OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL

OPERATION AND ORGANIZATIONAL MAINTENANCE MANUAL

RAWIN SETS
AN/GMD-1A AND AN/GMD-1B

This copy is a reprint which includes current pages from Changes 1 thru 3. The title was changed by C 1 to read as shown above.

HEADQUARTERS, DEPARTMENT OF THE ARMY

4 JUNE 1971

CHANGE

No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 5 March 1985

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL
AN/GMD-1A (NSN 6660-00-224-6137)
AN/GMD-1B (NSN 6660-00-599-8252)
AN/GMD-1C (NSN 6660-01-077-7797)
AN/GMD-1D (NSN 6660-01-072-9995)

TM 11-6660-206-12, 4 June 1971, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

Remove pages	*Insert pages*
None	A/(B blank)
i through iv	i through iv
1-1 and 1-2	1-1 and 1-2
4-1 and 4-2	4-l and 4-2
5-l through 5-4	5-1 and 5-2
A-1 and A-2	A-1 through A-3/(A-4 blank)
I-1 through I-5	I-1 through I-5/(I-6 blank)

2. File this change sheet in the front of the publication for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKHAM JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadiar General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-36B literature requirements for AN/GMD-l.

*This change supersedes TM 11-6660-206-ESC, 10 August 1973.

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *20 September 1983*

Operator's and Organizational Maintenance Manual

For

AN/GMD-1A (NSN 6660-00-224-6137)

AN/GMD-1B (NSN 6660-00-599-8252)

AN/GMD-1C (NSN 6660-01-077-7797)

AN/GMD-1D (NSN 6660-01-072-9995)

TM 11-6660-206-12, 4 June 1971, is changed as follows:

1. Title of the manual is changed as shown above.
2. New or revised material is indicated by a vertical bar in the margin. Where an entire chapter, section, or illustration is added or revised, the vertical bar is placed opposite the identification number and title.
3. Remove old pages and insert new pages as follows:

Remove pages	*Insert pages*
i through iv	i through iv
1- through 1-4.2	1-1 through 1-4.2
1-7 through 1-10	1-7 through 1-10.4
1-21 through 1-32	1-21 through 1-32
1-35 and 1-36	1-35 and 1-36
2-3 and 2.4	2-3 and 2-4
3-7 and 3-8	3-7 and 3-8
6-1 and 6-2	6-1 and 6-2
7-1 and 7-2	7-1 and 7-2
7-5 through 7-7	7-5 and 7-6
A-1 and A-2	A-1 and A-2
B-1 and B-2	B-1 through B-3
C-1 through C-4	C-1 through C-8
	D-1 through D-8

4. File this change sheet in front of the manual for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKMAN JR.
General, United States Army
Chief of Staff

Official:
ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25C, Operator's Maintenance requirements for Meterology.

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *21 December 1973*

Operator's and Organizational Maintenance Manual

RAWIN SETS AN/GMD-1A AND AN/GMD-1B

TM 11-6660-206-12,4 June, 1971, is changed as follows:

The title is changed to read as shown above.

1. A vertical bar appears opposite changed material.

2. Remove and insert pages as indicated in the page list below:

Remove	*Insert*
i and ii	i and ii
1-1 through 1-4	1-1 through 1-4
None	1-4.1 and 1-4.2
B-1 through B-4	B-1 and B-2

3. File this change sheet in the front of the manual for reference purposes.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

Active Army:

- USASA (2)
- CNGB (1)
- ACSC-E (2)
- Dir of Trans (1)
- COE (1)
- TSG (1)
- USAARENBD (1)
- USAMB (10)
- AMC (1)
- TRADOC (2)
- ARADCOM (2)
- ARADCOM Rgn (2)
- OS Maj Comd (4)
- LOGCOMDS (3)
- MICOM (2)
- TECOM (2)
- USAFABD (1)
- APG (1)
- DPG (1)
- USACC (4)
- MDW (1)
- Armies (2)
- corps (2)
- HISA (ECOM) (18)
- Svc Colleges (1)
- USASESS (5)
- USAADS (2)
- USAFAS (10)
- USAARMS (2)
- USAIS (2)
- USAES (2)
- USAINTS (3)
- WRAMC (1)
- USACDCEC (10)
- ATS (1)
- Instl (2) except:
  - Ft Gordon (10)
  - Ft Huachuca (10)
  - WSMR (1)
  - Ft Carson (5)
  - Ft Richardson (ECOM Ofc) (2)
- Army Dep (2) except:
  - LBAD (14)
  - SAAD (30)
  - TOAD (14)
  - ATAD (10)
- GENDEP (2)
- Sig Sec GENDEP (2)
- Sig Dep (2)
- Sig FLDMS (1)
- USAERDAA (1)
- USAERDAW (1)
- MAAG (1)
- USARMIS (1)
- Units org under fol TOE (1 cy each):
  - 6-100
  - 6-185
  - 6-186
  - 6-200
  - 6-201
  - 6-300
  - 6-302
  - 6-525
  - 6-526
  - 6-575
  - 6-576
  - 6-700
  - 6-701
  - 7
  - 7-100
  - 11-117
  - 11-158
  - 11-500 (AC-AC)
  - 17
  - 17-100
  - 29-134
  - 29-136
  - 37
  - 37-100
  - 39-51
  - 57
  - 67

NG: State AG (3)

USAR: NONE

For explanation of abbreviations used, see AR 310-50.

WARNING
RFI Filters

This equipment contains Radio Frequency Interference (RFI) filters, NSN 5915-00-909-7762, which may contain a dielectric fluid with Polychlorinated Biphenyls (PCB's).

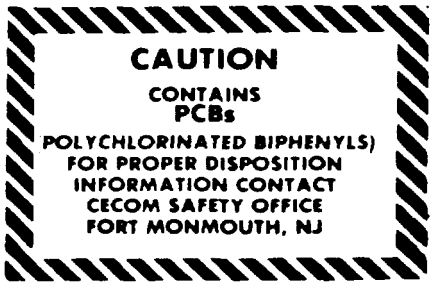
PCB's are toxic and may pose serious health and environmental hazards if misused or mishandled. Health hazards involve ingestion and prolonged or frequent skin contact. Environmental hazards involve contamination of soil and water.

Use rubber gloves, rubber apron and eye protection when handling PCB fluid. In the event of eye contact, immediately flush the eyes with clean water and continue to flush for 10 minutes. Seek medical attention. Skin contact requires washing with soap and water.

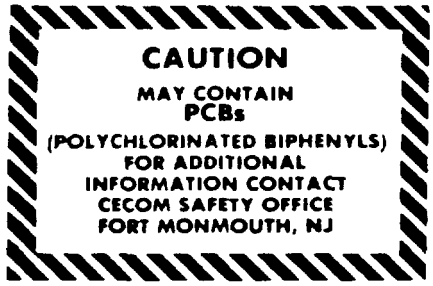
RFI filter part number SP-289, manufactured before 1 Jan 1975 (date code 7501) by FILTRON Mfg. Co., Inc., contains PCB dielectric fluid.

RFI filters which have been painted over or otherwise have had identifying marks obliterated must be assumed to contain PCB dielectric fluid.

RFI filters known to contain or suspected of containing PCB's, and the panels behind which they are located, must be labeled IAW environmental protection regulations contained in Title 40, Code of Federal Regulations, Part 761 (40 CFR 761). Warning Label 'A', below, identifies an RFI filter known to contain PCB's. Label 'B' identifies an RFI filter suspected of containing PCB's.



LABEL 'A'



LABEL 'B'

Leaking RFI filters known to contain or suspected of containing PCB's must be removed from service IAW 40 CFR 761, disposed of through the 'Defense Property Disposal Office (DPDO) and replaced with non PCB RFI filters.

Contact your unit's environmental, safety, industrial hygiene or preventive medicine personnel if you observe a leaking RFI filter or if you need additional local assistance in this matter.

Technical Manual

No. 11-6660-206-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 4 June 1971

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL
RAWIN AN/GMD-1A (NSN 6660-00-224-6137)
RAWIN AN/GMD-1B (NSN 6660-00-599-8252)
RAWIN AN/GMD-1C (NSN 6660-01-077-7797)
RAWIN AN/GMD-1D (NSN 6660-01-072-9995)

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 back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5007.

In either case, a reply will be furnished direct to you.

*This manual supersedes TM 11-6660-206-10, 2 February 1961, and TM 11-6660-206-20, September 1961, including all changes.

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Section I. General

1-1. Scope

a. General. This manual describes Rawin Set AN/GMD-1A, AN/GMD-1B*, AN/GMD-1B**, AN/GMD-1C, and AN/GMD-1D (fig. 1-1) and (para 1-11). In this manual you will find a description of the equipment, installation and operating instructions and operator and organizational maintenance information.

b. Components of End Item Basic Issue Items List, Additional Authorization List and Maintenance Allocation Chart (MAC). The Components of End Item List (COEI) and Basic Issue Items List (BII) appear in appendix B. The Additional Authorization List (AAL) appears in appendix C. The Maintenance Allocation Chart (MAC) appears in appendix D.

c. Use of Asterisk Without Parentheses. The single asterisk after the type of designator (for example: /GMD-1B*) indicates equipment built under contracts prior to 1970, the double asterisk after the type designator (for example /GMD-1B** or / GMD-1**) indicates equipment built under contract E-190-69(N).

d. Use of Asterisk In Parentheses (*). Official nomenclature followed by (*), is used to indicate all models of the specific equipment item covered in this manual. Thus, Rawin Set AN/GMD-1(*) represents Ramin Sets AN/GMD-1A/C and AN/GMD-1B/D. Reference to major components of the equipment item will be indicated in a similar manner. Rawin Receiver R-301(*)/GMD-1 represents Rawin Receivers R-301B/GMD-1, R-301C/GMD-1, and R-301D/GMD-1. Antenna Control C-578(*)/ GMD-1 represents Antenna Controls C-578A/ GMD-1, C-578B/GMD-1, and C-578C/GMD-1. Pedestal AB-159(*)/GMD-1 represents Pedestals AB-159B/GMD-1, AB-159C/GMD-1, AB-159D/ GMD-1, and AB-159E/GMD-1, Control-Recorder C-577(*)/GMD-1 represents Control-Recorders C-577B/GMD-1, C-577D/GMD-1, and C-577E/ GMD-1. Antenna AS-462(*)/GMD-1 represents Antennas AS-462A/GMD-1, AS-462B/GMD-1, and AS-462C/GMD-1. Test Set TS-538(*)/U represents Test Sets TS-538A/U, TS-538B/U, and TS-538C/U. Radiosonde AN/AMT-4(*) represents Radiosondes AN/AMT-4, AN/AMT-4A, AN/ AMT-4B, AN/AMT-4C, and AN/AMT-4D. Radiosonde Recorder AN/TMQ-5(*) represents Radiosonde Recorder AN/TMQ-5, AN/TMQ-5A, AN/TMQ-5B, and AN/TMQ-5C. Meterological Data Processing Groups OL-192(*)/GMD-1 represents Meteorological Data Processing Groups OL-192/GMD-1 and OL-192A/GMD-1.

1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. 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.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribcd in AR 735-11-2/DLAR 4140.55/ NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

c. 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.

1-3.1. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in Chapter 7.

1-3.2. Destruction of Army Electronics Materiel

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

1-3.3. Reporting Equipment Improvement Recommendations (EIR)

If your Rawin Set 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 your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We'll send you a reply.

1-3.4. Hand Receipt

This manual has a companion document with a TM number followed by -HR (which stands for Hand Receipt). The TM 11-6660-206-12-HR consists of preprinted hand receipts (DA Form 2062) that list end item related equipment (i.e., COEI, BII, and AAL) you must account for. As an aid to property accountability, additional —HR manuals may be requisitioned from the US Army Adjutant General Publications Center in Baltimore, MD, in accordance with the procedures in chapter 3, AR 310-2, and DA Pam 310-10.

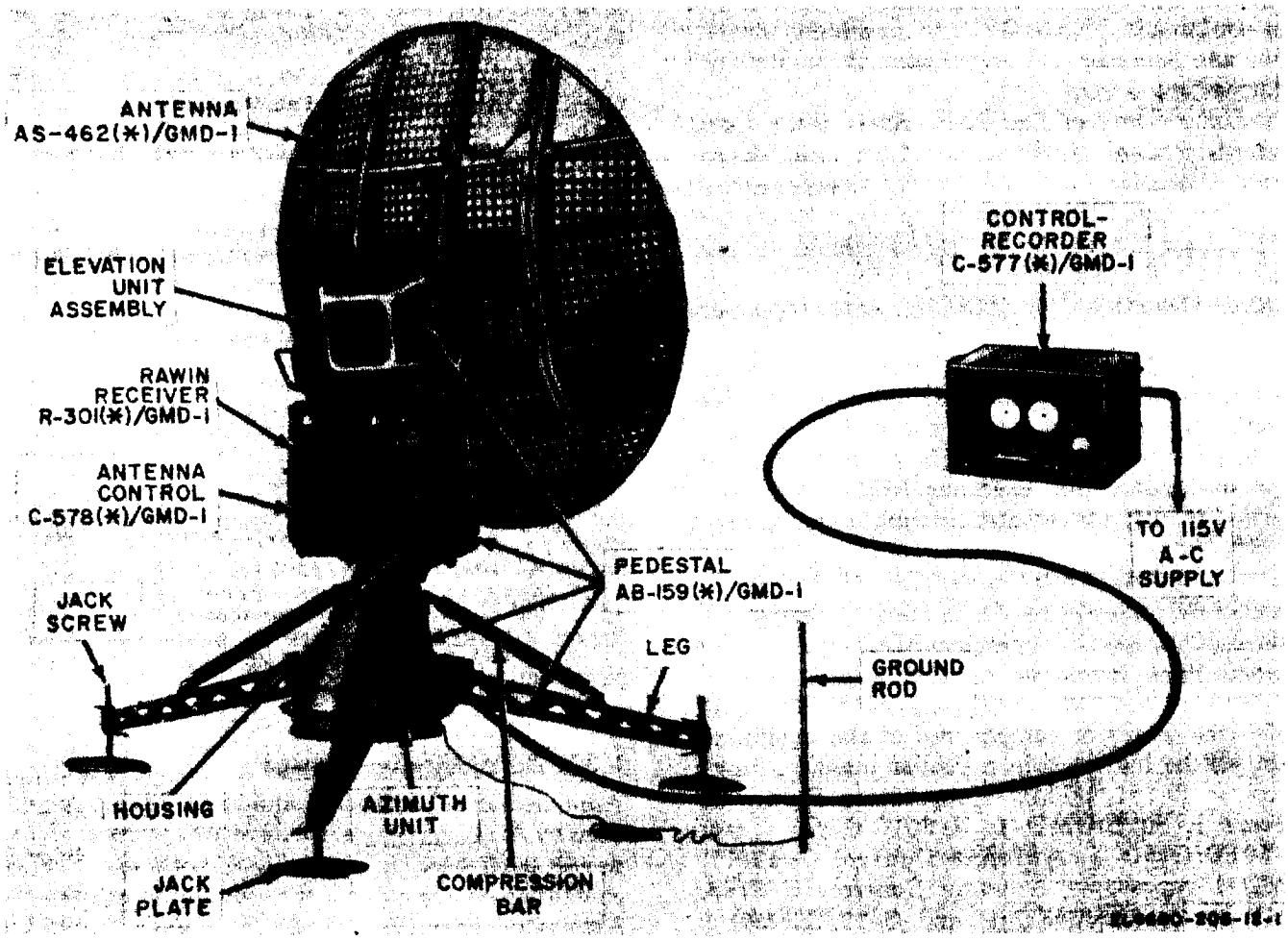


Figure 1-1. Rawin Set AN/GMD-1(*), operating components (excluding OL-192(*)/GMD-1).

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

Rawin Set AN/GMD-1(*) (fig. 1-1) is a transportable radio direction finder. It is designed to track a balloon-borne radiosonde transmitter automatically. A radiosonde signal containing meteorological information in the form of amplitude or frequency modulation is received, amplified and detected by this equipment. The detected radiosonde signal is passed to separate equipment in the rawinsonde system (para 1-5) where it is recorded. By reference to calibration data for the Radiosonde AN/AMT-4(*) or National Weather Service Radiosonde Set J031 (para 1-5), this recorded information is converted to values of temperature, humidity, and pressure. Recordings

of time versus progressive changes of the elevation and azimuth positions of the ascending balloon, as determined by tracking of the signal from the radiosonde, are made so that they can be later converted to windspeed and direction. These recordings are used to analyze and forecast weather conditions, guide and plan for the navigation of aircraft, and to prepare ballistic corrections for the effect of the atmosphere on the trajectory of projectiles, missiles, and rockets.

1-5. System Application

The rawinsonde system (fig. 1-2) consists of Radiosonde AN/AMT-4(*) or National Weather Service Radiosonde Set J031, Rawin Set AN/GMD-1(*), Radiosonde Recorder AN/TMQ-5(*), and Meteorological Data Processing Group OL-192(*)/GMD-1.

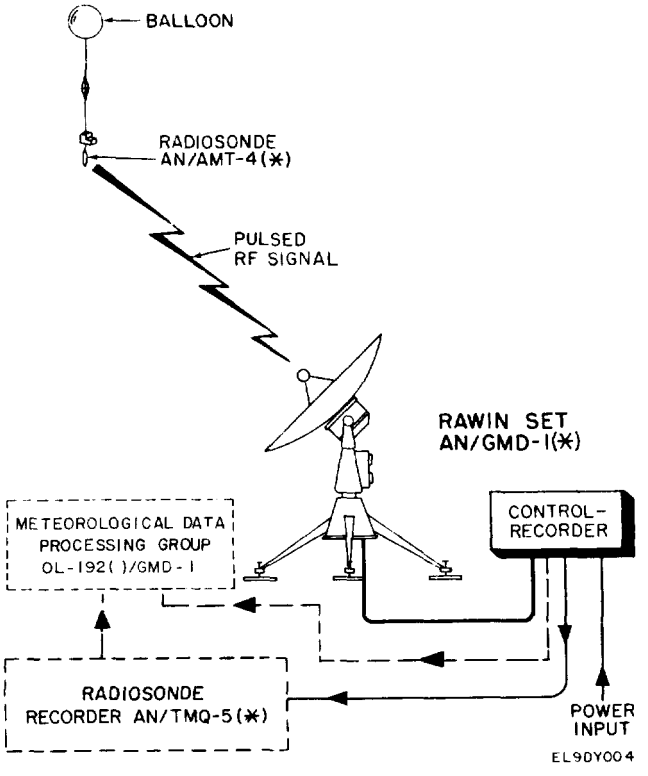


Figure 1-2. Rawinsonde system block diagram.

a. Radiosonde AN/AMT-4(*) and National Weather Service Radiosonde Set J031. This equipment consists of a transmitter, a modulator, an antenna, a battery, and pressure, temperature, and humidity sensing elements. The assembled equipment weighs about 3 pounds and can be carried to an altitude of about 100,000 feet by a gas-filled balloon. The battery furnishes power to the modulator and transmitter. The transmitter operates in the 1,660- to 1,700-MHz band and its carrier is amplitude modulated by an audio frequency (af) pulse, the rate of which is determined by the pressure, temperature and humidity sensing elements, Refer to TM 11-6660-228-10.

b. Rawin Set AN/GMD-1(*). Rawin Set AN/GMD-1(*) automatically tracks the balloon-borne radiosonde (by continuous homing on the radiosonde signal) to altitudes of 1000,000 feet or more, and to horizontal distances of about 125 miles, depending on the surrounding terrain. The equipment indicates and records the azimuth and elevation angles of the balloon-borne radiosonde, and these angles can be plotted with the height (computed from the temperature and pressure data) to determine wind direction and windspeed. Rawin Set AN/GMD-1(*) receives and amplifies the signal from the radiosonde and passes this signal to Radiosonde Recorder AN/TMQ-5(*) (TM 11-6660-204-10).

c. Recording Equipment. Radiosonde Recorder AN/TMQ-5(*) prints the received pressure, temperature, and humidity data *(b* above).

d. Meteorological Data Processing Group OL-192(*)/GMD-1. This equipment consists of a commercial programmable desk top computer interfaced with a compatible commercial teletype paper tape reader /perforator. The OL-192(*)/GMD-1 reduces the raw meteorological data received by Radiosonde Recorder AN/TMQ-5(*) and Control Recorder C-577(*)GMD-1 into meterological messages. Refer to TM 11-6660-263-10 for operation of the OL-192(*)/GMD-1.

1-6. Technical Characteristics

a. General.	
Power input	105 to 129 volts ac, 50 to 65 Hz, 1,000 watts.
Frequency range	1,660 to 1,700 MHz.
Types of signals received	Am or fm.
Weight	2,075 pounds.
b. RF System.	
Scanning type	Conical
Antenna type	Single dipole.
Reflector type	Parabolic.
Antenna scanner assembly drive motor	Introduction, split-phase, capacitor start, 115 volts ac ±10%, 60 Hz +5-10, 1,760 r/min.
Reference voltage generator	2,040 r/min, 15 volts ac, 34 Hz (nominal), 2-phase, self-excited.
Lobe width	6.5° nominal, 3db down at 1,680 MHz.
c. Receiving System.	
Type receiver	Superheterodyne.
Normal operating frequency	1,680 MHz.
Intermediate frequency	30 MHz (band width below).
Frequency control	Automatic and manual.
Local oscillator	Tube type 5675.
Local oscillator frequency	1,650 MHz ±1 MHz.
Input impedance (receiver)	50 ohms (nominal).
Bandwidth	Sharp, 0.75 ±0.15 MHz; broad, 1.5 ±0.3 MHz.
Tracking accuracy	0.50° max error, between 10° and 60° elevation.
d. Antenna Positioning System.	
Tracking	Automatic, local manual, and remote manual.
Drive motors (elevation and azimuth)	60 volts dc (nominal), 1.4 Amperes, split-stator reversible, 1/20 hp at 5,000 r/min.
Antihunt generators (elevation and azimuth)	2.1 volts dc (nominal) per 100 r/min, self-excited, permanent magnet.
e. Positioning, Indicating, and Recording Systems.	
Synchro transmitters (elevation azimuth)	Single-phase, self-synchronous, energizing, voltage 115 volts ±10%, 60 Hz +5-10.
Synchro receivers (elevation and azimuth)	Single-phase, self-synchronous, energizing voltage 115 volts ±10%, 60 Hz +5-10.
Type recording	Time, elevation angle, and azimuth angle printed on tape.
Print-cycle motor	20-30 volts dc, chronometer movement.

1-7. Components, Dimensions and Running Spares

a. The components and dimensions of Rawin Set AN/GMD-1(*) which comprises an operable equipment and the running spares are listed in tables 1-1 and 1-2.

b. A group of running spares is supplied with Rawin Set AN/GMD-1(*). Some running spares, not listed in table 1-2, are supplied for Test Set TS-538(*)/U. Such spares are stored in the cover of the test equipment and are listed in TM 11-6625-213-12. Except where otherwise noted in the list below, all spares for GMD-1A/C are packed in Case CY-898/GMD-1. Spares for Rawin Set AN/GMD-1B/D) are packed in Case, Standardized Components, Electrical CY-1895/GMD-1. The spare parts for both models are tabulated in table 1-2.

1-7.1 Items Comprising an Operable Equipment

NSN	Qty	Nomenclature, part No., and mfr code	Usable on code	Fig. No.
		NOTES The part number is followed by the applicable 5-digit Federal Supply Code for Manufacturers (FSCM) identified in SB 708-41/42 and used to identify manufacturer, distributor or Government agency; etc. A number 1 in usable on code column refers to items comprising an operable AN/GMD-1A and AN/GMD-1C; a number 2 refers to items comprising an operable AN/GMD-1B* and AN/GMD-1D; a number 3 refers to items comprising an operable AN/GMD-1B** and AN/GMD-1D.		
		RAWIN Set AN/GMD-1A and AN/GMD-1C RAWIN Set AN/GMD-1B* and AN/GMD-1D RAWIN Set AN/GMD-1B** and AN/GMD-1D Consisting of:		
5935-00-201-3089	1	Adapter, Connector SC-C-93555; 80063	1,2,3	1-25
6660-00-497-8501	1	Antennas AS-462A/GMD-1, AS-462B/GMD-1, and AS-462C/GMD-1	1,2,3	1-1
6660-00-253-1605	1	Reflector, Center, Right and Left Wing Sections SM-D-28256; 80063	1,2	1-3
6660-00-240-3858	1	Reflector, Center, Right and Left Wing Sections SC-D-93252; 80063	3	1-3
6660-00-774-8432	1	Spinner Cup and Radome Assembly (Antenna Scanner} SC-D-93883; 80063	1	1-25
6660-00-681-9749	1	Spinner Cup and Radome Assembly (Antenna Scanner) SM-D-282255: 80063	2,3	1-25
6660-00-372-2675	1	Controls, Antenna C-578A/GMD-1, C578B/GMD-1, and C578C/GMD-1	1,2,3	1-3
6660-00-191-9773	1	Cable Assy CX-1216/U	1,2,3	1-3
6660-00-160-5889	1	Cable Assy CX-1217/U	1,2,3	1-25
6660-00-170-8777	1	Cable Assy CX-1492/U	1,2,3	2-37
6660-00-498-3355	1	Cable Assy CX-1493/U	1,2,3	1-25
6660-00-255-2059	1	Cable Assy CX-2043/U	1,2,3	1-3
6660-00-498-9650	1	Control-Recorders C-577B/GMD-1, C-577D/GMD-1, and C-577E/GMD-1	1,2,3	1-3
3895-00-510-4761	1	Holder, Cable Reel MT-1421/U	1,2,3	
6660-00-735-6464	1	Packing Kit SC-DL-282552; 80063		1-24
6660-00-355-8972	1	Antenna Wing Fixture Assy SM-D-192358; 80063		1-24
6660-00-356-5138	1	Skid, Azimuth Unit SM-D-109177; 80063		1-24
5975-00-284-8299	1	Guy SC-D-84302GR1; 80063		1-24
5975-00-284-8302	1	Guy SC-D-84302GR2; 80063		1-24
5975-00-284-5796	1	Guy SC-D-84302GR3; 80063		1-24
5975-00-284-8301	1	Guy SC-D-84302GR4: 80063		1-24
5975-00-284-8304	1	Guy SC-D-84303; 80063		1-24
5975-00-284-8303	1	Guy SC-D-84304; 80063		1-24
5975-00-567-2322	1	Guy SC-D-84305; 80063		1-24
6660-00-356--5069	1	Frame, Leg Assembly SM-D-192298; 80063		1-24
6660-01-065-4467	1	Meteorological Data Processing Group OL-192/GMD-1	1,2,3	1-3.1 ①
6660-01-065-4466	1	Meteorological Data Processing Group OL-192A/GMD-1	1,2,3	1-3.1 ②
6660-00-025-3908	2	Support, Wood SC-D-84307; 80063		1-24
6660-00-263-0896	1	Pedestal AB-159A/GMD-1	1	1-1
6660-00-256-8328	1	Pedestals AB-159B/GMD-1, AB-159C/GMD-1, and AB-159D/GMD-1	2	1-1
6660-00-752-5801	1	Pedestal AB-159E/GMD-1 Consisting of	3	1-1
	1	Azimuth Assembly SM-D-282640; 80063	1,2,3	1-3
6660-00-170-4499	1	Cable Assy CX-1285/U	1,2,3	1-25
6660-00-285-0214	2	Leg, Support (Compression Bar) SC-C-93051GR1; 80063	1,2,3	1-3
6660-00-257-4799	1	Leg, Support (Compression Bar) SC-C-93051GR2; 80063	1,2,3	1-3
6660-00-774-8411	1	Elevation Assy SM-D-282589; 80063	1,2,3	1-3
5985-00-356-7385	1	Housing (For Receiver and Antenna Control Units) SM-D-93078; 80063	2,3	1-3
6660-00-705-5884	1	Housing (For Receiver and Antenna Control Units) SM-D-198222; 80063	2,3	1-3
6660-00-031-0215	3	Leg Assy (Includes Outrigger, Jack Screws, Locking Lugs) SC-D-98529; 80063		1-3
6660-00-404-2998	3	Plate, Tripod SC-D-93154; 80063	1,2,3	1-3
5820-00-537-9205	1	Receivers, Radio R-301B/GMD-1, R-301C/GMD-1 and R-301D/GMD-1 Consisting of	1,2,3	1-3
6660-00-504-2437	1	Cable Assy CG-490E/U	1,2,3	1-25
5995-00-251-3848	1	Cable Assy CG-530B/U	1,2,3	1-25

1-7.1 Items Comprising an Operable Equipment-Continued

NSN	Qty	Nomenclature, part No., and mfr code	Usable on code	Fig. No.
5895-00-519-5569	1	Mixer Stage, Frequency SC-D-93689; 80063	1,2,3	1-25
8130-00-498-8366	1	Reel, Cable, RL-137/GMD-1	1,2,3	1-3
8130-00-061-8203	1	Reel, Cable, RL-183/GMD-1	1,2,3	1-3
5975-00-240-3860	1	Rod, Ground and Cable Assy SC-C-93153; 80063	1,2,3	1-25
6660-00-568-9987	1	Telescope, Elbow M 17 Modified SM-C-282647-1; 80063	1,2,3	1-25
5120-00-596-8653	1	Screwdriver, Flat Tip (Phasing Tool) SC-B-93534; 80063	1,2,3	1-25
5120-00-393-0556	2	Wrench, Speed 15/16 Socket, Universal SC-D-93535; 80063	1,2.3	1-25
6626-00-243-5174	1	Test Sets TS-538/U, TS-538A/U, TS-538B/U, and TS-538C/U	1,2,3	1-25

1-8. Common Names

A list of nomenclature and common name assignments for the components of Rawin Set AN/GMD-1(*) is given in table 1-3. The common names of the equipment component assemblies and auxiliary equipment with component parts are listed in table 1-4.

1-9. Description of Rawin Set AN/GMD-1(*)

(Figs 1-3 and 1-4)

a. Overall Description. Rawin Set AN/GMD-1(*) consists of two major operating assemblies. In addition to these two assemblies, a suitable power source (115 volts alternating current (ac)) is required for operation. The rawin set is used in a rawinsonde system (para 1-5). The two operating assemblies are the main assembly and the control-recorder.

Table 1-1. Rawin Set AN/GMD-1(*), Components and Dimensions.

NSN	Item	Required No. for AN/GMD-1(*)	Height (in.)	Depth (in.)	Width or length (in.)	Unit wgt. lb	Figure No.
6660-00-735-6464	Accessory Kit	1					1-3 ①
5935-00-201-3089	Adapter for Test Set TS-538(*)/U.	1					1-25
6660-00-497-8501	Antenna AS-462(*)/GMD-1 Consisting of						1-4
6660-00-253-1605	Reflector	1	84	22¾	84	126	1-3 ①
6660-00-834-3641	Antenna Scanner Assembly	1	13	13	42	51	1-4
6660-00-191-9773	Cable Assembly, Special Purpose, Electrical CX-1216/U (W901).	1	1 1/8 (dia.)		205 ft	205[a] (275[a d])	1-3 ①
5995-00-091-0415	Cable Assembly, Special Purpose CX-1217/U (W921).	1	1 1/8		26 ft	7	1-25
6660-00-170-8777	Cable Assembly, Power, Electrical CX-1492/U (W971).	1	3/4 (diam.)		1 ft	1	2-37
6660-01-065-4467	Meteorological Data Processing Group OL-192/GMD-1.	1	Refer to TM 11-6660-263-10				
6660-01-065-4466	Meteorological Data Processing Group OL-192A/GMD-1.		Refer to TM 11-6660-263-10				
6660-01-068-0401	Case, Meteorological Data Processing Group CY-7761/GMD-1.	1	Refer to TM 11-6660-263-10				
6660-01-074-6220	Case, Calculator, Programmable, CY-7762/GMD-1.	1	Refer to TM 11-6660-263-10				
660-01-068-0400	Case, Reader-Perforator, CY-7763/GMD-1.	1	Refer to TM 11-6660-263-10				

See footnotes at end of table.

Federal stock No.	Item	Required No. for AN/GMD-1(*)	Height (in.)	Depth (in.)	Width or length (in.)	Unit wgt. lb	Figure No.
6660-498-3355	Cable Assembly, Power, Electrical CX-1493/U.	1	¾ (dia.)	----------	96	2	1-25
6660-225-2059	Cable Assembly, Power, Electrical CX-2043/U (W911).	1	¾ (dia.)	----------	150 ft	61 [a] (65 [a d])	1-3①
6660-497-9770	Case CY-734/GMD-1	1	37⅛	22⅜	20½	300 [b]	1-3②
6660-318-4231	Case CY-735(*)/GMD-1	1	20⅜	24	25	198 [b]	1-3②
6660-038-0847	Case CY-736/GMD-1	1	26¾	25 15/16	32 1/16	366 [b] (381 [b d])	1-3②
6660-497-9773	Case CY-737(*)/GMD-1	1	17¼	19 5/16	26 15/16	159 [b]	1-3②
6660-356-3912	Case Components CY-1157/GMD-1A.	1	17½	19 5/16	26 15/16	219 [a]	1-3②
6660-333-2688	Case, Standardized Components, Electrical CY-1895/GMD-1.	1	19¾	20	25	73 [b]	1-3②
	Case CY-898/GMD-1	1 [e]	20	21	25	48 [b]	
6660-372-2675	Control, Antenna C-578(*)/GMD-1 [c].	1	11	15	22¼	70	1-3①
6660-498-9650	Control-Recorder C-577(*)/GMD-1	1	14½	16	23½	115	1-3①
3895-510-4761	Holder, Cable Reel	1	16½	17	31	12	1-3①
6660-752-5801	Pedestal, Antenna AB-159(*)/GMD-1 consisting of—						
	Azimuth unit assembly	1	29	29	27¾	257 1/2 [a] (273 [d])	
6660-774-8411	Elevation unit assembly	1	13½	18⅝	32½	196	1-3①
6660-705-5884	Housing	1	23½	17¼	23⅜	235 [b] (273 [b d])	1-19
6660-031-0215	Outrigger assembly	1	----------	----------	32	321	
6660-170-4499	Cable Assembly, Special Purpose CX-1285/U (W951).	1	1⅛	----------	47	2	1-25
5820-537-9205	Receiver, R-301(*)/GMD-1 [c] including—	1	11	15	22¼	68	1-3①
5995-537-5617	Cable Assembly, Radio Frequency CG-409/U (W121).	1	¼ (dia.)	----------	72	1	1-25
5995-280-4266	Cable Assembly, Radio Frequency CG-530/U (W131).	1	¼ (dia.)	----------	72	1	1-25
5895-378-4823	Mixer assembly	1	6¼	1⅛	8 11/16	1½	1-25
8130-498-8366	Cable Reel RL-137/GMD-1	1	27½	14	27½	31	1-3①
8130-061-8203	Cable Reel RL-138/GMD-1	1	32	7	22	25	1-3①
5975-240-3860	Ground Cable and Rod assembly	1	----------	----------	----------	4	2-31
6650-568-9987	Telescope, Elbow M-17 (modified).	1	----------	----------	----------	5	1-27
6625-243-5174	Test Set TS-538(*)/U	1	9¼	8	11½	23½	1-25
5120-393-0556	Wrench (15/16 socket)	2	5	----------	22	2½	1-25
5120-063-5831	Phase adjustment tool	1	1	----------	8	----------	1-25

Note. Repair parts and special tools that accompany Rawin Set AN/GMD-1( ) are listed in appendix B.

[a] Weight with cable reel.

[b] Weight includes contents.

[c] Normally shipped installed in the housing (p/o Pedestal, Antenna AB-159(*)/GMD-1).

[d] AN/GMD-1B Equipment built under Contract E-190-69(N).

[e] Not furnished with AN/GMD-1B* or AN/GMD-1B**.

Table 1-2. Running Spares

Item	GMD-1A	Quantity GMD-1B*	GMD-1B**
Rawin Receiver R-301B/GMD, or R301C/GMD-1	1		
Rawin Receiver R-301D/GMD-1		1	1
Antenna Control C-578A/GMD-1 or C-578B/GMD-1	1		
Antenna Control C-578C/GMD-1		1	1
Brush, Motor (GE 3860)	4	4	4
Charts, roll	19	19	20
Fuse, Cartridge 3 amp, 250V, FO2A250V3A	10	20	30
Fuse, Cartridge 5 amp, 250V, F02A250V5A	10	15	10
Fuse, Cartridge 8 amp, 250V, F03A250V8A	10	20	20
Fuse, Cartridge 10 amp, 250V, F03A25010A	10	10	10
Fuse, Cartridge 20 amp, 250V, F09A25020A	10	10	10
Lamp, Glow, NE-51	2	3	3
Lamp, Incandescent, 6S6, 135V	1	4	2
Lamp, Incandescent, No. 44, MS15571-1	1	2	4
Ribbon, typewriter	2	2	2
Electron tube, 6627/OB2WA	1	2	2
Electron tube, 5U4GB	1	2	2
Electron tube, 5654/6AK5W	2	4	4
Electron tube, 5726/6AL5W	3	6	6
Electron tube, 6005/6AQ5W	1	2	2
Electron tube, 6AS7G	1	2	2
Electron tube, 6X4WA	2	4	4
Electron tube, 6AU6WB	1	2	2
Electron tube, 6BN6	1	2	2
Electron tube, 6189/12AU7WA	3	6	6
Electron tube, 12AT7WB	1	2	2
Electron tube, 5675		2	2
Electron tube, 12AX7WA			6
Semiconductor device, diode 1N21B	1		
Semiconductor device, diode 1N21C		2	
Semiconductor device, diode 1N23B		2	
Semiconductor device, diode 1N21WE			2
Switching Unit, SCR, (SM-C-584950)	4	4	4
Cable Assembly, CG-530B/U (length 6 ft) (IF cable)		2	3
Cable Assembly, CG-409/U (length 6 ft) (oscillator cable)		2	3
Belt, motor drive			1
Mixer assembly	1	1	1

Table 1-3. Common Name Assignments

Nomenclature	*Common name*
Antenna AS-462(*)/GMD-1	Antenna assembly
Antenna Control C-578(*)/GMD-1	Antenna control
Control-Recorder C-577(*)/GMD-1	Control-recorder
Case CY-734/GMD-1	CY-734/GMD-1
Case CY-735(*)/GMD-1	CY-735/GMD-1
Case CY-736/GMD-1	CY-736/GMD-1
Case CY-737(*)/GMD-1	CY-737/GMD-1
Case CY-898/GMD-1	CY-898/GMD-1
Case, Components CY-1157/GMD-1A	CY-1157/GMD-1A or accessories case
Case, Standardized Components, Electrical CY-1895/GMD-1	CY-1895/GMD-1
Cable Assembly, Special Purpose, CX-1285/U	Elevation unit cable (W951)
Cable Assembly, Radio Frequency CG-530/U	IF cable
Cable Assembly, Radio Frequency CG-409/U	Oscillator cable
Cable Assembly, Special Purpose Electrical CX-1216/U	Main cable (W901)
Cable Assembly, Special Purpose CX-1217/U	Meteorological cable (W921)
Pedestal AB-159(*)/GMD-1	Pedestal assembly
Cable Assembly, Power, Electrical CX-1492/U	Power cable adapter
Cable Assembly, Power, Electrical CX-2043/U	Power cable (W911)
Rawin Set AN/GMD-1(*)	Rawin set
Rawin Receiver R-301(*)/GMD-1	Receiver

Nomenclature	*Common name*
Cable Assembly, Power, Electrical CS-1493/U	Receiver and antenna control test cable
Cable Reel RL-137/GMD-1	RL-137/GM1)-1
Cable Reel RL-138/GMD-1	RL-138/GMD-1
Elbow Telescope M-17 (modified)	Telescope
Test Set TS-538(*)/U	Test set
Accessory Kit	Trailer adapter kit
Radiosonde Set AN/AMT-4C, Radiosonde Set AN/AMT-4D	Radiosonde
Radiosonde Recorder AN/TMQ-5(*)	Meteorological recorder
Meteorological Data Processing Groups OL-192(*)/GMD-1	OL-192

Table 1-4. Components and Auxiliary Equipment

Common name	Description
Main assembly	Includes all components of the rawin set shown in figure 1-3 except the control-recorder. Nomenclature items are Antenna AS-462(*)/GMD-1, Rawin Receiver R-301(*)/GMD-1. Antenna Control C-578(*)/GMD-1, Pedestal AB-159(*)/GMD-1.
Elevation unit assembly (fig. 1 -3)	Part of Pedestal AB-159(*)/GMD-1 (fig. 1-3); consists of an elevation unit and a yoke, mounted between the antenna assembly and housing. Contains elevation positioning circuits and allows movement of the antenna assembly in the vertical direction,
Elevation unit	This unit consists of that part of the elevation unit assembly without the yoke.
Housing (fig. 1-3)	Part of Pedestal AB-159(*)/GMD-1; used to house the receiver and antenna control. Contains interunit cabling for the main assembly and is mounted between the elevation unit assembly and the azimuth unit (fig. 1-3).
Azimuth unit (fig. 1-3)	Part of Pedestal AB-159(*)/GMD-1; contains the azimuth positioning circuits, Top portion, referred to as a turnable, allows the assemblies (housing, elevation unit assembly, and antenna assembly) mounted on it to turn 360° in azimuth. Around its sides (fig. 1-1) are mounts to which outrigger legs and compression bars are attached to give stability to the main assembly.
Outrigger assembly (fig. 1-22)	Consists of three outrigger legs, three compression bars, three jackscrews, and three jack plates, and is mounted to the azimuth unit (described above), Gives stability to the main assembly and provides means for leveling,
Antenna scanner assembly (fig. 1-5)	Part of Antenna AS-462(*)/GMD-1, and contains necessary components to provide conical scanning. Includes drive motor, reference voltage generator, dipole antenna, eccentric cup, rigid transmission line, power cable, and protective housing for its components. It is mounted to the reflector (described below).
Reflector (fig. 1-4)	Consists of three sections; center section, right wing section, and left wing section, These sections are bolted together to form a parabolic reflector for Antenna AS-462(*)/GMD-1. A telescope assembly is permanently mounted to the reflector. Provisions are included for mounting the antenna scanner assembly. The entire antenna assembly mounts to the elevation unit assembly (fig. 1-1).
Mixer assembly (fig. 1-7)	Part of the Rawin Receiver R-30(*)/GMD-1 and functions as the mixer stage for the receiver. It is mounted to the antenna scanner assembly at the rear of the reflector and includes housing for the crystal, mounting, and coupling hardware to connect between the transmission line of the antenna scanner assembly and the cables to the receiver.
Meteorological recorder	Auxiliary equipment (para 6-4) used to record meteorological data received and detected by the rawin set. Radiosonde Recorder AN/TMQ-5(*) (fig. 6-2) is most commonly used, This component is not a part of the rawin set.
Radiosonde	Auxiliary equipment (para 6-2) used as the balloon-borne transmitter that is sent aloft to sense weather conditions and transmit them to the rawin set. Radiosonde AN/AMT-4(*) (fig. 6-1) is used for this function, and is not part of the rawin set.
Telescope assembly (fig. 1-26)	Used to mount the telescope to the reflector. Includes a mounting bracket, that has two locking knobs and adjusting screws for moving the telescope in elevation and azimuth.
OL-192 (fig. 1-3.1 ① and 1-3.1 ②)	Used to reduce raw meteorological data received by Radiosone Recorder AN/TMQ-5(*), and Angular data received by Control Recorder C-577(*)/GMD-1 into meteorological messages. Consists of a commercial, programmable, desk top computer interfaced with a compatible commercial teletype paper tape reader/perforator, The OL-192/GMD-1 (fig. 1-3.1 ① is specifically used by artillary MET sections of armored, infantry, and mechanized units authorized truck-mounted Electronic Equipment Shelter S-281/G or Shop Van M 109. The OL-192A/GMD-1 (fig. 1-3.1 ② is specifically used by artillary MET sections operating with airborne or airmobile units.

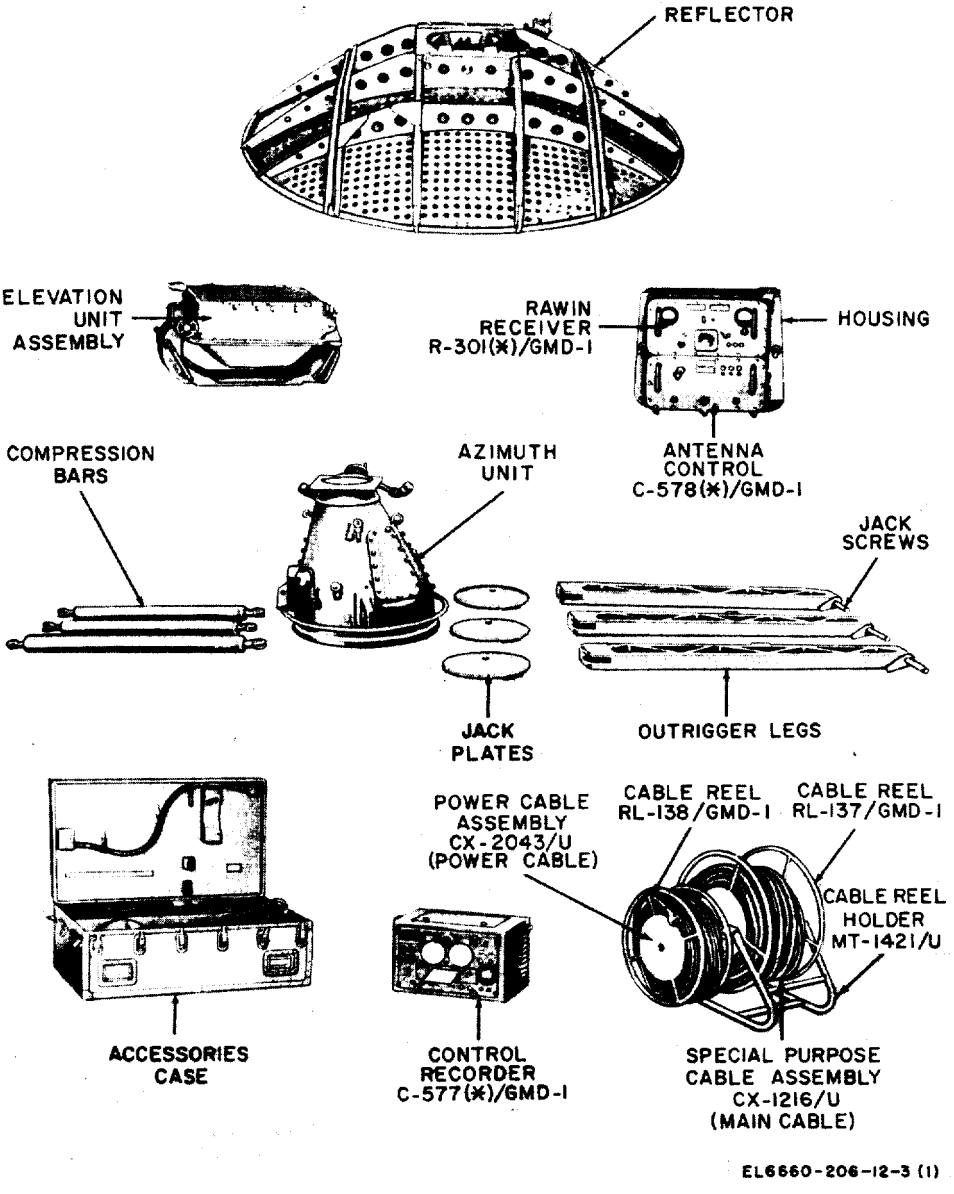


Figure 1-3 ①. Raw in Set AN/GMD-1(*), main components (sheet 1 of 2).

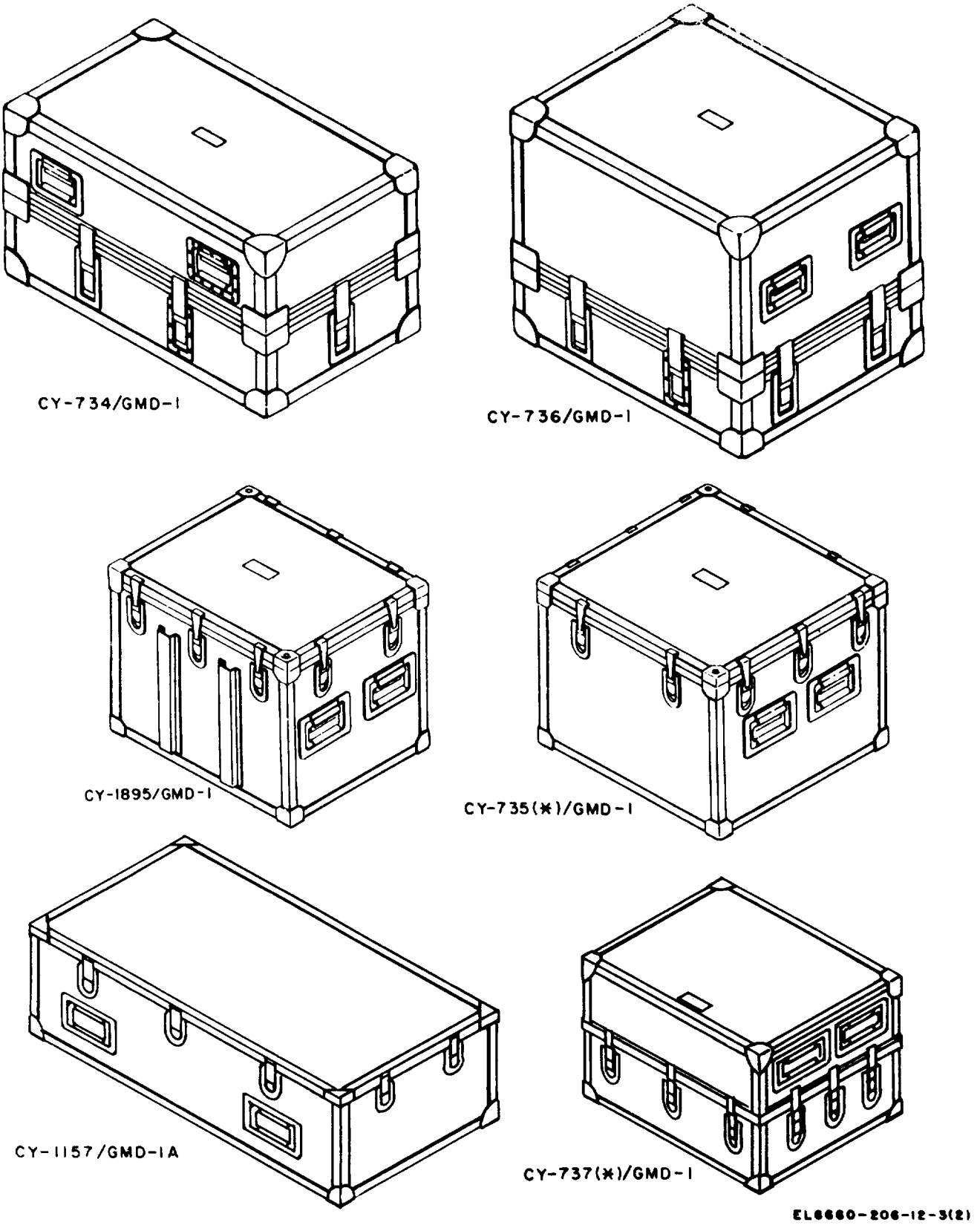


Figure 1-3 ②. Rowin Set AN/GMD-1(*), main components (sheet 2 of 2).

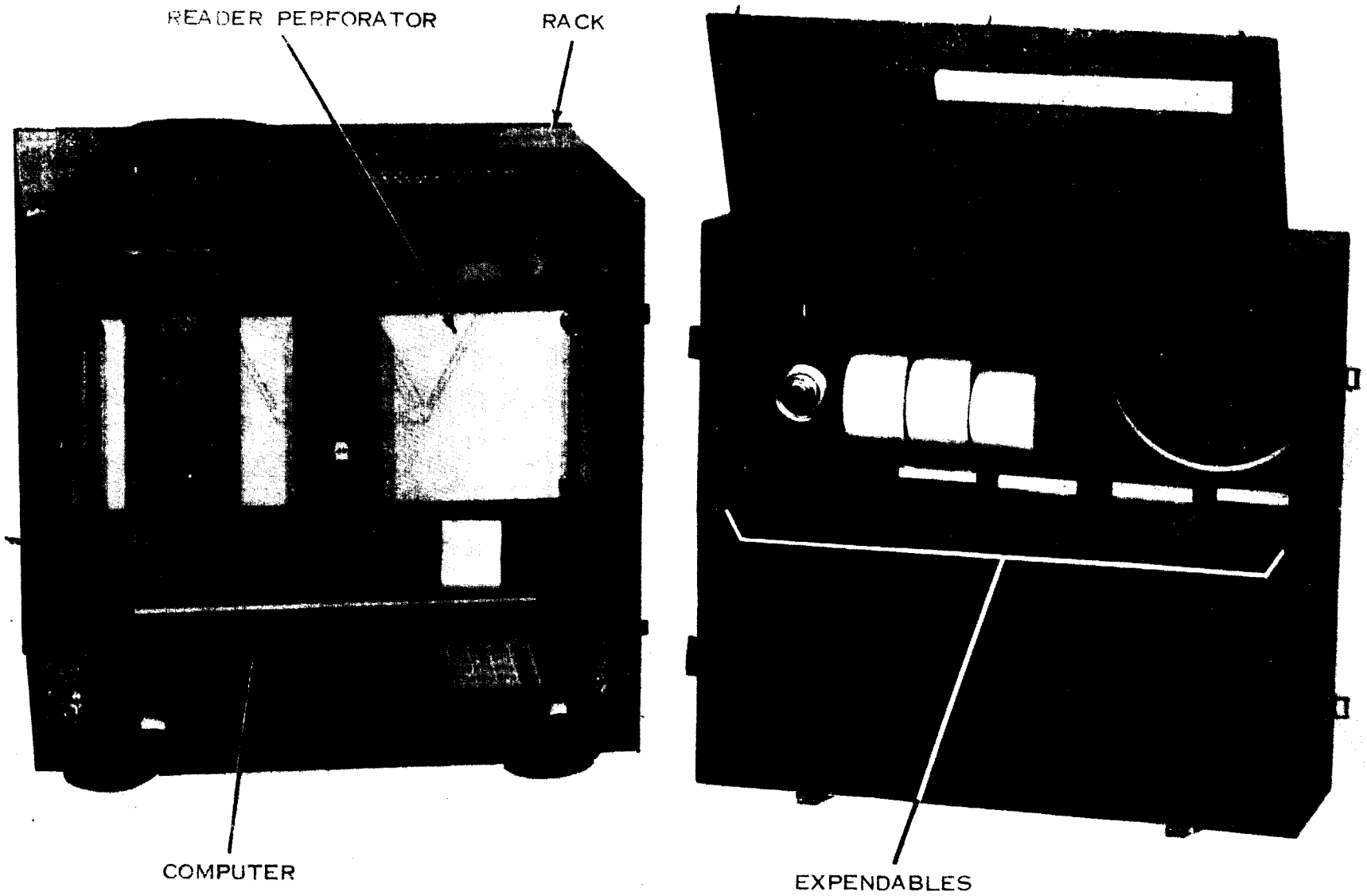


Figure 1-3.1 ①. Meteorological Data Processing Group, OL-192/GMD-1 (sheet 1 of 2)

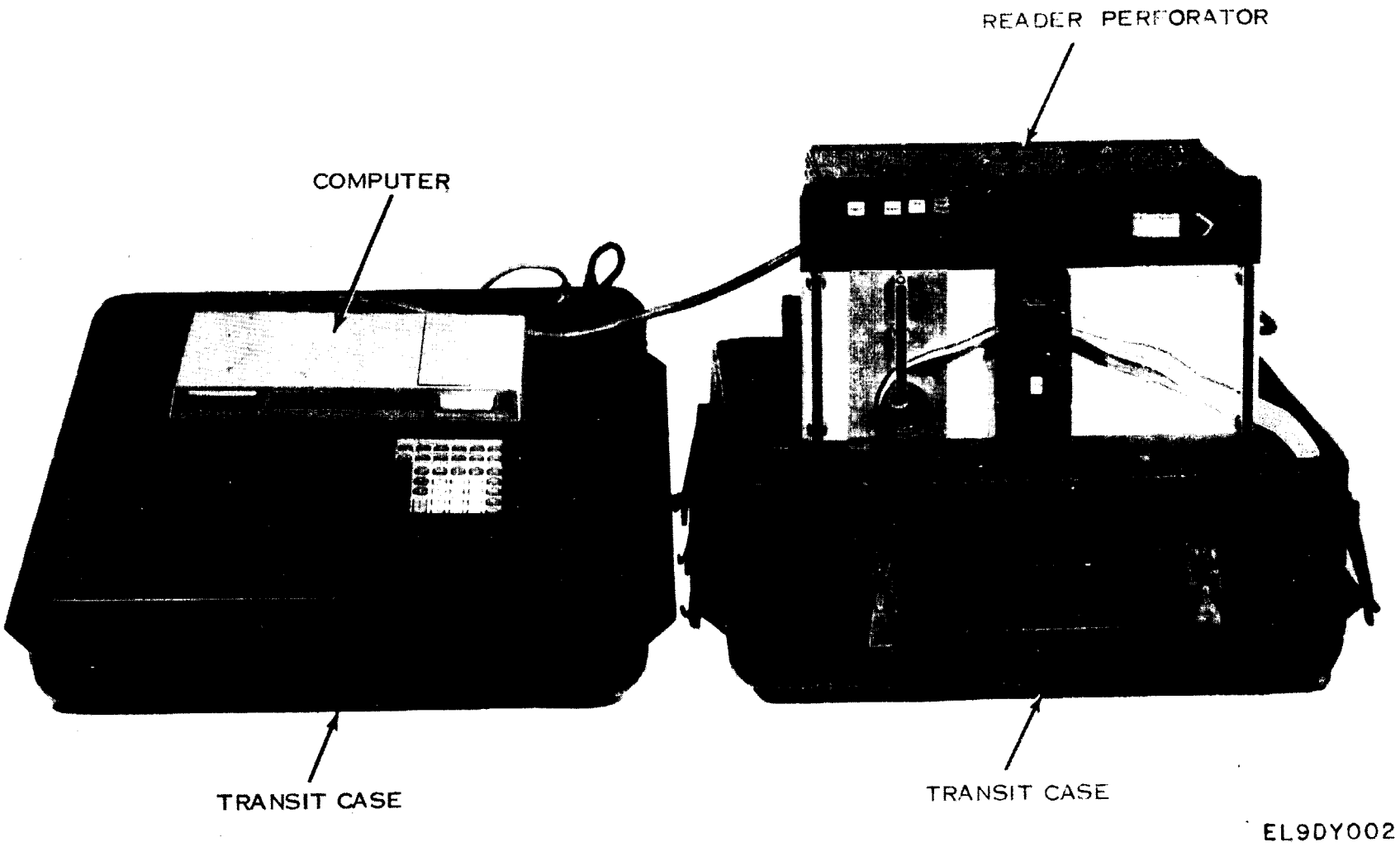


Figure 1-3.1 ②. Meteorological Data Processing Group, OL-192A/GMD-1 (sheet 2 of 2).

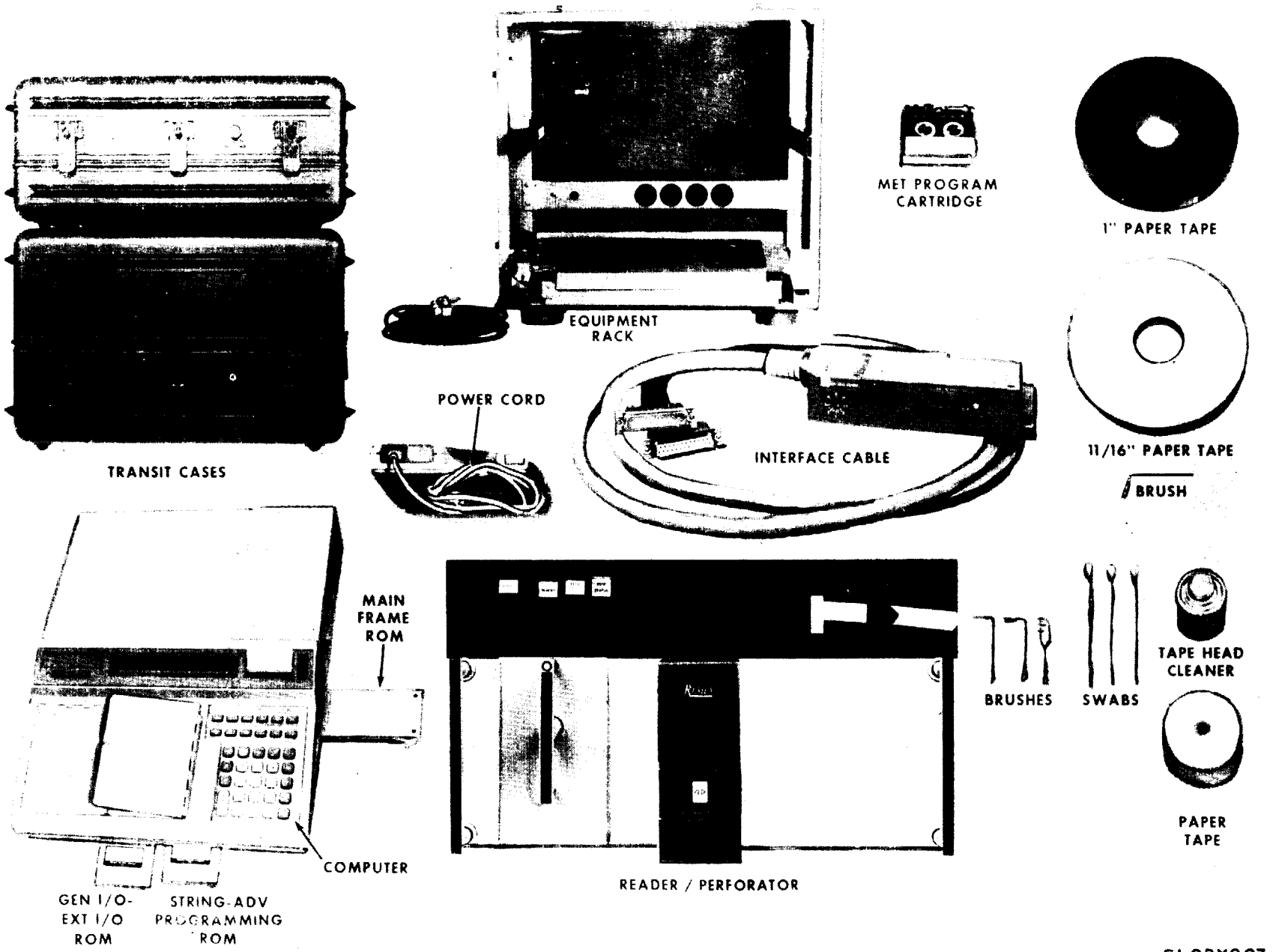


Figure 1-3.2. Meteorological Data Processing Groups OL-192/GMD-1 and OL-192A/GMD-1 (major components).

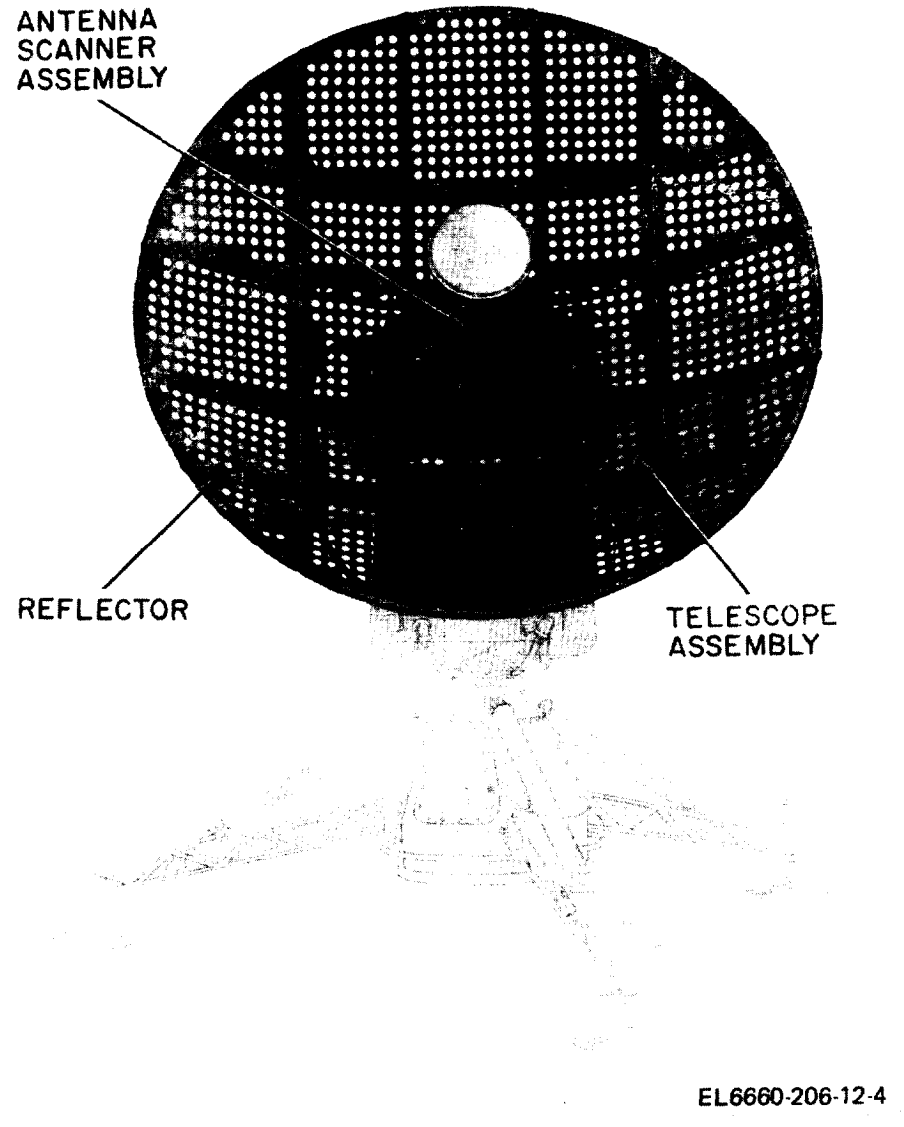


Figure 1-4. Antenna AS-462(*)/GMD-1, front view.

