

Illustrated Parts List and Maintenance Instructions

FOR

AUTOMATIC DIRECTION FINDER (KR 85)
Part No. 369H90067 Basic,
369H90067-501, 369H90067-51
and 369H90067-61

USED ON HUGHES 500D (MODEL 369D) HELICOPTERS



Hughes Helicopters division of summa corporation / culver city, california

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FOREWORD

F-1. PURPOSE AND CONTENT OF THIS MANUAL. This manual supplements information contained in HMI - Vol 1 and 369D - IPC, and contains instructions for maintenance of the KR 85 automatic direction finder (ADF) installation. This manual also contains parts lists for procuring replacement parts for the automatic direction finder installation.

F-2. APPLICABILITY. The KR 85 automatic direction finder is applicable for use on any Hughes 500D (Model 369D) helicopter.

F-3. COMPATIBILITY OF COMBINED OPTIONAL EQUIPMENT. For compatibility information on which optional equipment may or may not be used in combination at the same time, refer to Section 21, HMI - Vol 1.

F-4. ORGANIZATION OF CONTENTS. The contents of this manual are grouped into sections as outlined in the Table of Contents. Each section is organized to provide comprehensive

coverage of entire systems, major equipment groupings, and major components that are similar or associated. Procedures for each of these are presented in sequence as defined in Section 1, HMI - Vol 1.

F-5. USE OF THIS MANUAL. This manual is for use by operators of the Model 369D helicopter equipped with KR 85 automatic direction finder. Although this manual is a separate publication, it should be kept with HMI - Vol 1, HMI - Vol 2, 369D - IPC and other handbooks listed in Section 1, HMI - Vol 1 that form the primary information file for the helicopter.

F-6. RELATED PUBLICATIONS. Reference is made to applicable portions of HMI - Vol 1 and 369D - IPC as required to accomplish instructions contained herein.

F-7. LITERATURE CHANGES AND REVISIONS. Changes and revisions to contents of this manual are made as defined in Section 1, HMI - Vol 1.

SECTION I

ILLUSTRATED PARTS LIST

1-1. **SCOPE AND CONTENTS.** This illustrated parts list provides, by means of text (parts lists) and companion illustrations, a complete parts definition of the 369H90067 Automatic Direction Finder (KR 85) installation, manufactured by Hughes Helicopters, Culver City, California.

NOTE: The illustrated parts list is organized and presented in the same manner as the 369D Series Illustrated Parts List (369D - IPC). (For information on use, refer to the 369D - IPC.)

1-2. **GROUP ASSEMBLY PARTS LIST.** The parts lists furnish information for procuring replacement parts for the automatic direction finder installation and shall not be used for any other purpose.

1-3. **ILLUSTRATIONS.** An isometric illustration is provided for the group assembly parts list. The illustration is exploded to the extent necessary to show parts relationship for the complete automatic direction finder installation.

