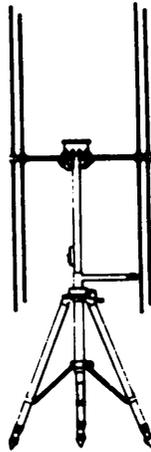
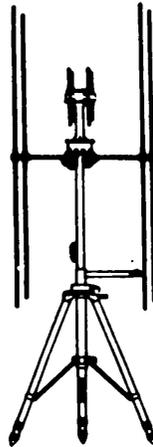


TECHNICAL MANUAL  
**OPERATOR'S, ORGANIZATIONAL,  
DIRECT SUPPORT AND GENERAL SUPPORT  
MAINTENANCE MANUAL**



**DIRECTION FINDER ANTENNA AS-3732/PRD-11  
(NSN 5865-01-165-4578)**



**AND  
DIRECTION FINDER ANTENNA AS-3733/PRD-11  
(NSN 5820-01-200-0177)**

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## SAFETY SUMMARY

These general precautions should be followed whenever working with electronic equipment to prevent injury to personnel.

- Do not work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
- Whenever possible, turn off the power supply to the equipment before beginning maintenance on the equipment.
- Do not remove the protective covers to the equipment unless you are authorized to do so.
- When the technicians are aided by operators, they must be warned about dangerous areas. Aperiodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended.
- Seek advice from your supervisor whenever you are in doubt about electrical safety conditions.
- For Artificial Respiration, refer to FM 21-11.

Extreme caution must be exercised when working with or around the antenna mast. Careless or inattentive operation of the antenna mast and accessories can lead to personal injury and damage to the antenna mast machinery or lofted payload. The following precautions must be observed at all times. Other safety factors are defined at applicable parts of the operating and maintenance instructions.

- Electrical Hazard: Avoid overhead obstacles. Keep the antenna mast away from electric high power lines and telephone lines.
- Antenna Mast Sections: Keep articles of clothing and hands and feet away from the antenna mast. Under no circumstances can antenna mast be climbed.
- Guy Line Hazard: When moving around the operational site, be alert to guying anchors and guy line placement.

## PROPRIETARY STATEMENT

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TM 11-5895-1227-14-4

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TECHNICAL MANUAL  
NO. 11-5895-1227-14-4

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC, 15 February 1988

Operator's, organizational,  
Direct Support and General Support  
Maintenance Manual

**DIRECTION FINDER ANTENNA AS-3732/PRD-11  
(NSN 5865-01-160-4411)  
AND  
DIRECTION FINDER ANTENNA AS-3733/PRD-11  
(NSN 5820-01-200-0177)**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of away 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 direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, N.J 07703-5000. A reply will be furnished direct to you.

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## SECTION O

### INTRODUCTION

#### 0.1 **SCOPE**

##### 0.1.1 **TYPE OF MANUAL**

This is an Operator's, Organizational, Direct Support and General Support Maintenance commercial manual.

##### 0.1.2 **MODEL NUMBERS AND EQUIPMENT NAMES**

The Direction Finder Antennas, AS-3732/PRD-11 and AS-3733/PRD-11 are separate antennas that can be used with the Radio Receiver Direction Finder Set, AN/PRD-11. The other units of the direction finder set include the Receiver, AN/GRR-8(V), the Processor Display Control, C-11495/PRD-11 and the Panoramic Indicator IP-1355/GRR-8(V). In this manual, the AS-3732/PRD-11 Direction Finder Antenna will be referred to as the WJ-9880A DF Antenna. The receiver will be referred to as the WJ-8640 Series Manpack Receiver and the processor display control will be referred to as the WJ-8975A Direction Finder. A complete cross reference of common equipment names and nomenclatures used in this manual is provided in **paragraph 0.7**.

##### 0.1.3 **PURPOSE OF EQUIPMENT**

The Direction Finder Antennas collect radio frequency (rf) signals between 20 and 175 MHz with a low bay section and 20 and 850 MHz rf signals with a high bay section. The antennas also receive electrical signals from the WJ-8975 Direction Finder which activates antenna elements in sequence for the process of obtaining a bearing on a transmitted signal.

#### 0.2 **CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS**

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

#### 0.3 **MAINTENANCE FORMS, RECORDS AND REPORTS**

##### 0.3.1 **REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT**

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

**0.3.2 REPORT OF PACKAGING AND HANDLING DEFICIENCIES**

Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73 B/AFR 400-54/MCO 4430.3H.

**0.3.3 DISCREPANCY IN SHIPMENT REPORT (DISREP) (SF 361)**

Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

**0.4 DESTRUCTION OF ARMY ELECTRONICS MATERIEL**

Destruction of Army electronic materiel to prevent enemy use shall be in accordance with TM 750-244-2.

**0.5 ADMINISTRATIVE STORAGE**

Disassembly and repacking of equipment for shipment or limited storage are covered in Section II.

**0.6 TOOLS AND TEST EQUIPMENT**

Test equipment required for troubleshooting and maintenance of the direction finder antennas is listed in paragraphs 4.5 and 5.7.

**0.7 OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS**

The list below will help you identify the official nomenclature of the major equipment items used with the direction finder antennas. It also provides the common name used in the manual when it is different from the official nomenclature. Official nomenclature must be used when completing forms or when looking up technical manuals.

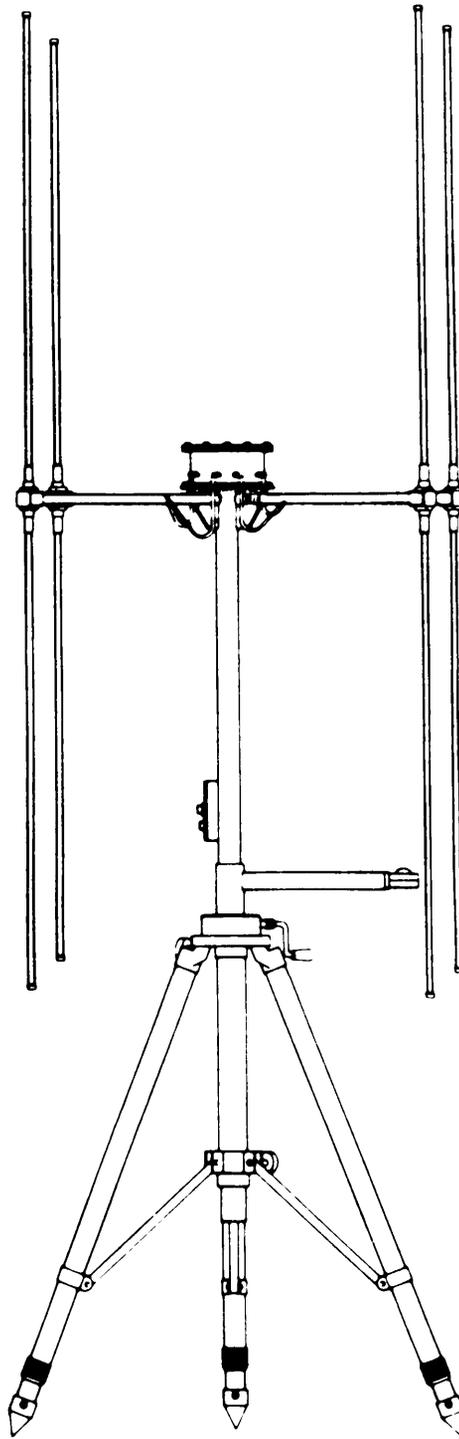
Common Name	Official Nomenclature
Direction finder antenna  Direction Finder, WJ-8975A  Manportable Vehicular Direction Finding System Manpack Receiver, WJ-8640 Signal Monitor, WJ-9180-1	Antenna, Direction Finder, AS-3732/PRD-11 or Antenna, Direction Finder, AS-3733/PRD-11 Processor Display Control, C-11495/PRD-11 Radio Receiver Direction Finder Set, AN/PRD-11 Receiver, AN/GRR-8(V) Indicator, Panoramic, IP-1355/GRR-8(V)

**0.8            REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS**

If your **DF Antenna** needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communication-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000. We'll send you a reply.

