Technical Manual

Aviation Unit and Intermediate Troubleshooting Manual

for

ARMY Model AH-64A HELICOPTER (NSN 1520-01-106-9519) (EIC: RHA)

SUPERSEDURE NOTICE: This manual supersedes TM 55-1520-238-T-3, dated 15 DECEMBER 1985, including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY
30 APRIL 1992

HEADQUARTERS
DEPARTMENT OF THE ARMY
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TECHNICAL MANUAL

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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 document by substitution with chemicals that do not cause atmospheric Ozone depletion.

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* **SUPERSEDURE NOTICE:** **This manual supersedes TM 55-1520-238-T-8, dated 15 DECEMBER 1985, including all changes.**

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HOW TO USE THIS VOLUME

OVERVIEW

If you can't find information, you can't do the job. Learn how to use the integrated troubleshooting manual series and this volume. Refer to TM 1-1520-238-T-2 for instructions on how to use the troubleshooting manual system and TM 1-1520-238-T-4 for instructions on how to use this volume.

USING AH-64A HELICOPTER EFFECTIVITY CODES

Helicopter effectivity codes designate differences between helicopters by helicopter serial numbers. These codes consist of 3 letters representing various helicopter serial number blocks. They are used throughout this volume as necessary to aid the helicopter troubleshooting effort.

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

- When used within narrative text and fault isolation procedures (FIPs), effectivity codes appear within parentheses.

  For Example: 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: Example: Wiring interconnect diagram 

This volume 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-hand 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

Effectivity Code	Helicopter Serial No.
AAP	82-23355 thru 88-0214
AAQ	82-23355 thru 84-24311
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	82-23344 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

HOW TO USE THIS VOLUME (cont)

Effectivity Code	Helicopter Serial No.
ABZ	With T700-GE 701C engines
ACA	82-23355 thru 88-0199
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, 90-0292 thru 90-0301 (Before MWO 1-1520-238-50-07)
ACK	82-23355 thru 90-0290, 90-0292 thru 90-0301 (After MWO 1-1520-238-50-07) 90-0291, 90-0302 and subsequent
ACL	82-23355 thru 83-23814
ACM	83-23815 and subsequent
ACN	85-25471 thru 90-0448 (Before MWO 1-1520-238-50-37)
ACP	85-25471 thru 90-0448 (After MWO 1-1520-238-50-37) 90-0449 and subsequent
ACQ	82-23355 thru 90-0448 (Before MWO 1-1520-238-50-36)
ACR	82-23355 thru 90-0448 (After MWO 1-1520-238-50-36) 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 T700-GE-701C engines (Before MWO 1-1520-238-50-38)
ACW	89-0192 thru 90-0434 with T700-GE-701C engines (After MWO 1-1520-238-50-38) 90-0435 and subsequent with T700-GE-701C engines
ACY	82–23355 thru 92–0485 (Before MWO 9–1230–476–50–01)
ACZ	82–23355 thru 92–0485 (After MWO 9–1230–476–50–01) 86-08940 and subsequent
ADC	Before MWO 1–1520–238–50–49

HOW TO USE THIS VOLUME (cont)

Effectivity Code	Helicopter Serial No.
ADD	After MWO 1–1520–238–50–49
ADJ	82–233355 thru 82–23361
ADK	82–233361 and subsequent

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 component or wiring 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**
P910	W102	J910	W211	48B	R295 DOOR
P916	W118	J916	W119	1D	CPG STATION
P941	W268	J1	L44	44D	B200

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 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 component 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 to the connector can be obtained (TM 1-1520-238-23).

HOW TO USE THIS VOLUME (cont)

For example, to locate connector P910 on the aircraft find connector P910 in the **FROM COLUMN Connector Ref Des** column, and then refer to the **FROM COLUMN Component/Harness** column. This column shows that P910 is part of wire harness W102. The **TO COLUMN Connector/Ref Des** column shows that P910 connects to J910 on wire harness W211. The **Grid Area** column indicates that P910 is depicted at illustration grid zone 48B, and that **Access** to the connector is obtained through the R295 DOOR.