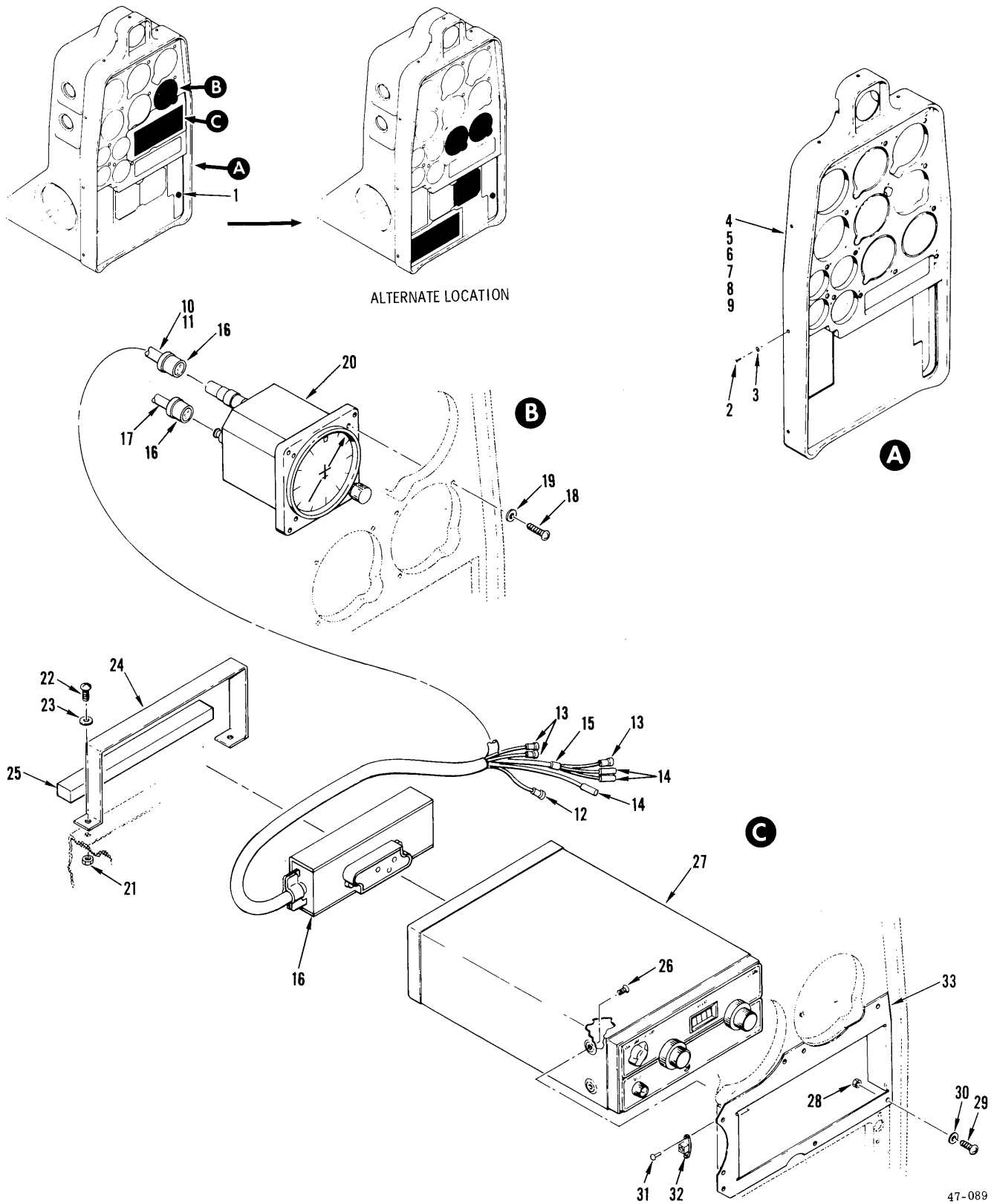


Figure 1-1. Automatic direction finder installations

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY
1-1-	369H90067	AUTOMATIC DIRECTION FINDER (KR 85) (See figure 1-2 for further bkdn)	1
	369H90067-501	AUTOMATIC DIRECTION FINDER (KR 85) (Provisions instl)	1
-1	2TC13-2	. CIRCUIT BREAKER	1
-2	MS51957-43B	. SCREW	9
-3	MS27129-9	. WASHER	9
-4	MS35214-29	. SCREW	1
-5	MS35214-31	. SCREW	2
-6	MS35214-32	. SCREW	1
-7	MS35214-109	. SCREW	1
-8	AN960XC6L	. WASHER	5
-9	369H6423-505 KR 85	. HOOD DIGITAL AUTOMATIC DIRECTION FINDER (ADF) EQUIPMENT	1 1
-10	369H90067-31	. WIRE HARNESS ASSY	1
-11	024-0003-00	. COAXIAL CABLE (Supplied with KR 85)	1
-12	32863	. LUG	1
-13	MS25036-102	. LUG	3
-14	MPCM22M-HI	. HYTIP	3
-15	D121	. SLEEVE	1
-16	050-1165-05	. CONNECTOR (SET) (Supplied with KR 85) (Used with wire harness assy 369H90067-31)	1
-17	155-2008-01	. LOOP ANTENNA CABLE (Supplied with KR 85)	1
-18	MS35214-28	. SCREW	3
-19	NAS620A6L	. WASHER	3
-20	066-3017-00	. KI225 INDICATOR (Supplied with KR 85)	1
-21	MS21042-08	. NUT	2
-22	MS51957-43	. SCREW	2
-23	AN960A8L	. WASHER	2
-24	369H90067-9	. CLAMP	1
-25	369H90067-33	. FILLER	1
-26	NAS623-2-1	. SCREW	4
-27	066-1023-00	. AUTOMATIC DIRECTION FINDER RECEIVER (KR 85) (Supplied with KR 85)	1
-28	MS21042-08	. NUT	2
-29	MS35214-40	. SCREW	2
-30	NAS620A8L	. WASHER	2
-31	MS20426AD3	. RIVET	8
-32	MS21075-08	. NUTPLATE	4
-33	369H90067-21	. PANEL FACE ASSY	1