**0.9            WARRANTY INFORMATION**

The **DF Antenna** is warranted by Watkins-Johnson Company for a period of 1 year following delivery. It starts on the date found in block 23, DA Form 2408-9, in the logbook. This warranty may contain repair restrictions. Report all defects in material or workmanship to your supervisor.



**Figure 1-1. WJ-9880A Direction Finder Antenna**

## SECTION I

### GENERAL DESCRIPTION

#### 1.1 ELECTRICAL CHARACTERISTICS

The WJ-9880A Direction Finder Antenna is designed to be used in conjunction with the Watkins-Johnson Company's Manportable/Vehicular Direction Finding System. This system includes the WJ-8640 Series Manpack Receiver, the WJ-8975A Direction Finder, and tie WJ-9180 Series Signal Monitor. The WJ-9880A DF Antenna provides bearing information for signals received in the band of 20 to 175 MHz.

#### 1.2 MECHANICAL CHARACTERISTICS

The WJ-9880A Direction Finder Antenna was designed for fixed site or vehicular operation. The WJ-9880A DF Antenna has been ruggedized to withstand the most severe environmental conditions.

An adjustable tripod comes with the WJ-9880A DF Antenna to provide support and ease of transportation. Vertical elevation of the WJ-9880A DF Antenna is accomplished by means of a crank assembly located on the tripod. To transport the DF Antenna to another site, the tripod disconnects from the antenna with a turn of the thumbscrews. The antenna elements unscrew 1/4 turn from the antenna and the arms fold down toward the antenna mast. The tripod also folds down. If the WJ-9880A DF Antenna must be stored, storage space can be minimized by folding the antenna and the tripod.

All connectors needed to connect the WJ-9880A DF Antenna with the Manportable/Vehicular Direction Finding System are located on the antenna mast. Refer to **Table 2-1** for connector nomenclature. A compass is supplied with the WJ-9880A DF Antenna to provide accurate alignment of magnetic north for signal bearing coordinates.

#### 1.3 EQUIPMENT SUPPLIED

The equipment supplied with the WJ-9880A DF Antenna includes an adjustable tripod, a standard compass (MIL-C-10436), and 50 foot RF cables.

#### 1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

The WJ-9880A Direction Finder Antenna works in conjunction with the ManPortable/Vehicular Direction Finding System. This system includes:

- 1) WJ-8975A Direction Finder
- 2) WJ-8640 Series Manpack Receiver
- 3) WJ-9180 Series Signal Monitor (optional)
- 4) The Antenna Control Cable (part of WJ-8975A equipment)

**Table 1-1. WJ-9880A DF Antenna Specifications**

Frequency Range: .....	20-175 MHz
Vertical Angle Coverage: .....	±300
Environmental Limits:	
Wind .....	100 mph*
Ice .....	1/4 inch radial dimension, maximum
Operating Size**: .....	The antenna height is 67.53 inches nominal, above the base. The antenna is 39.5 inches in diameter. The antenna weighs 14 lbs., nominal.
Storage Size: .....	The folded down antenna measures 35 inches in height, with a diameter of 7.25 inches.

\* Per instructions in **paragraph 2.2**. For more information, contact the Watkins-Johnson Company, CEI Division, Gaithersburg, Maryland.

\*\* The height measurements for the antenna exclude the adjustable tripod which extends to a maximum of seventy-six inches. When retracted, the tripod measures thirty-nine inches. The tripod weighs 10 lbs., nominal.

**SPECIFICATIONS NOTE**

The specifications and the design of the type WJ-9880A Direction Finder Antenna as indicated in the preceding table are subject to change in accordance with modification improvements.

## SECTION II

### INSTALLATION AND OPERATION

#### 2.1 UNPACKING AND INSPECTION

Examine the shipping carton for damage before unpacking the equipment. If the carton appears to be damaged, have the carrier's agent present when the equipment is unpacked. If this is not possible, retain all packaging material and shipping containers for the carrier's inspection to verify damage to the equipment after unpacking. Also verify that the equipment shipped corresponds to the packing slip. Contact the Watkins-Johnson Company, CEI Division or your Watkins-Johnson representative for any discrepancies or shortages.

#### 2.2 INSTALLATION

To install the WJ-9880A DF Antenna, the following procedure should be followed. **Table 2-1** outlines the connectors located on the antenna mast.

For field operation, the tripod must beset firmly on the ground. Extend the legs of the tripod to obtain a vertical position. (If the center column of the tripod is one or two degrees from true vertical, this will not cause any significant error.) Once vertical position is obtained, make sure the legs of the tripod are pressed firmly into the ground. Before installing the WJ-9880A DF Antenna on the tripod, wind conditions must be observed. Once the location site for the antenna is determined, verify what direction the wind is coming from. If one leg of the tripod faces with the wind, a maximum wind speed of 30 mph can be accommodated. If one leg of the tripod faces with the wind, a maximum wind speed of 45 mph can be accommodated. The above figures represent a safety factor in which the antenna mounted on the tripod will not upset due to high wind speeds. Variable wind speeds and directions require extra support such as guy wires. In order to guy the tripod, wind speed and tripod height must be determined. If the tripod's center column is not elevated, the antenna mounted on the tripod can withstand wind speeds up to 100 mph, providing the guy wires are 45° or more from the center column. If the tripod is used to the maximum extended height, wind speeds up to 80 mph can be withstood, providing the guy wires are 45° or more from the center column. Place the WJ-9880A DF Antenna on the tripod. Unlock the arms of the WJ-9880A DF Antenna by pulling the knurled bolt outward. Once unlocked, swing the arms away from the center mast up toward the top of the antenna. When the arms are in place the knurled bolt will snap back into the locked position. Tighten the knurled bolt to lock the arms tight. (Refer to **Figure 2-1** for an outline of the WJ-9880A DF Antenna.) Disassembly is done by unlocking the arms and pushing them down toward the base. With the arms of the antenna locked in the open position, insert the antenna elements and tighten.

#### NOTE

To ease the assembly effort, place the WJ-9880A DF Antenna on the tripod with the arms folded down, insert 4 elements then unlock the arms and install the remaining elements.