(1) *Main assembly.* The main assembly consists of all components shown in figure 1-1 except the control-recorder. Antenna AS-462(*)/GMD-1 includes an antenna scanner assembly and reflector that is used to receive the incoming signal and provide conical scanning. Attached to the antenna scanner assembly is the mixer stage of the receiver in a mixer assembly (not shown). Conversion of the income signal takes place in the mixer assembly as oscillator injection is supplied by a cable from the receiver. Another cable carries the intermediate frequency (IF) signal to the receiver. The elevation unit assembly mounted between the antenna assembly and the housing contains part of the elevation positioning circuits that. allow the antenna assembly to be positioned through 95° elevation either manually or automatically (elevation drive information comes from the antenna control). The housing provides mounting and interconnecting facilities for the receiver, antenna control, and elevation unit assembly. The housing is mounted on the turntable of the azimuth unit to allow the antenna assembly to turn 360° in azimuth. The receiver amplifies the IF signal and detects the meteorological information which is passed on through the control-recorder to the meteorological recorder (para 1-5). The antenna control contains the antenna control circuits necessary to control the movement of the antenna assembly in elevation and azimuth both manually and automatically. For automatic movement of the antenna as-

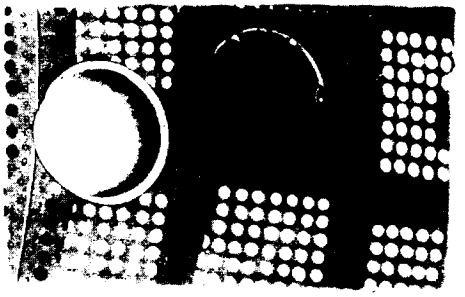
sembly, information originates in the antenna scanner assembly, is made part of the incoming signal, passes through the receiver, is converted in the antenna control, and then is sent to the driving mechanisms of the antenna assembly. The aximuth unit contains part of the azimuth positioning circuits that allow the assemblies mounted on it is turn 360° in azimuth either manually or automatically (azimuth drive information comes from the antenna control). Mounted to the azimuth unit is the outrigger assembly that provides leveling and stability to the main assembly. A long interconnecting cable is provided between the main assembly and the control-recorder. It supplies 115 volts ac to the units of the main assembly, carries elevation and azimuth angle information to the control-recorder, and meteorological information also to the control-recorder where it is passed on the meteorological recorder (para 1-5).

(2) *Control-recorder.* The control-recorder consists of a printing mechanism, elevation and azimuth angle indicators, and switching circuits. The 115-volt ac source passes through this unit to the main assembly. The detected meteorological information from the main assembly passes through the switching circuits of the control-recorder to the meteorological recorder (para 1-5). The elevation and azimuth information from the main assembly is received and converted to dial indications and is simultaneously printed on tape. Time intervals of balloon-borne radiosonde (para 1-5) ascent are also indicated and printed on the same tape to coincide with the elevation and azimuth information. The power cable that supplies power to the rawin set is connected between the control-recorder and the 115-volt ac source. Meteorological information that is passed through the control-recorder is sent to the meteorological recorder through an interconnecting meteorological cable (not shown).

b. Antenna AS-462(*)/GMD-1. The antenna assembly consists of the reflector and antenna scanner assembly.

(1) *Reflector* (fig. 1-4). The spun aluminum reflector is perforated to reduce the weight and wind resistance and is made in three sections to facilitate shipping. The back of each section is reinforced by aluminum stiffeners which serve as bolting surfaces when assembling. The brackets riveted to the rear of the reflector are used to mount the assembly on the elevation unit assembly. The hole at the center of the reflector mounts

the antenna scanner assembly. The mounting hook and guide pins are used on the aluminum stiffeners to support and align the assembly. As a guide in the assembly of later models, matching painted stripes located on the rear of the reflector are used. A hole located in the lower right-hand portion of the reflector is used as a window for the telescope assembly. The hardware required to assemble and mount the reflector is attached to the aluminum stiffeners by chains and retainer rings.



EL6660-206-12-5

1-5. Antenna scanner assembly.

(2) *Antenna scanner assembly* (figs. 1-5 and 1-6). The antenna scanner assembly consists of the motor and generator assembly, the pylon, and the radome. It is furnished completely assembled.

(a) Motor and generator assembly. This assembly is mounted within the antenna scanner assembly on a mounting plate that is located at the large end of the cone formed by the pylon. The power for the drive motor is furnished from the housing through a cable that is permanently connected to the antenna scanner assembly. The drive motor rotates at a constant speed (approx 1,760 revolutions per minute) and drives the eccentric CLIP, located within the radome, and the reference voltage generator *((b)* below).

(b) Reference voltage generator. The ref-

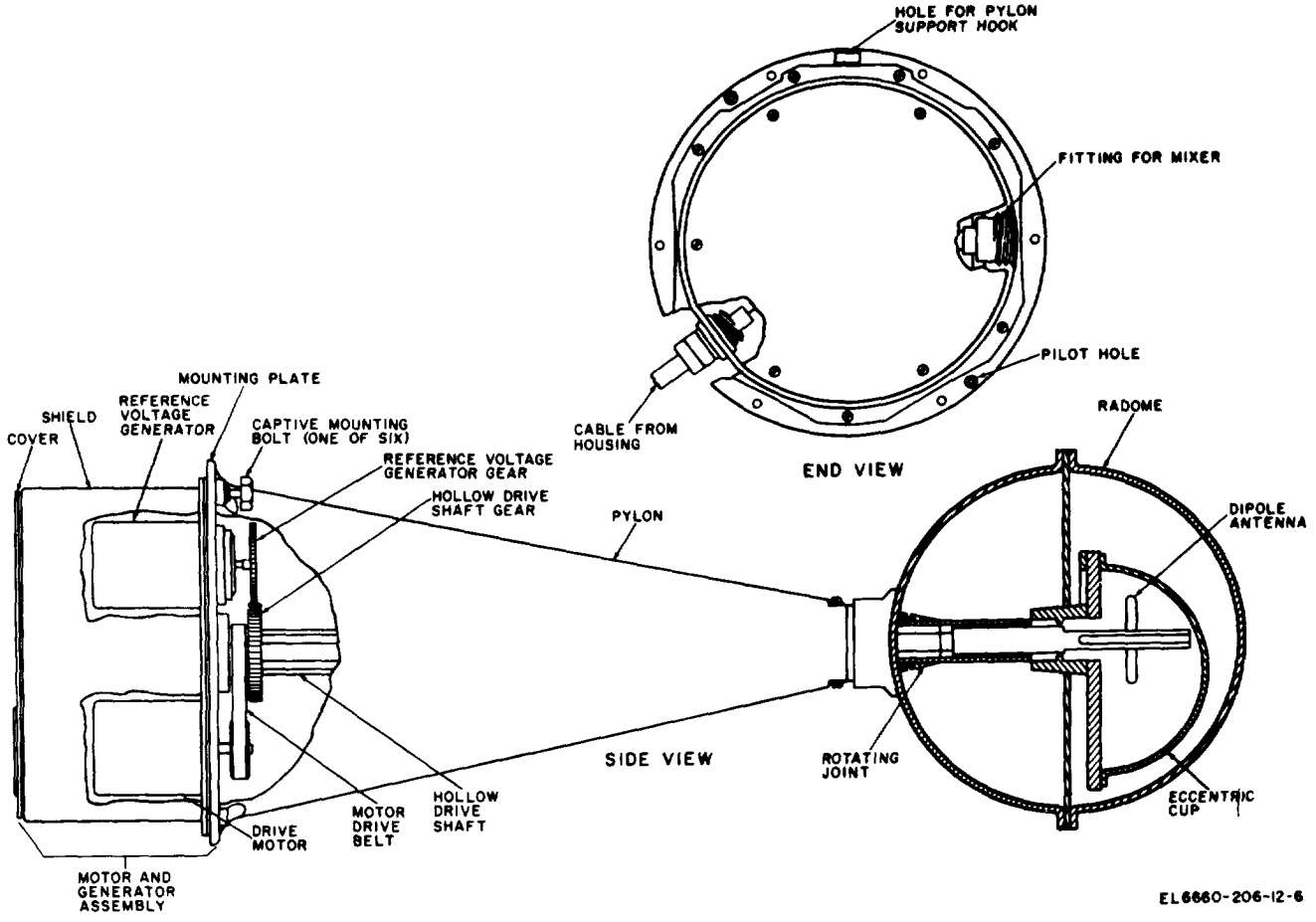


Figure 1–6. Antenna scanner assembly, simplified cutaway views.

erence voltage generator is located within the antenna scanner assembly and is on the same mounting plate that holds the drive motor (fig. 1-6). The reference voltage generator is driven by the drive motor and generates the reference voltage used by the rawin set to track the radiosonde in azimuth and elevation. The same cable that contains power leads for the motor provides output leads for the reference voltage generator. Both the reference voltage generator and the drive motor are protected from moisture and dust by a shield and cover.

(c) Pylon. The pylon is a conical metal structure located between the motor and generator assembly and the radome. It is mounted on the mounting plate of the motor and generator assembly by six mounting screws. The hollow drive shaft and associated gears that drive the eccentric cup are housed in the pylon.

(d) Radome. The radome is a two-section fiberglass dome which houses the eccentric cup, rotating joint, and the dipole antenna. One section is mounted on the narrow end of the pylon; the other section is joined to the first by 12 mounting screws. A neoprene gasket is used between the two sections to protect the operating elements against dust and moisture.

c. Rawin Receiver R-301(*)/GMD-1. Rawin Receiver R-301(*)/GMD-1 consists of the mixer assembly and the receiver. The mixer assembly, which contains the mixer stage of the receiver, is described in (1) below. The receiver, which contains the remainder of the receiver circuits, is described in (2) below.

(1) *Mixer assembly* (fig. 1-7). The mixer assembly is a rigid coaxial transmission line with a coupling at one end and two arms mounted in a line and at 90° to the main body near the other end. The coupling on the end of the mounting extension connects the mixer assembly by means of a knurled nut to the supporting stub and transmission line in the motor and generator assembly (fig. 1-6). The mixer assembly is mounted at the rear of the reflector with the arms parallel to the side of the elevation unit assembly (fig. 2-27). Connection is made to the antenna scanner assembly on the threaded fitting through the access hole in the reflector. Two coaxial cables connect the mixer assembly to the receiver. One coaxial cable connects the receiver local oscillator output (OSC OUTPUT) to the oscillator injection arm of the mixer assembly. A second coaxial cable connects the received (IF INPUT) to the IF arm of the mixer assembly.

(2) *Receiver.* The receiver (figs. 1-8 and 1-9) is located in the top compartment of the

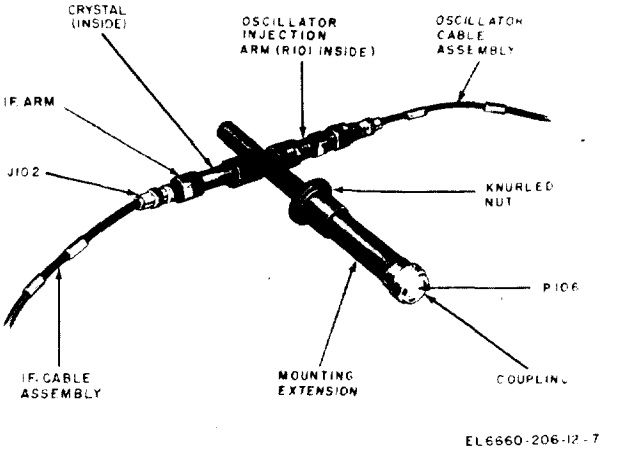


Figure 1-7. Mixer assembly.

housing (fig. 1-1). The IF amplifier and the local oscillator and servo assembly are mounted on the receiver chassis. The local oscillator and servo assembly contains the local oscillator, tuning motor, antihunt generator, three limit switches, and the associated circuit components. This assembly is located at the front left-hand side of the receiver chassis. The components of the automatic frequency control (afc) circuits are mounted on the right-hand side of the receiver chassis. The FREQUENCY MEGACYCLES meter is visible through a small window in the control panel. The elements of the power supply are located on the rear portion of the receiver chassis. The SERVICE METER and the METER SELECTOR switch are on the left-hand side of the control panel, and two active fuses and two spare fuses are located at the top of the chassis in the front right-hand corner.

d. Antenna Control C-578(*)/GMD-1. The antenna control (figs. 1-10 and 1-11) is located in the bottom compartment of the housing (fig. 1-1). Most of the component parts in this unit are arranged symmetrically on the chassis so that the azimuth channel components are on the right-hand side of the chassis, the equivalent elevation channel components are on the left-hand side. A screened compartment encloses the switching units and the driver power transformer. Three socket mounted spare fuses are located next to the three active fuses. A 115-volt ac outlet on the front panel facilitates testing and servicing the rawin set. It supplies power for soldering irons, the test set, and other low power test equipment.

NOTE

Azimuth or elevation drivers (SCR) shown in figure 1-11 may be type 3C23

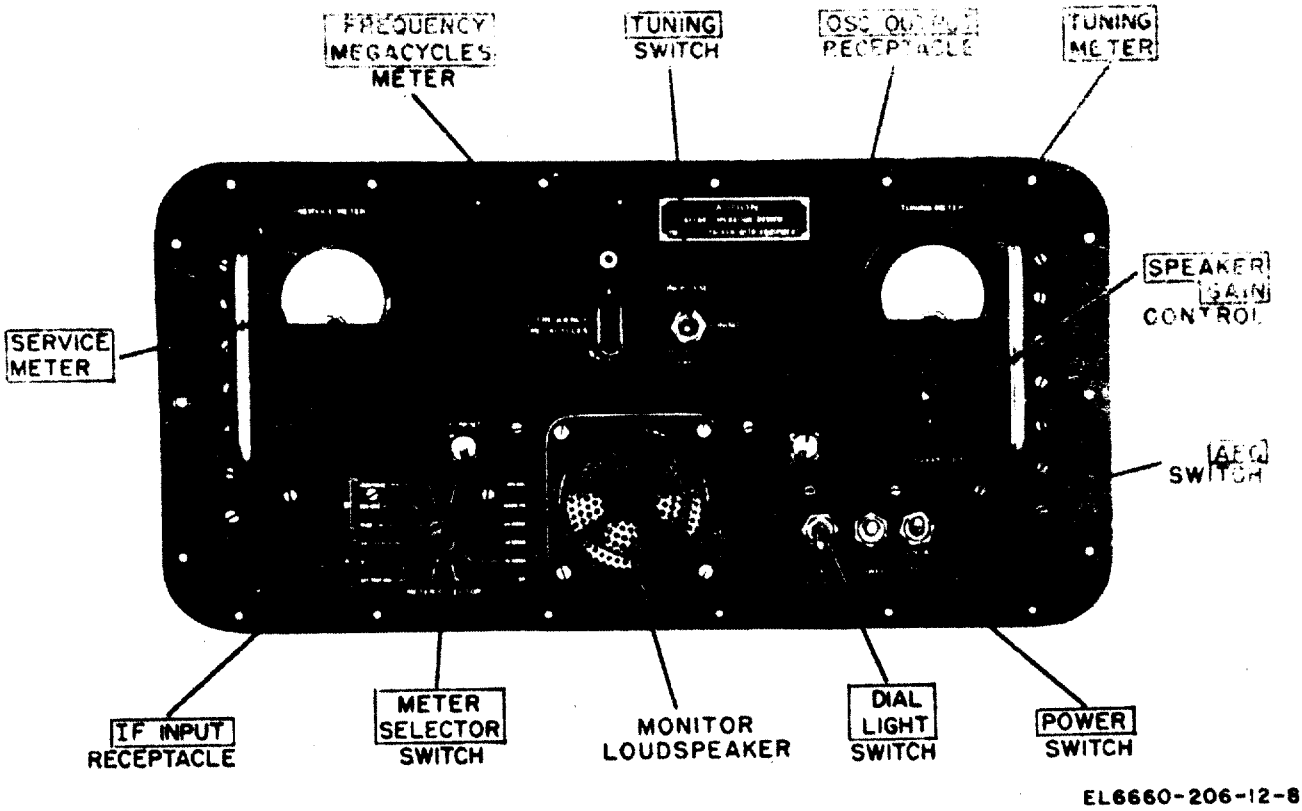


Figure 1-8. Rawin Receiver R-301(*)/GMD-1.

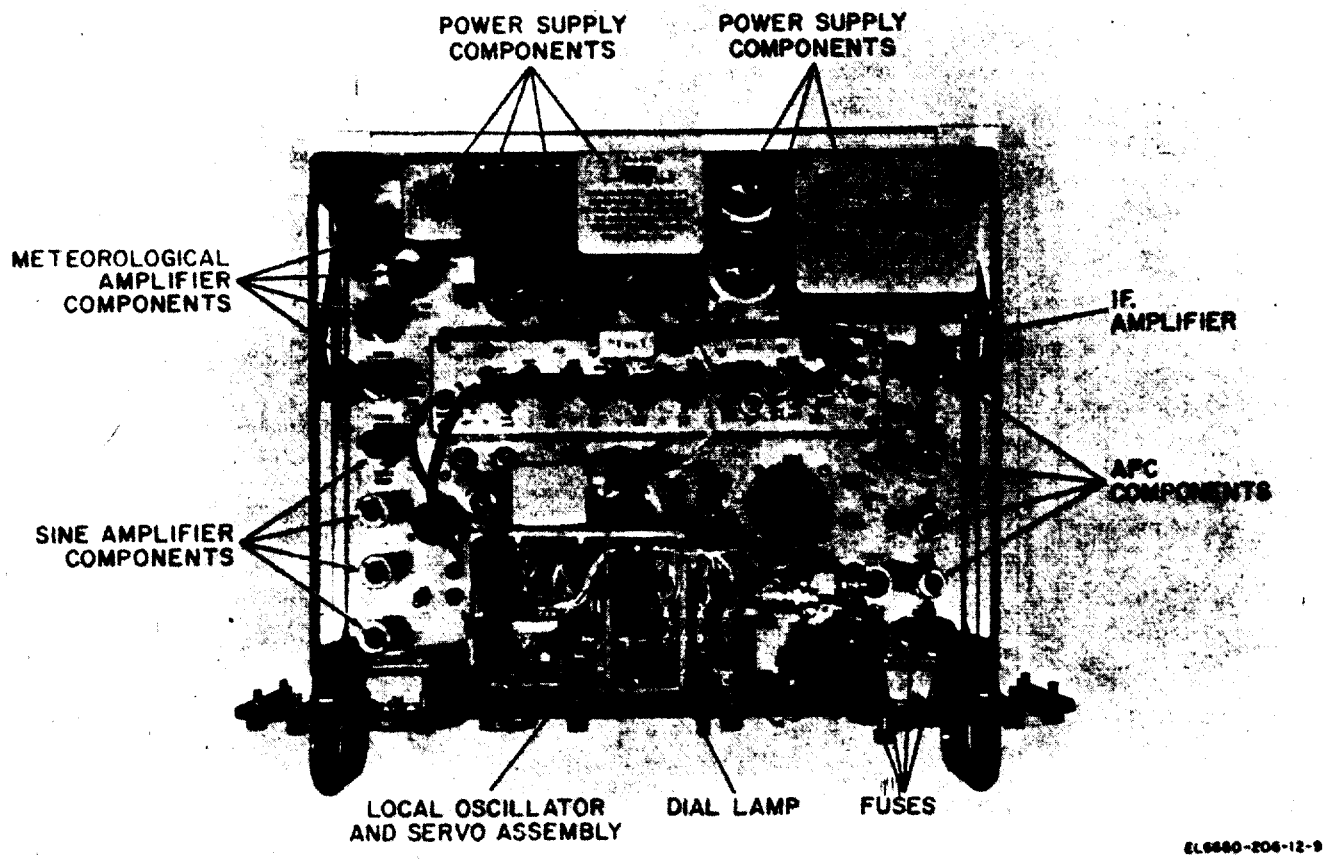


Figure 1-9. Rawin Receiver R-301(*)/GMD-1, top view.

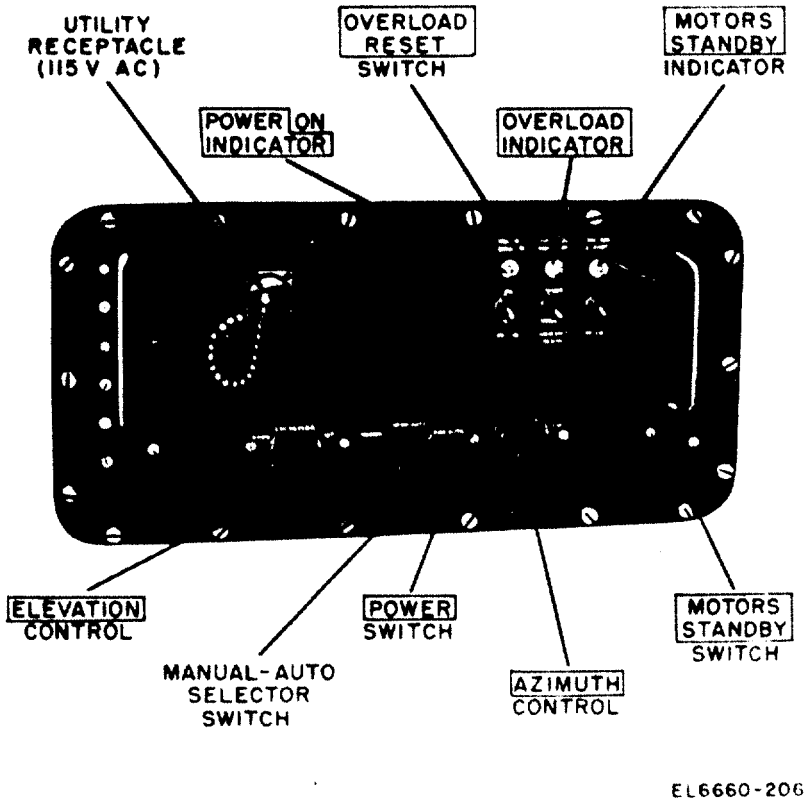


Figure 1-10. Antenna Control C-578(*)/GMD-1, front view.

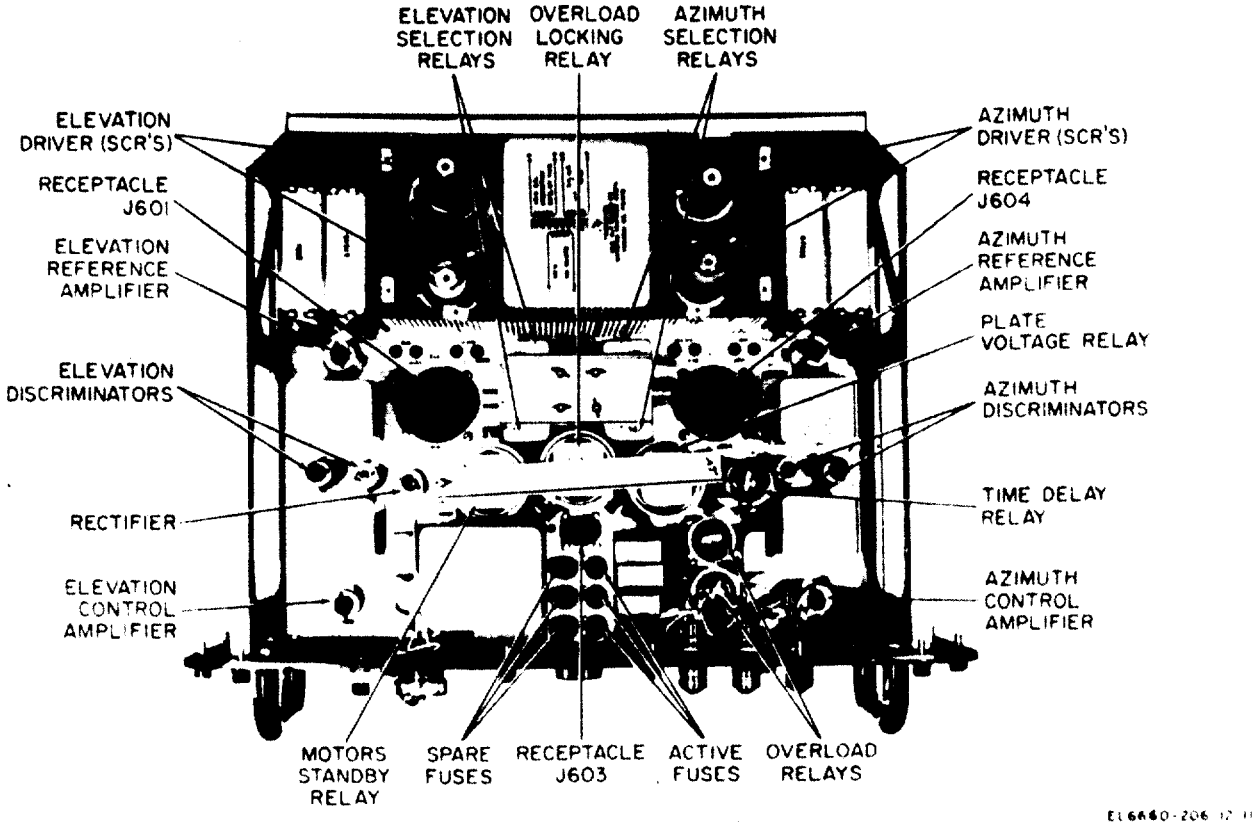


*Figure 1-11. Antenna Control C-578C/GMD-1**, top view.*

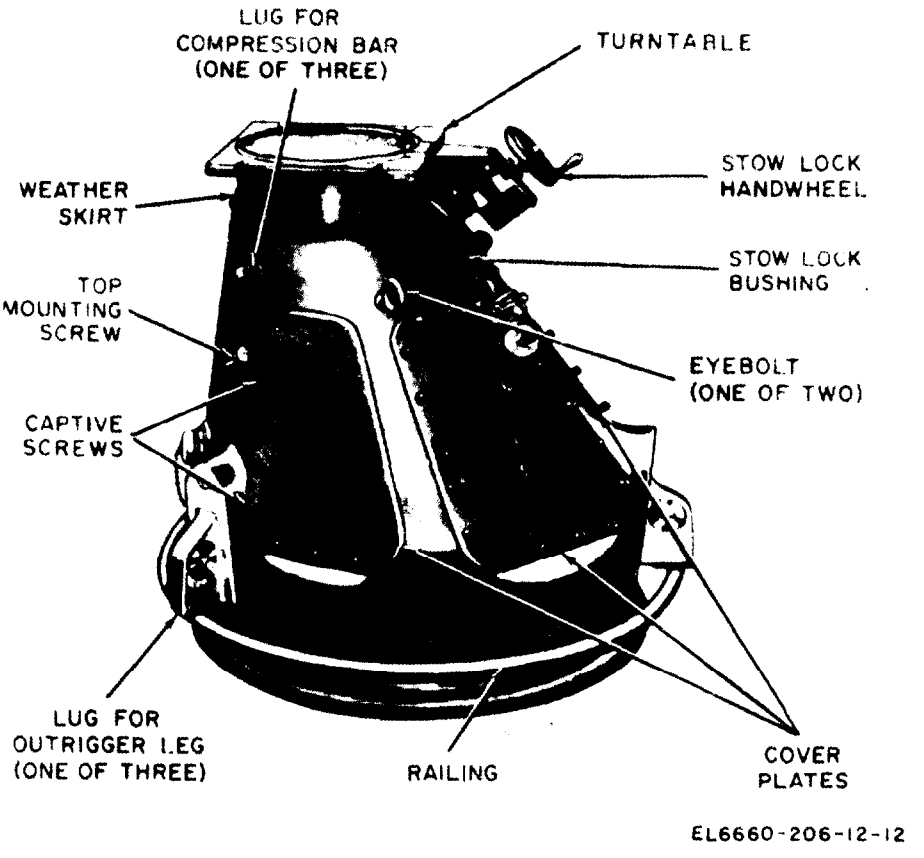


Figure 1-12. Azimuth unit, side view.

thyratron tubes in some models. These tubes will be replaced by solid state switching units when existing supplies of thyratrons are depleted.

e. Pedestal AB-159(*)/GMD-1. Pedestal AB-159(*)/GMD-1 (fig. 1-1) contains the azimuth unit, the elevation unit assembly, the housing, and the outrigger assembly. These components are described separately in paragraphs 1-13 through 1-16.

f. Azimuth Unit. The azimuth unit (figs. 1-12 and 1-13), an irregular, cone-shaped housing, contains an azimuth drive assembly, a turntable assembly, and miscellaneous components. A 115-volt ac outlet supplies power for low-power test equipment (550 watts or less).

(1) *Azimuth unit housing.* A flat shelf in the housing supports the aximuth drive assembly and the bottom bearing of the turntable assembly. The top, or neck, of the azimuth housing supports the top bearing of the turntable assembly. Four cover plates on the sides of the housing permit access to the interior elements. One of these covers has a circular window, protected by a small hinged cover, to view the azimuth angle indicator. The revolving elements of the main assembly are electrically connected to stationary spring contacts. These contacts ride on the sliprings of the turntable assembly. The spring contacts are fastened to two vertical terminal boards mounted in the azimuth unit. The tubular railing near the bottom of the azimuth unit and the two eyebolts near the top are used to lift the unit.

(2) *Azimuth drive assembly.* The azimuth drive assembly (fig. 1-13) consists of the azimuth drive motor, the azimuth synchro transmitter, the azimuth antihunt generator, and gears and shafts. The components of this assembly are mounted on an aluminum frame. Rotation of the azimuth drive assembly causes rotation of the turntable assembly ((3) below) and all the units mounted on the turntable, and consequently cause rotatior. of the antenna assembly. The azimuth drive assembly is also geared to the azimuth synchro transmitter which transmits azimuth angle information of the antenna to the control-recorder *(j* below). In addition, rotation of the azimuth drive motor determines the position of the azimuth angle indicator (a mechanical device equipped

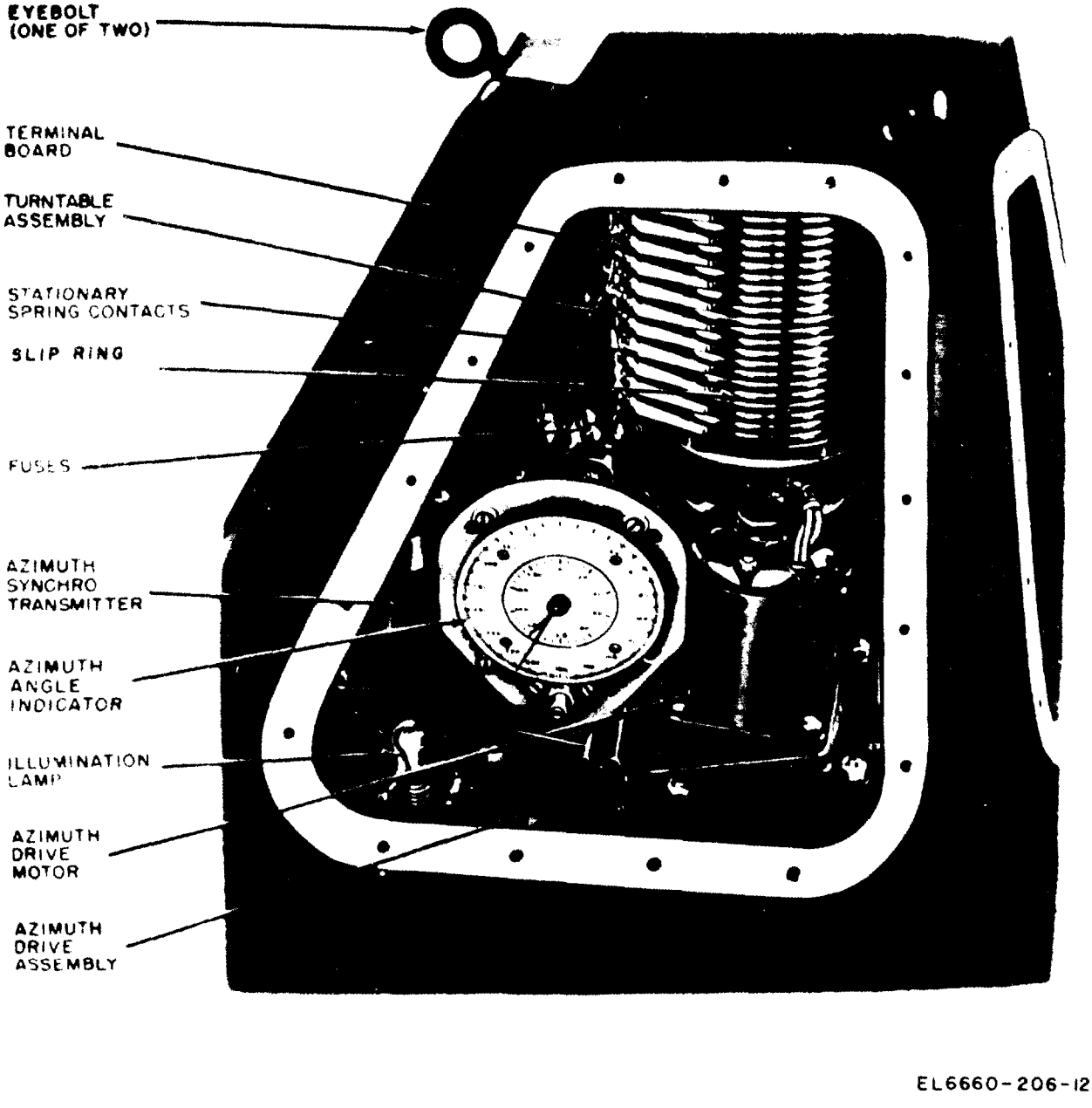


Figure 1-13. Azimuth unit, front view, cover removed.

with two pointers and two concentric scales). The equipment is oriented so that the azimuth angle indicator reads 0° when the axis of the reflector is pointing to north. A spring-loaded screwdriver adjustment (fig. 3-5) directly below the indicator dial is used to set the azimuth angle indicator to any desired reading,

(3) *Turntable assembly.* The turntable assembly supports the revolving units of the main assembly and also establishes the required electrical connections between these units and the azimuth unit. The turntable (fig. 1-12) is that portion of the turntable assembly that extends outside of the top of the azimuth unit housing. A steel-faced square shelf on top of the turntable forms a mounting base for the housing. Rotation of the stow lock handwheel, on the side of the turntable, extends a shaft into the stow lock bushing of the azimuth unit housing. Power is disconnected from the azimuth drive motor when the stow lock handwheel is turned to the extreme clockwise position, Three of the six mounting lugs on the side of the azimuth unit housing are used to attach the outrigger legs to the azimuth unit the other three lugs are used to attach the compression bars to the unit. The lower portion of the

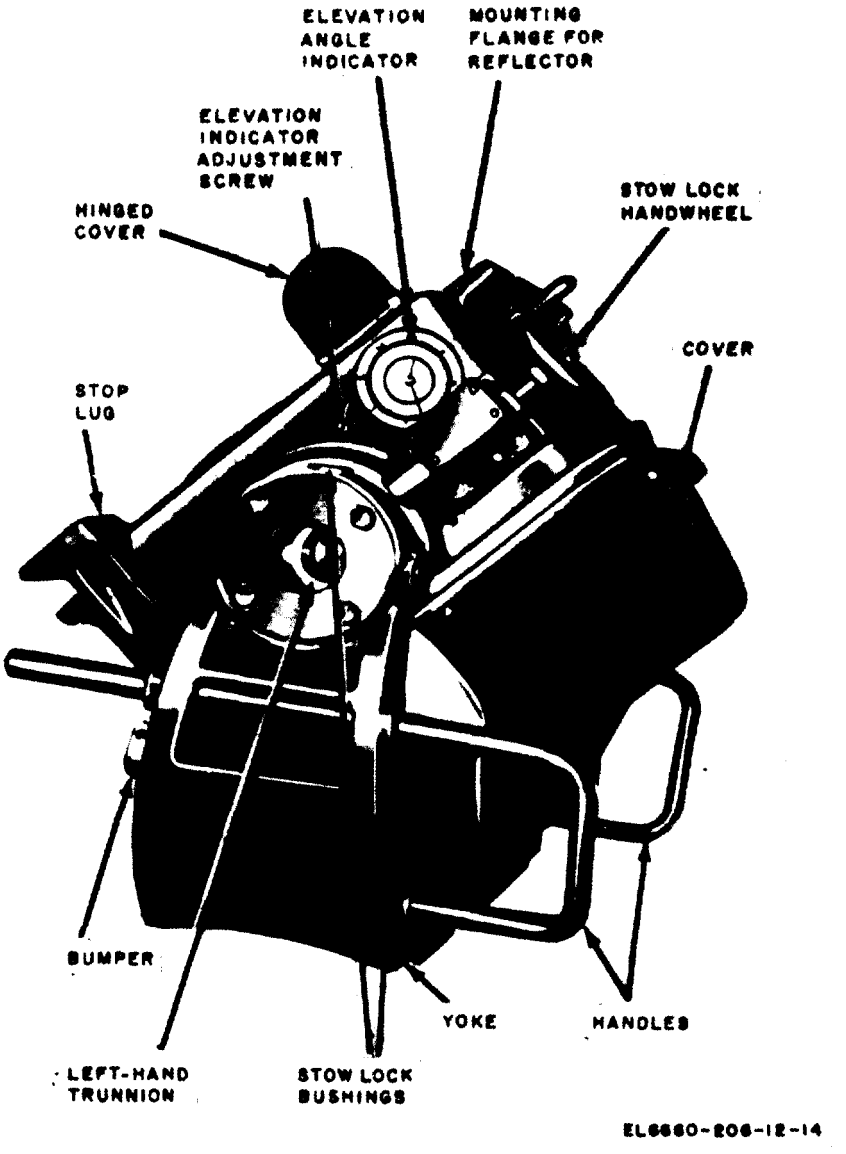


Figure 1-14. Elevation unit, side view.

turntable forms a weather skirt to protect the components in the azimuth unit housing.

g. Elevation Unit Assembly. The elevation unit assembly (figs. 1-14 and 1-15) consists of the yoke and the elevation unit.

(1) *Yoke.* The U-shaped yoke has two carrying handles and mounting facilities to secure the elevation unit assembly to the top of the housing. Because it is secured in this position, the yoke is fixed in elevation. Two trunnions extend through the holes in the arms of the yoke and into the sides of the elevation unit housing. The rubber bumper on the right-hand handle of the yoke comes in contact with a stop lug on the elevation unit housing when the antenna assembly, which is mounted to the elevation unit *((b)* below), reaches maximum elevation. Another rubber bumper, mounted at the rear of the left arm of the yoke acts similarly when the antenna assembly reaches minimum elevation. A bushing at the top of the left-hand trunnion receives the stow lock shaft when the elevation unit is in the 0° elevation position. A hole on the front of the left-hand trunnion receives the stow lock shaft when the elevation unit is in maximum elevation position (90°), Safety shields on both sides of the yoke protect personnel against possible injury when the antenna elevation is being changed. In Rawin Set AN/GMD-1B*, a spirit level is located in the center of the yoke base; it is installed as a

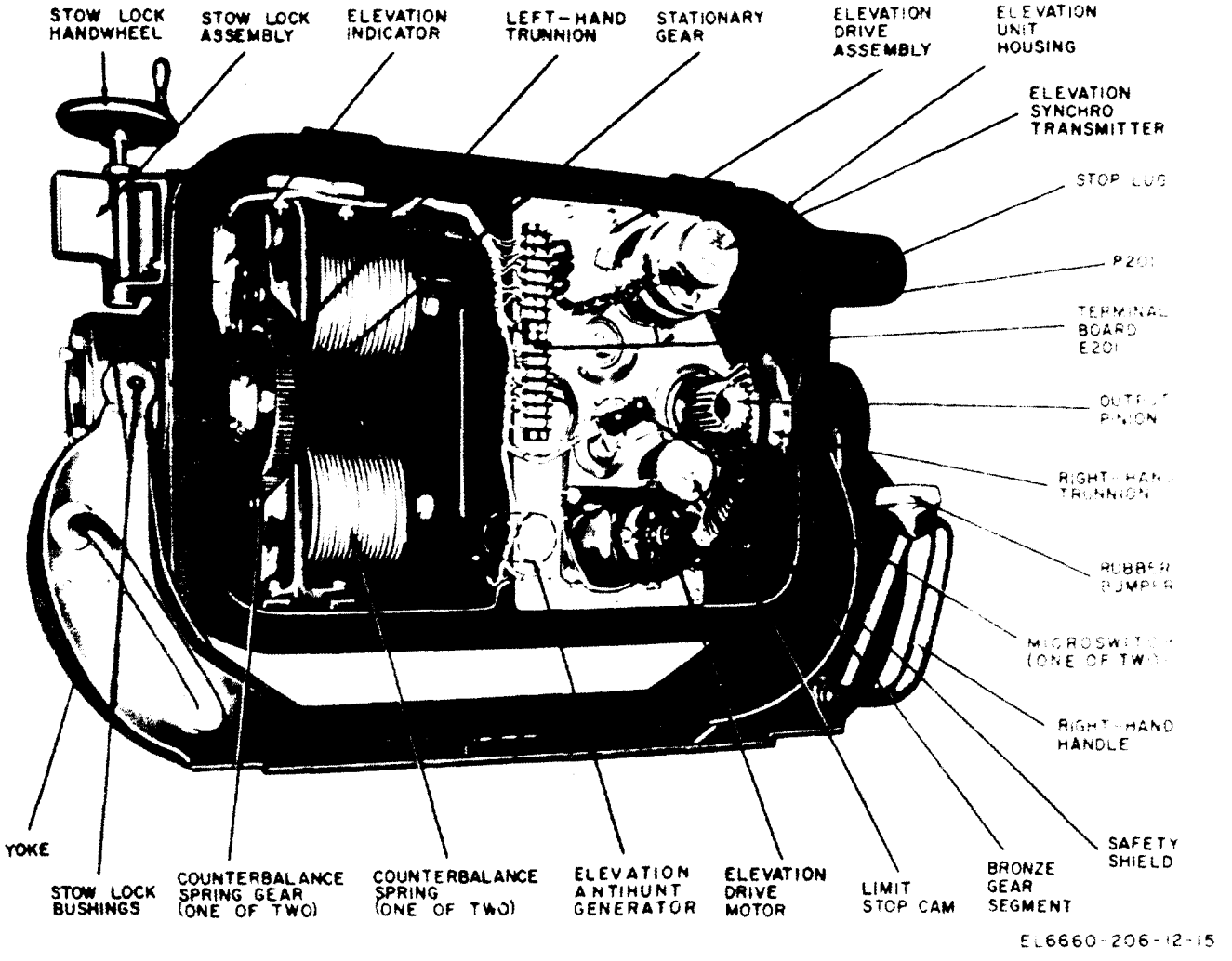


Figure 1-15. Elevation unit, front view, cover removed.

preparatory feature for future addition of ranging equipment.

(2) *Elevation unit.* The elevation unit consists of an elevation unit housing (fig. 1-15) and cover (fig. 1-14), an elevation drive assembly, an elevation indicator, a stow lock assembly, and the counterbalance springs and gears.

(a) Housing and cover. The elevation unit housing is made of cast aluminum and houses the elevation drive assembly, the counterbalance springs and gears, and the elevation indicator. Slots (mounting flange for reflector) in the rear the top and bottom of the elevation unit housing are used to attach the antenna assembly. The stow lock assembly is mounted on the left side of the elevation unit. Rotation of the stow lock handwheel causes a shaft in the stow lock assembly to extend outward, If the axis of the reflector is at the 0° or 90° position, the stow lock shaft enters one of the stow lock bushings in the yoke. In either of the stowed positions, the stow lock assembly prevents movement of the antenna in elevation. When the stow lock shaft is engaged in a stow lock bushing, it shuts off the power supply to the elevation drive motor. The neoprene gasket between the cover and the housing has one corner extending beyond the edge of the cover as a warning to operating personnel to move their hands away from the yoke when the elevation angle of the antenna is being decreased.

(b) *Elevation drive assembly.* The elevation drive assembly consists of the elevation drive motor and elevation drive circuits that are necessary to control the antenna assembly movement in elevation. These elements are mounted on an aluminum frame, and the frame is bolted to the elevation unit housing. The elevation drive motor is controlled by the antenna control. Rotation of the

elevation drive motor tilts the entire elevation unit upward or downward, depending on the direction of rotation of the motor. The antenna assembly is bolted to the elevation unit housing and tilts in elevation when the elevation drive motor rotates.

(c) Counterbalance springs and gears. The counterbalance springs and gears aid the elevation drive motor in positioning the antenna assembly by exerting a force in an opposite direction to the weight of the antenna assembly. When the axis of the reflector is vertical (reflector facing straight up, A, fig. 1-16), the entire weight of the antenna assembly is on top of the trunnions and the coil springs are completely unwound. One end of each spring is fastened to the elevation unit housing, and the other end is secured to a gear shaft. The gears on both shafts mesh with the stationary gear on the left-hand trunnion of the yoke. As the elevation angle of the elevation unit housing and antenna assembly decreases, the two coil spring gears rotate and both coil springs wind up. When the axis of the reflector is horizontal (B, fig. 1-16), the coil springs are fully wound, and their combined tension exerts a force that is opposite and nearly equal to the weight of the antenna assembly. Because the springs unwind as the antenna assembly is raised in elevation, the required torque of the elevation drive motor is small.

(d) Elevation angle indicator. The elevation angle indicator (fig. 1-14), a mechanical device geared to the elevation drive assembly, has two pointers and two concentric scales. The elevation angle indicator reads 0° when the reflector axis is in a horizontal position and 90° when the reflector axis is vertical. The elevation angle indicator has a spring-loaded screwdriver adjustment, accessible through a hole in the elevation unit housing, to set the elevation angle indicator to any desired reading. A dial light mounted in the elevation unit housing illuminates the indicator.

h. Housing. The housing (figs. 1-17 through 1-21) supports the elevation unit assembly and antenna assembly, houses the receiver and antenna control, and interconnects the various units of the main assembly. The housing is a sheet aluminum case mounted within a cast aluminum framework. The base of the housing framework is secured to the azimuth unit and the yoke of the elevation unit assembly is mounted on the top. The exhaust fan at the rear of the housing and the screened vent panels provide ventilation for the receiver and antenna control. An M-type thermostat (S301) in the power circuit of the exhaust

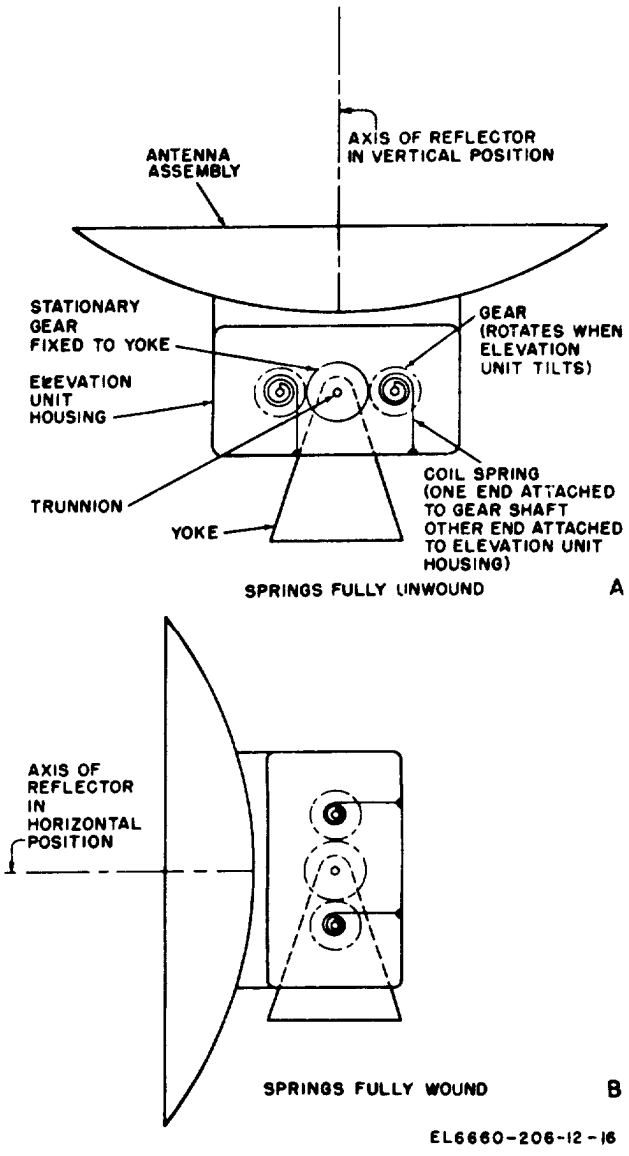


Figure 1-16. Action of counterbalance springs.

fan, turns off the fan when the temperature drops to O°C., and it turns the fan on again when the temperature reaches 14°C in the housing on the AN/GMD-1B. Two spring-loaded chassis locks on the side of the housing secure the two chassis when they are pulled out on the guide rails for adjustment or repair. There are two additional multipin receptacles J305 and J306 on the AN/GMD-1B housing (fig. 1-21). The two potentiometers on the panel on the left side of the housing are used for manual control (figs. 3-3 and 3-4) of the antenna position. The location of these controls facilitates orientation of the rawin set and manual tracking of the balloon when sighting through the telescope. Roilers and guide rails for the two chassis are mounted in the housing and

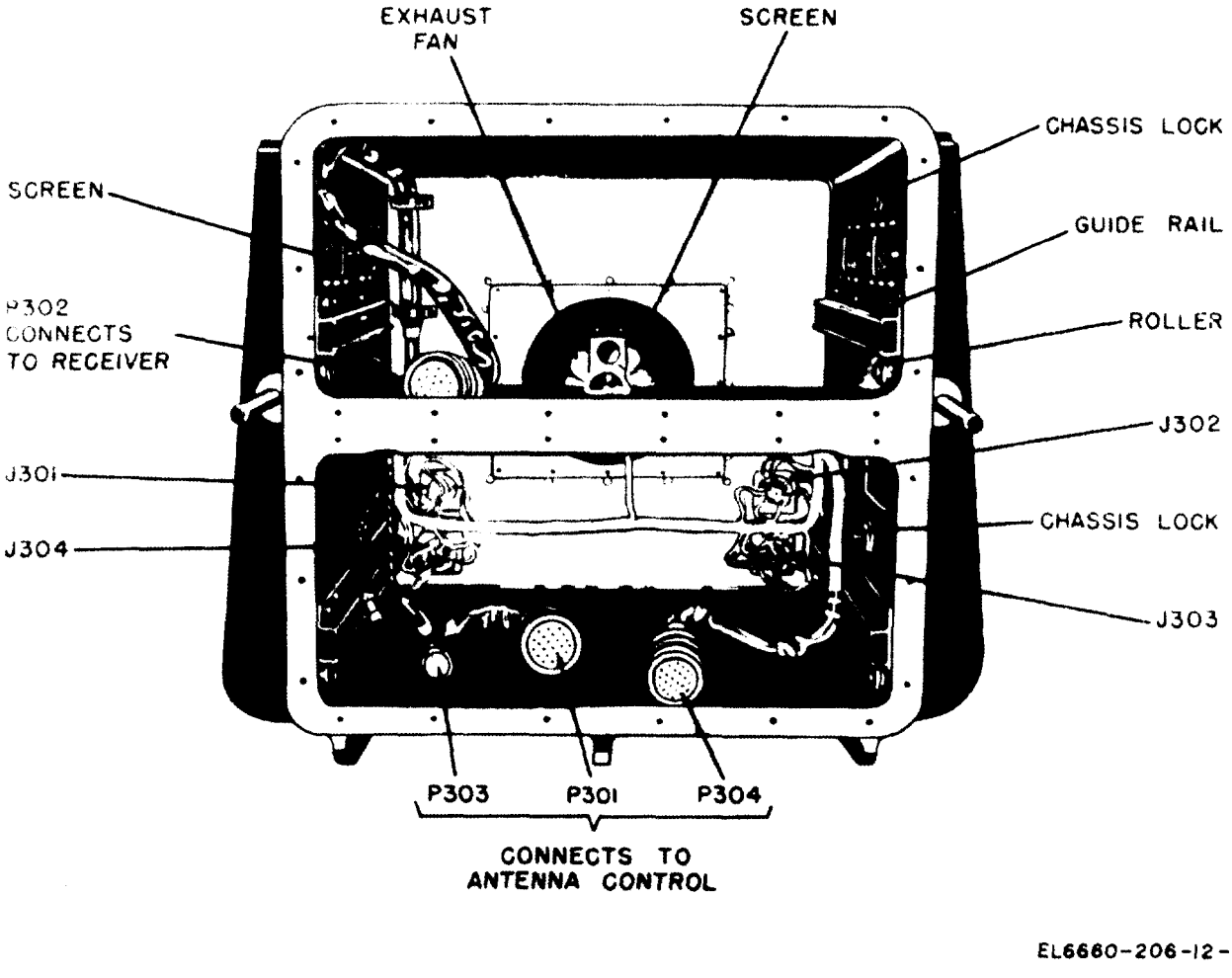


Figure 1-17. Housing, AN/GMD-1A, front view.

engage similar rollers and guide rails on the receiver and antenna control chassis. The two spirit levels mounted at right angles on the right side of the housing (fig. 2-15) are used for leveling the main assembly. The mounting bolts for the yoke are secured to the housing framework by chains and clips.

i. Outrigger Assembly. The outrigger assembly consists of three sets of outrigger legs, compression bars, jackscrews, and jack plates (fig. 1-22). The legs, bolted to the sides of the azimuth unit, are supported by jackscrews that are inserted through the legs and rest on circular jack plates. The jackscrews are used to level the main assembly. The three compression bars bolted to the azimuth unit housing and to the outrigger legs prevent possible tilting of the azimuth unit housing caused by the weight of the antenna assembly,

j. Control Recorder C-577(*)/GMD-1. The control-recorder (fig. 1-23) acts as a remote station for the rawin set, indicates the azimuth and elevation angles of the antenna assembly, and produces a printed record of these angles coordinated with a time recording. The operating components of the control-recorder are normally mounted in a case (fig. 5-13). The case has carrying handles and ventilating louvers on the sides. A hinged door on the top permits access to the main chassis for paper replacement and to the spare fuses (mounted to the rear panel of the case). The front panel is mounted to the control-recorder chassis and contains all operating controls and indicators for the control-recorder. An incandescent lamp on the back of the front panel illuminates the TIME, ELEVATION, and AZIMUTH angle indicators. An access panel (fig. 5-13) can be removed from the front panel for replacement of the ribbon. Line fuses for the control-recorder are on the f rent panel. Line fuses for the entire rawin set are at the rear of the control-recorder.

k. Accessory Kit. The accessory kit (fig. 1-24) more commonly known as the trailer adapter kit,

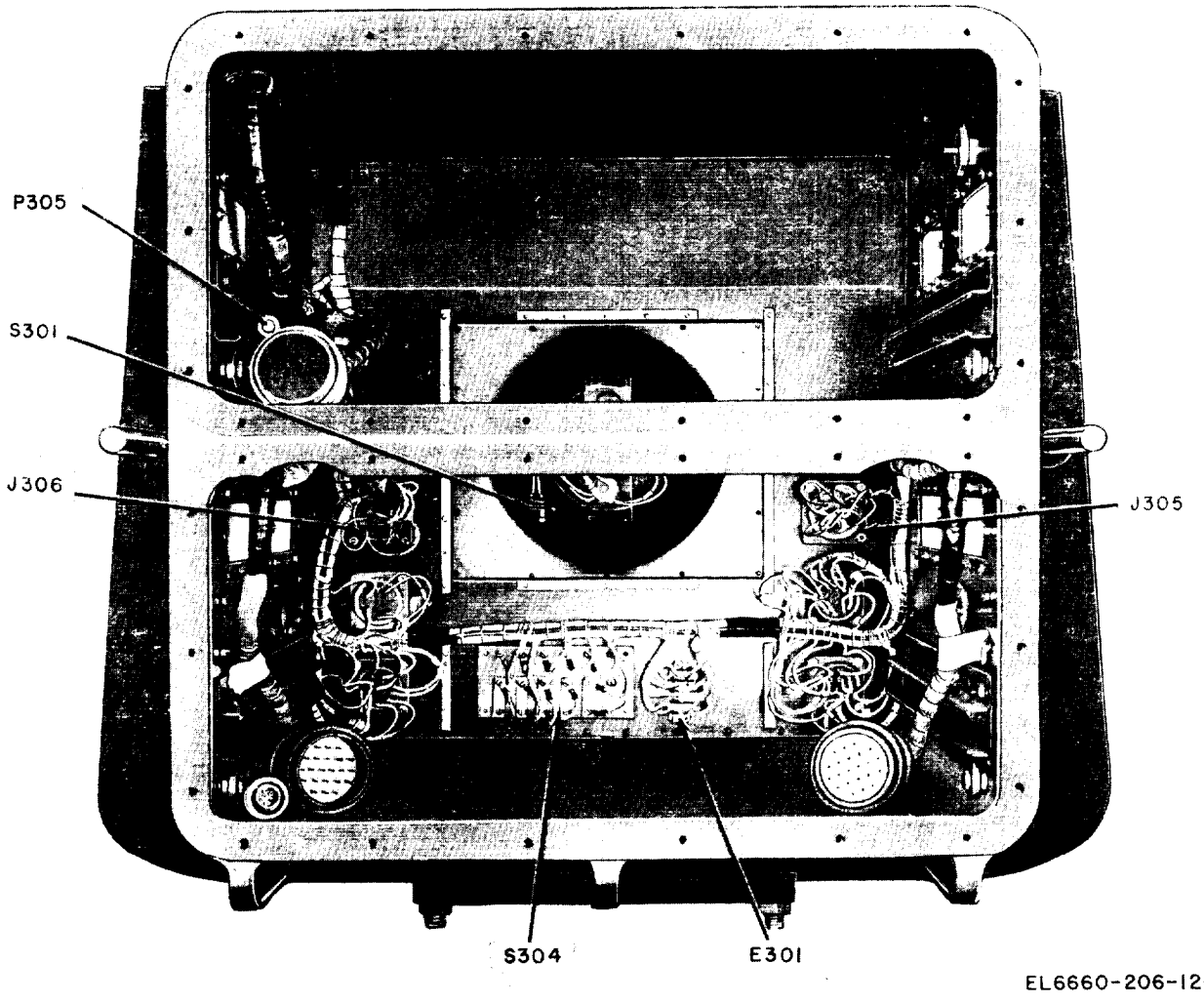


Figure 1-18 Housing, AN/GMD-1B/D, front view.*

contains an azimuth unit skid, a turntable cover, a leg frame, an antenna wind frame, guy assemblies, and two wooden blocks. This kit permits the rawin set to be stowed neatly and systematically in an Ordnance trailer.

(1) *Azimuth unit skid.* The azimuth unit skid is flat, has an irregular octagonal shape, and is constructed of olive-drab-finished, aluminum covered plywood. Three 2- by 2- by 3-inch right angles are located on a circle 120° apart and mounted on the top face of the skid. Each angle contains a winged fastener for holding the skid to the azimuth unit when mounted. The yellow painted stripe on front of one angle is used to locate the longest slope of the azimuth unit in the proper position on the skid. The base is approximately 25 inches long by 32 inches wide.

(2) *Turntable cover.* The rectangular turntable cover is made of olive-drab finished sheet aluminum, and the center section is higher than the two sides. One side is flanged to permit catching it under the turntable; the other side has a fastener screw for holding it in place on the turntable of the azimuth unit. A detachable screw is held to the cover by a 4-inch piece of 5/16-inch chain.

(3) *Leg frame.* The leg frame is the longest piece of the kit and provides space inside for the three outrigger legs and compression bars of the rawin set. The three jack plates (fig. 2-12) are stored on top of the frame in the jack plate holder (fig. 1-24). The frame is constructed of olive-drab finished angle aluminum and is reinforced with steel corners. Inside at one end is a removable leg clamp, held in place by fastener screws. The leg clamps has three indentations for positioning the legs in the frame. A plate 20 by 14 inches (jack plate holder) is on the top of the frame toward the center. Two angle brackets are riv-

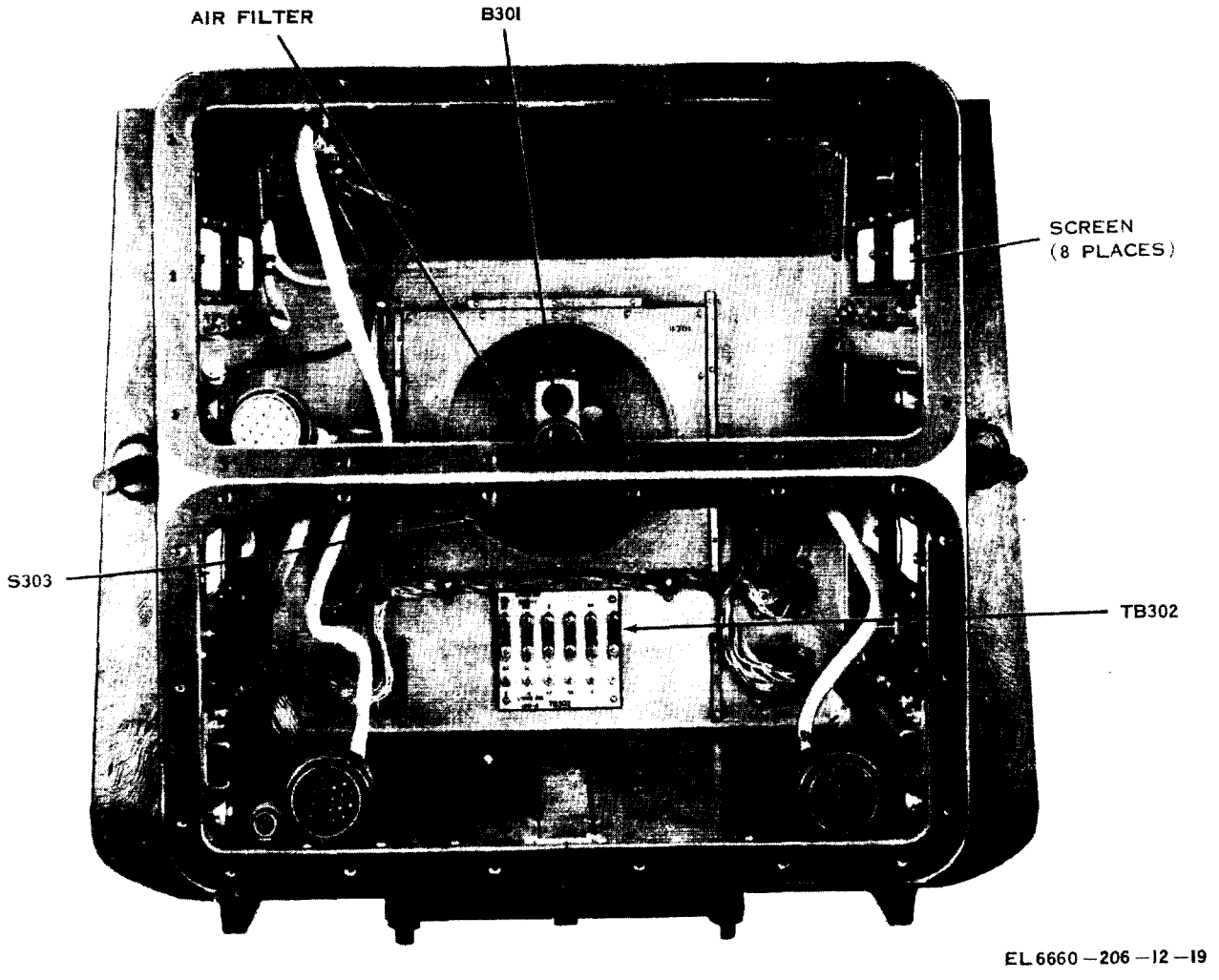


*Figure 1-19. Housing, AN/GMD-1B**/D, front view.*

eted in place on its upper surface. A third removable angle bracket is on the same surface. An extension with three indentations, on the underside of the plate, positions the compression bars. Additional brackets on the top of the frame and on either side of the jack plate holder are used to position and secure other components of the rawin set.

(4) *Antenna wing frame.* The antenna wing frame secures the two wings of the antenna to the center section for transit in the trailer. It is an olive-drab finished, aluminum box approximately 10 inches long, 3 inches wide, and 4 inches deep. The frame has a flange, two hooks, and two captive bolts on each side. Each side has four threaded holes so that the antenna wing sections can be bolted to it. Each flange has two holes to pass the captive bolts that attach to the pylon (antenna scanner assembly) receptacle of the reflector center section.

l. Minor Components. The minor components supplied with the rawin set, are described in (1) through (4) below. Cable assemblies are described in paragraph 1-9 *m*. Minor components are shipped or stored in Case Components CY-1157/GMD-1A and are shown in figure 1-25.