CHAPTER 12
UTILITY SYSTEMS

CHAPTER INDEX

CHAPTER INDEX (cont)

SECTION I. EQUIPMENT DESCRIPTION AND DATA

a. **Characteristics.**

(1) **Canopy Defog and Anti-Ice System.** The canopy defog system removes fog by blowing hot air on the pilot and copilot/gunner (CPG) windshields. The anti-ice system prevents ice uses electrical heating elements in the aircraft windshields, target acquisition designation sight (TADS) windows and pilot night vision sensor (PNVS) window.

(2) **Engine Anti-Ice System.** The engine anti-ice system uses electrical heating elements and compressor bleed air to prevent engine ice.

(3) **Pitot Anti-Ice System.** The pitot anti-ice system uses electrical heating elements to prevent ice accumulation.

(4) **Rotor Blades De-Ice System.** The rotor blades de-ice system provides controlled ice removal from the main and tail rotor blades using electrically heated blankets that are bonded to the blades.

(5) **Windshield Wipers.** The windshield wipers remove moisture from the pilot and CPG windshields using wiper blades.

(6) **Engine 1 Fire Detection System.** The engine 1 fire detection system uses optical sensing devices to detect fire.

(7) **Engine 2 Fire Detection System.** The engine 2 fire detection system uses optical sensing devices to detect fire.

(8) **Auxiliary Power Unit (APU) Fire Detection System.** The APU fire detection system uses optical sensing devices to detect fire.

(9) **Fire Extinguishers System**. The fire extinguishers system uses a pressurized chemical fire extinguishing agent to extinguish fires in the engine and APU compartments.

b. **Capabilities and Features.**

(1) **Canopy Defog and Anti-Ice System.** The canopy defog system allows the pilot to control the flow of hot air on the windshields to remove fog. The anti-ice system allows the pilot to control heating elements in the windshields and TADS/PNVS windows to prevent or remove ice.

(2) **Engine Anti-Ice System.** The engine anti-ice system prevents engine ice by directing compressor bleed air onto engine components and electrically heating the nose gearbox (NGB). Compressor bleed air flow is directed to the engine components by control valves and air temperature sensing switches. The NGB and upper aft fairing heaters maintain the NGB and upper aft fairing temperature between 225°F (107°C) and 235°F (113°C) through control units.

(3) **Pitot Anti-Ice System.** The Pitot anti-ice system uses heating elements, mounted in the left and right Pitot tubes, to prevent ice accumulation when energized. The pilot controls the operation of the heating elements.

(4) **Rotor Blades De-Ice System.** The rotor blades de-ice system provides ice removal in trace to moderate icing conditions. The main and tail rotor blades can be de-iced automatically or manually.

12–1. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (cont) 12–1

(5) **Windshield Wipers.** The windshield wipers can be operated at low and high speeds and provide windshield clearing in heavy rain conditions of up to 1.6 inches per hour at airspeeds of up to 204 knots.

(6) **Engine 1 Fire Detection System.** The engine 1 fire detection system senses fire and lights engine 1 fire pull handle on pilot L/H instrument panel and the CPG L/H glareshield fire extinguisher panel.

(7) **Engine 2 Fire Detection System.** The engine 2 fire detection system senses fire and lights engine 2 fire pull handle on pilot L/H instrument panel and the CPG L/H glareshield fire extinguisher panel.

(8) **APU Fire Detection System.** The APU fire detection system senses fire and lights the APU fire pull handle on the APU panel on the pilots R/H aft console and the APU fire indicator on the pilot and CPG master caution/warning panels.

(9) **Fire Extinguishers System**. The fire extinguishers system allows the pilot and CPG to discharge stored fire extinguishing agent to extinguish fires in the engine and APU compartments.

12–2. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS 12–2

a. **Canopy Defog and Anti-Ice System.** The canopy defog and anti-ice system consists of the defog shutoff valve, canopy heating elements, canopy temperature sensor, canopy temperature control, TADS heating elements and PNVS heating element.

(1) **Defog Shutoff Valve.** The defog shutoff valve (fig. 12–1), located in the aft equipment bay on the left engine louver housing, is a normally closed, 28 VDC electrically actuated air operated poppet valve. The defog shutoff valve provides on/off control of hot air to the windshields.