With the compass mounted on the base of the antenna, rotate the antenna the compass indicates a northern direction. A black line on the underside of the lower

assembly is the zero degree reference. Once the antenna is aligned, tighten the three thumbscrews and remove the compass from the antenna.

2.2.1 **CONNECTOR SIGNALS**

2.2.1.1 **Signal Output (J11)**

This signal output connector is an N-Type. It is used for lower frequency coverage of 20 to 175 MHz. It provides the RF signal to the receiver.

2.2.1.2 **Antenna Switch (J10)**

The antenna switch connector is a multipin type. This connector provides signals to the antenna switch from the WJ-8875A Direction Finder for commutation of the dipoles.

**Table 2-1. Type WJ-9880A DF Antenna Connectors**

Connector Number	Connector Nomenclature	Connector Function
J19	SIGNAL OUTPUT	Provides RF signals in the 20 to 175 MHz range.
J10	ANTENNA SWITCH	Accepts signals from the WJ-8975A Direction Finder for Commutation of the dipoles.

2.3 **EQUIPMENT MALFUNCTIONS**

The WJ-9880A Direction Finder Antenna was thoroughly inspected and adjusted for optimum performance prior to shipment. If any malfunctions are encountered after performing the recommended installation procedures, verify that the correct signals are present at the proper jacks. The schematic diagrams in **Section IV** will aid the maintenance and troubleshooting of the unit. To avoid possible voiding of the warranty prior to taking any corrective maintenance action, contact your Watkins-Johnson representative or the Watkins-Johnson Company, CEI Division, Gaithersburg, Maryland.

2.4 **OPERATION**

The following step by step operational description of the WJ-9880A Direction Finder Antenna coincides with the Manportable/Vehicular Direction Finding System.

1. Set up the tripod to a vertical position and mount antenna onto tripod. (Refer to **paragraph 2-2** on installation instructions.)
2. Connect multipin control cable to the Antenna Switch (J10) on the antenna and to the DF ANT CONTROL (J4) on the WJ-8975A.

3. Connect the RF signal cable from the Signal Output from the Signal Output (J11) (for 20 to 175 MHz operation) on the WJ-9880A DF Antenna to the RF INPUT (J1) connector on the WJ-8640 Series Manpack Receiver.
4. Connect a cable from the SM OUTPUT (J2) connector on the WJ-8640 Series Manpack Receiver to the DF INPUT (J1) on the WJ-8975A Direction Finder.
5. If the signal is to be monitored, connect a cable from the SM OUTPUT (J2) of the WJ-8975A Direction Finder to the SM INPUT (J3) on the WJ-9180 Series Signal Monitor (optional).
6. Energize all equipment.
7. Set the WJ-8975A Direction Finder's Function Switch (S4) to CAL. If the (BAND Select) (S2) is in the 80-250 MHz setting, the 3 digit display will read 0°. If the 20-80 MHz/250-500MHz setting is used, the 3 digit display will read 180°. If the reading is not as indicated above, use the zero adjust to compensate.
8. Tune the desired Frequency on the WJ-8640 Series Manpack Receiver and determine the proper bandwidth for the clearest and strongest reception. Set the same bandwidth on the WJ-8975A Direction Finder via IF BANDWIDTH (S6). Also set the same BAND select.

#### **NOTE**

The IF BANDWIDTH and the BAND Select Switches must be set the same on both units. Failure to do this may cause an error of 180°.

#### 2.5 **PREPARATION FOR RESHIPMENT**

If the unit must be prepared for reshipment, the packaging methods should follow the patterns established in the original shipment. If retained, the original materials can be reused to a large extent or at least provide guidance for repacking.



**SECTION III**  
**REPLACEMENT PARTS LIST**

3.1        **UNIT NUMBERING METHOD**

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules) and parts. An example of the unit numbering method follows:

<u>Subassembly Designation A1</u>	<u>R1 Class and No. of Item</u>
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

3.2        **REFERENCE DESIGNATION PREFIX**

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Reference Designation Prefixes are provided on drawings and illustrations in parenthesis within the figure titles.

3.3        **LIST OF MANUFACTURERS**

<u>Mfr. Code</u>	<u>Name and Address</u>	<u>Mfr. Code</u>	<u>Name and Address</u>
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878	73899	JFD Electronics Co. 15th at 62nd Street Brooklyn, NY 11219
16179	Omni-Spectra, Inc. 24600 Hallwood Ct. Farmington, MI 48024	75042	TRW Electrnc. Components IRC Fixed Resistors 401 North Broad Street Philadelphia, PA 19108
28480	Hewlett-Packard Co. Corporate Headquarters 1501 Page Mill Road Palo Alto, CA 94304	77820	Bendix Corporation The Electrical Comp. Div. Sherman Avenue Sidney, NY 13838
72982	Erie Tech. Products Inc. 644 West 12th Street Erie, PA 16512	80058	Military Specifications

<u>Mfr. Code</u>	<u>Name and Address</u>	<u>Mfr. Code</u>	<u>Name and Address</u>
89110	AMP, Inc. 155 Park Street Elizabethtown, PA 17022	99800	American Precision Industries Delevan Electronics Division 270 Quaker Road East Aurora, NY 14052
95077	Solitron Devices, Inc. Solitron/Microwave Division P.O. Box 278 Port Salerno, FL 33492		

3.4 **PARTS LIST**

The parts list which follows contains all electrical parts used in the equipment and certain mechanical parts which are subject to unusual wear or damage. When ordering replacement parts from the Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation and description of each part ordered. The list of manufacturers provided in **paragraph 3.3** and the manufacturer's part number for components are included as a guide to the user of the equipment in the field. These parts may not necessarily agree with the parts installed in the equipment; however, the parts specified in this list will provide satisfactory operation of the equipment. Replacement parts may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original indicated part. In the case of components defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

**NOTE**

As improved semiconductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

## 3.5 TYPE WJ-9880(A) DF Antenna, (20-175 MHz) MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	RF Switch Assembly	1	794024-1	14632	
J1	Connector, Jack	8	2946-6001	95077	
J2 Thru J8	Same as J1				
J9	Connector, Jack: Type N	2	UG1095AU	80058	
J10	Connector, Receptacle, Multipin	1	JTP02RE-10-98S	77820	
J11	Same as J9				
J12	Antenna Adapter, Socket	8	170049-2	14632	
J13 Thru J19	Same as J11				
MP1	Compass, Magnetic	1	MIL-C-10436	81349	
P1	Connector, Plug, SMA	16	201-2A	16179	
P2	Connector, Plug, SMA	8	521-1	16179	
P3	Same as P1				
P4	Same as P2				
P5	Same as P1				
P6	Same as P2				
P7	Same as P1				
P8	Same as P2				
P9	Same as P1				
P10	Same as P2				
P11	Same as P2				
P12	Same as P1				
P13	Same as P2				
P14	Same as P1				
P15	Same as P2				
P16	Same as P1				
P17	Same as P2				
R1	Resistor, Fixed, Film: 200 $\Omega$ , 1%, 1/4 W	16	RN60D2000F	81349	
R2 Thru R8	Same as R1				
U1	Antenna Element	8	794210-2	14632	
U2 Thru U8	Same as U1				
W1	Cable Assembly	1	270651-1	14632	
W2	Cable Assembly	1	270651-2	14632	
W3	Cable Assembly	1	270651-3	14632	
W4	Cable Assembly	1	270651-4	14632	
W5	Cable Assembly	1	270651-5	14632	
W6	Cable Assembly	1	17300-197-1	14632	

