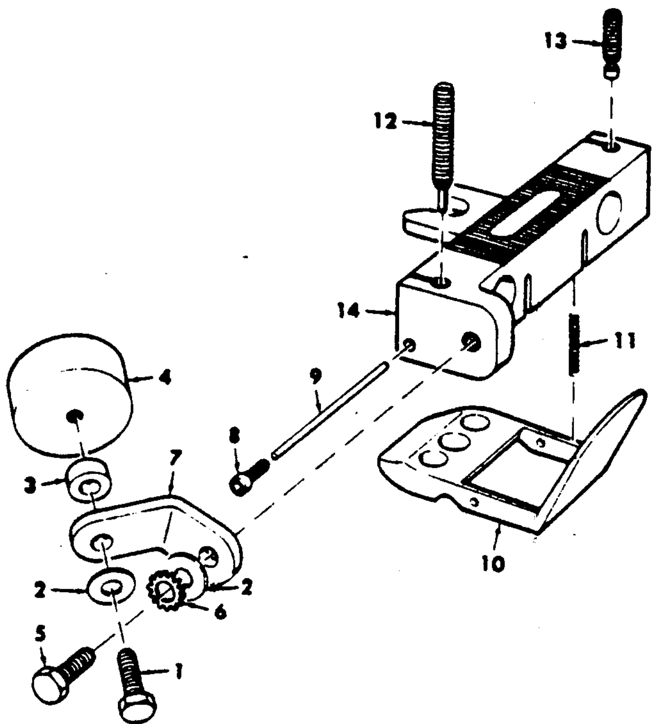


Figure B-5. Pilot front support assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 5						GROUP: 2275.21 PILOT FRONT SUPPORT ASSEMBLY FOR NHA,SEE FIG. B- 4		
B- 5	1	PAFZZ	5306-00-156-2327	AN3C6A	88044	BOLT,MACHINE	EA	1
B- 5	2	PAFZZ	5310-00-619-1148	MS15795-808	96906	WASHER,FLAT	EA	2
B- 5	3	PAFZZ	5365-00-698-7889	2278964-00	06901	SPACER,SLEEVE	EA	1
B- 5	4	PAFZZ	1270-00-573-5197	2251720-02	06401	MAGNET	EA	1
B- 5	5	PAFZZ	5306-00-156-2336	AN3C3A	88044	BOLT,MACHINE	EA	1
B- 5	6	PAFZZ	5310-00-942-6110	MS35335-00	96906	WASHER,LOCK	EA	1
B- 5	7	PAFZZ	5340-00-606-9815	2278465-00	06401	BRACKET,ANGLE	EA	1
B- 5	8	PAFZZ	5305-00-978-9347	MS16997-19	96906	SCREW,CAP,SOCKET HEAD	EA	2
B- 5	9	PAFZZ	1270-00-573-5204	2251726-00	06401	SHAFT,STRAIGHT	EA	1
B- 5	10	PAFZZ	1270-00-573-6196	2277726-00	06401	LATCH	EA	1
B- 5	11	PAFZZ		C0088-012-06203	83553	SPRING,HELICAL,COMPRESSION	EA	2
B- 5	12	PAFZZ		352-001-03	01226	PLUNGER,QUICK RELEASE	EA	1
B- 5	13	PAFZZ		7910040-00	06401	SETSCREW,SOCKET,DRIVE	EA	1
B- 5	14	PAFZZ	1270-00-573-5224	2278966-00	06401	SUPPORT,FRONT,PILOT	EA	1

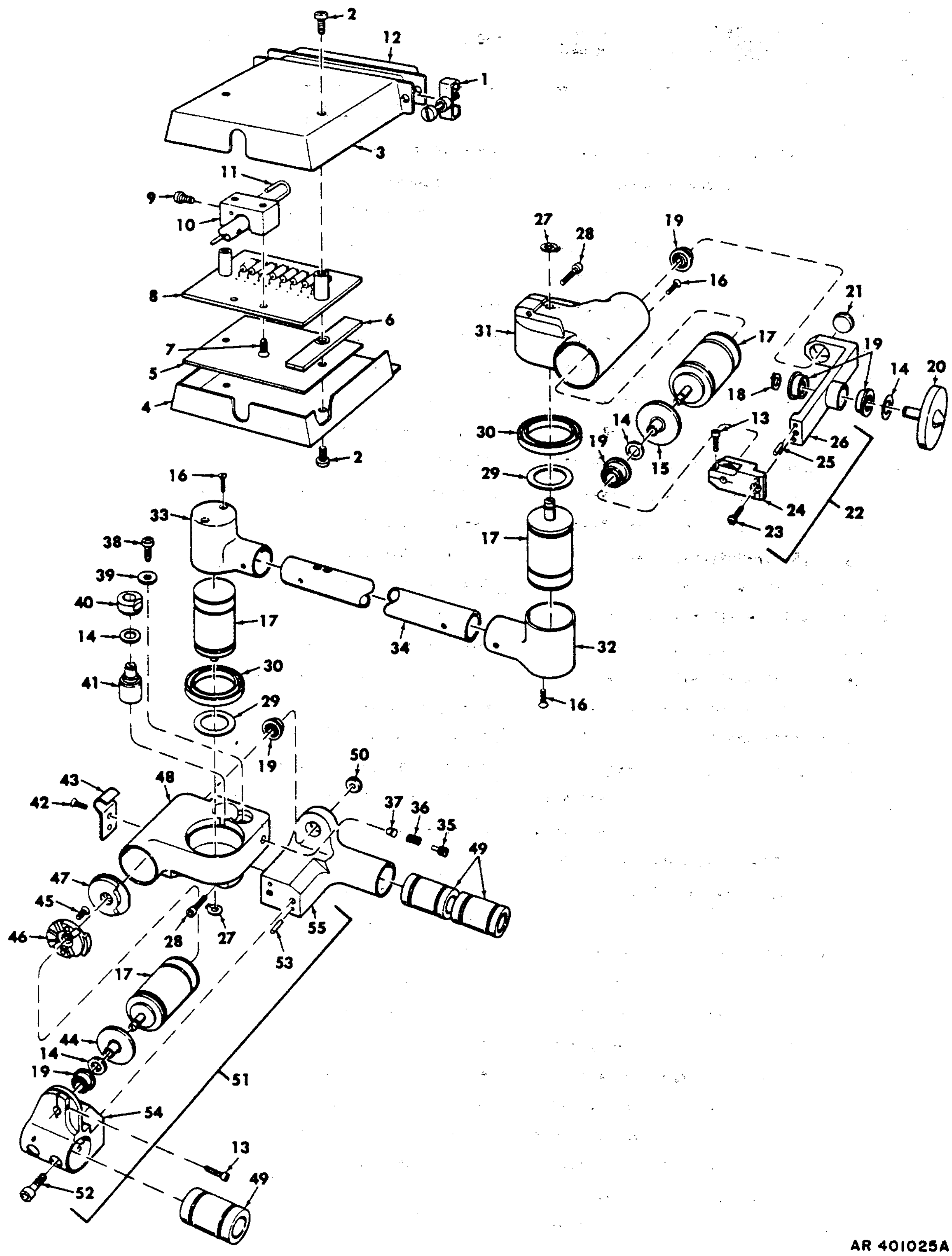


Figure B-6. Pilot arm assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B- 6						GROUP: 2275.22 PILOT ARM ASSEMBLY FOR NHA.SEE FIG. B- 4		
B- 6	1	PAFZZ	5305-00-073-8885	8213510-6	19200	SCREW LOCK	EA	2
B- 6	2	PADZZ	5305-00-054-6650	MS51957-26	96906	SCREW,MACHINE	EA	4
B- 6	3	XA		2215700-00	06401	JUNCTION SHELL,TOP	EA	1
B- 6	4	XA		2215701-00	06401	JUNCTION SHELL,BOTTOM	EA	1
B- 6	5	XA		2215703-00	06401	INSULATOR	EA	1
B- 6	6	PADZZ		2215702-00	06401	SHIM	EA	2
B- 6	7	PADZZ	5305-00-993-9189	MS24693C2	96906	SCREW,MACHINE	EA	2
B- 6	8	XBDZZ		2215705-00	06401	PRINTED WIRING BOARD	EA	1
B- 6	9	PADZZ	5305-00-054-5637	MS51957-3	96906	SCREW,MACHINE	EA	1
B- 6	10	XA		2215704-00	06401	MOUNT,SUPPORT,CABLE	EA	1
B- 6	11	PADZZ	5360-00-606-9812	2251758-00	06401	SPRING,HELICAL	EA	1
B- 6	12	PADZZ	5935-00-493-0466	M24308-3-5	81349	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	1
B- 6	13	PADZZ	5305-00-058-2075	MS16997-3	96906	SCREW,SOCKET HEAD	EA	2
B- 6	14	PADZZ	5365-00-845-7667	B6-1	00141	SHIM, 0.004 IN.THICK	EA	2
B- 6	14	PADZZ	5365-00-052-8846	B6-2	00141	SHIM, 0.006 IN.THICK	EA	2
B- 6	14	PADZZ	5365-00-802-2360	B6-3	00141	SHIM, 0.008 IN.THICK	EA	2
B- 6	14	PADZZ	5365-00-804-0465	B6-4	00141	SHIM, 0.010 IN.THICK	EA	2
B- 6	14	PADZZ	5365-00-598-7868	B6-24	00141	SHIM, 0.002 IN.THICK	EA	2
B- 6	15	PADZZ	1270-00-573-5121	2251716-00	06401	END PLATE	EA	1
B- 6	16	PADZZ	5305-00-062-0872	0411-47	07187	SCREW,MACHINE	EA	6
B- 6	17	PADZZ	5990-00-573-4731	CM41084025	88818	RESOLVER,ELECTRICAL	EA	4
C B- 6	18	PADZZ		MS16624-5018	96906	RING,RETAINING	EA	1
C B- 6	19	PADZZ		SFR166LL3K25-7	83086	BEARING,BALL,FLANGED	EA	6
B- 6	20	PADZZ	1270-01-011-3335	2277717-00	06401	FASTENER	EA	1
B- 6	21	PADZZ	5340-00-610-4189	2251721-00	06401	DISK,SOLID,PLAIN	EA	1
B- 6	22	XBDZZ		2277719-00	06401	YOKE ASSEMBLY	EA	1
B- 6	23	PADZZ	5305-00-054-5647	MS51957-13	96906	SCREW,MACHINE	EA	1
B- 6	24	XA		2277719-53	06401	END PLATE	EA	1
B- 6	25	PADZZ	5315-00-282-1187	AN122676	88044	PIN,STRAIGHT,HEADLESS	EA	2
B- 6	26	XA		2277719-52	06401	YOKE	EA	1
B- 6	27	PADZZ	5365-00-149-8696	MS16624-5012	96906	RING,RETAINING	EA	2
B- 6	28	PADZZ	5305-00-978-9343	MS16997-10	96906	SCREW,SOCKET HEAD	EA	2
C B- 6	29	PADZZ		HE00603600004-01	81349	WASHER,SPRING,TENSION	EA	2
B- 6	30	PADZZ	3110-00-607-1455	3TKLZZ12-16UL02	78118	BEARING,BALL	EA	2
B- 6	31	PADZZ	1270-00-573-5124	2277721-00	06401	GIMBAL	EA	1
B- 6	32	XBDZZ		2277720-00	06401	HOUSING,LOWER SENSOR	EA	1

(1) Illustration		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) Fig No.	(b) Item No.	SMR code	National stock number	Part number	FSCM	Description Usable on Code	U/M	Qty inc in unit
B- 6	33	XBDZZ		2277718-00	06401	HOUSING,UPPER SENSOR	EA	1
B- 6	34	PADZZ	1270-00-615-9004	2251722-00	06401	ARM,PILOT	EA	1
B- 6	35	PADZZ	5305-00-625-8485	2278389-00	06401	SETSCREW	EA	1
B- 6	36	PADZZ	5360-00-610-5818	MS24585-1019	96906	SPRING,HELICAL,COMPRESSION	EA	1
B- 6	37	PADZZ	5340-00-603-2297	2278388-00	06401	PLUG,PROTECTIVE,DUST	EA	1
B- 6	38	PADZZ	5305-00-054-5635	MS51957-1	96906	SCREW,MACHINE	EA	1
B- 6	39	PADZZ	5310-00-595-6761	MS15795-B02	96906	WASHER,FLAT	EA	1
B- 6	40	PADZZ	5999-01-017-2056	2278390-00	06401	CAP,ELECTRICAL	EA	1
B- 6	41	PADZZ	3020-00-613-5840	2278393-00	06401	GEAR,WORM	EA	1
B- 6	42	PADZZ	5305-00-814-1707	NAS662C2R4	80205	SCREW,MACHINE	EA	2
B- 6	43	XBDZZ		2215711-00	06401	HANGER	EA	1
B- 6	44	PADZZ	1270-00-573-5123	2278379-00	06401	END PLATE	EA	1
B- 6	45	PADZZ	5305-00-760-3848	MS35191-207	96906	SCREW,MACHINE	EA	2
B- 6	46	PADZZ	3070-00-604-7482	2278391-00	06401	GEAR,WORM,MODIFIED	EA	1
B- 6	47	PADZZ	5340-00-607-0581	2278392-00	06401	COVER,SPECIAL	EA	1
B- 6	48	PADZZ	1270-00-573-5195	2278378-00	06401	GIMBAL	EA	1
B- 6	49	PADZZ	3110-00-790-4646	A61014SS	96881	BEARING,BALL,LINEAR	EA	3
B- 6	50	PADZZ	5340-00-621-4840	2251771-01	06401	PLUG,PROTECTIVE,DUST AND MOISTURE SEAL	EA	1
B- 6	51	XBDZZ		2277722-00	06401	CARRIAGE ASSEMBLY	EA	1
B- 6	52	PADZZ	5305-00-978-9348	MS16997-20	96906	SCREW,CAP,SOCKET HEAD	EA	2
B- 6	53	PADZZ	5315-00-282-1187	AN122676	88044	PIN,STRAIGHT,HEADLESS	EA	2
B- 6	54	XA		2277722-51	06401	END PLATE,CARRIAGE	EA	1
B- 6	55	XA		2277722-52	06401	CARRIAGE	EA	1

