Technical Manual

# Aviation Unit and Intermediate Troubleshooting Manual

for

# ARMY AH–64A HELICOPTER (NSN 1520–01–106–9519) (EIC: RHA)



SUPERSEDURE NOTICE: This manual supersedes TM 55–1520–238–T–1, dated 15 DECEMBER 1985, including all changes.



HEADQUARTERS, DEPARTMENT OF THE ARMY
30 April 1992

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DEPARTMENT OF THE ARMY
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**TECHNICAL MANUAL**

# AVIATION UNIT AND INTERMEDIATE TROUBLESHOOTING MANUAL

**FOR**

**ARMY MODEL
AH–64A HELICOPTER
(NSN 1520–01–106–9519) (EIC:RHA)**

## 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, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898–5230. A reply will be furnished to you.

You may also send in your comments electronically to our e–mail address: 2028@redstone.army.mil or by fax 205–842–6546/DSN 788–6546. Instructions for sending an electronic 2028 may be found at the end of this manual immediately preceding the hard copy 2028.

**OZONE DEPLETING CHEMICAL INFORMATION:**
This document has been reviewed for the presence of Class I Ozone depleting chemicals. As of Change 8 dated 19 December 1997, all references to Class I Ozone depleting chemicals have been removed from this documentation by substitution with chemicals that do not cause atmospheric Ozone depletion.

**DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.**

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*** SUPERSEDURE NOTICE: This manual supersedes TM 55–1520–238–T–4, dated 15 DECEMBER 1985, including all changes.**

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## HOW TO USE THIS VOLUME

### OVERVIEW

- This is the fourth volume of a ten volume troubleshooting manual (TM 1-1520-238-T-1 through TM 1-1520-238-T-10) for the helicopter.
- TM 1-1520-238-T-4 through TM 1-1520-238-T-8 contains troubleshooting instructions for the helicopter and consists of the following five volumes:

| Volume | Contains |
|---|---|
| TM 1-1520-238-T-4 | Airframe<br>Landing Gear System<br>Power Plants<br>Rotors<br>Drive System |
| TM 1-1520-238-T-5 | Hydraulic and Pneumatic System<br>Instruments |
| TM 1-1520-238-T-6 | Electrical System |
| TM 1-1520-238-T-7 | Fuel System<br>Flight Control System |
| TM 1-1520-238-T-8 | Utility System<br>Environmental Control System<br>Hoists and Wenches (not applicable)<br>Auxiliary Power Unit<br>Mission Equipment<br>Appendix<br>Glossary |

- TM 1-1520-238-T-4 through TM 1-1520-238-T-8 are used in conjunction with multiple manuals TM 1-1520-238-23 (maintenance information for the helicopter).
- Learn how to use the Integrated Troubleshooting Manual series, which is explained in “How To Use This Manual” in TM 1-1520-238-T-2.
- Chapter 1 of this volume contains general information you will need in order to use TM 1-1520-238-T-4 through TM 1-1520-238-T-8 successfully.

### CHAPTERS and SECTIONS

- Chapter 1 contains general troubleshooting information.
- Chapter 2 and subsequent chapters provide troubleshooting information for each system.

**HOW TO USE THIS VOLUME (cont)**

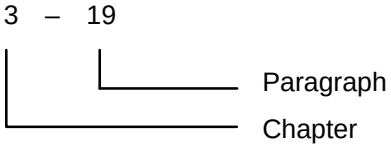
- Chapters contain sections and paragraphs with troubleshooting procedures.
- Chapter indexes are on the first page of each chapter and provide sections and paragraphs covered.

## PARAGRAPHS

Each paragraph in chapter 3 and subsequent chapters contain troubleshooting procedures needed for a specific job.

## PARAGRAPH NUMBERING

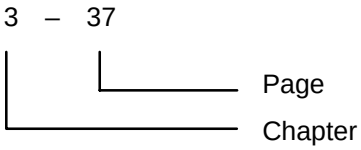
Paragraph numbers are in two parts. The first is the chapter number. The second is the paragraph number. Each number is separated by a dash as shown in the example.




Paragraph numbers are the most important numbers in the volume. Except when using the table of contents always use the paragraph number to find information – NOT the page number.

## PAGE NUMBERING

All page numbering is done by chapters, paragraph numbers are not included in the page numbers. The first number represents the chapter, the second number represents the page in that chapter. The numbers are separated by a dash as shown in the example.




## INITIAL SETUP

Each maintenance task is headed by an initial setup. This table outlines what is needed as well as certain conditions which must be met before starting the task. DON'T START A TASK UNTIL:

- You understand the task.
- You understand what you are to do.
- You understand what is needed to do the work.
- You have the things you need.

Not all tasks have all the headings shown. The following subparagraphs explain each part of the initial setup.