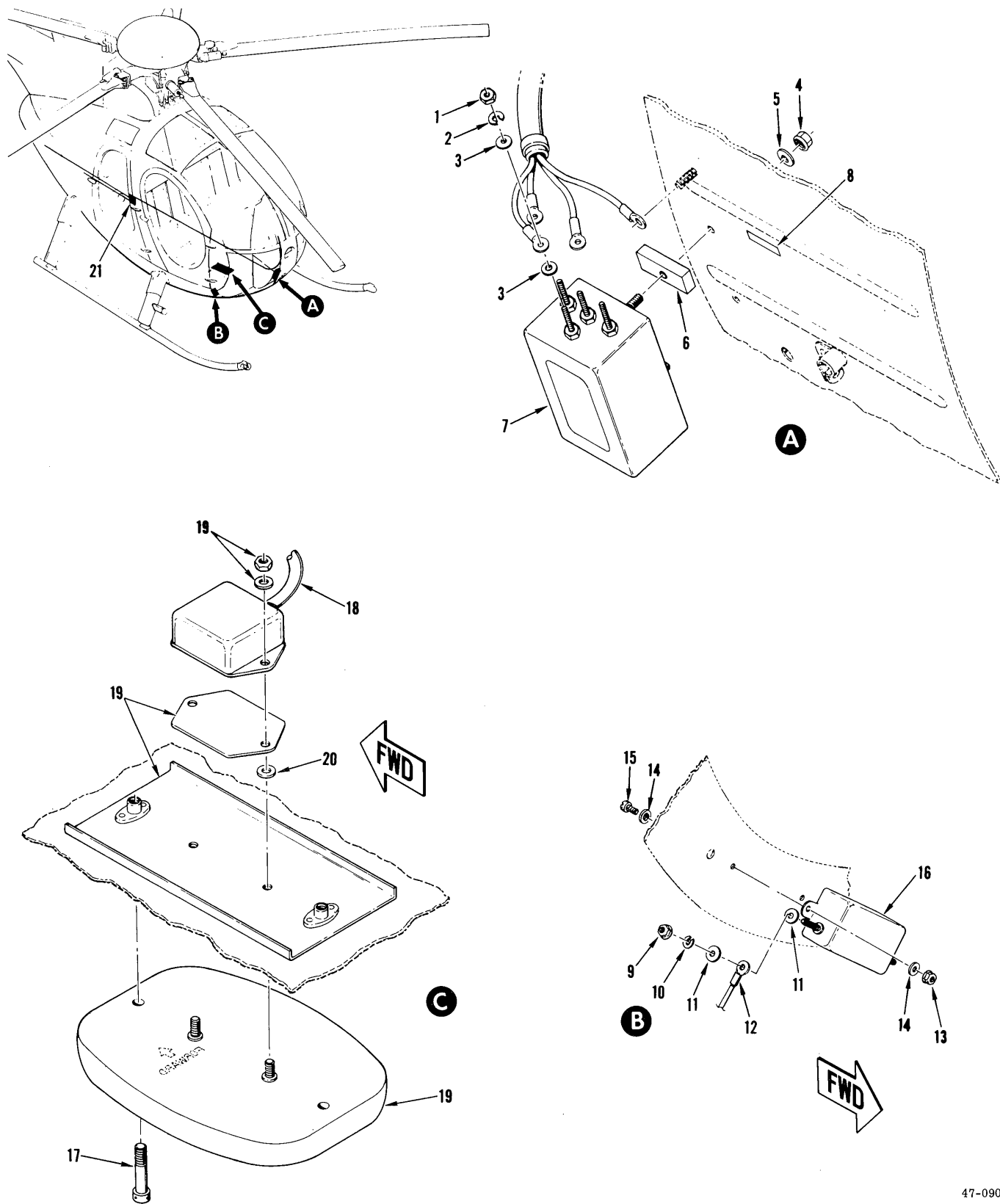
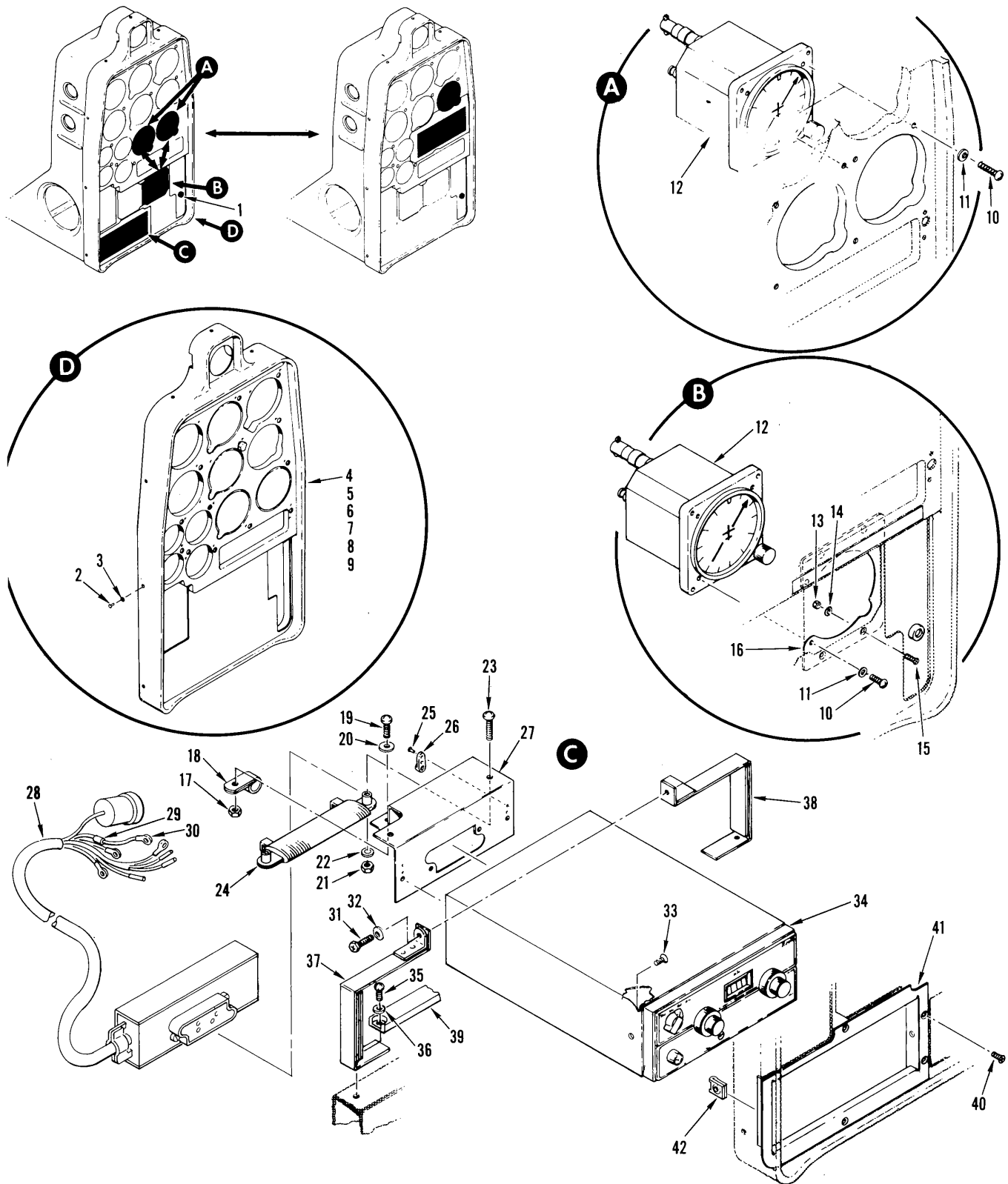