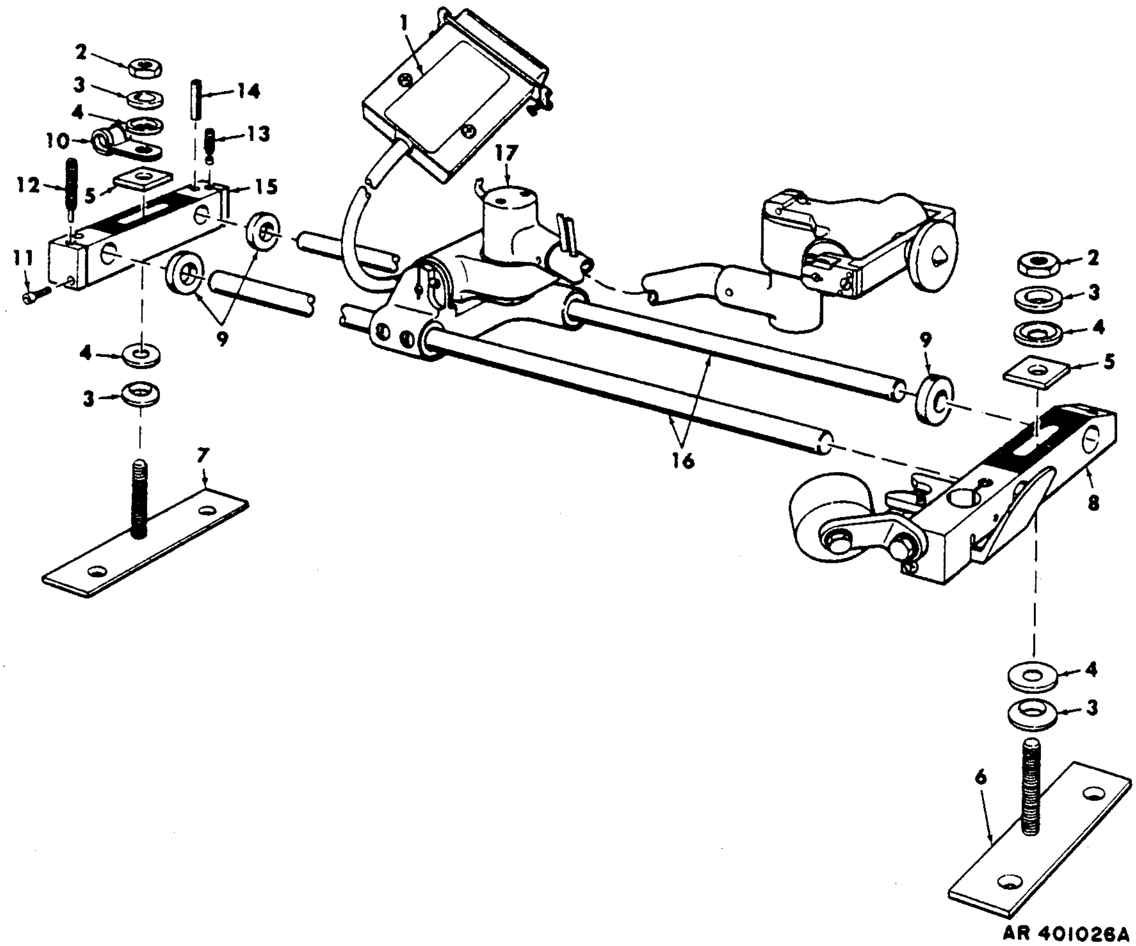


Figure B-7. Gunner linkage assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 7						GROUP: 2275.3 GUNNER LINKAGE ASSEMBLY FOR NHA,SEE FIG. B- 1		
B- 7	1	PADZZ	9905-00-573-4988	2278373-02	06401	PLATE,IDENTIFICATION	EA	1
B- 7	2	PAFZZ	5310-00-897-6145	MS21083C4	96906	NUT,SELF-LOCKING,HEXAGON	EA	2
B- 7	3	PAFZZ	5310-00-610-5656	2251719-00	06401	WASHER,CONCAVE	EA	4
B- 7	4	PAFZZ	5310-00-607-0579	2251717-00	06401	WASHER,CONVEX	EA	4
B- 7	5	PAFZZ	5310-00-610-5655	2215734-00	06401	WASHER,KEY	EA	2
B- 7	6	XA		2251724-00	06401	BRACKET	EA	1
B- 7	7	XA		2251724-01	06401	BRACKET	EA	1
B- 7	8	PDFZZ		2278611-00	06401	FRONT SUPPORT ASSEMBLY,GUNNER FOR BREAKDOWN, SEE FIG. B- 8	EA	1
B- 7	9	PAFZZ	5365-00-618-0063	2251718-00	06401	BUSHING,RUBBER	EA	3
B- 7	10	PAFZZ	5340-00-205-6301	MS21919DG4	96906	CLAMP,LOOP	EA	1
B- 7	11	PAFZZ	5305-00-978-9347	MS16997-19	96906	SCREW,CAP,SOCKET HEAD	EA	2
B- 7	12	PAFZZ		552-001-03	01226	PLUNGER,QUICK RELEASE	EA	1
B- 7	13	PAFZZ		7910040-00	06401	SETSCREW,SOCKET,DRIVE	EA	1
C B- 7	14	PAFZZ		MS171559	96906	PIN,SPRING	EA	2
B- 7	15	PAFZZ	1270-00-573-5047	2277727-00	06401	SUPPORT,AFT	EA	1
B- 7	16	PAFZZ	5340-00-603-2289	2251723-00	06401	ROD,GROOVED,HEADLESS	EA	2
B- 7	17	PAFDO	1270-00-573-5085	2277750-00	06401	ARM ASSEMBLY,GUNNER FOR BREAKDOWN, SEE FIG. B- 9	EA	1

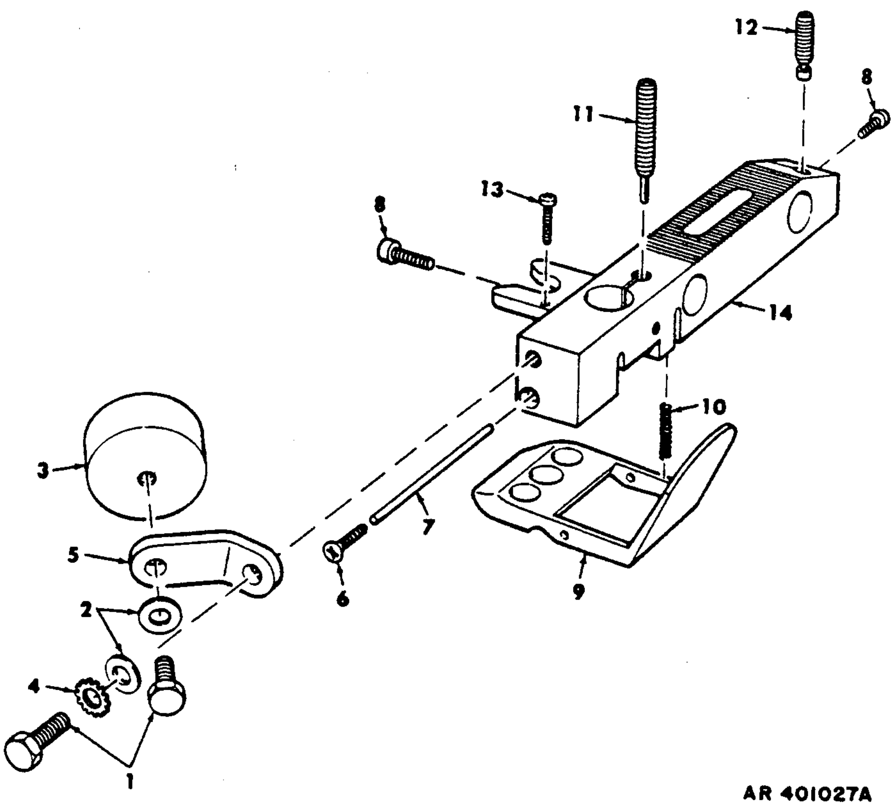


Figure B-8. Gunner front support assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 8						GROUP: 2275.31 GUNNER FRONT SUPPORT ASSEMBLY FOR NHA,SEE FIG. B- 7		
B- 8	1	PAFZZ	5306-00-156-2336	AN3C3A	88044	BOLT,MACHINE	EA	2
B- 8	2	PAFZZ	5310-00-619-1148	MS15795-606	96906	WASHER,FLAT	EA	2
B- 8	3	PAFZZ	1270-00-673-5197	2251720-02	06401	MAGNET	EA	1
B- 8	4	PAFZZ	5310-00-942-6110	MS35335-00	96906	WASHER,LOCK	EA	1
B- 8	5	PAFZZ	5340-00-607-0570	2251740-00	06401	BRACKET,ANGLE	EA	1
B- 8	6	PAFZZ	5305-00-760-0336	MS61959-17	96906	SCREW,MACHINE	EA	1
B- 8	7	PAFZZ	1270-00-573-5204	2251726-00	06401	SHAFT,STRAIGHT	EA	1
B- 8	8	PAFZZ	5305-00-970-9347	MS16997-19	96906	SCREW,CAP,SOCKET HEAD	EA	2
B- 8	9	PAFZZ	1270-00-573-5196	2277726-00	06401	LATCH	EA	1
B- 8	10	PAFZZ		C0088-012-0620S	03553	SPRING,HELICAL,COMPRESSION	EA	2
B- 8	11	PAFZZ		552-001-03	01226	PLUNGER,QUICK RELEASE	EA	1
B- 8	12	PAFZZ		7910040-00	06401	SETSCREW,SOCKET,DRIVE	EA	1
B- 8	13	PAFZZ	5305-00-925-4771	MS35275-211	96906	SCREW,MACHINE	EA	1
B- 8	14	PAFZZ	1270-00-573-5208	2277770-00	06401	SUPPORT,FRONT,GUNNER	EA	1