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
W7	Cable Assembly	1	270651-6	14632	
W8	Cable Assembly	1	270651-7	14632	
W9	Cable Assembly	1	270651-8	14632	

3.5.1 TYPE 794024-1 RF SWITCH

REF DESIG PREFIX AI

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Antenna Switch	1	370094-1	14632	
FL1	Filter, RFI: 3000 pF, 50 VDC/35 VAC	8	51-744-002	33095	
FL2 Thru FL8	Same as FL1				
J1	Connector, Receptacle: SMA Series	8	2052-1658-02	26805	
J2 Thru J8	Same as J1				
T1	Antenna Balun	1	841016	14632	

3.5.2.1 Part 370094-1 Antenna Switch

REP DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 $\mu$ F, 20%, 200 V	2	8131A200Z5U103M	72982	
C2	Same as C1				
CR1	Diode, Pin: 100 PRV, 1 mS	16	5082-3080	28480	
CR2 Thru CR16	Same as CR1				
L1	Coil, Fixed: 3.3 $\mu$ H	2	1025-32	99800	
L2	Same as L1				
R1	Resistor, Fixed, Film: 200 $\Omega$ , 1%, 1/4 W	2	RN60D2000F	81349	75042
R2	Same as R1				
R3	Resistor, Fixed, Film: 750 $\Omega$ , 1%, 1/4 W	8	RN60D7500F	81349	75042
R4 Thru R10	Same as R3				

## SECTION IV

### MAINTENANCE AND SCHEMATIC DIAGRAMS

#### 4.1 FUNCTIONAL DESCRIPTION

Electrical impulses are sent from the Direction Finder to the Direction Finder Antenna turning the switching diodes in the antenna switch assembly on and off. Each switching diode causes the antenna arm circuitry to be turned off and on in a clockwise direction from true north. As the switching diodes are turned on, rf signals, detected by the elements on each antenna arm, flow through the arm circuitry to the receiver through an rf cable.

#### 4.2 PREVENTIVE MAINTENANCE CHECKS AND SERVICES

The WJ-9880A DF Antenna has been designed to operate for long periods of time with little or no routine maintenance operations recommended. The intervals for these operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with the schematic diagrams found in this section. A complete parts list and illustrations showing part location can be found in **Section III**.

#### 4.3 CLEANING AND LUBRICATION

The direction finder antenna should be kept free of dust, moisture, grease, and foreign matter. If available, use low velocity compressed air to blow accumulated dust from the exterior of the unit. A clean, dry cloth, a soft bristled brush, or a cloth saturated with a mild soap solution may also be used. The WJ-9880A direction finder antenna does not need lubrication.

#### 4.4 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the antenna. For this reason, a complete visual inspection should be made at direct support for indication of mechanical and electrical defects whenever the antenna is inoperative. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Mechanical parts should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

#### 4.5 TEST EQUIPMENT REQUIRED

The following instruments, or their equivalents, are required to properly troubleshoot the WJ-9880A DF Antenna:

- 1) Digital Multimeter, AN/PSM-45
- 2) Test Lead Set, Simpson Cat. No. 00577
- 3) Signal Generator, SG-1112
- 4) Cable, RF 50 Ohm, HP 10503A

- 5) RF Voltmeter, Boonton 92C
- 6) High Frequency Probe, Boonton 92-12F

#### 4.6 **TROUBLESHOOTING PROCEDURES**

Troubleshooting efforts should first be directed toward identifying the symptom. The schematic diagrams for the antenna are contained in **Figures 4-1** and **4-2**.

#### 4.7 **ASSEMBLY REMOVAL, REPAIR, AND REPLACEMENT**

The WJ-9880A DF Antenna assemblies are mounted in such a way as to permit easy accessibility/removal. Before the assembly is removed, any cable connections must be resoldered or disconnected. Repair procedures are straightforward and conventional.

##### 4.7.1 **ANTENNA SWITCH (A1)**

The Antenna Switch (A1) can be removed by performing the following steps:

- 1) Using No. 1 Phillips screwdriver remove 8 Phillips screws and lockwashers from top plate of antenna lower bay chassis.

**NOTE**

Mark all cables before disconnecting.

- 2) Using 5/16 open end wrench disconnect 8 cables J1 thru J8.

**CAUTION**

Handle cables with care. Cable ends can be damaged and disconnected from cable through improper handling.

- 3) Pull cables through holes in bottom plate.
- 4) Using No. 1 Phillips screwdriver remove 4 Phillips screws and lockwashers. Phillips screws are located between each pair of coaxial cables.
- 5) Using No. 1 Phillips screwdriver remove 4 Phillips screws and lockwashers located at bottom corners of bottom plate.
- 6) Push up on assembly to separate from mounting plate (rubber gasket may cause difficult separation).
- 7) Using 5/16 open end wrench disconnect RF cable from balun transformer.
- 8) Using 5/16 open end wrench disconnect 8 semi-rigid cables connected to J1 thru J8.
- 9) Using No. 1 Phillips screw driver remove 1 Phillips screw holding cable retaining clamp.