Figure 1-2. Automatic direction finder antenna and filter installations

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY
1-2-	369H90067	AUTOMATIC DIRECTION FINDER (KR 85) (Cont) (See figure 1-1 for initial bkdn)	REF
	369H90067-501	AUTOMATIC DIRECTION FINDER (KR 85) (Provisions instl)	1
-1	MS35082-1	. NUT	3
-2	MS35338-41	. WASHER	3
-3	AN960-6L	. WASHER	6
-4	MS21042-3	. NUT	2
-5	AN960PD10L	. WASHER	2
-6	369H90067-39	. SPACER	2
-7	369H6461	. FILTER	1
-8	369H6615-155	. DECAL	1
-9	NAS671-6	. NUT	2
-10	AN935-6L	. WASHER	2
-11	AN960C6L	. WASHER	4
-12	MS25036-102	. TERMINAL	2
-13	MS21042-08	. NUT	2
-14	AN960C8L	. WASHER	4
-15	MS51957-43	. SCREW	2
-16	1549	. FILTER	1
-17	NAS1351C4-20	. SCREW	2
-18	155-2008-01	. LOOP ANTENNA CABLE (Supplied with KR 85) (See figure 1-1 for NHA)	REF
-19	071-1006-11	. KA 42 ADF LOOP ANTENNA (Supplied with KR 85) . . .	1
-20	AN960C10	. WASHER	2
-21	369H90146-503	. ANTENNA INSTL (Use 369H90146-505 if navigation radio option is installed)	1



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Figure 1-3. Automatic direction finder alternate indicator and receiver installation provisions