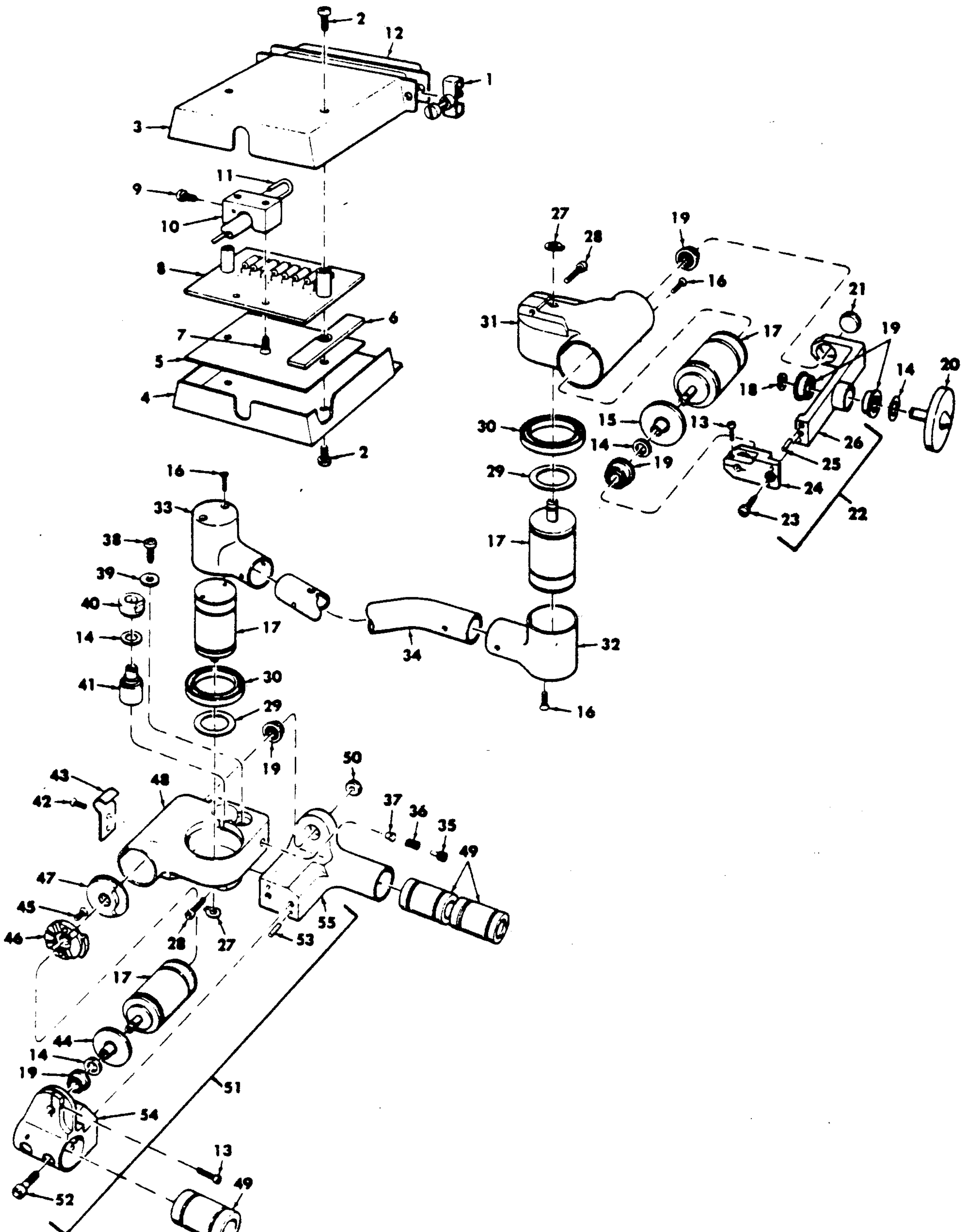


Figure B-9. Gunner arm assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B- 9						GROUP: 2275.32 GUNNER ARM ASSEMBLY FOR NHA,SEE FIG. B- 7		
B- 9	1	PAFZZ	5305-00-073-8885	8213510-6	19200	SCREW LOCK	EA	2
B- 9	2	PADZZ	5305-00-054-6650	MS51957-26	96906	SCREW,MACHINE	EA	4
B- 9	3	XA		2215700-00	06401	JUNCTION SHELL,TOP	EA	1
B- 9	4	XA		2215701-00	06401	JUNCTION SHELL,BOTTOM	EA	1
B- 9	5	XA		2215703-00	06401	INSULATOR	EA	1
B- 9	6	PADZZ		2215702-00	06401	SHIM	EA	2
B- 9	7	PADZZ	5305-00-993-9189	MS24693C2	96906	SCREW,MACHINE	EA	2
B- 9	8	XBDZZ		2215705-00	06401	PRINTED WIRING BOARD	EA	1
B- 9	9	PADZZ	5305-00-054-5637	MS51957-3	96906	SCREW,MACHINE	EA	1
B- 9	10	XA		2215704-00	06401	MOUNT,SUPPORT,CABLE	EA	1
B- 9	11	PADZZ	5360-00-606-9812	2251758-00	06401	SPRING,HELICAL	EA	1
B- 9	12	PADZZ	5935-00-493-0466	M24308-3-5	81349	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	1
B- 9	13	PADZZ	5305-00-058-2075	M514997-3	96906	SCREW,SOCKET HEAD	EA	2
B- 9	14	PADZZ	5365-00-845-7667	B6-1	00141	SHIM, 0.004 IN.THICK	EA	2
B- 9	14	PADZZ	5365-00-052-8846	B6-2	00141	SHIM, 0.006 IN.THICK	EA	2
B- 9	14	PADZZ	5365-00-802-2360	B6-3	00141	SHIM, 0.008 IN.THICK	EA	2
B- 9	14	PADZZ	5365-00-804-0465	B6-4	00141	SHIM, 0.010 IN.THICK	EA	2
B- 9	14	PADZZ	5365-00-598-7868	B6-24	00141	SHIM, 0.002 IN.THICK	EA	2
B- 9	15	PADZZ	1270-00-573-5121	2251716-00	06401	END PLATE	EA	1
B- 9	16	PADZZ		0411-47	07187	SCREW,MACHINE	EA	6
B- 9	17	PADZZ	5990-00-573-4731	CM41084025	88818	RESOLVER,ELECTRICAL	EA	4
C B- 9	18	PADZZ		MS16624-5018	96906	RING,RETAINING	EA	1
C B- 9	19	PADZZ		SFR166LL3K25-7	83086	BEARING,BALL,FLANGED	EA	6
B- 9	20	PADZZ	1270-01-011-3335	2277717-00	06401	CONNECTOR	EA	1
B- 9	21	PADZZ	5340-00-610-4189	2251721-00	06401	PLUG,PROTECTIVE,DUST AND MOISTURE SEAL	EA	1
B- 9	22	XBDZZ		2277719-00	06401	YOKE ASSEMBLY	EA	1
B- 9	23	PADZZ	5305-00-054-5647	MS51957-13	96906	SCREW,MACHINE	EA	1
B- 9	24	XA		2277719-53	06401	END PLATE	EA	1
B- 9	25	PADZZ	5315-00-282-1187	AN122676	88044	PIN,STRAIGHT,HEADLESS	EA	2
B- 9	26	XA		2277719-52	06401	YOKE	EA	1
B- 9	27	PADZZ	5365-00-149-8696	MS16624-5012	96906	RING,RETAINING	EA	2
B- 9	28	PADZZ	5305-00-978-9343	MS16997-10	96906	SCREW,SOCKET HEAD	EA	2
C B- 9	29	PADZZ		MEOO630600004-01	81349	WASHER,SPRING,TENSION	EA	2
B- 9	30	PADZZ	3110-00-607-1455	3TKLZZ12-16ULO2	78118	BEARING,BALL	EA	2
B- 9	31	PADZZ	1270-00-573-5124	2277721-00	06401	GIMBAL	EA	1
B- 9	32	XBDZZ		2277720-00	06401	HOUSING,LOWER SENSOR	EA	1

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B- 9	33	XBDZZ		2277718-00	06401	HOUSING,UPPER SENSOR	EA	1
B- 9	34	PADZZ	1270-00-570-5086	2277728-00	06401	ARM,GUNNER	EA	1
B- 9	35	PADZZ	5305-00-625-8485	2278389-00	06401	SETSCREW	EA	1
B- 9	36	PADZZ	5340-00-610-5818	MS24583-1019	96906	SPRING,HELICAL,COMPRESSION	EA	1
B- 9	37	PADZZ	5340-00-403-2297	2278388-00	06401	PLUG,PROTECTIVE,DUST	EA	1
B- 9	38	PADZZ	5305-00-054-5635	MS51957-1	96906	SCREW,MACHINE	EA	1
B- 9	39	PADZZ	5310-00-595-6761	MS15795-802	96906	WASHER,FLAT	EA	1
B- 9	40	PADZZ	5999-01-017-2056	2278390-00	06401	CAP,ELECTRICAL	EA	1
B- 9	41	PADZZ	3020-00-613-5840	7278393-00	06401	GEAR,WORM	EA	1
B- 9	42	PADZZ	5305-00-814-1707	NAS662C2R4	80204	SCREW,MACHINE	EA	2
B- 9	43	XBDZZ		2215711-00	06401	HANGER	EA	1
B- 9	44	PAOZZ	1270-00-573-5123	2278379-00	06401	END PLATE	EA	1
B- 9	45	PADZZ	5305-00-760-3848	MS35191-207	96906	SCREW,MACHINE	EA	2
B- 9	46	PADZZ	3020-00-604-7482	2278391-00	06401	GEAR,WORM,MODIFIED	EA	1
B- 9	47	PADZZ	5340-00-607-0581	2278392-00	06401	COVER,SPECIAL	EA	1
B- 9	48	PADZZ	1270-00-573-5195	2278378-00	06401	GIMBAL	EA	1
B- 9	49	PADZZ	3110-00-790-4646	A61014SS	96801	BEARING,BALL,LINEAR	EA	3
B- 9	50	PADZZ	5340-00-621-4840	2251721-01	06401	PLUG,PROTECTIVE,DUST AND MOISTURE SEAL	EA	1
B- 9	51	XBDZZ		2277722-00	06401	CARRIAGE ASSEMBLY	EA	1
B- 9	52	PADZZ	5305-00-978-9348	MS16997-20	96906	SCREW,CAP,SOCKET HEAD	EA	2
B- 9	53	PADZZ	5315-00-282-1187	AN122676	88044	PIN,STRAIGHT,HEADLESS	EA	2
B- 9	54	XA		2277722-51	06401	END PLATE,CARRIAGE	EA	1
B- 9	55	XA		2277722-52	06401	CARRIAGE	EA	1

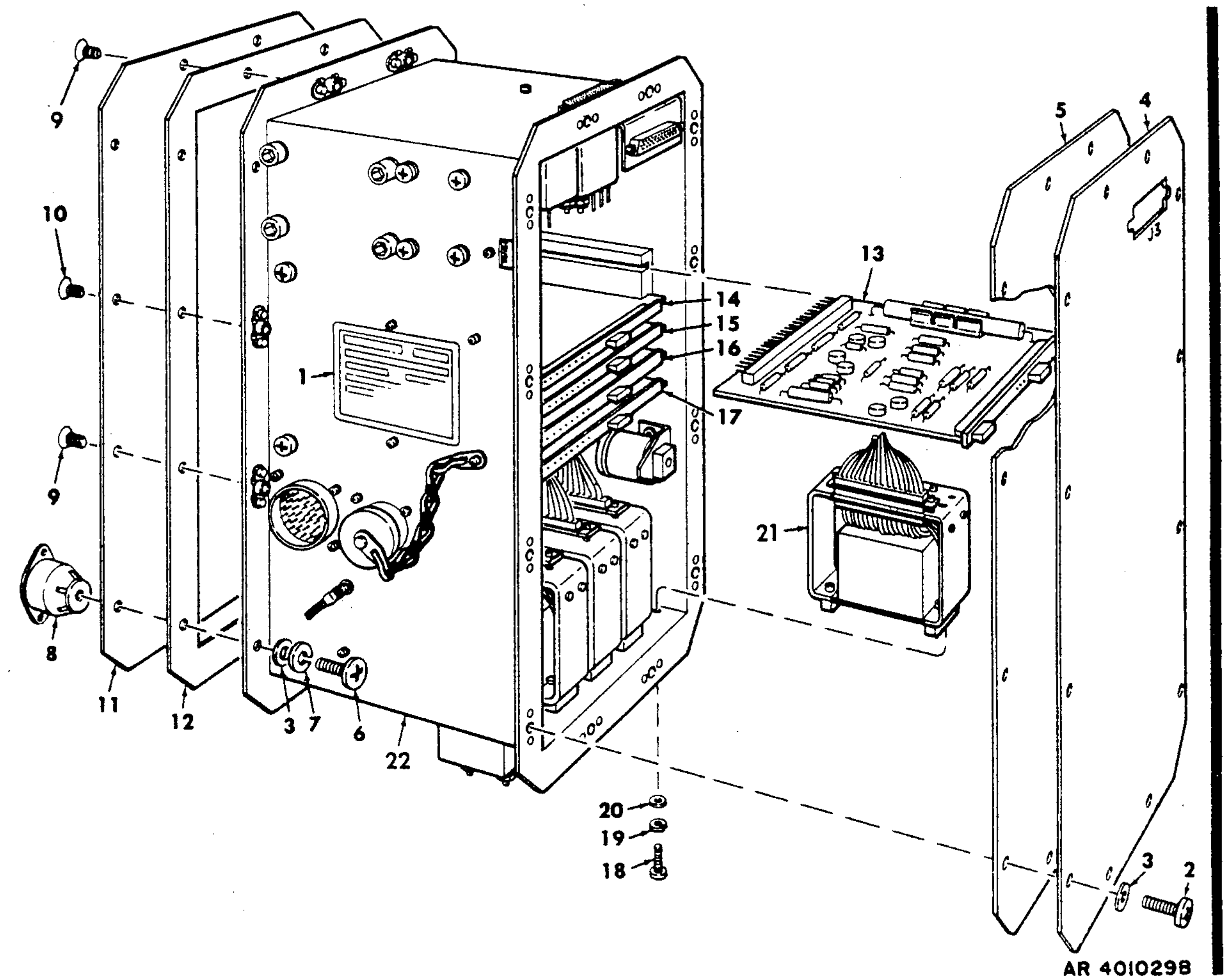


Figure B-10. Electronic interface assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B-10						GROUP: 2275.4 ELECTRONIC INTERFACE ASSEMBLY FOR NHA,SEE FIG. B- 1		
B-10	1	PADZZ	9905-00-573-4727	2278374-00	06401	PLATE,IDENTIFICAITON A	EA	1
B-10	1	PADZZ	9905-01-041-4362	2278374-07	06401	PLATE,IDENTIFICATION B	EA	1
C B-10	2	PAFZZ		MS51957-46	96906	SCREW,MACHINE	EA	12
B-10	3	PAFZZ	5310-00-880-5978	MS15795-807	96906	WASHER,FLAT	EA	16
B-10	4	XBFZZ		2277742-00	06401	COVER,TOP	EA	1
B-10	5	XBFZZ		2277740-00	06401	GASKET,TOP	EA	1
B-10	6	PAFZZ	5305-00-054-6672	MS51957-47	96906	SCREW,MACHINE	EA	4
B-10	7	PAFZZ	5310-00-933-8119	MS35338-137	96906	WASHER,LOCK,SPRING	EA	4
B-10	8	PAFZZ	5340-01-015-9018	E22-02-60	13636	MOUNT,RESILIENT	EA	4
B-10	9	PAFZZ	5305-00-079-5835	MS24693C50	96906	SCREW,MACHINE	EA	5
N B-10	10	PAFZZ		MS24693C51	96906	SCREW,MACHINE	EA	3
B-10	11	XBFZZ		2277741-00	06401	COVER,BOTTOM	EA	1
B-10	12	XBFZZ		2277739-00	06401	GASKET,BOTTOM	EA	1
B-10	13	PAFOO	1270-00-578-0731	2277780-00	06401	CIRCUIT CARD ASSEMBLY	EA	1
B-10	14	PAFDD	1270-00-578-0741	2278300-00	06401	CIRCUIT CARD ASSEMBLY	EA	1
B-10	15	PAFDD	1270-00-578-0757	2278340-00	06401	CIRCUIT CARD ASSEMBLY	EA	1
B-10	16	PAFDD	1270-00-578-0756	2278296-00	06401	CIRCUIT CARD ASSEMBLY A	EA	1
B-10	16	PAFDL	1270-01-022-5324	2202191-00	06401	CIRCUIT CARD ASSEMBLY B	EA	1
B-10	17	PAFDD	1270-00-578-0762	2278298-00	06401	CIRCUIT CARD ASSEMBLY	EA	1
B-10	18	PAFZZ	5305-00-054-6652	MS51957-28	96906	SCREW,MACHINE	EA	16
B-10	19	PAFZZ	5310-00-929-6395	MS35338-136	96906	WASHER,LOCK,SPRING	EA	16
B-10	20	PAFZZ	5310-00-722-5998	MS15795-805	96906	WASHER,FLAT	EA	16
C B-10	21	PAFDL	1270-00-573-4730	2277748-00	06401	MODULE ASSEMBLY,BUFFER AMPLIFIER A	EA	8
C B-10	21	PAFDL		2277748-01	06401	MODULE ASSEMBLY,BUFFER AMPLIFIER B	EA	8
B-10	22	XA		2278471-00	06401	ELECTRONIC INTERFACE SUBASSEMBLY A FOR BREAKDOWN,SEE FIG. B-11	EA	1
B-10	22	XA		2202195-00	06401	ELECTRONIC INTERFACE SUBASSEMBLY B FOR BREAKDOWN,SEE FIG. B-11	EA	1

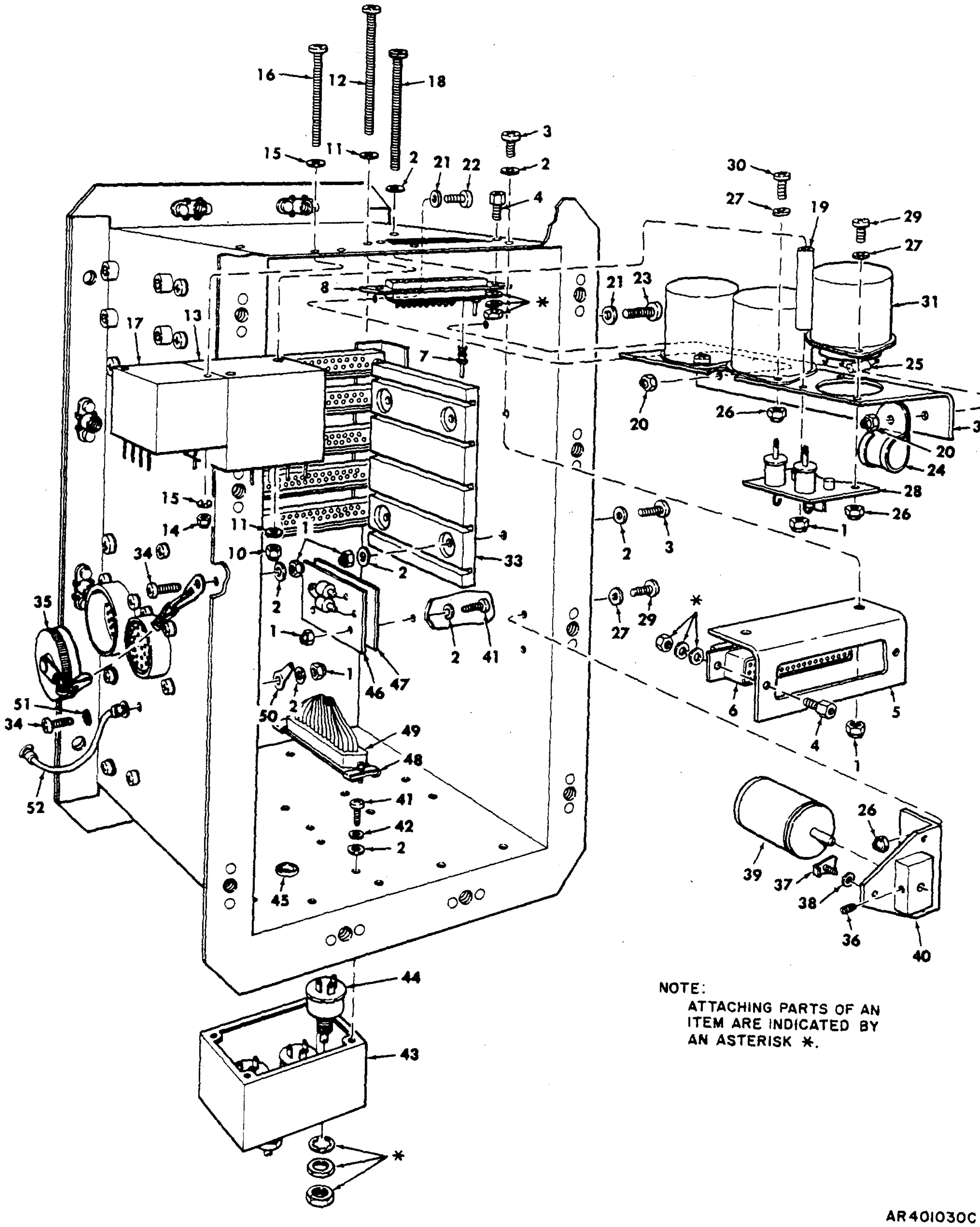


Figure B-11. Electronic interface subassembly (sheet 1 of 2)

