

TECHNICAL MANUAL

TROUBLESHOOTING INSTRUCTIONS

AVIATION UNIT MAINTENANCE (AVUM) LEVEL
AND
INTERMEDIATE MAINTENANCE (AVIM) LEVEL

AH-1F (MC)
AND AH-1F (MCN)

INTEGRATED ARMAMENT SYSTEM

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 JUNE 1983



INTRODUCTION

HEAD UP DISPLAY SUBSYSTEM
(HUDS)

FIRE CONTROL COMPUTER
(FCC)

AIR DATA SUBSYSTEM (ADS)

ROCKET MANAGEMENT
SUBSYSTEM (RMS)

UNIVERSAL TURRET
SUBSYSTEM (UTS)

HELMET SIGHT SYSTEM (HSS)

TOW MISSILE SUBSYSTEM

ARMAMENT POWER

JETTISON

Troubleshooting Instructions
Aviation Unit Maintenance (AVUM) Level and Intermediate Maintenance (AVIM) Level
AH-1F (MC) AND AH-1F (MCN)
INTEGRATED ARMAMENT SYSTEM

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS.

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, or the DA Form 2028-2 located in the back of this manual direct to:

Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP,
4300 Goodfellow Blvd., St. Louis, Mo. 63120-1798.

A reply will be furnished to you.

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HOW TO USE THIS MANUAL.

This troubleshooting manual is as easy to use as a road map. You must leave a given location (problem) and proceed along a desired route (troubleshooting) and arrive at your destination (solution).

Keep in mind that this manual assumes that "ONLY ONE PROBLEM EXISTS AT A TIME". However, a problem may appear in many ways. For example, a symbol is missing, out of shape, inverted, indicator pointer incorrect, lamp out, etc. Also, the problem may be discovered in several ways, such as pilot/gunner writeup, during maintenance, operational check, etc. In some cases there may be several symptom indications, for a single problem.

The technician must be able to quickly find the particular portion of the manual that contains the needed information.

The front cover, index, table of contents, Maintenance Action Precise Symptoms (MAPS) list, and text (highlighted with a box) provide information for major topic and subtopic breakdown and some locations.

Troubleshooting is designed to promote rapid fault isolation. This allows you to quickly remedy the problem and return the helicopter to operational status. Quick turnaround, with accurate solution, is the essence of troubleshooting.

The troubleshooting is test and fault-isolation oriented and the data will get you directly from the symptom to the proper solution using minimum information. It divides troubleshooting into three major steps:

1. Recreate or maintain the condition that led you or the operator to the problem.

2. Find needed information by referring to the Maintenance Action Precise Systems (MAPS) list, table of contents, front cover, etc.

3. Accomplish troubleshooting using logic trees, wiring diagrams, reference data, etc.

If these troubleshooting procedures are not successful, references are provided that will allow the troubleshooting to be continued within the appropriate subsystem manual (see paragraph 1-1). The logic tree, when used with built-in-test (BIT) troubleshooting, will lead you to the faulty part or wiring with a high degree of certainty.

Entry into Logic Trees. Logic trees are designed to be entered directly from a specific location in the operational check. The operational check sets all switches, circuit breakers, etc. in the proper position for that logic tree. In some cases a logic tree is entered directly from another logic tree. A logic tree entered directly from another logic tree shall be

considered a continuation of the first logic tree. In the block which sends the user to a referenced logic tree, all additional switches, circuit breakers, etc. must be pre-positioned to be compatible with the referenced logic tree. If the referenced logic tree is in another chapter, instructions are given to work the referenced logic tree (including the operational check called out in the referenced logic tree) and then perform the operational check of the originating logic tree chapter.

Example:

Set PLT ORIDE switch to PLT ORIDE.

Set MASTER ARM switch to OFF.

Accomplish paragraph 8-15.

Then go to paragraph 2-2.

Trouble Discovered by Operator. Read the problem statement (write-up), in the aircraft form, very carefully and whenever possible debrief the operator (flight crew) to get a general idea of the problem.

1. Determine which subsystem has a fault.

2. Find symptom description in the MAPS list which correlates the symptom to a precise troubleshooting procedure.

3. Perform the subsystem operational check to verify the fault.

Trouble Discovered by Technician. When the trouble is found during normal maintenance, your choices for finding the appropriate data are as follows:

Use the MAPS list (this manual) to find the required troubleshooting data and operational check.