(1) Test Set TS-538(*)/U. The test set (2, fig. 1-25) is used to orient the rawinset and to check the power output and the frequency of Radiosonde Set AN/AMT-4C or AN/AMT-4D (TM 11-6660-228-10) or National Weather Service Radiosonde Set J031. Details of the test set operation may be found in TM 11-6625-213-12 or TM 11-6660-206-20.

(2) Telescope. (3, fig. 1-25 and figs. 1-26 and 1-27). The eight-power, prism-type telescope is se-

cured, when needed, to a mounting bracket by three thumbscrews. The mounting bracket is permanently attached to one of the vertical stiffeners of the reflector. The eyepiece of the telescope is equipped with a focusing ring, and a reticle (fig. 5-14) that has calibrated markings for accurate sighting. A selector knob on the body of the telescope allows a choice of a clear, neutral, amber, or red filter. The mounting bracket (fig. 2-28) permits movement of the telescope independently of the reflector. The mounting bracket is equipped' with two knobs (not shown) that lock the telescope in azimuth and elevation. Two adjustment screws are provided for fine adjustment of the telescope line of sight.

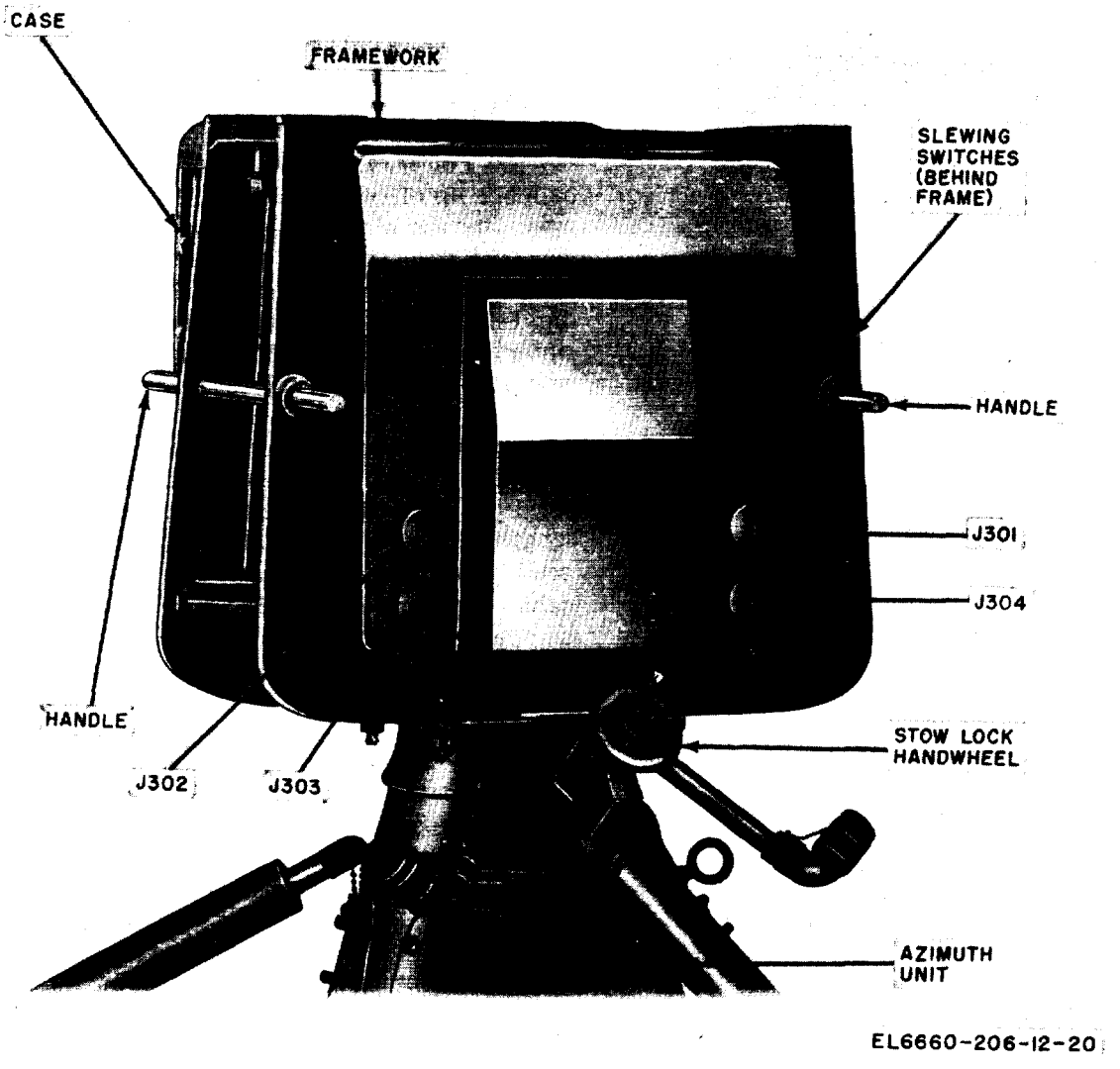


Figure 1-20. Housing, AN/GMD-1A/C, rear view.

(3) *Adapter for Test Set TS-538(*)/U.* The test set adapter (8, fig. 1-25) is a cable connector adapter used when connecting the test set directly to the mixer assembly of the rawin set for test purposes.

(4) *Special tools.* Two speed wrenches, (9, fig 1-25) and a phase adjustment tool (6) are provided for installation and adjustment of the rawin set.

m. Cable Assemblies.

(1) *Cable assembly, special purpose, electrical CX-1216/U.* The main cable (W901) connects the control-recorder to the azimuth unit. This is a neoprene-covered, 20-conductor, 205-foot cable with a male connector on one end and a female connector on the other. When shipped, it is wound on Cable Reel RL-137/GMD-1.

(2) *Cable assembly, power, electrical CX-2043/U (W911) and cable assembly, power, electrical CX-1492/U.* The power cable (W911) connects the control-recorder to the 115-volt ac supply. This is a neoprene-covered, two-conductor, 155-foot cable with a female connector on one end and a twist-lock type male connector on the other. The cable adapter is a neoprene-covered, two-conductor, 1-foot cable with a twist-lock type female connector on one end and a plain, two-prong male connector on the other. The power cable adapter (5, fig. 1-25) is connected to the power cable in installations where the female connector of the power source is not of the twist-lock type. The power cable is wound on Cable Reel RL-138/GMD-1 when shipped; the power cable adapter is shipped in the accessories case.

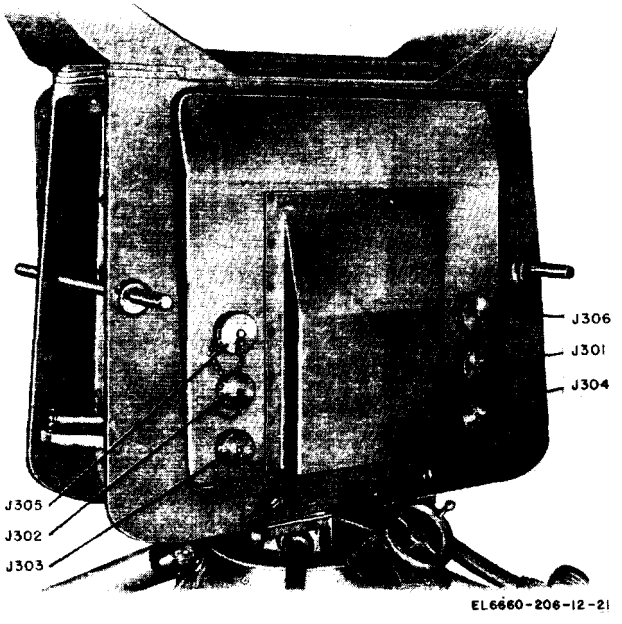


Figure 1-21. Housing, AN/GMD-1B/D, rear view.

(3) *Ground rod and cable assembly.* The ground rod and cable assembly (12, fig. 1-25) includes neoprene-covered, single-conductor ground cable (W961) with a connecting lug on one end. This lug is connected to the azimuth unit. The other end of the ground cable (W961) is connected to the clamp of the ground rod (fig. 1-1). The ground rod includes a copper rod that is driven into the ground; a clamp with a square head screw connects the ground cable (W961) to the ground rod. The ground rod and cable assembly is shipped in the accessories case.

(4) *Special purpose cable assembly CX-1217/U.* The meteorological cable (W921) (4, fig. 1-25) is a neoprene-covered, eight-conductor cable with a male connector on one end and a female connector on the other. One end plugs into the control-recorder; the other end plugs into the Radiosonde Recorder AN/TMQ-5(*) (para 1-5). Special Purpose Cable Assembly CX-1217/U is shipped in the accessories case.

(5) *Antenna scanner assembly power cable.* This 4-foot, neoprene-covered cable has six conductors and is fitted at one end with an elbow connector; the other end is attached permanently to the antenna scanner assembly (1, fig. 1-25). The cable connects the antenna scanner assembly to the housing.

(6) *Cable assembly, special purpose CX-1285/U (W951).* This 12-conductor, neoprene-covered cable is 47 inches long and has a female connector at one end and a male connector at the other. It connects the elevation unit to the housing. Cable Assembly, Special Purpose CX-1285/U (10, fig. 1-25) is shipped in the accessories case.

(7) *Power cable assembly CX-1493/U.* This cable is made up of two 8-foot lengths of two-conductor wire. One end of each cable terminates in a standard ac power plug; the other end connects to the receiver and the antenna control, respectively. This cable (11, fig. 1-25) is used to supply power to the receiver and antenna controls when they are being tested. It is shipped in the accessories case.

(8) *Cable assembly, radio frequency CG-409/U and cable assembly, radio frequency CG-530/U.* The IF cable (14, fig. 1-25) and the oscillator cable (13, fig. 1-25) are single-conductor, vinyl covered, 6-foot lengths of coaxial cable. They connect the mixer assembly to jacks on the receiver front panel. Both cables are connected to the mixer assembly and are shipped in the accessories case.

n. Meteorological Data Processing Groups OL-192/GMD-1 and OL-192(A)/GMD-1. Used to reduce raw meteorological data received by Radiosonde Recorder AN/TMQ-5(*) and angular data received by Control Recorder C-577(*)/GMD-1 into meteorological messages. Consists of a commercial, programmable, desk top computer interfaced with a compatible commercial teletype paper tape reader/perforator. The OL-192/GMD-1 (fig. 1-3.1 ① is specifically used by artillery MET sections of armored, infantry, and mechanized units authorized truck-mounted Electronic Equipment Shelter S-281/G or Shop Van M109. The OL-192(A)/GMD-1 (fig. 1-3.1 ②) is specifically used by artillery MET sections operating with airborne or airmobile units. For detailed information refer to TM 11-6660-263-10.

1-10. Additional Equipment Required

a. The following material is not supplied as part of Rawin Set AN/GMD-1(*) but is required for its normal operation.

(1) Radiosonde Set AN/AMT-4(*) (fig. 6-1) or National Weather Service Radiosonde Set J031, and meteorological balloons (TM 11-6660-222-12).

(2) Radiosonde Recorder AN/TMQ-5(*) (fig. 6-2).

b. If a 115-volt power source is not available, Power Unit PE-75 or its equivalent may be used to supply power to Rawin Set AN/GMD-1(*).

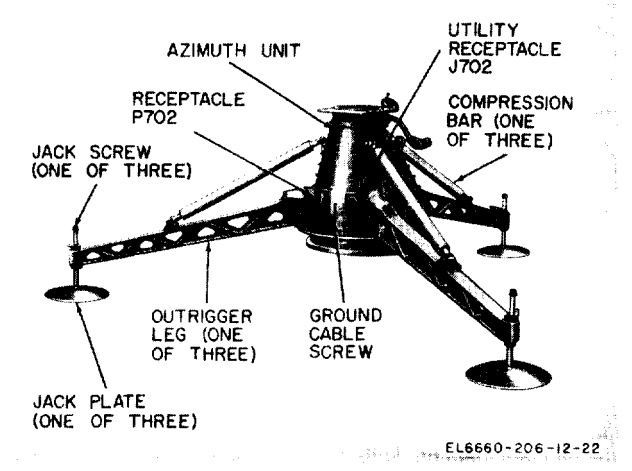


Figure 1-22. Azimuth unit and outrigger assembly.

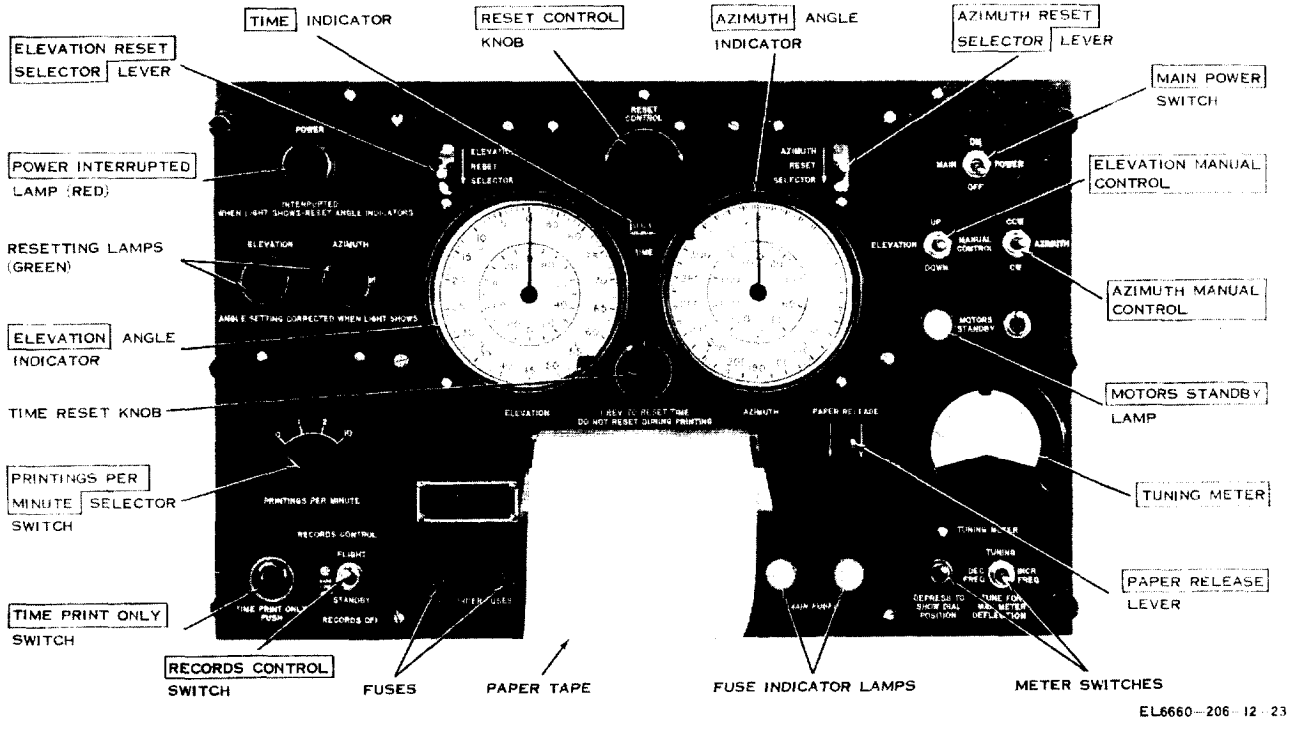


Figure 1-23. Control Recorder C-577(*)/GMD-1, front view

1-11. Nomenclature and Functional Differences in Models

a. The main components of Rawin Sets AN/GMD-1A/C and AN/GMD-1B/D are similar and can be interchanged from one model to another; however, since certain adjustments must be made, interchanging of these components must be made by higher maintenance level personnel. Table 1-4.1 lists model functional differences. Table 1-5 lists the major components issued as parts of the three rawin sets. Table 1-6 lists the functional differences of models that concern organizational level personnel.

Table 1-4.1. Model Functional Differences

Model	Used With	Nomenclature
AN/GMD-1A	OL-192/GMD-1	AN/GMD-1A
AN/GMD-1A	OL-192/GMD-1	AN/GMD-1C
AN/GMD-1B*	OL-192/GMD-1	AN/GMD-1B*
AN/GMD-1B*	OL-192A/GMD-1	AN/GMD-1D
AN/GMD-1B**	OL-192/GMD-1	AN/GMD-1B**
AN/GMD-1B**	OL-192A/GMD-1	AN/GMD-1D

b. The differences in reference designations for different order numbers of Rawin Set AN/GMD-1B/D are listed in table 1-7.

c. Information pertinent to the substitution of components from Rawin Set AN/GMD-1B/D to Rawin Set AN/GMD-1A/C are listed in table 1-8.

d. Information pertinent to the substitution of components from Rawin Set AN/GMD-1A/C to Rawin Set AN/G MD-1B/D are listed in table 1-9.

e. The principal differences between the main components of the rawin set are described in (1) through (10) below.

(1) The reticle lines in the telescope have been extended inward to terminate at 0.05° from the crossover point in the Rawin Set AN/G MD-1B telescope.

(2) The block-type fuse holder in the azimuth unit has been replaced by two extractor post-type fuseholders (fig. 2-35) in Pedestal AB-159D/GMD-1 and Pedestal A13-159E/GMD-1.

(3) A strap has been added to the elevation unit assembly of Pedestal AB-159D/GMD-1 and Pedestal AB-159E/GMD-1 to prevent damage to the antenna scanner assembly cable (W101) during operation.

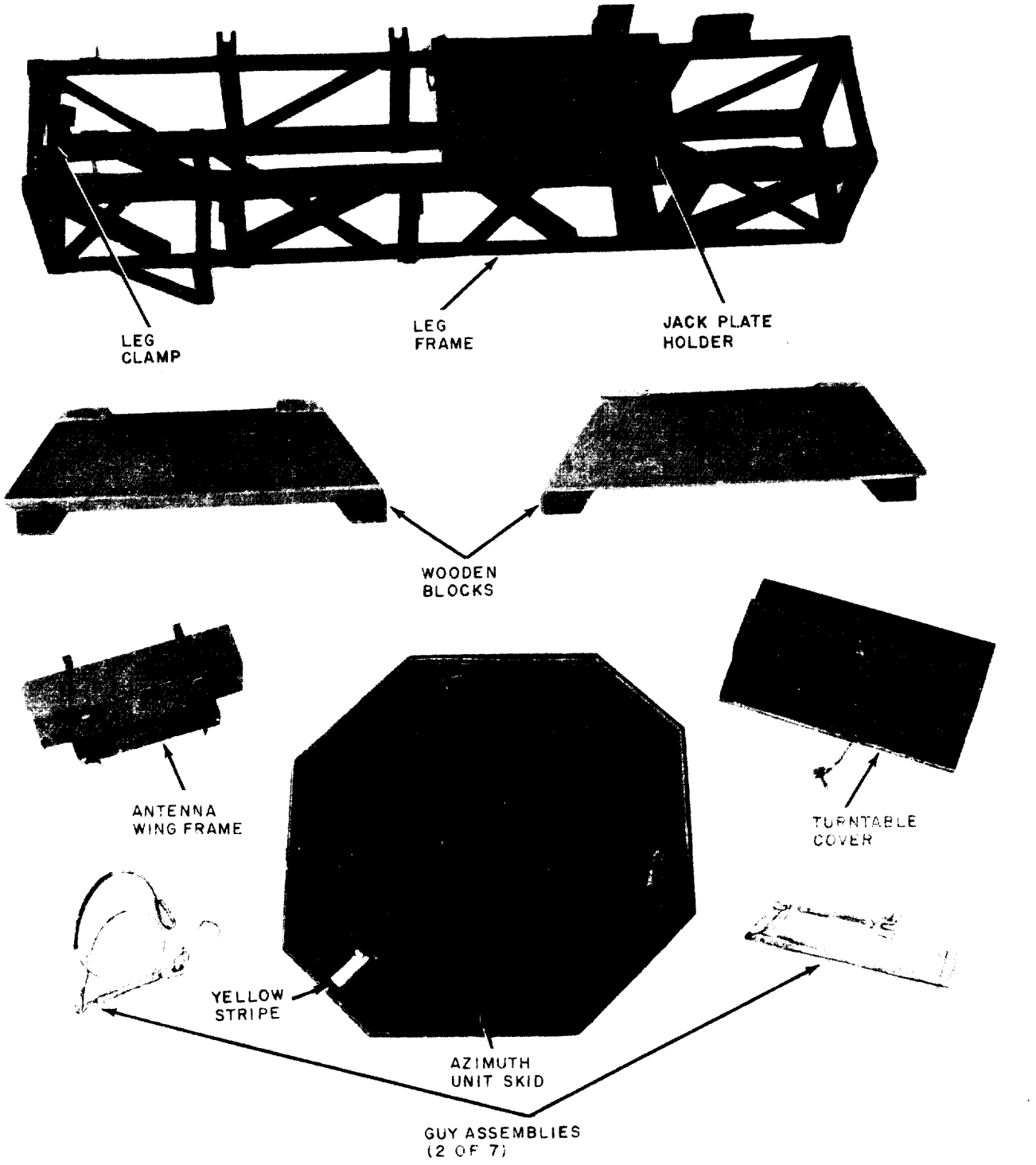
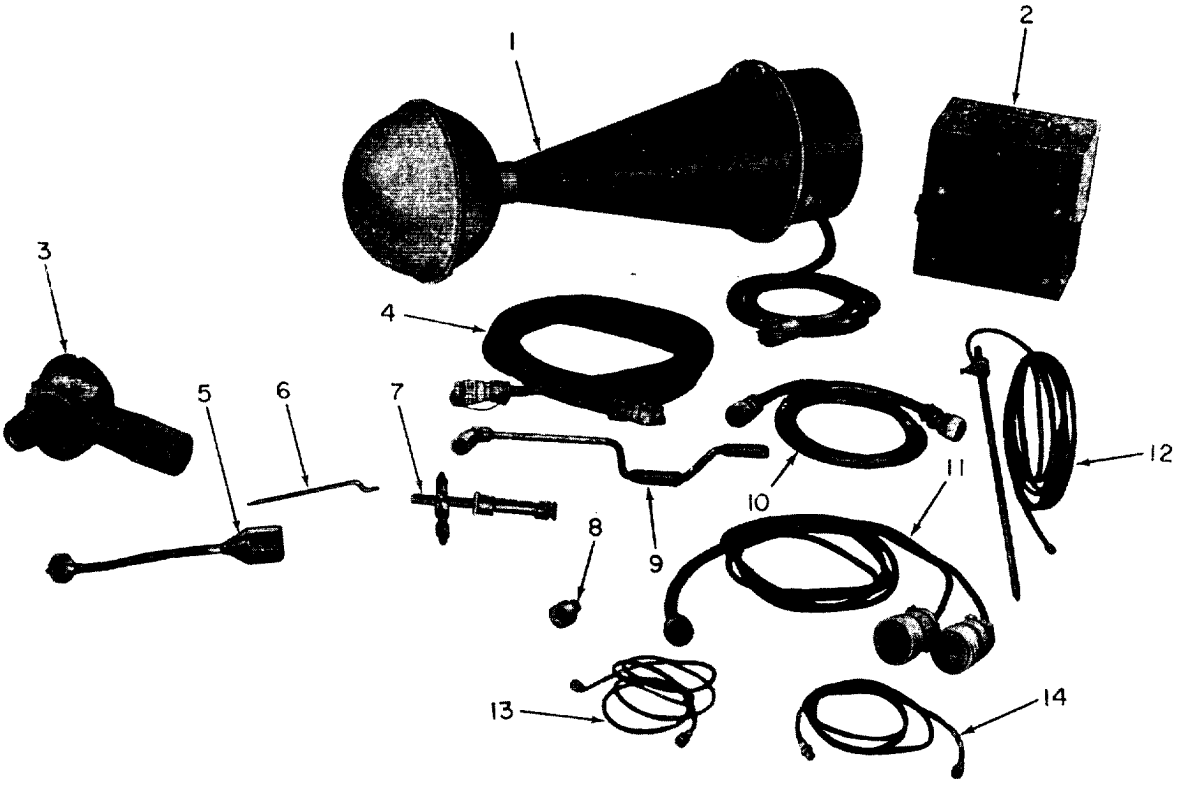


Figure 1-24. Trailer adapter kit.



LEGEND

1. ANTENNA SCANNER ASSEMBLY
2. TEST SET TS-538(*)/U
3. TELESCOPE
4. CABLE ASSEMBLY CX-1217/U
5. POWER CABLE ADAPTER
6. PHASE ADJUSTMENT TOOL
7. MIXER ASSEMBLY (2)
8. ADAPTER CONNECTOR
9. SPEED WRENCH (2)
10. CABLE ASSEMBLY CX-1285/U
11. CABLE ASSEMBLY CX-1493/U
12. GROUND ROD AND CABLE ASSEMBLY
13 CABLE ASSEMBLY CG-530/U (4)
14. CABLE ASSEMBLY CG-409/U (4)

EL6660-206-12-25

Figure 1-25. Minor components.

Table 1-5. Nomenclature Differences in Models

AN/GMD-1A and AN/GMD-1C	AN/GMD-1B*and AN/GMD-1D	AN/GMD-1B**andAN/GMD-1D
Antenna AS-462A/GMD-1 or AS462B/GMD-1 [a]	Antenna AS-462C/GMD-1	Antenna AS-462C/GMD-1
Control, Antenna C-578A/GMD-1 or C-578B/GMD-1 [a]	Control, Antenna C-578C/GMD-1	Control, Antenna C-578C/GMD-1.
Case CY-734/GMD-1	Case CY-734/GMD-1	Case CY-734/GMD-1
Case CY-735/GMD-1	Case CY-735/GMD-1	Case CY-735(*)/GMD-1
Case CY-736/GMD-1	Case CY-726/GMD-1	Case CY-736/GMD-1
Case CY-737A/GMD-1	Case CY-737A/GMD-1	Case CY-737A/GMD-1
Case, Components CY-1157/GMD-1A	Case, Components CY-1157/GMD-1A.	Case, Components CY-1157/GMD-1A.
Case CY-898/GMD-1	Case, Standardized Components, Electrical CY-1895/GMD-1.	Case, Standardized Components, Electrical CY-1895/GMD-1.
Control-Recorder, C-577B/GMD-1	Control-Recorder, C-577D/GMD-1	Control-Recorder, C-577E/GMD-1
Telescope, Elbow M-17	Telescope, Elbow M-17 (Mod.)	Telescope, Elbow M-17 (Mod.)
Pedestal AB-159B/GMD-1 or AB-159C/GMD-1 [a].	Pedestal AB-159D/GMD-1	Pedestal AB-159E/GMD-1
Cable Assy, Power, Electrical CX-2043/U	Cable Ass y, Power, Electrical CX-2043/U.	Cable Assy, Power, Electrical CX-2043/U.
Cable Assy, Power, CX-1493/U	Cable Assy, Power, CX-1493/U	Cable Assy, Power, CX-1493/U

AN/GMD-1A and AN/GMD-1C	AN/GMD-1B* and AN/GMD-1D	AN/GMD-1B** and AN/GMD-1D
Rawin Receiver R-301B/GMD-1 or R-301C/GMD-1 [a].	Rawin Receiver, R-301D/GMD-1	Rawin Receiver, R-301D/GMD-1
Cable Reel RL-137/GMD-1	Cable Reel RL-137/GMD-1	Cable Reel RL-137/GMD-1
Cable Reel RL-138/GMD-1	Cable Reel RL-138/GMD-1	Cable Reel RL-138/GMD-1
Cable Assy, Special Purpose, Electrical CX-1216/U.	Cable Assy, Special Purpose, Electrical CX-1216/U.	Cable Assy, Special Purpose, Electrical CX-1216/U.
Cable Assy, Special Purpose Electrical CX-1285/U.	Cable Assy, Special Purpose Electrical CX-1285/U	Cable Assy, Special Purpose, Electrical CX-1285/U.
Cable Assy, Special Purpose, Electrical CX-1217/U.	Cable Assy, Special Purpose, Electrical CX-1217/U.	Cable Assy, Special Purpose, Electrical CX-1217/U.
Accessory Kit FSN 6660-092-1546	Accessory Kit FSN 6660-092-1546 ...	Accessory Kit FSN 6660-092-1549
Test Set TS-538A/U, Test Set TS-538B/U [a]	Test Set TS-538C/U	Test Set TS-538(*)/U
Case, Meteorological Data Processing Group, CY-7761/GMD-1.	Case, Meteorological Data Processing Group, CY-7762/GMD-1 and CY-7763/GMD-1.	Case, Meteorological Data Processing Group, CY-7762/GMD-1 and CY-7763/GMD-1.

[a] There are no differences in these components of Rawin Set AN/GMD-1A and AN/GMD-1C although the have different nomenclatures.

Table 1-6. Internal and Functional Differences in Models

Item	A/C Model	B*/D Model	B**/D Model
Telescope	Reticle lines in the telescope terminate at 0.3° from cross-over point.	Reticle lines in the telescope terminate at 0.05° from cross-over point.	Same as for B*/D model.
Fuseholder in azimuth unit.	Block-type fuseholder for F701 and F702.	Two extractor type fuseholder for F701 and F702.	Same as for B*/D model.
Strap for antenna scanner cable.	None used	A strap has been added to the elevation unit to prevent damage to antenna scanner cable during operation.	Same as for B*/D model.
Azimuth unit heaters .	Heater lamp to eliminate excessive moisture in the azimuth unit (power cable for lamp connected to utility outlet).	Thermostatically operated heater consisting of thermostat K701 and heater HR701 to reduce excessive moisture in the azimuth unit. Some B models (Order No. 07154-PP-59) have added manually operated strip heaters consisting of plug P704 and jack J704, switch S702, lamp 1701, and heater HR702, in addition to the thermostatically controlled strip heater.	Same as B*/D except that manually operated heaters are not provided in Pedestal, Antenna AB-159E/GMD-1. Thermostat reference designator is S702.
Elevation unit heaters .	None used	Thermostatically controlled strip heaters consisting of thermostat K702 and heater HR702.	Thermostatically controlled strip heater consisting of thermostat S204 and heater HR201.
Stip heaters in antenna scanner assembly.	None used	Thermostatically controlled strip heaters consisting of thermostat S101 and heater HR101.	Same as for B*/D model.
Azimuth antihunt generator.	A 2-to-1 gear reduction is provided between azimuth drive motor B701 and azimuth antihunt generator G701.	A 1-to-1 ratio is used between azimuth drive motor B701 and azimuth antihunt generator G701.	Same as for B*/D model.
Elevation antihunt generator.	A 2-to-1 gear reduction is provided between elevation drive motor B201 and elevation antihunt generator G201.	A 1-to-1 ratio is used between elevation drive motor B201 and elevation antihunt generator G201.	Same as for B*/D model.
Manual controls on side of housing.	Elevation local manual control R302 and azimuth local manual control R301	Elevation local manual control R302 and azimuth local manual control R301 have	Same as for B*/D model except that CW-CCW switch is designated as S301 and the

Item	A/C Model	B*/D Model	B**/D Model
	are located on the lower ventilating louver on the left side of the housing.	been shifted from the lower ventilating louver to the upper louver on the left side of the housing. Immediately above these controls, slewing switches S302 and S303 have been added, so that the panel markings for the knob controls apply also to the added switches. These switches operate in parallel with the slewing switches on the panel of the control-recorder.	UP-DOWN switch is designated as S302.
Solid state motor-control circuits in Antenna Control C-578C/ GMD-1*.	These models were equipped orginally with type 3C23 thyratron motor control tubes. SCR switching assemblies are used as direct replacements.	. . . . .	Antenna Control C-578C/ GMD-1** is equipped with solid state motor direction and speed control assemblies (SCR switching units).
Provisions for remote resetting of drive motor overload circuit in Antenna Control C-578C/GMD-1*.	. . . . .		In Antenna Control C-578C/ GMD-1**, the overload relay lock-in circuit has been rewired so that holding current flows through contacts on the standby relay, permitting resetting of the overload circuit by switching the remote MOTORS STANDBY switch to MOTORS STANDBY and then back to MOTORS position after an overload occurs.
ELEVATION DOWN-UP manual control R632.	The center tap is taken at the junction of two equal resistors, R633 and R635 that provide a voltage divider network across the supply voltage (Antenna Controls C-578A/GMD-1 and C-578B/GMD-1).	In Antenna Control C-578C/ GMD-1, the voltage from terminals 10 and 11 of T606 is center tapped by a central terminal on UP-DOWN ELEVATION manual control R632, which provides a voltage divider network across the supply voltage.	Same as for B*/D model.
AZIMUTH CW-CCW manual control R665.	The center tap is taken at the junction of two equal resistors, R662 and 663, which provide a voltage divider network across the supply voltage (Antenna Controls C-578A/GMD-1 and C-578B/GMD-1).	In Antenna Control C-578C/ GMD-1, the voltage from terminals 12 and 13 of T606 is center tapped by a central terminal on the CW-CCW AZIMUTH manual control, R665, which provides a voltage divider network across the supply voltage.	Same as for B*/D model.
Pedestal sliprings . .	In Pedestal AB-159B/GMD-1 and Pedestal AB-159C/ GMD-1, there are 25 sliprings.	In Pedestal AB-159D/GMD-1, there are 28 sliprings. Three sliprings have been added to provide facilities for ranging equipment.	Same as for B*/D model.
Broad am. detector filter	Filter capacitors C432, C433, C448, and C449 are 100 micromicrofarads ($\mu\mu f$) in Rawin Receivers R-301B/ GMD-1 and R-301C/ GMD-1.	Filter capacitors C432, C433, C448, and C449 are 10 $\mu\mu f$ in Rawin Receiver R-301D/ GMD-1.	Capacitors C432, C433, C448, C449, C458, C459 and C460 are 10 $\mu\mu f$ in Rawin Receiver R-301D/GMD-1**.

Item	A/C model	B*/D model	B**/D model
Integrating capacitor C1039 in receiver.	None used ----------	In Rawin Receiver R-301D/GMD-1 capacitor C1039 is used to enable the receiver to receive a 200-microsecond pulse. Capacitor C1039 is connected to ground when am-fm switch S1002 is in the fm position.	Same as for B*/D model.
AM-fm switch in receiver	AM-fm switch S1002 in Rawin Receivers R-301A/GMD-1, R-301B/GMD-1, and R-301C/GMD-1 is a single-pole double-throw switch.	AM-fm switch S1002 in Rawin Receiver R-301D/GMD-1 is a double pole, double-throw switch.	Same as for B*/D model.
Receiving circuit tubes	Cathode follower V1001B used to receive fm signals in Rawin Receiver R-301B/GMD-1 and R-301C/GMD-1.	Pulse preamplifier V1001B and dual polarity pulse stage V1002B with pulse polarity selector switch S1009 used to receive fm signals of either polarity (positive or negative) in Rawin Receiver R-301D/GMD-1.	Same as for B*/D model.
Link switchboards	None used ----------	Link switchboards added to the housing for making semi-permanent selection of ranging or nonranging operation.	Same as for B*/D model.
Relay socket	None used ----------	Socket XK1001 has been added to the chassis of Rawin Receiver R-301D/GMD-1 to accommodate a relay. Until the relay is provided, a dummy plug is inserted in the socket to provide the proper feed-through connections. The socket is located near V1004.	Same as for B*/D model.
Time only printing circuit in the Control-Recorder C-577E/GMD-1.			The time-printing hammer has been made independent of the angle information printing mechanism. A relay, K850, has been added to control the printing of time. During automatic printing solenoids are electrically operated simultaneously. When TIME PRINT ONLY PUSH switch S809 or the remote time print only switch is depressed relay K850 disconnects the angle printing solenoids and actuates the time-printing circuit.

Table 1-7. Differences in Reference Designations for Different Order Numbers

Item	Order No. 15590-Phila-55	Order No. 15903-Phila-55	AN/GMD-1B**/D
Link switch in receiver and antenna control housing	[a]TB302	[a]S304	TB302
Thermostat in receiver and antenna control housing	K301	S301	S303
Azimuth switch in receiver and antenna control housing	S301	S303	S301
Thermostat in pedestal	K701	S703	S702
Link switch in pedestal	TB701	S702	TB701
Small terminal board in pedestal	E709	E712A	TB703

[a]Numbers on outer terminals of TB302 are reversed with respect to those on S304.

Table 1-8. Substitution Characteristics Between AN/GMD-1B/D and AN/GMD-1A/C

Component installed	*Condition and results*
Antenna AS-462C/GMD-1	When orienting the rawin set, keep target in center of reticle. Normal reception.
Rawin Receiver R-301D/GMD-1	Dummy plug must be in socket XK1001. Normal reception.
Antenna Control C-578C/GMD-1	Normal operation.
Receiver and antenna control housing of Rawin Set AN/GMD-1B/D.	Knob controls of antenna position are on the left upper louver and slewing switches are immediately above the knob controls. These switches are wired in parallel with those on the control-recorder and should not be operated at the same time as those on the control-recorder. Sockets J305 and J306 are left vacant. Plug P305 is attached to J1002 for support. Otherwise, operation will be normal.
Elevation unit of Pedestal AB-159D/GMD-1.	Elevation antihunt control R621 will need readjustment (para 2-33). Cable W101 should be supported by the strap supplied with this elevation unit to prevent damage to the cable during antenna rotation. Normal operation.
Azimuth unit of Pedestal AB-159D/GMD-1.	Azimuth antihunt control R672 will need readjustment (para 2-33). Normal operation.
Telescope M-17 supplied with Antenna AS-462C/GMD-1.	When orienting the rawin set, keep target in center of reticle rather than in the lower left corner. Otherwise, normal operation.
Test Set TS-538C/U	Use the technical manual that applies to the model of test set in use.
OL-192(A)/GMD-1	Not mounted in Electronic Equipment Shelter S-281/G or Shop Van M109.

Table 1-9. Substitution Characteristics Between AN/GMD-1A/C and AN/GMD-1B/D

Component installed	Condition and results
Antenna AS-462A/GMD-1 or AS-462B/GMD-1	During orientation of the rawin set, the target may wander around the center of the reticle or in the lower left corner. Normal reception.
Rawin Receiver R-301B/GMD-1 or R-301C/GMD-1	Normal reception.
Antenna Control C-578A/GMD-1 or C-578B/GMD-1	Normal reception.
Receiver and antenna control housing (part of Rawin Set AN/GMD-1A/C).	Slewing control switches no longer available at the antenna. Antenna controlled by knob on the lower left louver. Otherwise, normal operation.
Elevation unit (part of Pedestal AB-159B/GMD-1 or AB-159C/GMD-1).	Elevation antihunt control R621 will need readjustment (para 2–33). Normal operation.
Azimuth unit (part of Pedestal AB-159B\GMD-1 or AB-159C/GMD-1).	Azimuth antihunt control R672 will need readjustment (para 2-33). Normal operation.
Telescope M-17 (part of Antenna AS-462A/GMD-1 or AS-462B/GMD-1).	During orientation of the rawin set, the target may wander around the center of the reticle or in the lower left corner. Otherwise, normal operation.
Test Set TS-538/U, TS-538A/U, or TS-538B/U.	Use the technical manual that applies to the model of test set in use.
OL-192/GMD-1	Not in air drop cases.

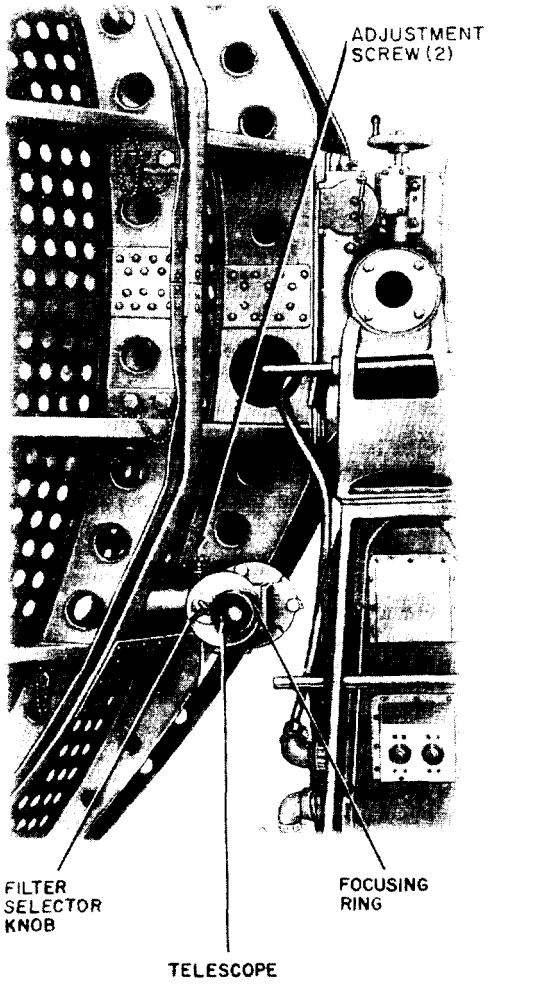


Figure 1-26. Telescope mounted.

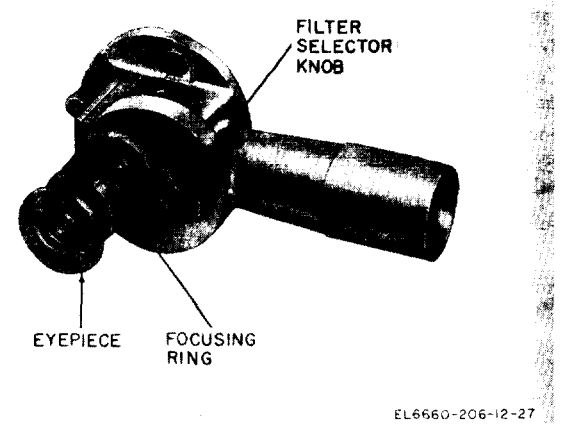


Figure 1-27. Telescope.

(4) Four strip heaters have been added in the elevation and azimuth units of Pedestal AB-159D/GMD-1 in Rawin Set AN/GMD-1B*/D to prevent stiffening of the lubricants in cold weather. Three of these heaters are controlled automatically by thermostatic switches. The fourth is located in the azimuth unit of sets on order No. 07154-PP-59 and is controlled manually. Pedestal AB-159E/GMD-1 of Rawin Set AN/GMD-1B**/D (contract No. E-190-69(N)) contains two automatically controlled strip heaters. One is located in the elevation unit and the other is in the base of the azimuth assembly.

(5) The speed of the elevation and azimuth antihunt generators (tachometers), in relation to the speed of their respective drive motors in Pedestal AB-159D/GMD-1 and Pedestal AB-159E/GMD-1 has been doubled. This results in twice the output voltage for a given rate of antenna rotational speed.

(6) Added sliprings in Pedestal AB-159D/GMD-1 and Pedestal AB-159E/GMD-1 bring the total number to 28. Not all of these will be in actual use until proposed ranging equipment has been added.

(7) The knobs for slow-motion, manual control of antenna assembly positioning have been shifted from the lower ventilating louver to the upper louver, on the left side of the housing in the Pedestal AB-159D/GMD-1 and Pedestal AB-159E/GMD-1. Immediately above these controls, slewing switches S302 and S303 have been added, so that the panel markings for the knob controls apply also to the added switches. These switches operate in parallel with the slewing switches on the panel of the control-recorder.

(8) A third spirit level has been provided at the center of the antenna yoke to substitute for the level that will be hidden by the proposed ranging equipment in Rawin Set AN/GMD-1B/D.

(9) Multipin receptacles J305 and J306 and a coaxial cable with connector P305 have been added to housing in Pedestal AB-159D/GMD-1 and Pedestal AB-159E/GMD-1.

(10) On order No. 29114-PP-58 and subsequent orders of AN/GMD-1B/D models. Cases CY-734/GMD-1 and CY-736/GMD-1 are provided with adjustable tension latches.

NOTE

If components of AN/GMD-1A/C and AN/GMD-1B/D are interchanged, certain adjustments must be made by higher level maintenance personnel. Refer to appendix D.

1-12. Application of Equipment

Rawin Set AN/GMD-1(*) is a receiving-type radio direction finder that tracks automatically. It is used in conjunction with a balloon-borne radiosonde transmitter and a radiosonde recorder to obtain data concerning windspeed and direction, atmospheric pressure, temperature, and humidity.

a. Windspeed and Direction. Since the rawin set automatically tracks the balloon-borne radiosonde, the antenna continuously points in the direction of the radiosonde. The angles of elevation and azimuth of that direction are recorded periodically on a paper tape by the recording system of the rawin set, and the average wind velocity between any two recordings can be calculated by using the data on this tape.

b. Air Pressure, Temperature, and Humidity. The meteorological information, in the form of pulses, amplitude modulates the radio frequency (RF) signal emitted by the radiosonde transmitter, This information is received, amplified, and detected by the rawin set. The detected pulses are then passed to a meteorological recorder (not part of the rawin set), where they are recorded on a graph as atmospheric pressure, temperature, and humidity.

1-13. Azimuth

a. The Rawin set is oriented initially so that the electrical axis of the antenna points to north (B, fig. 1-28) when the azimuth scales read zero; then the rawin set is oriented to a known reference point which is used as a periodic check. As the rawin set tracks the balloon-borne radiosonde transmitter, the electrical axis of the antenna changes in azimuth with respect to north. The azimuth angle is the angle formed by this deviation of the electrical axis of the antenna from north. Measurements of azimuth angle are made in degrees, from 0° to 360°. As the balloon-borne radiosonde is blown about by the wind, the angle of the radiosonde with respect to north and the position of the electrical axis of the antenna changes.

b. The 1,680-MHz signal transmitted by the radiosonde strikes the reflector of the rawin set, then is reflected to the rotating eccentric cup and, in turn, to the dipole antenna. When the radiosonde is in line with the electrical axis of the antenna, the same amount of energy reaches the antenna for all positions of the antenna lobe (A, fig. 1-29). If the radiosonde moves off the electrical axis of the antenna, the amount of energy received varies with the position of the antenna lobe (B, fig. 1-29). The position of the antenna lobe depends on the position of the eccentric cup. Because the lobe rotates at a fixed rate (2,040 r/min, determined by the speed of rotation of the cup), the amount of energy that reaches the antenna varies sinusoidally at a frequency of 34 Hz; therefore, the 1,680-MHz signal received from the radiosonde, is amplitude modulated (am) sinusoidally.

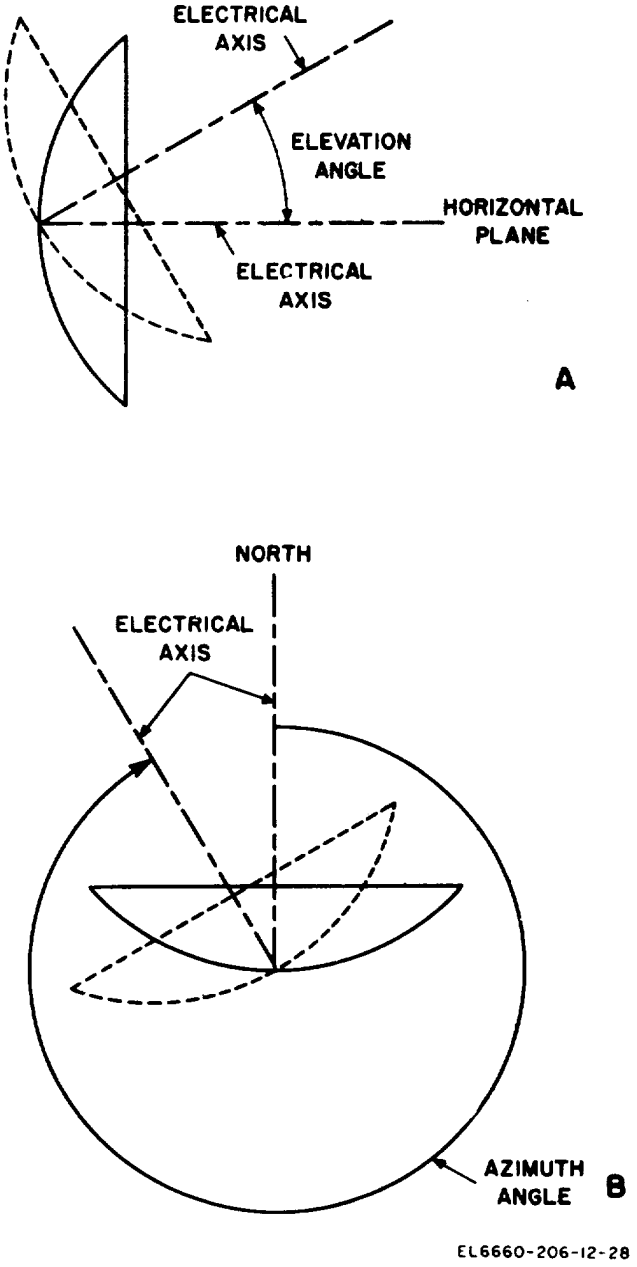


Figure 1-28. Determining azimuth and elevation angle.

c. The magnitude of the departure of the radiosonde from the electrical axis of the antenna of the rawin set determines the magnitude of the sinusoidal signal. The direction of the departure determines the phase of the signal related to the phase of the reference generator. In the receiving system of the rawin set, the sinusoidally modulated RF is beat against the output of the local oscillator to produce a 30 MHz IF which also varies sinusoidally. The IF then is amplified, detected, and the 34-Hz component is passed to the antenna positioning system. In the antenna positioning system, the sinusoidal content is amplified further and compared with the reference voltage that corresponds to the azimuth component of the position of the antenna lobe. The resultant is a direct current (dc) voltage that has a magnitude and polarity corresponding to the angle of the radiosonde transmitter with respect to the electrical axis of the rawin set antenna. This voltage, known as the azimuth error voltage, is applied to the azimuth drive, which positions the antenna in azimuth, to enable the rawin set to track the balloon-borne radiosonde in azimuth. The electrical axis of the antenna is in line with the radiosonde, and the resultant azimuth angle is shown in B, figure 1-28. When the radiosonde is moving in azimuth (relative to the rawin set), the angle of azimuth is changing constantly in azimuth. These changes in the azimuth angle of the antenna are indicated and recorded by the position indicating and recording system. The data obtained are used for computing windspeed and direction.

1-14. Elevation

a. The rawin set is oriented initially so that when the axis of the antenna is horizontal, the elevation scale reads zero (A, fig. 1-28). As the rawin set tracks the balloon-borne radiosonde, the electrical axis of the antenna departs from the horizontal position. The angle of elevation is formed by the deviation of the electrical axis of the antenna from the horizontal position.

b. The 1,680-MHz signal, transmitted by the radiosonde, strikes the reflector of the rawin set, which reflects it to the rotating eccentric cup and then to the dipole antenna. As the radiosonde rises, it moves off the electrical axis of the antenna, and the angle at which the signal strikes the reflector changes. The amount of energy received varies with the position of the antenna (paras 1-13 and 1-17). A change in phase of the signal results in an elevation error voltage in the same way that such a change results in an azimuth error voltage. The elevation error voltage is applied to the elevation drive, which positions the antenna in elevation. In this manner, the rawin set is enabled to track the balloon-borne radiosonde in elevation. The electrical axis of the antenna is aligned with the radiosonde, and the resultant elevation angle is shown in A, figure 1-28. Because the radiosonde is in constant motion, the angle of elevation is changing constantly, and the antenna of the rawin set is moved constantly in elevation. These changes in the elevation angle of the antenna are indicated and recorded by the position indicating and recording system. The data obtained are used for computing windspeed and direction.

1-15. Conical Scanning

a. When a signal transmitted by a radiosonde strikes the reflector of the rawin set, it is reflected to the eccentric cup that rotates in front of the dipole. This cup is an off center, hemispherical reflector driven by a hollow drive shaft and motor. The dipole is mounted directly in line with the center of the reflector and is connected by a transmission line to the receiving system. The rotation of the offcenter cup in front of the dipole and reflector causes the point of maximum sensitivity of the dipole to rotate about the axis of the reflector and vary the voltage induced in the dipole. When the signal from the radiosonde transmitter is directly in line with the axis of the reflector, it is reflected by the eccentric cup to the dipole as a constant voltage (A, fig, 1-29). However, when the signal is received from a point at an angle with the axis of the reflector, the voltage induced in the dipole varies (B, fig. 1-29). The eccentric cup rotates at a speed of 2,040 r/min; therefore, the variation in voltage results in amplitude modulation of the received signal at a frequency of 34 Hz. The magnitude of the departure of the radiosonde transmitter from the electrical axis of the dipole determines the magnitude of the signal; the phase varies with the direction of the departure. The sinusoidal variation of the received signal by conical scanning is used in the antenna positioning system to track the radiosonde.

b. The radiosonde (A, fig. 1-29) is directly in line with the electrical axis of the antenna. The shaded circle represents the area of the lobe that corresponds to one position of the eccentric cup. The center of the area of the lobe rotates in a path indicated by the unshaded circle. Four points on this path are indicated by numbers 1, 2, 3, and 4. In A, figure 1-29, the energy received by the rawin set is equal when the center of the area of the lobe is at any of these points. In B, figure 1-29, the radiosonde is not in line with the electrical axis of the antenna and the amount of energy received by the rawin set is equal at points 2 and

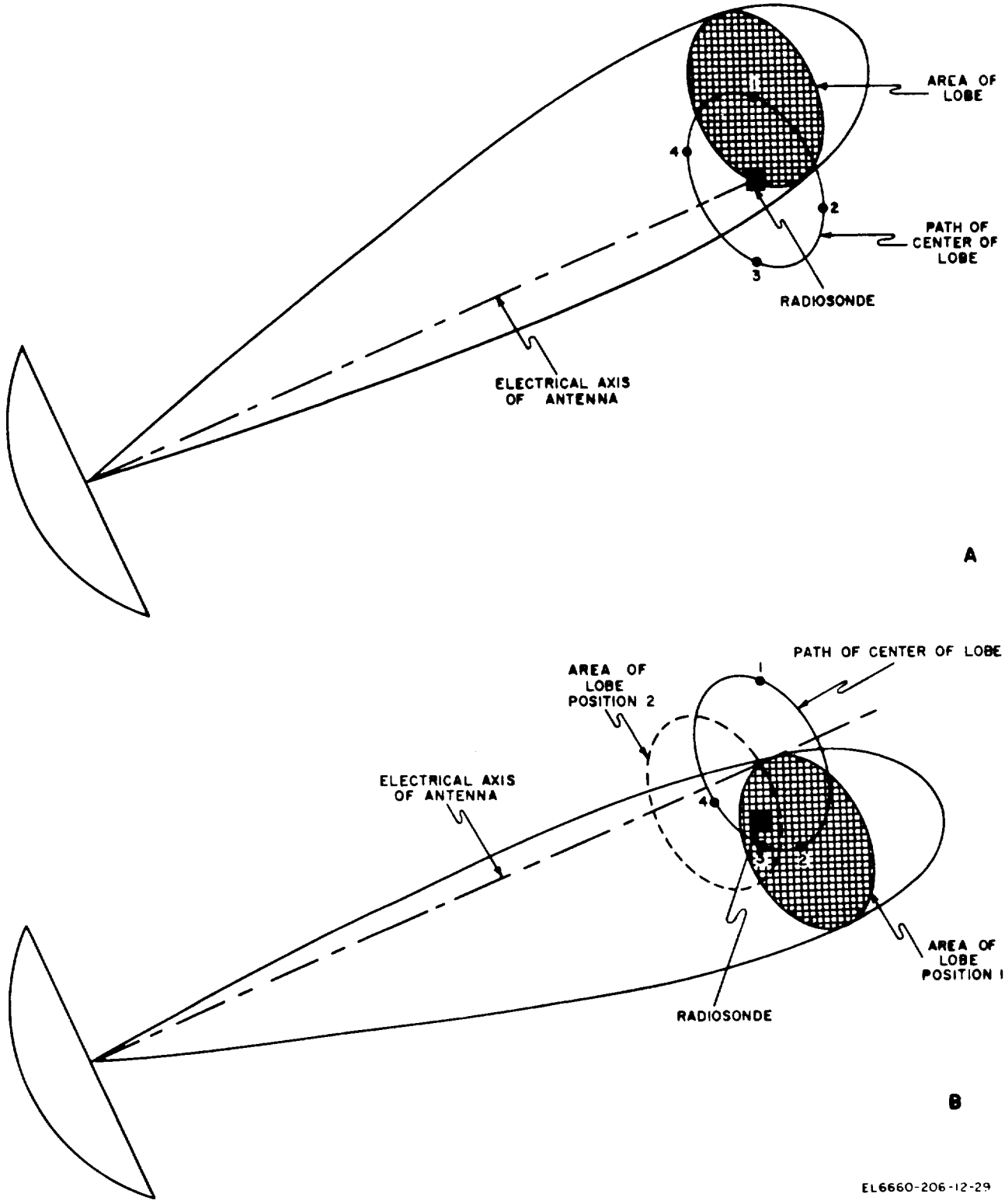


Figure 1-29. Conical scanning.

4. More energy is received when the center of the area of the lobe is at point 3 than when it is at point 1. This results in an error voltage being superimposed on the received signal. This error voltage causes the antenna to be moved in a direction that tends to counteract the error. For any other variation in the radiosonde position, a corresponding error signal results.

1-16. Tracking

Rawin Set AN/GMD-1(*) tracks the balloon-

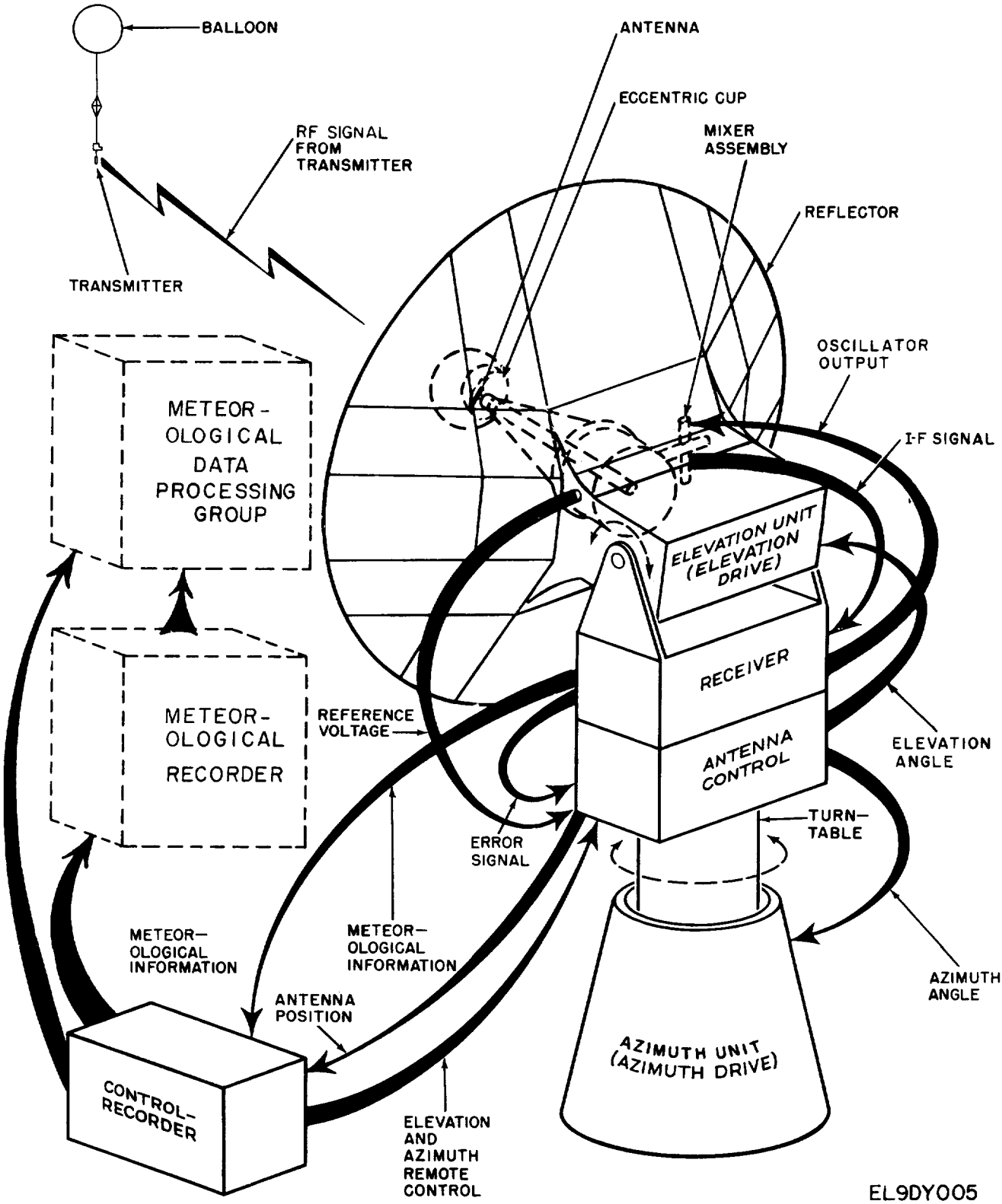


Figure 1-30. Rawin Set AN/GMD-1(*), functional diagram.

borne radiosonde transmitter automatically or manually in both azimuth and elevation. Manual tracking is used to align the antenna of the rawin set with the radiosonde transmitter before the balloon bearing the transmitter is released. After the rawin set is aligned, it can be switched to automatic tracking by a three-position switch (MANUAL-NEAR AUTO-FAR AUTO) on the

front panel of the antenna control (fig. 3-2). With this switch in the MANUAL position, manual tracking may be performed from either the local or remote location. Local manual tracking is accomplished by varying the ELEVATION and AZIMUTH potentiometers on the front panel of the antenna control. Remote manual tracking, from the control-recorder, is accomplished by MANUAL CONTROL AZIMUTH switch (fig. 3-7).

CAUTION

Do not actuate elevation or azimuth override controls for more than a one minute duration, to do so can damage the drive motors.

With the antenna control MANUAL-NEAR AUTO-FAR AUTO switch in the NEAR AUTO or FAR AUTO position, the rawin set tracks the radiosonde transmitter automatically (except that the automatic tracking can be overriden by operation of one of the manual control switches on the control-recorder). The NEAR AUTO setting permits rapid automatic tracking when the balloon-borne radiosonde is close to the rawin set, and shifts in its position with respect to the antenna assembly are sudden. The FAR AUTO setting permits slow tracking, and is more accurate when the balloon-borne radiosonde is distant and its movements with respect to the rawin set are gradual.

1-17. Function of Components

A general functional description of Rawin Set AN/GMD-1(*), based on the diagram shown in figure 1-30, is described in *a* through *j* below.

a. The RF signal from the balloon-borne-radiosonde transmitter is reflected to a rotating eccentric cup which, in turn, reflects the energy to a stationary dipole (antenna). This action results in sinusoidal modulation of the received signal (para 1-15).

b. The RF energy is fed from the dipole to a mixer assembly.

c. An RF signal, 30 MHz lower in frequency than the RF signal from the radisonde transmitter, is produced by the local oscillator and is fed to the mixer assembly.

d. The mixer output, a 30-MHz IF signal, is fed to the receiver.

e. The IF signal is amplified, demodulated, and divided into two outputs. One output contains the meteorological information and is connected through the control-recorder to a meteorological recorder (not part of the rawin set). The other output is an error signal which is sent to the antenna control and is proportional to the deviation of the balloon-borne transmitter from the axis of the reflector.

f. The antenna control unit determines the angles of azimuth and elevation through which the axis of the reflector must move to be in line with the balloon borne transmitter.

g. The antenna control has two inputs: the error signal and a reference voltage corresponding to the position of the eccentric cup.

h. The elevation angle signal is fed to the elevation drive in the elevation unit, thus positioning the antenna in elevation. The azimuth angle signal is fed to the azimuth drive in the azimuth unit, thus positioning the antenna in azimuth.

i. A synchro transmitter in the elevation unit transmits the elevation angle to the control-recorder. Another synchro transmitter in the azimuth unit transmits the azimuth angle to the control-recorder. The control-recorder indicates and records the azimuth and elevation angles of the antenna electrical axis with respect to north and zero elevation respectively.

j. When required, the antenna control and elevation and azimuth drives can be operated by remote control from the control-recorder.

CHAPTER 2

INSTALLATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unpacking

a. General. The components of Rawin Set AN/GMD-1(*) may be shipped in oversea or domestic packing cases and, sometimes, in their own carrying cases. When new equipment is received, select a location where the equipment may be unpacked without exposure to the elements and which is convenient to the permanent or semipermanent installation. The instructions in *b* through *f* below apply to equipment shipped in export packing cases (fig. 2-1), and the instructions in *g* and *h* below apply to the equipment shipped in domestic packing cases. Aside from making sure that all carrying cases are present and that the equipment is undamaged, no special unpacking and uncrating procedures are necessary for equipment shipped in carrying cases.

CAUTION

Be careful when uncrating, unpacking, and handling the equipment. If it becomes damaged or exposed to adverse conditions, a complete overhaul may be required or the equipment might be rendered useless.

b. Export Shipments. When packaged for export shipment, the components of the rawin set are placed in moisture-vaporproof containers (fig. 2-1) and packed in 11 wooden export crates or boxes numbered 1 through 11. The outrigger assembly, reflector, and the two cable reels are packed in four wooden crates (numbered 1, 5, 8, and 9). Other crates contain the transit cases which house the various components, accessories, and spares. The transit cases are wrapped in moisture-vaporproof materials and packed in seven export crates. A typical shipping box and packaging material are shown in figure 2-1. The number, size, weight, and contents of each crate are listed in table 2-1.

c. Step-by-Step Instructions for Uncrating and Unpacking Export Shipments.