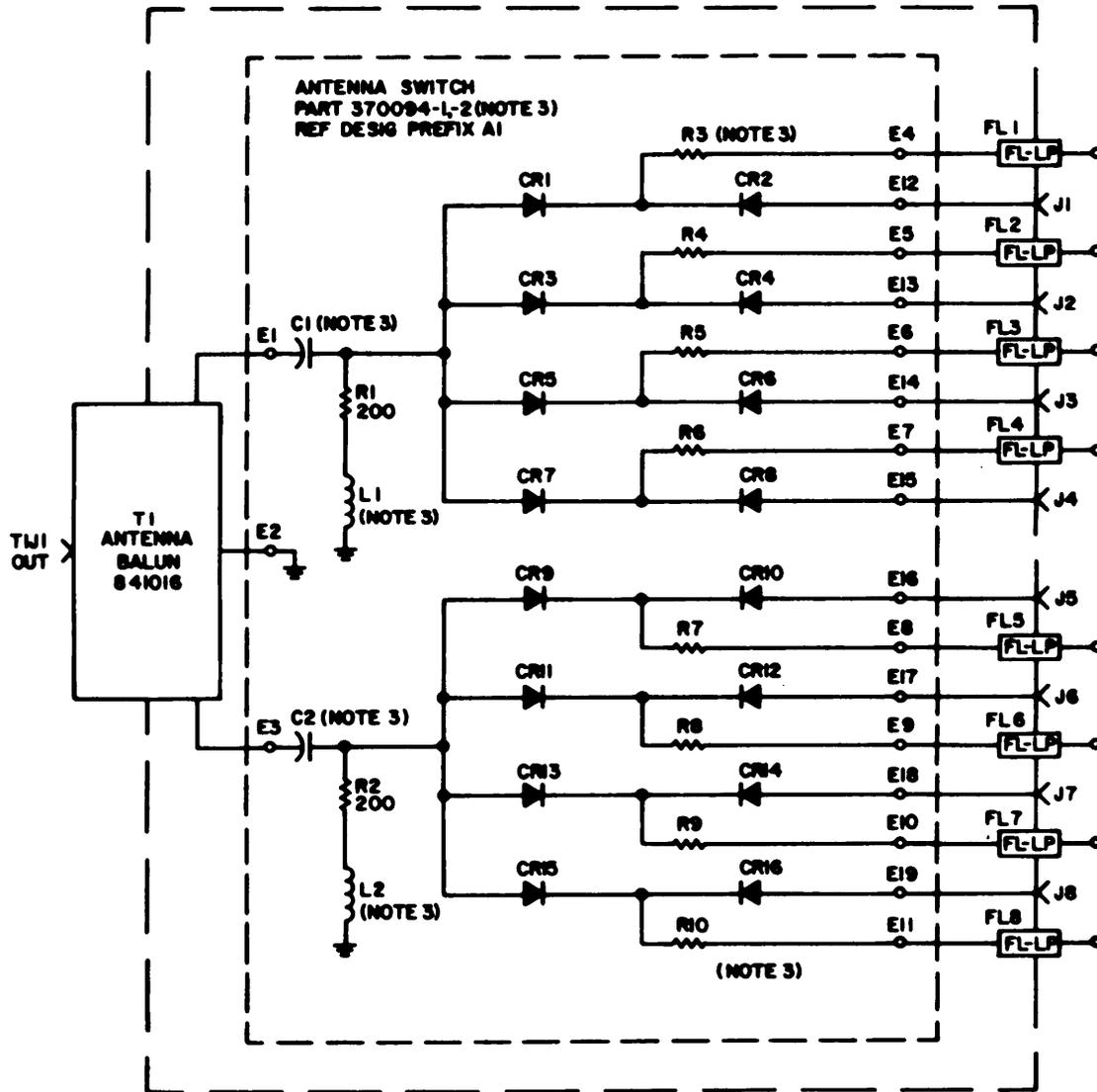
- 10) Using No. 1 Phillips screwdriver remove 4 Phillips screws holding switch assembly to lower bay chassis.
- 11) Using soldering iron, tip (PTA) and solder removal tape desolder switching wires FL1 thru FL8 and ground wire.
- 12) Remove assembly from lower bay chassis.

The Antenna Switch (A1) can be replaced by performing the following steps:

- 1) Replace antenna switch into lower bay chassis.
- 2) Resolder switching wires FL1 thru FL8 to antenna switch using soldering iron, tip (PTA) and solder.
- 3) Replace cable clamp and Phillips screw. Tighten using No. 1 Phillips screwdriver.
- 4) Replace 4 Phillips screws holding switch assembly to lower bay chassis, tighten using No. 1 Phillips screwdriver.
- 5) Reconnect 8 semi-rigid cables to J1 thru J8, tighten 1/4 turn using 5/16 inch open end wrench. Do not over tighten.
- 6) Reconnect RF cable to balun transformer, tighten 1/4 turn using 5/16 inch open end wrench. Do not over tighten.
- 7) Replace assembly and rubber gasket on antenna lower chassis.
- 8) Replace 4 Phillips screws and lockwashers located at bottom corners of bottom plate, tighten using No. 1 Phillips screwdriver.
- 9) Replace 4 Phillips screws and lockwashers located between cable jacks, tighten using No. 1 Phillips screwdriver.
- 10) Replace 8 cables through bottom plate and on to jacks J1 thru J8, tighten 1/4 turn using 5/16 inch open end wrench. Do not over tighten.
- 11) Replace 8 Phillips screws and lockwashers securing top plate to antenna lower bay chassis, tighten using No. 1 Phillips screwdriver.

#### 4.7.2 **DIRECT SUPPORT SUBASSEMBLY REPAIR AND REPLACEMENT**

Repair and replacement of antenna subassemblies is not authorized at the direct support maintenance level.

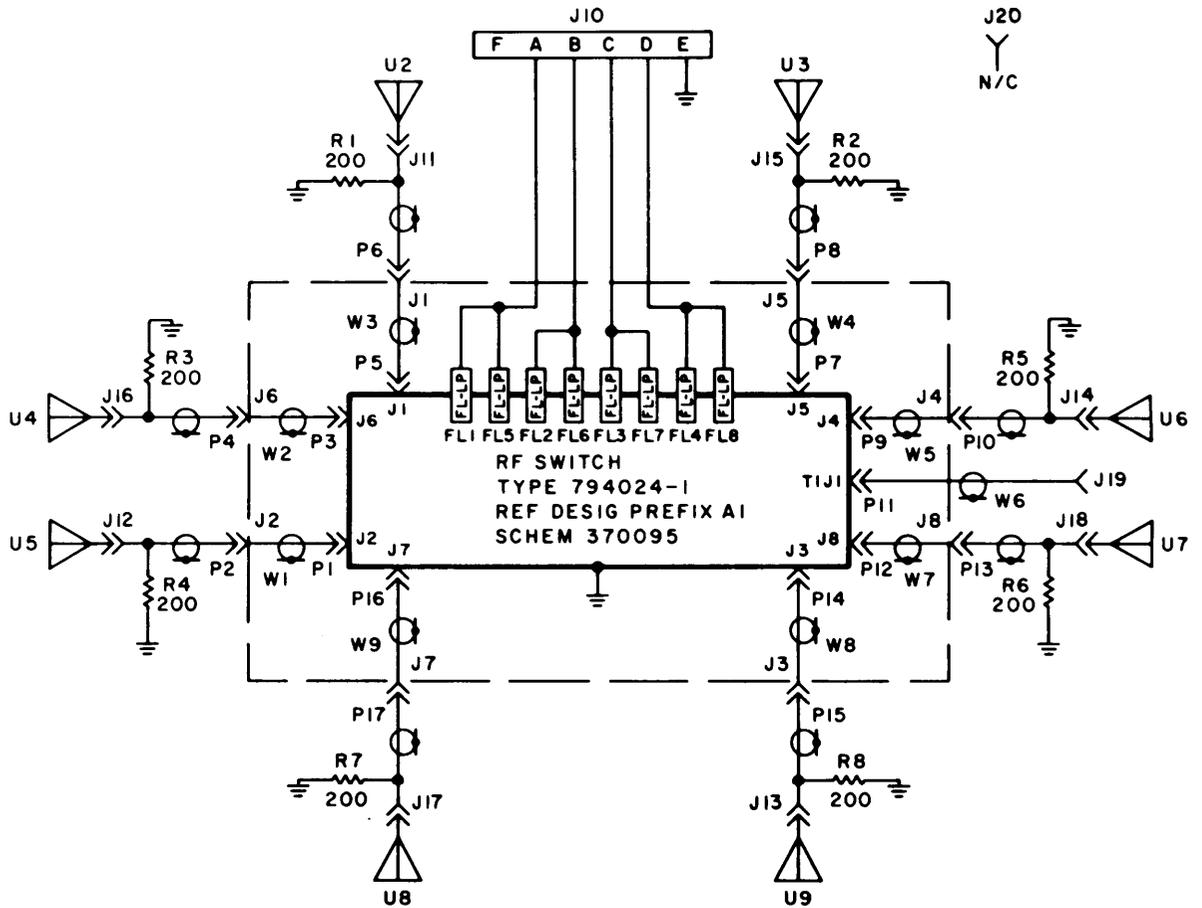


NOTES:

1. RESISTANCE IS IN OHMS  $\pm$  1% 1/4 W
2. DIODES CR1 THRU CR16 ARE 5082-3080
3. DIFFERENCE BETWEEN -1 AND -2 IS LISTED IN TABLE A:

TYPE	A1	L1-L2	R3-R10	C1-C2
794024-1	370094-1	3.3 $\mu$ H	750	.01 $\mu$ F
794024-2	370094-2	.33 $\mu$ H	750	470 pF

Figure 4-1. Type 794024-1, -2, (WJ-9880)(A1), Schematic Diagram 370095



- NOTE:
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS,  $\pm 1\%$ , 1/4W.
  2. ZERO DEGREE REFERENCE IS BETWEEN J4 & J5.

Figure 4-2. Type WJ-9880 DF Antenna, Main Chassis, Schematic Diagram 370482

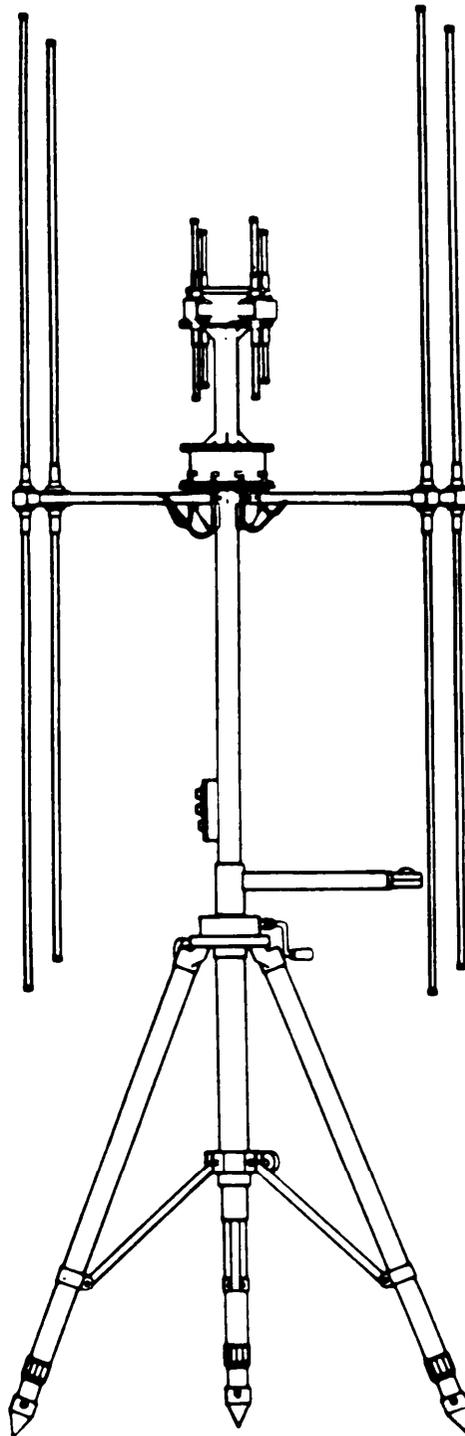


Figure 5-1. WJ-9880A-1 Direction Finder Antenna

**SECTION V WJ-9880A-1 DF ANTENNA****5.1 ELECTRICAL CHARACTERISTICS**

The WJ-9880A-1 DF Antenna is similar to the WJ-9880A DF Antenna. The WJ-9880A-1 incorporates an upper antenna array including an additional RF Switch assembly (Type 794023-2.) The upper bay expands the frequency capability of the WJ-9880A-1 from 20-850 MHz. The break frequency of the WJ-9880A-1 DF Antenna is between 150 to 175 MHz. This is the range in which either the upper or lower antenna arrays are activated.

**5.2 MECHANICAL CHARACTERISTICS**

The WJ-9880A-1 DF Antenna is mechanically identical to the WJ-9880A DF Antenna. The basic difference is the addition of the upper antenna array which includes an additional RF Switch Assembly. The antenna elements used in the upper bay are shorter in length due to the extended frequency capability.

**5.3 INSTALLATION AND OPERATION**

Follow the paragraphs below for installation and operation procedures for the WJ-9880A-1 DF Antenna.

**5.3.1 UNPACKING AND INSPECTION**

Examine the shipping carton for damage before unpacking the equipment. If the carton appears to be damaged, have the carrier's agent present when the equipment is unpacked. If this is not possible, retain all packaging material and shipping containers for the carrier's inspection to verify damage to the equipment after unpacking. Also verify that the equipment shipped corresponds to the packing slip. Contact the Watkins-Johnson Company, CEIDivision, or your Watkins-Johnson representative for any discrepancies or shortages.

**5.3.2 INSTALLATION**

The installation procedures for the WJ-9880A-1 DF Antenna are identical to those of the WJ-9880A DF Antenna. Additional procedures include installing eight short elements to the upper bay; connection of an rf cable to J19 if frequencies between 20 and 175 MHz are to be received; or connection of an rf cable to J20 if frequencies between 150 and 850 MHz are to be received. Refer to **paragraph 2.2** for complete installation procedures.

**5.3.3 CONNECTOR SIGNALS****5.3.3.1 Signal Output (J19)**

This signal output connector is an N-type. It is for lower frequency coverage of 20 to 175 MHz. It provides the RF signal to the receiver.

### 5.3.3.2 **Signal Output (J20)**

This signal output connector is an N-type. It is used for higher frequency coverage of 150 to 850 MHz. It provides the RF signal to the receiver.

### 5.3.3.3 **Antenna Switch (J10)**

The antenna switch connector is a multipin type. This connector provides signals to the antenna switch from the WJ-8975A Direction Finder for commutation of the dipoles.

### 5.3.4 **EQUIPMENT MALFUNCTIONS**

The WJ-9880A-1 DF Antenna was thoroughly inspected and adjusted for optimum performance prior to shipment. If any malfunctions are encountered after performing the recommended installation procedures, verify that the correct signals are present at the proper jacks. The schematic diagrams in **paragraph 5.11** will aid in the maintenance and troubleshooting of the unit. To avoid possible voiding of the warranty prior to taking any corrective maintenance action, contact your Watkins-Johnson representative or the Watkins-Johnson Company, CEI Division, Gaithersburg, Maryland.