**HOW TO USE THIS VOLUME (cont)**

**Title: (a)** The title in the upper border contains the paragraph number and title of the task as listed in the index.

**Tools: (b)** Special tools are listed when needed. Their use is called out in the task.

**Personnel Required: (c)** This heading lists only personnel required to perform the task. Unless otherwise specified, any qualified and certified individual is authorized to perform power up applications on the helicopter.

**References: (d)** This lists other technical manuals (TMs) you will need to complete the task. The steps in the task will tell you when you must refer to another TM.

**Equipment Conditions: (e)** This lists conditions that must be met before starting the task. It may require an installation or removal operation. These operations are described in other tasks or TMs. The TMs that describe how to do these operations are referenced here. The statement “Helicopter safed” refers to TM 55-1520-238-23 where helicopter safety procedures are described. The statement “Helicopter safed” appears in a power up task or a maintenance operational check (MOC) when power up is not required. Be sure to comply with call outs under equipment conditions, then do the task.

## EXAMPLE OF INITIAL SETUP

**(a) 5–13. MAIN ROTOR BLADE TASB ADJUSTMENT – BLADE GOES OUT OF TRACK MORE THAN 2 INCHES BETWEEN GROUND TRACK (AT 100% $N_R$) AND HOVER** **5–13**

**(b) Tools:**

| Nomenclature | Part Number |
|---|---|
| Tool Kit, Aircraft Mechanic’s | SC518099CLA01 |
| Accessories Kit, Rotor Track and Balance | 7-262100008 |

**(c) Personnel Required:**

67R Attack Helicopter Repairer
Attack Helicopter Repairer Technical/Inspector
152FG Maintenance Test Pilot(2)

**(d) References:**

TM 1-1520-238-23

**Equipment Conditions:**

**(e)**

| Ref | Condition |
|---|---|
| TM 1-1520-238-23 | Track and balance kit installed |

**USING THIS VOLUME**

Equipment description and theory of operation is provided to aid in troubleshooting the equipment. If performing the MOC does not locate the failure, refer to the appropriate theory of operation for troubleshooting one or more functions of the equipment.

Theory of operation describes how the equipment works by function. Each equipment function has a functional flow diagram with a description of how the equipment performs the function. These troubleshooting aids provide you with additional information for troubleshooting.

Perform the MOC when it has been determined that a failure exists.

The wiring interconnect diagram provides wiring information between related components and may be used with the fault isolation procedures (FIP) as an aid to troubleshooting.

## USING AH–64A HELICOPTER EFFECTIVITY CODES

Helicopter effectivity codes designate differences between helicopters by helicopter serial numbers. These codes consist of three letters representing various helicopter serial number blocks. They are used throughout this volume as necessary to aid in the helicopter troubleshooting effort.

The codes are used to designate serial number block differences as follows:

- When used within narrative text and FIPs, effectivity codes appear within parenthesis.

  For Example: Narrative text and FIPs (AAA)

- When used inside wiring interconnect diagrams, effectivity codes appear within triangular borders and are placed on the line which represents that particular helicopter's configuration.

  For Example: Wiring interconnect diagrams 


This volumes uses these effectivity codes and corresponding helicopter serial numbers for reference.

To use the helicopter effectivity codes, note the helicopter serial number on the left side of the fuselage directly below the CPG window. Use this serial number to determine which procedure or path in a wiring interconnect diagram or FIP to use.

The effectivity codes and helicopter serial number blocks applicable to this volume are as follows:

| Effectivity Code | Helicopter Serial No. |
|---|---|
| AAA | 82–23355 thru 82–23365 |
| AAB | 82–23355 thru 83–23798 |
| AAC | 82–23355 thru 83–23814 |
| AAD | 85–25424 and subsequent |
| AAE | 82–23355 thru 84–24231 |
| AAF | 84–24216 and subsequent |
| AAG | 82–23355 thru 84–24289 |
| AAH | 82–23355 thru 85–25398 |
| AAJ | 85–25351 and subsequent |
| AAK | 82–23355 thru 85–25488 |
| AAL | 88–0215 and subsequent |
| AAM | 85–25465 and subsequent |
| AAN | 83–23787 thru 85–25415 |
| AAP | 82–23355 thru 88–0214 |
| AAQ | 82–23355 thru 84–24311 |

