

Illustrated Parts List and Maintenance Instructions

FOR

AUTOMATIC DIRECTION FINDER (KR 86)
Part No. 369H90056 Basic and
369H90056-501

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 86 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 86 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 86 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 1

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 369H90056 Automatic Direction Finder (KR 86) 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.

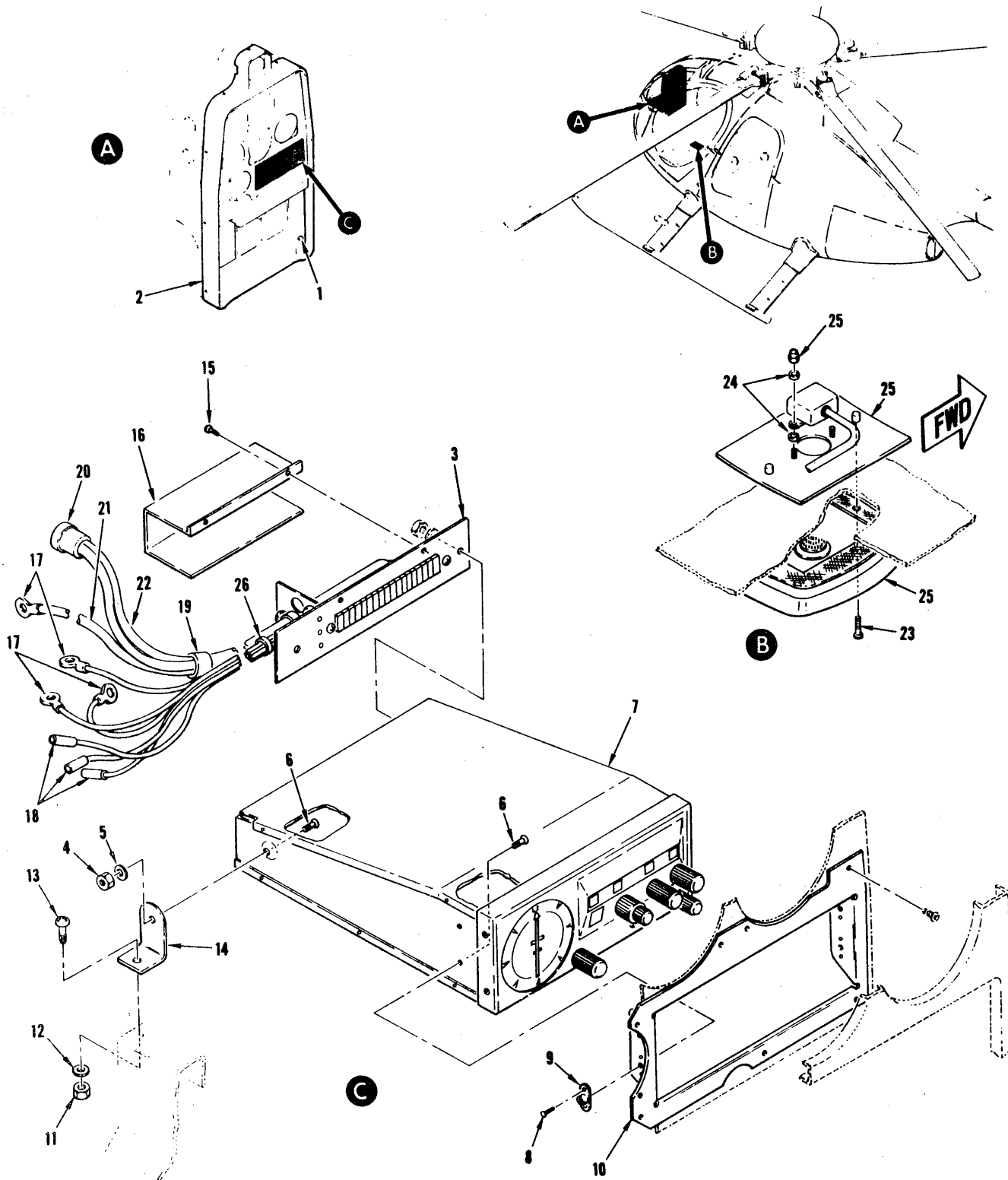


Figure 1-1. KR 86 automatic direction finder

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY
1-1-	369H90056	KR 86 AUTOMATIC DIRECTION FINDER SYSTEM INSTL EQPT	1
	369H90056-501	KR 86 AUTOMATIC DIRECTION FINDER SYSTEM PROVISIONS	1
-1	2TC13-2	. CIRCUIT BREAKER	1
-2	369H6423-505	. HOOD	1
	369H90056-21	. HARNESS ASSY	1
	KR 86	. AUTOMATIC DIRECTION FINDER SYSTEM EQPT (NHA 369H90056)	1
	369H90056-31	. MISCELLANEOUS PARTS	1
-3	200-0523-01	. . RACK CABLE PLATE ASSY (NHA 369H90056-21) . . .	1
-4	MS21042-08	. . NUT (NHA 369H90056 and 369H90056-501)	2
-5	AN960PD8L	. . WASHER (NHA 369H90056 and 369H90056-501)	2
-6	NAS623-2-1	. . SCREW (NHA 369H90056 and 369H90056-501)	6
-7	050-1308-03	. KR 86 AUTOMATIC DIRECTION FINDER RECEIVER (NHA KR 86)	1
-8	MS20426AD3	. . RIVET	8
-9	MS21076-108	. . NUTPLATE	4
-10	369H90056-3	. . PLATE	1
-11	MS21042-08	. NUT (NHA 369H90056 and 369H90056-501)	1
-12	AN960PD8L	. WASHER (NHA 369H90056 and 369H90056-501)	2
-13	MS51957-43	. SCREW (NHA 369H90056 and 369H90056-501)	2
-14	369H90056-5	. ANGLE (NHA 369H90056 and 369H90056-501)	2
-15	089-5899-03	. SCREW (NHA 369H90056-31)	3
-16	047-2686-01	. SHIELD (NHA 369H90056-31)	1
-17	MS25036-102	. LUG (NHA 369H90056-21)	4
-18	MPCM22M-HI	. HYTIP (NHA 369H90056-21)	3
-19	D121	. SLEEVE (NHA 369H90056-21)	6
-20	03-1046-08	. CONNECTOR (P101) (NHA 369H90056-21)	1
-21	200-0447-00	. SENSE CABLE ASSY (NHA KR 86)	1
-22	200-0446-00	. LOOP CABLE ASSY (NHA 369H90056-31)	1
-23	NAS1351C4-20	. SCREW (NHA 369H90056 and 369H90056-501)	2
-24	AN960C10	. WASHER (NHA 369H90056 and 369H90056-501)	2
-25	071-1006-11	. KA 42 LOOP ANTENNA (NHA KR 86)	1
-26	MS17821-1-9	. TIE STRAP (NHA 369H90056-21)	AR

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SECTION 2