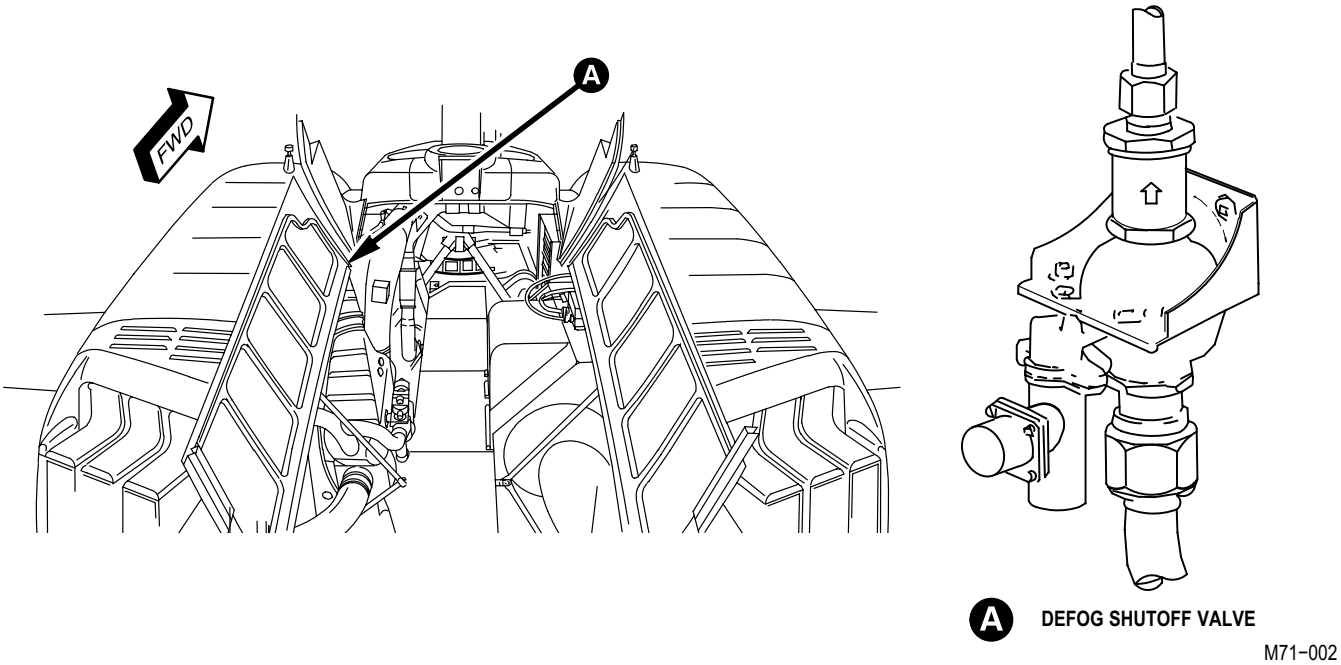

Figure 12–1. Defog Shutoff Valve Location

(2) **Canopy Heating Elements.** Canopy heating elements (fig. 12–2), bonded between the inner and outer plies of the pilot and CPG windshields, are joined together in a 3-phase, 115/200 VAC delta connection.

(3) **Canopy Temperature Sensor.** The canopy temperature sensor, bonded between the inner and outer plies of the pilot windshield, is a sensing element with a positive temperature coefficient that monitors canopy temperature.