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY
1-3-	369H90067	AUTOMATIC DIRECTION FINDER (KR 85) (Cont)	REF
		(See figures 1-1 and 1-2 for initial bkdn)	
	369H90067-51	AUTOMATIC DIRECTION FINDER (KR 85)	1
		(Provisions for alternate locations of indicator)	
-1	2TC13-2	. CIRCUIT BREAKER (See figure 1-1 for NHA)	REF
-2	MS51957-43B	. SCREW (See figure 1-1 for NHA)	REF
-3	MS27129-9	. WASHER (See figure 1-1 for NHA)	REF
-4	MS35214-29	. SCREW (See figure 1-1 for NHA)	REF
-5	MS35214-31	. SCREW (See figure 1-1 for NHA)	REF
-6	MS35214-32	. SCREW (See figure 1-1 for NHA)	REF
-7	MS35214-109	. SCREW (See figure 1-1 for NHA)	REF
-8	AN960XC6L	. WASHER (See figure 1-1 for NHA)	REF
-9	369H6423-505	. HOOD (See figure 1-1 for NHA)	REF
-10	MS35214-28	. SCREW (See figure 1-1 for NHA)	REF
-12	066-3017-00	. KI225 INDICATOR (Supplied with KR 85)	REF
		(See figure 1-1 for NHA)	
-13	MS21042-06	. NUT	4
-14	NAS620A6L	. WASHER	4
-15	MS24693C26	. SCREW	4
-16	369H90067-41	. PLATE	1
	369H90067-61	AUTOMATIC DIRECTION FINDER (KR 85)(Provisions for alternate location of receiver)(See figure 1-1 for NHA)	REF
-17	MS21042-3	. NUT	1
-18	MS25281-7	. CLAMP	1
-19	MS51958-63	. SCREW	1
-20	AN960PD10L	. WASHER	1
-21	MS21042-3	. NUT	2
-22	AN960PD10L	. WASHER	2
-23	MS51958-65	. SCREW	2
-24	HL-55-08Z	. RESISTOR	1
-25	MS20426AD3	. RIVET	4
-26	MS21071-06	. NUTPLATE	2
-27	369H90067-55	. SUPPORT.	1
-28	369H90067-65	. WIRE HARNESS ASSY (Make from wire harness assy)	1
		369H90067-31)(See figure 1-1 for details of -31 assy)	
-29	MS25181-1	. SPLICE	1
-30	MS25030-102	. LUG	1
-31	NAS1096-3-12	. SCREW	1
-32	AN960PD10L	. WASHER	1
-33	NAS623-2-1	. SCREW (See figure 1-1 for NHA)	2
-34	066-1023-00	. AUTOMATIC DIRECTION FINDER RECEIVER (KR 85)	REF
		(Supplied with KR 85) (See figure 1-1 for NHA)	
-35	MS51958-61	. SCREW	2
-36	AN620A10L	. WASHER	2
-37	369H90067-45	. CLAMP ASSY, OUTBD.	1
-38	369H90067-47	. CLAMP ASSY, INBD	1
-39	369H90067-57	. FILLER.	1
-40	MS24693C26	. SCREW	6
-41	369H90067-43	. PANEL	1
-42	C-8104-832	. NUTPLATE	2

SECTION II

MAINTENANCE INSTRUCTIONS

2-1. GENERAL INFORMATION. The KR 85 automatic direction finder (ADF) installation is used for homing on selected radio stations to obtain accurate bearing information. The installation consists of a KR 85 ADF receiver and KI 225 indicator mounted in the instrument panel. A KA 42 loop antenna is attached to the underside of the fuselage. A sense antenna lead-in wire is attached to the ADF/UHF nav antenna on the underside of the fuselage. The installation receives +28 vdc electrical power from the main power bus through the 2-ampere ADF circuit breaker on the instrument panel. Figure 2-1 provides a wiring diagram for the ADF installation. System components are described in the following paragraphs.

NOTE: An integrated interphone communication system (ICS) must be installed in the helicopter for use with the ADF installation. The ICS audio equipment (headset, switch and jack assembly and control unit) are required for reception of ADF voice and code signals. The electrical interface of the ADF and ICS is shown in figure 2-1, and the ICS electrical circuitry is described in the ICS Opt Eqpt Manual (table 21-1, HMI - Vol 1).