| Effectivity Code | Helicopter Serial No. |
|---|---|
| AAR | 82–23355 thru 84–24239 |
| AAS | 84–24240 and subsequent |
| AAT | 82–23355 thru 83–23804 |
| AAU | 83–23787 and subsequent |
| AAV | 83–23805 and subsequent |
| AAW | 83–23799 and subsequent |
| AAX | 83–23799 thru 84–24245 |
| AAY | 83–23799 thru 85–25470 (Before MWO 1–1520–238–50–37) |
| AAZ | 83–23815 and subsequent |
| ABA | 84–24200 and subsequent |
| ABB | 84–24246 and subsequent |
| ABC | 84–24290 and subsequent |
| ABD | 82–23355 thru 85–25415 |
| ABE | 82–23355 thru 84–24295 |
| ABF | 84–24296 and subsequent |
| ABG | 85–25399 and subsequent |
| ABH | 82–23355 thru 84–24245 |
| ABJ | 85–25447 and subsequent |
| ABK | 82–23355 thru 85–24446 |
| ABL | 82–23355 thru 89–0215 |
| ABM | 84–24290 thru 88–0199 |
| ABN | 89–0192 and subsequent |
| ABP | 85–25471 and subsequent |
| ABQ | 86–8940 and subsequent |
| ABR | 82–23355 thru 84–24232 |
| ABS | 84–24233 and subsequent |
| ABT | 82–23355 thru 83–23816 |
| ABU | 83–23817 thru 85–25415 |
| ABV | 84–24246 thru 85–25398 |
| ABW | 82–23355 thru 83–23795 |
| ABX | 83–23796 and subsequent |
| ABY | With T700–GE 701 engines |
| ABZ | With T700–GE 701C engines |
| ACA | 82–23355 thru 88–0199 |

| Effectivity Code | Helicopter Serial No. |
|---|---|
| ACB | 88–0200 and subsequent |
| ACC | 82–23355 thru 83–23834 |
| ACD | 85–25416 and subsequent |
| ACE | 82–23355 thru 86–9011 |
| ACF | 82–23355 thru 88–0284 |
| ACG | 89–0192 and subsequent |
| ACH | 82–23355 thru 85–25423 |
| ACJ | 82–23355 thru 90–0290,<br>90–0292 thru 90–0301<br>(Before MWO 1–1520–238–50–07) |
| ACK | 82–23355 thru 90–0290,<br>90–0292 thru 90–0301<br>(After MWO 1–1520–238–50–07)<br>90–0291, 90–0302 and subsequent |
| ACL | 82–23355 thru 83–23814 |
| ACM | 83–23815 and subsequent |
| ACN | 85–25471 thru 90–0448<br>(Before MWO 1–1520–238–50–37) |
| ACP | 85–25471 thru 90–0448<br>(After MWO 1–1520–238–50–37)<br>90–0449 and subsequent |
| ACQ | 82–23355 thru 90–0448<br>(Before MWO 1–1520–238–50–36) |
| ACR | 82–23355 thru 90–0448<br>(After MWO 1–1520–238–50–36)<br>90–0449 and subsequent |
| ACS | 82–23355 thru 90–0437 |
| ACT | 90–0438 and subsequent |
| ACU | 82–23355 thru 90–0436 |
| ACV | 89–0192 thru 90–0434 with<br>T700–GE–701C engines<br>(Before MWO 1–1520–238–50–38) |
| ACW | 89–0192 thru 90–0434 with<br>T700–GE–701C engines<br>(After MWO 1–1520–238–50–38)<br>90–0435 and subsequent with<br>T700–GE–701C engines |
| ADC | Before MWO 1–1520–238–50–49 |
| ADD | After MWO 1–1520–238–50–49 |

**HOW TO USE THIS VOLUME (cont)**

## APPENDIXES

The appendix for this volume is contained in TM 1-1520-238-T-8. It contains a list of other manuals you might need to do your job.

## GLOSSARY

The glossary for volumes TM 1-1520-238-T-4 through TM 1-1520-238-T-8 is contained at the end of TM 1-1520-238-T-8. It contains a list of abbreviations and acronyms. An abbreviation is a shortened form of a word, expression, or phase used to conserve space and time. Acronyms are shortened terms for several words and usually use only the first letter of each word. Abbreviations and acronyms are defined the first time they are used within the text of each chapter. The glossary provides a good place to check if there is any doubt. The glossary also contains definitions of unusual terms that appear in this series of volumes. Check the list of definitions if you see a word in a volume that you're not sure of.

## ALPHABETICAL INDEX

The alphabetical index for volumes TM 1-1520-238-T-4 through TM 1-1520-238-T-8 is contained at the end of TM 1-1520-238-T-8. It contains a list of all paragraph titles in alphabetical order. After you find the title in the index, it tells the paragraph number. For example, if you need information on how to power–up the drive system, go to the "D" section of the index and look under Drive System.

For Example: Drive System Power Up . . . . . Paragraph 6–10

The index informs you that the Drive System Power Up is in chapter 6, paragraph 10.

You can find your paragraph in the index, even if you only know a single word in the title. The example shows how you can also find the paragraph by looking under "Power Up."

For Example: Power Up, Drive System . . . . . Paragraph 6–10

Any paragraph can be located in the way described. If you know the name of the operation, system, assembly, etc., you can use one of the words to find the paragraph number in the index. It makes locating information quick and easy.