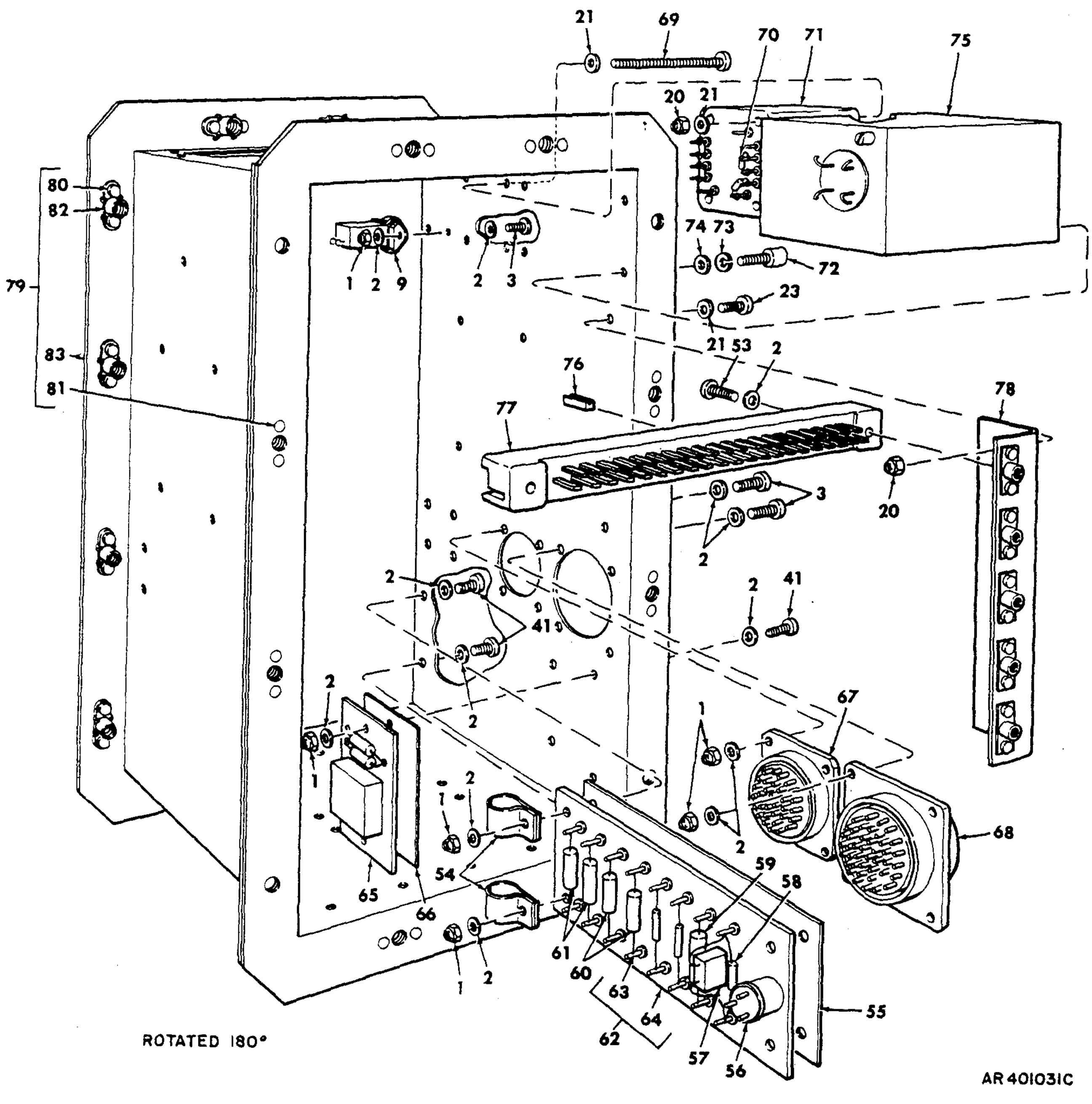


Figure B-11. Electronic interface subassembly (sheet 2 of 2)

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B-11						GROUP: 2275.41 ELECTRONIC INTERFACE SUBASSEMBLY FOR NHA,SEE FIG. B-10		
C B-11	1	PAHZZ	5310-00-982-4999	MS21044C04	96906	NUT,SELF-LOCKING,HEXAGON A	EA	27
C B-11	1	PAHZZ	5310-00-982-4999	MS21044C04	96906	NUT,SELF-LOCKING,HEXAGON B	EA	29
C B-11	2	PAFZZ	5310-00-595-6211	MS15795-803	96906	WASHER,FLAT A	EA	59
C B-11	2	PAFZZ	5310-00-595-6211	MS15795-803	96906	WASHER,FLAT B	EA	63
B-11	3	PAFZZ	5305-00-054-5649	MS51957-15	96906	SCREW,MACHINE	EA	19
C B-11	4	PADZZ		D20418-2	71468	SCREW LOCK ASSEMBLY	EA	4
B-11	5	XA		2251751-00	06401	BRACKET,CONNECTOR	EA	1
B-11	6	PADZZ	5935-00-493-0465	M24308-1-5	81349	CONNECTOR,RECEPTACLE,ELETRICAL	EA	1
B-11	7	PADZZ	5999-00-520-9972	DM53744-24	71468	RECEPTACLE	EA	2
B-11	8	PADZZ	5935-00-161-9100	DDMM43W25	71468	CONNECTOR,ELECTRICAL	EA	1
B-11	9	PAHZZ	6645-00-255-1371	MS17322-10	96906	METER,TIME TOTALIZING	EA	1
N B-11	10	PADZZ		MS21043-06	96906	NUT,SELF-LOCKING,HEXAGON	EA	2
N B-11	11	PADZZ		NAS620C6	80205	WASHER,FLAT	EA	4
B-11	12	PAFZZ	5305-00-054-6677	MS51957-52	96906	SCREW,MACHINE	EA	2
B-11	13	PAHZZ	5950-00-601-6231	2201709-00	06401	TRANSFORMER,POWER,STEPDOWN	EA	1
N B-11	14	PADZZ		MS21043-08	96906	NUT,SELF-LOCKING,HEXAGON	EA	4
N B-11	15	PADZZ		NAS620C8	80205	WASHER,FLAT	EA	12
C B-11	16	PAHZZ		MS51957-125	96906	SCREW,MACHINE	EA	2
B-11	17	PAHZZ	5950-00-603-6938	2201707-00	06401	TRANSFORMER,POWER,STEPDOWN	EA	1
C B-11	18	PAHZZ		2299063-00	06401	SCREW,MACHINE	EA	1
B-11	19	PADZZ	5365-00-606-9748	2251753-01	06401	SPACER,SLEEVE	EA	1
C B-11	20	PAHZZ	5310-00-982-6814	M521044C08	96906	NUT,SELF-LOCKING,HEXAGON	EA	6
C B-11	21	PAFZZ	5310-00-880-5978	M515795-807	96906	WASHER,FLAT	EA	12
B-11	22	PAHZZ	5305-00-054-6670	MS51957-45	96906	SCREW,MACHINE	EA	5
B-11	23	PADZZ	5305-00-054-6671	MS51957-46	96906	SCREW,MACHINE	EA	1
C B-11	24	PAHZZ		NAS1397R6B	80205	CLAMP,LOOP	EA	2
B-11	25	PADZZ	5960-00-985-4900	JAN1N647	81349	SEMICONDUCTOR DEVICE,DIODE	EA	3
C B-11	26	PAHZZ	5310-00-982-6813	M521044C06	96906	NUT,SELF-LOCKING,HEXAGON	EA	8
B-11	27	PAFZZ	5310-00-722-5998	MS15795-805	96906	WASHER,FLAT	EA	20
B-11	28	XA		2215727-00	06401	FILTER ASSEMBLY,ELECTROMAGNETIC INTERFFRENCE FOR BREAKDOWN, SEE FIG. B-12	EA	1
C B-11	29	PADZZ	5305-00-054-6653	MS51957-29	96906	SCREW,MACHINE A	EA	3
N B-11	29	PADZZ	5305-00-054-6653	MS51957-29	96906	SCREW,MACHINE B	EA	7
B-11	30	PAHZZ	5305-00-054-6652	MS51957-28	96906	SCREW,MACHINE	EA	5
B-11	31	PADZZ	5945-00-823-2611	M5757-1-103	81349	RELAY,ARMATURE	EA	3
B-11	32	XA		2251754-00	06401	BRACKET,RELAY	EA	1

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B-11	13	XBDZZ		2251752-00	06401	GUIDE	EA	2
C B-11	34	PAHZZ	5305-00-054-5650	MS51957-16	96906	SCREW,MACHINE A	EA	2
C B-11	34	PAFZZ	5305-00-054-5651	MS51957-17	96906	SCREW,MACHINE B	EA	2
B-11	35	PAFZZ	5935-00-226-4885	MS3181-16C	96906	COVER,ELECTRICAL CONNECTOR	EA	1
B-11	36	PADZZ		MS51029-102	96906	SETSCREW	EA	1
B-11	37	PADZZ	5340-00-871-9071	MS17183-1	96906	CLAMP,RIM CLENCHING	EA	3
N B-11	38	PADZZ		NAS620C4	80205	WASHER,FLAT	EA	3
B-11	39	PADZZ	5990-00-570-4731	CM41084025	88818	RESOLVER,ELECTRICAL	EA	1
B-11	40	XA		2251750-00	D6401	BRACKET,ASSEMBLY,RRESOVLER	EA	1
N B-11	41	PAHZZ	5305-00-054-5650	MS51957-16	96906	SCREW,MACHINE A	EA	6
C B-11	41	PAHZZ	5305-00-054-5650	MS51957-16	96906	SCREW,MACHINE B	EA	19
N B-11	42	PADZZ		MS35338-135	96906	WASHER,LOCK B	EA	9
B-11	43	XA		2202196-00	06401	CHASSIS,POTENTIOMETER MOUNTING B	EA	1
B-11	44	PAHZZ	5905-00-552-5490	RV6LAYSA252A	81349	RESISTOR,VARIABLE,COMPOSITION	EA	4
N B-11	45	PADZZ		MS35489-1	96906	GROMMET,RUBBER B	EA	1
N B-11	46	PADZZ		7605067-00	06401	TERMINAL BOARD ASSEMBLY FOR BREAKDOWN,SEE FIG. B-13	EA	1
N B-11	47	PADZZ		7605066-00	06401	BOARD,INSULATOR	EA	1
B-11	48	PAFZZ	5935-00-956-2935	D20419	71468	LOCK,FEMALE	EA	16
B-11	49	PADZZ	5935-00-351-6135	M24308-1-3	81349	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	8
B-11	50	PAFZZ	5940-00-177-7974	MS77070-1	96906	TERMINAL,LUG	EA	1
B-11	51	PAHZZ	5310-00-939-1063	MS35335-85	96906	WASHER,LOCK	EA	1
B-11	52	PAFZZ	1270-00-615-8998	2215787-00	06401	LEAD,ELECTRICAL A	EA	1
B-11	52	PAFZZ		2202197-00	06401	LEAD,ELECTRICAL B	EA	1
B-11	53	PAHZZ	5305-00-054-5652	MS51957-18	96906	SCREW,MACHINE	EA	10
C B-11	54	PADZZ		NAS1397R48	80205	CLAMP,LOOP A	EA	2
N B-11	54	PADZZ		NAS1397R58	80205	CLAMP,LOOP B	EA	2
B-11	55	XBDZZ		2251767-00	06401	SHEET,SPACER	EA	1
C B-11	56	PAHZZ		JAN2N2324A	81349	SEMICONDUCTOR DEVICE,TRANSISTOR	EA	1
B-11	57	PAHZZ	5910-00-600-6889	M39014-02-1230	81349	CAPACITOR,FIXED,CERAMIC	EA	1
B-11	58	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR,FIXED,COMPOSITION	EA	1
B-11	59	PAHZZ	5961-00-850-9438	JAN1N3033B	81349	SEMICONDUCTOR DEVICE,DIODE	EA	1
B-11	60	PAHZZ	5905-00-782-4554	RW69V121	81349	RESISTOR,FIXED,WIREWOUND	EA	2
B-11	61	PAHZZ	5905-00-880-0900	RW69V9R1	81349	RESISTOR,FIXED,WIREWOUND	EA	2
B-11	62	XA		2277769-00	06401	TERMINAL BOARD ASSEMBLY	EA	1
B-11	63	PAHZZ	5940-00-990-1658	MS17122-6	96906	TERMINAL,STUD	EA	19
B-11	64	XA		2277769-51	06401	TERMINAL BOARD	EA	1
C B-11	65	XA		2202193-00	06401	TERMINAL BOARD ASSEMBLY B FOR BREAKDOWN,SEE FIG. B-14	EA	1