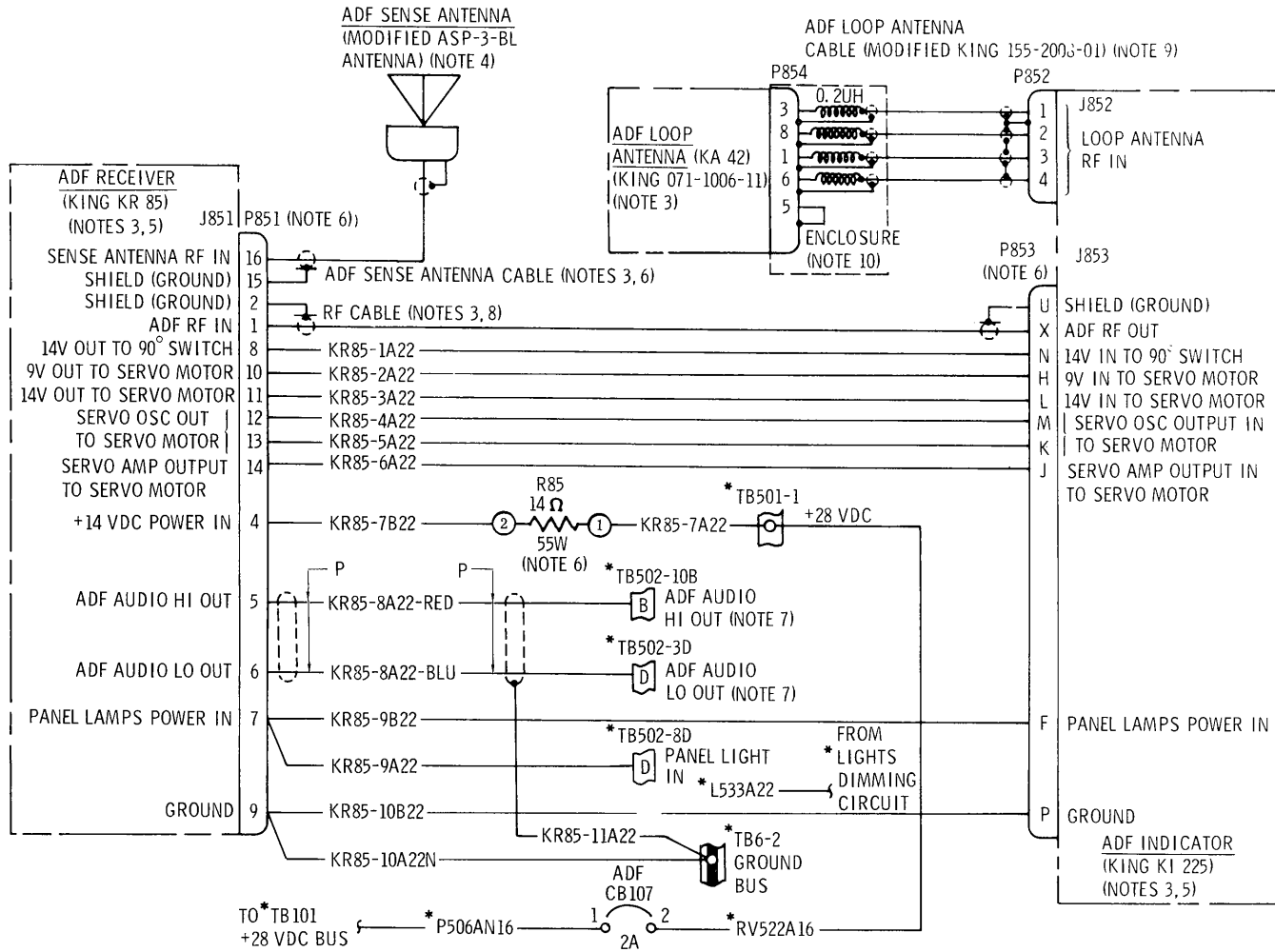
2-2. DESCRIPTION OF KR 85 ADF RECEIVER. The KR 85 ADF receiver (27, fig. 1-1) is used for homing and direction-finding on the source of low-frequency, amplitude-modulated or interrupted-carrier radio signals within the range of 200 kHz to 1699 kHz. The digitally selected frequency channels may be selected in 1 kHz increments. The receiver is flush mounted in the helicopter instrument panel. Panel controls enable the operator to select frequency and three modes of operation, and to adjust audio volume. The audio output of the receiver is available at the headsets of the interphone communication system (ICS). The receiver also supplies signals to the KI 225 indicator for visual indication of radio signal source bearing. Reception range of the receiver is dependent on helicopter altitude and weather conditions. For detailed theory of operation of the ADF receiver, refer to the manufacturer's publication (table 2-2, HMI - Vol 1).

2-3. DESCRIPTION OF KI 225 ADF INDICATOR. The KI 225 ADF indicator (20, fig. 1-1) provides visual indication of the bearing of incoming radio signals. The heading card may be rotated by use of the HDG control at the front of the indicator. The heading pointer rotates to indicate the bearing of the radio signal source in degrees. The indicator is flush mounted on the helicopter instrument panel. For detailed theory of operation, refer to the manufacturer's publication (table 2-2, HMI - Vol 1).

2-4. DESCRIPTION OF KA 42 ADF LOOP ANTENNA. The KA 42 ADF loop antenna (19, fig. 1-2) consists of two windings wound at right angles. The windings are symmetrical with respect to ground to prevent unwanted pickup. The magnet field of the radio signal induces a voltage in the loop antenna. The relative direction of the signal source determines the amplitude of the voltage induced in each antenna winding. These voltages are used in the ADF indicator to position the heading pointer to indicate the angle at which the radio signal is entering the loop antenna. The loop antenna is mounted on the underside of the fuselage below the pilot's compartment. The ADF loop antenna is connected to the ADF indicator via the 155-2008-01 loop antenna cable.

2-5. DESCRIPTION OF KA 42 LOOP ANTENNA CABLE. The KA 42 loop antenna cable (18, fig. 1-3) is a four-conductor shielded cable. The loop-antenna end of the cable is terminated into a terminal box, which contains four 0.2 uH chokes that aid in phasing the antenna voltages.

2-6. DESCRIPTION OF 369H90067-31 WIRE HARNESS ASSEMBLY. The wire harness assembly (10, fig. 1-1) consists of shielded cable, wiring, connectors, and connecting hardware. It is used to interconnect the ADF receiver, ADF indicator, sense antenna, and helicopter integrated interphone communication system (ICS). The wire harness assembly also includes a 14-ohm, 55-watt, fixed wire-wound resistor (R85) which is used to drop the 28 vdc from the ICS to 14 vdc required by the ADF system. A 48-inch coaxial