2. Use troubleshooting procedures within the subsystem manual being used to perform the maintenance.

3. Use troubleshooting data in other subsystem manual(s).

NOTE

Some logic trees in this manual cannot be reached from the operational check. If a defined symptom does not appear during the operational check, refer directly to the MAPS and comply with the action specified for that symptom.

Logic Tree. The Logic PROBLEM EXISTS AT A TIME. It is a programmed method that involves user-logic tree interaction. The user is given a particular instruction, then is asked a YES-NO question about the result of his or her action. Based on

HOW TO USE THIS MANUAL (CONTINUED).

the answer, the user is directed to another block of instruction. Faults that occur on a rare or random basis are excluded and the technician may elect to refer to another troubleshooting aid such as a simplified circuit or wiring diagram.

Large Logic Trees. Large logic trees are broken into logical segments (parts). This isolates systems using common switches, circuit breakers, etc. and are identified as parts A, B, C, etc.

Each logic tree with its locator illustrations stand alone and are broken into smaller page size segments with single flow arrows. A block "Go to paragraph_" directs the continuation of the logic.

Each continuation of the logic tree has locator illustrations on the facing page identifying items on that portion of the logic tree. Each continuation has the same format as a regular logic tree except that the initial setup, tools, personnel and references are not repeated.

A total electrical schematic for the MAPS problem is included with the starting logic tree. Each continuing subparagraph has only the portion of the total electrical schematic applicable to the logic tree in this paragraph.

Verification of Symptom.

When a particular symptom is found, reverify that the symptom is present before proceeding to the repair action procedure. This precludes unnecessary maintenance in the event an erroneous symptom occurs.

Verification of Repair.

Under certain circumstances, a fault may be exhibited during the accomplishment of the Operational Check in one chapter and the troubleshooting and repair logic tree for that fault in another chapter. Also, some logic trees refer to another chapter or logic tree within another chapter for continuation of troubleshooting. After location and repair of the fault, rerun the operational check in which the fault appeared.

CHAPTER 1. INTRODUCTION

SECTION I. GENERAL

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1-1. SCOPE.

The AH-1S (MC) and AH-1S (MCN) Integrated Armament and Fire Control System is a network of seven specific subsystems which are linked together throughout the helicopter with

wires, connectors, terminal boards, and other airframe components. Each subsystem has its own maintenance manual which includes troubleshooting procedures. The various subsystems and their respective maintenance manuals are as follows:

HEAD UP DISPLAY SUBSYSTEM (HUDS)	TM 9-1270-220-13&P
FIRE CONTROL COMPUTER (FCC)	TM 9-1270-218-13&P
AIR DATA SUBSYSTEM (ADS)	TM 9-1270-219-13&P
ROCKET MANAGEMENT SUBSYSTEM (RMS)	TM 9-1090-207-13&P
■ UNIVERSAL TURRET SUBSYSTEM (UTS)	TM 9-1090-206-20-1 TM 9-1090-206-30
HELMET SIGHT SUBSYSTEM (HSS)	TM 9-1270-212-14&P
TOW MISSILE SYSTEM (TMS)	TM 9-1425-473-20 TM 9-1425-473-34

These separate manuals troubleshoot only to the specific subsystem. A problem caused by airframe components, wiring, or assemblies cannot be detected using the separate manuals. Each of the subsystems send signals to, or receive signals from one or more of the other subsystems .

This manual troubleshoots all of these interfaces.

This manual covers Troubleshooting Instructions (AVUM/AVIM) for Helicopter Models AH-1F Modernized Cobra (MC) and AH-1F Modernized Cobra with C-NITE (MCN) , Integrated Armament and Fire Control Systems utilizing the following Military Occupational Specialty (MOS) numbers:

CAREER MANAGEMENT FIELD (CMF) 67	
Title	MOS
Aircraft Fire Control Repairer	.68J
Aircraft Electrician	.68F

1-2. MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM38-750, The Army Maintenance Management System (TAMMS).

Accidents involving injury to personnel or damage to material will be reported on DA Form 285 (Accident Report) in accordance with AR385-40. Explosives and ammunition malfunctions will be reported in accordance with AR75-1.