(1) Illustration		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) Fig No.	(b) Item No.	SMR code	National stock number	Part number	FSCM	Description Usable on Code	U/M	Qty inc in unit
B-11	66	XA		2202199-00	06401	INSULATOR BOARD B	EA	1
B-11	67	PADZZ	5935-00-827-1545	M53112E16-26S	96906	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	1
B-11	68	PADZZ	5935-00-822-5838	MS3112E22-55P	96906	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	1
B-11	69	PAHZZ	5305-00-054-6680	MS51957-53	96906	SCREW,MACHINE	EA	4
B-11	70	PAHZZ	5910-00-099-0541	M39014-05-2261	81349	CAPACITOR,FIXED,CERAMIC	EA	9
B-11	71	PAHZZ		2278339-00	06401	TRANSFORMER,POWER,STEP DOWN	EA	1
B-11	72	PAHZZ	5305-00-057-4593	MS16996-9	96906	SCREW,CAP,SOCKET HEAD	EA	4
B-11	73	PAFZZ	5310-00-933-8120	MS35338-138	96906	WASHER,LOCK,SPRING	EA	4
B-11	74	PAFZZ	5310-00-989-0640	NAS620C10	80205	WASHER,FLAT	EA	4
B-11	75	PAHZZ	1270-00-611-7214	C28D0-8	15755	POWER SUPPLY	EA	1
C B-11	76	XBOZZ		M21097-11-3	81349	KEY,POLARIZING A	EA	5
N B-11	76	XBOZZ		M21097-11-3	81349	KEY,POLARIZING B	EA	8
B-11	77	PADZZ	5935-00-926-7522	M21097-4-33	81349	CONNECTOR,ELECTRICAL	EA	5
B-11	78	XA		2251749-00	06401	BRACKET ASSEMBLY,CIRCUIT BOARD CONNECTOR	EA	2
B-11	79	XBDZZ		2278349-00	06401	CHASSIS ASSEMBLY A	EA	1
B-11	79	XBDZZ		2202198-00	06401	CHASSIS ASSEMBLY B	EA	1
N B-11	80	PADXX	5320-00-117-6939	MS20426AD3-5	96906	RIVET,SOLID	EA	90
B-11	81	PADZZ	5320-00-584-0672	MS20426AD3-6	96906	RIVET,SOLID	EA	8
B-11	82	PADZZ	5310-00-772-3721	MS21075L08	96906	NUT,SELF-LOCKING,PLATE	EA	20
B-11	33	XA		2278349-51	06401	CHASSIS A	EA	1
B-11	83	XA		2202198-51	06401	CHASSIS B	EA	1

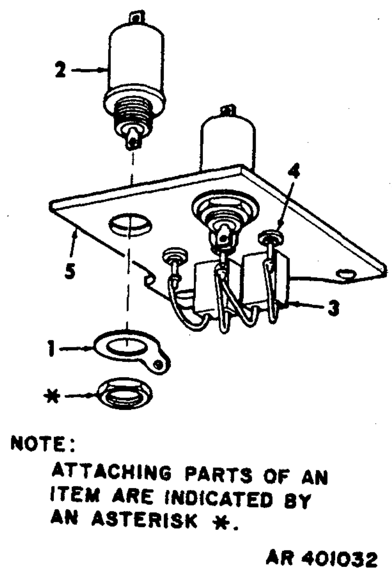


Figure B-12. EMI filter assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B-12						GROUP: 2275-411 ELECTROMAGNETIC INTERFERENCE FILTER ASSEMBLY FOR NHA,SEE FIG. B-11		
B-12	1	PAHZZ	5940-00-110-4443	MS77073-7	96906	TERMINAL,LUG	EA	2
B-12	2	PAHZZ	5915-00-946-6906	11728792	19200	FILTER,RADIO FREQUENCY	EA	2
B-12	3	PAHZZ	5910-00-606-6889	M39014-02-1230	81349	CAPACITOR,FIXED,CERAMIC	EA	2
B-12	4	PAHZZ	5940-00-926-0018	MILT55155-8	81349	TERMINAL,STUD	EA	3
B-12	5	XA		2215716-00	06401	BRACKET	EA	1

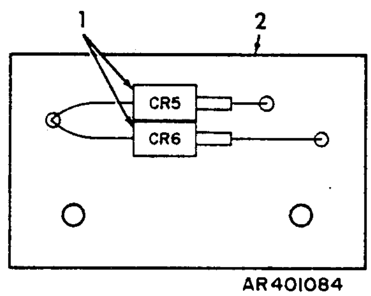


Figure B-13. Terminal board assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
N B-13						GROUP: 2275.412 TERMINAL BOARD ASSEMBLY FOR NHA,SEE FIG. B-11		
N B-13	1	PADZZ		JAN1N6048A	81349	DIODE	EA	2
N B-13	2	PADZZ		7605065-00	06401	TERMINAL BOARD	EA	1

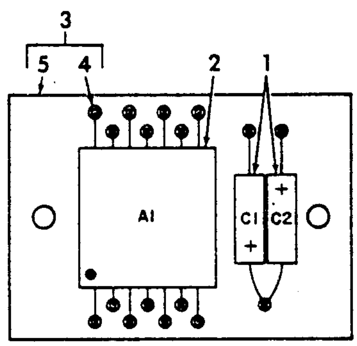


Figure B-14. Terminal board assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
B-14						GROUP: 2275.413 TERMINAL BOARD ASSEMBLY FOR NHA,SEE FIG. B-11		
B-14	1	PAFZZ	5910-00-104-5917	M39003-01-2303	81349	CAPACITOR,FIXED,ELECTROLYTIC B	EA	2
B-14	2	PAFZZ		7905640-00	06401	MICROCIRCUIT,HYBRID B	EA	1
B-14	3	XA		2202199-00	06401	TERMINAL BOARD B	EA	1
C B-14	4	PAHZZ		M8394-3	21242	TERMINAL,STUD B	EA	17
C B-14	5	XA		2202199-51	06401	TERMINAL BOARD B	EA	1

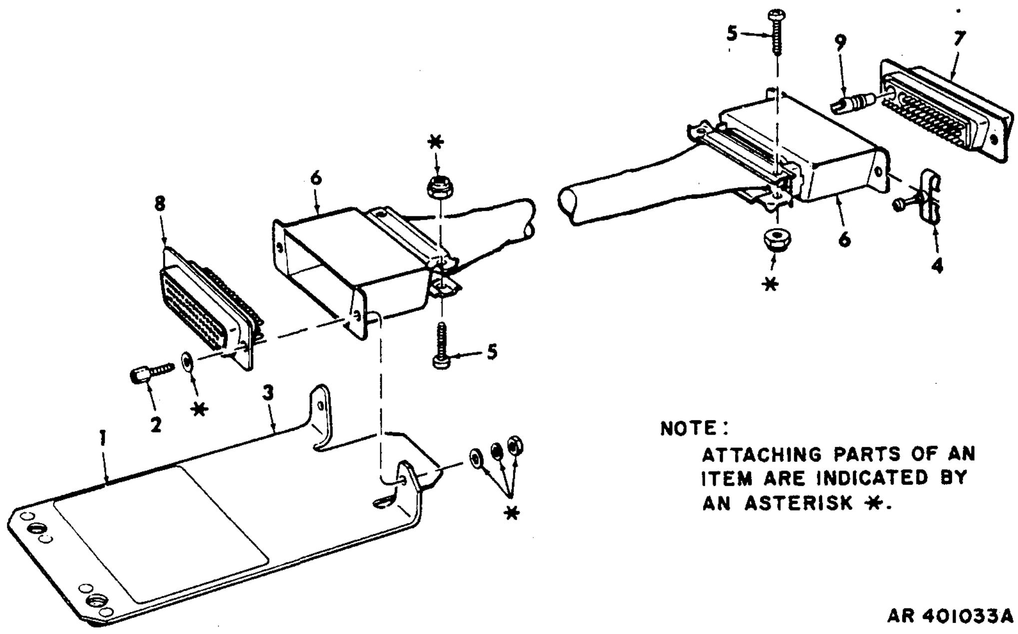


Figure B-15. Electrical special purpose cable assembly

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B-15						GROUP: 2275.5 ELECTRICAL SPECIAL PURPOSE CABLE ASSEMBLY FOR NHA,SEE FIG. B- 1		
B-15	1	PAFZZ	9905-00-573-4732	2278374-01	06401	PLATE,IDENTIFICATION	EA	1
B-15	2	PAFZZ	5935-00-792-4267	20418-19	71468	SCREW LOCK ASSEMBLY	EA	2
B-15	3	XBDZZ		2251728-00	06401	BRACKET ASSEMBLY,CABLE	EA	1
B-15	4	PAHZZ	5305-00-073-8885	8213510-6	19200	SCREW LOCK	EA	2
B-15	5	PAFZZ	5305-00-054-5651	MS51957-17	96906	SCREW,MACHINE	EA	4
B-15	6	XA		DD24661	71468	SHIELD,ELECTRICAL CONNECTOR	EA	2
B-15	7	PADZZ	5935-00-161-9101	DDMM43W2P	71468	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	1
B-15	8	PADZZ	5935-00-493-0465	M24308-1-5	81349	CONNECTOR,RECEPTACLE,ELECTRICAL	EA	1
B-15	9	PADZZ	5999-00-520-6145	DM53745-25	71468	CONTACT,ELECTRICAL	EA	2

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) U/M	(8) Qty inc in unit
BULK						BULK MATERIALS		
BULK		PAFZZ	9535-00-232-0418	QQA250-5	81348	ALUMINUM ALLOY,2024 CLAD	IN	V
BULK		PAFZZ	5306-00-274-2119	AN3-5A	88044	BOLT,MACHINE NO. 10-32UNF BY 1-5/8 IN.	EA	V
BULK		PAFZZ	5306-00-151-1423	AN4-11A	88044	BOLT,MACHINE 1/4-28UNF BY 5/32 IN.	EA	12
BULK		PAFZZ	5306-00-722-5211	NAS428-6-30	80205	BOLT,MACHINE,ADJUSTING 3/8-24UNF BY 3 IN.	EA	9
BULK		PAFZZ	5310-00-167-1343	AN315-3R	88044	NUT,PLAIN,HEXAGON	EA	V
BULK		PAFZZ	5310-00-167-1344	AN315-4R	88044	NUT,PLAIN,HEXAGON	EA	12
BULK		PAFZZ	9520-00-288-1106	QQ5741	81348	ANGLE,STEEL 1 BY 1 BY 1/8 IN. THICK	FT	V
BULK		PAFZZ	9515-00-224-6025	QQ5635	81349	PLATE,STEEL 1/4 IN.	FT	V
BULK		PAFZZ	9510-00-229-4769	QQ5631	81348	ROD,STEEL 1/2 BY 3 IN.	FT	V
BULK		PAFZZ	9520-00-954-6174	QQ5741	81348	STEEL,T-SECTION 1-3/4 BY 1-3/4 IN.	FT	V
BULK		PAFZZ	4710-00-287-1464	MILT5066	81349	TUBE,STEEL 1-3/4 OD BY 1/8 IN. WALL	IN	V
BULK		PAFZZ	4710-00-287-1467	MILT5066	81349	TUBE,STEEL 1-1/2 OD BY 1/8 IN. WALL	FT	V
BULK		PAFZZ	5310-00-183-4406	AN960PD10	88044	WASHER,FLAT	EA	V
BULK		PAFZZ	5310-00-791-8501	AN960PD416	88044	WASHER,FLAT	EA	12

SECTION III. SPECIAL TOOLS LIST

(1) Illustration (a) Fig No.	(b) Item No.	(2) SMR code	(3) National stock number	(4) Part number	(5) FSCM	(6) Description / Usable on Code	(7) U/M	(8) Qty inc in unit
B-16						SPECIAL TOOLS		
B-16	1	PDFZZ		1045948	82577	BORESIGHT DEVICE,TSU	EA	
B-16	2	PEFDD	4931-00-121-8707	2201736-05	06401	TEST SET,FIRE CONTROL SUBSYSTEM AN/GSM-249	EA	
B-16	3	PDOZZ	4931-00-124-5453	2277279-00	06401	BORESIGHT KIT,HSS,ORGANIZATIONAL	EA	
B-16	4	PAFZZ		2278864-00	06401	HOLDING DEVICE	EA	