(1) Place packing cases numbered 1, 2, 3, 4, 5, 7, and 8, near the site chosen for the main assembly. Place packing cases numbered 6 and 9 near the site chosen for the control-recorder.

(2) Cut and fold back the steel straps.

(3) Remove the nails with a nailpuller. Remove the top and one side of the packing case. Do not attempt to pry off the sides and top; the equipment may become damaged.

(4) Remove the waterproof metal container or moistureproof barrier and any excelsior or corrugated paper covering the equipment inside the case. Refer to *e* below for instructions on removing the waterproof metal container.

(5) Remove the equipment from its inner case and place it on the workbench or near its final location.

(6) Inspect the equipment for possible damage incurred during shipment.

(7) Check the contents of the packing case against the master packing slip.

(8) The instructions that follow apply only to packing cases numbered 2, 3, 4, 6, and 7.

(9) Cut the steel straps that fasten the transit cases to the skids on the bottom panel of the crate.

(10) Use the carrying handles to remove the five transit cases.

(11) Release the latches on the front of each transit case. Do not remove the contents at this time. Instead, remove each unit as required for installation. Do not open packing cases numbered 10 and 11 at this time; they contain the running spare parts.

d. Opening Cardboard Carton and Waterproof Barrier. No special instructions are needed for opening the waterproof paper barrier and removing the equipment from the cardboard carton.

e. Instructions for Opening Metal Conatiners. The top of the metal container is soldered to the

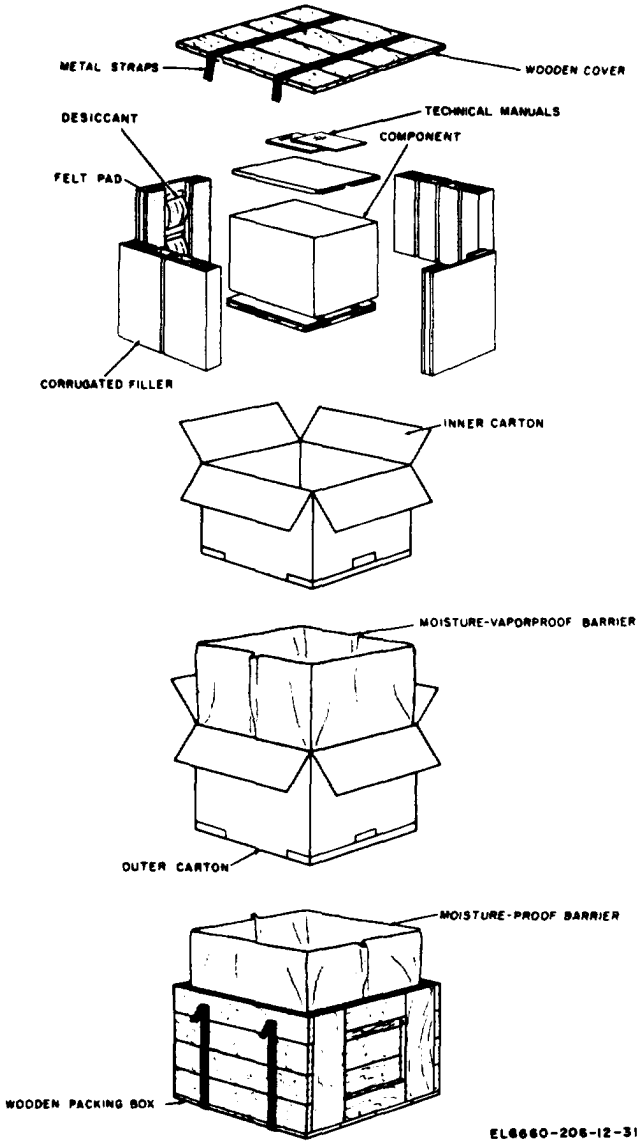


Figure 2-1. Typical packaging of components of Rawin Set AN/GMD-1(*) for export shipment.

sides. To open, break the soldered seam by prying the sides of the container away from the soldered seam as outlined in (1) through (4) below.

WARNING

Never use a torch to remove excess solder because the contents of the container are flammable.

(1) Wipe off the excess solder with a soldering iron.

(2) With a wooden block or a screwdriver, pry the sides from the soldered seam.

(3) When the seam is open completely, pry off the cover.

(4) Remove the bags of desiccant and the protective cardboard packing and lift or draw out the packages.

f. Checking. Check the contents against the master packing slip.

g. Domestic Shipments. When the equipment is packed for domestic shipment, the reflector sections, outrigger assembly, and cable reels are shipped in crates. The other equipment units, accessories, and spares are shipped in six transit cases. During movement between sites, usually the components are arranged and shipped in a trailer (para 7-8). The equipment that is shipped unpacked in a trailer or in crates is listed in table 2-2 with the unit weight. The equipment that is shipped in transit cases is listed in table 2-3 with the nomenclature, size unit weight, and contents.

h. Unpacking Domestic Packing Cases. Radio equipment may be received in domestic packing cases. The instructions given in *c* above also apply to unpacking domestic shipments. Cut the metal bands. Open the cartons that protect the equipment; or, if heavy wrapping paper has been used, remove it carefully and take out the components. Check the contents of the packing case against the master packing slip.

NOTE

Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

(1) The outrigger parts, the reflector sections, and the two cable reels are received unpacked. Set these parts near the site chosen for the main assembly.

(2) Place the CY-734/GMD-1, CY-736/GMD-1, and CY-1157/GMD-1A near the site chosen for the main assembly.

(3) Place Case CY-737/GMD-1 near the site chosen for the control-recorder.

Table 2-1. Shipping Crate Particulars

Crate No.	Volume	Unit weight(lb)	Contents
1	11.5	225	Outrigger assembly and packing frame.
2	36	490	Azimuth unit, azimuth unit and, and azimuth unit cover.
3	26.3	437	Case CY-736/GMD-1 and housing.
4	17.6	392	Case CY-734/GMD-1 and elevation unit.
5	83.6	440	Reflector and packing frames.
6	10.7	228	Case CY-737/GMD-1 and control-recorder.
7	18.4	312	Case, Components CY-1157/GMD-1A and accessories.
8	8	203	Cable Reel RL-137/GMD-1 and Cable Assembly, Special Purpose, Electrical CX-1216/U (main cable W901), and Cable Reel Holder MT-1421/U.
9	3.2	100	Cable Reel RL-138/GMD-1 and Cable Assembly, Power Electrical CX–2043/U (power cable W911)).
10	14	268	Case CY-735/GMD-1, spare receiver, and antenna control.
11	14.2	133	Case CY-898/GMD-1 and running spares (for AN/GMD-1A/C)
or			
11	14.2	133	Case, Standardized Components, Electrical Case CY-1895/GMD-1 and running spares (for AN/GMD-1B/D)

Table 2-2. Domestic Shipping Weights of Unpacked Equipment Shipped in Crates or Unpacked in Trailer

Equipment	*Unit weight (lb)*
Azimuth unit, azimuth skid, and azimuth turntable cover	273
Reflector	440
Outrigger assembly with reel stand	212
Cable Reel RL-137/GMD-1 and Cable Assembly, Special Purpose, Electrical CX-1216/U.	205
Cable Reel RL-138/GMD-1 and Cable Assembly, Power Electrical CX-2043/U	61

Table 2-3. Domestic Shipping Particulars of Equipment in Transit Cases

Equipment	Height (in.)	Depth (in.)	Width or length (in.)	Unit weight (lb)	Contents
Case CY-734/GMD-1	21	22 ½	37 ¼	300	Elevation unit assembly.
Case CY-735(*)/GMD-1	20 ½	24 ½	25 ¼	198	Spare Rawin Receiver R-301(*)/GMD-1 and spare Antenna Control C-578(*)/GMD-1.
Case CY-736/GMD-1	28 ½	26 ½	32 ¾	366	Rawin Receiver R-301(*)/GMD-1, Antenna Control C-578(*)/GMD-1, and housing.
Case CY-737(*)/GMD-1	17 ¼	19	26 ¼	159	Control-Recorder C-577(*)/GMD-1.
Case, Components CY-1157/GMD-1A.	15 ¾	25 ¾	44 ¾	219	See figure 1-25.
Case CY-898/GMD-1	20	21	25	48	Running spares for AN/GMD-1A/C.
or					
Case, Standardized Components, Electrical CY-1895/GMD-1.	20 ½	20 ½	25 ¼	73	Running spares for AN/GMD-1B(*)/D.

(4) Release the latches on the front of the four transit cases ((2) and (3) above). Do not remove the contents at this time. Instead, remove each unit as required for installation. Cases CY-735/GMD-1 and CY-898/GMD-1, or the CY-1895/GMD-1 contain running spares and they do not have to be opened.

2-2. Checking Unpacked Equipment

a. Inspect the equipment for any loss or damage that might have occurred during shipment. If the equipment has been damaged or is incomplete, refer to paragraph 1-3.

b. Check the equipment against the packing list.

When no packing list accompanies the equipment, the table of components (para 1-7) or the packaging data (para 2-1) may be used as a general check to indicate the equipment which probably has been packed.

c. Check to see that all cable assemblies are included and that they are in good condition.

d. If the equipment has been used or reconditioned, check to see whether it has been changed by a modification work order (MWO). If modified, the MWO number will appear on the front panel of the modified unit, usually near the nomenclature plate. Check to see that the MWO information appears in the manual that accompanies the equipment.

2-3. Siting

The ideal site for the operation of Rawlin Set AN/GMD-1(*) is the center of a large plateau (fig. 2-2) with no natural or artificial objects within 200 yards, and no obstructions, at any distance, that extend above 3° from the horizon. However, ideal conditions seldom exist and the

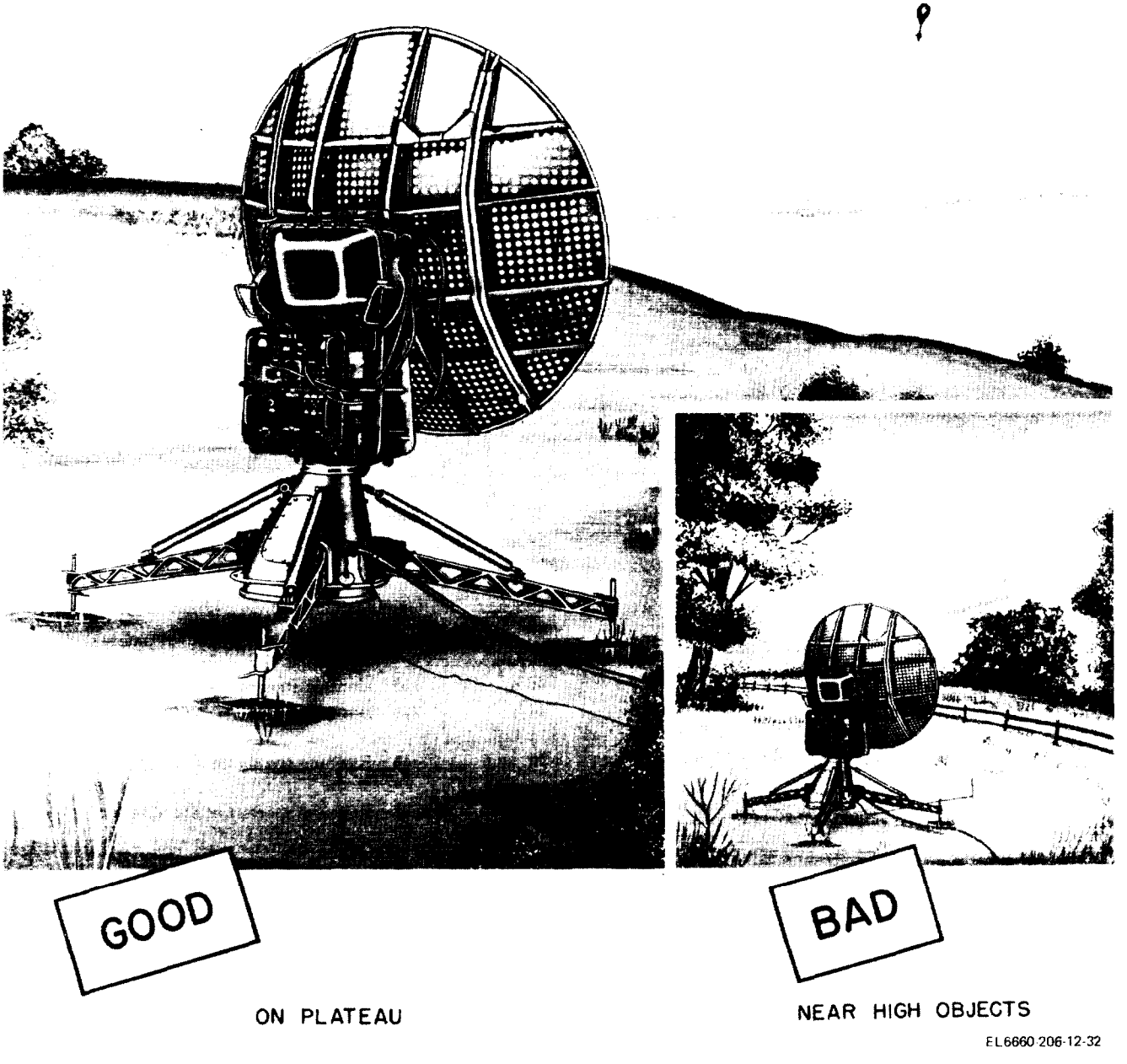


Figure 2-2. Siting Rawin Set AN/GMD-1(*).

selection of an operating site must often be a compromise. Several of the major considerations for siting the rawin set are listed in *a* through *j* below.

a. The distance from the operating location of the control-recorder to the main assembly must not exceed 200 feet (the length of the main cable).

b. The horizon from the main assembly should be unobstructed above 3° (at least in the direction toward which the balloon-borne transmitter is carried by the prevailing winds). The prevailing winds at both low and high levels must be considered.

c. The main assembly must be installed on a level and firm site, so that proper leveling and orientation may be obtained.

d. Adequate clear areas must be available for the release of balloons; these areas must be adjacent to the balloon inflation shelter.

e. Nearby structures and elevated terrain must be avoided because they may intercept or reflect the radio signal from the transmitter and give erroneous bearings.

f. Distant landmarks, suitable for orientation references, should be visible from site.

g. The operating site should be conveniently accessible to operating personnel.

h. Installation of the main assembly on the roof of a solidly constructed building is often desirable. The control-recorder and meteorological recorder can be installed on a lower floor of the same or adjacent building.

i. Received radio interference is seldom a problem, except possibly from certain older types of radar equipment using spark gap modulators.

j. Transmitted radio interference is not present except for the local oscillator radiation at approximately 1,650 MHz.

2-4. Shelter Requirements

If the installation is temporary, the control-recorder may be placed on a transit case adjacent to the meteorological recorder. However, if the installation is semipermanent or permanent, the control-recorder should be sheltered in a tent or building and placed on a bench or table. Because of cable length limitations, the control-recorder should be installed not more than 200 feet from the main assembly, not more than 25 feet from the meteorological recorder, and not more than 150 feet from the 115-volt, 60-Hz power source.

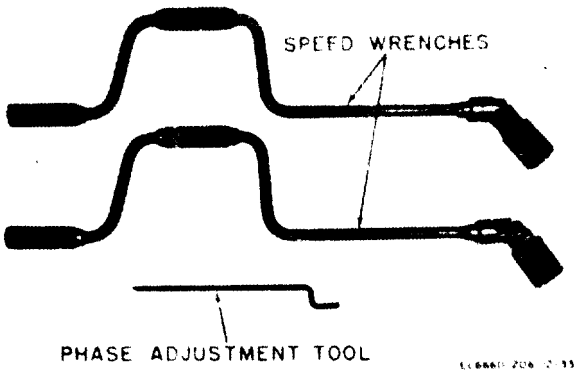


Figure 2-3. Special tools supplied with Rawin Set AN/ GMD-1(*).

2-5. Tools, Test Equipments, and Materials Required for Installation, Checking and Alignment

The following tools are required for installation of the rawin set:

a. Furnished as Part of Set. Two each speed wrenches, 15/16 hexagonal opening (fig. 2-3); used for adjustment of bolts on the rawin set.

b. Not Furnished as Part of Set. One each Tool Equipment TK-101/G; used to supply various handtools needed to install the rawin set.

c. Special Tools and Test Equipment. Special tools and test equipments required to check, align, and adjust the rawin set are listed in appendix C. The items furnished with the rawin set are listed with their uses in (1) and (2) below. These items are shipped and stored in the accessories case.

(1) *Tools.*

(a) The phase adjustment tool (fig. 2-3) is used to adjust the phasing of the reference generator located in the antenna scanner assembly.

(b) Two speed wrenches (15/16) (fig. 2-3) are used to tighten mounting nuts to check for proper installation of the rawin set.

(2) *Test Equipment.* Test Set TS-538(*)/U is used as signal source for the rawin set and to check the frequency and power output of the radiosonde transmitter.

Section II. INSTALLATION INSTRUCTIONS

2-6. General

a. For service upon receipt of the rawin set, refer to paragraph 2-2.

b. Four men under the direction of a team chief are required to install the rawin set. An experienced team can assemble the set in approximately 15 minutes.

c. Determine the location and azimuth angle of the reference point (para 2-23).

d. Install the rawin set in the sequence given in the procedures given in (1) through (12) below. Except for the installation of the shelter, the procedures are covered in this paragraph through paragraph 2-18. For installation of the shelter, refer to the applicable technical manual.

(1) Unload the trailer (para 2-7).

(2) Install the azimuth unit and outrigger assembly (para 2-8).

(3) Install the receiver, antenna control, and housing (para 2-9).

(4) Install the elevation unit assembly (para 2-10).

(5) Assemble the reflector (para 2-11).

(6) Install the reflector (para 2-12).

(7) Install and connect, the antenna scanner assembly (para 2-13).

(8) Install and connect the mixer assembly (para 2-14).

(9) Install the telescope assembly (para 2-15).

(10) Install the control-recorder (para 2-16).

(11) Install the shelter, if used.

(12) Install the cables (para 2-17).

e. All the hardware required to assemble or install the various components of the main assembly is chained and clipped to the components where it is used.

f. The interconnecting cables supplied have a male connector on one end and a female connector on the other. When interconnecting the various units, be certain that a male connector is inserted into a female receptacle. Careless forcing of a male connector into a male receptacle may seriously damage the connector and receptacle pins. All cables, connectors, and receptacles of the various units are equipped with captive protective caps. Each pair of corresponding cover caps is threaded to match. After inserting a connector into a receptacle and tightening the connector in place, screw the two cover caps together to prevent corrosion of the threaded parts.

2-7. Unloading Trailers

After the initial unpacking from the original crates, the rawin set may be moved to subsequent sites on a standard 1½-ton Ordnance trailer. An accessories kit (trailer adapter kit) is provided with the rawin set so that the set can be transported without damage in the trailer. Trailer M-104 or M-105 may be used for this purpose. Trailer M-105 does not have a front gate. Unload the trailer as follows:

a. Lower the trailer jack and set it.

b. Loosen the tarpaulin ropes and rope extensions (fig. 2-4); remove the tarpaulin.

c. Remove the bows and bow extensions.

d. Loosen and remove the four reflector guy assemblies (fig. 2-5).

e. Loosen and remove the two adjustable azimuth unit guy assemblies.

f. Remove the tailgate pins and lower the tailgate.

g. Unload Case CY-736/GMD-1 from the trailer and place it about 20 feet away from the trailer.

h. Loosen the captive thumbscrews that hold the azimuth unit to the azimuth unit skid.

i. Move the azimuth unit (fig. 2-5) enough to permit the removal of the remaining guy assembly.

j. Use four men to unload the azimuth unit and skid.

k. Remove the screw that holds the azimuth unit turntable cover in place and lift the cover off the turntable; be sure to disengage the side of the cover caught under the turntable.

l. Loosen the screws on the azimuth unit skid and remove the azimuth unit from the skid.

m. Use four men to slide Case CY-1157/GMD-1A (fig. 2-6) from beneath the leg frame and unload it from the trailer.

n. Open this accessories case and remove the speed wrenches (fig. 2-3).

o. Obtain a 15/16-inch open end wrench from the repairman's tool equipment and use it along with the speed wrenches to loosen the antenna mounting bolts from the holddown brackets (fig. 2-6) on the leg frame.

p. Swing the bolts clear from the holddown brackets and unload the antenna.

q. Take out the four bolts that hold the two antenna wing sections to the antenna wing frame.

r. Use two men to lift the reflector wing sections (fig. 2-6) and to disengage and remove the wing sections from the antenna wing frame.

s. Take out the four bolts that hold the antenna wing frame to the antenna center section, and remove the antenna wing frame.

t. Use four men to remove the leg frame that contains leg assembly with contents (fig. 2-7) from the trailer.

u. Remove the screw that holds the removable bracket to the plate (part of the jack plate holder) on top of the leg frame.

v. Remove the jack plates.

w. Replace the bracket *(u* above) and tighten the screw that holds it in place.

x. Remove the jack plate holder by loosening the four screws that hold it to the top of the leg frame.

y. Loosen the two thumbscrews that hold the leg clamp at one end of the frame, and remove the leg clamp.

z. Lift the three leg assemblies (part of outrigger leg assembly) out of the leg frame.

aa. Replace the leg clamp and the jack plate holder on the leg frame, and tighten the screws that hold them in place.

ab. Unload Cases CY-734/GMD-1, CY-735(*)/GMD-1, CY-736/GMD-1, CY-737(*)/GMD-1, CY-1157/GMD-1A and CY-1895/GMD-1 from the trailer.

ac. Unload the two cable reels from the trailer and remove the wooden blocks (fig. 2-6) from the wheel wells.

NOTE

Do not discard any of the trailer adapter kit parts. These parts are needed for repacking the equipment into the trailer.

2-8. Installation of Azimuth Unit and Outrigger Assembly

a. General. The procedure in, *b* below is used for

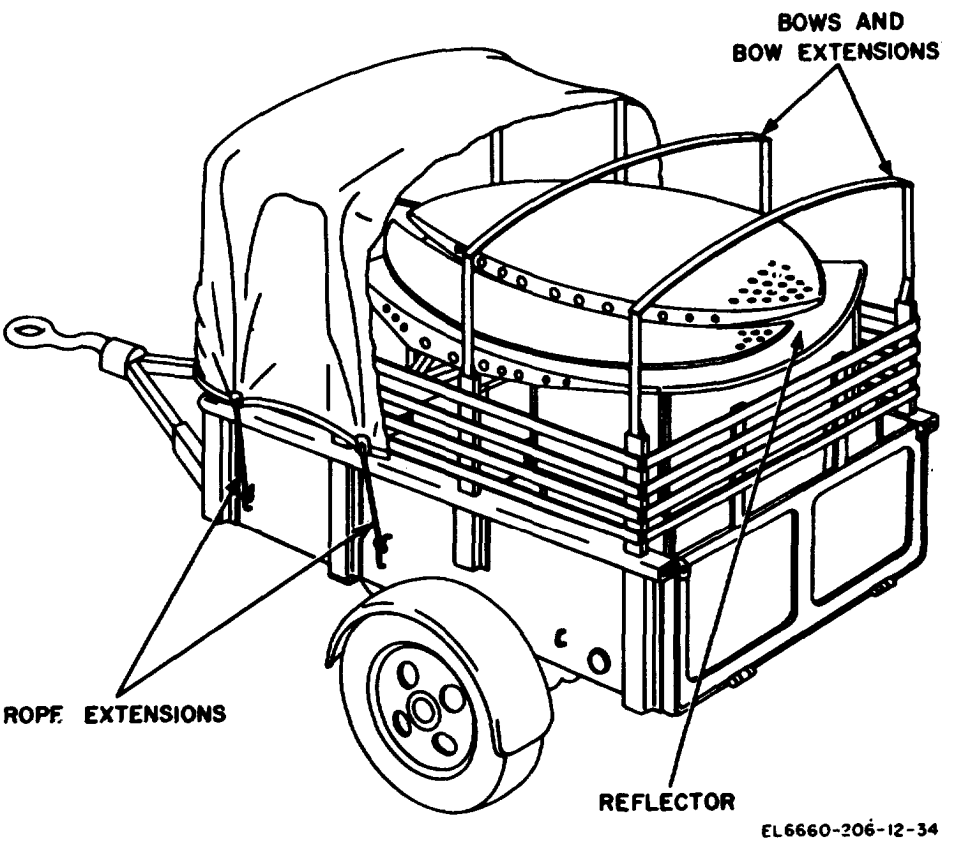


Figure 2-4. Trailer showing tarpaulin and bow extensions.

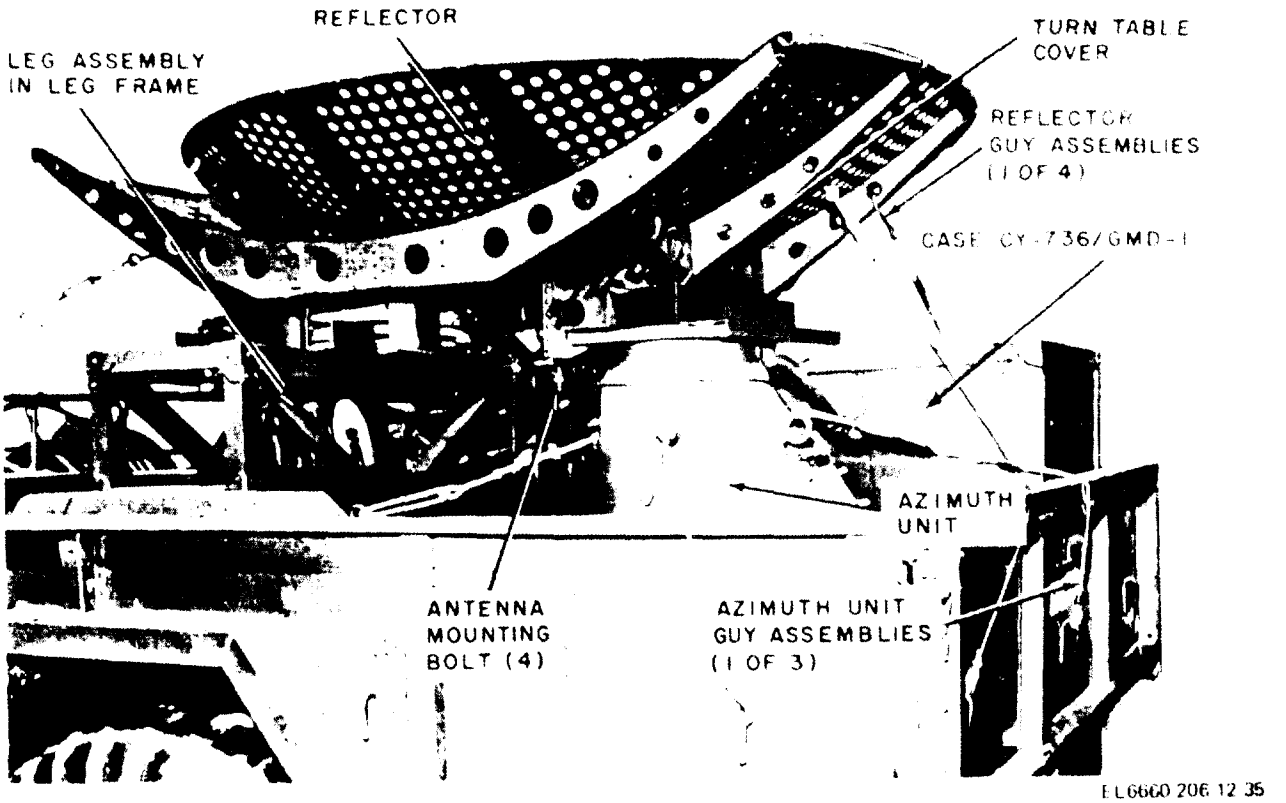


Figure 2-5. Loaded trailer, rear left view.

routine installation; the procedure in *c* below is used when the rawin set is unpacked from the original packing crates. The two procedures differ because some items of the outrigger assembly are not removed when the rawin set is disassembled for change of location. Before proceeding with the installation of the azimuth unit and outrigger assembly, choose the method of orienting the rawin set that will cover the existing installation requirements. Orientation of the rawin set as described in paragraph 2-23 will determine where the azimuth unit and outrigger assembly will be located.

b. Routine Installation.

(1) Place the main cable reel (fig. 2-8) on its flat side over the spot where the center of the azimuth unit and outrigger assembly is to be installed. This cable reel provides a temporary base for the azimuth unit.

(2) With the azimuth unit separated from the azimuth unit skid, lift the azimuth unit by its railing and place it on top of the main cable reel; use four men.

NOTE

For orientation purposes, note that the center of the base of the azimuth unit is not the center of the turntable of the azimuth unit. The center of the turntable should be directly over the surveyed spot used for orientation (para 2-23) to locate the azimuth unit.

(3) Pick up the outrigger leg with the longest compression bar and place it in a horizontal position in front of the mounting lug (fig. 2-9) on the side of the azimuth unit with the longest slope.

(4) Use two men to push the outrigger leg into a position so that the two holes in the outrigger leg, align with the bottom hole in the azimuth unit mounting lug.

CAUTION

Be sure that no weight is placed on the screws that fasten the outrigger assembly while they are being inserted and handtightened, because cross threading may result.

(5) While two men hold the outrigger leg in place, insert the tapered-end screw through the holes in the outrigger leg and mounting lug, and handtighten.

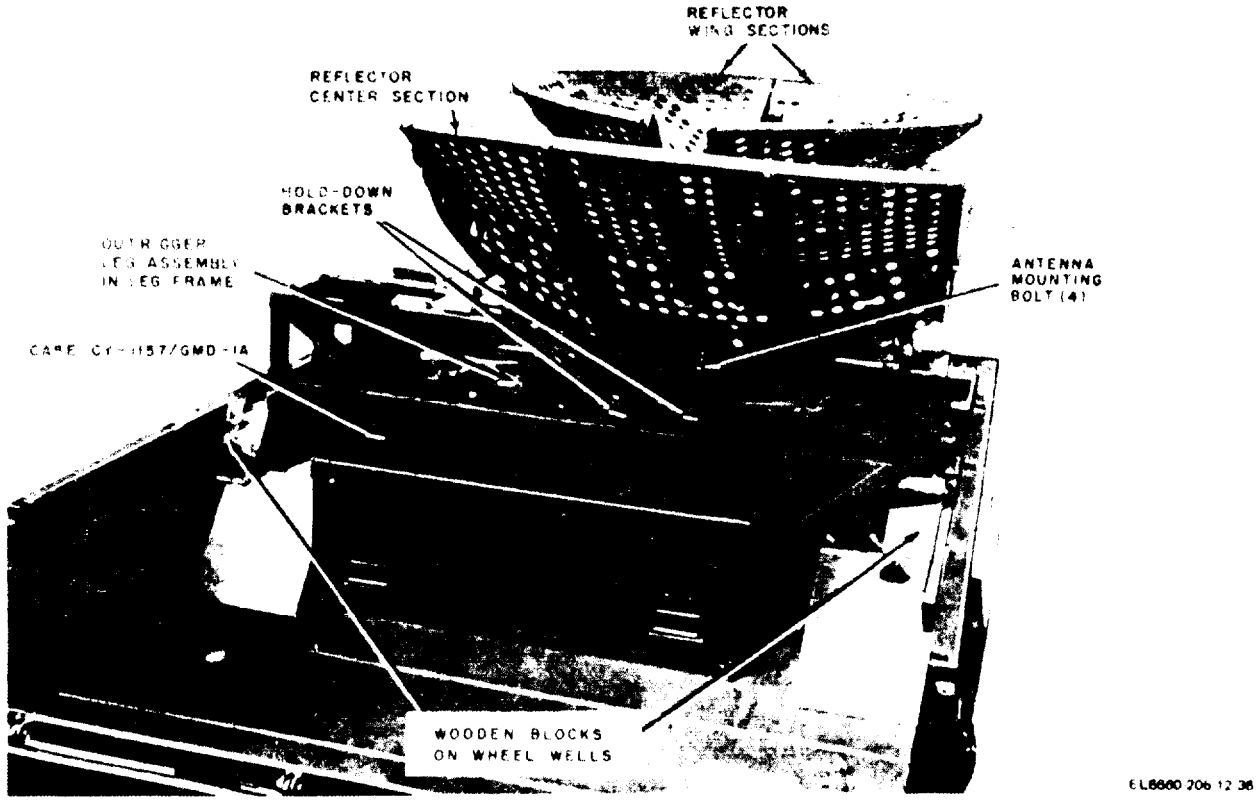


Figure 2-6. Position of antenna on leg frame.

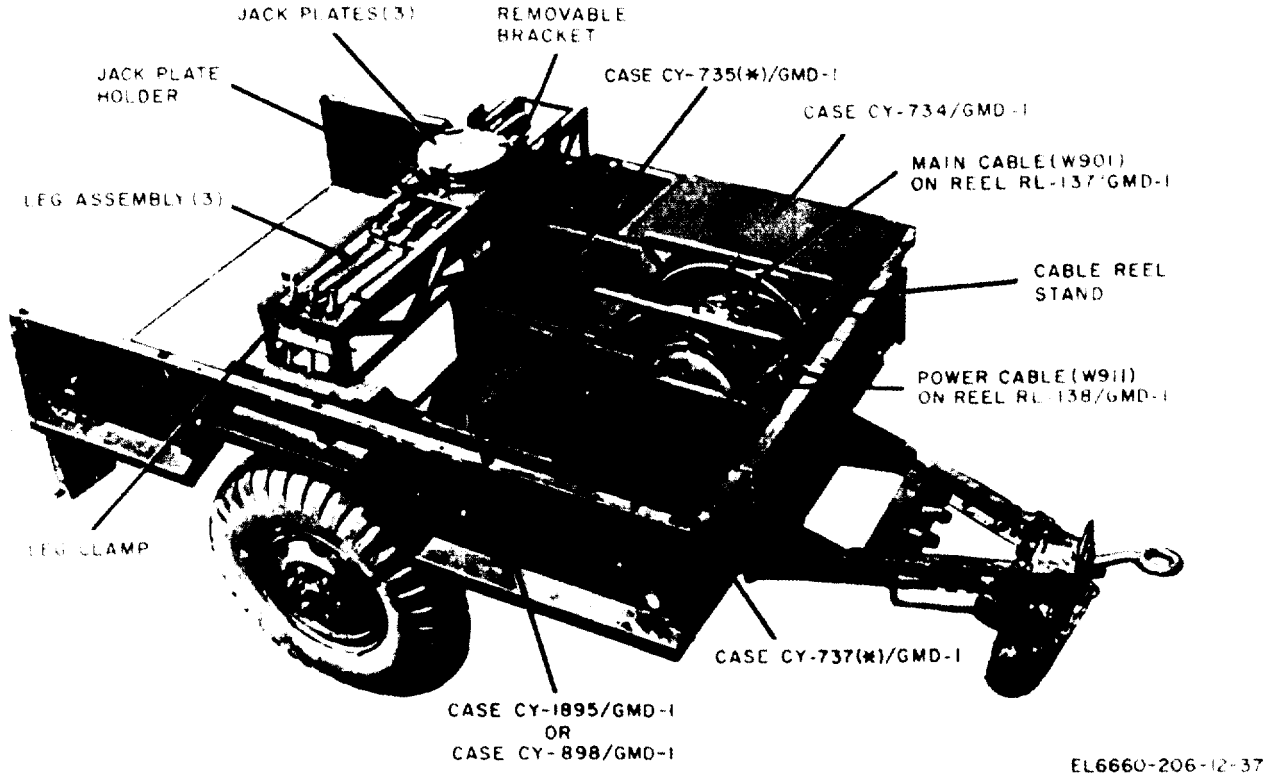


Figure 2-7. Trailer partially unloaded.

(6) Insert and handtighten the securing screw through the hole in the outrigger leg and the hole in the mounting lug.

(7) Use the speed wrench to tighten the tapered-end screw and the securing screw.

(8) Repeat procedures (4) through (7) above for the other two outrigger legs.

(9) Check to see that the upper coupling of the compression bar being secured (fig. 2-10) reaches the top mounting lug of the azimuth unit; turn the compression bar body in the direction necessary to align the holes in the coupling with the hole in the top mounting lug.

(10) Insert the top mounting screw (fig. 2-11) and tighten with the speed wrench.

(11) Install the other two compression bars as described in procedures (9) and (10) above.

(12) Place a jack plate directly under each jackscrew (fig. 2-12) and use the speed wrench to turn each jackscrew until the jackscrew touches the jack plate.

(13) Use the speed wrench to turn each jackscrew until the azimuth unit is raised sufficiently to remove the main cable reel from under the azimuth unit. (It may be necessary to loosen and reposition the locking plates (fig. 2-12) as the jackscrews are turned.)

c. Original Installation.

(1) Repeat the procedures described in *b* (1) through (8) above except, when performing procedure (3), ignore the detailes about the longest.

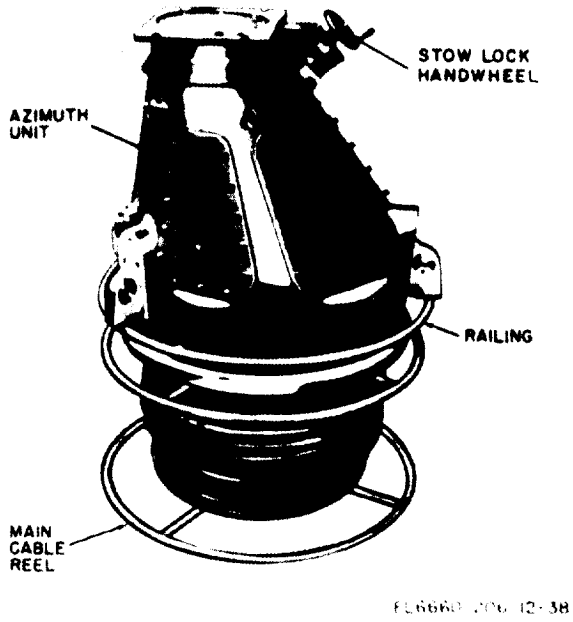


Figure 2-8. Azimuth unit temporarily set on main cable reel.

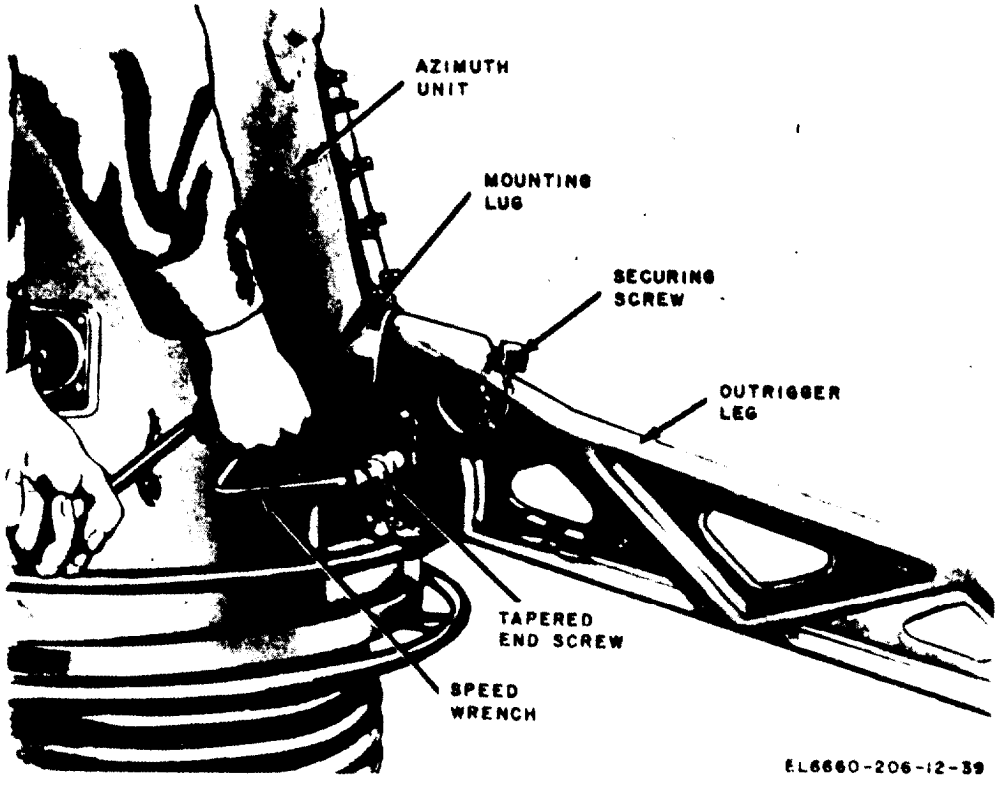


Figure 2-9. Attaching outrigger legs.

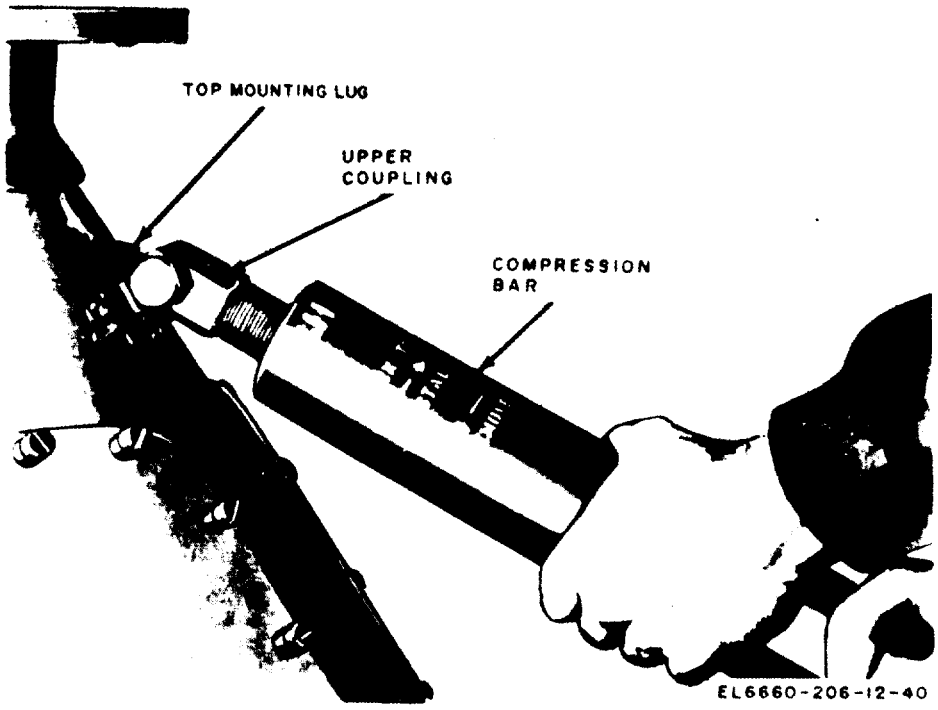


Figure 2-10. Rotating compression bar body.

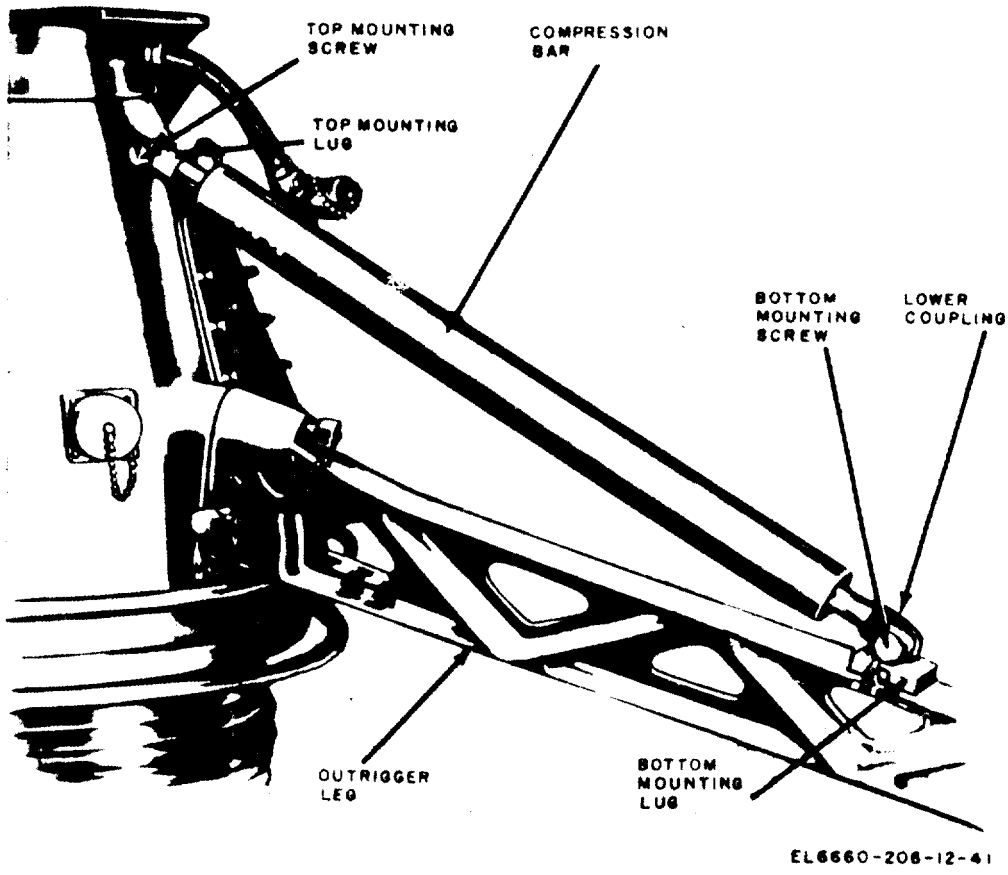


Figure 2-11. Installation of compression bars.

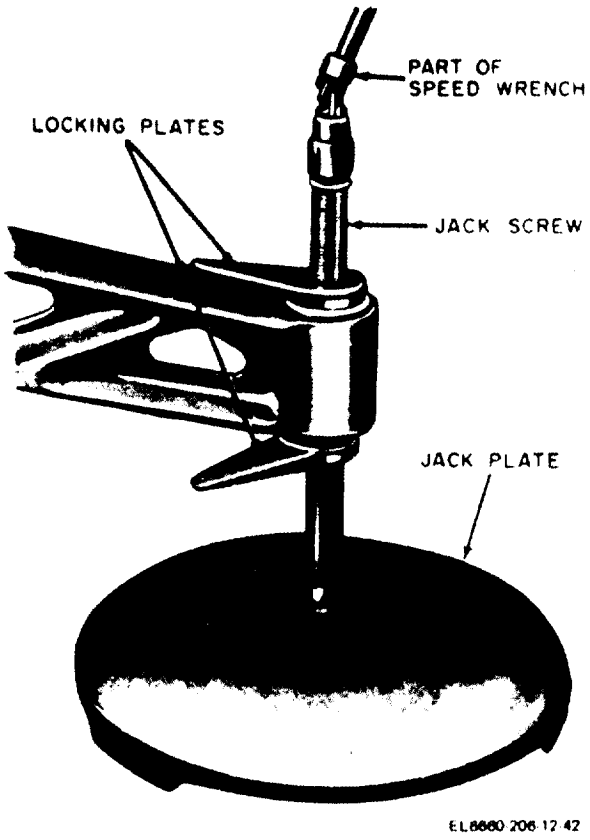


Figure 2-12. Installation of jack plate.

compression bar, because the original shipments are made with the compression bars separated from the outrigger legs.

(2) Pick up the longest of the three compression bars and join the lower coupling to the bottom mounting lug (fig. 2-11) on the outrigger leg that is attached to the azimuth unit side with the longest slope.

(3) Insert the bottom mounting screw and handtighten it.

(4) Check to see that the upper coupling (fig. 2-10) reaches the top mounting lug of the azimuth unit; make the necessary change in length by rotating the compression bar until the holes in the top mounting lug and the upper coupling are aligned.

(5) Insert the top mounting screw (fig. 2-11) and handtighten.

(6) Tighten both the top and bottom mounting screws with the speed wrench.

(7) Install the remaining two compression bars as described in (2) through (6) above except, when performing procedure (2), ignore details pertaining to the longest compression bar, because the remaining two bars are identical.

(8) Loosen the locking plates (fig. 2-12).

(9) Place a jack plate directly under each jackscrew and use the speed wrench to turn each jackscrew until the jackscrew touches the jack plate.

(10) Use the speed wrench to turn each jackscrew until the azimuth unit is raised sufficiently to remove the main cable reel from under the azimuth unit. (It may be necessary to reposition the locking plates as the jackscrews are turned.)

NOTE

At this point the installation should appear as shown in figure 2-13.

2-9. Installation of Rawin Receiver, Antenna Control, and Housing

a. Remove the housing, which also includes the receiver and the antenna control as one unit from Case CY-736/GMD-1.

b. Prepare to place the housing on top of the azimuth unit (turntable) by observing the location of the stow lock assembly for properly orienting the housing.

c. Use four men to lift the complete housing assembly to the top of the turntable; use the handles provided on the housing frame. Orient the rear of the housing toward the side of the azimuth unit turntable that contains the stow lock assembly (fig. 2-14).

d. Position the housing as necessary to align the four pivoted eyebolts (fig. 2-15) located on the underside of the housing, with the four grooves in the turntable mounting plate.

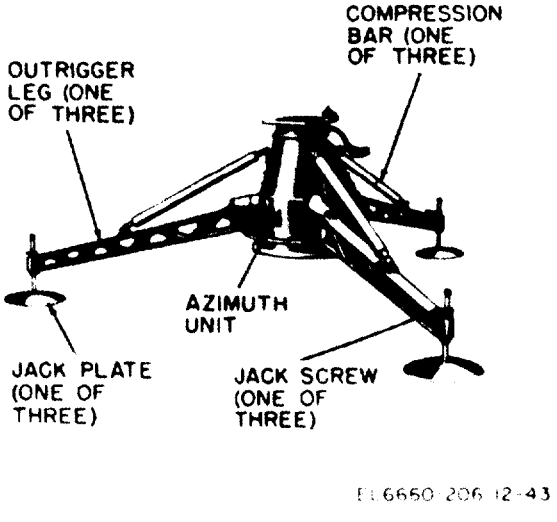


Figure 2-13. Azimuth and outriggger assembly installed.

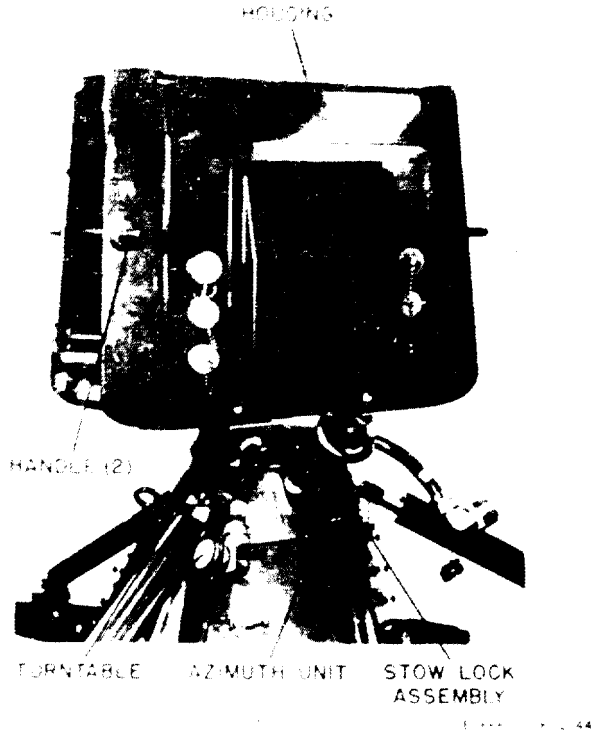


Figure 2-14. Installation of housing, rear view.

e. Check to see that the housing is seated evenly on the mounting plate.

f. Swing the four pivoted eyebolts into the grooves and tighten the associated mounting nuts with the speed wrench.

g. Connect the two cables (W701 and W702) extending out of the turntable to the two lower receptacles of the housing (fig. 2-16).

h. Rotate the stow lock handwheel (fig. 2-15) located on the azimuth unit fully counterclockwise.

NOTE

At this point the assembly should appear as shown in figure 2-17.

2-10. Installation of Elevation Unit Assembly

a. Remove the elevation unit assembly from Case CY-734/GMD-1.

b. Use four men to lift the elevation unit assembly to the top of the housing (fig. 2-18), use the handles provided. The elevation unit assembly should be oriented with the U-shaped handles above the front of the receiver (fig. 2-19).

c. Check to see that the yoke mounting plate is seated evenly on the housing flanges (fig. 2-18).

d. Insert the four captive mounting bolts (fig. 2-19) into the yoke mounting plate and tighten with the speed wrench.

e. Turn the elevation stow lock handwheel (fig. 2-20) fully counter clockwise.

NOTE

The assembly should now appear as shown in figure 2-20 with the elevation unit directed vertically (straight up).

2-11. Assembly of Reflector

a. Place the reflector center section face down on the ground (fig. 2-21).

b. Place the right and left wing sections face down on the ground, alongside of the center section. Be certain that the wing section equipped with dowel pins along the edge is placed on the side of the center section equipped with dowel holes. (On the AN/GMD-1B, painted stripes are provided to correctly match the sections of the reflector.)

c. Use the captive bolts on the reflector stiffeners to bolt the two wing sections to the center section; tighten all bolts with the speed wrench.

2-12. Installation of Reflector

For normal installation, the reflector is placed on the elevation unit mounting flange when the elevation unit is in a vertical position as shown in (fig. 2-20). This procedure is described in *a* below. Under certain conditions, it may not be possible to lift the reflector and place it into position with the elevation unit in a vertical position; therefore the elevation unit must be tilted forward (fig. 2-22) before the reflector is installed. For this procedure, follow the method given in *b* below.

a. Normal Installation.

(1) Pick up the reflector and rest it on the elevation unit mounting flange (fig. 2-23) so that the hooks of the reflector engage the slots on the flange.

(2) Swing the six pivoted eyebolts attached to the reflector stiffeners into the slots in the elevation unit mounting flange.

(3) Use a speed wrench to tighten the six mounting nuts.

NOTE

On some sets these nuts can be tightened with the speed wrench, while others require the use of a 15/16-inch open end wrench.

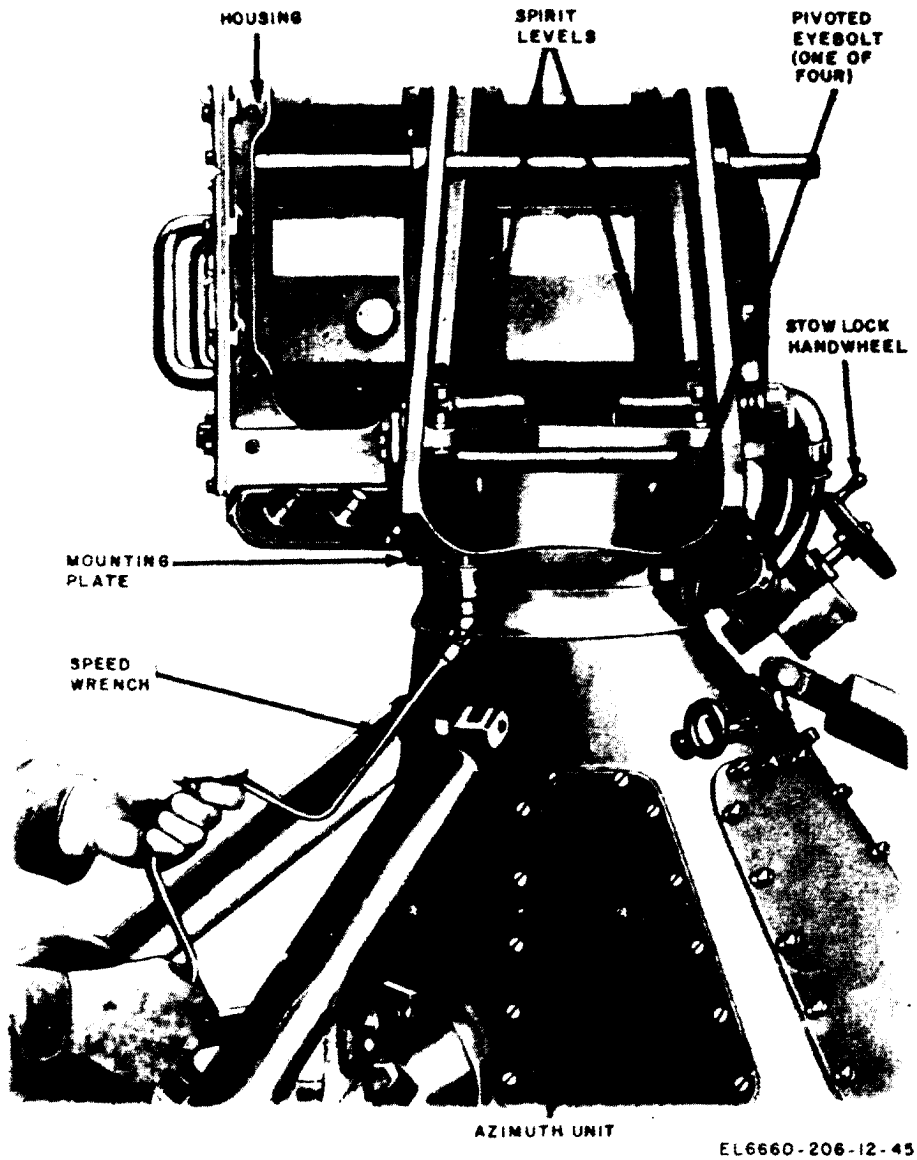


Figure 2-15. Tightening nuts on housing mounting.

b. Alternate Method of Installation.

(1) Install the control-recorder (para 2-16).

(2) Connect the main cable (W-901) (CX-1216/U (para 2-17).

(3) Install the ground rod and the ground cable (W961) (para 2-17).

(4) Make the power cable connections (para 2-17c).

(5) Tilt the elevation unit forward as follows:

(a) Check to see that the pointers on all three ELEVATION and AZIMUTH controls, one of each located on the antenna control (fig. 3-2), the housing (figs. 3-3 and 3-4), and the control-recorder (fig. 3-7), are vertical (centered), and that the elevation stow lock handwheel is fully counterclockwise.

(b) Set the MANUAL-NEAR AUTO–FAR AUTO switch (fig. 3-2), on the antenna control to MANUAL.

(c) Set the POWER switch on the antenna control panel to ON.

(d) Set the MAIN POWER switch (fig. 3-7), on the control-recorder to ON.

(e) While three men have the assembled reflector in position to hang on the elevation unit, the fourth man should turn the ELEVATION control (fig. 3-2) on the antenna control front panel fully counterclockwise (in the DOWN direction) until rotation of the elevation unit is stopped by the tightening of the counterbalance springs.

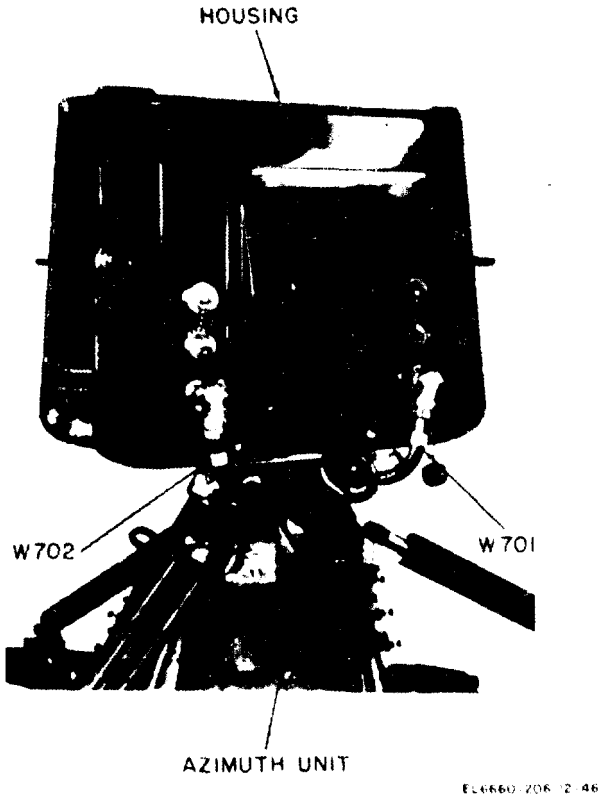


Figure 2-16. Cable connections, azimuth unit to housing.

(f) Turn the ELEVATION control *((e)* above) clockwise until the pointer on the knob is vertical. This leaves the elevation unit tilted approximately 45°

(g) Hang the reflector in place and hold it temporarily by hand.

CAUTION

Use the antenna position controls to position the reflector. Never try to position the reflector by grasping the edge and applying force. To do so will warp the reflector.

(h) Turn the ELEVATION control *((e)* above) clockwise until the elevation unit and reflector have titled upward sufficiently to allow access to the eyebolts (fig. 2-23); stop the movement of these units by returning the ELEVATION control pointer to its vertical position.

(i) Proceed with *a* (2) and (3) above. Use the ELEVATION control *((e)* above) as necessary to position the reflector to gain access to the mounting nuts (eyebolts).

2-13. Installation and Connection of Antenna Scanner Assembly

a. Position the reflector downward until it reaches its stop.

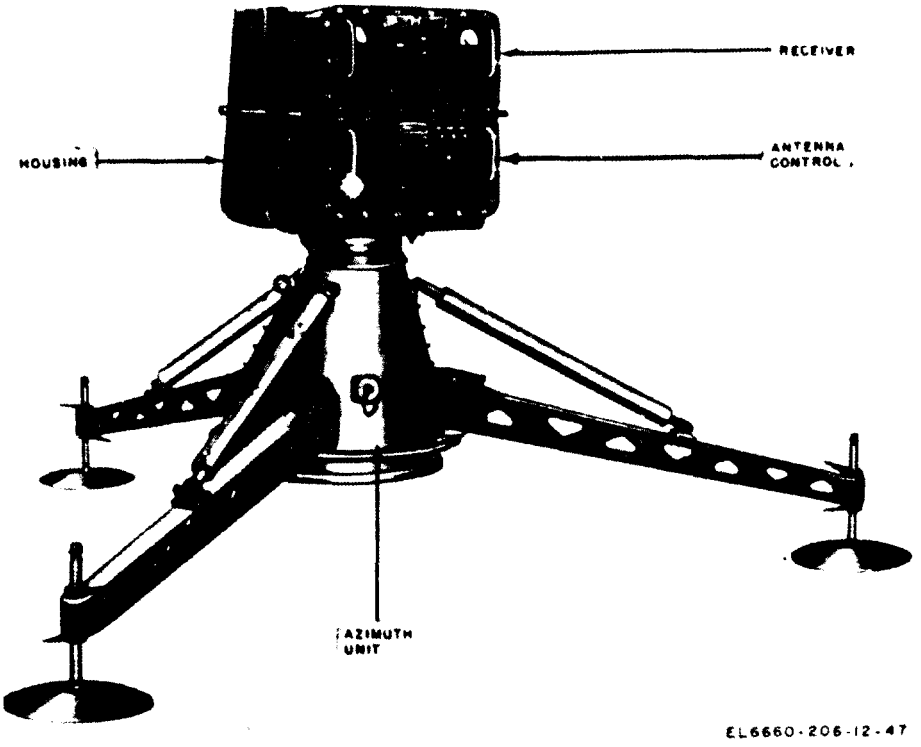


Figure 2-17. Receiver, antenna control, and housing installed on azimuth unit.

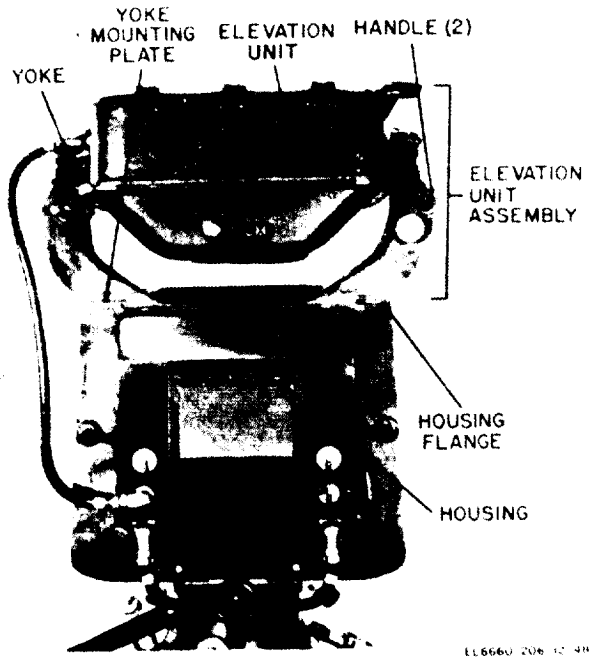


Figure 2-18. Installation of elevation unit assembly.

b. Remove the antenna scanner assembly from the accessory case.

c. Remove the cap from the mixer receptacle on the antenna scanner assembly.

d. From the front of the reflector, insert the power cable and the motor and generator assembly end of the antenna scanner assembly into the opening at the center of the reflector. The power cable side of the antenna scanner assembly should be on the installer's right.

e. Lead power cable W101 (fig. 2-25) through the hole in the horizontal stiffener of the reflector.

f. Position the antenna scanner assembly so that the hole in its casting engages the pylon support hook (fig. 2-24) located on top of the center opening of the reflector.

g. Align the antenna scanner assembly by means of the two pilot pins in the reflector opening and the corresponding holes in the mounting flange on the pylon.

h. Insert the six captive mounting bolts of the mounting flange into the corresponding holes in the reflector and handtighten.

i. Use a speed wrench to tighten all six captive bolts.

j. Attach the connector of cable W101 to receptacle J301 (fig. 2–25), located on the rear surface of the housing.