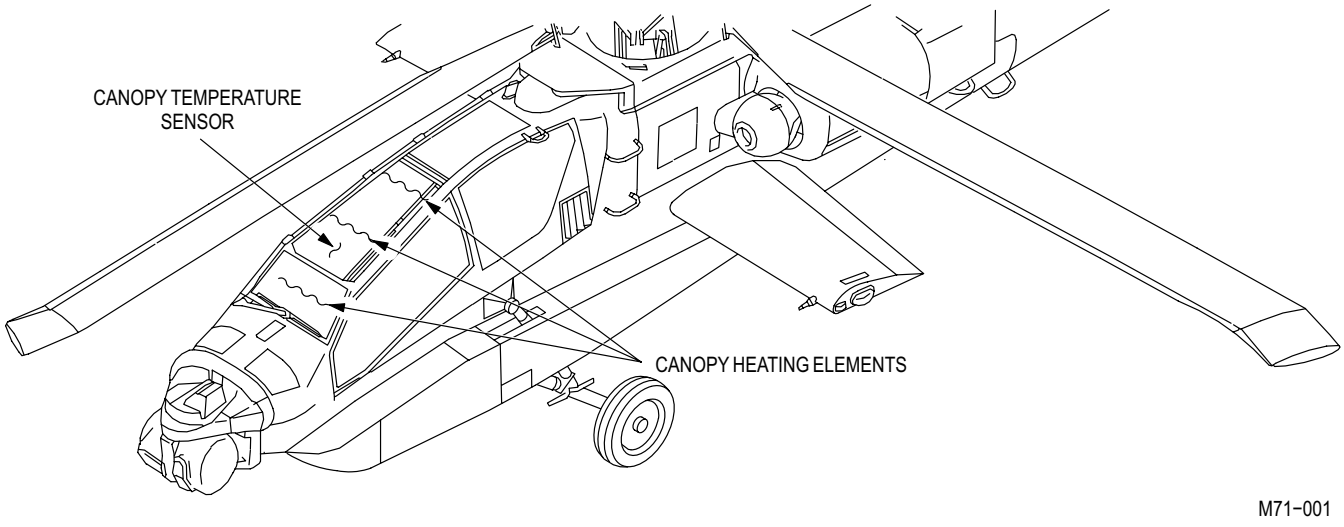

Figure 12–2. Canopy Heating Elements and Canopy Temperature Sensor Location

(4) **Canopy Temperature Control.** The canopy temperature control (fig. 12–3), located in the CPG left console under the recorder control panel, is a solid state unit using 28 VDC control power and 3-phase 115/200 VAC heating element power. The canopy anti-ice temperature control unit monitors and controls canopy temperature.

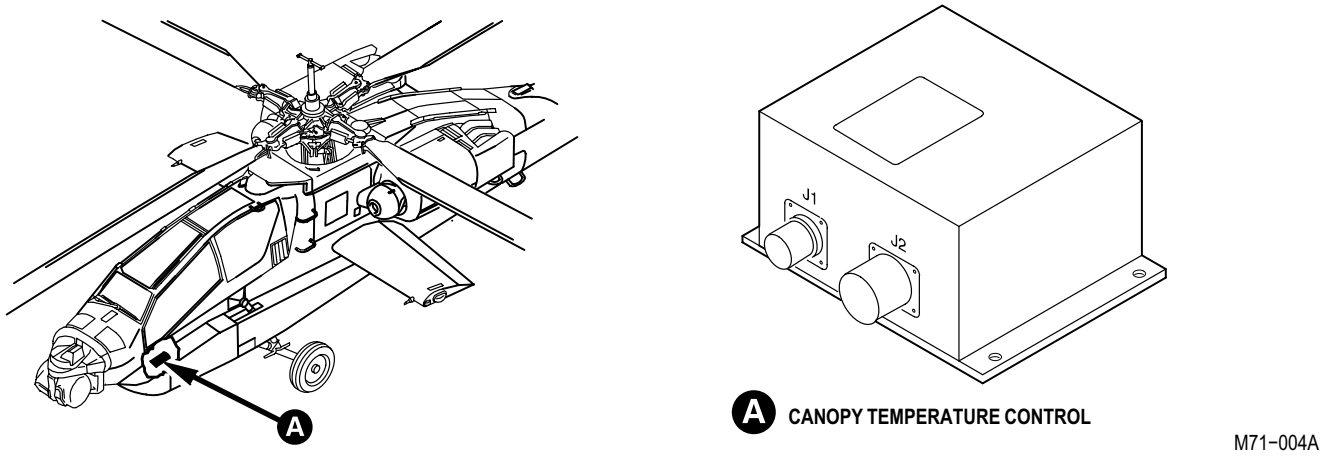

Figure 12–3. Canopy Temperature Control Location

(5) **TADS Heating Elements.** TADS heating elements (fig. 12–4), bonded between the inner and outer plies of the TADS windows, use 3-phase 115/200 VAC power.