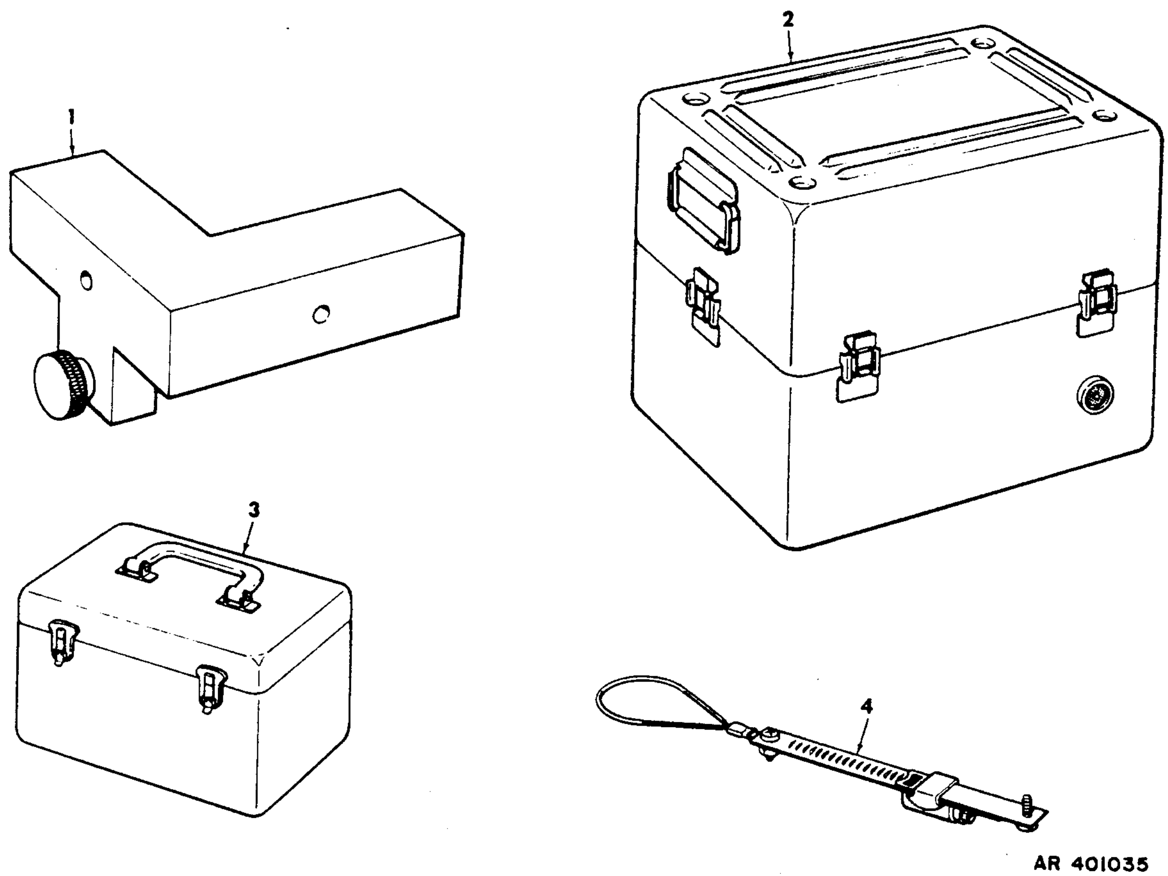


Figure B-16. Special tools

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
5365-00-052-8846	B-3	22	9535-00-232-0418	BULK	
5365-00-052-8846	B-6	14	6645-00-255-1371	B-11	9
5365-00-052-8846	B-9	14	5306-00-274-2119	BULK	
5305-00-054-5635	B-6	38	5315-00-282-1187	B-6	25
5305-00-054-5635	B-9	38	5315-00-282-1187	B-6	53
5305-00-054-5636	B-2	9	5315-00-282-1187	B-9	25
5305-00-054-5637	B-6	9	5315-00-282-1187	B-9	53
5305-00-054-5637	B-9	9	4710-00-287-1464	BULK	
5305-00-054-5638	B-3	3	4710-00-287-1467	BULK	
5305-00-054-5639	B-2	35	9520-00-288-1106	BULK	
5305-00-054-5644	B-3	1	5935-00-351-6135	B-11	49
5305-00-054-5647	B-2	22	5310-00-379-4571	B-2	14
5305-00-054-5647	B-6	23	5935-00-493-0465	B-11	6
5305-00-054-5647	B-9	23	5935-00-493-0465	B-15	8
5305-00-054-5648	B-2	12	5935-00-493-0466	B-6	12
5305-00-054-5649	B-11	3	5935-00-493-0466	B-9	12
5305-00-054-5650	B-11	34	5999-00-520-6145	B-15	9
5305-00-054-5650	B-11	41	5999-00-520-9972	B-11	7
5305-00-054-5650	B-11	41	5905-00-552-5490	B-11	44
5305-00-054-5651	B-11	34	5990-00-570-4731	B-11	39
5305-00-054-5651	B-15	5	1270-00-570-5086	B-9	34
5305-00-054-5652	B-11	53	1240-00-573-4672	B-2	15
5305-00-054-5654	B-3	9	1270-00-573-4675	B-2	17
5305-00-054-6650	B-6	2	1270-00-573-4681	B-3	13
5305-00-054-6650	B-9	2	1270-00-573-4689	B-3	12
5305-00-054-6652	B-10	18	1270-00-573-4692	B-3	35
5305-00-054-6652	B-11	30	1270-00-573-4693	B-3	10
5305-00-054-6653	B-11	29	1270-00-573-4695	B-3	4
5305-00-054-6653	B-11	29	1270-00-573-4696	B-3	19
5305-00-054-6670	B-11	22	1270-00-573-4715	B-3	36
5305-00-054-6671	B-11	23	1270-00-573-4716	B-3	11
5305-00-054-6672	B-10	6	1270-00-573-4720	B-3	34
5305-00-054-6677	B-11	12	1270-00-573-4721	B-3	25
5305-00-057-4593	B-11	72	1270-00-573-4722	B-3	24
5305-00-058-2075	B-6	13	1270-00-573-4723	B-2	26
5305-00-058-2075	B-9	13	1270-00-573-4725	B-2	33
5305-00-062-0872	B-6	16	9905-00-573-4727	B-10	1
5305-00-073-8885	B-6	1	1270-00-573-4730	B-10	21
5305-00-073-8885	B-9	1	5990-00-573-4731	B-6	17
5305-00-073-8885	B-15	4	5990-00-573-4731	B-9	17
5305-00-079-5835	B-10	9	1270-00-573-4737	B-1	3
5910-00-104-5917	B-14	1	9905-00-573-4988	B-7	1
5940-00-110-4443	B-12	1	1270-00-573-5047	B-4	13
5320-00-117-6939	B-11	80	1270-00-573-5047	B-7	15
4931-00-121-8707	B-16	2	1270-00-573-5085	B-7	17
1270-00-122-9449	B-1		1270-00-573-5121	B-6	15
4931-00-124-5453	B-16	3	1270-00-573-5121	B-9	15
5905-00-141-1183	B-11	58	1270-00-573-5123	B-6	44
5365-00-149-8696	B-6	27	1270-00-573-5123	B-9	44
5365-00-149-8696	B-9	27	1270-00-573-5124	B-6	31
5306-00-151-1423	BULK		1270-00-573-5124	B-9	31
5310-00-155-4926	B-6	29	1270-00-573-5195	B-6	48
5306-00-156-2327	B-5	1	1270-00-573-5195	B-9	48
5306-00-156-2336	B-5	5	1270-00-573-5196	B-5	10
5306-00-156-2336	B-8	1	1270-00-573-5196	B-8	9
5935-00-161-9100	B-11	8	1270-00-573-5197	B-5	4
5935-00-161-9101	B-15	7	1270-00-573-5197	B-8	3
5310-00-167-1343	BULK		1270-00-573-5204	B-5	9
5310-00-167-1344	BULK		1270-00-573-5204	B-8	7
5940-00-177-7974	B-11	50	1270-00-573-5208	B-8	14
5310-00-180-8988	B-3	31	1270-00-573-5209	B-1	2
5310-00-183-4406	BULK		9905-00-573-5211	B-4	1
5340-00-205-6301	B-7	10	1270-00-573-5222	B-4	15
9515-00-224-6025	BULK		1270-00-573-5224	B-5	14
5935-00-226-4885	B-11	35	1270-00-578-0536	B-1	1

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
1270-00-578-0542	B-3	5	1270-00-615-8998	B-11	52
1270-00-578-0627	B-3	32	1270-00-615-9004	B-6	34
1270-00-578-0677	B-3	30	5365-00-618-0063	B-4	8
1270-00-578-0717	B-2	29	5365-00-618-0063	B-7	9
1270-00-578-0721	B-1	4	5310-00-619-1148	B-2	2
1270-00-578-0731	B-10	14	5310-00-619-1148	B-2	31
1270-00-578-0741	B-10	15	5310-00-619-1148	B-5	2
1270-00-578-0756	B-10	16	5310-00-619-1148	B-8	2
1270-00-578-0757	B-10	13	5365-00-619-3609	B-3	31
1270-00-578-0762	B-10	17	5365-00-619-3610	B-3	31
1270-00-578-0763	B-1	5	5340-00-619-7754	B-2	4
5320-00-584-0672	B-11	81	5340-00-621-4840	B-6	50
5310-00-595-6211	B-11	2	5340-00-621-4840	B-9	50
5310-00-595-6211	B-11	2	5305-00-625-8485	B-6	35
5310-00-595-6761	B-2	11	5305-00-625-8485	B-9	35
5310-00-595-6761	B-2	37	5305-00-627-4287	B-3	15
5310-00-595-6761	B-6	39	5340-00-627-4351	B-3	14
5310-00-595-6761	B-9	39	5365-00-627-4748	B-3	16
5365-00-598-7868	B-3	22	5360-00-630-2365	B-3	2
5365-00-598-7868	B-6	14	5365-00-630-2467	B-3	7
5365-00-598-7868	B-9	14	5365-00-632-3169	B-3	31
5365-00-598-7889	B-5	3	5315-00-685-4846	B-7	14
5330-00-598-8445	B-2	16	5305-00-716-7725	B-2	27
5365-00-598-8683	B-3	31	5306-00-722-5211	BULK	
5910-00-600-6889	B-11	57	5310-00-722-5998	B-10	20
5950-00-601-6231	B-11	13	5310-00-722-5998	B-11	27
5340-00-603-2289	B-4	14	5305-00-760-3848	B-6	45
5340-00-603-2289	B-7	16	5305-00-760-3848	B-9	45
5340-00-603-2297	B-6	37	5305-00-768-0336	B-8	6
5340-00-603-2297	B-9	37	5310-00-772-3721	B-11	82
5950-00-603-6938	B-11	17	5310-00-782-1349	B-2	23
3020-00-604-7482	B-6	46	5905-00-782-4554	B-11	60
3020-00-604-7482	B-9	46	3110-00-790-4646	B-6	49
5910-00-606-6889	B-12	3	3110-00-790-4646	B-9	49
5365-00-606-9748	B-11	19	5310-00-791-8501	BULK	
5360-00-606-9812	B-6	11	5935-00-792-4267	B-15	2
5360-00-606-9812	B-9	11	5365-00-802-2360	B-3	22
5340-00-606-9815	B-5	7	5365-00-802-2360	B-6	14
5310-00-607-0576	B-2	13	5365-00-802-2360	B-9	14
5340-00-607-0578	B-8	5	5365-00-804-0465	B-3	22
5310-00-607-0579	B-4	4	5365-00-804-0465	B-6	14
5310-00-607-0580	B-2	30	5365-00-812-0474	B-3	20
5340-00-607-0581	B-6	47	5305-00-814-1707	B-6	42
5340-00-607-0581	B-9	47	5305-00-814-1707	B-9	42
3110-00-607-1455	B-6	30	5935-00-822-5838	B-11	68
3110-00-607-1455	B-9	30	5945-00-823-2611	B-11	31
5340-00-610-4189	B-6	21	5935-00-827-1545	B-11	67
5340-00-610-4189	B-9	21	5365-00-845-7667	B-3	22
5360-00-610-4190	B-3	23	5365-00-845-7667	B-6	14
5365-00-610-4210	B-3	6	5365-00-845-7667	B-9	14
5310-00-610-5653	B-2	28	5961-00-850-9438	B-11	59
5310-00-610-5655	B-4	5	5340-00-871-9071	B-11	37
5310-00-610-5655	B-7	5	5935-00-878-3959	B-2	47
5310-00-610-5656	B-4	3	5905-00-880-0900	B-11	61
5310-00-610-5656	B-7	3	5310-00-880-5978	B-10	3
5360-00-610-5818	B-6	36	5310-00-880-5978	B-11	21
5360-00-610-5818	B-9	36	5310-00-897-6145	B-4	2
9905-00-611-7197	B-2	8	5310-00-897-6145	B-7	2
1270-00-611-7214	B-11	75	5305-00-925-4771	B-8	13
5365-00-612-2947	B-3	27	5940-00-926-0018	B-12	4
3020-00-613-5840	B-6	41	5935-00-926-7522	B-11	77
3020-00-613-5840	B-9	41	5310-00-928-2690	B-2	10
3040-00-613-5845	B-3	8	5310-00-928-2690	B-2	36
5930-00-615-3936	B-2	32	5310-00-929-6395	B-10	19

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
5310-00-933-8119	B-10	7	5960-00-985-4900	B-11	25
5310-00-939-1063	B-11	51	5940-00-990-1658	B-11	63
5310-00-942-5110	B-5	6	5305-00-993-9189	B-6	7
5310-00-942-5110	B-8	4	5305-00-993-9189	B-9	7
5915-00-946-6906	B-12	2	1270-01-005-2849	B-2	34
9520-00-954-6174	BULK		1270-01-011-3333	B-3	33
5935-00-956-2935	B-11	48	1270-01-011-3335	B-6	20
5305-00-959-0382	B-3	17	1270-01-011-3335	B-9	20
5340-00-964-2555	B-11	54	1270-01-013-4240	B-1	6
5320-00-972-3366	B-2	1	5320-01-014-2626	B-2	3
5305-00-978-9343	B-6	28	5320-01-014-2626	B-2	6
5305-00-978-9343	B-9	28	5320-01-014-4353	B-2	7
5305-00-978-9347	B-4	9	5340-01-015-9018	B-10	8
5305-00-978-9347	B-5	8	5999-01-017-2056	B-6	40
5305-00-978-9347	B-7	11	5999-01-017-2056	B-9	40
5305-00-978-9347	B-8	8	1270-01-019-3422	B-2	49
5305-00-978-9348	B-6	52	1270-01-022-5324	B-10	16
5305-00-978-9348	B-9	52	1270-01-032-5123	B-1	4
5310-00-982-4999	B-11	1	5355-01-033-8645	B-2	18
5310-00-982-4999	B-11	1	1270-01-041-3767	B-1	
5310-00-982-6813	B-11	26	9905-01-041-4362	B-10	1
5310-00-982-6814	B-11	20			

PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER	PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER
AN122676	88044	B-6	25	MILT55155-8	81349	B-12	4
AN122676	88044	B-6	53	MLCDT186	12617	B-2	32
AN122676	88044	B-9	25	MS15795-802	96906	B-2	11
AN122676	88044	B-9	53	MS15795-802	96906	B-2	37
AN3C3A	88044	B-5	5	MS15795-802	96906	B-6	39
AN3C3A	88044	B-8	1	MS15795-802	96906	B-9	39
AN3C6A	88044	B-5	1	MS15795-803	96906	B-11	2
AN3-5A	88044	BULK		MS15795-803	96906	B-11	2
AN315-3R	88044	BULK		MS15795-804	96906	B-2	23
AN315-4R	88044	BULK		MS15795-805	96906	B-10	20
AN4-11A	88044	BULK		MS15795-805	96906	B-11	27
AN960PD10	88044	BULK		MS15795-807	96906	B-10	3
AN960PD416	88044	BULK		MS15795-807	96906	B-11	21
A61014SS	96881	B-6	49	MS15795-808	96906	B-2	2
A61014SS	96881	B-9	49	MS15795-808	96906	B-2	31
B0750-028S	83553	B-2	14	MS15795-808	96906	B-5	2
B6-1	00141	B-3	22	MS15795-808	96906	B-8	2
B6-1	00141	B-6	14	MS16624-5012	96906	B-6	27
B6-1	00141	B-9	14	MS16624-5012	96906	B-9	27
B6-2	00141	B-3	22	MS16624-5018	96906	B-6	18
B6-2	00141	B-6	14	MS16624-5018	96906	B-9	18
B6-2	00141	B-9	14	MS16995-17	96906	B-3	17
B6-24	00141	B-3	22	MS16996-9	96906	B-11	72
B6-24	00141	B-6	14	MS16997-10	96906	B-6	28
B6-24	00141	B-9	14	MS16997-10	96906	B-9	28
B6-3	00141	B-3	22	MS16997-19	96906	B-4	9
B6-3	00141	B-6	14	MS16997-19	96906	B-5	8
B6-3	00141	B-9	14	MS16997-19	96906	B-7	11
B6-4	00141	B-3	22	MS16997-19	96906	B-8	8
B6-4	00141	B-6	14	MS16997-20	96906	B-6	52
B6-4	00141	B-9	14	MS16997-20	96906	B-9	52
B6-9	00141	B-3	20	MS16997-3	96906	B-6	13
CM41084025	88818	B-6	17	MS16997-3	96906	B-9	13
CM41084025	88818	B-9	17	MS17122-6	96906	B-11	63
CM41084025	88818	B-11	39	MS171437	96906	B-3	18
C0088-012-0620S	83553	B-5	11	MS171559	96906	B-4	12
C0088-012-0620S	83553	B-8	10	MS17183-1	96906	B-11	37
C28D0-8	15755	B-11	75	MS17322-10	96906	B-11	9
DDMM43W2P	71468	B-15	7	MS20426AD3-5	96906	B-11	80
DDMM43W2S	71468	B-11	8	MS20426AD3-6	96906	B-11	81
DD24661	71468	B-15	6	MS21043-06	96906	B-11	10
DM53744-24	71468	B-11	7	MS21043-08	96906	B-11	14
DM53745-25	71468	B-15	9	MS21044C04	96906	B-11	1
D20418-2	71468	B-11	4	MS21044C04	96906	B-11	1
D20419	71468	B-11	48	MS21044C06	96906	B-11	26
D4-187	00141	B-2	42	MS21044C08	96906	B-11	20
E120-020-0620S	83553	B-2	40	MS21075L08	96906	B-11	82
E22-02-60	13636	B-10	8	MS21083C4	96906	B-4	2
G78-1	00328	B-3	31	MS21083C4	96906	B-7	2
G78-2	00328	B-3	31	MS21270A92	96906	B-3	15
G78-3	00328	B-3	31	MS21919DG4	96906	B-7	10
G78-4	00328	B-3	31	MS24585-1019	96906	B-6	36
G78-5	00328	B-3	31	MS24585-1019	96906	B-9	36
HL22D6-2	73197	B-2	3	MS24665-1002	96906	B-2	41
HL22D6-3	73197	B-2	5	MS24693C2	96906	B-6	7
HL22D6-7	73197	B-2	7	MS24693C2	96906	B-9	7
HL22D6-8	73197	B-2	6	MS24693C50	96906	B-10	9
HL77-6	73197	B-2	1	MS24693C51	96906	B-10	10
HP3N	09922	B-2	4	MS3112E16-26S	96906	B-11	67
JAN1N3033B	81349	B-11	59	MS3112E22-55P	96906	B-11	68
JAN1N6048A	81349	B-13	1	MS3181-16C	96906	B-11	35
JAN1N647	81349	B-11	25	MS35191-207	96906	B-6	45
JAN2N2324A	81349	B-11	56	MS35191-207	96906	B-9	45
ME00630600004-01	81349	B-9	29	MS35275-211	96906	B-8	13
MILT5066	81349	BULK		MS35335-85	96906	B-11	51

PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER	PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER
MS35335-88	96906	B-5	6	NAS620C6	80205	B-11	11
MS35335-88	96906	B-8	4	NAS620C8	80205	B-11	15
MS35338-134	96906	B-2	10	NAS662C2R4	80205	B-6	42
MS35338-134	96906	B-2	36	NAS662C2R4	80205	B-9	42
MS35338-135	96906	B-11	42	QQA250-5	81348	BULK	
MS35338-136	96906	B-10	19	QQS631	81348	BULK	
MS35338-137	96906	B-10	7	QQS635	81349	BULK	
MS35489-1	96906	B-11	45	QQS741	81348	BULK	
MS1029-102	96906	B-11	36	QQS741	81348	BULK	
MS51957-1	96906	B-6	38	RCR07G101JS	81349	B-11	58
MS51957-1	96906	B-9	38	RV6LAYSA252A	81349	B-11	44
MS51957-11	96906	B-3	1	RW69V121	81349	B-11	60
MS51957-125	96906	B-11	16	RW69V9R1	81349	B-11	61
MS51957-13	96906	B-2	22	SFR166LL3K25-7	83086	B-3	21
MS51957-13	96906	B-6	23	SFR166LL3K25-7	83086	B-6	19
MS51957-13	96906	B-9	23	SFR166LL3K25-7	83086	B-9	19
MS51957-14	96906	B-2	12	S52-001-03	01226	B-4	10
MS51957-15	96906	B-11	3	S52-001-03	01226	B-5	12
MS51957-16	96906	B-2	24	S52-001-03	01226	B-7	12
MS51957-16	96906	B-11	34	S52-001-03	01226	B-8	11
MS51957-16	96906	B-11	41	W0734-009S	83553	B-6	29
MS51957-16	96906	B-11	41	0411-47	07187	B-6	16
MS51957-17	96906	B-11	34	0411-47	07187	B-9	16
MS51957-17	96906	B-15	5	1045948	82577	B-16	1
MS51957-18	96906	B-11	53	11728792	19200	B-12	2
MS51957-2	96906	B-2	9	20418-19	71468	B-15	2
MS51957-20	96906	B-3	9	2201707-00	06401	B-11	17
MS51957-26	96906	B-6	2	2201709-00	06401	B-11	13
MS51957-26	96906	B-9	2	2201713-00	06401	B-3	33
MS51957-28	96906	B-10	18	2201736-05	06401	B-16	2
MS51957-28	96906	B-11	30	2202156-00	06401	B-2	19
MS51957-29	96906	B-11	29	2202190-00	06401	B-1	4
MS51957-29	96906	B-11	29	2202191-00	06401	B-10	16
MS51957-3	96906	B-6	9	2202193-00	06401	B-11	65
MS51957-3	96906	B-9	9	2202194-00	06401	B-11	66
MS51957-4	96906	B-3	3	2202195-00	06401	B-10	22
MS51957-45	96906	B-11	22	2202196-00	06401	B-11	43
MS51957-46	96906	B-10	2	2202197-00	06401	B-11	52
MS51957-46	96906	B-11	23	2202198-00	06401	B-11	79
MS51957-47	96906	B-10	6	2202198-51	06401	B-11	83
MS51957-5	96906	B-2	35	2202199-00	06401	B-14	3
MS51957-52	96906	B-11	12	22021..-51	06401	B-14	5
MS51959-17	96906	B-8	6	2202214-00	06401	B-2	25
MS51981-18	96906	B-2	27	2202215-00	06401	B-1	6
MS77070-1	96906	B-11	50	2202219-00	06401	B-2	20
MS77073-2	96906	B-12	1	2215700-00	06401	B-6	3
M21097-11-3	81349	B-11	76	2215700-00	06401	B-9	3
M21097-11-3	81349	B-11	76	2215701-00	06401	B-6	4
M21097-4-33	81349	B-11	77	2215701-00	06401	B-9	4
M24308-1-3	81349	B-11	49	2215702-00	06401	B-6	6
M24308-1-5	81349	B-11	6	2215702-00	06401	B-9	6
M24308-1-5	81349	B-15	8	2215703-00	06401	B-6	5
M24308-3-5	81349	B-6	12	2215703-00	06401	B-9	5
M24308-3-5	81349	B-9	12	2215704-00	06401	B-6	10
M39003-01-2303	81349	B-14	1	2215704-00	06401	B-9	10
M39014-02-1230	81349	B-11	57	2215705-00	06401	B-6	8
M39014-02-1230	81349	B-12	3	2215705-00	06401	B-9	8
M42176	01887	B-3	29	2215706-00	06401	B-3	35
M5757-1-103	81349	B-11	31	2215709-00	06401	B-3	27
M8394-3	21242	B-14	4	2215710-00	06401	B-3	30
NAS1397R4B	80205	B-11	54	2215711-00	06401	B-6	43
NAS1397R58	80205	B-11	54	2215711-00	06401	B-9	43
NAS1397R6B	80205	B-11	24	2215713-00	06401	B-3	16
NAS428-6-30	80205	BULK		2215716-00	06401	B-12	5
NAS561C5-11	80205	B-7	14	2215720-00	06401	B-3	6

PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER	PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER
2215721-00	06401	B-3	7	2277720-00	06401	B-9	32
2215727-00	06401	B-11	28	2277721-00	06401	B-6	31
2215734-00	06401	B-4	5	2277721-00	06401	B-9	31
2215734-00	06401	B-7	5	2277722-00	06401	B-6	51
2215787-00	06401	B-11	52	2277722-00	06401	B-9	51
2251716-00	06401	B-6	15	2277722-51	06401	B-6	54
2251716-00	06401	B-9	15	2277722-51	06401	B-9	54
2251717-00	06401	B-4	4	2277722-52	06401	B-6	55
2251717-00	06401	B-7	4	2277722-52	06401	B-9	55
2251718-00	06401	B-4	8	2277726-00	06401	B-5	10
2251718-00	06401	B-7	9	2277726-00	06401	B-8	9
2251719-00	06401	B-4	3	2277727-00	06401	B-4	13
2251719-00	06401	B-7	3	2277727-00	06401	B-7	15
2251720-02	06401	B-5	4	2277728-00	06401	B-9	34
2251720-02	06401	B-8	3	2277729-00	06401	B-3	10
2251721-00	06401	B-6	21	2277735-00	06401	B-3	36
2251721-00	06401	B-9	21	2277736-00	06401	B-3	24
2251721-01	06401	B-6	50	2277737-00	06401	B-3	34
2251721-01	06401	B-9	50	2277738-00	06401	B-3	12
2251722-00	06401	B-6	34	2277739-00	06401	B-10	12
2251723-00	06401	B-4	14	2277740-00	06401	B-10	5
2251723-00	06401	B-7	16	2277741-00	06401	B-10	11
2251724-00	06401	B-4	6	2277742-00	06401	B-10	4
2251724-00	06401	B-7	6	2277748-00	06401	B-10	21
2251724-01	06401	B-7	7	2277748-01	06401	B-10	21
2251726-00	06401	B-5	9	2277750-00	06401	B-7	17
2251726-00	06401	B-8	7	2277751-00	06401	B-4	15
2251728-00	06401	B-15	3	2277753-00	06401	B-2	17
2251730-00	06401	B-3	11	2277769-00	06401	B-11	62
2251731-00	06401	B-3	14	2277769-51	06401	B-11	64
2251733-00	06401	B-3	2	2277770-00	06401	B-8	14
2251740-00	06401	B-8	5	2277780-00	06401	B-10	14
2251741-00	06401	B-2	30	2278296-00	06401	B-10	16
2251743-00	06401	B-2	13	2278298-00	06401	B-10	17
2251744-00	06401	B-2	16	2278300-00	06401	B-10	15
2251745-00	06401	B-3	23	2278316-00	06401	B-3	19
2251746-00	06401	B-3	32	2278317-00	06401	B-3	8
2251747-00	06401	B-3	13	2278325-00	06401	B-1	5
2251749-00	06401	B-11	78	2278339-00	06401	B-11	71
2251750-00	06401	B-11	40	2278340-00	06401	B-10	13
2251751-00	06401	B-11	5	2278348-00	06401	B-1	4
2251752-00	06401	B-11	33	2278349-00	06401	B-11	79
2251753-01	06401	B-11	19	2278349-51	06401	B-11	83
2251754-00	06401	B-11	32	2278373-00	06401	B-2	8
2251758-00	06401	B-6	11	2278373-01	06401	B-4	1
2251758-00	06401	B-9	11	2278373-02	06401	B-7	1
2251765-00	06401	B-3	5	2278374-00	06401	B-10	1
2251767-00	06401	B-11	55	2278374-07	06401	B-10	1
2251773-00	06401	B-1	1	2278378-00	06401	B-6	48
2251774-00	06401	B-2	45	2278378-00	06401	B-9	48
2277279-00	06401	B-16	3	2278379-00	06401	B-6	44
2277711-00	06401	B-1	3	2278379-00	06401	B-9	44
2277712-00	06401	B-1	2	2278388-00	06401	B-6	37
2277716-00	06401	B-1		2278388-00	06401	B-9	37
2277716-01	06401	B-1		2278389-00	06401	B-6	35
2277717-00	06401	B-6	20	2278389-00	06401	B-9	35
2277717-00	06401	B-9	20	2278390-00	06401	B-6	40
2277718-00	06401	B-6	33	2278390-00	06401	B-9	40
2277718-00	06401	B-9	33	2278391-00	06401	B-6	46
2277719-00	06401	B-6	22	2278391-00	06401	B-9	46
2277719-00	06401	B-9	22	2278392-00	06401	B-6	47
2277719-52	06401	B-6	26	2278392-00	06401	B-9	47
2277719-52	06401	B-9	26	2278393-00	06401	B-6	41
2277719-53	06401	B-6	24	2278393-00	06401	B-9	41
2277719-53	06401	B-9	24	2278464-00	06401	B-5	3

PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER	PART NUMBER	FSCM	FIGURE NUMBER	ITEM NUMBER
2278465-00	06401	B-5	7	2278797-00	06401	B-2	21
2278466-00	06401	B-5	14	2278799-00	06401	B-2	18
2278467-00	06401	B-2	29	2278864-00	06401	B-16	4
2278468-00	06401	B-2	33	2279787-00	06401	B-3	28
2278469-00	06401	B-2	28	2299063-00	06401	B-11	18
2278471-00	06401	B-10	22	261-11-08-030	71785	B-2	47
2278478-00	06401	B-2	49	3TKLZZ12-16UL02	78118	B-6	30
2278509-00	06401	B-2	44	3TKLZZ12-16UL02	78118	B-9	30
2278510-00	06401	B-2	43	7605065-00	06401	B-13	2
2278511-00	06401	B-2	38	7605066-00	06401	B-11	47
2278512-00	06401	B-2	39	7605067-00	06401	B-11	46
2278611-00	06401	B-7	8	7650446-00	06401	B-3	26
2278612-00	06401	B-4	7	7905640-00	06401	B-14	2
2278613-00	06401	B-2	26	7910040-00	06401	B-4	11
2278614-00	06401	B-3	4	7910040-00	06401	B-5	13
2278615-00	06401	B-3	25	7910040-00	06401	B-7	13
2278652-00	06401	B-2	15	7910040-00	06401	B-8	12
2278685-00	06401	B-2	46	8213510-6	19200	B-6	1
2278687-00	06401	B-2	48	8213510-6	19200	B-9	1
2278742-00	06401	B-2	34	8213510-6	19200	B-15	4