MAINTENANCE INSTRUCTIONS

2-1. GENERAL INFORMATION. The KR 86 automatic direction finder (ADF) homes on selected ground radio stations to provide accurate bearing information for helicopter navigation. It consists of a KR 86 receiver with integral vhf omnirange (VOR) indicator, KA 42 loop antenna, wire harness assembly which includes the loop antenna cable and sense antenna cable, and attaching hardware. The sense antenna cable connects to the 369H90146-503 (ASP-3-BL) whip antenna which is already installed in the helicopter. The KR 86 receiver consists of the enclosed receiver unit and a rack cable plate assembly which mounts on the rear of the unit. The ADF system is powered by +28 vdc from the helicopter main bus, supplied through the 2-ampere ADF circuit breaker (CB107) (1, fig. 1-1) on the instrument panel. This manual provides maintenance instructions for the ADF system. For maintenance information pertaining to the KR 86 receiver, refer to the manufacturer's publication (table 2-12, HMI - Vol 1).

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 86 RECEIVER. The KR 86 receiver (7, fig. 1-1) is a digitally-tuned solid state receiver which operates within the 200 kHz-to-1750 kHz frequency range. The receiver is flush mounted in the helicopter instrument panel. Three rotary switches on the receiver front panel are used to select the operating frequency (in 1 kHz increments) and the selected frequency is shown on a four-digit display. The TEST/ADF two-position rotary switch is used to select the test of ADF mode of operation. The OFF/VOL rotary switch is used to turn the ADF on, and to adjust the ADF audio to a comfortable level. The receiver supplies signals to the ADF indicator, flush mounted on the front panel of the receiver, to position a pointer to indicate the direction of the station

from which the signal is received. The HDG/TEST control is used to manually position the heading card in the face of the indicator. The rack cable plate assembly (3, fig. 1-1) contains a voltage converter which converts the +28 vdc supplied to the receiver to +13.75 vdc at 0.5 ampere, maximum. For additional description and theory of operation, refer to the manufacturer's publication (table 2-12, HMI - Vol 1).