1-3. NOMENCLATURE CROSS REFERENCE .

The following cross-reference index lists the military nomenclature (when assigned) or manufacturer's (contractor's) nomenclature with the simplified (common name) nomenclature. The official and simplified nomenclature (acronym) are applied to first usage. Thereafter, the simplified nomenclature is used, except where use of the official nomenclature may aid understanding.

1 - 3 . NOMENCLATURE CROSS REFERENCE (CONTINUED).

Nomenclature Cross Reference List.

Official Name (Common Name)	Acronym
Digital Fire Control Computer, XM 22	FCC
Fire and Flight Air Data Subsystem XM143.	
Air Data Subsystem	ADS
Airspeed and Direction Sensor	AADS
Electronics Processor Unit	EPU
Low Airspeed Indicator	LAI
Headup Helicopter Sight Subsystem	HUDS
Head-up Display Unit.	HUD
Signal Processor	SP
Helmet-Directed Fire Control Subsystem, XM136	HSS
(Helmet Sight Subsystem)	
Electronic Interface Assembly	EIA
Helmet Sight Assembly.	HSA
Rocket Management Subsystem, XM128	RMS
Display Unit	DU
Operations Unit	OU
TOW Guided Missile Armament Subsystem, M65	TMS
Electronic Control Amplifier.	MCA
(Missile Command Amplifier)	
Electronic Control Amplifier.	SCA
(Stabilization Control Amplifier)	
Electronic Power Supply.	EPS
Laser Electronic Unit.	LEU
Sight Hand Control	SHC
Telescopic SightU nit.	TSU
TOW Control Panel	TCP
TOW Missile Launcher.	TML
MCN FLIRControl Panel.	FCP
MCN FLIR Power Supply.	FPS
MCN FLIR Missile Tracker	FMT
Left Hand grip	LHG
20 MM Automatic Gun Armament Subsystem	UTS
(Universal Turret Subsystem)	
Gunner Control Panel.	
Interface Control Unit.	IFCU
Logic Relay Assembly.	
Pilot Control Panel.	
Turret Buffer Amplifier.	-----
AIM-1/EXL IR Laser Gunsight System	AIM

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your equipment needs improvement , let us know. Send us an EIR. You, the uscr, are the only one who can tell us what you don't like about your equipment . Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, US Army Aviation and TROOP Command, ATTN:AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO. 63120-1798). We'll send you a reply.

1-4.1. DESIGNATOR SYMBOL

A designator symbol is used in conjunction with operational checks, troubleshooting contents, paragraph headings, and component nomenclatures to indicate limited effectivity of the data. AH-1F (MC) peculiar data has an **MC** designator symbol. AH-11F (MCN) peculiar data has an **MCN** designator symbol. No designator symbols are used when data applies to both AH-1F (MC) and AH-1F (MCN) helicopter configurations.

QUALITY DEFICIENCY REPORT
(Category II)

SECTION I

1a. From (Originating point)

2a. To (Screening point)

1b. Typed Name, Duty Phone and Signature

2b. Typed Name, Duty Phone and Signature

3. Report Control No.

4. Date Deficiency Occurred

5. National Stock No. (NSN)

6. Name of Unit

7. Manufacturer Mfg. Code Shipment

8. Mfg. Part No.

9. Serial Lot Batch No.

10. Contract/PO Document No.

11. Item

12. Date Manufactured/Repaired/Overhauled

13. Operating Time at Failure

14. Government Furnished Material

☐ New

☐ Repaired/Overhauled

☐ a. Received

☐ b. Inspected

☐ c. Deficient

☐ d. In Stock

15. Quantity

16. Defective from work On Work

17. Dollar Value

18. Est. Correction Cost

19. Item Under Warranty

20. Item Unit Code (IC (Army and Air Force only)

21. Action Disposition

22. Details (Describe in brief ability, what is wrong, how and why, circumstances when it occurred, description of effect, cause, action taken including disposition, recommendations. Identify with related item numbers. Include and list supporting documents. Continue on separate sheet if necessary.)