NOTE

Rawin Set AN/GMD-1B(*) is supplied with a strap that is anchored to one of the bolts that hold the cover to the elevation unit. To prevent damage to the cable (W101), secure it by means of the strap.

2-14. Installation and Connection of Mixer Assembly

a. Remove the mixer assembly (fig. 2-26) from the accessories case.

b. Orient the mixer assembly with the intermediate frequency (IF) arm upward and insert the threaded coupling end of the mounting extension through the access hole at the back of the reflector (on the opposite side from the antenna scanner assembly power cable).

c. Engage the coupling with the fitting provided in the shield of the motor and generator assembly.

d. Turn and tighten the knurled nut of the mounting extension on the mixer assembly to complete the joint. The mixer assembly should now be in the position shown in figure 2-27.

e. Connect the oscillator cable CG-409E/U (W121) to the lower end of the mixer assembly through the cable-supporting ring to the OSC OUTPUT receptacle on the receiver.

f. Connect the IF cable assembly CG-530B/U (W131) to the upper end of the mixer assembly through the cable-supporting ring to the OSC INPUT receptacle on the receiver.

NOTE

Place the cable assemblies *(e* and *f* above) as shown in figure 2-27. Because of the similarity of these cables, check to see that they are connected properly.

2-15. Installation of Telescope

The telescope mounting bracket (fig. 2-28) is attached to the bracket by three thumbscrews. When the telescope is not in actual use, remove it and store it in the accessories case.

2-16. Installation of Control-Recorder C-577(*)/GMD-1

a. Remove the control-recorder (fig. 3-7) from Case CY-737/GMD-1.

b. Use the carrying handles on the sides of the

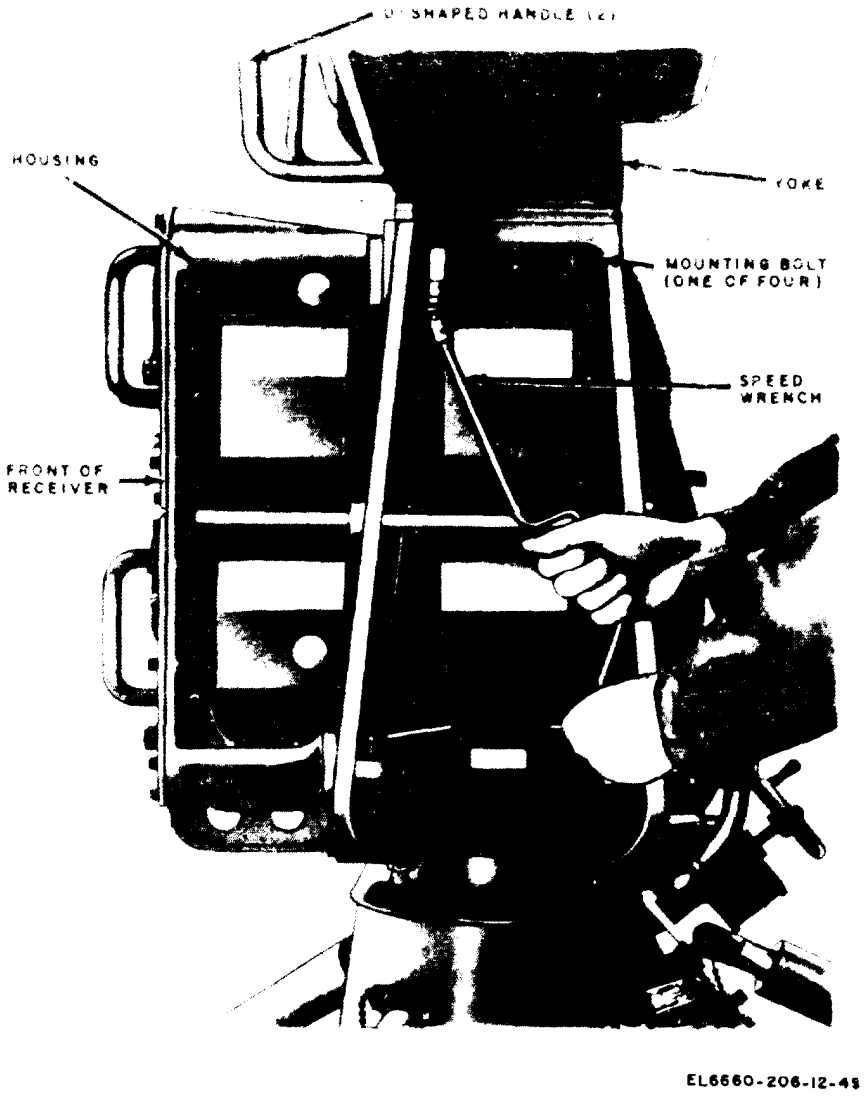


Figure 2-19. Tightening mounting bolts, elevation unit assembly.

control-recorder case to pick up the control-recorder and set it on the designated bench, table, or other suitable base. The control-recorder need not be secured in position.

c. Set the MAIN POWER switch to the OFF position.

2-17. Cabling and Connections

a. General. All the cable assemblies necessary for interconnection of the components are furnished with the equipment. Cable connections necessary at the time of installation are described in *b* and *c* below. The methods for connecting a ground to the rawin set are described in *d* below. Checking cable connections for those cables installed before equipment is shipped and after installation is made is described in paragraph 2-18.

b. Connection of Main Cable CX-1216/U (W901).

CAUTION

Do not connect or disconnect the main cable CX-1216/U, (W901) when MAIN POWER switch S806 is in the ON position. Sensitive microammeters may become damaged.

(1) Unwind as much of the main cable CX-1216/U (W901) from reel RL-137/GMD-1 as necessary to extend from the azimuth unit to the control-recorder.

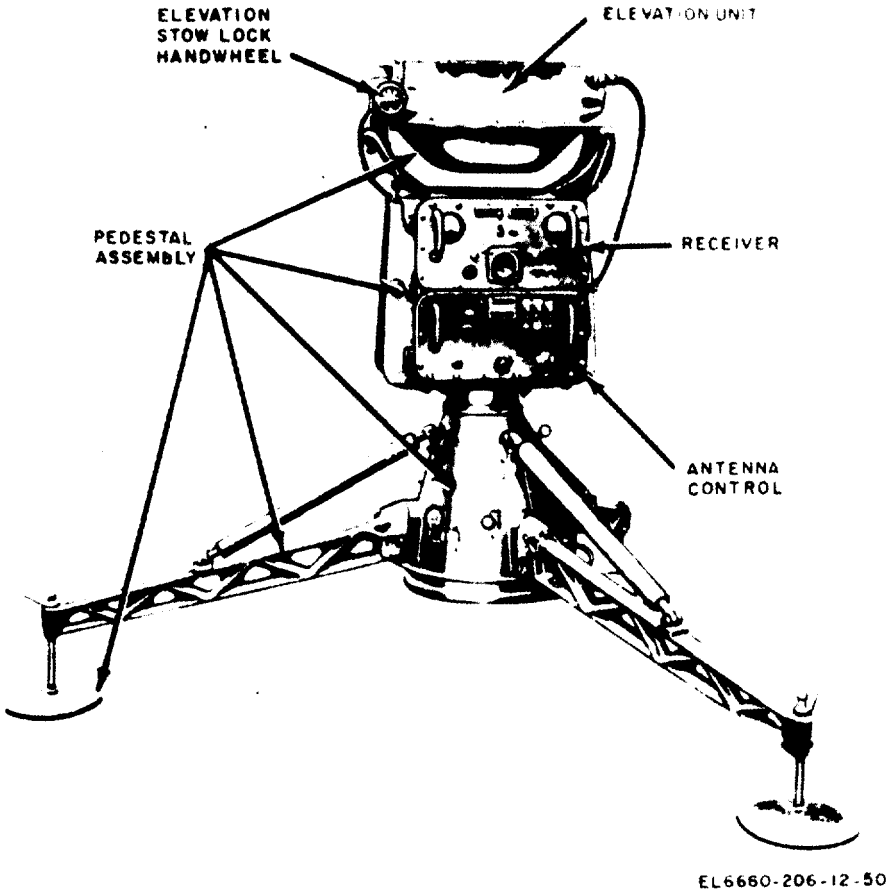


Figure 2-20. Elevation unit assembly installed, front view.

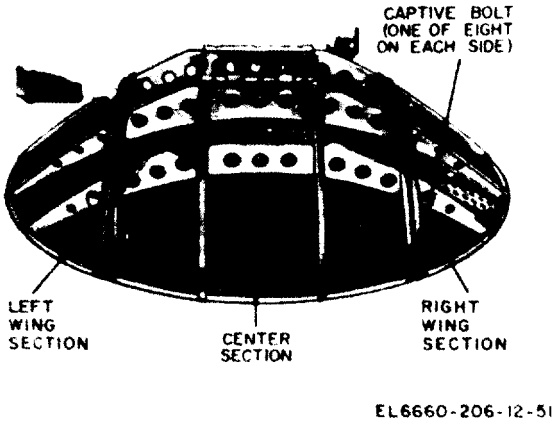


Figure 2-21. Assembly of reflector.

(2) Plug the female connector of the main cable (W901) into receptacle J703 on the azimuth unit (fig. 2-29).

(3) Plug the male connector of the main cable into receptacle J801 on the back of the control-recorder (fig. 2-37).

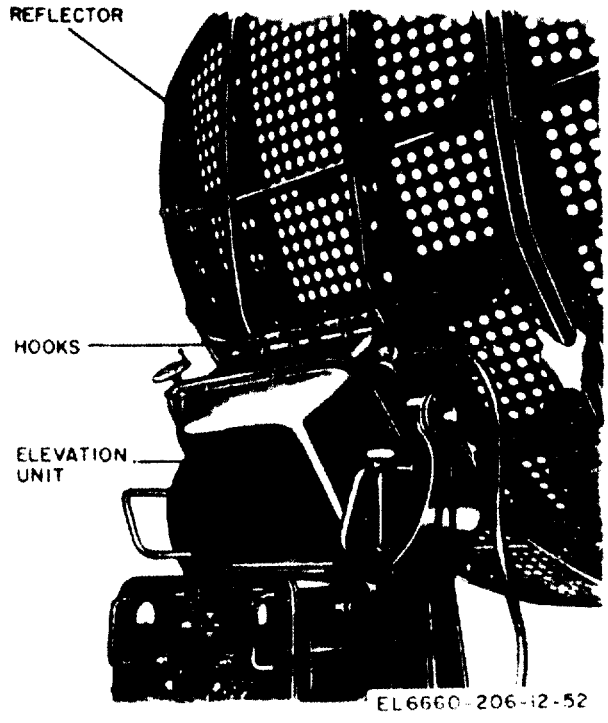


Figure 2-22. Mounting reflector on tilted elevation unit.

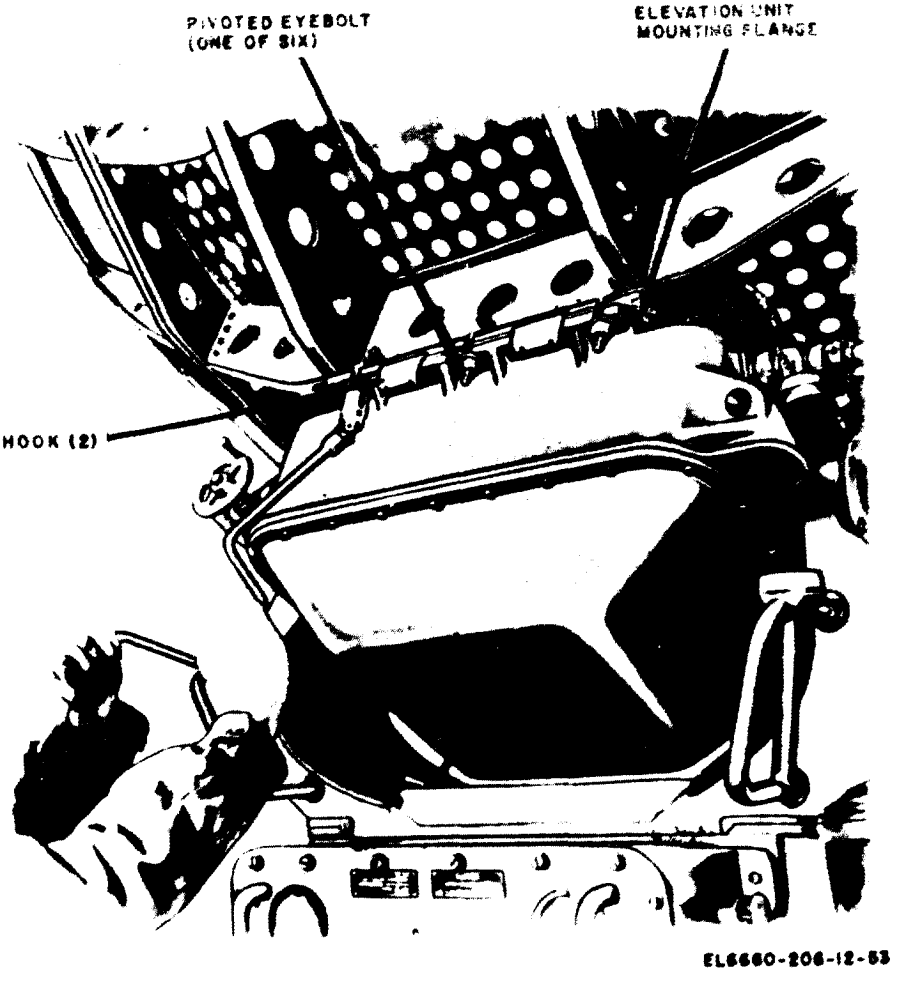


Figure 2-23. Tightening reflector mounting nuts.

CAUTION

Use necessary protective measures for that portion of the main cable extending between the azimuth unit and the control-recorder so that it will not be damaged by vehicular traffic.

c. Cabling Connections.

(1) Remove the elevation unit cable CX-1255/U (W951) from the accessories case.

(2) Plug the female connector of the elevation unit cable (W951) (fig. 2-30) into the receptacle on the side of the elevation unit, and plug the male connector into receptacle J302 on the rear of the housing.

(3) Remove the meteorological cable C-1217/U (W921) from the accessories case.

(4) If Radiosonde Recorder AN/TMQ-5(*) is used, plug the female connector of meteorological cable CX-1217/U directly in to its receptacle (fig. 2-37).

(5) Attach the male connector of the meteorological cable to J802 on the back of the control-recorder.

(6) Make the power connection as described in *(a)* through *(f)* below:

NOTE

Before making the power connection, be certain that the control-recorder POWER switch is set to OFF.

(a) Unwind as much of the power cable CX-2043/U from Cable Reel RL-138/GMD-1 as necessary to extend between the control-recorder and the power source.

(b) Plug the female connector of the power cable into P801 on the control-recorder (fig. 2-37). Note that on some older control-recorders this connector may be labeled J803.

(c) Plug the twist-lock male connector on the other end of power cable CX-2043/U into the 117-volt alternating current (ac) power source re-

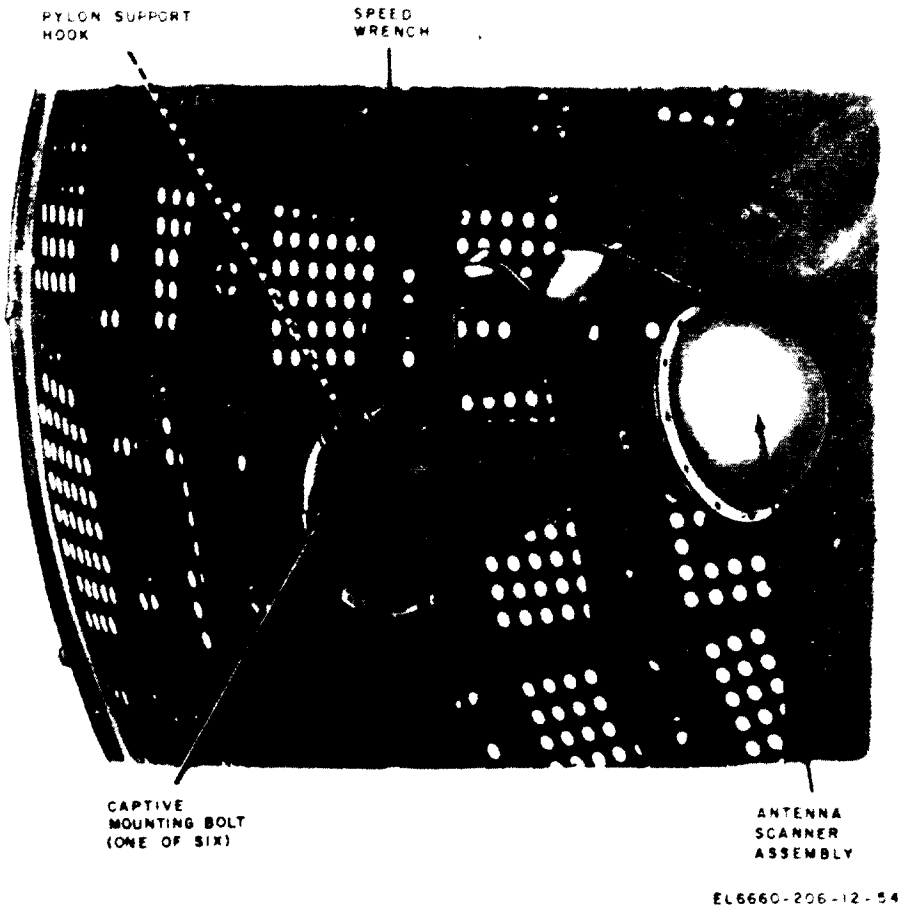


Figure 2-24. Installation of antenna scanner assembly.

ceptacle. If this power source receptacle is not the twist-lock type, follow the instructions given in *(d)* through *(f)* below.

(d) Remove the power cable adapter (5, fig. 1-25) from the accessories case.

(e) Plug the twist-lock male connector of power cable CX-2043/U into the twist-lock female connector of the power cable adapter.

(f) Plug the male connector of the power cable adapter in the regular receptacle of the power source.

d. Ground Connections. Under normal conditions, make ground connection as described in (1) below. Under abnormal conditions, where a more elaborate ground is required, follow instructions in (2) below.

(1) *Normal grounding connections.*

(a) Remove the ground cable and rod assembly from the accessories case.

(b) Temporarily remove the screw and clamp from the ground rod (fig. 2-31).

(c) Select a ground location not more than 20 feet from the azimuth unit and drive the ground rod approximately 2½ feet into the ground.

(d) Replace the screw and clamp and insert the bare end of the ground cable (W961) under the screw and clamp; tighten securely.

(e) Run the ground cable to the azimuth unit and secure the lug on the end of the ground cable by using the ground connection screw (fig. 2-29) .

(2) *Grounding connections for high resistance ground areas.*

(a) Place two ground rods about 20 feet apart and drive them approximately 4 feet into the ground.

(b) Measure the resistance between the two rods with the multimeter.

(c) If the resistance is greater than 1,000 ohms, drive additional pairs of ground rods parallel to the first pair of rods at approximately 5-foot intervals.

(d) Connect each row of rods electrically

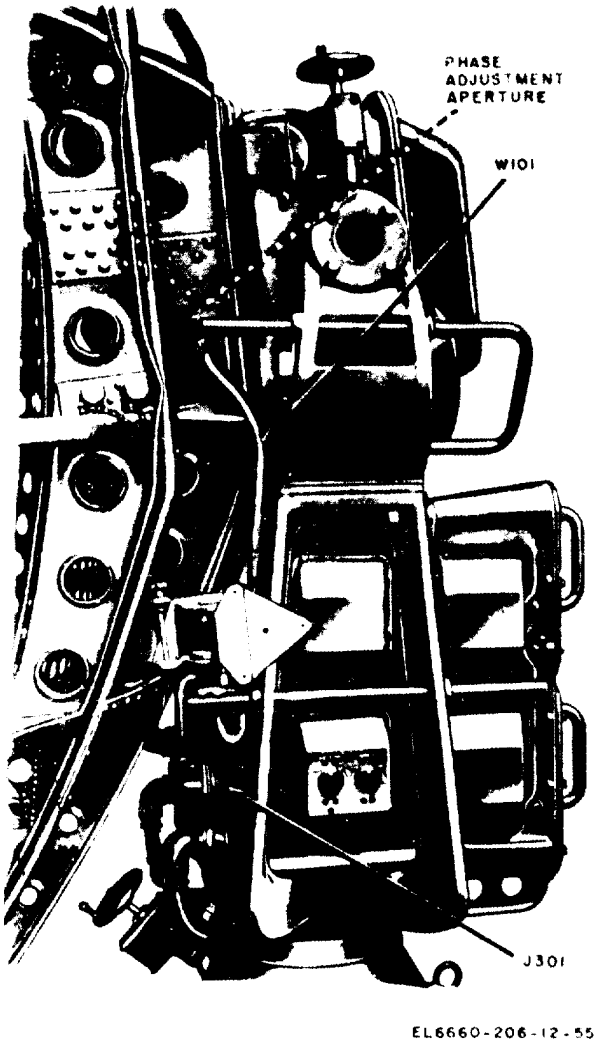


Figure 2-25. Connection to antenna scanner assembly.

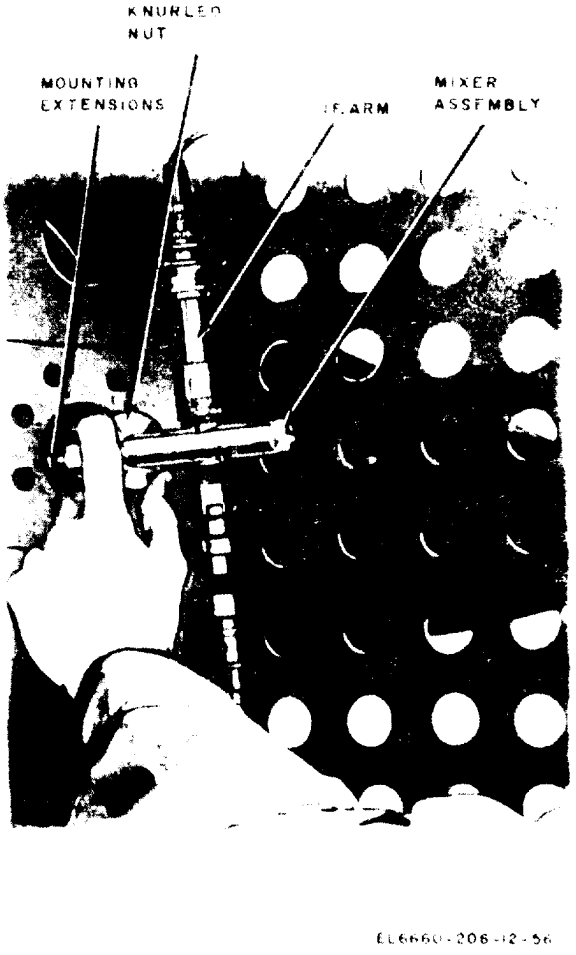


Figure 2-26. Installation of mixer assembly.

and measure the resistance between the rows with the multimeter.

(e) Drive additional rods until the resistance between the two rows of rods is less than 1,000 ohms.

(f) Connect all the rods electrically and use the combination of rods at the ground.

2-18. Checking the Installation

a. Tubes, Crystals, and Fuses. Rawin Set AN/GMD-1(*) is shipped from the factory with tubes, crystals, and fuses installed. It will be necessary to see that tubes are properly seated in their sockets and that the proper value fuses have been inserted in the fuse holders. Tables 2-4 and 2-5 list tube type, reference symbol, and quantities. Table 2-6 lists fuses, fuse ratings, and fuse locations by figure reference. Refer to paragraph 5-19 for a list of preferred type tubes that are used in place on nonpreferred types listed in tables 2-4 and 2-5.

b. Cable Checks.

(1) Cables W301A, W301B, W301C, and W301D are installed when the rawin set is packed at the factory. No additional connections are required for these cables unless the receiver or antenna control is replaced. Check the connections between the various units of Rawin Set AN/GMD-1(*) with the information given in table 2-7 and in figure 2-37. Table 2-7 lists the order of their installation.

CAUTION

Be sure to check the connection carefully against the interconnection diagram to prevent damage to the equipment when the circuits are energized.

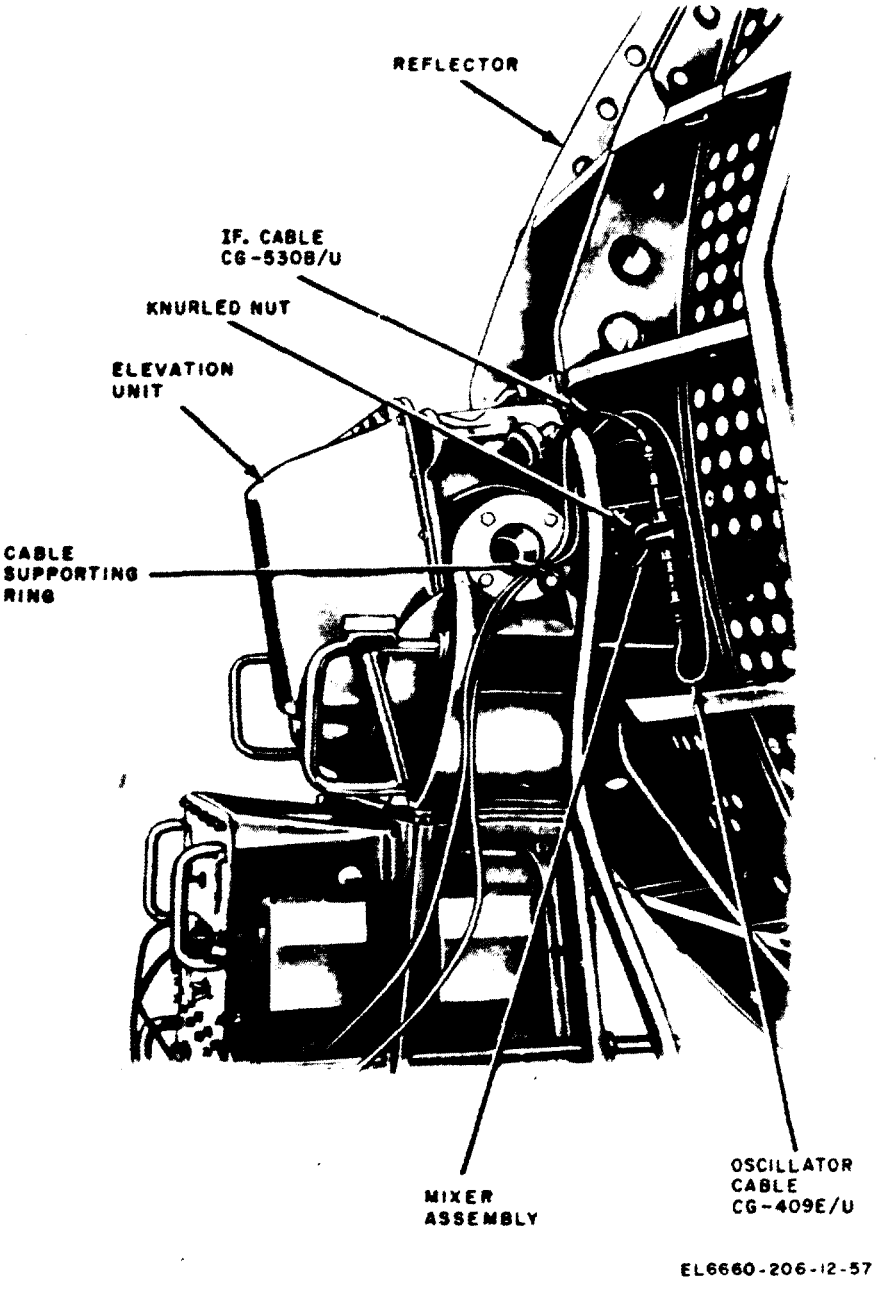


Figure 2-27. Mixer installed with cable connections.

Table 2-4. Receiver Tube Complement
(fig. 2-32 and 2-33)

Tube type	Number of tubes	Reference symbol
5654/6AK5W	6	V401, V402, V403, V405, and V1016
5726/6AL5W	2	V409 and V1010
6005/6AQ5W	3	V109, V1013, and V1014
6AU6WB	2	V407 and V408
6BN6	1	V406
5675	1	V501
12AT7WA	1	V1001
6189/12AU7WA	4	V1003, V1004, V1005, and V1008
12AX7WA	5	V1002, V1006, V1007, V1011, and V1012
6AS7G	1	V1015
OB2WA	1	V1017
6X4WA	1	V1018
5U4GB	1	V1019

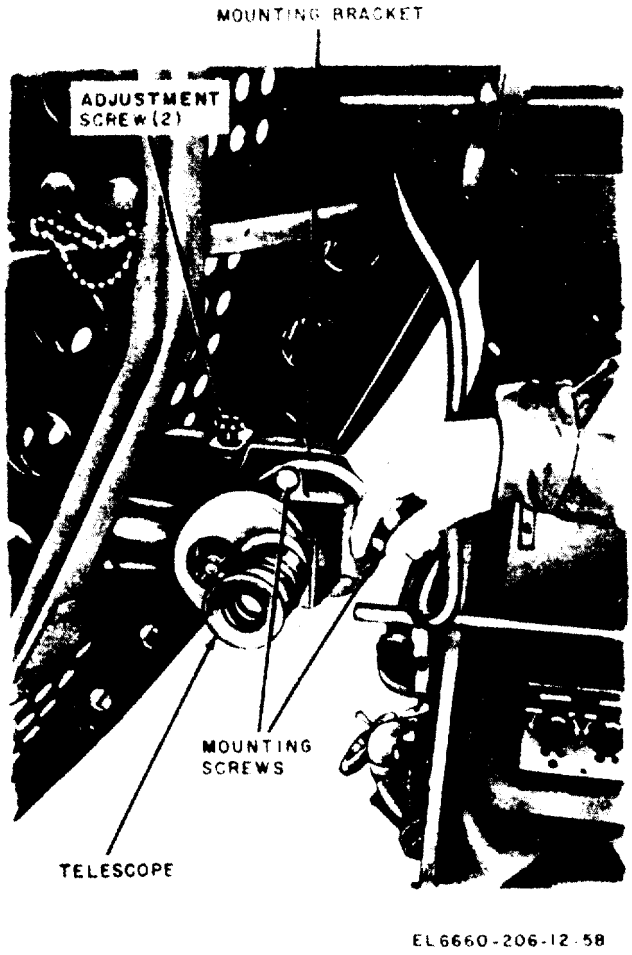


Figure 2-28. Telescope, mounted.

(2) Check to see that the ground connections for the rawin set have been properly made (para 2-17d) and are securely fastened at the ground rod (fig. 2-31) and at the azimuth unit (fig. 2-29). Use the multimeter to check ground resistance.

c. Control Settings. Check all exterior controls on the main assembly and on the control-recorder for physical damage and for freedom of movement. Preset the controls as outlined in chapter 3, except that the POWER switches on the receiver and antenna control should be in the OFF position.

CAUTION

Do not connect or disconnect the main cable (W901) or the receiver cable (W301A) when the POWER switch on the control-recorder is in the ON position, because sensitive microammeters may become damaged.

d. Control-Recorder Paper. To assure that the paper feed and print out are functioning properly, proceed as follows:

(1) Connect 115 Vac to P801.

(2) Position the PRINTINGS PER MINUTE switch to either the 1, 2, or 10 position.

(3) Position RECORDS CONTROL switch to FLIGHT.

(4) Rotate the RESET CONTROL knob until the TIME frame reads 000.

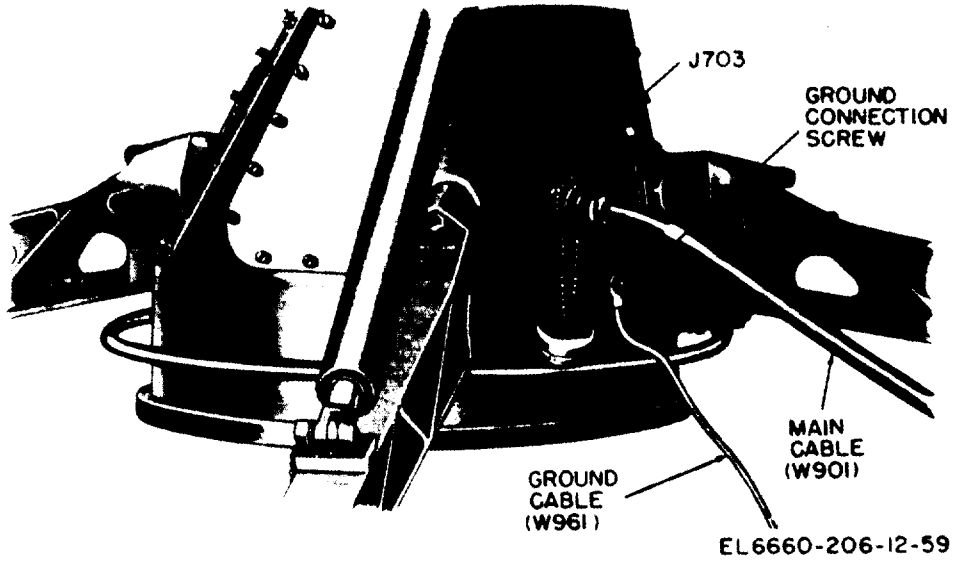


Figure 2-29. Connections to azimuth unit.

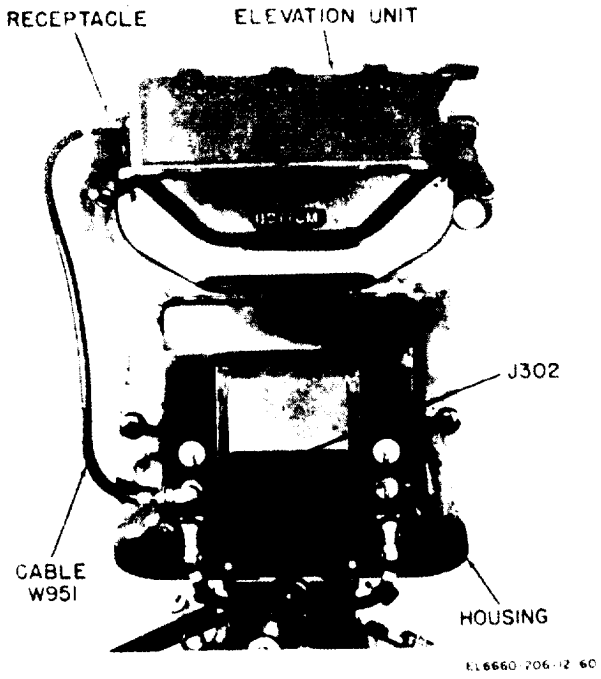


Figure 2-30. Cable connections, housing to elevation unit.

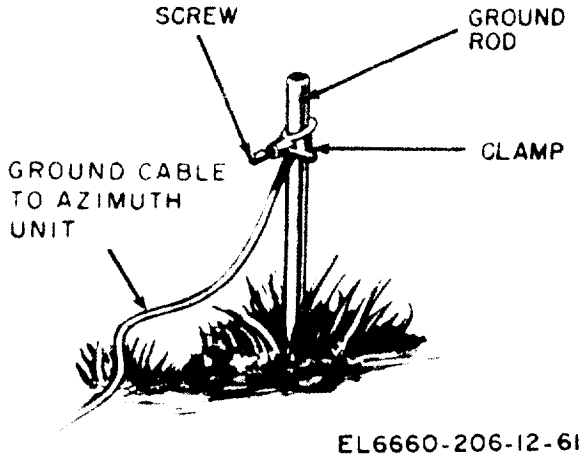


Figure 2-31. Ground connections.

(5) Place the MAIN POWER switch to ON. Observe, for at least 1 minute, that the print out coincides with the readings on the TIME, ELEVATION, and AZIMUTH dials.

Table 2-5. Antenna Control Tube Complement (fig. 2-34)

Tube type	Number of tubes	Reference symbol
5726/6AL5W	4	V601, V602, V607, and V608
6X4WA	1	V611
6189/12AU7WA	2	V609 and V613
12AX7WA	2	V610 and V612
1142256 (SM-C-584950)	4	CR603, CR604, CR605, and CR606 (SCR units).

Table 2-6. Fuse Rating and Location

Ref. symbol	Fuse rating		Location		
	Volts	Amp	Component	Circuit	Fig. No.
F601	250	8	Antenna control	Powerline	2-34
F602	250	8	Antenna control	Powerline	2-34
F603	250	5	Antenna control	Auxiliary power receptacle J602	2-34
F701	250	5	Azimuth unit	Circuit protection	2-35, 2-36
F702	250	5	Azimuth unit	Circuit protection	2-35, 2-36
F801	250	20	Control-recorder	Main fuse, powerline	4-1
F802	250	20	Control-recorder	Main fuse, powerline	4-1
F803	250	10	Control-recorder	Transformer power supply	3-7
F804	250	10	Control-recorder	Transformer power supply	3-7
F1001	250	3	Receiver	Powerline	2-33
F1002	250	3	Receiver	Powerline	2-33

Table 2-7. Rawin Set AN/GMD-1(*), Intercabling

Cable	Nomenclature	Length (ft)	Connects		Remarks
			From—	To—	
W701	----------		Azimuth unit -----	Housing ----------	Permanently connected to azimuth unit.
W702	----------		Azimuth unit -----	Housing ----------	Permanently connected to azimuth unit.
W101	----------	4	Antenna scanner assembly.	Housing ----------	Permanently connected to antenna scanner assembly.
W131	Cable Assembly, Radio Frequency CG-530/U.	6	Mixer assembly ---	Receiver (IF INPUT).	Connected to mixer assembly and in CY-1157/GMD-1A.
W121	Cable Assembly, Radio Frequency CG-409/U.	6½	Mixer assembly ----	Receiver (OSC OUTPUT).	Connected to mixer assembly and shipped in CY-1157/GMD-1A.
W901	Cable Assembly, Special Purpose Electrical CX-1216/U.	205	Azimuth unit -----	Control-recorder---	Shipped on Cable Reel RL-137/ GMD-1.
W961	----------	25	Azimuth unit -----	Ground rod -------	Shipped in CY-1157/GMD-1A.
W951	Cable Assembly, Special Purpose CX-1285/U.	4	Housing ----------	Elevation unit ----	Shipped in CY-1157/GMD-1A.
W921	Special Purpose, Cable Assembly CX-1217/U.	26	Control-recorder---	Meteorological recorder.	Shipped in CY-1157/GMD-1A.
W911	Cable Assembly, Power, Electrical CX-2043/U.	150	Control-recorder---	Power source -----	Shipped on Cable Reel RL-138/ GMD-1.
W301A	----------		Housing ----------	Receiver ---------	Permanently connected to housing. Normally connected to receiver.
W301B	----------	----	Housing ----------	Antenna control --	Permanently connected to housing. Normally connected to antenna control.
W301C	----------	------	Housing ----------	Antenna control --	Permanently connected to housing. Normally connected to antenna control.
W301D	----------		Housing-- --------	Antenna control---	Permanently connected to housing. Normally connected to antenna control.

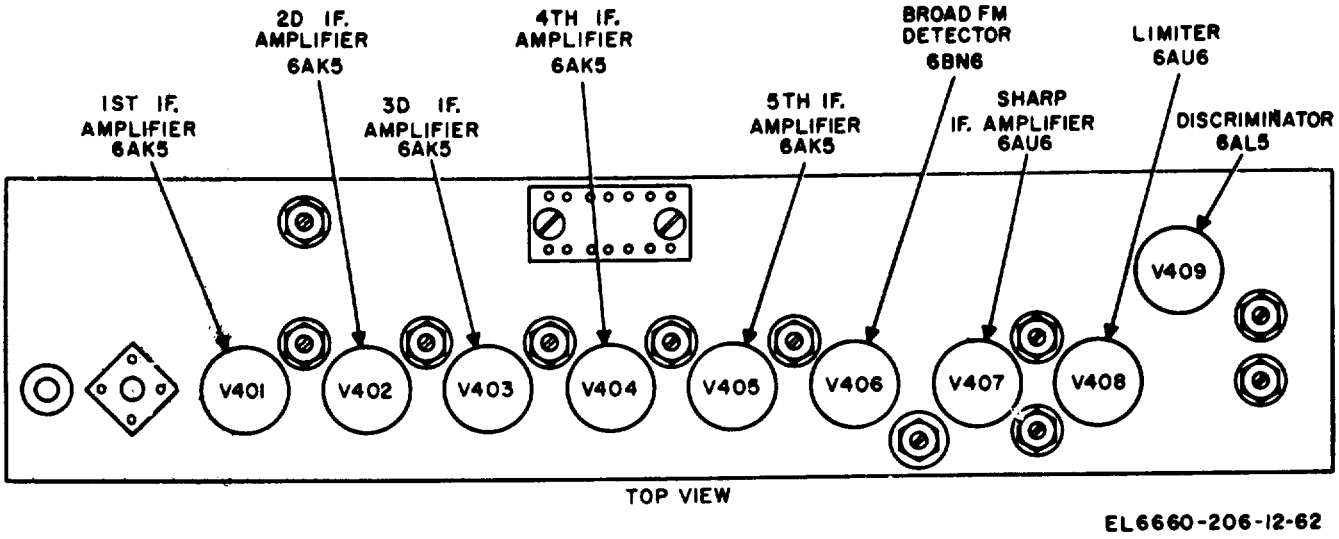


Figure 2-32. IF amplifier (receiver), tube location.

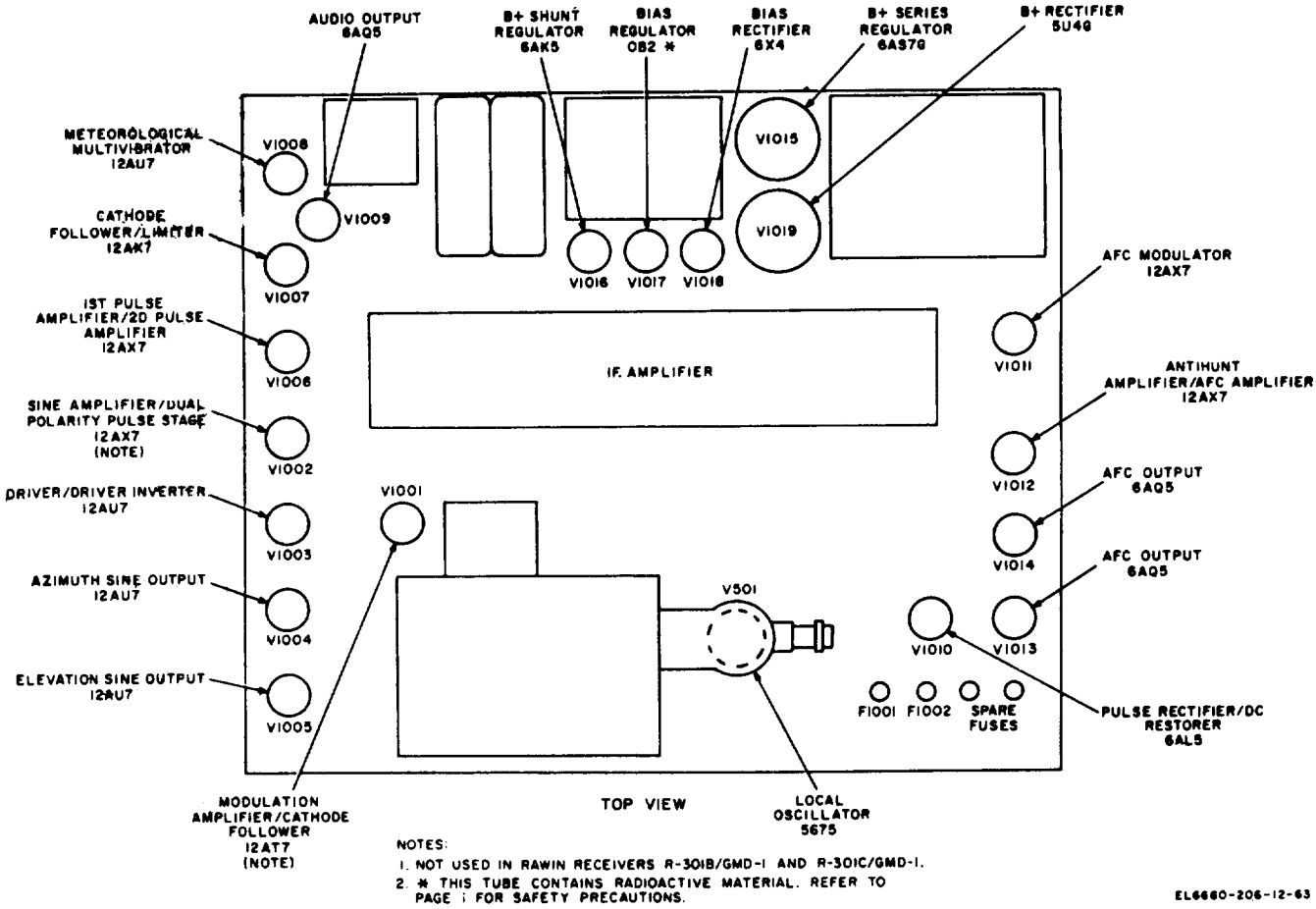


Figure 2-33. Receiver (less IF amplifier), tube and fuse location.

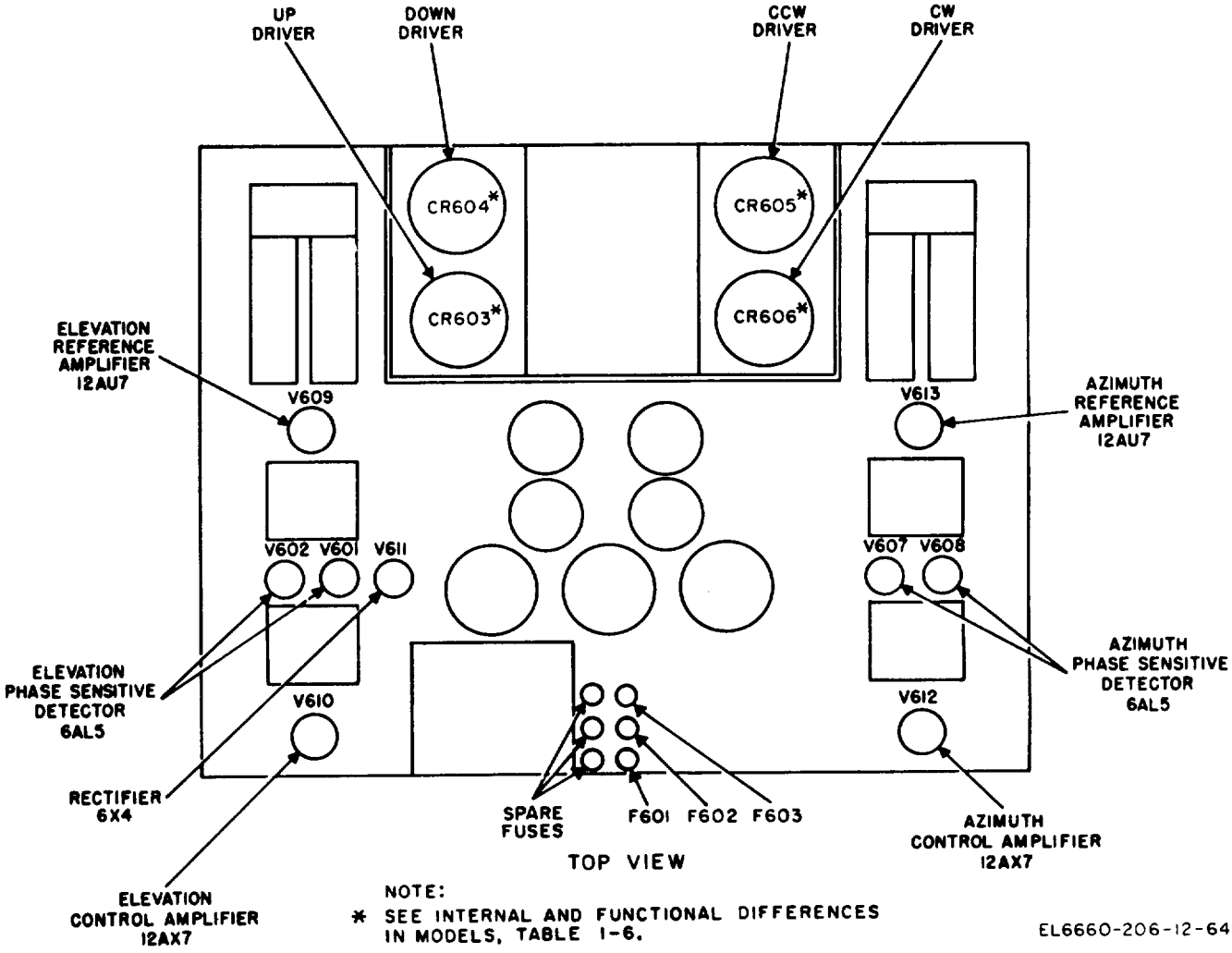


Figure 2-34. Antenna control, SCR, tube and fuse location.

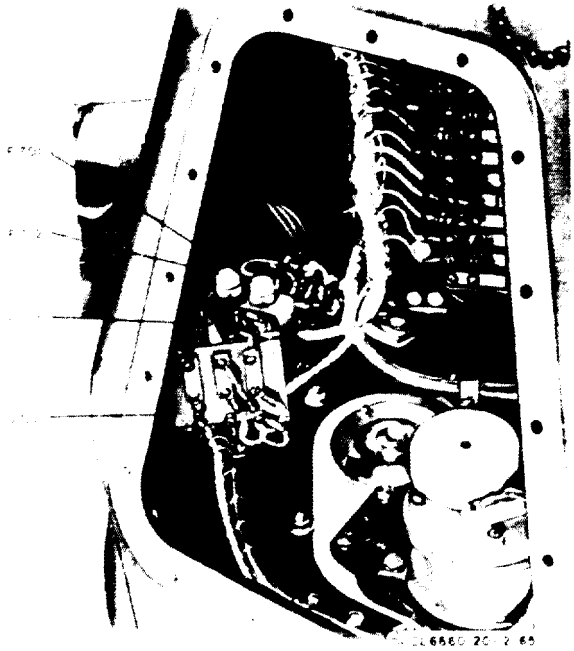


Figure 2-35. Pedestal AB-159D/GMD-1, fuse location.

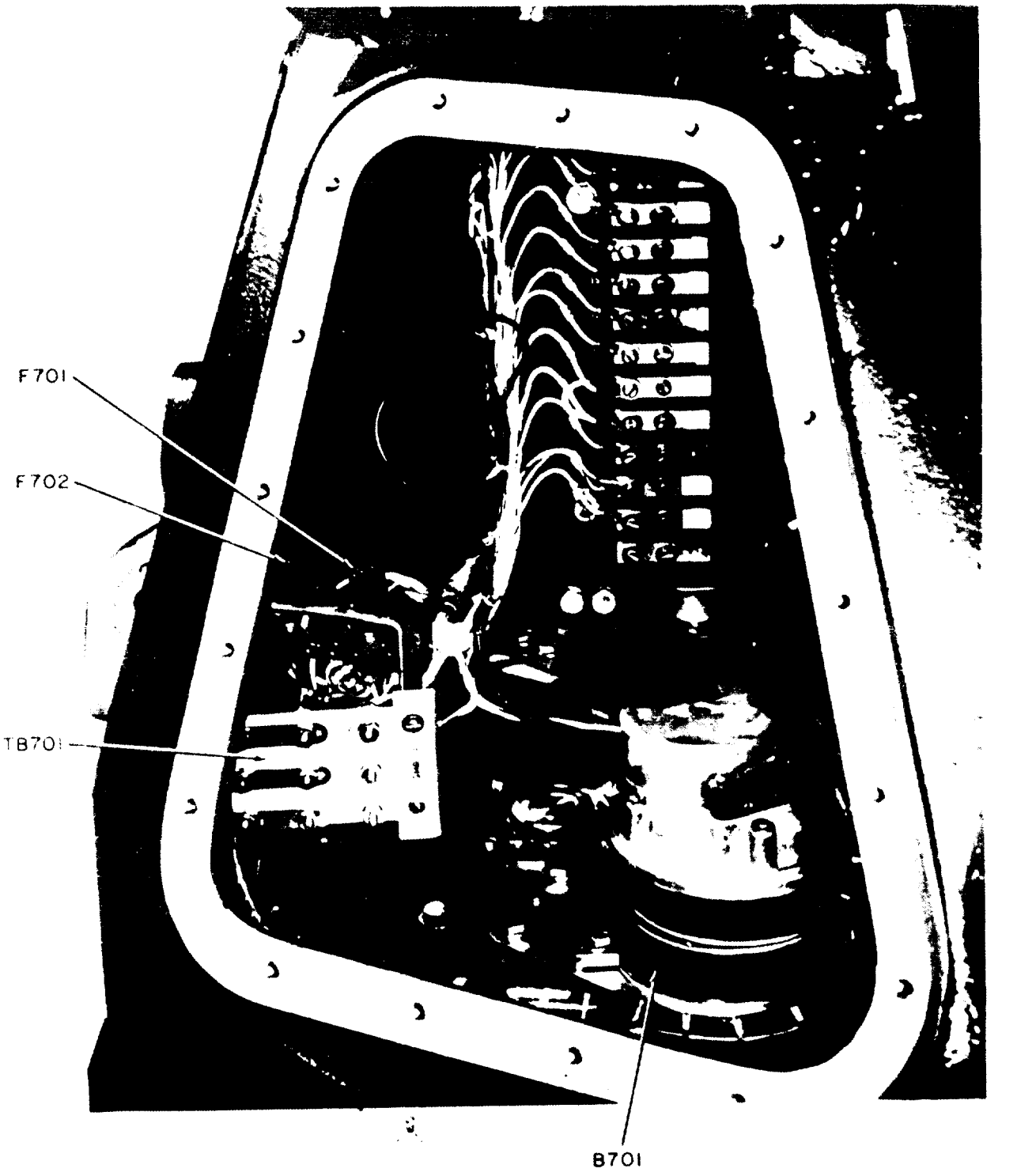


Figure 2-36. Pedestal AB-159E/GMD-1, fuse location.

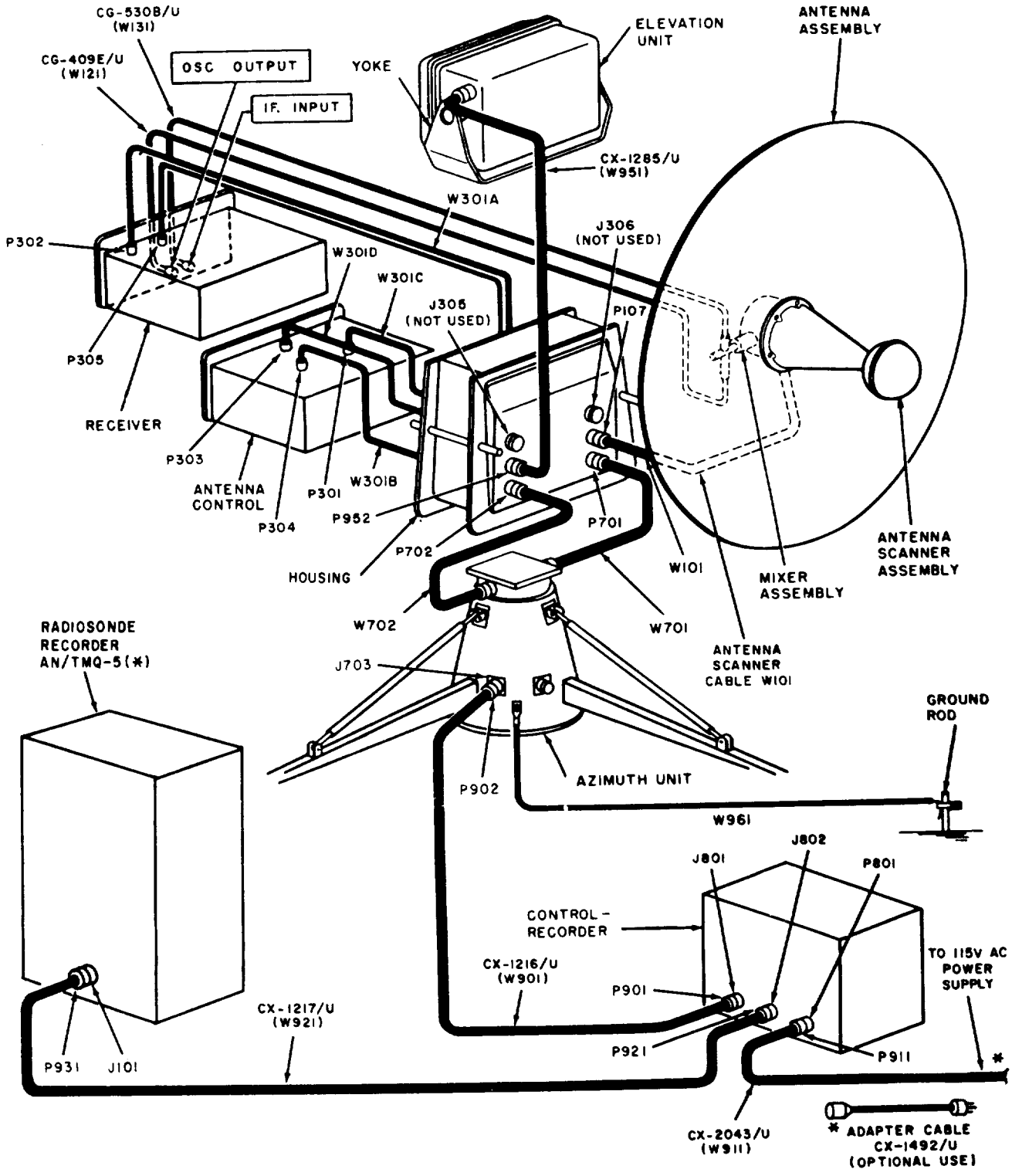


Figure 2-37. Rawin Set AN/GMD-1(*), cabling diagram.

Section III. INITIAL ALIGNMENT AND ADJUSTMENT

2-19. General

a. This section covers the initial installation and operational checks, and the alignment and adjustment procedures that must be performed on Rawin Set AN/GMD-1(*) after installation and prior to initial operation of the equipment. Control settings and adjustments that are made during operation and are also required at initial installation are given in this section and clearly 3 and are referenced in this section.

b. Because of the physical location of the various units of the rawinsonde system in which the rawin set is used, some of the alignment and adjustment procedures require at least two men qualified in the required procedures. It may be necessary to establish telephone communication between components during alignment procedures.

c. Before proceeding, carefully read all the alignment procedures outlined in this section and define clearly the responsibilities of each man. Haphazard sequence in performing the alignment and adjustment procedures may result in serious damage to the set; therefore, perform the procedures in the order in which they are presented. Be sure to make all the initial checks before applying power to the set.

d. Because the rawin set is part of a rawinsonde system, it is necessary to use other equipment in the system when performing installation alignment and adjustment procedures. Reference will be made to these equipments and to the technical manual needed to their operation.

2-20. Standby Power Checks

The components of Rawin Set AN/GMD-1(*) are individually and collectively checked for proper operation before being crated and shipped from the factory. However, because of the possibility of internal damage during transit and installation, carefully turn on the equipment in stages, and correct any faults before energizing additional circuits. The standby power checks for the rawin set are described in procedures *a* through *f* below. Correct any malfunctions before energizing additional circuits. Corrective measures must be performed by qualified personnel.

a. Check to see that the rawin set controls are set as indicated in paragraph 2-18c.

b. Make necessary arrangements for turning on the ac power source either by turning the commercial power switch or starting the engine of the power generator.

c. Use the multimeter to measure the ac power source (at the source); it should be 115 ± 10 volts; make necessary corrections.

NOTE

If commercial power is being used, report incorrect voltage to higher authority. If an engine generator is used, make necessary adjustments as outlined in the applicable technical manual.

d. Set control-recorder MAIN POWER switch to ON; normal indications are that the angle indicator and the POWER INTERRUPTED indicator lamp lights.

e. Set the receiver POWER switch to ON; normal indication is that the dial lamp lights.

f. Set the antenna control POWER switch to ON; normal indication is that the POWER INDICATOR lamp lights.

2-21. Alignment and Adjustment Procedures

Paragraphs 2-22 through 2-28 describe alignment and adjustment procedures that must be performed after installation and prior to routine operation of the rawin set. These procedures involve leveling and orientation of the rawin set. Paragraphs 2-29 through 2-33 describe the alignment and adjustment procedures necessary if the installation performance tests (para 2-34) that involve automatic tracking prove unsatisfactory.

2-22. Leveling Rawin Set

a. General. The main assembly of Rawin Set AN/GMD-1(*) must be leveled as accurately as possible to prevent errors in elevation angle readings as the antenna rotates in azimuth. To compensate for possible sinking of the jack plates, the main assembly should be leveled when installed with all units mounted. Leveling should be checked before each balloon flight, after each flight, and after a rain. Two spirit levels, placed at right angles to each other, are mounted on the right side of the housing (figs. 2-15 and 2-38). (In Rawin Set AN/GMD-1B, a third spirit level is mounted on the base of the yoke. It has been provided for future use with ranging equipment.) Each level is equipped with a tubular cover that can be rotated to cover the glass portion of the level when the level is not in use. For maximum

stability, keep as much of the jackscrews above the legs as is practicable, thus keeping the set close to the ground.

b. Leveling Instructions.

NOTE

The method of leveling ((1) through (12) below) is not the standard method for leveling a tripod mount. However, it is a method that allows for the possibility that the levels may not be perfectly parallel to the turntable. This method also can be used if one of the levels has been damaged or destroyed.

(1) Raise the antenna to the 90° (vertical) position.

(2) Rotate the turntable until spirit level No. 1 is parallel with leg A (B, fig. 2-38).

NOTE

If spirit level No. 1 has been damaged or removed, level No. 2 may be substituted.

(3) Raise or lower leg A (A, fig. 2-38) to center the bubble in the level.

(4) Rotate the turntable 180°.

(5) If the bubble in the level is not centered, raise or lower leg A until the bubble is halfway to the center of the level.

(6) Rotate the turntable 180°. If the bubble does not have the same position after adjustment, raise or lower leg A until it does.

(7) Repeat the procedure given in (6) above until the bubble has the same location in both positions of the turntable.

(8) Rotate the turntable until spirit level No. 1 is parallel with leg B.

(9) Follow the procedures given in (3) through (7) above to level leg B. Rotate the turntable 180° to make sure that the bubble keeps the same position.

(10) Repeat the procedures given in (8) and (9) above for leg C.

(11) Slowly rotate the turntable several times. Make certain that the bubble keeps the same position throughout the rotation.

(12) Tighten all locking plates.

2-23. Orientation of Rawin Set

a. General. The azimuth and elevation angles of the balloon-borne radiosonde are indicated and recorded by Rawin Set AN/GMD-1(*). The accuracy of these readings depends to a great extent on the accuracy of the orientation of the rawin set. Generally, the rawin set is installed either on a tower platform 20 to 30 feet above the ground, in a building, or on the ground. The orientation procedures described in the following paragraphs are applicable to all three types of installation. The methods of orienting the rawin set will not differ when a shelter is used. Although the shelter introduces an error in orientation as well as absolute and incremental azimuth and elevation errors, these errors are such that they may be ignored when considered on an overall system basis. When the shelter is used there are three possible conditions for preparation of the installation site. The first and most usual is when the rawin set already is installed and the shelter is to be installed, the second is when it is necessary to erect the shelter before the rawin set is received, and the third, when both the shelter and the rawin set are installed at the same time.

b. Methods of Orientation. The differences that exist between various installations make it difficult to specify any one method of orienting the rawin set. Therefore, four methods of orientation are given in the following paragraphs for the more usual conditions encountered in the field. Because these methods do not cover areas where un-

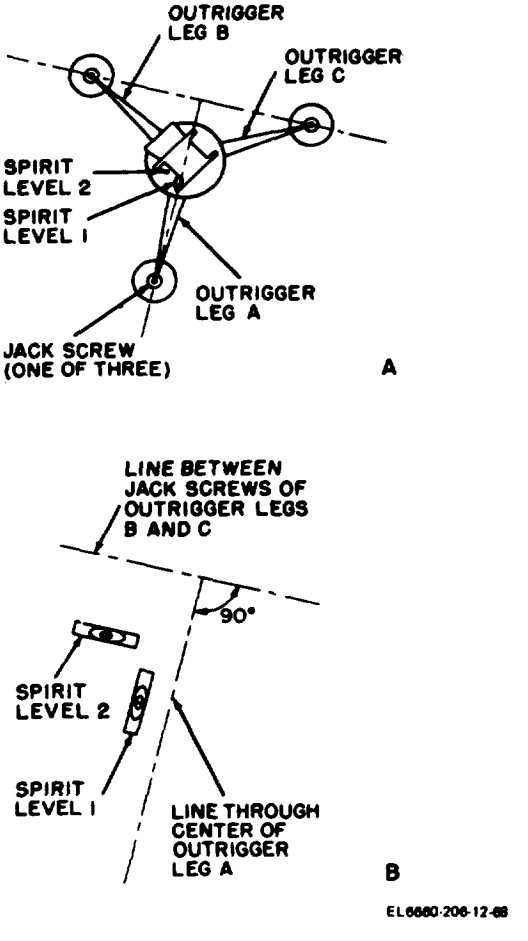


Figure 2-38. Leveling rawin set.

usual conditions exist, installation personnel must determine the most satisfactory approach with the suggested methods as a guide. The instructions describe the orientation of the rawin set installed on the ground, a tower, or a building (with or without a shelter). Methods 1 and 2 employ a nearby reference point (para 2-24c and *d*). Method 1 uses a stationary nonradiating reference object and is described in paragraph 2-25. Method 2 uses a fixed radiating target (para 2-24d) and is described in paragraph 2-26. Methods 3 and 4 both use a distant reference point. Method 3 uses a target that is visible from within the shelter where the rawin set is or will be located, and is described in paragraph 2-27. Method 4 uses a target that is not visible from within the shelter where the rawin set is to be installed, and is described in paragraph 2-28. A qualified surveying team with a theodolite or surveyor's transit, plumbline, and spirit level is necessary to orient the equipment. Orientation definitions are described in paragraph 2-24.