### 5.3.5 **OPERATION**

The operation of the WJ-9880A-1 DF Antenna is identical to that of the WJ-9880A DF Antenna. The only difference is the connection of an rf cable to J19 if frequencies between 20 and 175 MHz are to be received or connection of an rf cable to J20 if frequencies between 150 and 850 MHz are to be received. Refer to **paragraph 2.4** for complete operating procedures.

### 5.3.6 **PREPARATION FOR RESHIPMENT**

If the unit must be prepared for reshipment, the packaging methods should follow the patterns established in the original shipment. If retained, the original materials can be reused to a large extent or at least provide guidance for repacking.

### 5.4 **PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

The WJ-9880A-1 DF Antenna has been designed to operate for long periods of time with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. The intervals for these operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with the schematic diagrams found in this section. A complete parts list and illustrations showing part location can be found in **Section III** and In **paragraph 5.10**.

### 5.5 **CLEANING AND LUBRICATION**

The antenna should be kept free of dust, moisture, grease and foreign matter. If available, use low velocity compressed air to blow accumulated dust from the exterior of the

unit. A clean, dry cloth, a soft bristled brush, or a cloth saturated with cleaning compound may also be used. The WJ-9880A-1 Direction Finder does not need lubrication.

## 5.6 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by visual inspection of the antenna. For this reason, a complete visual inspection should be made for indication of mechanical and electrical defects on a periodic basis, or whenever the antenna is inoperative. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Mechanical parts should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

## 5.7 TEST EQUIPMENT REQUIRED

The following instruments, or their equivalents, are required to properly troubleshoot the WJ-9880A-1 DF Antenna:

- 1) Digital Multimeter, AN/PSM-45
- 2) Test Lead Set, Simpson Cat. No. 00577
- 3) Signal Generator, SG-1112
- 4) Cable, RF, HP 10503A
- 5) RF Voltmeter, Boonton 92C
- 6) High Frequency Probe, Boonton 92-12F

## 5.8 TROUBLESHOOTING PROCEDURES

Troubleshooting efforts should first be directed toward identifying the symptom. The schematic diagrams for the antenna are contained in **Figures 4-1** and **5-2**.

## 5.9 ASSEMBLY REMOVAL, REPAIR, AND REPLACEMENT

The WJ-9880A-1 DF Antenna assemblies are mounted in such a way as to permit easy accessibility/removal. Before the assembly is removed, any cable connections must be resoldered or disconnected. Repair procedures are straightforward and conventional.

### 5.9.1 ANTENNA SWITCHES (A1andA2)

The Antenna Switch (A1) can be removed by following the procedures listed in **paragraph 4.7.1**. Antenna Switch (A2)) can be removed by performing the following steps:

- 1) Using No. 1 Phillips screwdriver remove top plate antenna upper bay chassis by removing 4 Phillips screws and lock washers from upper bay mounting plate.
- 2) Using No. 1 Phillips screwdriver remove 8 Phillips screws and lockwashers from upper bay mounting plate.

- 3) Once screws are removed, push up on assembly to release from mounting plate (rubber gasket may cause difficult separation).
- 4) Using 5/16 inch open end wrench disconnect RF cable from balun transformer.
- 5) Using 5/16 inch open end wrench disconnect 8 semi-rigid cables connected to J1 thru J8.
- 6) Using No. 1 Phillips screwdriver remove 4 Phillips screws holding switch assembly to upper bay chassis.
- 7) Using a soldering iron, tip (PTA) and solder removal tape, desolder switching wires FL1 thru FL8 and ground wire.
- 8) Remove assembly from upper bay chassis.

The Antenna Switches (A1 and A2) can be replaced by performing the following steps:

- 1) Ensure zero degree mark on the upper and lower bay antenna switch housings are aligned.
- 2) Place antenna switch assembly into upper bay assembly.
- 3) Resolder switching wires FL1 thru FL8 and ground wire using soldering iron, tip (PTA) and solder.
- 4) Replace 4 Phillips screws securing switch assembly to upper bay chassis, tighten using No. 1 Phillips screwdriver.
- 5) Replace 8 semi-rigid cable connected to J1 thru J8, tighten 1/4 turn using 5/16 inch open end wrench. Do not overtighten.
- 6) Reconnect RF cable to balun transformer.
- 7) Position assembly and rubber gasket on mounting plate.
- 8) Replace 8 Phillips screws and lockwashers securing assembly to mounting plate, tighten using No. 1 Phillips screwdriver.
- 9) Replace top plate using 4 Phillips screws and flat-washers, tighten using No. 1 Phillips screwdriver.

#### 5.9.2 **DIRECT SUPPORT SUBASSEMBLY REPAIR AND REPLACEMENT**

Repair and replacement of antenna subassemblies is not authorized at the direct support maintenance level.

## 5.10 **PARTS LIST**

The added RF Switch Assembly (Type 794024-2) is identical electrically to the Type 794024-1. Refer to **paragraph 3.5.2** for the RF Switch List. The Type 794024-2 has the following changes:

- A1 Antenna Switch, P/N 370094-2
- J1 Connector Receptacle, P/N 2052-1658-02

The Type 370094-2 Antenna Switch is electrically identical to the type 370094-1. Refer to **paragraph 3.5.2.1**. The following has changed:

- C1 Capacitor, P/N UY03-471J
- L1 Coil, P/N 1025-08

## 5.11 **SCHEMATIC DIAGRAMS**

Refer to **Figure 4-1** for the Type 794024-2 Schematic Diagram. **Figure 5-2** is the Main Chassis Schematic Diagram for the WJ-9880A-1 DF Antenna.

## 5.12 **SIX FOOT ELEMENT MODIFICATION**

For those units modified, or supplemented, with 6 foot lower bay element Antenna Element (Type 794068-1) U2 through U9, is replaced with Antenna Element (Type 470884 - inner element) and Antenna Element (Type 470883 - outer element). The mast extension is Type 470880.