(6) **PNVS Heating Element.** The PNVS heating element, bonded between the inner and outer plies of the PNVS window, uses single phase 115 VAC power.

b. **Engine Anti-Ice System.** The engine anti-ice system consists of the engine anti-ice bleed/start valve, thermal switch, engine inlet anti-ice valve, NGB heater, upper aft fairing heater, control unit and bleed air relay.

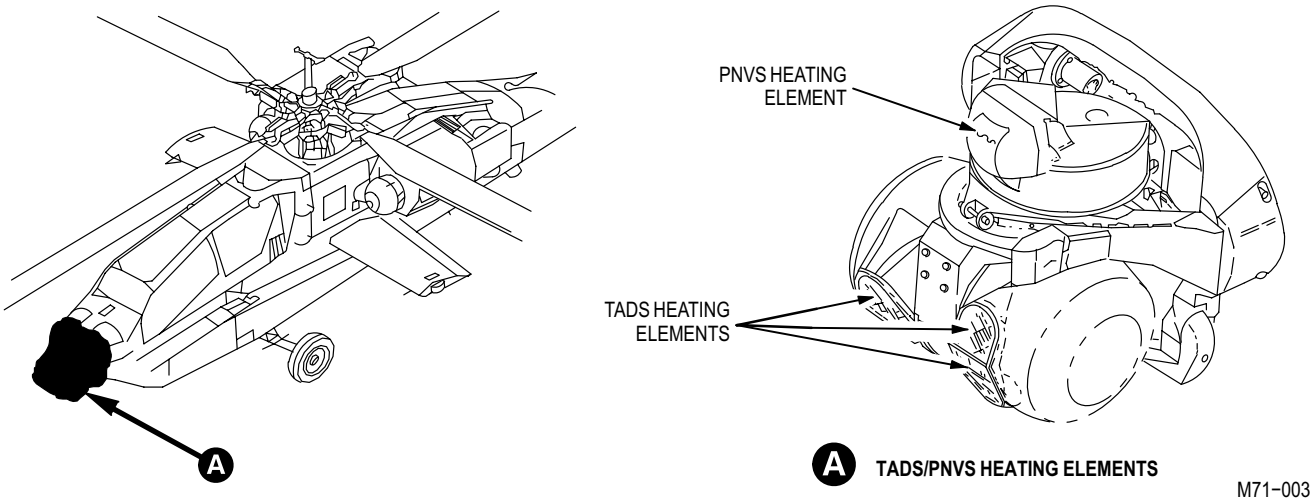

Figure 12–4. TADS/PNVS Heating Elements Location

(1) **Engine Anti-Ice Bleed/Start Valve.** The engine anti-ice bleed/start valve (fig. 12–5), located on the lower left side of the compressor stator of each engine, is a spring loaded open valve that controls anti-icing airflow to the engine and bleeds air from the compressor during start and low engine speeds. The engine anti-ice bleed/start valve is controlled mechanically by a variable geometry actuator and electrically by a solenoid valve.

(2) **Thermal Switch.** The thermal switch (fig. 12–6), mounted in the bleed air tube between the engine inlet anti-ice valve and engine inlet fairing of each engine, energizes the bleed air relay. It is a normally open switch that will respond to a temperature change in 40 seconds or less.

(3) **Engine Inlet Anti-Ice Valve.** The engine inlet anti-ice valve, located on the outboard side of the main cold frame section of each engine, controls anti-icing airflow to the engine inlet fairings. The engine inlet anti-ice valve is an electrically controlled, spring loaded open pneumatic valve.

(4) **NGB Heater.** The NGB heater (fig. 12–7) is an integral part of the forward and aft NGB fairings. The heater elements require 3-phase 115/200 VAC power.

(5) **Upper Aft Fairing Heater.** The upper aft fairing heater**,** an integral part of the upper aft fairing, require 3-phase 115/200 VAC power.