2-3. DESCRIPTION OF WIRE HARNESS ASSEMBLY. The 369H90056-21 wire harness assembly consists of a loop antenna cable, sense antenna cable, five interconnecting wires, two connectors, miscellaneous parts, and the rack cable plate assembly. The wiring diagram for the wire harness assembly is shown in figure 2-1. The receiver ends of the cables and wires are connected to connector P101 which is part of rack cable plate assembly (3, fig. 1-1). The wire harness assembly interconnects the ADF receiver loop antenna, sense antenna, light dimming circuit, and ICS audio circuits.

NOTE: Wire connections at connector P104 must be as shown in figure 2-1 for proper phasing of loop antenna input signals.

2-4. DESCRIPTION OF KA 42 ADF LOOP ANTENNA. The KA 42 ADF loop antenna (25, fig. 1-1) 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 receiver via the 200-0446-00 loop antenna cable.

2-5. DESCRIPTION OF ADF SENSE ANTENNA. The ADF sense antenna receives incoming radio signals which are used to produce an audio output. Also, the sense antenna input is added to the loop

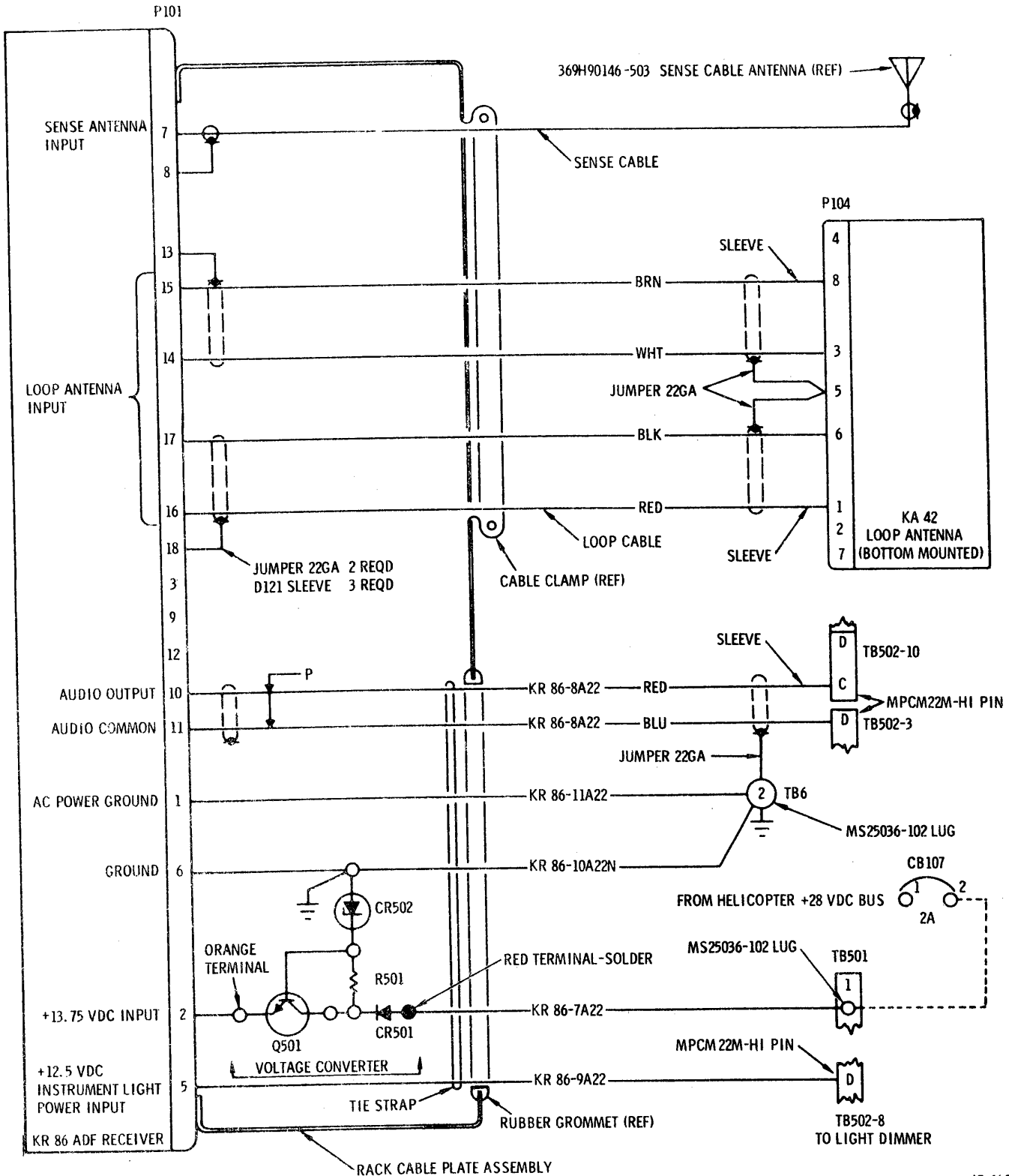


Figure 2-1. KR 86 automatic direction finder (ADF) and interphone communication system (ICS) electrical interface

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 ADF sense antenna cable, a part of the 369H90056-21 wire harness assembly, connects to the antenna base at the forward side of 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.

2-6. 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).

2-7. 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 (Section 21, HMI - Vol 1) for troubleshooting procedures for that portion of ADF audio circuitry.

2-8. 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. With other avionics systems operating, verify that ADF system operation is not affected by emission interference from other systems nor affects operation of other systems.
- b. Using distant stations which are known to provide approximately the same signal conditions which would be experienced at the distances shown below, verify that the tone audio identification

of each station to which the receiver is tuned is intelligible.

<u>Facility</u>	<u>Range</u>
Compass Locators	15 Nautical miles
Transmitters 100-200 watts	50 Nautical miles
Transmitters 200-400 watts	60 Nautical miles
Transmitters over 400 watts	75 Nautical miles

c. 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.

2-9. ALIGNMENT. Refer to the manufacturer's publication (table 2-2, HMI - Vol 1) for instruction for aligning the ADF system.