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE WIRING DIAGRAM FOR THE HELICOPTER ELECTRICAL SYSTEM (HMI-VOL 1) AND THE WIRING DIAGRAM FOR THE INTEGRATED INTERPHONE COMMUNICATION SYSTEM (ICS) FOR COMPLETE WIRING INTERCONNECTION INFORMATION.
2. ASTERISK (*) INDICATES PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. PART OF KING KR 85 ADF SYSTEM.
4. ASP-3-BL ANTENNA MANUFACTURED BY ANTENNA SPECIALISTS PRODUCTS.
5. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-2, HMI-VOL 1) FOR INTERNAL MAINTENANCE OF MAJOR COMPONENTS.
6. PART OF KR 85 ADF WIRE HARNESS ASSEMBLY THAT ALSO INCLUDES WIRING ATTACHED TO AND BETWEEN CONNECTORS.
7. FOR WIRING INTERCONNECTIONS, REFER TO INFORMATION ON THE INTEGRATED INTERPHONE COMMUNICATION SYSTEM (ICS).
8. DO NOT ALTER LENGTH.
9. AT REPLACEMENT, REPLACEMENT CABLE MUST BE WIRED ON END AT P854 AS SHOWN AND MODIFIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS FOR CORRECT PHASING WITH UNDERSIDE MOUNTED LOOP AND ADF SENSE ANTENNA.
10. ALL INDUCTORS ARE SAME VALUE (0.2 MICROHENRIES).

Figure 2-1. Automatic direction finder interconnection wiring diagram

cable connected between the two harness connectors feeds loop antenna r-f signals from the ADF indicator to the ADF receiver.

2-7. DESCRIPTION OF ADF SENSE ANTENNA.

The ADF sense antenna (21, fig. 1-3) receives incoming radio signals which are used to produce an audio output. Also, the sense antenna input is added to the loop antenna input to obtain pointing modulation. The ADF sense antenna is a modified Antenna Specialists Products ASP-3-BL whip antenna. It is mounted fore-and-aft on the ADF sense/vhf nav antenna bracket at the center underside of the fuselage structure. A nut and washer secure the antenna base to an aluminum plate and phenolic insulator on the forward side of the antenna bracket with the antenna rod element extending aft through a grommet in the aft side of the antenna bracket. The grommet, phenolic insulator and three nylon flanged washers electrically isolate the antenna element from the metal antenna bracket. The sense antenna has an over-all length of 60 inches, including the antenna base. The ADF sense antenna cable, a part of the ADF 369H90067-31/51 wire harness assembly, connects to the antenna base at the forward side of the antenna bracket. Clips, clamps and other miscellaneous hardware furnish attachment for the ADF sense antenna cable at various routing locations. A thermoplastic fairing is secured to the fuselage underside with sponge rubber seal with adhesive backing and screws and washers, over the antenna bracket. When the helicopter is also equipped with a vhf navigation antenna installation, a vhf navigation antenna is secured to the underside of the antenna bracket.

2-8. DESCRIPTION OF NOISE FILTERS. The two noise filters (FL100 and FL101) (7 and 16, fig. 1-3) are sealed and potted L-C devices used to filter out inductive noise which could affect operation of the ADF. FL100 is installed in series in the dc power input line to the gyro system. FL101 is installed in series in the dc power input line to the strobe light.

2-9. REFERENCE DATA. Information on helicopter components that interface with the ADF system is in HMI - Vol 1 and 369D - IPC. For information on associated optional avionics equipment used with the ICS system, refer to the applicable Opt Eqpt Manual for that specific equipment (Section 21, HMI - Vol 1).

2-10. TROUBLESHOOTING. If the ADF system does not operate properly during operational check or normal use, refer to table 2-1 for aid in locating the probable trouble and for corrective action. Refer to the ADF wiring diagram (fig. 2-1)

for aid in troubleshooting. If troubleshooting indicates that the trouble is in the ADF indicator or the ADF receiver, refer to the manufacturer's publication (table 2-2, HMI - Vol 1) for unit troubleshooting and corrective action.

NOTE: ADF audio is reproduced by components of the integrated interphone communication system (ICS) which, in itself, may be the source of ADF audio trouble. When ADF audio malfunction is encountered, refer to the ICS Opt Eqpt Manual (table 2-21, HMI - Vol 1) for troubleshooting procedures for that portion of ADF audio circuitry.

2-11. OPERATIONAL CHECK. The following procedure is used to verify the capability of the ADF system to function properly. The procedure should be performed anytime a malfunction is suspected, and prior to normal use after repair.

a. Position the helicopter on a compass rose. Using a strong station in the 200 kHz to 415 kHz band, obtain ADF bearings for increments of 15 degrees beginning with the helicopter on a 0 degree heading. Make quadrantal error corrections, if necessary. The combined error should not exceed ± 5 percent.

b. Verify that the ADF audio is present and that sufficient volume adjustment is available.

2-12. ALIGNMENT. Refer to the manufacturer's publication (table 2-2, HMI - Vol 1) for instruction for aligning the ADF system.

2-13. INSPECTION. Inspect components of the ADF system in accordance with FAA AC 43.13-1A and standard avionics maintenance practices, and the following:

a. Inspect all components for obvious physical damage, corrosion and evidence of electrical overheating.

b. Inspect the ADF indicator and ADF receiver for loose or missing control knobs, damaged or obscured markings, and loose or damaged connectors.

c. Inspect the wire harness assembly and loop antenna cable for cuts and other damage, loose connectors or connecting hardware, and frayed insulation.

d. Inspect the noise filters for case damage and loose terminals.