2-24. Orientation Definitions

The terms used in orientation procedures are defined in *a* through *j* below so that the procedures can be followed easily.

a. Local Angle Indicators. The local angle indicators are the azimuth and elevation angle indicators located in the azimuth and elevation units. They are connected mechanically to the movement of the reflector.

b. Remote Angle Indicators. The remote angle indicators are the AZIMUTH and ELEVATION angle indicators located in the control-recorder. They are connected electrically through a servosystem to the movement of the reflector.

c. Visible Target. The visible target is a fixed point of known bearing from the rawin set. It should be easily visible through the telescope of the rawin set. Examples of visible targets are mountain peaks, permanent tall structures, and stars commonly used for celestial navigation. The visible target should be at least ½ mile from the rawin set to reduce the parallax error to an allowable amount. Wherever possible, the elevation of the target should be above the level of the ground.

d. Fixed Radiating Target. The fixed radiating target is a rigidly mounted, vertically polarized transmitter that operates at 1,680 MHz. It should be located at least 100 yards from the rawin set and 5° above the horizontal level of the raw in set. The terrain between the target and the rawin set should be reasonably level and clear. In addition,

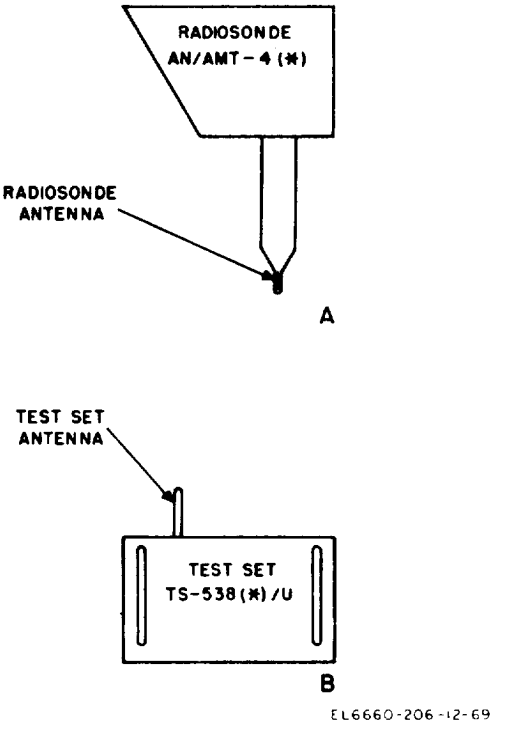


Figure 2-39. Orientation of transmitting targets.

there should be no large objects between the signal source and the set in the region of 45° either side of the reflector electrical axis. The true bearings of fixed radiating targets for orientation must be measured or calculated. Therefore, it is desirable that measurements be made before the rawin set and shelter are installed on the selected site. Test Set TS-538(*)/U with the antenna installed (TM 11-6625-213-12) or Radiosonde AN/AMT-4(*) (TM 11-6660-228-10) can be used as a transmitter. When either of these equipments is used as a transmitter, the antenna (fig. 2-39) of the equipment should be used as the target.

e. Measurements. Since the point on the ground that is the exact axis of horizontal rotation of the rawin set lies under the rawin set, it is usually more accurate and convenient to measure target bearings before the rawin set is assembled on the site.

f. Telescope Orientation. Orientation of the telescope means obtaining an agreement between the direction of the telescope and the electrical axis of the reflector of the rawin set. This is accomplished by sighting through the telescope at a balloon-borne radiosonde during a flight and adjusting the telescope so that the balloon is seen at the center of the telescope reticle. Because the balloon and transmitter are separated by the length of the

balloon train (cord between balloon and radiosonde, usually 100 feet), there will be a considerable elevation angle error if the balloon is used as the sighted object, unless the distance between the balloon train and the rawin set is sufficiently great. In order that the orientation error be held to about 0.05°, it is necessary that a 100-foot balloon train be approximately 100,000 feet away at the lower elevation angles. Table 2-8 establishes minimum conditions for checking telescope orientation. Orientation of the telescope at angles of more than 60° is not recommended. In case of poor visibility, the length of the balloon cord may be shortened to 50 feet and the altitudes in the 50-foot column may be used.

g. Rawin Set Orientation. Orientation of the rawin sets is the obtaining of agreement between the electrically determined angles of elevation and azimuth (electrical bearings) of a remote signal source, or a fixed point, with the actual surveyed direction (true bearings) of that source or point. This is accomplished by the sighting of the rawin set telescope on either a surveyed remote signal source or a surveyed fixed point, and by the adjustment of the local and remote angle indicators to agree with the surveyed bearings.

h. Preflight Orientation. A check is made before each radiosonde flight to insure proper operation of the rawin set.

Table 2-8. Telescope Orientation

Elevation angle of rawin set (degrees)	Minimum altitude of radiosonde (ft)	
	50-ft balloon train	100-ft balloon train
6 to 15	10,000	20,000
15 to 30	20,000	40,000
30 to 60	30,000	60,000

i. Periodic Orientation. This check is made periodically (usually once a month) to insure continued accuracy of orientation. Monthly orientation is not sufficient when the rawin set is moved, disassembled, or replaced, or when the level is shifted by soft ground or a settling building.

j. Magnetic Declinations.

(1) The weather data obtained by means of a rawinsonde system usually is coordinated with data obtained simultaneously with similar rawinsonde systems located at other points. Since the location of the magnetic pole with respect to true north is changing continuously, it is imperative that the various rawin sets be oriented in azimuth with respect to true north. The angular difference between true north and magnetic north for a given location and date is called the magnetic declination or variation. The declination is east when the magnetic north is east of true north; the declination is west when the magnetic north is west of true north.

(2) *For example,* the declination at a specific location site is 9.62° west. An azimuth angle of 124.72° (obtained with a magnetic compass) would be 124.72° less 9.62°, or 115.10° (with reference to true north).

2-25. Orientation Method 1

NOTE

This method has the advantage of eliminating the use of the telescope after initial installation. Also, if the equipment is removed from the shelter and returned at a later date, or if it is replaced with another equipment, the orientation procedure will be valid provided the set is placed in the same center position that the first set occupied, and provided the fixed radiating target is erected in exactly the same position.

a. Select a stationary reference object (para 2-24c) such as a pole, a large tree, a building, or a tower as far as possible from the site chosen for the main assembly of the rawin set. The exact latitude and longitude of the rawin set site do not have to be determined unless the required weather information is to be correlated with other data taken over a large area.

b. Set up a surveyor's transit or theodolite over the site chosen for the main assembly of the rawin set.

c. Level the transit and mark the point where the plumb bob touches the ground.

d. Find the angle of elevation of a point of the reference object with respect to the horizontal plane. Record this angle.

e. Use the transit to find the azimuth angle of the reference object with respect to magnetic north.

f. Apply the magnetic declination (para 2-24j) so that the azimuth angle is referenced to true north. Record this angle.

g. Install the main assembly as described in paragraphs 2-6 through 2-18.

h. Remove the telescope from the accessories case and install it on the telescope mounting bracket; use the three thumbscrews.

i. Orient the telescope (para 2-24f).

j. Set the local indicators to agree with the surveyed bearings.

k. Install a permanently fixed radiating target (para 2-24d).

l. Erect the shelter as directed in the applicable technical manuals.

m. Permit the rawin set to track the fixed radiating target automatically.

n. Record the bearings on the local angle indicators (para 2-24a).

o. For preflight orientation, set the remote angle indicators to agree with the local angle indicators.

p. For periodic orientation, permit the rawin set to track automatically the fixed radiating target and, if necessary, set the local angle indicators to agree with the bearings recorded in *n* above. The radiating target must be erected in exactly the same place each time a check is made.

2-26. Orientation Method 2

a. Set up a fixed radiating target (para 2-24d), preferably Radiosonde AN/AMT-4(*).

b. Obtain the bearings of the fixed radiating target from a convenient location point for the rawin set.

c. Erect the shelter as directed in the applicable technical manual.

d. Level the rawin set.

e. Use the reference point *(b* above) to compute the angles in azimuth and elevation of the target from the rawin set according to standard surveying methods.

f. Permit the rawin set to track the radiating target.

g. Set the local angle indicators to agree with the bearings of the radiating target.

h. For preflight orientation, set the remote angle indicators to agree with the local angle indicators.

i. For periodic orientation, repeat the procedures given in *a, f,* and *g* above.

2-27. Orientation Method 3

NOTE

This method has the disadvantage of the set orientation becoming void if the system loses telescope orientation. If the telescope orientation is lost (or when the shelter is erected before the rawin set), the rawin set must be removed from the shelter, erected outside, a flight conducted in clear weather, and the telescope oriented. The set then is disassembled and reassembled in the shelter. Be sure not to distort the telescope mount.

a. Assemble the rawin set on the intended site (paras 2-6 through 2-18).

b. Level the rawin set (para 2-22).

c. Select the distant target that is visible from the site of the rawin set.

d. Determine the direction angles, in azimuth and elevation of the target, from the site of the rawin set.

e. Orient the telescope (para 2-24f).

f. Aim the rawin set at the distant visible target; use the telescope.

g. Adjust the local angle indicators to agree with the bearings of the target as measured according to *d* above.

h. Erect a shelter as directed in the applicable technical manual.

i. For preflight orientation, set the remote angle indicators to agree with the local angle indicators.

j. For periodic orientation, it is necessary to be able to sight the distant visible target through the telescope and one of the openings in the shelter.

2-28. Orientation Method 4

NOTE

This method has the advantage that no visible or active target is required from the actual site of the shelter, and because of the nature of the periodic orientation check, it is suggested that this method be used only when necessary.

a. Use a surveyor's transit to survey a distant target that is visible from a surveyed point near the shelter.

b. Mark a line on the ground near the shelter installation and 24 inches from the surveyed point.

c. Mark a line on the floor of the shelter platform parallel to the line on the ground and 34 inches from the center of the platform.

d. Erect the shelter on the platform as directed in the applicable technical manual.

e. Erect the rawin set on the ground level site so that the jackscrews on the two legs with the short compression bars lie on the line on the ground and 34 inches from the center of the platform.

f. Orient the telescope during flight (para 2-24f) .

g. Sight the telescope on a fixed target and adjust the local angle indicators to agree with the surveyed angles.

h. Disassemble the rawin set and reassemble it in the shelter, so that the two legs with the short compression bars lie on the line marked on the shelter floor. Make no adjustments of the local angle indicators during this movement. The set is now oriented.

i. For preflight orientation, set the remote angle indicators to agree with the local angle indicators.

j. For periodic orientation, repeat the procedures given in *a* through *c,* and *e* through *h* above.

NOTE

Before adjusting the potentiometers described in paragraphs 2-29 through 2-33, loosen the locknuts on the shafts. After adjustment, tighten the locknuts.

2-29. B + SET Adjustment

a. Start the rawin set as instructed in chapter 3.

b. Turn METER SELECTOR switch S1003 (fig. 2-40) to B + .

c. Slide the receiver partially (to its stop) from the housing by releasing the front panel captive screws and pulling on the two handles.

d. Adjust R1093 (fig. 2-41) until SERVICE METER M1002 (fig. 2-40) reads 180.

NOTE

When performing the procedures described in paragraphs 2-30 through 2-33, use the radiosonde as the target transmitter. It may be possible to use the Test Set TS-538(*)/U for the target transmitter by following the procedure in TM 11-6625-213-12.

2-30. Sine Gain and Phasing Adjustment

a. Adjustment of SINE GAIN Control (R1018). SINE GAIN control R1018 (fig. 2-41 or 2-42) should be adjusted so that the rawin set is just stable when S605 (fig. 2-43) is in the NEAR AUTO position and when properly phased. Adjust the SINE GAIN control as described in procedures (1) through (10) below.

(1) Start the rawin set.

(2) Prepare the radiosonde for normal operation (TM 11-6660-220-10 or TM 11-6660-228-10); operate it as a target transmitter, about 150 feet away from the rawin set so that the elevation angle of the target from the rawin set is between 3° and 15°.

(3) Set METER SELECTOR switch S1003 to the AC ERROR position.

(4) Orient the reflector of the rawin set toward the target by tracking manually until the reading on SERVICE METER M1002 is minimum. Use the telescope if it has been oriented.

(5) If the rawin set tracks automatically, turn S605 (fig. 2-43) to the FAR AUTO position for 5 seconds and then return it to MANUAL.

(6) Note the readings of the local angle indicaters.

(7) Move the reflector 1° in azimuth in either direction by using AZIMUTH control R665.

(8) Adjust SINE GAIN control R1018 until SERVICE METER M1002 reads approximately 80.

(9) Set S605 (fig. 2-43) to the NEAR AUTO position. The antenna should oscillate in azimuth about the target 2 or 3 times.

(10) If it does not, readjust the SINE GAIN control. When the antenna tends to spiral, readjust the phasing *(b* below).

b. Adjustment of Sine Phasing. The procedure described in (1) through (14) below is based on a rawin set that has a large phasing error.

(1) Perform the adjustment of SINE GAIN control (R1018) described in *a* above.

(2) Set METER SELECTOR switch S1003 to AC ERROR.

(3) Set SINE PHASING control R1016 to the center of its rotation.

(4) Prepare the radiosonde for normal operation (TM 11-6660-220-10 or TM 11-6660-228-10); operate it as a target transmitter, about 150 feet away from the rawin set, so that the elevation angle of the target from the rawin set is between 3° and 15°.

(5) Orient the reflector of the rawin set toward the target by tracking manually until the reading on SERVICE METER M1002 reads minimum. Use the telescope if it has been oriented or, if the set will track automatically, turn S605 to the FAR AUTO position for 5 seconds, and then return it to MANUAL.

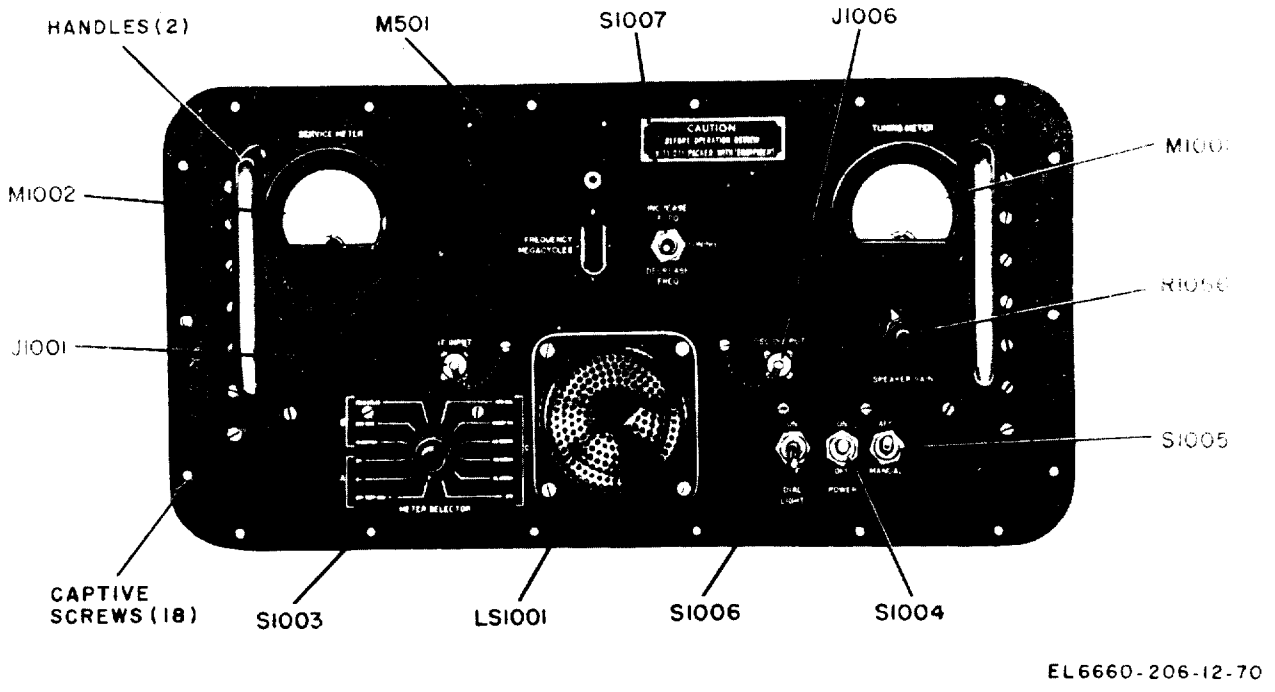


Figure 2-40. Receiver, front view.

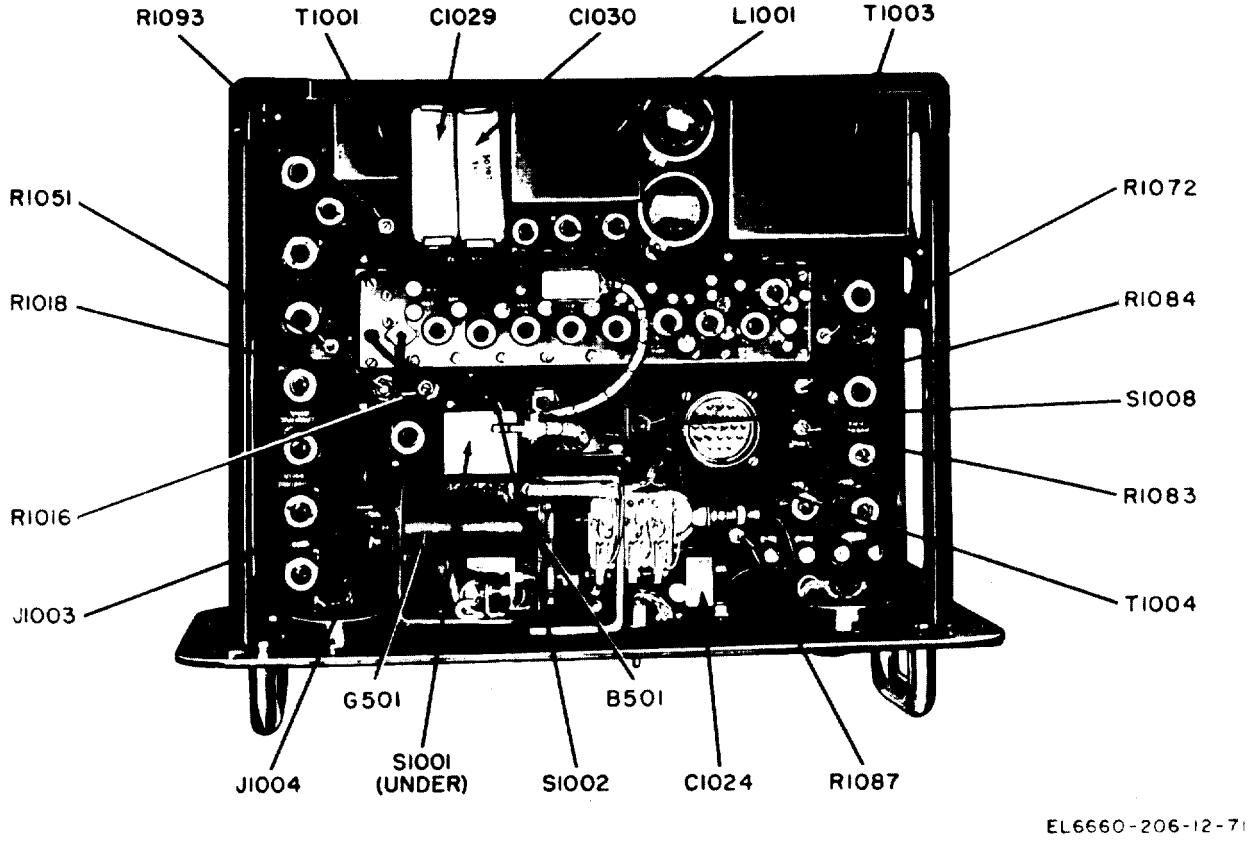


*Figure 2-41. Receiver, (except R-301D/GMD-1** top view, showing adjustment controls.*

(6) Move the reflector ½° clockwise in azimuth by using AZIMUTH control R665.

(7) Set the METER SELECTOR switch S1003 to AZ ERROR.

(8) Obtain the phase adjustment tool (fig. 2-3) from the accessories case and insert it through the access hole in the rear of the reflector and into the phase adjustment aperture (fig. 2-25) of the antenna scanner assembly. A slotted shaft should be engaged for turning the adjusting mechanism of the reference voltage generator.

(9) Adjust the slotted shaft until a maximum reading is obtained on SERVICE METER M1002.

(10) Turn S605 to the FAR AUTO position and let the rawin set track (automatically) on target. Return the switch to MANUAL.

(11) Turn METER SELECTOR switch S1003 to EL ERROR.

(12) Move the reflector 1° in azimuth in either direction by using AZIMUTH control R665.

(13) Adjust the reference voltage generator ((8) preceding) to obtain a reading of zero (midscale) on SERVICE METER M1002. The set is now phased properly.

(14) The spare receiver can now be phased by the installation of the receiver and the repetition of the procedures given in (10) through (12) above, and by the adjustment of SINE PHASING control R1016 to obtain a zero (midscale) reading on SERVICE METER M1002. Do not adjust the reference generator.

2-31. Balance and Sensitivity Adjustments of Antenna Control Equipped With Thyratron Tubes

During adjustment of the antenna control for balance and sensitivity, the rawin set must be in normal operating condition but without any IF signal coming through the receiver. To eliminate possible signals, the local oscillator input to the mixer assembly is removed. The procedure is described in *a* through *p* below.

a. Remove IF cable (W131) from J1001, and oscillator cable (W121) from J1006 on the receiver (fig. 2-40).

b. Release the front panel captive screws and pull out the antenna control to the limit of its travel.

c. Place the rawin set into operation and leave

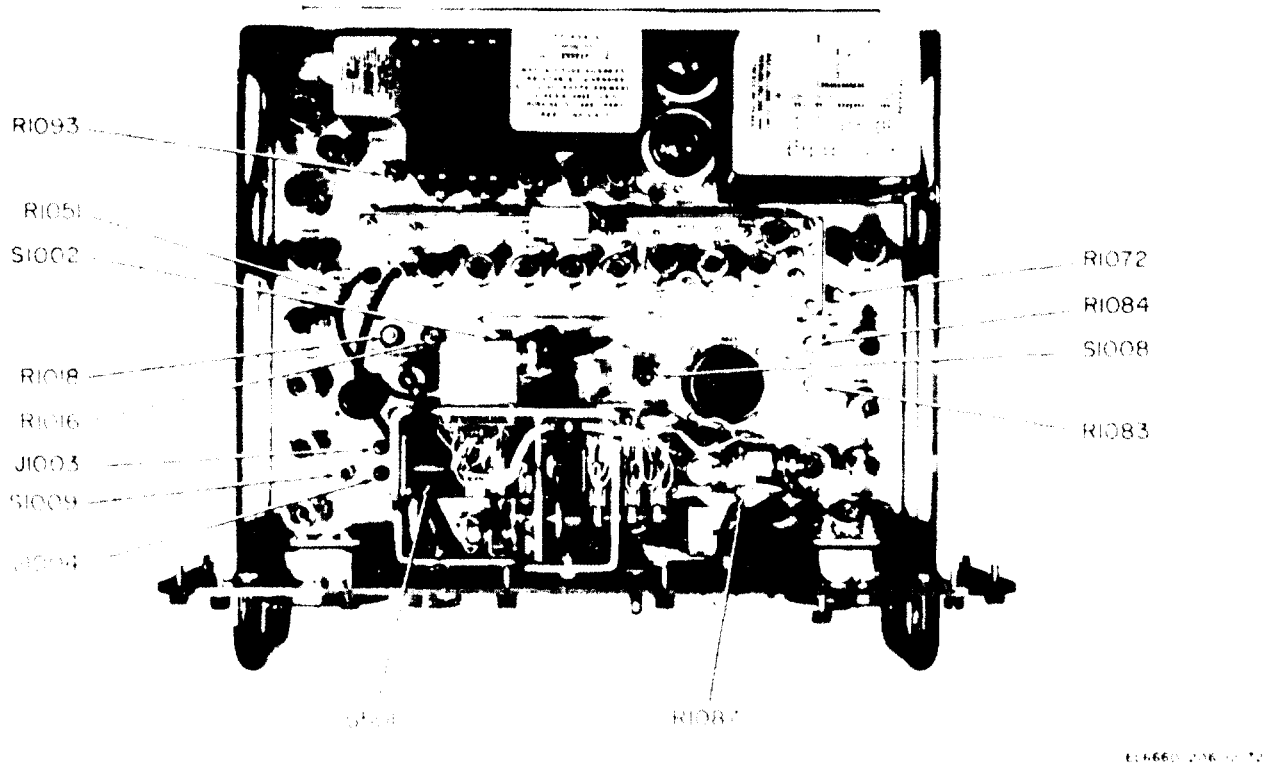


*Figure 2-42. Receiver R-301D/GMD-1**, top view showing adjustment controls.*

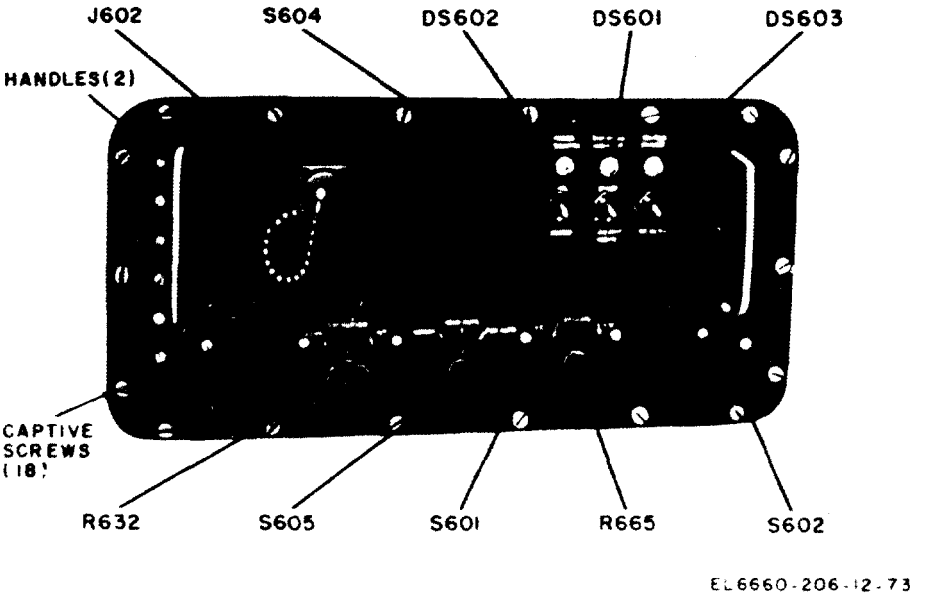


Figure 2-43. Antenna control, front view.

the MOTORS switch S602 (fig. 2-43) in the position that will indicate MOTORS STANDBY (lamp lighted).

d. Turn switch S605 to FAR AUTO.

e. With the multimeter set to measure 0-4 milliamperes (ma), insert the test leads in the AZ SENS test jacks located near J604 (fig. 2-44), and observe polarity.

f. Place the MOTORS switch S602 to the opposite position to start the dipole antenna rotating (MOTORS STANDBY lamp out).

g. Adjust AZIMUTH SENS control R658 (fig. 2-44) on the right side of the antenna control chassis for a multimeter reading of 0.7 ma. This value is equivalent to a total current of 300 ma through the thyratrons.

h. Place the MOTORS switch S602 to the opposite position; the MOTORS STANDBY lamp should light.

i. Change the range of the multimeter to read 0-10 volts direct current (dc).

j. Change the multimeter leads from the AZ SENS jacks to AZ BAL jacks.

NOTE

If the multimeter reads in the reverse direction, reverse the leads. If the multimeter reads less than 4 volts, change the scale to suit the lower voltage.

k. Place the MOTORS switch S602 to the opposite position; the MOTORS STANDBY lamp should go out.

l. Adjust AZIMUTH BALANCE control R657, located on the right side of the antenna control chassis, until the multimeter reads zero. The azimuth thyratrons are now balanced.

m. Place the MOTORS switch S602 to the opposite position; the MOTORS STANDBY lamp should light.

n. Repeat the procedures given in *e* through *m* above for the elevation portion of the antenna control chassis by adjusting the ELEV SENS control R639 and ELEV BALANCE control R640 and by using the ELEV SENS and BAL test jacks near J601.

o. Again repeat procedures *e* through *m* above for the azimuth portion. Some interaction between the two systems exists and a readjustment may be found necessary.

p. Replace the cables from the mixer assembly to the jacks on the receiver and secure the antenna control chassis into the housing.

2-32. Balance and Sensitivity Adjustments of Antenna Control Equipped With SCR Switching Units

a. Rawin Set AN/GMD-1B** utilizes SCR switching units in the antenna-control circuits

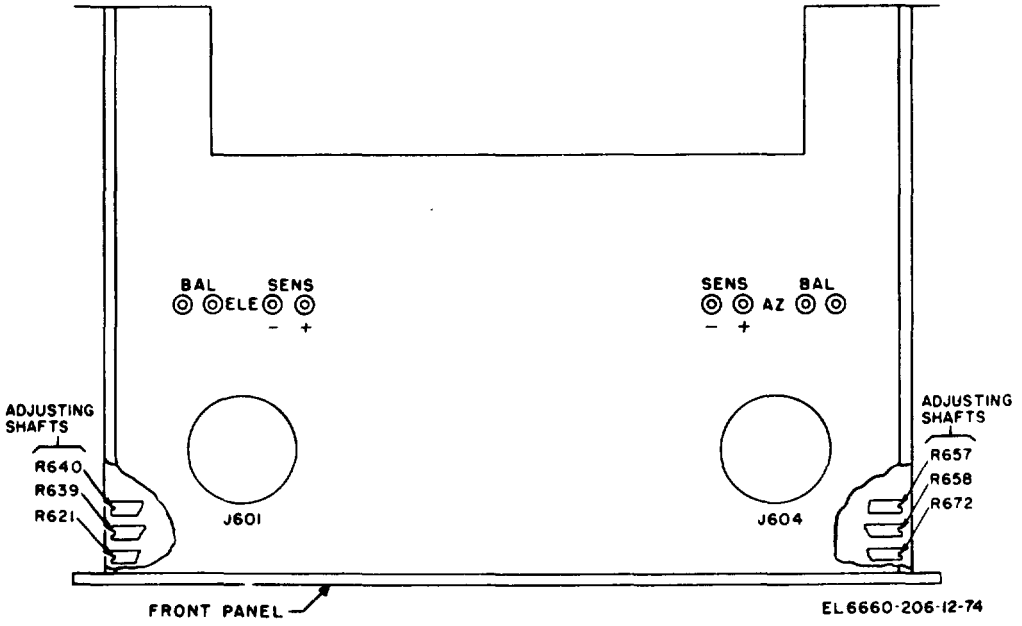


Figure 2-44. Antenna control test jacks and controls.

(CR603, CR604, CR605, and CR606). Adjustment of these circuits for balance and sensitivity requires the use of Multimeter TS-352(*)/U or equivalent. The rawin set must be operating normally without an input signal. Proceed as outlined in the remainder of this paragraph. (Other models of Rawin Set AN/GMD-1 will be eventually equipped with SCR switching units. This procedure is applicable to all sets so equipped.)

(1) Place Rawin Set AN/GMD-1(*) (equipped with SCR switching units) in operation. Allow a 30-minute warmup. Place MO-switch S602 to MOTORS STANDBY position, the MOTORS STANDBY lamp should light.

(2) At the receiver, remove the IF cable (W131) from J1001 and the oscillator cable (W121) from J1006.

(3) Release the front panel captive screws and pull out the antenna control unit to the limit of its travel.

NOTE

If SCR switching units are to be removed or replaced, the drawer must be cautiously pulled out beyond the limit stop.

CAUTION

Before proceeding, make sure the antenna control POWER switch is OFF and the receiver power switch is ON. Stow locks must be extended.

b. Balance Adjustment (Elevation).

(1) Set multimeter to the 0-10 VDC range.

(2) Place selector switch on the front of the antenna control panel in the FAR AUTO position, MOTORS switch in the MOTORS position.

(3) Insert multimeter probes in ELE BAL jacks (J605, J606) on base plate.

(4) Set antenna control POWER switch to the ON position. Wait for relay to activate.

CAUTION

To avoid damage to the multimeter, do not rotate the MANUAL-NEAR AUTO-FAR AUTO switch when multimeter is connected to the BAL jacks and the POWER switch is ON.

(5) Adjust the ELEV BAL control (R640) located on the left side of the panel drawer, for a zero reading on the multimeter.

(6) Place the antenna control POWER switch in the OFF position; MOTORS switch to MOTORS STANDBY.

c. Sensitivity Adjustment (Elevation).

(1) Set multimeter to the 0-500 ma range.

CAUTION

Before proceeding to the next step, insure that the POWER switch in the antenna control unit is in the OFF position and the MOTORS switch is in the MOTORS STANDBY position.

WARNING

Be sure not to touch the terminals of the POWER switch, which is mounted on the front panel, when removing the relay. Injury or shock to personnel may result.

(2) Remove thermal relay K605 from the circuit. Note relay is plug-in type.

(3) Turn the antenna control POWER switch to the ON position and MOTORS switch to MOTORS position. Allow 1 minute for stabilization.

(4) Insert multimeter probes in ELE SENS jacks (J607, J608) on base plate.

(5) Adjust ELE SENS control (R639) for a reading of 200 ma.

NOTE

This is the total current reading of both SCR switching units.

(6) Turn the antenna control POWER switch to the OFF position and MOTORS switch to the MOTORS STANDBY position.

(7) Remove multimeter probes from jacks and replace relay K605.

d. Balance Adjustment (Azimuth).

(1) Set multimeter to 0-10 VDC range.

(2) Turn MOTORS switch to MOTORS. Place selector switch on the front panel in the FAR AUTO position.

(3) Insert multimeter probes in AZ BAL jacks (J611, J612) on base plate.

(4) Place the antenna control POWER switch to the ON position.

(5) Adjust AZ BAL control (R657) for a zero reading on the multimeter.

(6) Turn antenna control POWER switch to the OFF position. MOTORS switch to MOTORS STANDBY.

e. Sensitivity Adjustment (Azimuth).

(1) Set multimeter to the 0-500 ma range.

CAUTION

Before proceeding to the next step insure that the POWER switch in the antenna control is in the OFF position, and MOTORS switch in MOTORS STANDBY.

WARNING

Be careful not to touch the terminals of the POWER switch mounted on the front panel, when removing relay. Injury or shock to personnel may result.

(2) Remove thermal relay K604 from circuit. Note relay is plug-in type.

(3) Turn the antenna control POWER switch to the ON position, and MOTORS switch to MOTORS. Allow 1 minute for stabilization.

(4) Insert multimeter probes in AZ SENS jacks (J609, J610) on base plate.

(5) Adjust AZ SENS control (R658) for a reading of 200 ma.

NOTE

This is the total current reading at both SCR units. A quick GO–NO–GO test on SCR units can be made by inserting a multimeter in the circuit. Then adjust the AZ or SENS control clockwise until a reading of 150 ma is reached, then reverse the procedure and adjust the AZ or SENS control counterclockwise until a reading of 50 ma is read. These coditions indicate an operational SCR unit.

(6) Turn the antenna control POWER switch to OFF position, and MOTORS switch to MOTORS STANDBY.

(7) Remove the multimeter and replace relay K604.

(8) Verify zero balance reading in *d* above. If further balancing is required, repeat the procedures in *b* and *d* above.

f. Replace the IF and oscillator cables on the receiver and secure the antenna control in the housing.

2-33. Antenna Control Antihunt Adjustments

NOTE

These adjustments should not be made until the sine gain and phasing adjustments have been made in accordance with paragraph 2-30.

a. Release the front panel captive screws and pull out the antenna control to the limit of its travel.

b. Prepare the radiosonde for normal operation; operate it as a target transmitter, about 150 feet away from the rawin set, so that the elevation angle of the target from the rawin set is between 3° and 15°.

c. Place the rawin set into operation.

d. Operate the AZIMUTH and ELEVATION controls, R665 and R632, as necessary to orient the reflector toward the target.

e. Set S605 to the FAR AUTO position and allow the rawin set to position iteself (track) on target.

f. If hunting prevents the rawin set from tracking, adjust AZ ANTIHUNT control R672 and ELEV ANTIHUNT control R621 as necessary to stop the hunting.

g. Allow the rawin set to track on the target. To make certain that the rawin set is tracking, observe the SERVICE METER M1002 (fig. 2-40) with the METER, SELECTOR switch S1003 in the AC ERROR position. Meter indicates zero.

h. Set S605 (fig. 2-43) to MANUAL and operate the ELEVATION control R632 as necessary to move the reflector 1° off the target. Use the local elevation angle indicator to read the 1°.

i. Set S605 to FAR AUTO and allow the rawin set to track automatically on target.

j. Repeat the procedures given in *h* and *i* above several times while adjusting ELEV ANTIHUNT control R621, until the rawin set tracks on the target with no more than one overshoot.

k. Set S605 to MANUAL and operate the AZIMUTH control R665 as necessary to move the reflector 1° off the target. Use the local azimuth angle indicator to read the 1°.

l. Set S605 to FAR AUTO and allow the rawin set to track automatically on target.

m. Repeat the procedures given in *k* and *l* above several times while adjusting AZ ANTIHUNT control R672, until the rawin set tracks on the target with no more than one overshoot.

2-34. Installation Performance Tests

To insure that the rawin set is in optimum operating condition, certain performance tests must be made on the equipment after it has been aligned and adjusted. For an overall performance check of the equipment, follow the procedure given in paragraph 4-9. For receiver sensitivity tests, refer to TM 11-6625-213-12. If the sensitivity of the receiver is less than 90 on the OUTPUT POWER dial located on the test set, refer the receiver alignment to maintenance personnel.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. OPERATOR'S CONTROLS, INSTRUMENTS, AND INDICATORS

3-1. Damage From Improper Settings

Haphazard operation or improper setting of the controls can cause damage to electronic equipment; therefore, it is important to know the function of every operational control. The actual operation of the equipment is discussed in paragraphs 3-2 through 3-14. Controls, instruments, and indicators and their functions are listed in tables 3-1 through 3-6.

CAUTION

Never employ these tables as operating instructions or equipment may be damaged. You must refer to the operating instructions in paragraphs 3-2 through 3-14.

Table 3-1. Rawin Receiver R-301(*)/GMD-1, Controls, Instruments, and Indicators

Control	*Function*
(Refer to figure 3-1)	
POWER ON-OFF switch (S1004)	In ON position, connects 115-volt ac power to the receiver.
FREQUENCY MEGACYCLES meter (M501) . . .	Indicates local oscillator frequency plus 30 MHz. (This is equivalent to the radiosonde frequency.) Lamp DS501 illuminates the dial and indicates that 115-volt ac power is connected to the receiver.
TUNING INCREASE FREQ-DECREASE FREQ switch (S1007).	Increases oscillator frequency in INCREASE FREQ position. Decreases oscillator frequency in DECREASE FREQ position.
AFC-MANUAL switch (S1005)	Connects afc circuit for automatic control of the local oscillator frequency in the AFC position. In MANUAL position, the oscillator frequency is controlled by TUNING switch.
TUNING METER (M1001)	Reads avc voltage, which is highest when receiver is correctly tuned to radiosonde signal.
SERVICE METER (M1002)	Indicates currents and voltages of various circuits in rawin receiver and external dc readings, according to setting of METER SELECTOR switch.
METER SELECTOR switch (S1003)	Connects SERVICE METER to indicate current or voltage in 10 different circuits of raw in set or for external dc readings; also has OFF position.
Monitor loudspeaker (LS1001)	Gives audible signal between 5 and 200 Hz; indicates operation of meteorological amplifier.
SPEAKER GAIN potentiometer (R1066) .	Increases monitor volume when turned clockwise.
DIAL LIGHT ON-OFF switch (S1006) .	Switches dial lamp DS501 on and off.

Table 3-2. Antenna Control C-578(*)/GMD-1, Controls and Indicators

Control	*Function*
(Refer to figure 3-2)	
POWER ON-OFF switch (S604)	In ON position, connects antenna control to the ac power source.
POWER INDICATOR lamp (DS602)	Lights when ac power is connected to antenna control.
OVERLOAD RESET RESET-NORMAL switch (S601).	When set in nonlocking RESET position, resets overload relay of servosystem.

Control	*Function*
OVERLOAD INDICATOR lamp (DS601) . .	Lights when overload condition exists in servosystem.
MOTORS switch (S602)	Operates elevation and azimuth drive motors and antenna scanner assembly drive motor in one position. Operates standby relay, which prevents operation of all three motors, but permits immediate operation of the rawin set in the other position. Actual position for each function depends on setting of MOTORS switch (S805) in control-recorder.
MOTORS STANDBY lamp (DS603)	Lights when MOTORS switch (S602) is in standby position.
MANUAL-NEAR AUTO-FAR AUTO control (S605).	In MANUAL position, permits manual positioning of the antenna assembly through use of ELEVATION and AZIMUTH controls of antenna control (fig. 3-2), ELEVATION and AZIMUTH manual controls of housing (figs. 3-3 and 3-4), or ELEVATION and AZIMUTH MANUAL controls of control-recorder (figs. 3-7 and 3-8). In NEAR AUTO position, control permits rapid automatic control of antenna assembly when balloon-borne radiosonde is nearby and radiosonde movements with respect to main assembly are sudden. In FAR AUTO position, control permits slow automatic control of antenna assembly when balloon-borne radiosonde is distant and its movements with respect to main assembly are gradual. Automatic positions permit manual positioning by use of ELEVATION and AZIMUTH MANUAL controls of control-recorder.
ELEVATION DOWN-UP control (R632) . .	Rotation of control to UP moves antenna assembly upward. Rotation to DOWN moves antenna assembly downward. The farther this control is turned from its center position, the faster the antenna assembly moves.
AZIMUTH CCW-CW control (R665) .	In CW position, antenna assembly moves clockwise. In CCW position, antenna assembly moves counterclockwise. The farther this control is turned from its center position, the faster the antenna assembly moves in azimuth.

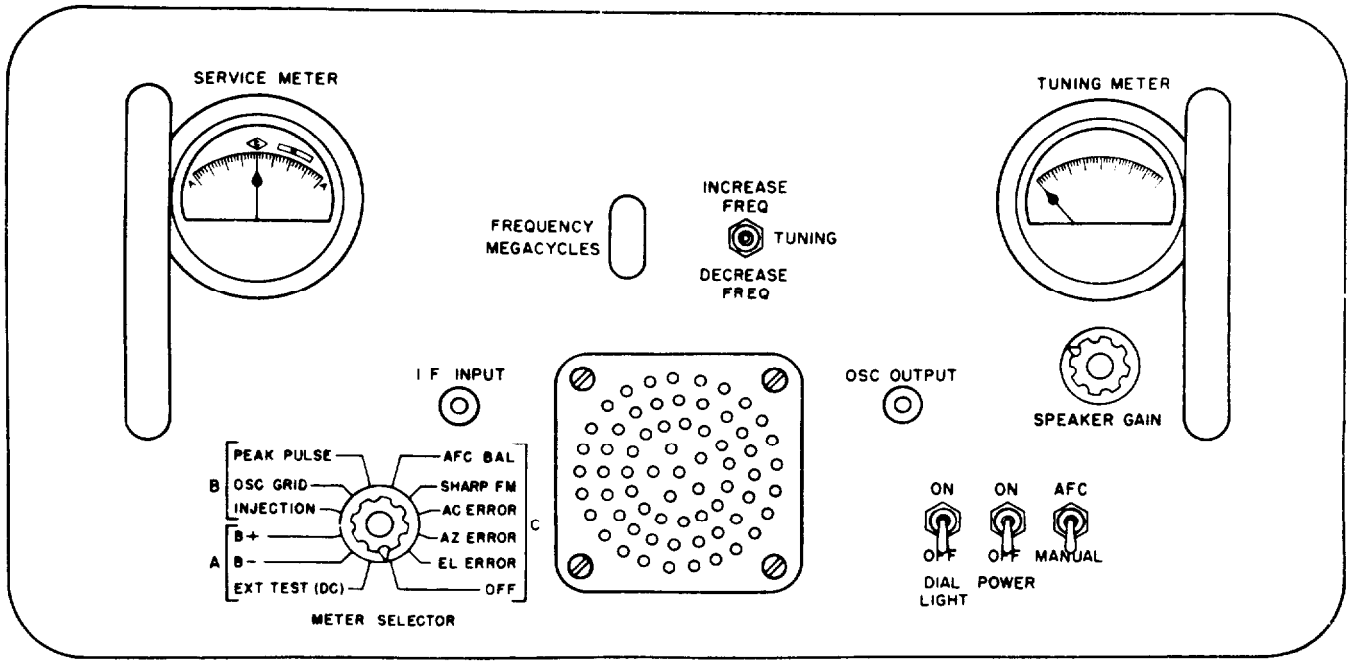


Figure 3-1. Receiver, front panel.

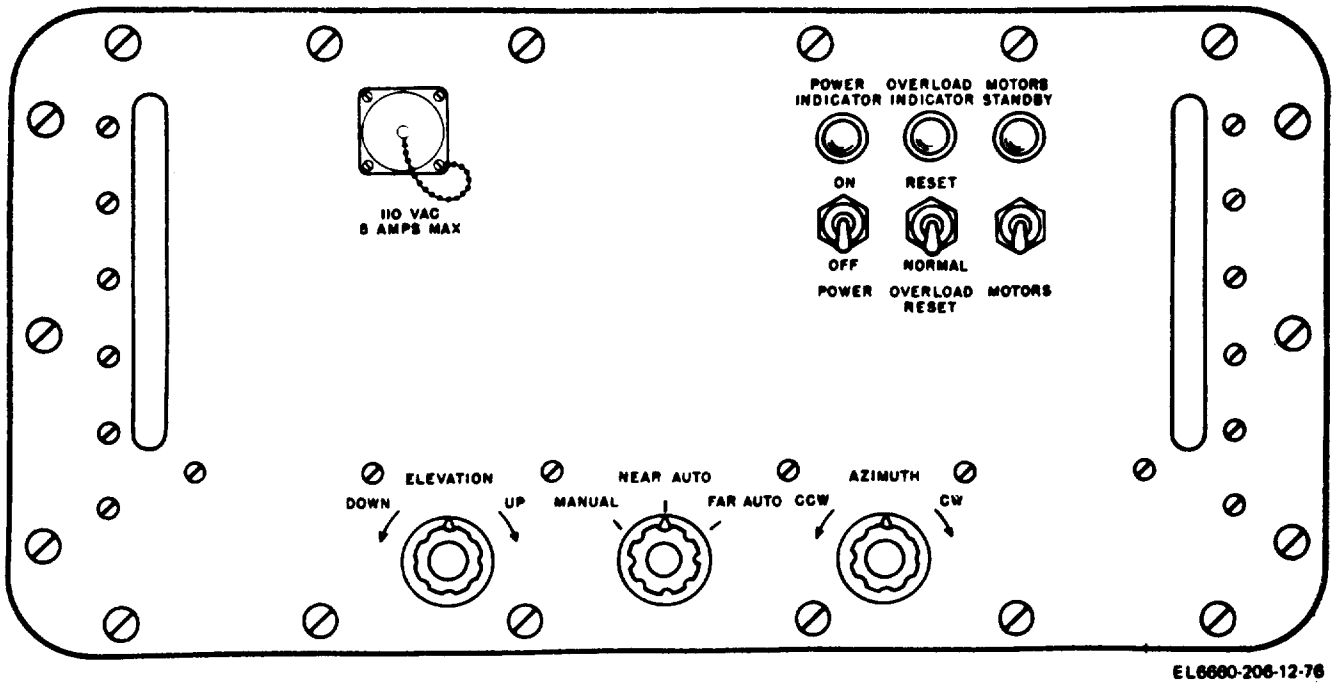


Figure 3-2. Antenna control, front panel.

Table 3-3. Housing Controls

Control	*Function*
(Refer to figures 3-3 and 3-4.)	
AZIMUTH CCW-CW manual control (R301)	When the control is turned clockwise, antenna assembly moves clockwise. When turned counterclockwise, antenna assembly moves counterclockwise. The farther this control is turned from its center position, the faster the antenna assembly moves in azimuth.
ELEVATION DOWN-UP manual control (R302).	When the control is turned clockwise, from the center position, the antenna assembly moves up, when the control is turned counterclockwise, from the center position, the antenna assembly moves down. The farther this control is turned from its center position, the faster the antenna assembly moves in elevation.
AZIMUTH CCW-CW switch (S301) (installed in Rawin Set AN/GMD-1B(*)).	When switch is depressed to the right, the antenna assembly moves clockwise, when switch is depressed to the left, the antenna moves counterclockwise. Switch is spring-loaded in center position.
ELEVATION DOWN-UP switch (S302) (installed in Rawin Set AN/GMD-1B(*)).	When switch is depressed to the right, the antenna assembly moves up. When switch is depressed to the left, the antenna assembly moves down. Switch is spring-loaded in center position.

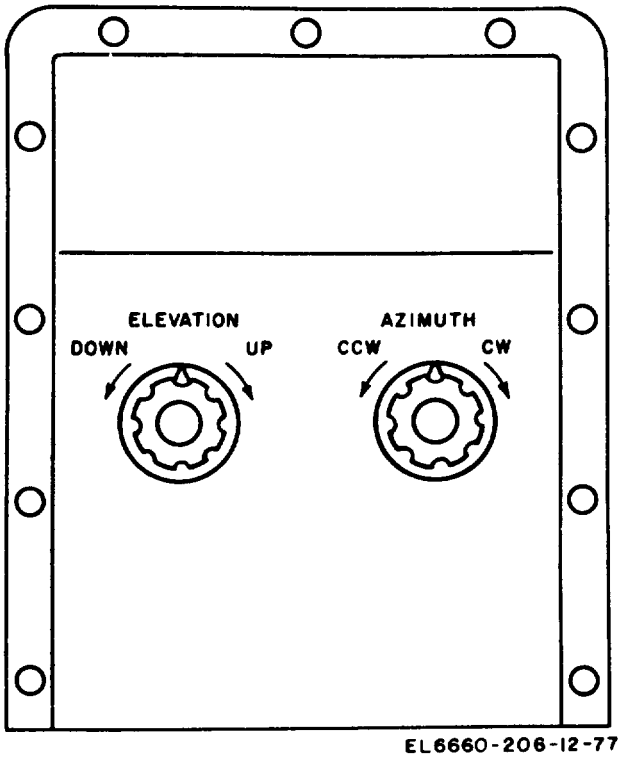


Figure 3-3. Housing AN/GMD-1A, showing manual antenna positioning controls.

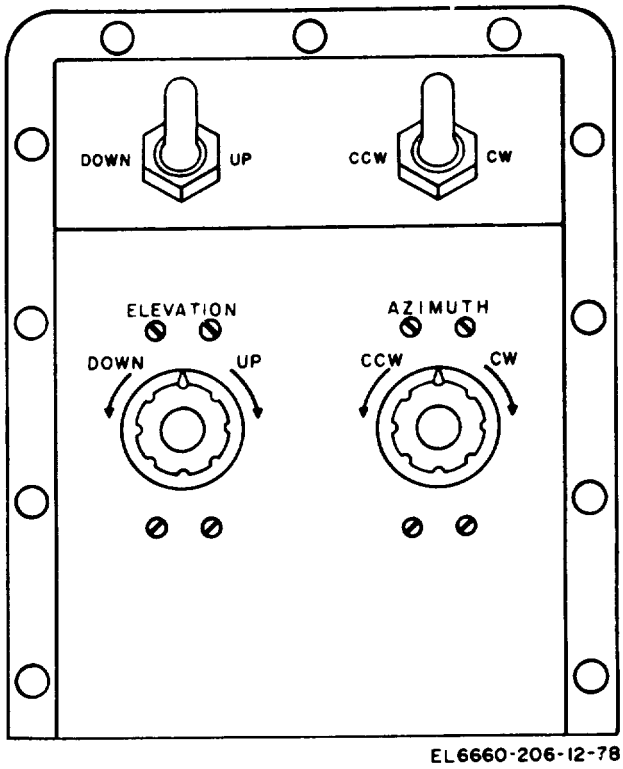


Figure 3-4. Housing AN/GMD-1B(*), showing manual antenna positioning controls.

Table 3-4. Azimuth Unit, Control and Indicator

Control	*Function*
(Refer to figure 3-5)	
Azimuth angle indicator	Indicates azimuth angle of antenna assembly with respect to north. Long pointer indicates degrees; short pointer indicates hundredths of a degree.
Azimuth angle setting adjustment . .	Screwdriver adjustment to set azimuth angle indicator.

Table 3-5. Elevation Unit Assembly Control and Indicator

Control	*Function*
(Refer to figure 3-6)	
Elevation angle indicator ----	Indicates elevation angle of antenna assembly with respect to zero level. Long pointer indicates degrees; short pointer indicates hundredths of a degree.
Elevation angle setting adjustment ---	Screwdriver adjustment, to rotate elevation angle indicator.

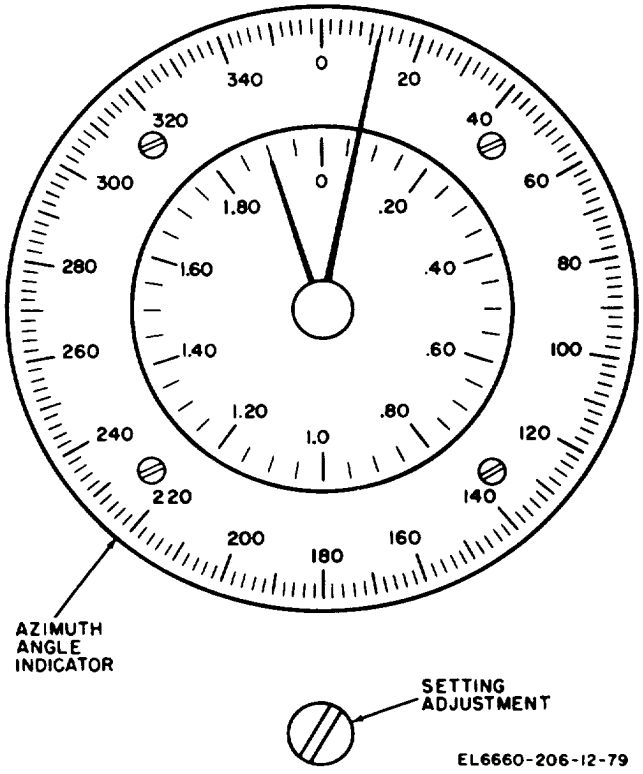


Figure 3-5. Azimuth angle indicator and setting adjustment.

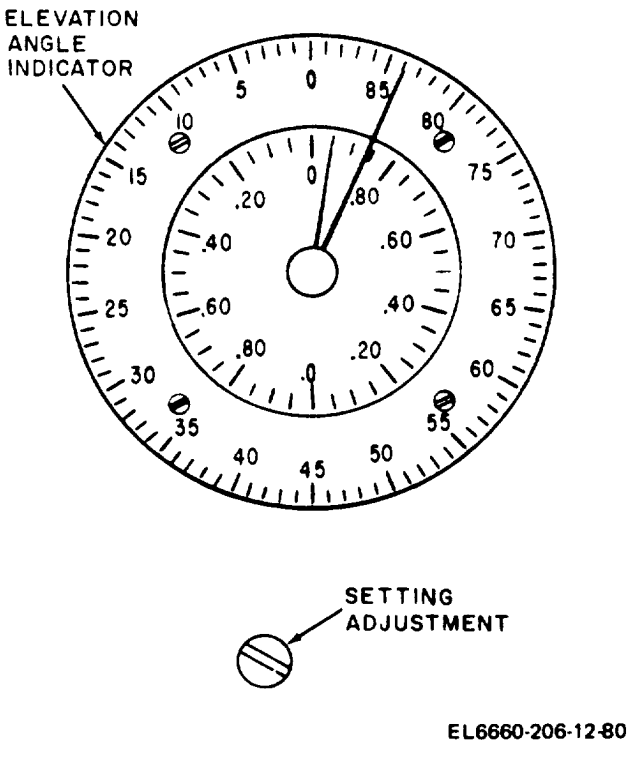
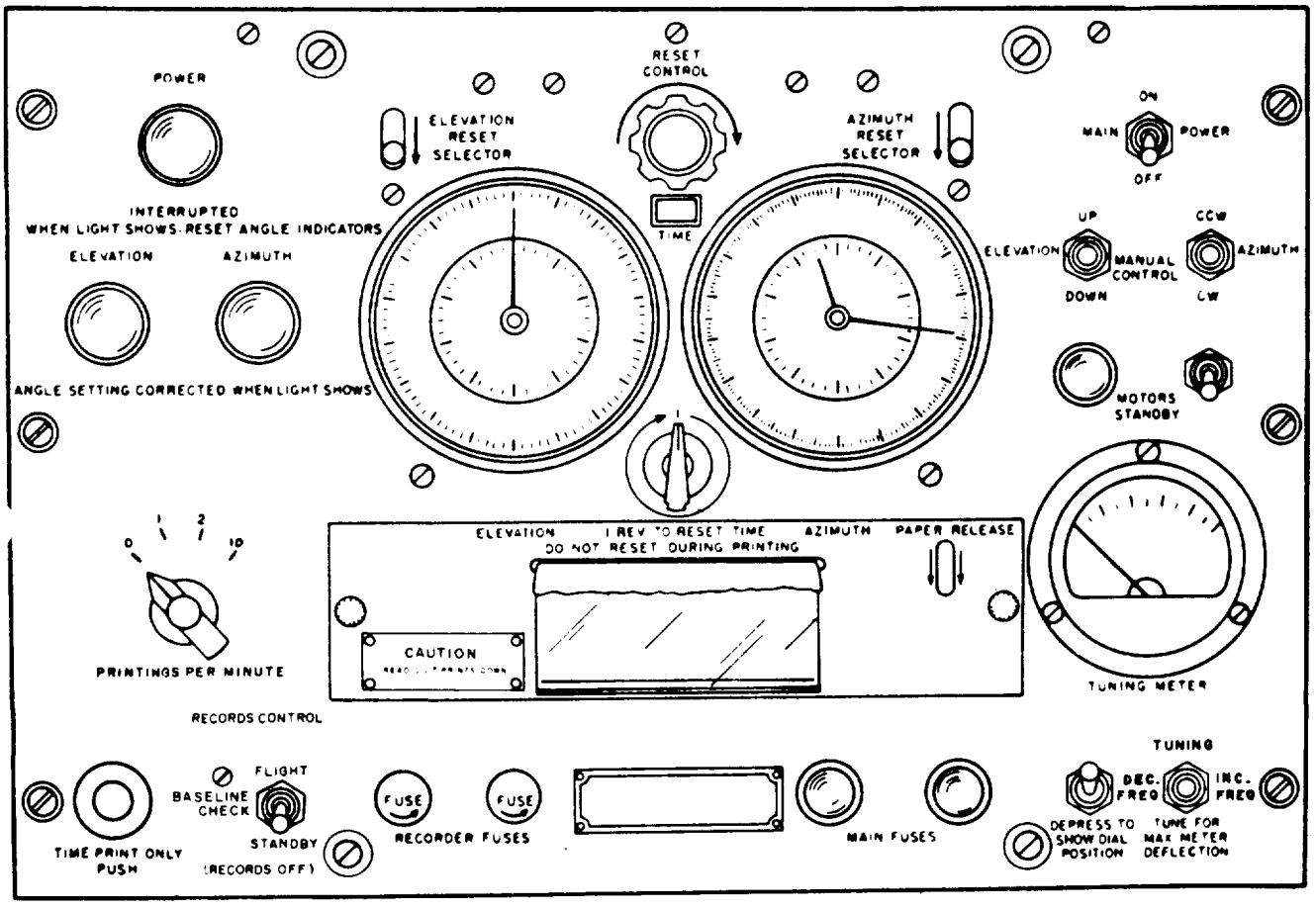


Figure 3-6. Elevation angle indicator and setting adjustment.

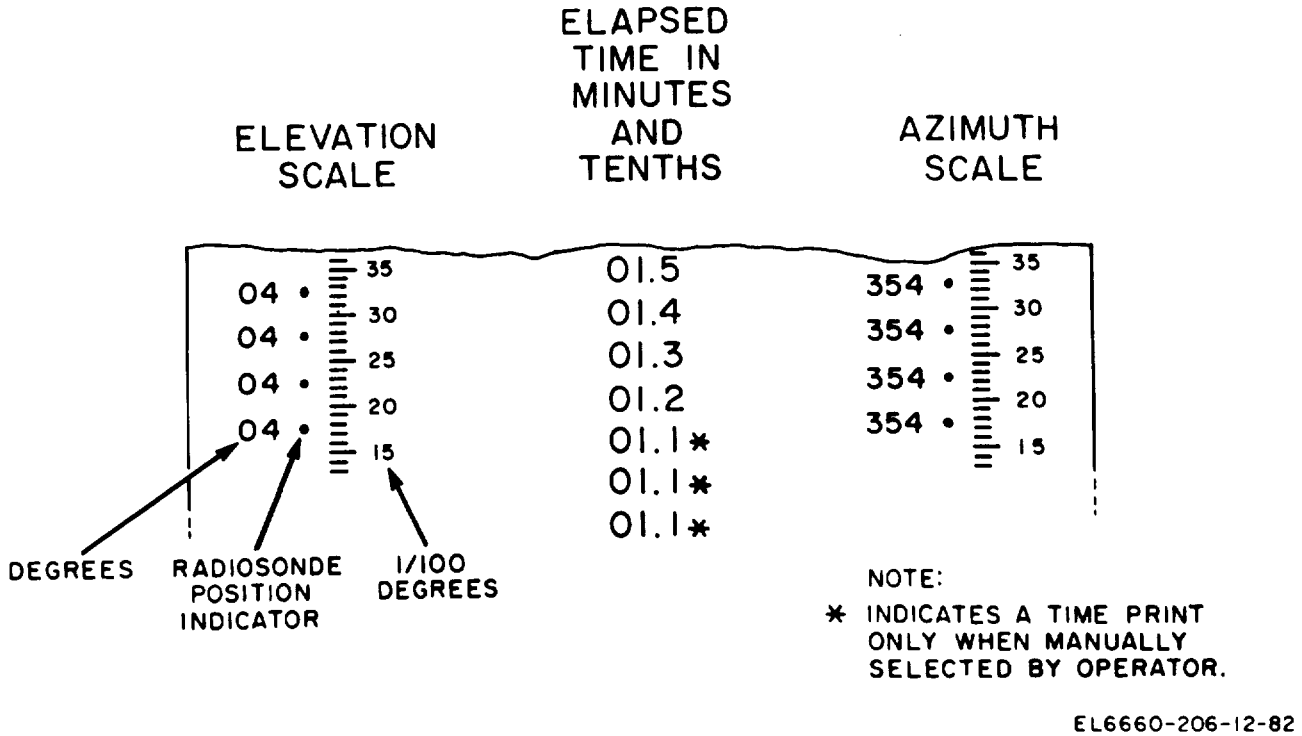
Table 3-6. Control-Recorder C-577(*)/GMD-1, Controls and Indicators

Control	*Function*
(Refer to figure 3-7)	
ELEVATION angle indicator	Indicates elevation angle of antenna assembly with respect to zero level. Long pointer indicates degrees; short pointer indicates hundredths of a degree.
AZIMUTH angle indicator	Indicator azimuth angle of antenna assembly with respect to north. Long pointer indicates degrees; short pointer indicates hundredths of a degree.
TIME indicator	Indicates the time in minutes and 10ths of minutes with respect to an arbitrary initial zero setting.
1 REV TO RESET TIME knob	One clockwise revolution of knob sets TIME indicator and time printing wheels to zero.
RESET CONTROL knob	When ELEVATION RESET SELECTOR lever is pushed down, rotation of knob sets ELEVATION angle indicator and elevation angle printing wheels to any desired angle. When AZIMUTH RESET SELECTOR lever is pushed down, rotation of knob sets AZ MUTH angle indicator and azimuth angle printing wheels to any desired angle.
ELEVATION RESET SELECTOR . . .	When lever is pushed down, RESET CONTROL knob is connected through gears to ELEVATION angle indicator and to elevation angle printing wheels.
AZIMUTH RESET SELECTOR lever	When lever is pushed down, RESET CONTROL knob is connected through gears to AZIMUTH angle indicator and to azimuth angle printing wheels.
ELEVATION lamp, green	Lamp lights after ELEVATION angle indicator has been set to desired angle and ELEVATION RESET SELECTOR level is released. Lamp goes out if power supply is interrupted, and does not light until ELEVATION angle indicator is reset and power is restored.
AZIMUTH lamp, green	Lamp lights after AZIMUTH angle indicator has been set to desired angle and AZIMUTH RESET SELECTOR lever is released. Lamp goes out if power supply is interrupted, and does not light until AZIMUTH angle indicator is reset and power is restored.
POWER INTERRUPTED lamp - --	Lamp is normally off and lights when ac power to the rawin set is interrupted momentarily. Lamp remains lighted, until both RESET SELECTOR levers are reset.