23a. To (Action Point)

24a. To (Support Point) (Use items 25 and 26 if more than one)

23b. Typed Name, Duty Phone and Signature

24b. Typed Name, Duty Phone and Signature

25a. To (Support Point)

26a. To (Support Point)

25b. Typed Name, Duty Phone and Signature

26b. Typed Name, Duty Phone and Signature

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STANDARD FORM 368, April 1974
General Services Administration (FPMR 101-26-73)

1-2 Change 4

SECTION II. EQUIPMENT DESCRIPTION AND DATA

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AIRFRAME COMPONENTS AND SYMBOLS	1-3

1-5. EQUIPMENT PURPOSE.

The Integrated Armament and Fire Control System results from interfacing all of the following Armament and Fire Control subsystems:

- 1. Head-up Display Sub-systems (HUDS).
 - Fire Control Computer (FCC)
 - Air Data Subsystem (ADS)
 - Rocket Management Subsystem (RMS).
- 5. Universal Turret Sub-system (UTS).
 - Helmet Sight Subsystem (HSS)
 - TOW Missile Subsystem (TMS)

These troubleshooting procedures apply mostly to airframe components and wiring between the subsystems (interface).

EXAMPLE:

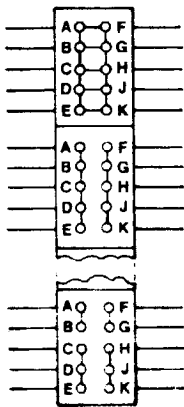
An airframe component, terminal board (16TB1), exists between the Fire Control Computer (16A1) and the Head-up Display signal processor (16A2).

1-6. AIRFRAME COMPONENTS AND SYMBOLS .

Airframe components, as they physically exist, cannot easily

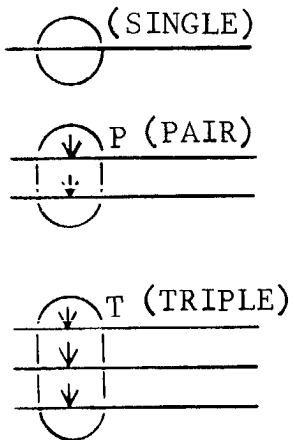
be illustrated. Therefore, a series of convenient symbols have been developed and standardized for that purpose. These symbols can be looked upon as "a graphic shorthand," to show the functions or interconnections of a circuit or wiring diagram. There are many electrical symbols, but the ones you will be dealing with, for the most part, in this manual are illustrated as follows:

a. Terminal Board. A terminal board consists of one or more insulated terminals and/or modules to form a convenient connect/disconnect junction for signal, power, and ground wiring. The terminal board serves as a point where signals can become integrated or interfaced between subsystems. It can also be used for power distribution and a central ground return point.



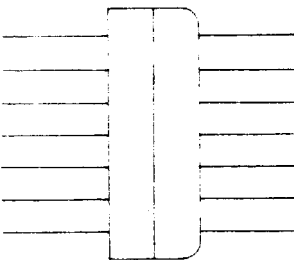
TERMINAL BOARD (TB)

b. Shields. A shield consists of wire strands braided together, and insulated, to form a flexible tube that covers the entire length of one or more insulated wires. The shield is used, when required, to eliminate Electro-magnetic Interference (EMI) .



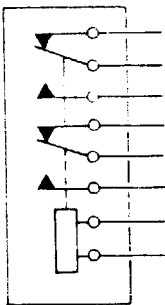
SHIELDED WIRE (K)

c. Connector. A connector is a device composed of mating halves called plugs and receptacles. Each of these halves has a coupling member and electrical contacts separated by insulating material. This provides a convenient means for connecting and disconnecting single or multiconductor cables.



CONNECTOR (J) (P)

d. Relay. A relay is a switching device used to control one or more circuits. Using an electromagnetic coil, to which control power is supplied, it provides mechanical motion to actuate the contacts of other circuits.



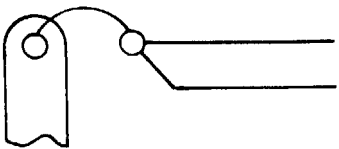
RELAY (K)

e. Splice. A splice is a device designed to physically join two or more conductors.



SPLICE

f. Circuit Breaker. A circuit breaker is a device designed to separate its contacts under abnormal conditions that exceed the rated current without damage.



CIRCUIT BREAKER (CB)