(6) **Control Unit.** The control unit, an integral part of the forward NGB fairing, consists of a control sensor and a safety sensor which controls the operation of the NGB and upper aft fairing heaters.

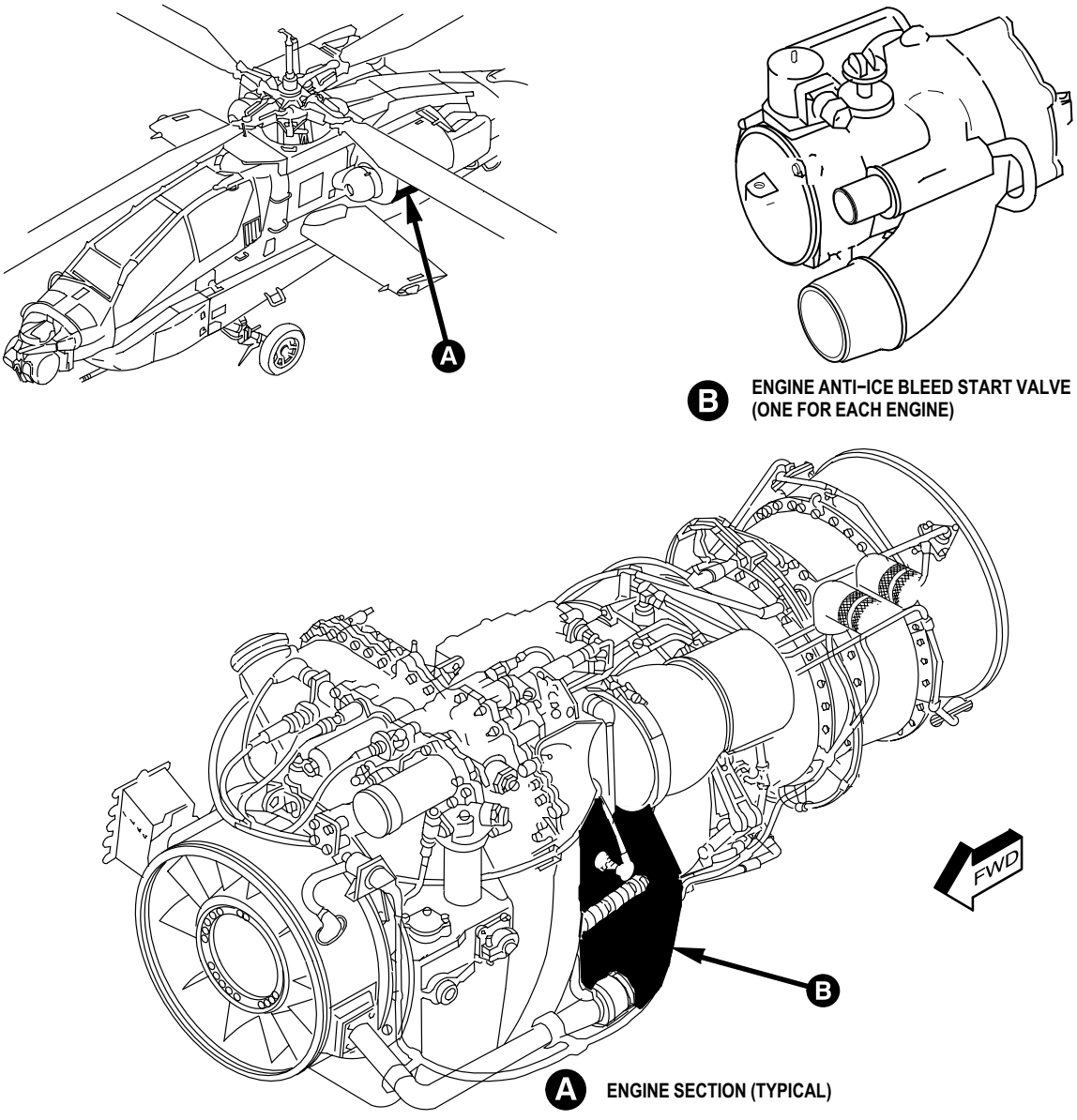

Figure 12–5. Engine Anti-Ice Bleed/Start Valve Location