EL6680-206-12-81

Figure 3-7. Control-recorder front panel.



EL6660-206-12-82

Figure 3-8. Sample of printed tape from control-recorder.

Control	*Function*
MAIN POWER ON-OFF ---------- . .	In ON position, as power is connected to control-recorder and to all other units of rawin set.
MANUAL CONTROL ELEVATION-UP-DOWN switch	A three-position switch used to control the movement of the antenna assembly in elevation. Switch is spring-loaded with the center position off.
MANUAL CONTROL AZIMUTH-CCW-CW switch.	A three-position switch used to control the movement of the antenna in azimuth. Switch is spring-loaded with the center position off.
MOTORS STANDBY switch ------	Permits operation of elevation and azimuth drive motors and antenna scanner assembly drive motor, in one position. Operates the standby relay which prevents operation of all three motors but permits immediate operation of the rawin set, when required, in the other position. Actual position for each function depends on setting of MOTORS switch in antenna control. In Rawin Sets AN/GMD-1(*) equipped with Antenna Control C-577E/GMD-1, moving the MOTORS STANDBY switch to the standby position and then back to the operate position resets the overload relays in the antenna-control unit.
MOTORS STANDBY lamp ..	Lights when MOTORS STANDBY switch is in standby position.
TUNING METER	Meter is calibrated in microampere and shows maximum deflection when received is tuned to radiosonde frequency properly. When DEPRESS TO SHOW DIAL POSITION switch is depressed, the meter shows a reading proportioned to frequency to local oscillator.
TUNE FOR MAX METER DEFLECTION switch.	Remote control switch for receiver tuning motor. In the DEC. FREQ or INC. FREQ position, switch varies local oscillator frequency in the receiver.
DEPRESS TO SHOW DIAL POSITION switch.	TUNING METER will read maximum when the local oscillator is on the correct frequency.
RECORDER FUSES	Protect control-recorder circuits. Spare fuses are inside rear panel of control-recorder case.
MAIN FUSES lamps	Neon lamp lights when one of main fuses (located at rear of control-recorder) is blown.
RECORDS CONTROL switch	In FLIGHT position, the control-recorder automatically prints the azimuth and elevation angles and time on paper tape (fig. 3-8) in accordance with the setting of PRINTING PER MINUTE selector switch. In BASELINE CHECK position, the radiosonde signal is fed to the meteorological recorder in normal fashion, and the control-recorder function is deactivated. In STANDBY position, the signal input to the meteorological recorder is shorted and the control-recorder printings are deactivated; this position is used just prior to launching a balloon. This switch does not control chart feed in the meteorological recorder.
PRINTINGS PER MINUTE-0-1-2-10 selector switch.	In zero position, control-recorder does not print. When set to other positions, control-recorder prints as many times per minute as setting selected (once each minute in setting 1, twice each minute in setting 2. and 10 times each minute in setting 10).
TIME PRINT ONLY switch	Pressing pushbutton causes control-recorder to print only the time and an asterisk on paper tape.
PAPER RELEASE lever ----	Lever is pushed down to permit pulling paper tape to read recent printings.
MAIN FUSES	Main ac power fuses for entire rawin set (located at rear of the control-recorder).

Table 3-7. Preliminary Control Settings

Unit	Control	Position
Control-recorder	MAIN POWER switch	OFF (fig. 3-7).
Control-recorder	RECORDS CONTROL switch	STANDBY.
Control-recorder	PRINTING PER MINUTE switch	Desired rate.
Control-recorder	1 REV TO RESET TIME knob	Rotate clockwise 1 revolution to reset the TIME indicator to zero.
Receiver	POWER switch	ON (fig. 3-1).
Receiver	DIAL LIGHT switch	ON
Receiver	AFC-MANUAL switch	AFC
Receiver	METER SELECTOR switch	PEAK PULSE.
Antenna control .	POWER switch	ON (fig. 3-2).
Antenna control .	MANUAL-NEAR AUTO-FAR AUTO switch	MANUAL
Antenna control .	AZIMUTH control	Pointer straight up.
Antenna control .	ELEVATION control	Pointer straight up.

Section II. OPERATIONS UNDER USUAL CONDITIONS

3-2. Preliminary Operation Procedures

The rawinsonde system (para 1-5) employs separate major items of equipments to gather weather information. The operation of each of these equipments is described in separate technical manuals and therefore is not integrated in a system operation procedure. System preliminary operations are outlined in *a* through *l* below so that the rawin set operator can integrate his operations with those in other parts of the system.

NOTE

It is assumed that the equipments in the rawinsonde system have been properly installed and initially checked for routine operation.

a. Follow the presetting, preliminary starting, and starting procedures for Radiosonde Recorder AN/TMQ-5(*) chapter 3, TM 11-6660-204-10).

b. Set the controls on the rawin set as indicated in paragraph 3-3 of this manual.

c. Assemble Radiosonde Set AN/AMT-4(*) (TM 11-6660-228-10) or National Weather Service Radiosonde Set J031.

d. Check the frequency and power output of the radiosonde *(c* above), using Test Set TS-538(*)/U as outlined in TM 11-6660-213-12. If trouble is encountered, refer to the technical manual *(c* above) for the radiosonde being used.

e. While the radiosonde is being prepared for flight *(c* and *d* above), inflate the balloon and assemble the balloon train as explained in TM 11-6660-218-12.

f. Prepare Radiosonde Baseline Check Set AN/GMM-1 for operation (TM 11-6660-219-12).

g. Perform the baseline check (sometimes referred to as ground check) as outlined in (1) through (4) below.

(1) Perform operations on the radiosonde baseline check set as outlined in TM 11-6660-219-12.

(2) Perform operations on the rawin set as outlined in paragraph 3-4.

(3) Perform operations on the meteorological recorder as outlined in chapter 3 of TM 11-6660-204-10.

(4) Perform necessary corrective action until a satisfactory baseline check is completed.

h. Adjust the radiosonde commutator as outlined in TM 11-6660-228-10.

i. Remove the radiosonde from the baseline check set and reconnect the test plug or clip off test leads (TM 11-6660-228-10).

j. Connect the radiosonde to the balloon train *(e* above) and prepare for release.

k. Place the RECORDS CONTROL switch on the control-recorder to STANDBY.

l. Place the POWER ON-POWER OFF-STAND BY switch on the meteorological recorder to STAND BY (chapter 3, TM 11-6660-204-10).

3-3. Preliminary Control Settings

Before proceeding with the operating instructions, initial checks and adjustments must be completed by organizational personnel. These checks include leveling and orientation of the rawin set and checking the frequency of the radiosonde. Table 3-7 lists controls, units with figure reference, and position of the controls on the rawin set as they should be before starting the equipment. Check the settings of these controls and reset as necessary.

3-4. Starting Procedure

NOTE

If an abnormal result is obtained during the starting procedure, refer to the operational checklist (para 4-8).

a. Set the control-recorder MAIN POWER switch (fig. 3-7) to ON. Allow a 15-minute warmup period.

b. If the MOTORS STANDBY lamps on the control recorder or antenna control (fig. 3-2) are lighted, push the MOTORS switch on the antenna control or the MOTORS STANDBY switch (fig. 3-7) on the control-recorder to the opposite position.

c. Operate the ELEVATION and AZIMUTH knobs (fig. 3-4) on the left side of the housing as necessary to orient the reflector toward the baseline check set (para 3-2 *f)* that contains the radiosonde. On the AN/GMD-1B(*), the ELEVATION and AZIMUTH slewing switches (fig. 3-4) may be used for this operation.

d. Operate the TUNING switch (fig. 3-1) on the receiver to either the INCREASE FREQ or DECREASE FREQ as necessary to set the FRE-

QUENCY MEGACYCLES dial to the peak indication on the tuning meter.

e. After the frequency and power output checks on the radiosonde (para 3-2 *d)* have been satisfactorily completed, check to see that the TUNING METER on the receiver reads between 60 and 70.

NOTE

If the TUNING METER reads low, opcrate the TUNING switch to either the INCREASE FREQ or DECREASE FREQ as necessary to increase the meter reading to proper value. If the TUNING METER reads high, position the reflector *(c* above) slightly away from the direction of the baseline check set, until the tuning meter reads within limits specified in *e* above. The audible signal (5 to 200 Hz) heard in the loudspeaker the meteorological signal. Set the volume of the signal to the desired level by means of the SPEAKER GAIN potentiometer.

f. Operate the ELEVATION and AZIMUTH controls (fig. 3-2) on the antenna control to position the reflector slightly away from the baseline check set.

g. Turn the MANUAL-NEAR AUTO–FAR AUTO switch on the antenna control to NEAR AUTO. The reflector should turn by itself toward the baseline check set and stay there. This checks the automatic tracking system of the rawin set.

h. Return the MANUAL-NEAR AUTO-FAR AUTO switch *(g* above) to MANUAL.

i. Position the reflector *(f* above) as necessary to obtain a reading between 60 and 70 on the TUNING METER (fig. 3-1).

j. Operate the MOTORS switch (fig. 3-2) located on the antenna control panel. The MOTORS STANDBY indicator should light.

k. Operate the RECORDS CONTROL switch (fig. 3-7) on the control-recorder to BASELINE CHECK.

l. Perform the baseline check (para 3-2 *g).*

m. After a satisfactory baseline check is completed, return the RECORDS CONTROL switch *(k)* above) to STANDBY.

n. Operate the MOTORS switch (fig. 3-2) located on the antenna control panel. The MOTORS STANDBY indicator light should go out.

CAUTION

Before proceeding with the following step, the clock must stop running before resetting the time to 000; otherwise, damage will occur in the gear mechanism.

o. Check to see that the TIME indicator (fig. 3-2) on the control-recorder is reading 000; reset, if necessary, by turning the RESET TIME control on control-recorder.

NOTE

The reset switch must be in the vertical position regardless of the exact reading of 000.

p. Position the reflector toward the location from which the radiosonde is to be launched by rotating the AZIMUTH and ELEVATION knobs on the antenna control (fig. 3-2) as necessary.

q. All equipments in the system should be ready for radiosonde release (para 3-2 *h).*

r. Check to see that ELEVATION angle indicator dial (fig. 3-7) on the control-recorder reads the same as that on the elevation unit assembly (fig. 1-14). If necessary, reset as described in (1) and (2) below.

(1) Press down and hold on the ELEVATION RESET SELECTOR (fig. 3-7).

(2) Turn the RESET CONTROL as necessary to obtain the same reading as the dial (fig. 3-6) on the elevation unit.

s. Check to see that the AZIMUTH angle indicator dial on the control-recorder reads the same as that on the azimuth unit (fig. 1-13). If necessary, reset as described in (1) and (2) below.

(1) Press down and hold on the AZIMUTH RESET SELECTOR (fig. 3-7).

(2) Turn the RESET CONTROL as necessary to obtain the same reading as the dial on the azimuth unit.

3-5. Flight Operation Procedure

Operation of the rawinsonde system during flight of the balloon-borne radiosonde requires the coordinated efforts of three men; two men are required to launch the balloon and operate the main assembly of the rawin set, and one man to operate the recording equipment. In the procedure outlined in *a* through *f* below, reference is made to other equipments in the system so that system operations can be coordinated.

NOTE

It is assumed that all equipments are ready for flight as outlined in paragraphs 3-3 and 3-4. Personnel must become thoroughly familiar with the

procedures in *a* through *f* below before launching the balloon.

a. With the reflector pointing toward the radiosonde, turn the MANUAL–NEAR AUTO–FAR AUTO swith (fig. 3-2) to NEAR AUTO. The reflector should follow the radiosonde automatically as it is being launched.

b. Launch the balloon-borne radiosonde as outlined in TM 11-6660-218-12.

NOTE

If the rawin set does not lock on the balloon-borne radiosonde and follow it automatically, turn the MANUAL-NEAR AUTO–FAR AUTO switch to MANUAL, and move the reflector toward the balloon by using the AZIMUTH and ELEVATION knobs on the antenna control. Return the MANUAL-NEAR AUTO-FAR AUTO to NEAR AUTO after the reflector is oriented toward the balloon.

c. As the balloon is being launched, the meteorological recorder operator should follow the final preflight procedure as outlined in TM 11-6660-204-10.

d. Place the RECORDS CONTROL switch (fig. 3-7) on the control-recorder to FLIGHT. Both the meteorological recorder and the control-recorder should start printing.

c. Follow the procedure for operating the meteorological recorder during flight as outlined in TM 11-6660-204-10.

f. Approximately 2 minutes after launching *(b* above), turn the MANUAL-NEAR AUTO–FAR AUTO switch (fig. 3-2) on the antenna control to FAR AUTO.

3-6. Stopping Procedure to a Standby Condition

Under normal conditions, the radiosonde reaches an average altitude of about 90,000 feet before the balloon bursts. Indicators of the bursting of the balloon and the descent of the radiosonde are observed only at the meteorological recorder.

3-7. Complete Shutdown

Do not disturb any of the settings of the rawin set until instructed to do so. Perform the following steps after receiving instructions from the meteorological recorder operator:

CAUTION

Before proceeding with the following step, note that you must never attempt to position the antenna by grasping the edge of the reflector and applying force. To do so may warp the reflector and reduce the tracking capability of the rawin set.

a. Place the MANUAL-NEAR AUTO-FAR AUTO switch on the antenna control to MANUAL. Use the ELEVATION control on the antenna control to lower the antenna assembly to the 0 position or raise if to the 90° position and engage the elevation stow lock handwheel (fig. 1-14).

b. Use the AZIMUTH control on the antenna control to rotate the antenna assembly in azimuth to engage the azimuth stow lock handwheel (fig. 1-12).

NOTE

Engage the stow locks before removing the power from the rawin set. This prevents any motion of the antenna assembly without motion of the angle indicators in the control-recorder unit.

c. Set the control-recorder MAIN POWER switch to OFF.

NOTE

If another flight is to be made within a short, time, do not lock the antenna assembly or set the MAIN POWER switch to OFF. Instead, set the MOTORS STANDBY switch of the control-recorder or the MOTORS switch of the antenna control to the standby position. This eliminates the necessity of checking the orientation of the rawin set and the delay necessary for the warmup of the electrical components.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-8. General

The operation of Rawin Set AN/GMD-1(*) may be difficult in regions where extreme cold, heat, humidity, moisture, sand conditions, or high winds prevail. In the following paragraphs, instructions are given on procedures for minimizing the effect of these unusual operation conditions.

3-9. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions under such adverse conditions follow:

a. Handle the equipment carefully.

b. Keep the POWER switches to all units on and the MOTORS STANDBY switch (fig. 3-7) of the control-recorder set to the standby position.

NOTE

Early models of the rawin set are not equipped with resistor heaters; however, Rawin Set AN/GMD-1B(*) has three resistor heaters: one each installed in the azimuth unit, the elevation unit, and antenna scanner assembly. When the POWER switches are at ON, these three heaters are turned on and off separately by thermostats at 0° C only. No provision is made for manual control of these heaters during operation. The rawin sets procured on order No. 07154-PP-59 have an additional resistor strip heater installed on the inner surface of the cover plate of the azimuth unit (fig. 3-9). This heater strip is installed for optional use as a preventive measure against collection of moisture within the azimuth unit and is operated manually by a toggle switch (fig. 3-10) on the exterior surface of the cover plate.

c. If keeping the power applied to all the units overtaxes the power supply, set the MOTORS STANDBY switch (figs. 3-2 and 3-7) to the standby position when the power switches of the various units are turned to ON. Wait about 15 minutes before operating the rawin set.

3-10. Operation in Tropical Climates

In tropical climates, when the rawin set is installed in swampy areas, moisture conditions are more acute than normal. Ventilation is usually very poor and the high relative humidity causes condensation on the equipment whenever the temperature of the equipment becomes lower than the ambient temperature. To minimize this condition, place lighted electric bulbs under the side vents of the receiver and antenna control housing. A modification work order has been issued to install a lamp inside the azimuth unit of AN/GMD-1A models (fig. 3-11). At the option of the operator, turn the manually controlled resistor heater on approximately 60 minutes before placing the rawin set in operation and then turn it off before the rawin set is placed in operation; however, if operating in extremely humid, damp conditions, it may be advisable to allow the heater to remain on during rawin set operation. When storing the equipment, place it in dry boxes (large heated containers).

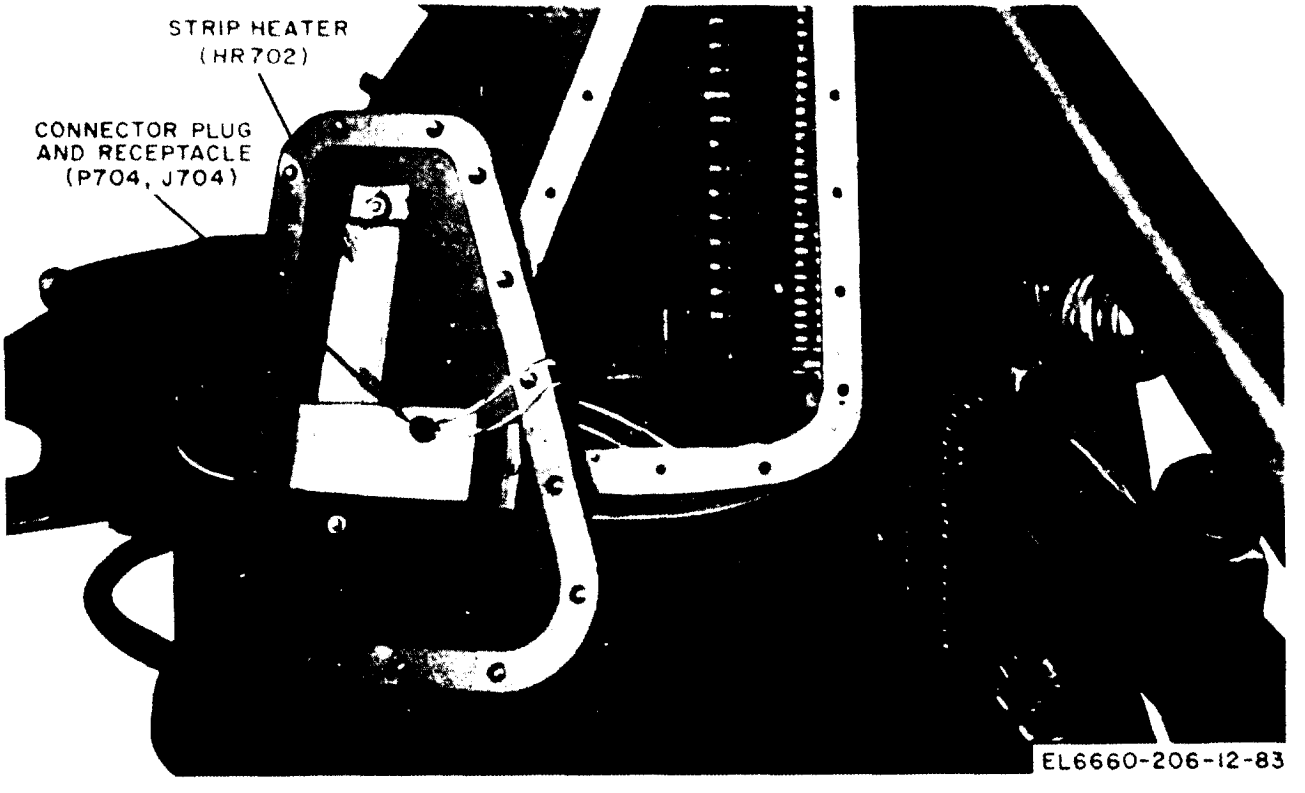


Figure 3-9. Azimuth unit, order number 01754-PP-59, view showing heater strip.

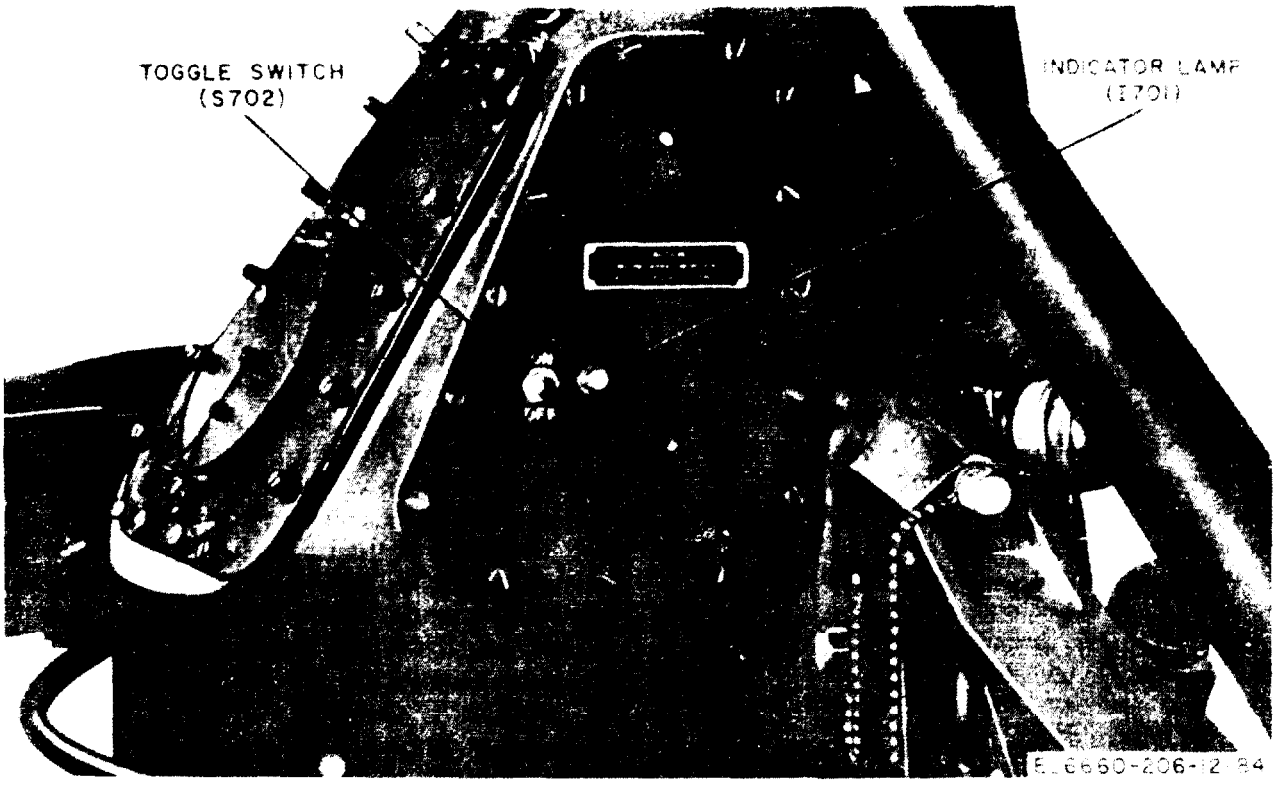


Figure 3-10. Azimuth unit, order number 01754-PP-59, view of modified cover plate.

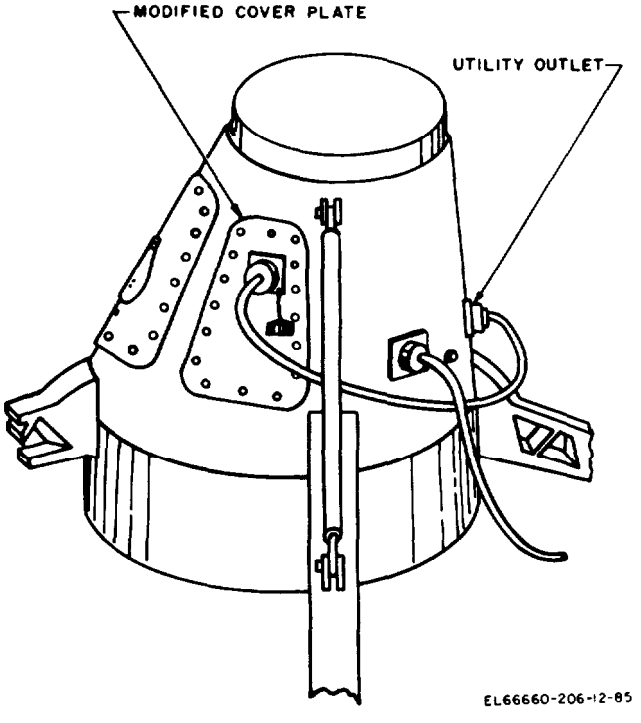


Figure 3-11. Added heater lamp on early model azimuth units.

3-11. Operation in Desert Climates

a. If excessive condensation occurs (because of extreme radiational cooling during the night), use the measures prescribed in paragraph 3-10 to insure proper operation of the equipment.

b. The main problem arising in equipment operation in desert areas is the large amount of sand or dust and dirt which enters the moving parts of the rawin set, such as the elevation and azimuth drives and the antenna scanner assembly. Be sure that all covers of the elevation unit (fig. 1-14) and the sides and bottom cover of the azimuth unit (fig. 1-2) are secured tightly.

c. When operating in a desert climate, keep the control-recorder in a building or tent. Do not allow sand or dust to accumulate on the print-cycle of this unit.

d. Do not tie the power or main cables to the inside or outside of tents. Desert areas are subject to sudden wind squalls that may break the lines.

e. Make frequent preventive maintenance checks (ch. 4). Pay particular attention to the lubrication of equipment (ch. 5). Excessive amounts of dust or sand that come into contact with oil and grease result in grit, which will damage the equipment.

f. Wrap the rawin set in tarpaulin when not in use. Tarpaulin covering adjusted to the contours of the rawin set may be fabricated locally.

3-12. Operation in High Velocity Winds

The rawin set is designed to stand upright unassisted in winds of 60 miles per hour (mi/h) or less. In regions where the winds of this velocity or higher can be expected, the rawin set should be anchored by means of sandbags, cables, or other appropriate means. When not in use, the rawin set should be left with the antenna axis set to the vertical position.

3-13. Operation in Salt Air and Sea Spray

The equipment must be protected from salt spray and kept free of salt and saline solutions. Wash contaminated areas with fresh water and dry thoroughly. Refer scratches and nicks that penetrate the finish to organizational maintenance personnel. Cover the equipment with clean plastic or canvas when not in use.

3-14. Operation Through Electronic Countermeasures

Refer problems with manmade interferences to organizational personnel. See TM 11-750 for operator's radar countermeasures information.

CHAPTER 4

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. SCOPE, TOOLS, AND EQUIPMENT

4-1. Scope of Operator's Maintenance

a. Listed in *b* below are the maintenance duties normally performed by the operator of Rawin Set AN/GMD-1(*). All equipments that comprise a rawinsonde system are necessary for these procedures. The materials required are listed in paragraph 4-2.

b. Operator's maintenance duties for Rawin Set AN/GMD-1(*) are listed in (1) through (5) below:

(1) Preventive maintenance (para 4-4).

(2) Operational check (para 4-8).

(3) Checking cable connections (table 2-7).

(4) Cleaning equipment (para 4-2).

(5) Replacement of control-recorder ribbon and paper (para 4-6 and 4-7).

4-2. Materials and Tools Required for Maintenance

Materials required. by the operator to perform the required maintenance on Rawin Set AN/GMD-1(*) are listed in *a* through *f* below.

a. Cloths, textile, lint-free.

b. Cleaning Compound (National Stock No. 6850-00-105-3084).

c. Friction tape, ¾-inch.

d. Electrical rubber tape, ¾-inch.

e. Lens tissue.

f. Camel's-hair brush.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Section II. MAINTENANCE

4-3. Visual Inspection

a. When the rawin set fails to perform properly, move the POWER switch (fig. 4-1) at the control-recorder to OFF and check all items listed below. Do not check any item with the power on.

(1) Settings of switches and controls (para 3-3).

(2) Worn, broken, loose, or disconnected cables, or plugs.

b. If none of the above troubles is evident, proceed to the operational checklist (para 4-8).

4-4. Preventive Maintenance and Services

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 4-3, 4-5, and 4-8 cover systematic care essential to proper upkeep and operation of the raw in set. The cleaning operations (para 4-5) should be performed once a day. If the equipment is not used daily, however, the cleaning operations must be performed before operation and after any extended shutdown, or once a week while the equipment is kept in the standby condition. The other items must be checked before the equipment is placed in operation after a shutdown, during the operation or after it is turned off, as specified in the applicable paragraph.

b. Preventive Maintenance Checks and Services. To

ensure that the Rawin Set is always ready for operation, inspect it systematically to discover and correct defects. The necessary preventive maintenance checks and services to be performed are listed in Table 4-1. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if deficiency is noted during operation which would damage the equipment. Records and reports of these checks and services must be made in accordance with the requirements set forth in DA Pam 738-750.

Table 4-1. Operator/Crew Preventive Maintenance Checks and Services

NOTE

The checks in the "Interval" column are to be performed in the order listed.

B - Before operation

Item No.	Interval B	Item to be inspected Procedure	Equipment is not ready/available if:
1	*	Radiosonde Recorder AN/TMQ-5(*). Perform PMCS checks as described in TM 11-6660-204-10.	Equipment fails to support assigned mission.
2	*	Radiosonde Set AN/AMT-4(*). Perform PMCS checks as described in TM 11-6660-228-10.	Equipment fails to support assigned mission.
3	*	Test Set TS-538(*)/U. Perform PMCS checks as described in TM 11-6660-213-12.	Equipment fails to support assigned mission.
4	*	Meteorological Station AN/TMQ-4. Perform PMCS checks as described in TM 11-6660-218-12.	Equipment fails to support assigned mission.
5	*	Radiosonde Baseline Check Set AN/GMM-1(*). Perform PMCS checks as described in TM 11-6660-219-12.	Equipment fails to support assigned mission.
6	*a*	Final system performance check. Perform operational checks as described in Chapter 2, paragraph 2-34 and Chapter 4, paragraph 4-9.	Equipment fails to support assigned mission.

* Do this check before each deployment to a mission location. This will permit any existing problems to be corrected before the mission starts. The check does not need to be done again until redeployment.
a. Perform after deployment, before operation and as required.

Table 4-2 (Deleted)

4-5. Special Cleaning Procedures

a. General. For best results, clean the individual component of the rawin set with a clean cloth. If the component cases or exteriors of the units themselves have accumulated a film of oil or grease, use cleaning fluid or cleaning compound on the cloth; then thoroughly dry the units and cases with a clean dry cloth.

b. Telescope and Glass Windows. Remove dust from the lenses, glass windows, or indicator lens with a camel's-hair brush. Remove oil or grease by applying a small amount of lens-cleaning soap; use lens tissue. Wipe dry with a clean piece of lens tissue.

WARNING

Before proceeding with the next step, be sure that the MAIN POWER switch on the control-recorder is in the OFF position.

c. Cleaning Connectors. Inspect all cable connectors for film of oil or grease on connector pins and jack insulation. Wipe off all oil and grease, using a clean, dry, lint free cloth.

d. Rawin Set Exterior Cleaning. Before washing the exterior of the rawin set main assembly, first make sure that all indicator window covers, front panels, and azimuth unit cover plates are tightly secured. Wipe the units with a rag or sponge while pouring water over them, either from a low pressure hose or buckets. When finished, wipe off the excess water with a dry cloth or sponge. Clean the control-recorder with cleaning compound only, and dry thoroughly.

4-6. Replacement of Paper in Control-Recorder

Two paper spools are mounted on a rack at the rear of the chassis (figs. 4-1 and 4-2). The lower (active) spool is used during operation of the equipment, and the upper (spare) spool is used as a spare. When the active spool is almost used up, an orange color appears on the paper. The active spool may be replaced (if necessary) during equipment operation or during maintenance periods, as directed in *a* through *k* below.

a. Release the two latches on the hinged door at the top of the control-recorder by pulling up on the two handles at the same time, lift the door and allow it to rest in its extreme open position.

b. Release the shaft latch at the left of the active spool and remove the spool from the rack.

c. Remove the remainder of the paper from the active spool, thus allowing the control-recorder to continue printing.

d. If scotch tape is available, fasten the end of the paper to the beginning of the paper on the spare spool.

e. Depress the paper release lever and pull the paper out through the paper chute until the splice *(d* above) is clear of the end of the paper chute.

f. If the paper on the active spool has run completely out, then place the spare spool in the active spool position by inserting the pointed end of the shaft in the hole at the lower right of the rack, and release the latch on the left side of the rack to allow the spool to go into the slot. The latch is spring-loaded and will lock the spool in place when released.

g. On the empty spool, loosen the setscrew that holds the paper retainer on the pointed end of the shaft and pull the paper retainer off the shaft.

h. Install a new roll of paper (from running spares) so that the beginning of the paper will unroll clockwise (looking at the pointed end of the spool shaft).

i. Slide the paper retainer on the shaft until it fits securely against the paper spool, and then tighten the setscrew.

j. Place the loaded spare spool into position, inserting the pointed end of the shaft in the hole at the upper right of the rack and release the latch on the left side of the rack to allow the spool to go into the slot. Release the latch and it will spring back into position.

k. Close the top door of the control-recorder.

4-7. Replacement of Control-Recorder Ribbon

To check the condition of, or remove and replace the ribbon in the control-recorder (fig. 4-1) proceed with *a* through *m* below.

a. Remove the access panel by pressing in on the two Dzus fasteners, turn counterclockwise to release, and lift the panel away from the chassis.

b. Remove the paper chute by sliding the chute to the left until the shaft is disengaged from the cone-pointed screw at the right, pull it off the cone-pointed screw at the left, and let it hang outside the access hole as shown in figure 4-1.

c. Pull the retainers off the ribbon feed shafts.

d. Slip the ribbon spools off the bobbins.

e. Slide the ribbon out from under the guides and remove through the access hole.

NOTE

On control-recorders, on order No. 29114-PP-58 and subsequent orders, the ribbon may be reversed because only half of it is used at a time, proceed with *h* below using the same ribbon, exchanging sides with existing spools.

f. If a new ribbon is needed, wind the worn ribbon on one of the spools, and slide the clip off the empty ribbon spool.

g. Secure a new ribbon from the running spares and fasten the loose end of the new ribbon to the empty spool by securing it with the clip *(f* above).

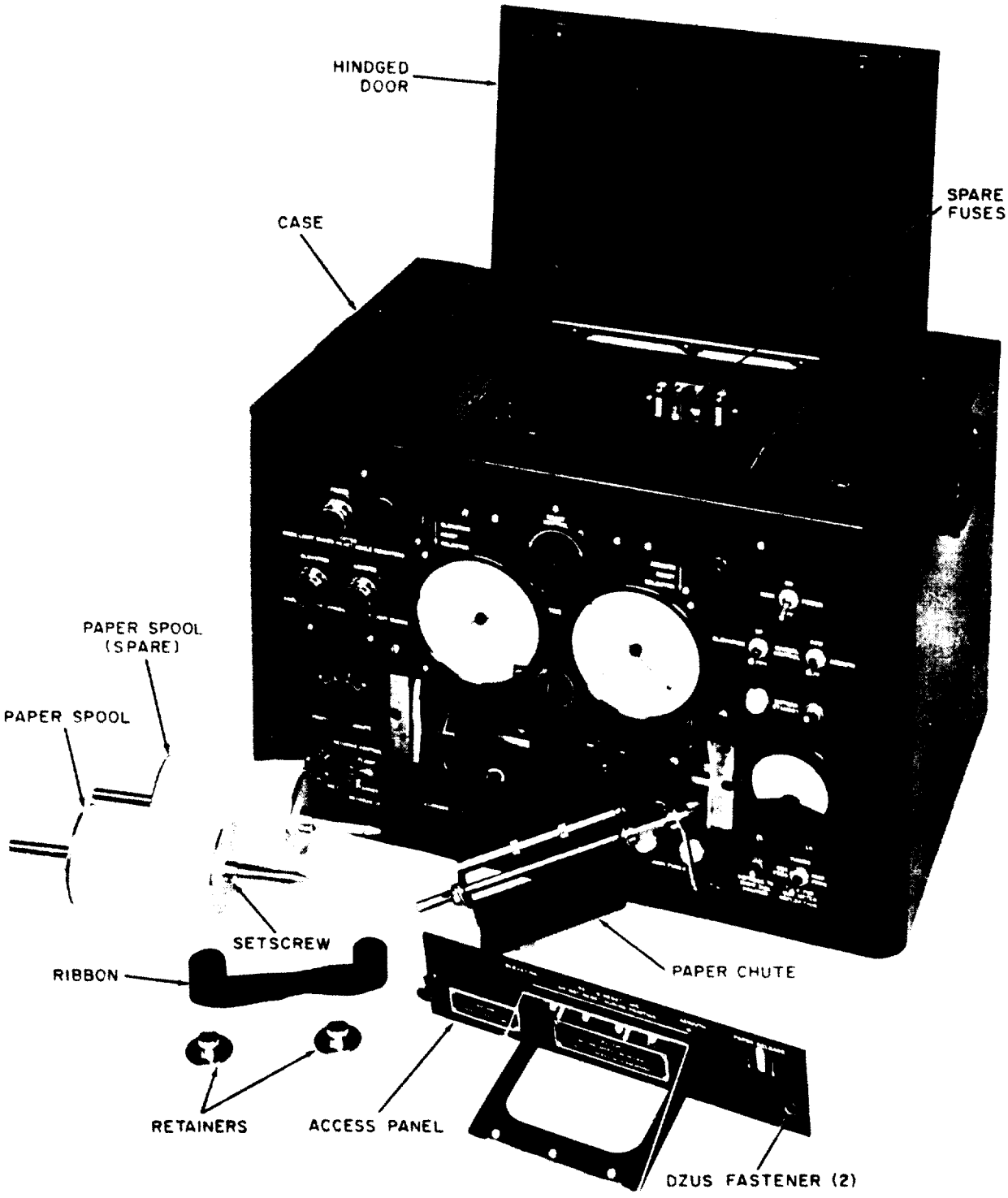


Figure 4-1. Control-Recorder C-577(*)/GMD-1, partially exploded view.

h. Slide the new ribbon under the guides.

i. Slide the ribbon spools on the shafts, align the locating holes in the ribbon spools with pins on the rear bobbins, and press the spools against the bobbins.

j. Take up the slack in the ribbon.

k. Replace the retainers on the ribbon feed shafts.

l. Replce the paper chute by sliding it through the access hole, engage the shaft with the spring-

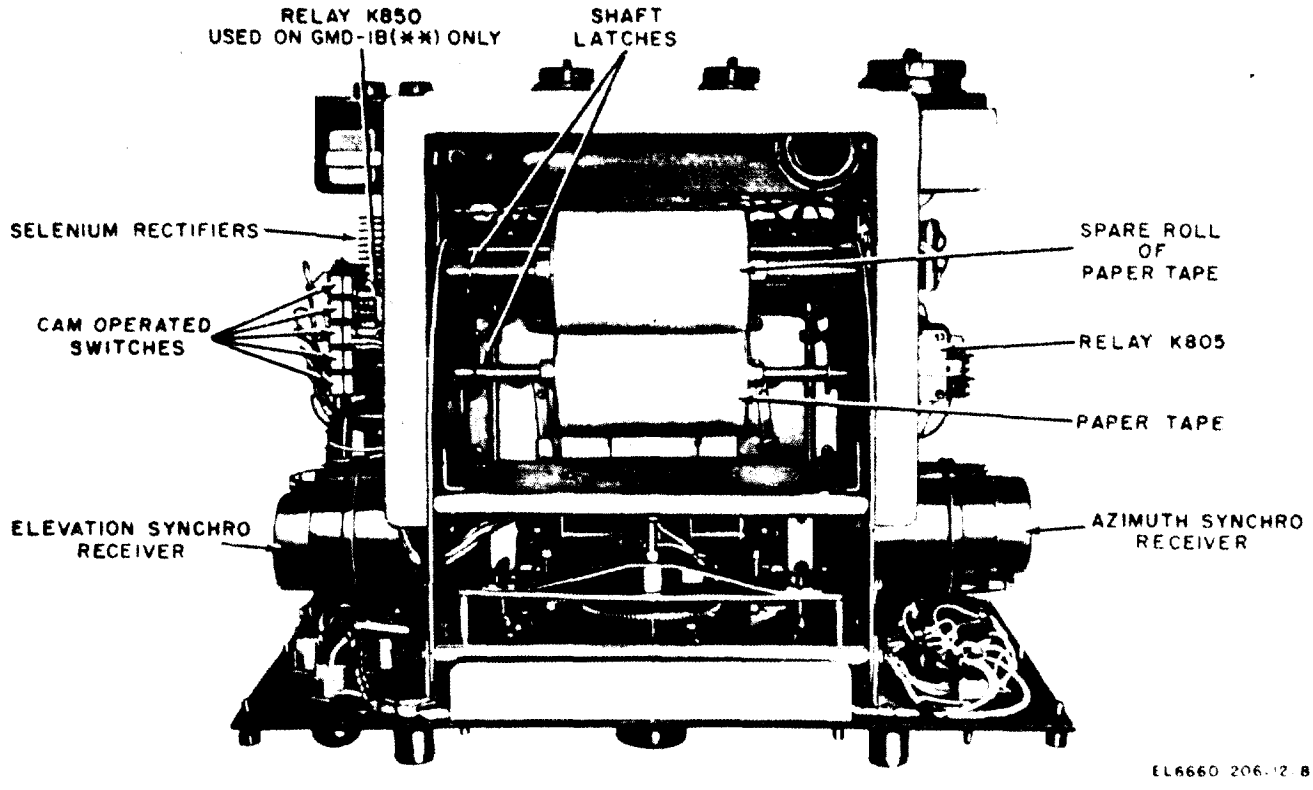


Figure 4-2. Control-Recorder C-577E/GMD-1, top view.

loaded cone-pointed screw at the left, depress the shaft toward the left until it can be engaged with the cone-pointed screw at the right.

m. Replace the access panel by fitting it in place on the front panel and secure the two Dzus fasteners.

4-8. Operator's Troubleshooting Checklist

a. General. The operator's troubleshooting checklist (table 4-3) will help the operator to locate a trouble in the rawin set. The corrective measures listed in the checklist are used to repair the trouble. If the measures suggested do not restore the equipment to normal operation, troubleshooting is required by higher maintenance personnel. The operator should place a tag on the equipment, describing the rawin set performance prior to a failure, listing the corrective measures taken, and then inform higher level maintenance that trouble exists in the rawin set which he cannot locate or fix.

b. Procedure. Follow the items listed in the checklist in numerical order, performing the actions or checking the conditions listed against the normal indications listed. If the indications are abnormal, perform the corrective measures noted in the list. If the corrective measures do not repair the trouble, or if the list states that higher level maintenance is required, mark the maintenance checklist indicating the trouble area, then inform higher level maintenance personnel that troubleshooting is necessary.

4-9. Operational Tests

NOTE

These tests are made with the rawin set operating in a system (paras 3-2 through 3-5) except that the radiosonde is transmitting from the baseline check set instead of in flight.

a. Elevation and Azimuth Angle Indicators.

(1) Make sure that the rawin set is leveled properly (para 5-15).

(2) Check the orientation of the rawin set.

(3) Make sure that the azimuth angle indicator on the azimuth unit, the elevation angle indicator on the elevation unit, the azimuth and elevation indicators on the control-recorder front panel, and the recorded angles indicate the reference point.

(4) If the angle indicators do not indicate the proper angles, proceed as follows: Reset the angle indicators of the azimuth unit and elevation unit until the proper readings are obtained. This is done by rotating the slotted shafts located near each indicator (figs. 3-5 and 3-6). To reset the angle indicators of the control-recorder, depress the desired RESET SELECTOR lever and rotate the RESET CONTROL until the proper reading is obtained.

(5) Set the MANUAL-NEAR AUTO-FAR AUTO control on the antenna control to MANUAL; check to see that the position of the reflector changes and the angle indicators vary in relation to the movement of the following manual controls:

Table 4-3. Operator's Troubleshooting Checklist

Step	Action or condition	Normal indication	Corrective measures
1	Set controls and switches as indicated in paragraph 3-3.		
2	Check cable connections (fig. 2-37) -------	All cables connected properly, and are tight.	Tighten all loose cables.
3	Perform the procedures given in paragraph 3-2 relating to the radiosonde.	Normal operation of the radiosonde and radiosonde baseline check set.	Refer to TM 11-6660-228-10 and TM 11-6660-220-10 for the radiosonde being used, and TM 11-6660-219-12 for the radiosonde baseline check set.
4	Set the control-recorder MAIN POWER switch to ON. Allow a 15-minute warm-up period.	Control-recorder angle indicator lamp lights. Control-recorder POWER INTERRUPTED indicator lamp lights.	Check power cable connection (fig. 2-37) and power source. Inform higher category of maintenance personnel.
5	Receiver POWER switch is at ON, switch DIAL LIGHT to ON.	Dial lamp should light ----------	Inform higher category of maintenance personnel.
6	Antenna control POWER switch is at ON.	POWER INDICATOR lamp lights ----	Inform higher category of maintenance personnel.
7	Check MOTORS STANDBY lamp on antenna control.	Should not light ----------	Push the MOTORS switch on the antenna control to opposite position from where it is.
8	On control-recorder, push down on ELEVATION RESET SELECTOR and turn RESET CONTROL until elevation angle indicator reading matches that on elevation unit, then release the ELEVATION RESET SELECTOR.	ELEVATION indicator lamp should light. Lamp that illuminates the elevation in the elevation unit should light.	Inform higher category of maintenance personnel. Inform higher category of maintenance personnel.
9	On control-recorder, push down on AZIMUTH RESET SELECTOR and turn RESET CONTROL until azimuth angle indicator reading matches that on the azimuth unit, and then release the AZIMUTH RESET SELECTOR.	AZIMUTH indicator lamp should light. Lamp illuminating azimuth indicator in azimuth unit should light. POWER INTERRUPTED lamp should go out.	Inform higher category of maintenance personnel. Inform higher category of maintenance personnel. Inform higher category of maintenance personnel.
	CAUTION: Check to see that the stow locks (fig. 1-20) are fully counterclockwise before operating the azimuth or elevation drive controls.		
	CAUTION: Do not apply physical force of any kind to the rim of the reflector in an attempt to orient or position the antenna because force may distort the antenna pattern.		
	CAUTION: Do not hold the DOWN-UP or CCW–CW switches in the energized position longer than 60 seconds during any antenna training operation or the motors and control circuit may be damaged.		

Step	Action or condition	Normal indication	Corrective measures
10	Operate the ELEVATION and AZIMUTH knobs on the left side of the housing as necessary to orient the reflector toward the baseline check set that contains the radiosonde. (On the AN/GMD-1B* or AN/GMD-1B**, the ELEVATION and AZIMUTH slewing switches maybe used for this operation.)	The reflector should move in the desired direction.	Inform higher category of maintenance personnel.
11	Operate the TUNING switch on the receiver to either the INCREASE FREQ or DECREASE FREQ as necessary to set the FREQUENCY MEGACYCLES dial to 1,680 MHz.	FREQUENCY MEGACYCLES dial will turn to 1,680 MHz.	Inform higher category of maintenance personnel.
12	With the radiosonde operating properly (para 3-2), observe the TUNING METER on the receiver.	Between 60 and 70 on TUNING METER.	If the TUNING METER reads low, operate the TUNING switch to INCREASE FREQ or DECREASE FREQ, as necessary. If the TUNING METER reads high, turn the ELEVATION and AZIMUTH knobs to position the reflector away from the direction of the baseline check set until the correct reading is obtained.
13	Listen for sound from the receiver speaker	An audible signal (5 to 200 Hz) is heard.	Turn SPEAKER GAIN potentiometer for desired level of sound.
14	Operate the ELEVATION and AZIMUTH controls on the antenna control to position the reflector slightly away from the baseline check set; then turn the MANUAL-NEAR AUTO-FAR AUTO switch to NEAR AUTO.	The reflector should turn by itself back toward the baseline check set and stay there.	Inform higher category of maintenance personnel.
15	Return the MANUAL-NEAR AUTO-FAR AUTO switch on the antenna conto MANUAL. Position the reflector as necessary to obtain a reading between 60 and 70 on the receiver TUNING METER.	Same as item 12 ----------	Same as item 12.
16	Operate the MOTORS STANDBY switch located on the control-recorder panel.	The MOTORS STANDBY indicators on the control-recorder and antenna control should light.	Inform higher category of maintenance personnel.
17	Operate the RECORDS CONTROL switch on the control-recorder to the BASELINE CHECK position, and perform the baseline check (para 3-2 *g).*	Control-recorder should not print, the radiosonde recorder should print.	Check for improper control settings. Inform higher category of maintenance personnel.
18	After a satisfactory baseline check is completed, turn the RECORDS CONTROL switch to FLIGHT, and the PRINTINGS PER MINUTE switch to 10.	Control-recorder should print elevation and azimuth angles and time to agree with readings of the ELEVATION, AZIMUTH, and TIME indicators at a rate of 10 times per minute.	Inform higher category of maintenance personnel.
19	Repeat item 18 for printing check in the 2 and 1 positions of the PRINTINGS PER MINUTE switch.	Printings (18 above) should occur two times and one time per minute, respectively.	Inform higher category of maintenance personnel.
20	Refer to paragraph 3-6 for stopping procedures.	All indications of power should be removed.	Inform higher category of maintenance personnel.

(a) AZIMUTH and ELEVATION controls on the antenna control and on the right side of the housing.

(b) AZIMUTH and ELEVATION slewing switches on the right side of the housing (AN/GMD-1B).

(c) MANUAL CONTROL AZIMUTH CCW–CW and ELEVATION switches on the control-recorder.

b. Automatic Tracking.

(1) Move the reflector slightly away from the source of signal (radiosonde), using the controls described in *a* (5) above.

(2) Set the MANUAL-NEAR AUTO-FAR AUTO control on the antenna control to the NEAR AUTO. The reflector should orient itself toward the radiosonde.

(3) Repeat (1) and (2) above by moving the reflector slightly away from the source in different directions. (To move the reflector manually, first set the MANUAL-NEAR AUTO-FAR AUTO control on the antenna control to MANUAL.)

c. Afc-Manual Control.

(1) Set the AFC-MANUAL switch on the receiver front panel to MANUAL.

(2) Move the TUNING switch on the receiver front panel to INCREASE FREQ and then to DECREASE FREQ, holding the switch in each of these positions while the FREQUENCY MEGACYCLES indicator varies through its entire range. The frequency range indicated should be between 1,655 and 1,705 MHz. Make the same check by means of the TUNE FOR MAX METER DEFLECTION switch on the control-recorder. Reset the FREQUENCY MEGACYCLES indicator to read 1,680 MHz with either of the above switches.

(3) On the control-recorder, push the DEPRESS TO SHOW DIAL POSITION switch and operate the TUNE FOR MAX METER DEFLECTION switch. Note that the reading of the TUNING METER varies.

(4) Set the AFC-MANUAL switch on the receiver front panel to MANUAL. If the frequency of the local oscillator is slightly off but within pull-in range of the afc circuit, the FREQUENCY MEGACYCLES indicator will move to the correct frequency automatically. Set the TUNING switch to INCREASE FREQ and then to DECREASE FREQ to purposely move the local oscillator off frequency. Note that the FREQUENCY MEGACYCLES indicator will move back to the correct frequency.

d. Control-Recorder Print Check.

(1) With the radiosonde sending a meteorological signal, set the RECORDS CONTROL switch on the control-recorder to FLIGHT.

(2) Check the printings on the tape while the PRINTINGS PER MINUTE switch is in positions 1, 2, and 10. Count the printings per minute on tape to see that they correspond to the switch setting.

(3) Depress the TIME PRINT ONLY switch on the control-recorder; a time print recording, with an asterisk (fig. 3-8), is obtained on the tape.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE

Section I. GENERAL

5-1. Scope of Maintenance

The maintenance information contained in this portion of the manual is provided to enable the repairman to keep the rawin set in operating condition. By using proper preventive maintenance, the organizational level technician can reduce the number of breakdowns of equipment to a minimum. The use of proper preventive maintenance procedures will enable the technician to detect slight abnormal conditions in the rawin set and correct these conditions before they cause a major breakdown of the set.

5-2. Tools, Materials and Test Equipment

A list of parts for Rawin Set AN/GMD-1(*) for organizational maintenance is contained in TM 11-6660-206-20P. The tools, materials, and test equipment required for organizational preventive maintenance are listed in *a* through *c* below.

a. Tools.

(1) *Speed wrenches.* Two speed wrenches, which are used in the installation of the rawin set, are packed in the accessories case and are a part of the rawin set.

(2) *Phase adjustment tool.* A phase adjustment tool (fig. 2-3) is packed in the accessories case. This tool is used to adjust the phasing of the reference voltage generator.

(3) *Tool Kit, Electronic Equipment TK-101/G.* This tool kit is not supplied with the rawin set, but is required to perform organizational maintenance.

b. Materials.

(1) Cleaning, compound (National Stock No. 6850-00-105-3084).

(2) Lens, tissue.

(3) Thinner, paint, mineral spirits TPM-1.

(4) Lubricating oil, (PL special).

(5) Grease, aircraft and instrument (GL).

c. Test Equipment.

(1) *Multimeter TS-352B/U.* The multimeter is used for voltage and continuity measurements.

(2) *Test Set TS-538/U.* The test set is used to orient the rawin set and to test its operation.

(3) *Electron Tube Test Set TV-7/U.* The test set is used to check the condition of electronic vacuum tubes.

Section II. PREVENTIVE MAINTENANCE

5-3. General

To insure that the rawin set is always ready for operation, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services are listed and prescribed in table 5-1. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for further correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation that would damage the equipment. Record all deficiencies together with the corrective action taken as prescribed in DA Pam 738-750.

5-4. Preventive Maintenance Checks and Services

The items listed in table 5-1 should be inspected or serviced by organizational personnel on a weekly, monthly, or quarterly basis as indicated.

NOTE

If the equipment must be kept in continuous operation, check or service only those items that can be checked and serviced without disturbing operation; perform the complete checks and services when the equipment can be shut down.

Table 5-1. Organizational Preventive Maintenance Checks and Services

NOTE

The checks in the "Interval" column are to be performed in the order listed.

M-Monthly

Item No.	Interval M	Item to be inspected	Procedures
1	*a*	Lubrication.	Ensure that equipment is properly lubricated as explained in paragraphs 5-7 through 5-10.
2	*a*	Standby Power Equipment.	Ensure that the power meets the requirements explained in paragraph 2-20.
3	*a*	Rawin Set AN/GMD-1(*).	Ensure that equipment meets the alignment and adjustment requirements explained in paragraphs 2-22 through 2-28.
4	*a*	Rawin Set AN/GMD-1(*).	Ensure that equipment functions properly as explained by the operational test procedures in paragraph 4-9 of this manual and TM 11-6625-213-12 for the Test Set TS-538(*)/U.

a As required.

Table 5-2. (Deleted)

5-5. Special Cleaning Procedures

a. Cleaning Rear Housing Air Cleaners. Remove the large cover assembly from the outside of the housing unit (fig. 2-18). Remove the air cleaner from the fan frame assembly. Because the air cleaner is impregnated with oil it must be immersed in an oil emulsifier, blown out with an airhose, washed with hot water and soap, and dried. After the air cleaner is dry, apply oil to the surface before reinstalling.

All data on pages 5-3 and 5-4 deleted.

b. Cleaning Side Housing Air Cleaners. To clean the housing side air vent screens (fig. 1-17), remove both the receiver and antenna control units from the housing. If an airhose is available, apply blasts of air to remove dust and dirt from the screen. However, if an airhose is not available, remove the four dust shields (fig. 5-9) and the air vent screens. Wash the screens with hot water and soap, dry, and reinstall.

5-6. Repainting and Refinishing

a. When the finish on the components of the main assembly or on the case of the control- recorder has been scarred or damaged badly, corrosion can be prevented by touching up bared surfaces. Use No. 000 sandpaper to clean the surface down to the bare aluminum; obtain a bright, smooth finish. Sand the area back to solid paint and feather the paint edge that leads to the exposed metal. Wipe the area clean and apply to metal surfaces one coat of zinc chromate metal primer and two finish coats of OD TT-E-475C, type 2.

b. When a touchup job is necessary, apply paint with a small brush. Remove rust by cleaning corroded metal with cleaning compound. In severe cases, it may be necessary to use cleaning compound to soften the rust and to use sandpaper to complete the preparation for painting. Apply paint as directed in *a* above.

Section III. LUBRICATION INSTRUCTIONS

5-7. General

Lubrication points for Rawin Set AN/GMD-1(*) are shown in figures 5-1 through 5-4; closer views of points difficult to see are illustrated in figures 5-5 through 5-9. A month interval consists of 30 days of normal 8-hour operation. If the equipment is operated more than 8 hours a day, the lubrication intervals will have to be adjusted to prevent excessive wear. For example, if the rawin set has to be operated 16 hours a day instead of 8, all lubrication periods have to be cut in half; monthly (M) periods would become twice a month, and so on. The type of lubricant to be used, the lubrication interval, and special lubrication instructions are given directly on the respective illustrations. Additional instructions necessary for lubrications are given in paragraphs 5-8 through 5-10.

5-8. Disassembly Required for Lubrication

To lubricate the rawin set properly, the repairman must partly disassemble various components of the rawin set. The instructions given in procedures *a* through *f* below, show the procedure necessary to enable the repairman to reach the necessary lubricating points.

a. Azimuth Angle Indicator. To reach the azimuth angle indicator gears and the indicator drive bearings in the azimuth unit (fig. 5-1), remove the cover that contains the azimuth angle indicator window by releasing the 17 captive thumbscrews that hold the cover plate onto the azimuth unit. Lubricate the components indicated on the lubrication chart and replace the azimuth unit cover plate.

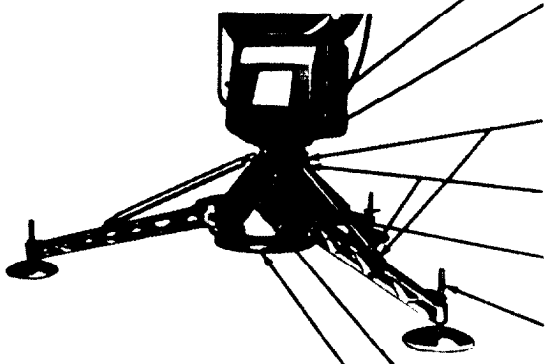
b. Azimuth Drive. Remove the cover that is directly clockwise in position from the cover with the azimuth angle indicator window, by releasing the 17 captive thumbscrews. Lubricate the azimuth unit turntable lower bearings and the azimuth drive motor. Replace azimuth unit cover plate.

c. Elevation Unit. Remove the elevation unit cover by releasing the 26 captive thumbscrews that hold the cover plate onto the elevation unit (fig. 5-2). Lubricate the elevation unit elevation angle indicator gears, the counterbalance drive bearings and gear segment, and the elevation drive motor. Replace the elevation unit cover plate.

d. Receiver. On the rawin receiver (fig. 5-3), release the 18 front panel captive screws and pull the receiver chassis forward until the stop is reached. Lubricate the tuning motor gears, replace the receiver chassis in the housing and reengage the captive screws.

e. Control-recorder. To lubricate the control-recorder (fig. 5-4), release the six front panel captive screws and the four screws at the rear, and remove the control-recorder from the case. Lubricate the control-recorder gears and ratchet wheels, the gear trains, and the bearings and rubbing surfaces. Replace the control-recorder in the case and reengage the screws.

f. Azimuth Drive Gears. To lubricate the azimuth unit azimuth drive gears (fig. 5-6), disassemble the rawin set (ch. 7), and then turn the azimuth unit on its side and remove the 24 screws that fasten the azimuth unit bottom cover plate to the azimuth unit. Lubricate the azimuth drive gears and replace the azimuth unit bottom plate. Reassemble the rawin set (ch. 2).



Interval-Lubricant

M PL **STOW LOCK SHAFT**
Apply liberally, rotate to spread

A GL **TURNTABLE UPPER BEARING**
Apply sparingly with manually operated grease gun.

M GL **COMPRESSION BARS MOUNTING SCREWS**
Coat lightly.

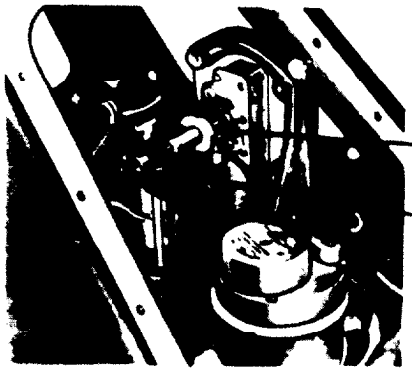
M GL **COMPRESSION BARS TURNBUCKLE**
Coat lightly

M GL **OUTRIGGER LEGS MOUNTING SCREWS**
Coat lightly.

W GL **JACK SCREWS**
Coat lightly.

M PL **COVER HINGE**
Apply liberally.

A GL **AZIMUTH DRIVE GEARS**
Apply sparingly to gear teeth.



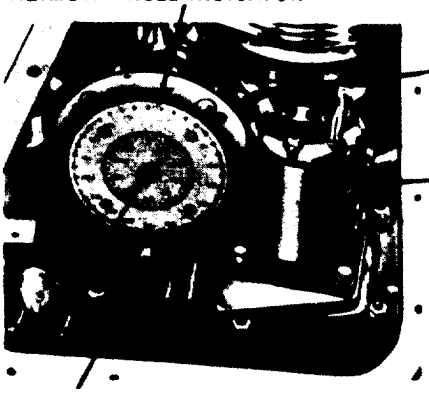
REMOVE COVER PLATE TO SERVICE

Interval-Lubricant

S GL **AZIMUTH ANGLE INDICATOR GEARS**
Apply sparingly to gear teeth

M PL **INDICATOR DRIVE BEARINGS**
Apply a few drops.

AZIMUTH ANGLE INDICATOR



REMOVE COVER PLATE TO SERVICE

Interval-Lubricant

A GL **TURNTABLE LOWER BEARING**
Apply sparingly with manually operated grease gun.

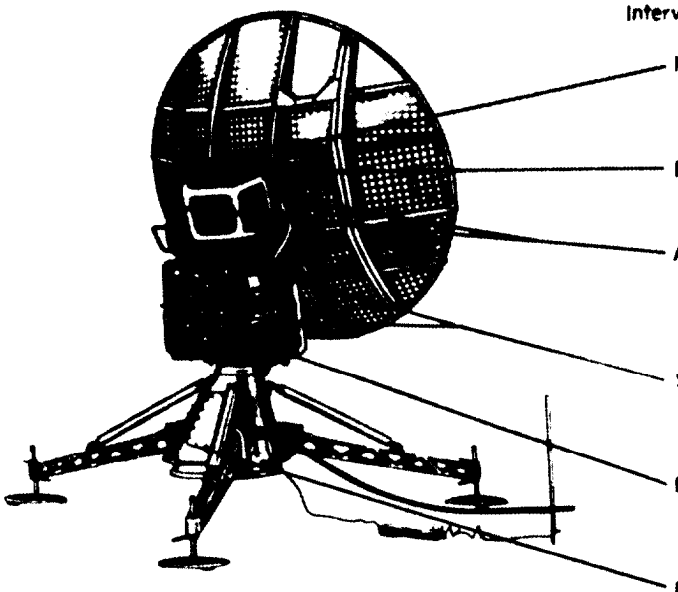
S GL **AZIMUTH DRIVE MOTOR**
At each end, remove 2 grease plugs, apply sparingly.

INDICATOR ADJUSTMENT SCREW

CLEANING—SOLVENT, dry-cleaning, only will be used to clean parts. Before lubricating clean exposed surfaces of parts with lintless cloth lightly dampened with SOLVENT, dry-cleaning. Do not allow cleaning fluid to get on other parts.

LUBRICANTS	SPEC	INTERVAL
PL—OIL, Special	VV-L-800	W—Weekly M—Monthly S—Semiannually A—Annually
GL—GREASE, lubricating Low temperature	MIL-G-23827	

Figure 5-1. Lubrication chart, Pedestal AB-159(*)/GMD-1.



Interval – Lubricant

M PL **ANGLE INDICATOR COVER HINGE**
Apply liberally.

M PL **STOW LOCK SHAFT**
Apply liberally, rotate to spread.

A GL **TRUNNION BEARINGS**
Apply sparingly with manually operated grease gun.

S GL **CHASSIS LOCKS**
Apply liberally.

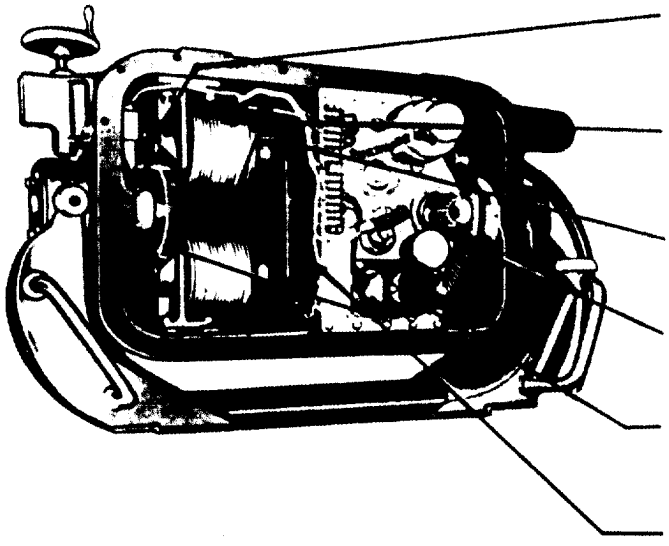
M PL **CAPTIVE SCREWS**
Apply 2 to 3 drops.