2-14. REPLACEMENT OF KI 225 INDICATOR.

CAUTION: Check that all electrical power is OFF.

a. Remove instrument panel side fairings (Section 17, HMI - Vol 1).

Table 2-1. Troubleshooting

Symptom	Probable Trouble	Corrective Action
No audio in either ADF or BFO mode and indicator inoperative.	ADF circuit breaker (1, fig. 1-1) not ON.	Set circuit breaker to ON.
	No d-c power on helicopter main bus.	Refer to Section 19, HMI - Vol 1.
	Disconnected or defective wire harness assembly.	Connect or repair wire harness assembly.
ADF circuit breaker trips.	Overload or short circuit in ADF receiver	Repair or replace ADF receiver.
	Overload or short circuit in ADF indicator.	Repair or replace ADF indicator.
	Resistor R-85 (24, fig. 1-3) defective.	Replace resistor.
Erroneous bearing indication, audio OK.	ADF system out of alignment.	Align ADF system (para 2-12).
	Defective ADF indicator.	Repair or replace ADF indicator.
	Defective or damaged ADF loop antenna.	Repair or replace ADF loop antenna.
	Disconnected or defective loop antenna cable.	Connect or repair loop antenna cable.
No ADF audio, bearing indication OK.	ADF system out of alignment.	Align ADF system (para 2-12).
	Defective ADF receiver.	Repair or replace ADF receiver.
	Defective ADF sense antenna lead-in wire.	Repair or replace sense antenna ADF lead-in wire.
No ADF audio, bearing indication incorrect, power OK.	Defective ADF receiver.	Repair or replace ADF receiver.
ADF audio weak, not adjustable to satisfactory level with AUDIO control.	ADF receiver audio potentiometer incorrectly adjusted.	Adjust ADF receiver audio potentiometer (para 2-18).

- b. Remove attaching parts (2 thru 8, fig. 1-1) and remove hood (9).
- c. Disconnect two connectors at rear of indicator (20).
- d. Remove attaching parts and remove indicator.
- e. Install the replacement indicator in reverse order of removal.

2-15. REPLACEMENT OF KR 85 ADF RECEIVER.

- a. Check that all electrical power is OFF.
- b. Remove instrument panel side fairings (Section 17, HMI - Vol 1).
- c. Remove attaching parts (2 thru 8, fig. 1-1) and remove hood (9).
- d. Disconnect connector at rear of receiver (27).
- e. Remove attaching parts (21, 22, 23) and remove clamp (24) and filler (25).
- f. Remove screws (26), then carefully withdraw receiver through front of instrument panel.
- g. Install the replacement receiver in reverse order of removal.

2-16. REPLACEMENT OF LOOP ANTENNA CABLE.

- a. Check that all electrical power is OFF.
- b. Remove instrument panel side fairings (Section 17, HMI - Vol 1).
- c. Disconnect loop antenna cable connector at rear of indicator (20, fig. 1-1).
- d. Gain access to pilot's underfloor compartment (Section 2, HMI - Vol 1).
- e. Remove loop antenna terminal box attaching parts.
- f. Disconnect and remove loop antenna cable. Retain spacer washers and rubber gasket for reinstallation of cable.
- g. Install replacement loop antenna cable in reverse order of removal.

2-17. REPLACEMENT OF KA 42 ADF LOOP ANTENNA.

- a. Gain access to the pilot's underfloor compartment (Section 2, HMI - Vol 1).
- b. Remove loop antenna terminal box attaching parts and disconnect loop antenna cable. Retain spacer washers and rubber gasket for reconnection of cable terminal box.
- c. Remove loop antenna attaching parts and remove loop antenna.
- d. Install replacement loop antenna in reverse order of removal. Check that the arrow on the antenna is pointing to the forward end of the helicopter, and that the antenna cable wiring is connected for proper phasing. Refer to the manufacturer's publication (table 2-2, HMI - Vol 1).

2-18. ADJUSTMENT. If the volume of the ADF audio can not be adjusted to a satisfactory level by use of the volume control on the ADF receiver, and the trouble is not in the integrated interphone communication system (ICS), adjust the volume potentiometer in the ADF receiver in accordance with the instructions in the manufacturer's publication (table 2-2, HMI - Vol 1).

2-19. REPAIR. Refer to Section 19 of HMI - Vol 1 for electrical repair instructions. Replace damaged cable clips and other attaching hardware with new parts. When a malfunction occurs in the ADF indicator or ADF receiver, replace parts found to be defective by the troubleshooting procedures provided in the manufacturer's publication (table 2-2, HMI - Vol 1). Align the ADF system, if necessary, in accordance with the manufacturer's publication.

2-20. WIRING DIAGRAM. See figure 2-1 for the ADF system interconnection wiring diagram.

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