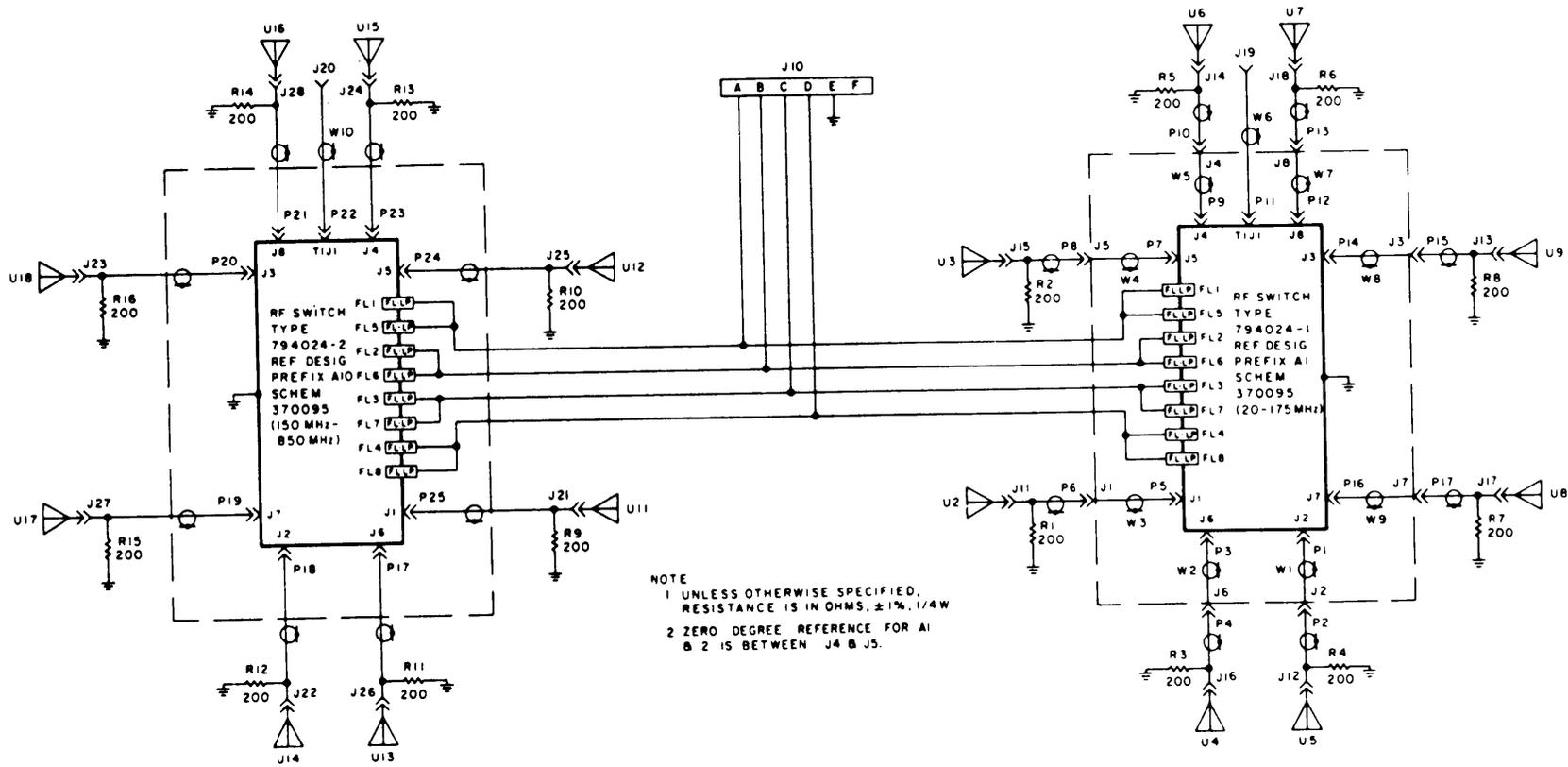


Figure 5-2. Type WJ-9880A-1, Manportable Direction Finder Antenna, Main Chassis, Schematic Diagram 470278

APPENDIX A

REFERENCES

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Refer to TM 11-5895 -1227-14-1 for references.



**APPENDIX B**  
**MAINTENANCE ALLOCATION**

---

**Section I. INTRODUCTION**

**B-1.        GENERAL**

This appendix provides a summary of the maintenance operations for the direction finder antennas. It authorizes categories of maintenance unrepairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

**B-2.        MAINTENCE FUNTION**

Maintenance functions will delimited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) for an unserviceable counterpart.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

**B-2.        MAINTENANCE FUNCTIONS - Continued**

i. Repair. The application of maintenance services (inspect, test service, adjust, aline, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e. DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc. ) considered in classifying Army equipments/components.

**B-3.        COLUMN ENTRIES**

a. Column 1 Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn, the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The number of task hours specified by the work time figure represents the average time required to restore an item to serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart.

- C Operator or crew
- O Organizational Maintenance
- F Direct Support Maintenance
- H General Support Maintenance
- D Depot Maintenance

**B-3. COLUMN ENTRIES - Continued**

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tools sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetical code which leads to the remark in Section IV, Remarks, which is pertinent to the item opposite the particular code.

**B-4. TOOL AND TEST EQUIPMENT REQUIREMENTS (Section III)**

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column in the MAC. The numbers indicate the applicable tool or test equipment for the maintenance function.

b. Maintenance Category. The code in this column indicates the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5 digit) in parentheses.

**B-5. REMARKS**

a. Reference Code. This code refers to the appropriate item in **Section II**, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in **Section II**.

SECTION II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Eqpt.	(6) Remarks
			C	O	F	H	D		
03	Antenna WJ-9880A WJ-9880A-1	Inspect		0.2					
		Inspect			0.2				
		Inspect						-	-
		Replace		0.2					
		Repair			0.5				6
		Repair						1.0	6
		Test				0.5			2-3
0301	RF Switch Assembly (A1)	Replace							
		Repair					0.5	6	O
0302	RF Switch Assembly (A2)	Replace					0.5	6	
		Repair					0.5	6	O, N

**SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS**

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National Stock Number	(5) Tool Number
2	O, F, D	Multimeter, Digital, AN/PSM-45	6625-01-134-2512	
3	O, F, D	Test Lead Set, Simpson Catalog No. 00577	N/A	
6	F, D	Tool Kit, Electronic Equipment, TK-105/G	5180-00-510-8177	

SECTION IV. REMARKS

Reference Code	Remarks
M	Antenna Repair is accomplished by removal and replacement of throwaway elements and cable assemblies.
O	Depot Tools and Equipment listed are an engineering estimate of the minimum requirement.
N	WJ-9880A has one RF Switch WJ-9880A-1 has two RF Switches

**APPENDIX C**  
**BASIC ISSUE ITEMS LIST**

---

**SECTION I. INTRODUCTION**

**C-1.        SCOPE**

This appendix lists the basic issue items for the direction finder antennas to help you inventory items required for safe and efficient operation. There are no components of end items.

**C-2.        GENERAL**

The Basic Issue Items (BII) has the minimum essential items required to replace the antenna in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the equipment during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition BII based on Table of Organization and Equipment/Modified Table of Organization and Equipment (TOE/MTOE) authorization of the end item.

**C-3.        EXPLANATION OF COLUMNS**

The following provides an explanation of columns found in the tabular listings:

a.    Column 1 - National Stock Number. This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.

b.    Column 2 - Description, FSCM and Part Number. This column indicates the federal item-name and, when applicable, a brief description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

c.    Column 3 - Unit of Measure (U/M). This column indicates the measure used in performing the actual operation/maintenance function. This measurement is expressed by a two character alphabetical abbreviation.

d.    Column 4 - Quantity Required (Qty Rqd). This column indicates the quantity of the item authorized to be used with/on the equipment.

SECTION II. BASIC ISSUE ITEMS

(1) National Stock Number	Description,	(2) FSCM	Part Number	(3) Unit of Measure	(4) Quantity Required
5865-01-165-4578	Antenna, Direction Finder, AS 3732/PRD-11	80058	WJ-9880A	Ea.	1
N/A	Antenna, Direction Finder, AS 3733/PRD-11	80058	WJ-9880A-1	Ea.	1
N/A	Publication N/S TM 11-5825-278-12-2	80058	N/A	Ea.	1
N/A	Publication N/S TM 11-5895-1227-14-1	80058	N/A	Ea.	1

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5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

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