2-10. 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 receiver for loose or missing control knobs, damaged or obscured markings, and loose or damaged connector.
- c. Inspect the wire harness assembly for cuts and other damage, loose connectors or connecting hardware, and frayed insulation.

2-11. REPLACEMENT OF KR 86 ADF RECEIVER.

- a. Check that all electrical power is OFF.
- b. Remove instrument panel side fairings (Section 17, HMI - Vol 1).
- c. Remove hardware that attaches hood (2, fig. 1-1) and remove hood.
- d. Remove rack cable plate assembly (3) being careful to avoid damaging connector.
- e. Remove nuts (4), washers (5), and screws (6), then remove ADF receiver (7).
- f. Do not remove plate (10) unless damaged.
- g. Do not remove angles (14) unless damaged.
- h. Install the replacement receiver in reverse order of removal.

2-12. 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.
- c. Remove screws (23, fig. 1-1) and remove loop antenna (25). Retain spacer washers and rubber gasket for reconnection of cable terminal box.

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.
	Incorrect operating voltage due to faulty voltage converter.	Replace defective zener diode CR502 or transistor Q501, as required.
ADF circuit breaker trips.	Overload or short circuit in ADF receiver.	Repair or replace ADF receiver.
	Overload or short circuit in wire harness assembly.	Repair or replace ADF wire harness assembly.
Erroneous bearing indication, audio OK.	ADF system out of alignment.	Align ADF system (para 2-9).
	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 2-9).
	Defective ADF receiver.	Repair or replace ADF receiver.
	Defective ADF sense antenna cable.	Repair or replace sense antenna ADF cable.
No ADF audio, bearing indication incorrect, power OK.	Defective ADF receiver.	Repair or replace ADF receiver.

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 wiring diagram (fig. 2-1) and the manufacturer's publication (table 2-2, HMI - Vol 1).

2-13. ADJUSTMENT. If the ADF indicator has a slight error in pointer position, adjust the position of the goniometer shield to compensate for the error in accordance with the instructions in the manufacturer's publication (table 2-2, HMI - Vol 1).

2-14. 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 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.

2-15. WIRING DIAGRAM. See figure 2-1 for the ADF system interconnection wiring diagram.

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