## DEFINITION OF WARNING, CAUTION, AND NOTE

**WARNING**

**An operation or maintenance procedure, practice, condition, statement, etc., which if not strictly observed could result in long term health hazards, death or injury to personnel. If injury occurs, seek medical aid immediately.**

**CAUTION**

**An operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed could result in damage to or destruction of equipment, cause loss of mission effectiveness.**

**NOTE**

**An essential operating or maintenance procedure, condition, or statement which must be highlighted.**

**HOW TO USE THIS VOLUME (cont)**

**REFERENCE**

For a listing of all TMs applicable to the helicopter, refer to APPENDIX A of TM 1-1520-238-T-8.

**USING THE ELECTRICAL COMPONENT LOCATION AND CONFIGURATION (ECLC) INDEX**

The ECLC index will help you find electrical components and their connectors on the helicopter during troubleshooting. The ECLC is located at the beginning of the troubleshooting procedures of each chapter (when applicable). This index is a list of connectors and applicable wire harnesses which are illustrated by component location. Component locations are shown from the helicopter's forward sections to its aft sections by horizontal and vertical grid numbers. Connectors are listed numerically in the **FROM COLUMN Connector Ref Des** column of the index. Every connector is referenced to a grid area within the illustrations.

**EXAMPLE OF ECLC INDEX**

| FROM COLUMN | | TO COLUMN | | | |
|---|---|---|---|---|---|
| **Connector Ref Des** | **Component/ Harness** | **Connector Ref Des** | **Component/ Harness** | **Grid Area** | **Access** |
| P1 | A76/W605 | J1 | A402 | 8B | PLT STATION |
| P402 | W170 | J402 | W211 | 13E | R295 DOOR |

Use the index to find connectors on the aircraft by first locating the connector reference designator number in the **FROM COLUMN Connector Ref Des** column of the index. Then, cross–reference the **FROM COLUMN Connector Ref Des** column with the following:

- **FROM COLUMN Component/Harness** column to locate the wiring component or wire harness number.
- **TO COLUMN Connector Ref Des** column to locate the mating connector number.
- **TO COLUMN Component/Harness** column to locate the mating connector or wire harness number.
- **Grid Area** column to find the grid zone (within the illustration) depicting the location of the connector on the aircraft.
- **Access** column to find where access can be obtained to the connector (TM 1-1520-238-23).

For example, to locate connector P1 on the aircraft find connector P1 in the **FROM COLUMN Connector Ref Des** column, then refer to the **FROM COLUMN Component/Harness** column. This column shows that P1 is part of component/harness A76/W605. The **TO COLUMN Connector/Ref Des column** shows that P1 connects to J1 on component A402 (**TO COLUMN Component/Harness** column). The **Grid Area** column indicates that P1 is depicted at illustration grid zone 8B, and that **Access** to the connector is obtained through the PLT STATION.

# CHAPTER 1
# INTRODUCTION

## CHAPTER INDEX

# SECTION I. TROUBLESHOOTING INFORMATION – GENERAL

## 1–1. SCOPE 1–1

This volume covers equipment description, theory of operation, FIPs, and AVUM and/or AVIM maintenance level instructions for the airframe, landing gear, power plants, rotors and drive system.

## 1–2. VOLUME CONTENT AND FORMAT 1–2

Equipment description and theory of operation for the helicopter landing gear, power plants, rotors and drive system are presented in Chapters 3, 4, 5, and 6. Before troubleshooting, learn the content and organization of this volume and how it relates to other manuals. For more information on volume content and usage refer to **HOW TO USE THIS VOLUME.**

## 1–3. REFERENCE MANUALS 1–3

Refer to APPENDIX A for a complete list of manuals you may need when troubleshooting the helicopter.

## 1–4. ELECTRICAL DATA 1–4

a. **Electrical Units.** Unless otherwise specified, the values indicated for electrical units in this volume are as follows:

- Phase reference symbol (∅) for AC voltage (VAC)
- Resistance (R) in ohms (Ω)
- Capacitance (C) in picofarads (pf)
- Inductance (L) in henrys (H)
- Voltage (E) in volts (V)
- Current (I) in amperes (A)
- Frequency in hertz (Hz)
- Power in watts (W)

b. **Electrical Measurement Tolerances.** Unless otherwise specified, tolerances for resistance, capacitance, inductance, voltage and current are ±10%.

c. **Grounds.** Unless otherwise indicated (such as chassis ground), all grounds shown are common ac, dc and signal grounds.

d. **DC Voltage Polarities.** DC voltages are positive polarity (+28 VDC, etc.) unless otherwise specified.

e. **AC Voltages.** All indicated ac voltages are 400 Hz.