REFERENCE DESIGNATOR	FIGURE NUMBER	ITEM NUMBER
A1	B-1	1
A1DS1	B-3	11
A1L1	B-3	30
A1P1	B-2	47
A1S1	B-2	32
A1TB1	B-3	35
A16	B-11	46
A16CR5	B-13	1
A16CR6	B-13	1
A2	B-1	2
A2B1	B-6	17
A2B2	B-6	17
A2B3	B-6	17
A2B4	B-6	17
A2P3	B-6	12
A3	B-1	3
A3B1	B-9	17
A3B2	B-9	17
A3B3	B-9	17
A3B4	B-9	17
A3P4	B-9	12
A4	B-1	4
A4AX10	B-11	77
A4AX11	B-11	77
A4AX12	B-11	77
A4AX13	B-11	77
A4AX14	B-11	77
A4AX9	B-11	77
A4A1	B-10	21
A4A1	B-10	21
A4A10	B-10	16
A4A11	B-10	15
A4A12	B-10	13
A4A13	B-10	14
A4A2	B-10	21
A4A2	B-10	21
A4A3	B-10	21
A4A3	B-10	21
A4A4	B-10	21
A4A4	B-10	21
A4A5	B-10	21
A4A5	B-10	21
A4A6	B-10	21
A4A6	B-10	21
A4A7	B-10	21
A4A7	B-10	21
A4A8	B-10	21
A4A8	B-10	21
A4A9	B-10	17
A4B1	B-11	39
A4CR1	B-11	25
A4CR2	B-11	25
A4CR3	B-11	25
A4CR4	B-11	59
A4C1	B-11	57
A4C2	B-12	3
A4C3	B-12	3
A4FL1	B-12	2
A4FL2	B-12	2
A4J1	B-11	68
A4J10	B-11	49
A4J11	B-11	49
A4J12	B-11	49
A4J2	B-11	67
A4J3	B-11	6

REFERENCE DESIGNATOR	FIGURE NUMBER	ITEM NUMBER
A4J5	B-11	49
A4J6	B-11	49
A4J7	B-11	49
A4J8	B-11	49
A4J9	B-11	49
A4K1	B-11	31
A4K2	B-11	31
A4K3	B-11	31
A4M1	B-11	9
A4PS1	B-11	75
A4Q1	B-11	56
A4R1	B-11	44
A4R11	B-11	58
A4R2	B-11	44
A4R3	B-11	44
A4R4	B-11	44
A4R5	B-11	61
A4R6	B-11	61
A4R7	B-11	60
A4R8	B-11	60
A4TB1	B-11	62
A4T1	B-11	71
A4T2	B-11	17
A4T3	B-11	13
W1	B-1	5
W1P1	B-15	8
W1P2	B-15	7
17A1	B-1	1
17A1DS1	B-3	11
17A1L1	B-3	30
17A1P1	B-2	47
17A1S1	B-2	32
17A1TB1	B-3	35
17A14A1	B-14	2
17A14C1	B-14	1
17A14C2	B-14	1
17A16	B-11	46
17A16CR5	B-13	1
17A16CR6	B-13	1
17A2	B-1	2
17A2B1	B-6	17
17A2B2	B-6	17
17A2B3	B-6	17
17A2B4	B-6	17
17A2P3	B-6	12
17A3	B-1	3
17A3B1	B-9	17
17A3B2	B-9	17
17A3B3	B-9	17
17A3B4	B-9	17
17A3P4	B-9	12
17A4	B-1	4
17A4AX10	B-11	77
17A4AX11	B-11	77
17A4AX12	B-11	77
17A4AX13	B-11	77
17A4AX14	B-11	77
17A4AX9	B-11	77
17A4A1	B-10	21
17A4A1	B-10	21
17A4A10	B-10	16
17A4A11	B-10	15
17A4A12	B-10	13
17A4A13	B-10	14
17A4A2	B-10	21

REFERENCE DESIGNATOR	FIGURE NUMBER	ITEM NUMBER
17A4A2	B-10	21
17A4A3	B-10	21
17A4A3	B-10	21
17A4A4	B-10	21
17A4A4	B-10	21
17A4A5	B-10	21
17A4A5	B-10	21
17A4A6	B-10	21
17A4A6	B-10	21
17A4A7	B-10	21
17A4A7	B-10	21
17A4A8	B-10	21
17A4A8	B-10	21
17A4A9	B-10	17
17A4B1	B-11	39
17A4CR1	B-11	25
17A4CR2	B-11	25
17A4CR3	B-11	25
17A4CR4	B-11	59
17A4C1	B-11	57
17A4C2	B-12	3
17A4C3	B-12	3
17A4F11	B-12	2
17A4F12	B-12	2
17A4J1	B-11	68
17A4J10	B-11	49
17A4J11	B-11	49
17A4J12	B-11	49
17A4J2	B-11	67

REFERENCE DESIGNATOR	FIGURE NUMBER	ITEM NUMBER
17A4J3	B-11	6
17A4J4	B-11	8
17A4J5	B-11	49
17A4J6	B-11	49
17A4J7	B-11	49
17A4J8	B-11	49
17A4J9	B-11	49
17A4K1	B-11	31
17A4K2	B-11	31
17A4K3	B-11	31
17A4M1	B-11	9
17A4PS1	B-11	75
17A4Q1	B-11	56
17A4R1	B-11	44
17A4R11	B-11	58
17A4R2	B-11	44
17A4R3	B-11	44
17A4R4	B-11	44
17A4R5	B-11	61
17A4R6	B-11	61
17A4R7	B-11	60
17A4R8	B-11	60
17A4TB1	B-11	62
17A4T1	B-11	71
17A4T2	B-11	17
17A4T3	B-11	13
17W1	B- 1	5
17W1P1	B-15	8
17W1P2	B-15	7

APPENDIX C

MAINTENANCE ALLOCATION CHART MAC)

Section I. INTRODUCTION

C-l. General.

This Maintenance Allocation Chart designates overall responsibility for the performance of maintenance functions for the HSS. The implementation of field maintenance tasks upon this system will be consistent with the assigned maintenance operations.

C-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 and detect incipient failure 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 end item in proper operating condition, i.e., to clean, to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

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 art 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) in a manner to allow the proper functioning of an equipment/system.

i. Repair. The application of maintenance services (input, test, service, adjust, align, calibrate, 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, disassembly, module/component/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 (e.g., DMWR) in pertinent technical publications. 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 material 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.

l. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

C-3. Explanation of Format.

Purpose and use of the format areas follows and will be explained in the introductory portion of the MAC.

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

b. Column 2. Functional Group. Column *2,* lists the next higher assembly group and the item names of components, assemblies, subassemblies, and modules within the group for which maintenance is authorized.

c. Column 3. Maintenance Functions. Column 3, lists the twelve maintenance functions defined in C-2 above. Each maintenance function required for an item shall be specified by the symbol among those listed in *d* below which indicates the level responsible for the required maintenance. Under this symbol there shall be listed an appropriate work measurement time value determined as indicated in *e* below.

d. Use of Symbol The following symbols will be used:

C - Operator/crew
O – Organizational
F - Direct support (intermediate)
H - General Support
D - Depot

e. Work Measurement Time. The active repair time required to perform the maintenance function will be included directly below the symbol identifying the category of maintenance. The manpower figures will be developed under conditions (real or simulated) corresponding to those that would be considered normal for TOE units operating in the field. The skill levels used to obtain the measurement times will approximate those found in typical TOE units. Active repair time specified is the average aggregate time to restore an item (subassembly, assembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, fault isolation/diagnostic time, and quality assurance/quality control time in addition to the time required to perform specific maintenance functions identified for the tasks authorized in the maintenance allocation chart. This time may be the established time standard developed through maintenance engineering analysis, or cart be derived from the calculation of a statistically weighted time estimate incorporating the optimistic (a), most likely (m), and pessimistic (b) estimated for the work to be accomplished using the formula:

$$t = \frac{a+4m+b}{6}$$

This time will be expressed in man-hours and carried to one decimal place (tenths of hours).

f. Column 4. Tools and Equipment. This column will be used to specify, by code, those tools and test equipment required to perform the designated function.

NOTE

A table, suitably coded and explained, listing the tool, test, and support equipment required by the level to perform the maintenance functions will be included as a complement to the MAC.

g. Column 5. Remarks. Self-explanatory.

Section II. MAINTENANCE ASSIGNMENT

Nomenclature of End Item or Component: Fire Control Subsystem, Helmet-Directed, XM128/XM136

(1) Group number	(2) Functional group Component assembly nomenclature	(3) Maintenance function: Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	(4) Tools and equipment	(5) Remarks
2275	Helmet direct fire control subsystem	0 0.1	0 0.2	0 0.1	0 0.2	F 2.0			F 0.4	0 0.2	D 72.0		1,2,3,4,9,10,11 13,14	A,H,I
2275.1	Helmet sight assembly (pilot and gunner)	0 0.1	0 0.1	0 0.1		0 0.2		F 0.3	F 0.2	0 0.1	D 5.0		1,2,4,7,8,12	A,B,N
2275.11	Sight assembly	0 0.1	D 0.5	0 0.1	0 1.0	D 1.0			D 0.8	0 0.1			3,4,12	C
2275.12	Visor housing assembly	0 0.1	F 0.5	0 0.1					D 0.8	D 0.3			4,6,12	K
2275.13	Receptacle assembly	0 0.1	0 0.1	0 0.1		0 0.2			D 0.3	F 0.2			4,6,12	
2275.14	Latch assembly	0 0.1		0 0.1					F 0.3	F 0.2			4	
2275.2, 2275.3	Linkage assembly (pilot and gunner)	0 0.1	0 0.1	0 0.1	F 0.3	F 1.0			F 0.5	F 0.2			1,4,9,10,11,12	A,E,L
2275.21, 2275.31	Front support assembly (pilot and gunner)	0 0.1		0 0.1					D 0.2	F 0.2	D 7.0		1,4,12	O,F
2275.22, 2275.32	Arm assembly (pilot and gunner)	0 0.1	F 0.3	0 0.1	F 0.1				F 0.2	F 0.2	D 7.0		1,4,5,12	D, F
2275.4	Electronic interface assembly	0 0.1	0 0.1	0 0.1	0 0.2		F 0.5		0 0.2	F 0.3	D 60.0		1,4,5,6,10,12	A,I
2275.41	Electronic interface subassembly	F 0.2	F 0.3	F 0.1	0 0.2		F 0.3			F 0.3			1,3,4,5,6,12	
2275.43	Circuit card assembly	F 0.1	F 0.2	F 0.1	F 0.1		F 0.2		F 0.3	D 9.2			1,4,12	J, M
2275.44	Buffer amplifier assemblies	F 0.2	F 0.2	F 0.1					F 0.3	D 8.0			1,4,12	
2275.5	Extension cable	0 0.1	0 0.2	0 0.1					F 0.2	F 0.2			1,4,6,12	A,G

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

Nomenclature of End Item or Component: Fire Control Subsystem, Helmet-directed, XM128/XM136

Tool or test equipment reference code	Maintenance category	Nomenclature	NSN	Tool number
1	F	TEST SET,FIRE CONTROL SUBSYSTEM AN/GSM-249	4931-00-121-8707	2201736-05
2	O	HSS ORGANIZATIONAL BORESIGHT KIT	4931-00-124-5453	2277279-00
3	O,F	TOOL SET, BASIC AIRCRAFT ARMAMENT REPAIRMAN	4933-00-987-9816	
4	F	TOOL SET,SUPPLEMENT AIRCRAFT ARMAMENT REPAIRMAN	4933-00-994-9242	
5	F	OSCILLOSCOPE, DUAL CHANNEL	6625-00-228-2201	
6	O,F	MULTIMETER, TS-352B/U	6625-00-553-0142	
7	F	HOLDING DEVICE		2278864-00
8	F	WRENCH, TORQUE		GGGW686 TYPE CLASS 1 STYLE B SIZE D
9	F	BORESCOPE	4933-00-867-6607	
10	O,F	ENGINE-GENERATOR SET, GASOLINE, 28 VDC	6115-00-017-8239	
11	F	TARGETS (3)		FABRICATE
12	D	DEPOT TEST EQUIPMENT		
		HSS LINKAGE AND SYSTEM TEST FIXTURE		2279028-00
		HSS ASSEMBLY AND SUB-ASSEMBLY TEST ELECTRONIC CONSOLE		2279034-01-00
		SIGHT FOCUS FIXTURE		2201496-00
		LINKAGE ARM INSPECTION FIXTURE		2201499-00
		LINKAGE HOLDING FIXTURE		2201500-00

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS-CONTINUED

Nomenclature of End Item or Component: Fire Control Subsystem, Helmet Directed, XM128/XM136

Tool or test equipment reference code	Maintenance category	Nomenclature	NSN	Tool number
12-CONT.		LINKAGE ARM ALIGNMENT FIXTURE		2201497-00
		RETICLE ALIGNMENT FIXTURE		2201495-00
		BEARING INSTALLATION ALIGN-MENT FIXTURE		2201501-00
		YOKE ASSEMBLY FIXTURE		2201498-00
13	F	BORESIGHT DEVICE, TSU		1045948
14	F	GUNNER'S QUADRANT	1270-00-719-7156	

Section IV. REMARKS

Nomenclature of End Item or Component: Fire Control Subsystem, Helmet-Directed, XM128/XMl36

Ref code	Remarks
A	BIT and operational checks are extent of testing at the organizational maintenance level.
B	Align refers to boresighting of the helmet sight assembly which will require cooperative effort of two individuals (either aircrew and maintenance or two maintenance personnel).
C	Replacement of lamp assembly is extent of organizational maintenance repair.
D	Field repair of the arm assemblies is limited to replacement of screw lock assemblies.
E	Alignment of linkage assemblies by direct support maintenance personnel is required prior to boresighting the subsystem.
F	Adjustment of arm assembly resolver (Bl) by direct support maintenance personnel may be required during boresighting.
G	The extension cable will be replaced at the direct support maintenance level because its removal affects the linkage alignment.
H	Align refers to the subsystem boresighting at the direct support maintenance level.
I	After repair or replacement of the EIA, adjustment of its AZ and EL potentiometers may be required by the organizational maintenance personnel to reestablish boresighting.
J	Amplifier card Al3 may require adjustment at the direct support maintenance level.
K	Limited testing can be performed at the direct support maintenance level, utilizing available test equipment.
L	Adjustment of the bit magnet bracket can be performed by direct support maintenance personnel utilizing the fire control subsystem test. set.
M	Circuit card assembly A14 in the EIA used in HSS XM136 is authorized field repair.
N	Use of shim 2202214-00 and wedge 2202213-00 are optional. These items must be used as a set.

ALPHABETICAL INDEX

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TM 9-1270-212-14&P	10 July 1981	Fire Control Subsystem, Helmet-Directed

BE EXACT . . PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
5-16		5-6		"Electronic Interface Assembly" not listed.

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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 Kilomter = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

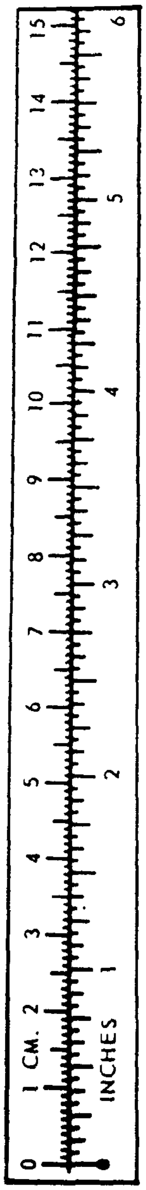
TEMPERATURE

5/9 (°F - 32) -°C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° + 32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	O.3O5
Yards	Meters	O.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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