M PL **COVER ASSEMBLY SCREWS**
Apply 2 to 3 drops.

CLEANING – SOLVENT, dry-cleaning, only will be used to clean parts. Before lubricating clean exposed surfaces of parts with lintless cloth lightly dampened with SOLVENT, dry cleaning. Do not allow cleaning fluid to get on other parts.

REMOVE COVER PLATE TO SERVICE

Interval – Lubricant



S GL **ELEVATION ANGLE INDICATOR GEARS**
Apply sparingly to gear teeth.

S GL **COUNTERBALANCE SPRINGS**
Apply liberally.

M PL **INDICATOR DRIVE BEARINGS**
Apply a few drops.

A GL **GEAR SEGMENT**
Apply sparingly to gear teeth.

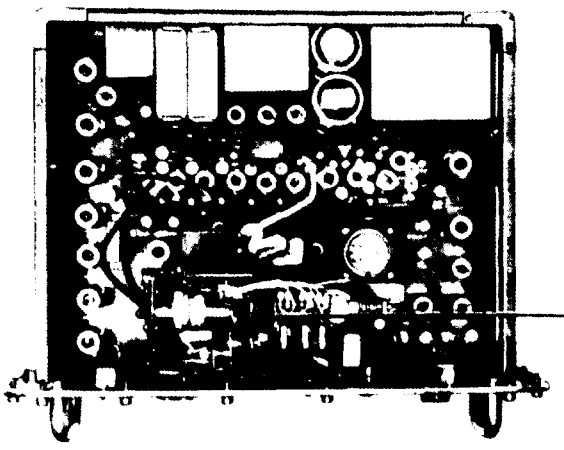
S GL **ELEVATION DRIVE MOTOR**
At each end remove 2 grease plugs, apply sparingly.

A GL **ELEVATION DRIVE AND COUNTER-BALANCE SPRING GEARS**
Apply sparingly to gear teeth.

LUBRICANTS	SPEC	INTERVAL
PL – OIL, Special	VV-L-800	M–Monthly S–Semiannually A–Annually
GL–GREASE, lubricating Low temperature	MIL-G-23827	

EL6660-206-12-89

Figure 5-2. Lubrication chart, elevation unit assembly.



REMOVE FROM HOUSING

Interval-Lubricant

S GL TUNING MOTOR GEARS
Apply sparingly to gear teeth

CLEANING—SOLVENT, dry-cleaning, only will be used to clean parts. Before lubricating clean exposed surface of parts with lintless cloth lightly dampened with SOLVENT, dry-cleaning. Do not allow cleaning fluid to get on other parts.

LUBRICANTS	SPEC	INTERVAL
GL—GREASE, lubricating Low temperature	MIL-G-23827	S—Semiannually

EL6660-206-12-90

Figure 5-3. Lubrication chart, Rawin Receiver R-301(*)/GMD-1.

5-9. Lubrication Under Usual Conditions

WARNING

Cleaning compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

a. Cleaning. Be sure that lubricants and points to be lubricated are clean and free from sand, grit, or dirt. These abrasives are the chief cause of bearing wear, which often necessitate bearing replacements. When the unit is overhauled or repairs are made, parts should be cleaned with cleaning compound.

WARNING

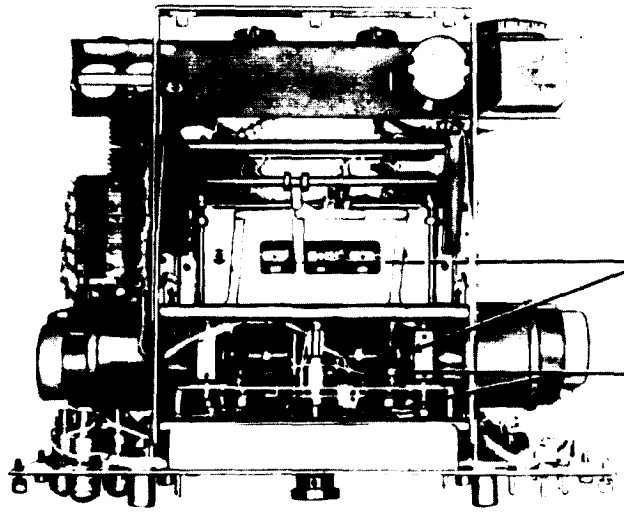
Gasoline shall not be used as a cleaning fluid for any purpose.

b. Changing Location. When the rawin set is dismantled for transportation, all mounting hardware parts should be cleaned and lubricated.

c. Excessive Lubricant. Do not use excessive amounts of oil or grease and do not allow connections to become greasy.

5-10. Lubrication Under Unusual Conditions

a. Arctic Regions. Lubricants that are satisfactory at moderate temperatures stiffen and solidify at subzero temperatures; as a result, moving parts bind or become inoperative. Refer to the key on the lubrication order for the proper grade of lubricant for operating the equipment in arctic regions. When preparing the equipment for low temperature operation, see that lubricants used for moderate temperatures are thoroughly removed. If even small amounts of such lubricants are allowed to remain, it may impair the operation of moving parts. Be sure to use the lubricant specified for low temperature operation. Lubricants indicated in the improvised lubrication data are satisfactory for arctic regions. In Rawin Set AN/GMD-1B**, thermostatically controlled strip heaters are installed in the elevation and azimuth units to ovecome stiffening of lubricants.



REMOVE FROM CASE TO SERVICE

Interval	Lubricant	
S	GL	GEARS AND RATCHET WHEELS Apply sparingly to gear teeth
S	PL	GEAR TRAINS BEARINGS AND RUBBING SURFACES 2 drops

LUBRICANTS	SPEC.	INTERVAL
PL— OIL, special	VV-L-800	S-Semiannually
GL— GREASE, lubricating Low temperature	MIL-G-23827	

EL6660-206-12-91

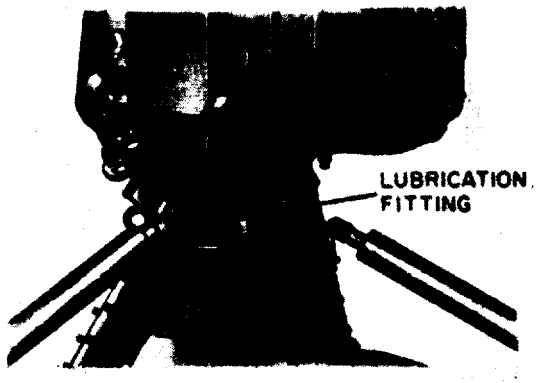
Figure 5-4. Lubrication chart, Control-Recorder C-577(*)/GMD-1.

b. Tropical Regions. High temperatures and moisture due to rain, condensation, etc., may cause lubricants that are normally satisfactory to flow from moving parts and other surfaces. Bearing surfaces will wear excessively, and hinges, fasteners, and other parts will be damaged or destroyed by rust and corrosion. Inspect the equipment daily and lubricate it as required to insure efficient operation; use lubricants suitable for high temperatures. Lubricants indicated in the improvised lubrication data are satisfactory for tropical regions.

c. Desert Regions. Dust and sand infiltration into the equipment causes grit in the lubricants and will seriously impair and damage the moving parts of the set. Hot, dry temperatures cause the lubricants to flow from the moving parts, and conditions similar to those described in *b* above will result. Use lubricants suitable for high temperatures. Inspect and clean the equipment daily. Check the inspection covers of the elevation and azimuth units for tight fit to prevent infiltration of dust and sand.

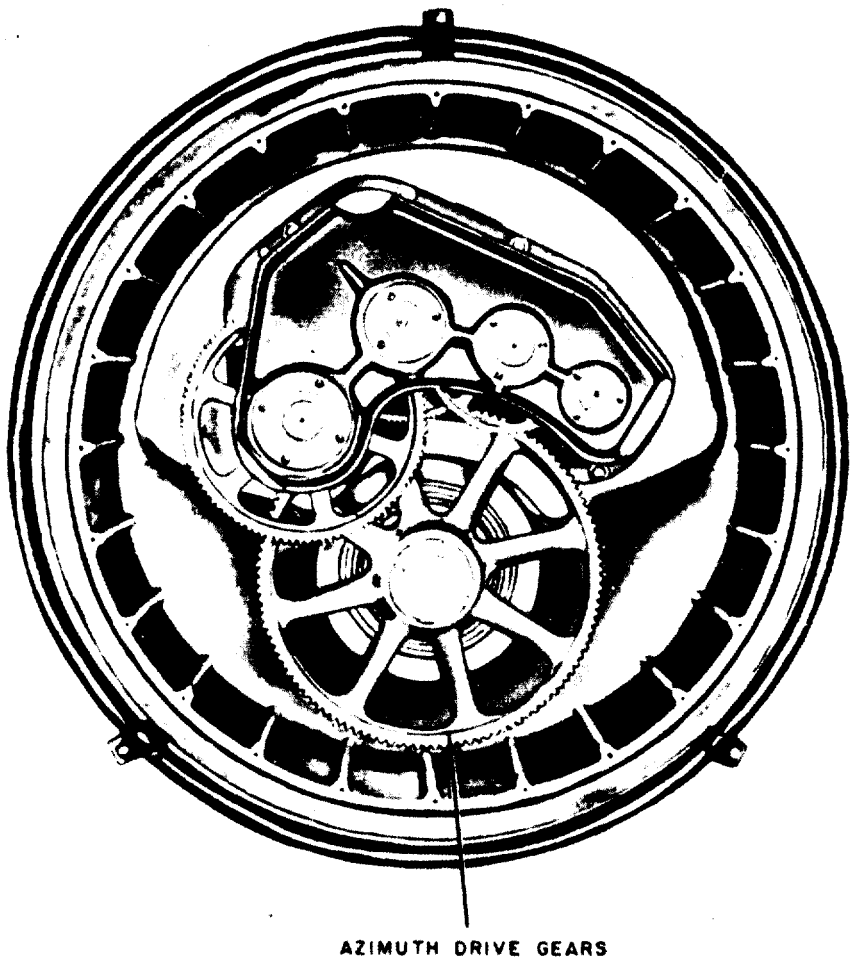
NOTE

Lubrication intervals listed in figures 5-1 through 5-4 are maximums for normal 8-hour day operation. When climatic and operating conditions necessitate more frequent servicing, the lubricating intervals should be shortened.



EL6660-206-12-92

Figure 5-5. Azimuth unit, side view.



EL6660-206-12-93

Figure 5-6. Azimuth unit, bottom view, cover removed.

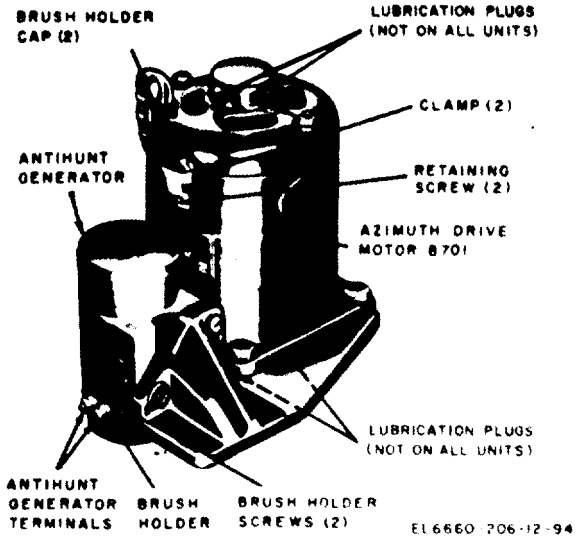


Figure 5-7. Azimuth unit, azimuth drive motor.

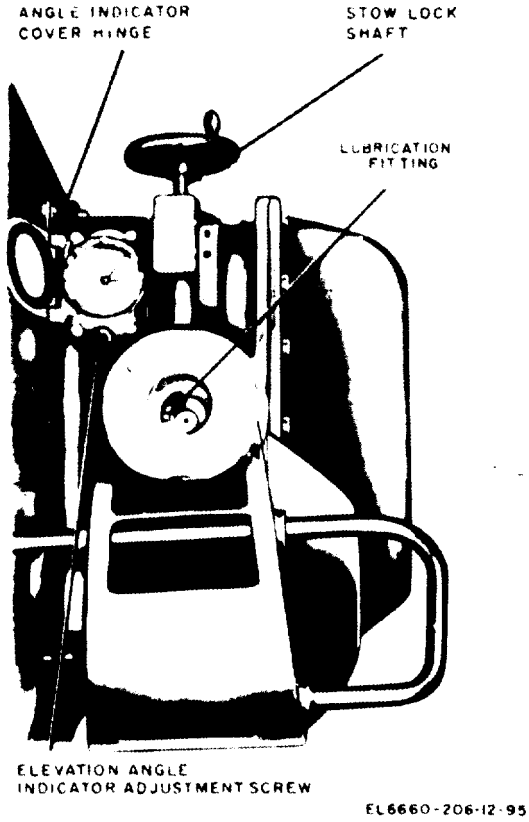


Figure 5–8. Elevation unit, left side view.

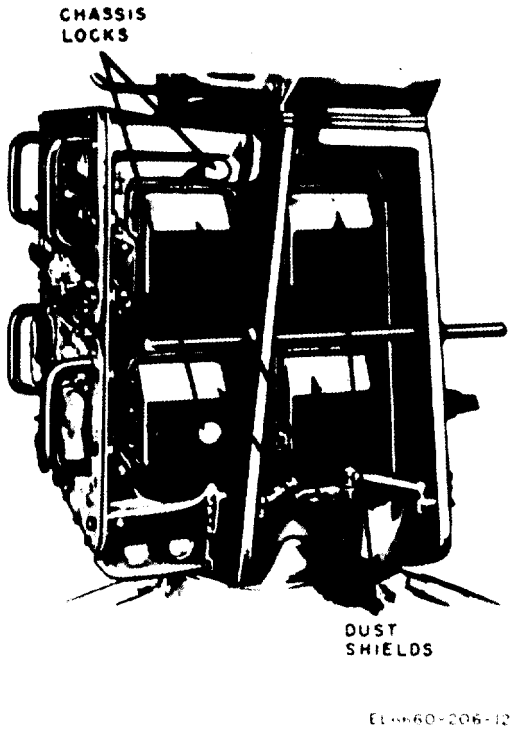


Figure 5-9. Housing, right oblique view.

Section IV. ORGANIZATIONAL TROUBLESHOOTING

5-11. General

This section presents a general description of the raw in set major subsystems functions, and their relationship to the overall system. Organizational maintenance personnel can utilize this information, to isolate trouble to a general area within the system.

5-12. Block Diagram Description

For purposes of explanation and troubleshooting, Rawin Set AN/GMD-1(*) is divided into five functional systems. The function of each system and the relationship of the systems to each other are shown in the system functional block diagram (fig. 5-10). The location and common names of the major components of the equipment are shown in figure 2-37.

a. Grouping of Components. All components of the RF system are located on the antenna assembly. The mixer assembly of the receiving system is

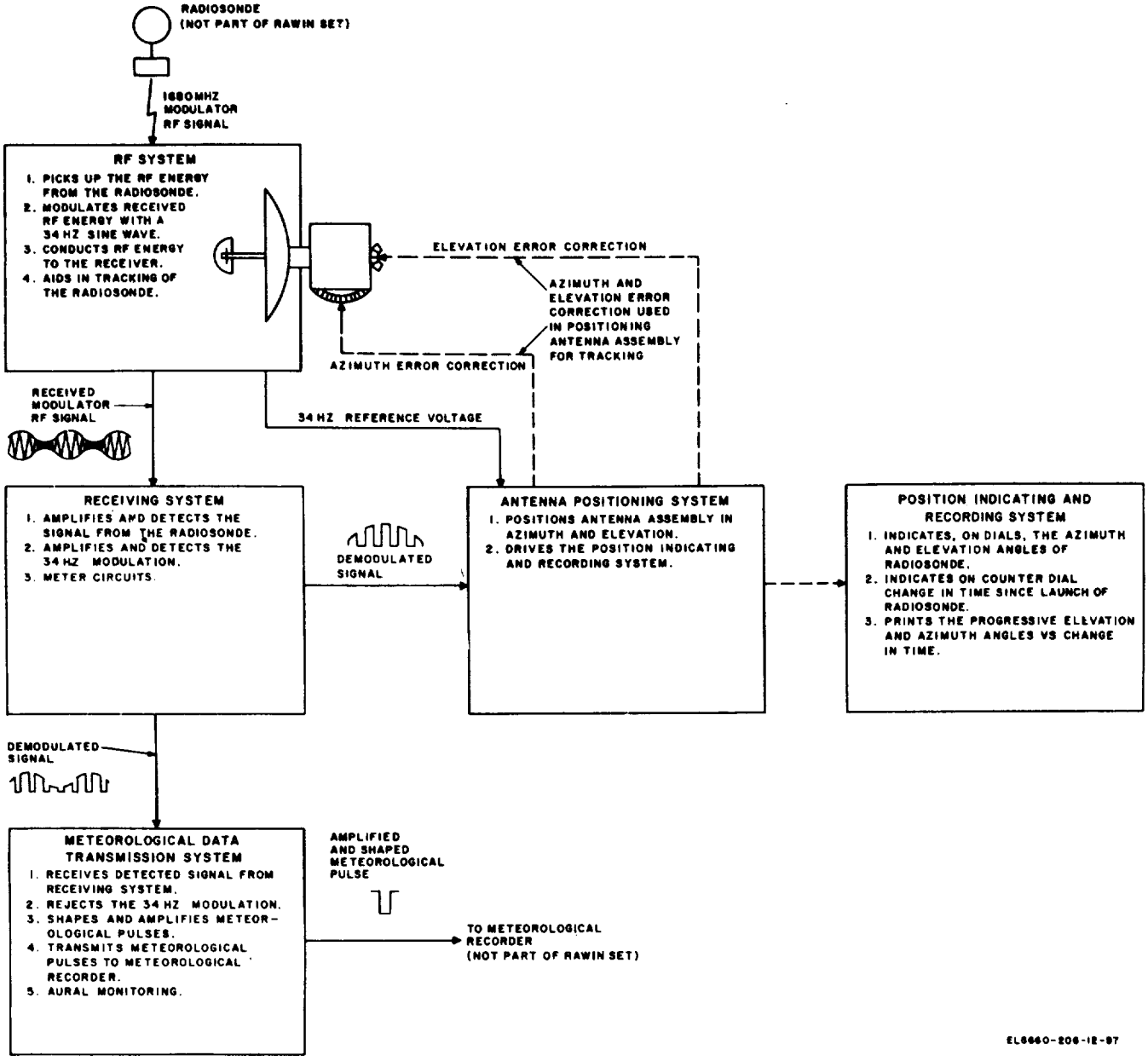


Figure 5-10. Rawin Set AN/GMD-1(*), system functional block diagram.

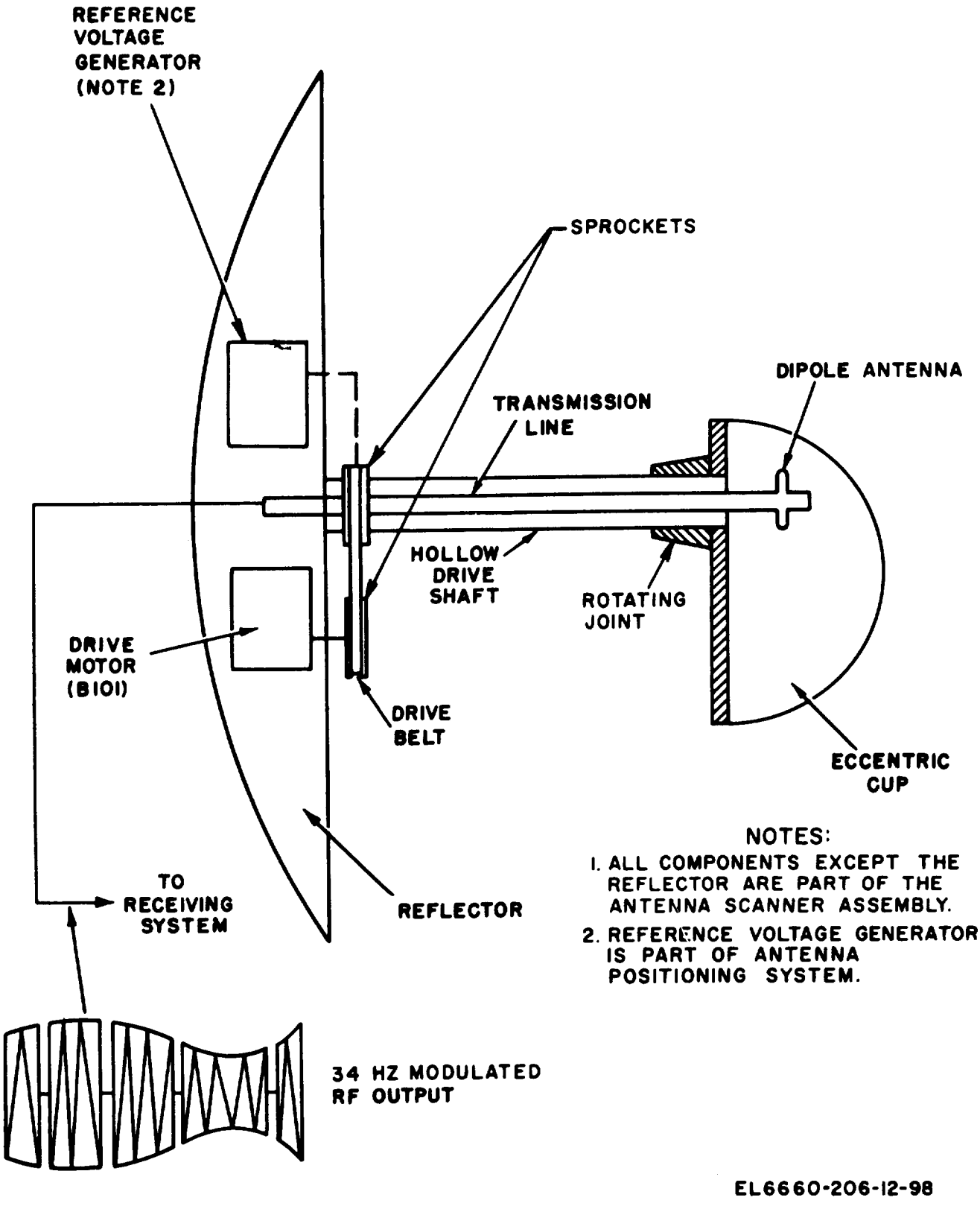


Figure 5-11. RF system, block diagram.

located at the back of the antenna reflector and the other components of the receiving system are located within the receiver. The components of the antenna positioning system are located within the elevation unit, the azimuth unit, the control-recorder, and the antenna assembly. The components for the position indicating and recording system are located within the elevation unit, the azimuth unit, and the control-recorder. The meteorological data transmission system is located within the receiver.

b. RF System. The RF system consists of the reflector and the antenna scanner assembly (fig. 5-11). The antenna scanner assembly consists of an eccentric cup rotated by a drive motor (B101), a hollow drive shaft, a dipole antenna, a transmission line, and a reference voltage generator which is part of the antenna positioning system although located in the antenna scanner assembly. This coaxial transmission line does not rotate with the eccentric cup. The reflector picks up the RF energy that is being transmitted by a radiosonde (fig. 5-10) and concentrates this energy on the rotating eccentric cup. The rotating eccentric cup reflects the RF energy to the dipole antenna. The rotation of the eccentric cup modulates the received RF energy with a 34-Hz sine wave. The dipole antenna picks up the received energy reflected from the eccentric cup and conducts it to the transmission line. The transmission line couples the RF signal to the mixer assembly of the receiving system. The 34-Hz modulation that is placed on the received signal is used by the antenna positioning system of the rawin set to produce error voltages that enable the rawin set to track the radiosonde in azimuth and elevation.

c. Receiving System. The receiving system consists of a superheterodyne receiver which detects both amplitude- and frequency-modulated signals. The receiver amplifies and detects both the signal from the radiosonde and the modulation that is placed on the received signal carrier by the antenna scanner assembly. The receiving system contains a local oscillator that can be tuned manually by the operator and kept on frequency by the receiving system automatic frequency control (afc) circuits. The receiver also contains metering circuits that are used to measure circuit conditions of other parts of the rawin set besides the receiving system. The mixer assembly of the receiver is located at the rear of the reflector and is coupled to the antenna scanner assembly. All other parts of the receiver are located within the receiver chassis which is mounted in the upper part of the housing. Operating controls for the receiver are located on the receiver front panel. A duplication of local oscillator tuning facilities are provided on the control-recorder for remote operation of these receiver circuits.

d. Antenna Positioning System.

(1) The antenna positioning system controls the position of the antenna in order to track the radiosonde in azimuth and elevation. The antenna positioning system consists of the following components:

(a) Reference voltage generator, located in the antenna scanner assembly (fig. 5-11).

(b) Elevation drive motor (fig. 5-12), located in the elevation unit.

(c) Azimuth drive motor (fig. 5-12), located in the azimuth unit.

(d) Azimuth and elevation antihunt generators, located in the azimuth unit and the elevation unit.

(e) Azimuth and elevation control circuits, located in the antenna control.

(f) Drive motor (B101) (fig. 5-11), located in the antenna scanner assembly.

(g) Relays in the various antenna positioning control circuits (fig. 5-11), located in the antenna control, the azimuth unit, and the elevation unit.

(h) Manual (AZIMUTH and ELEVATION) used for antenna positioning located on the control panels of antenna control, and control-recorder and on the side of the housing.

(2) During automatic tracking, the antenna is moved in azimuth and elevation by the azimuth and elevation drive motors. Each drive motor is energized by its corresponding driver circuits ((1) *(e)* above) located within the azimuth and elevation units. The direction of drive in azimuth and elevation is controlled by the polarity of the error voltages sent from the azimuth and elevation control circuits, located in the antenna control. These control circuits compare the phase and voltage of the reference voltage generator of the antenna scanner assembly with the phase and voltage of 34-Hz modulation placed on the received RF signal by the rotation of the eccentric cup in the antenna scanner assembly, The amplitude and phase of this modulation is determined by the position of the radiosonde in relation to the electrical axis of the rawin set reflector. The amplitude and phase of this modulation determines the amplitude and polarity of the error voltages (fig. 5-10) sent by the elevation and azimuth control circuits to the elevation and azimuth drive motors. As a result, an error voltage is developed that varies in polarity with the direction of displacement of the radiosonde from the electrical

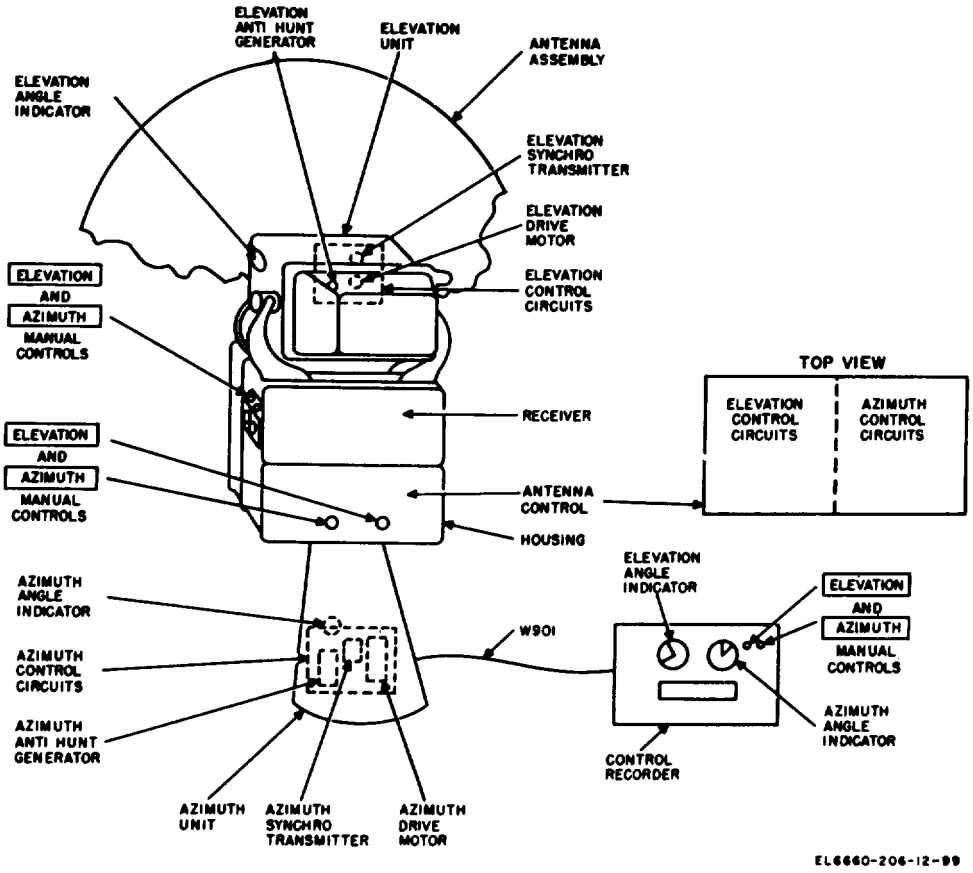


Figure 5-12. Systems component location.

axis of the reflector and varies in amplitude with the amount of displacement of the radiosonde from the axis of the reflector. This error voltage is used to control the movement of the reflector in azimuth and elevation and, as a result, causes the rawin set to track the radiosonde.

(3) During manual operation of the rawin set, the antenna is moved by the azimuth and elevation drive motors in response to the operation of the manual controls located on the antenna control front panel, the control-recorder panel, and the side of the housing.

(4) The rotation of the azimuth and elevation drive motors mechanically drive the azimuth and elevation synchro transmitters which transmit the changing azimuth and elevation angle data to the position indicating and recording system. These azimuth and elevation synchro transmitters are located in the azimuth and elevation units and are part of the position indicating and recording system.

e. Position Indicating and Recording System. The position indicating and recording system (fig. 5-10) receives position data pertaining to the radiosonde being tracked by the rawin set and displays this data in two ways. Dials with two moving pointers (fig. 3-7) are used to show the elevation and azimuth angles of the rawin set reflector. A counter indicates the elapsed time that starts when the balloon-borne radiosonde is launched. Both the progressive changing azimuth and elevation angles and the change (delta) in time are printed on a paper tape. The position indicating and recording system indicator dials are located in the elevation unit, the azimuth unit, and the control-recorder.

f. Meteorological Data Transmission System. The meteorological data transmission system (fig. 5-10) includes a meteorological amplifier which rejects the 34-Hz error modulation on the received carrier and accepts the detected meteorological data pulses from the receiving system. Additional circuits within the meteorological data transmission system then amplifies and reshapes the meteorological pulse. The resulting pulses are then transmitted to the meteorological recorder (not part of the rawin set but part of a rawinsonde system) through interconnecting cable. A loudspeaker located in the receiver provides for aural monitoring of the meteorological signal. The me-

teorological recorder (not a part of the rawin set) converts the meteorological pulses into a graphical representation of the functions of temperature, humidity, and pressure. The components of the meteorological data transmission system are located within the receiver.

5-13. Organizational Troubleshooting Procedures

Preliminary operations that must be completed before proceeding with the organizational troubleshooting procedures (table 5-6) are outlined in *a* through *c* below.

a. Additional damage will be caused if power is applied to equipment in which a complete or partial short circuit exists. When any of the following conditions apply, check for short circuits before applying power to the equipment:

(1) A replaced fuse has blown.

(2) Smoke observed coming from a component.

(3) Overheated parts observed or smelled.

(4) A defective component being serviced apart from other components of the rawin set and the nature of the trouble is not known.

(5) Abnormal symptoms reported from operational tests indicate possible partial or complete short circuits.

b. Check with the operator for indications of the location of trouble, check the cabling of the set (fig. 2-37), and set the switches and controls as indicated in tables 5-3 through 5-5.

c. A signal source must be provided and should be set up prior to the operation of the rawin set. Because of its use during normal operation of the rawin set, the radiosonde is recommended as a signal source. Prepare the radiosonde as outlined in TM 11-6660-220-10 or TM 11-6660-228-10. An alternate signal source may be produced by Test Set TS-538(*)/U (TM 11-6625-213-12).

Table 5-3. Control-Recorder Control Settings

Switch or control	*Position*
MAIN POWER switch S806	OFF
RECORDS CONTROL switch S818.	STANDBY
PRINTINGS PER MINUTE selector switch S817.	Desired rate
1 REV TO RESET TIME knob.	Rotate clockwise 1 revolution to reset the TIME indicator to 0. ***Caution:*** RECORDS CONTROL switch must be in STANDBY or BASELINE CHECK position before resetting or damage to gear clutch mechanism will occur.

Table 5-4. Receiver Control Settings

Switch	*Position*
POWER switch S1004	OFF
DIAL LIGHT switch S1006	ON
AFC-MANUAL switch S1005.	AFC
METER SELECTOR switch S1003.	PEAK PULSE

Table 5–5. Antenna Control, Control Settings

Switch or control	*Position*
POWER switch S604	OFF
MANUAL-NEAR AUTO-FAR AUTO switch S605	MANUAL
AZIMUTH control R665	Pointer straight up.
ELEVATION control R632.	Pointer straight up.

Table *5-6. Organizational Troubleshooting Procedures*

Step	*Procedure*	*Normal indications*	*Abnormal indications*	*Corrective measures*
1	Set MAIN POWER switch S806 (fig. 3-7) to ON. Allow a 15-minute warm-up period.	Control-recorder angle indicator lamp I807 lights.	Either or both MAIN FUSES indicators I802 and I803 light. Angle indicator lamp I807 does not light; indicators I802 and I803 do not light.	Replace main fuses on rear of control-recorder. Check angle indicator lamp with multimeter; replace if necessary (para 5-18). If angle indicator lamp I807 is good, check MAIN POWER switch S806 for continuity with power cable W911 removed. If defective, inform higher level maintenance personnel.
		Control-recorder POWER INTERRUPTED lamp I806 lights.	Control-recorder POWER INTERRUPTED lamp I806 does not light.	Replace RECORDER FUSES F803 or F804. If this does not correct trouble, check indicator

Step	Procedure	Normal indications	Abnormal indications	Corrective measures
				lamp I806 with the multimeter; replace if necessary.
		Azimuth unit angle indicator lights.	Azimuth unit angle indicator does not light.	Replace fuse F701. If this does not correct trouble, check indicator DS708 with the multimeter; replace if necessary.
		Elevation unit angle indicator lights.	Elevation unit angle indicator does not light.	Replace fuse F702. If this does not correct trouble, cheek indicator lamp DS201 with the multimeter; replace if necessary.
2	Set POWER switch S1004 (fig. 3-1) to ON.	Receiver dial lamp illuminates M501.	Dial lamp does not light.	Replace fuse F1001 or F1002 If this does not correct trouble, check dial lamp DS501 with the multimeter; replace if necessary. *a.* If trouble is still present, observe receiver tubes; if lighted, proceed to *c* below; if not, check to see that P302 is seated properly in J1005. *b.* Switch S1004 and T1003 must be checked by higher category of maintenance personnel. *c.* If power transformer T1003 is good, have DIAL LIGHT switch S1006 checked by higher category of maintenance personnel.
3	Set POWER switch S604 (fig. 3-2) to ON.	POWER INDICATOR DS602 lamp lights.	POWER INDICATOR lamp DS602 does not light.	Replace fuse F601 or F602. *a.* If this does not correct trouble, check POWER INDICATOR lamp DS602; replace if necessary. If POWER INDICATOR lamp is good, check to see that P304 is seated properly into J604. *b.* If trouble continues, have POWER switch S604 checked by higher level maintenance personnel.
4	Observe MOTORS STANDBY lamp (fig. 3-2); if lighted, set MOTORS switch to opposite position.	MOTORS STANDBY lamp does not light, antenna scanner assembly drive motor B101 can be heard rotating.	Lamp remains lighted, antenna scanner assembly drive motor B101 does not rotate.	Switch S805, S602, and K607 must be checked by higher category of maintenance personnel. Check for 115 Vac at L and M of J301 (fig. 2-25); access to this jack is made by removing P107. If voltage is present, trouble exists in antenna scanner assembly. Inform higher category of maintenance personnel.

Step	Procedure	Normal indications	Abnormal indications	Corrective measures
5	Set MOTORS switch S602 (fig. 3-2) to opposite position.	MOTORS STANDBY lamps DS603 (fig. 3-2) and I801 (fig. 3-7) should both light and antenna scanner assembly drive motor B101 should stop rotating.	MOTORS STANDBY lamp DS603 does not light.	Replace lamp DS603.
			MOTORS STANDBY lamp I801 does not light.	Replace lamp I801.
			Both MOTORS STANDBY lamps do not light, drive motor B101 continues to rotate.	Check items in 4.
6	Push down on control-recorder ELEVATION RESET SELECTOR lever S808 (fig. 3-7).	ELEVATION lamp I805 lights.	ELEVATION lamp I805 does not light.	Check lamp I805. Switch S808, and relay K802 must be checked by higher category of maintenance personnel.
7	Push down on control-recorder AZIMUTH RESET SELECTOR lever S807 (fig. 3-7).	AZIMUTH lamp I804 lights, POWER INTERRUPTED lamp I806 goes out.	AZIMUTH lamp I804 does not light, POWER INTERRUPTED lamp I806 goes out.	Check lamp I804 with the multimeter.
			AZIMUTH lamp I804 does not light, POWER INTERRUPTED lamp I806 stays on.	Switch S807 and relay K801 must be checked by higher category of maintenance personnel.
8	Move each ELEVATION manual control (fig. 5-12) to UP, check each control separately for normal indications. (After each is checked, return control to center position.)	Reflector will move upward, elevation angle indicators on elevation unit and control-recorder will move with reflector.	Reflector does not move ----	If the reflector does not move with the operation of any of the controls or switches, check CR603 and CR611 (para 5-21). If trouble is not corrected, inform higher category of maintenance personnel.
			Reflector moves but ELEVATION angle indicator on control-recorder does not operate.	Inform higher category of maintenance personnel.
9	Move each ELEVATION manual control (fig. 5-12) to DOWN, check each control separately for normal indications. (After each is checked, return control to its center position.)	Reflector will move downward, elevation angle indication on elevation unit and control-recorder will move with reflector.	Reflector does not move ----	Same as step 8, except check CR604 instead of CR603. If trouble is not corrected, inform higher category of maintenance personnel.
			Reflector moves but ELEVATION angle indicator on control-recorder does not move.	Inform higher category of maintenance personnel.
10	Move each AZIMUTH manual control (fig. 5-12) to CCW, check each control separately for normal indications. (After each is checked, return the control to its center position.)	Reflector will move counterclockwise, azimuth angle indication on azimuth unit and control-recorder will move with reflector.	Reflector does not move.. -.	If the reflector does not move with the operation of any of the controls, check CR605 or CR611. If trouble is not corrected, inform higher category of maintenance personnel.
			Reflector moves but AZIMUTH angle indicator on control-recorder does not move.	Inform higher category of maintenance personnel.
11	Move each AZIMUTH manual control (fig. 5-12) to CW, check each control separately for normal indications. (After each is checked, return the control to its center position.)	Reflector will move clockwise, azimuth angle indicator on azimuth unit and control-recorder will indicate azimuth angle.	Reflector does not move ..	Same as step 10, except check CR606 instead of CR605.
			Reflector moves but AZIMUTH angle indicator on control-recorder does not move.	Inform higher category of maintenance personnel.

Step	Procedure	Normal indications	Abnormal indications	Corrective measures
12	Move the reflector by using the manual controls (fig. 5-12) as necessary to orient the reflector toward the signal source.			
13	Operate TUNING switch S1007 (fig. 3-1) as necessary to set FREQUENCY MEGACYCLES meter M501 to 1,680 MHz.	FREQUENCY MEGACYCLES meter M501 positions to 1,680 MHz.	FREQUENCY MEGACYCLES meter M501 does not move.	Switch S1007 must be checked by higher category of maintenance personnel.
14	Observe TUNING METER M1001 (fig. 3-1).	M1001 indicates between 60 and 70.	M1001 reading is low, or 0 ---	Check to see that P1001 is seated properly into J403. Check and replace if necessary, tubes V401 through V405 (fig. 2-32). Increase S1007 to increase reading. If trouble is not corrected inform higher category of maintenance personnel.
			TUNING METER M1001 reading is high.	Move the reflector by using the manual controls (fig. 5-12) as necessary to orient the reflector away from the signal source until the meter reading is normal.
15	Turn SPEAKER GAIN control R1066 for desired sound level.	An audible signal (5 to 200 Hz) is heard.	Little or no sound is heard -	Check V1009, V1008, V1007, V1006, V1001. If trouble continues have higher category of maintenance personnel check R1006, T1001, LS1001 and S1002.
16	Operate the manual controls (fig. 5-12) as necessary to position the reflector slightly away from the signal source; then turn switch S605 (fig. 3-2) to NEAR AUTO.	Reflector positions and stays directly toward signal source.	Reflector does not position toward signal source.	Check V601, V602, V607, V608, V69, V613 (fig. 2-34), V1002, V1003, V1004, V1005 (fig. 2-33). If trouble continues have higher category of maintenance personnel check S605 and associated circuits.
17	Return switch S605 to MANUAL and operate the manual controls (fig. 5-12) as necessary to obtain a reading between 60 and 70 on TUNING METER M1001 (fig. 3-1).			
18	Set METER SELECTOR switch S1003 (fig. 3-1) to AC ERROR.	Meter reads within diamond C.	Meter does not read within specified area.	Check phasing adjustment of reference voltage generator (para 2-30). Check and replace if necessary, tubes V1005, V1003, V1002, and V1001 (fig. 2-33) on the receiver chassis. If trouble continues inform higher category of maintenance personnel.
19	Set switch to S1003 to AZ ERROR.	Meter reads within diamond C.	Meter does not read within specified area.	Check and replace if necessary, tubes V607, V608, V613 (fig. 2-34).

Step	Procedure	Normal indications	Abnormal indications	Corrective measures
20	Set switch S1003 to EL ERROR.	Meter reads within diamond C.	Meter does not read within specified area.	Check and replace if necessary, tubes V601, V602, V609 (fig. 2-34).
21	Set switch S1003 to B– ._.	Meter reads – 105 . .-... _	Meter does not read specified voltage.	Check and replace if necessary, tubes V1017, V1018 (fig. 2-31).
22	Set switch S1003 to B+ ___	Meter reads + 180 volts (approx).	Meter does not read within 10% of 180.	Check adjustment of R1093 (para 2-39). Check and replace if necessary tubes V1019, V1015, V1016 (fig. 2-33).
23	Set switch S1003 to INJECTION.	Meter reads within green block B.	Meter does not read within specified area.	Check cabling. If trouble continues inform higher category of maintenance personnel.
24	Set switch S1003 to OSC GRID.	Meter reads within green block B.	Meter does not read within specified area.	Inform higher category of maintenance personnel.
25	Set switch S1003 to PEAK PULSE.	Meter reads within green block B.	Meter does not read within specified area.	Check and replace if necessary tubes V1010, V1009, V1008, V1007, V1006, V1001 (fig. 2-33). If trouble continues inform higher category of maintenance personnel.
26	Set switch S1003 to AFC BAL.	Meter reads within diamond C.	Meter does not read within specified area.	Check and replace if necessary tubes V1013, V1014, V1012, V1011. If trouble continues inform higher category of maintenance personnel.
27	Set switch S1003 to SHARP FM.	Meter reads within diamond C.	Meter does not read within specified area.	Switch S1001 must be checked by higher category of maintenance personnel.
28	Move RECORDS CONTROL switch S818 (fig. 3-7) to FLIGHT, and PRINTINGS PER MINUTE switch S817 to 10.	Control-recorder should print elevation, azimuth angles, and time to agree with readings of the ELEVATION, AZIMUTH, and TIME indicators at a rate of 10 times per minute.	Printings do not agree with indicators.	Inform higher category of maintenance personnel.
29	Set switch S817 to 2 -------	Same as step 28, except rate of printings will be two per minute.	Same as step 28 _. _._. _____	Same as step 28.
30	Set switch S817 to 1 -------	Same as step 28, except rate of printings will be one per minute.	Same as step 28 ----------	Same as step 28.
31	Return switch S817 to desired printing rate. Refer to paragraph 3-12.			

5-14. Repair of Rawin Set AN/GMD-1(*)

Before proceeding with repairs, refer to appendix C to determine repair authorizations. At the organizational maintenance level you are issued the tools and test equipment you will need to install and adjust the rawin set and to do the testing required to isolate defective major components. Refer to the replacement procedures in this section before you remove and replace major assemblies or components.

5-15. Leveling Adjustment

See that the rawin set is level by positioning the reflector vertically (pointing straight up), using ELEVATION control (table 3-2) on the antenna control panel, and observe the two levels mounted on the right side of the housing (fig. 2-15). A third level is installed on the yoke above the front panels on AN/GMD-1B models. If the main assembly is not level, raise or lower the jackscrews (fig. 5-13) until it is level. To do this, release the locking plates and turn the jackscrew with the speed wrench. After the main assembly is made level, tighten the locking plates against the outrigger leg.

5-16. Orientation Adjustment

The main assembly is oriented by means of the telescope (fig. 1-26). The settings of the adjusting screws and knobs of the telescope mounting bracket may have been disturbed when the assembly was in transit or was installed. Therefore, make sure that the alignment of the telescope line of sight is parallel to the electrical axis of the reflector. If weather permits, make this check during the. time of the first flight at the new location and monthly thereafter.

a. Remove the telescope from the accessories case and install it on the mounting bracket (fig. 2-28) with the three mounting screws provided.

b. About 5 minutes (not sooner) after launching the balloon-borne radiosonde (para 3-5), sight the radiosonde through the telescope. Adjust the focusing ring (fig. 1-26) to obtain a clear image.

c. Observe the position of the radiosonde with respect to the pattern of the telescope reticle (fig. 5-14). Note that the balloon and radiosonde appear to wander about a point in the field of the reticle. This is characteristic of the system.

d. If the radiosonde appears to be consistently in one quadrant of the reticle, it is an indication that the telescope is not properly aligned. Align the telescope as described below.

(1) Loosen the azimuth and elevation thumbscrews of the telescope mounting bracket.

(2) If the reticle lines terminate at 0.05° from the center, turn the elevation and azimuth adjusting screws until the radiosonde wanders around the center of the reticle. If the reticle lines terminate at 0.3° from the center (early models), adjust the screws until the radiosonde wanders around the center or the lower left corner of the reticle center square. Tighten the azimuth and elevation locking knobs.

e. After the flight, and before the power is shut off, rotate the reflector to face the reference point (para 1-13). Sight the reference point through the telescope and position the reflector until the reference point is in the center of the reticle.

f. Note the readings of the elevation and azimuth angle indicators in the elevation and azimuth units. The readings should be the same as the reference point azimuth and elevation angles (para 1-13). If there is a difference between the angle indicator readings and reference point azimuth and elevation angles, make a record of the difference on the control-recorder paper tape and

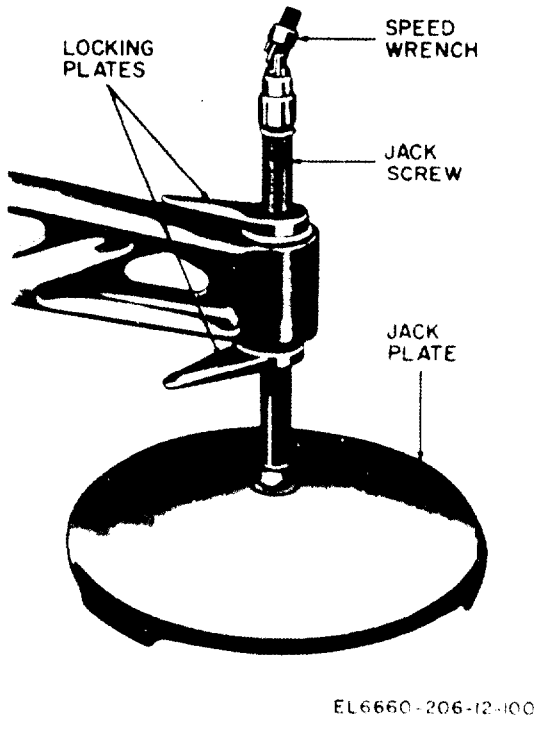


Figure 5-13. Jackscrew and plate for leveling.

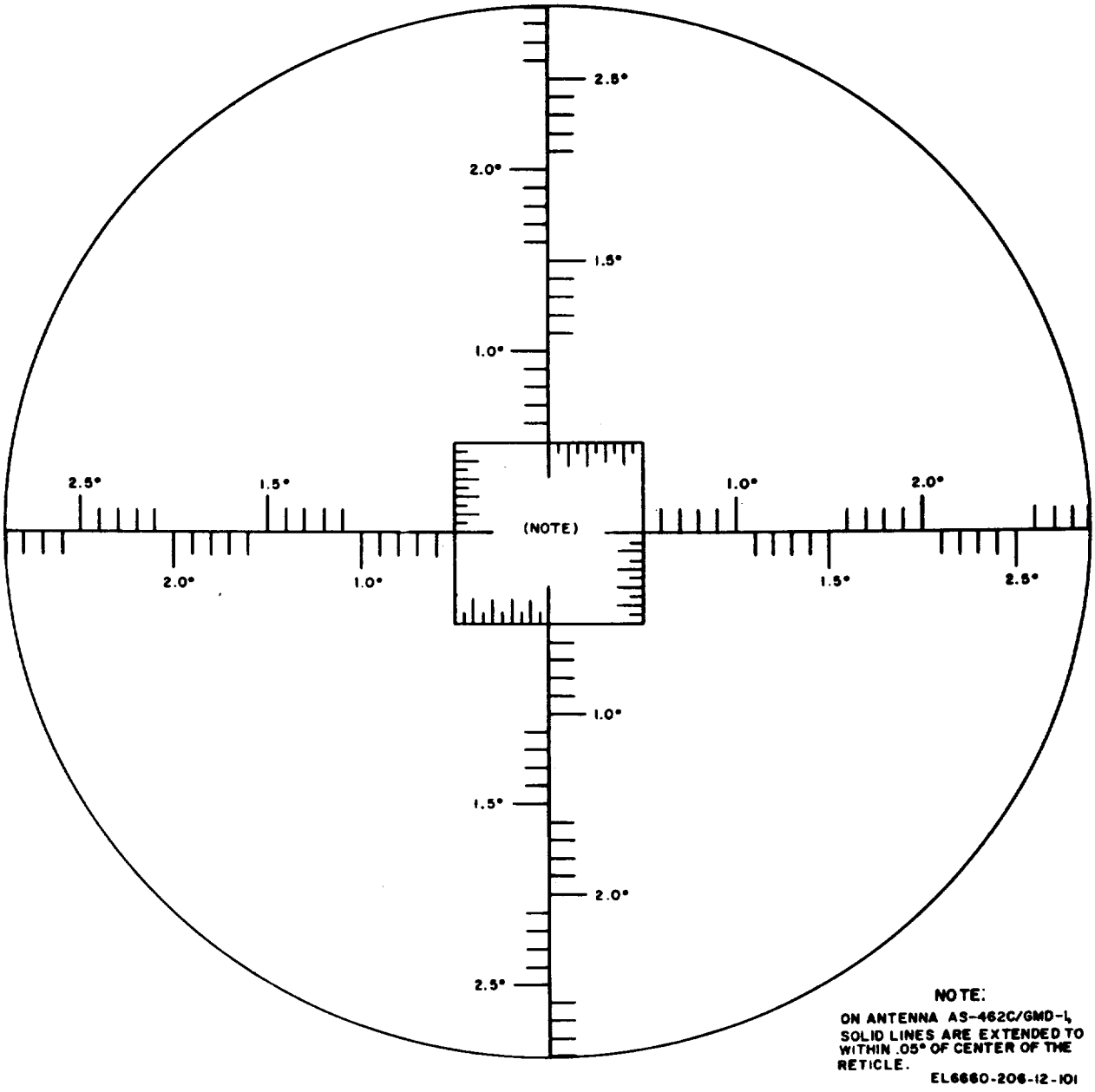


Figure 5-14. Elbow telescope M-17, reticle.

notify the meteorological recorder operator of the differences. Correct the angle indicators on the azimuth and elevation units by using the reset adjusting screws (figs. 3-5 and 3-6).

g. Remove the telescope from its mounting bracket and return it to the accessories case.

5-17. Replacement of Fuses

a. Replacement of Control-Recorder Front Panel Fuses.

(1) Push in slightly and turn counterclockwise to unlock the cover of the fuseholder (fig. 1-23).

(2) Remove the cover from the fuse holder, the fuse will come with it.

(3) Separate the fuse from the fuse holder cap by pulling them apart.

(4) Lift the top cover of the control-recorder by pulling up on the latch handles until the latches are released.

(5) Remove the spare fuse (fig. 4-1) that matches the defective one from the clips on the inner rear wall of the control-recorder.

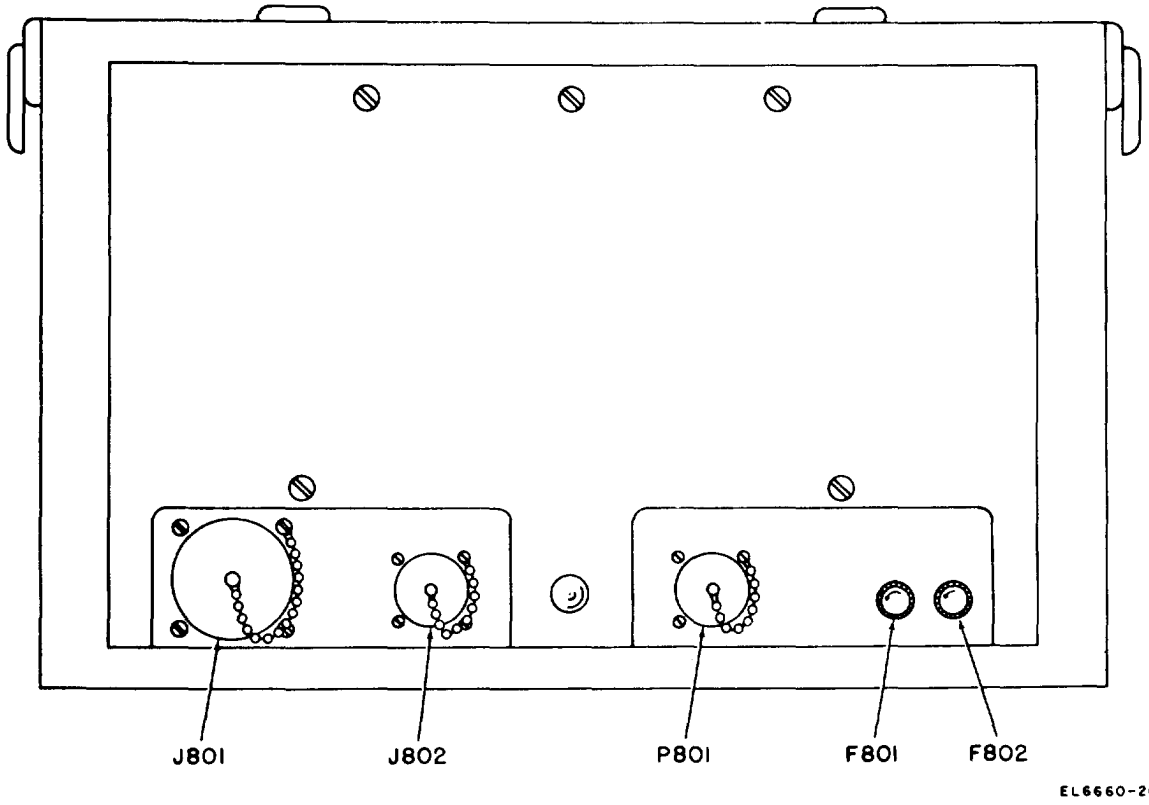


Figure 5-15. Control-Recorder C-577(*)/GMD-1, rear view.

(6) Insert the spare fuse into the cover of the fuse holder.

(7) Insert the fuse and cover into the fuse holder and turn clockwise pushing in slightly.

b. Replacement of Control-Recorder Rear Chassis Fuses (fig. 5-15).

(1) Unscrew the fuse holder cover from the fuse holder by turning it counterclockwise.

(2) Pull out the cover, the fuse will come with it.

(3) Obtain a new fuse as directed in *a* (4) and (5) above.

(4) Remove the defective fuse from the cover, and insert the new fuse in its place.

(5) Screw the fuse holder cover into the fuse holder by turning it clockwise.

c. Replacement of Receiver and Antenna Control Fuses (figs. 1-9 and 1-11). The procedure in (1) through (7) below describes the method of replacing the active fuse and the spare fuse that are contained in the same type of fuse holder.

(1) Release the 18 captive thumbscrews that hold the front panel by turning counterclockwise. (A coin can be used to start releasing the thumbscrews.)

(2) Pull the chassis out, using the handles fastened to the front panel. A stop will prevent the chassis from coming out entirely.

(3) Push in slightly and turn counterclockwise to unlock the cover of the fuse holder.

(4) Pull out the cover, the fuse will come with it.

(5) Remove the defective fuse from the cover, and insert the new fuse in its place.

(6) Insert the fuse and cover into the fuse holder and turn clockwise; push in slightly. (Replace the spare fuse with one from running spares in the same manner.)

(7) Push the chassis back in place and tighten all thumbscrews.

d. Replacement of Azimuth Unit Fuses. The fuses in the azimuth unit (fig. 2-36) can be replaced by first removing either of the cover plates to the left of the cover plate that has the indicator window. Two types of fuse holders are used; clip-in type in early models, screw-in type on later models. The procedure for replacing fuses installed in the screw-in type fuse holder is described in (1) through (6) below. Spare fuses installed in the clip-in fuseholders are removed by simply pulling the fuse outward from its clip.

(1) Release the thumbscrews around the edge of the cover plate by turning them counterclockwise; remove the cover plate.

(2) Unscrew the fuse holder cover from the fuse holder by turning it counterclockwise.

(3) Pull out the fuse holder cover, the fuse will come with it.

(4) Remove the defective fuse from the cover, and insert a new one in its place.

(5) Screw the fuse holder cover into the fuse holder by turning it clockwise.

(6) Replace the cover plate, insert the captive thumbscrews around the edge of the cover plate, then tighten securely.

5-18. Replacement of Dial and Indicator Lamps

a. Replacement of Azimuth Unit Indicator Lamp.

(1) Release the thumbscrews around the edge of the cover plate that has the indicator window by turning them counterclockwise; remove the cover plate. (It may be necessary to start the thumbscrews with a coin.)

(2) Unscrew the lamp (fig. 1-13) from the lampholder by turning it counterclockwise.

(3) Replace the new lamp in the lampholder by turning clockwise.

(4) Replace the cover plate, insert the captive thumbscrews around the edge of the cover plate, then tighten securely.

b. Replacement of Antenna Control Indicator Lamps.

(1) Unscrew the lens by turning it counterclockwise (fig. 1-10).

(2) Unlock the lamp by pushing in and turning it counterclockwise, and then remove it from the socket.

(3) Insert a new lamp in the socket, lock it in place by pushing in and turning clockwise.

c. Replacement of Receiver Dial Lamp.

(1) Release the 18 captive thumbscrews that hold the front panel by turning counterclockwise. (It may be necessary to start the thumbscrews with a coin.)

(2) Pull the chassis out, using the handles fastened to the front panel. A stop will prevent the chassis from coming out entirely.

(3) Unlock the lamp by pushing in and turning it counterclockwise, and then remove it from the socket (fig. 1-9).

(4) Insert the new lamp in the socket; lock it in place by pushing in and turning clockwise.

(5) Push the chassis back in place and tighten all thumbscrews.

d. Replacement of Control-Recorder Indicator Lamps. To replace the MOTORS STANDBY, POWER INTERRUPTED, ELEVATION, and AZIMUTH lamps, refer to figure 1-23 and proceed as described in (1) through (4) below.

(1) Unscrew the lens by turning it counterclockwise.

(2) Unscrew the lamp by turning it counterclockwise.

(3) Replace the lamp in the lampholder by turning it clockwise.

(4) Replace the lens by turning it clockwise.

5-19. Electron Tube Test and Replacement

When the organization troubleshooting table (para 5-13) indicates that an electron tube may be defective, utilize the following procedures. If a tube tester is available, proceed as outlined in *a* below. If no tube tester is available, process as outlined in *b* below. If the procedure in *b* fails to clear the trouble continue with the procedure outlined in *c* below.

CAUTIONS

1. Do not rock or rotate the top of a miniature tube when removing it from its socket; pull it straight out. Rocking or rotating the tube causes the pins to bend and may break the weld where the pins enter the glass. A high resistance or intermittent joint also may develop.
2. Local oscillator tube V501 requires a special procedure for replacement which is performed by direct support and higher categories of maintenance personnel.
3. Do not use nonpreferred-type tubes in place of preferred types. For example, do not use a 6AK5 (nonpreferred) to replace a 5654/6AK5W (preferred, para 5-20).
4. In the IF amplifier chassis, use only tubes specified by the marking on the chassis, regardless of the preferred- or nonpreferred-type designation. When replacing tubes on this chassis, select replacement tubes carefully and use only tubes that give best results in operation.

a. Using Tube Tester.

(1) Remove and test one tube at a time. If it

is necessary to remove more than one tube at a time, label each one so that it can be replaced, if satisfactory, in its original socket.

(2) Replace a tube only when there is an obvious defect, such as a broken glass envelope, open filament, broken lead or connecting prong, or when a test in a tube tester or other equipment shows the tube to be defective.

(3) Do not discard a tube merely because it tests on or near the low end of the acceptable range of the tube specification. These tubes provide satisfactory service over a long period of time, even though they remain at, or near, this low-limit value.

(4) Do not discard a tube merely because it has been in use for a specified length of time. Satisfactory operation in a circuit is final proof of tube quality.

b. Single-Tube Substitution Method.

(1) Substitute a new tube for one of the suspected original tubes. If the equipment continues to be inoperative, replace the new tube with the original. Similarly, check each original tube suspected, one at a time, until the defective tube is located and the equipment becomes operative. Discard the last original tube removed from the equipment.

NOTE

Do not leave a new tube in a socket if the equipment operates satisfactory with the original tube.

(2) If this method of tube substitution does not correct the trouble, try the method described in *c* below.

c. Multitube Substitution Method. Occasionally, two or more tubes are defective in a piece of equipment. In such cases, it is then necessary to install new tubes, one at a time, until the equipment becomes operative. Proceed as follows:

(1) Remove one of the suspected original tubes. Install a new tube. If the equipment is still inoperative, leave the new tube in place and remove the next suspected original tube. Install another new tube. Mark the original tubes with the socket number from which they were removed. Continue this procedure until the equipment becomes operative. The last original tube removed is defective and should be discarded.

(2) To determine whether another original tube is defective, return one of them to its original socket. If there is no noticeable difference in performance, leave the original tube in the equipment. In the same way, return the remaining original tubes to their sockets, one at a time. If equipment failure occurs, or performance suffers, discard the last original tube installed.

NOTE

DO NOT LEAVE A NEW TUBE IN A SOCKET IF THE EQUIPMENT OPERATES SATISFACTORY WITH THE ORIGINAL TUBE.

5-20. Preferred-Type Tubes

Table 5-7 lists the authorized preferred-type tube replacements for each nonpreferred-type tube replacements for each nonpreferred-type tube used in Rawin Set AN/GMD-1(*).

5-21. Replacement of SCR Switching Units

a. Failure Indications. Failure of an SCR switching unit is indicated by one of the following abnormal conditions:

(1) The antenna drives continuously in one direction.

(2) The UP-DOWN control or the CCW–CW control will control the antenna in one direction only.

(3) The antenna will not move in elevation or will not rotate when all other conditions are normal.

(4) The balance and sensitivity adjustment procedure (para 2-32) results in abnormal voltage and current values.

NOTE

A quick GO–NO–GO test on SCR units can be made by inserting a multi meter in the circuit (para 2–32). Adjust the AZ or SENS control clockwise until 150 ma is read on the meter, then reverse the procedure and adjust the AZ or SENS control counterclockwise until a reading of 50 ma is read on the meter. These conditions indicate an operational SCR unit.

Table 5-7. Preferred-Type Tube Replacements

Nonpreferred-type tube	*Preferred-type tube*
6AK5	5654/6AK5W/6096
6AL5	5726/6AL5W/6097
6AQ5	6005/6AQ5/6095
5AU6	6AU6WB
6X4	6X4W
OB2	6627/OB2WA
12AT7	12AT7WB
12AU7	6189/12AU7WA

b. Replacement.

NOTE

The following procedure applies to antenna-control units already equipped with SCR units. When converting from thyratrons to SCR switching units, install SCR switching units in pairs. For example, both elevation units or both azimuth units. After installing the new SCR units, make the balance and sensitivity adjustments described in paragraph 2-32.

(1) Set the MAIN POWER switch on the control-recorder to OFF.

(2) Release the front panel captive screws and pull out the antenna control to the limit of its travel.

(3) Release the chassis stop (fig. 5-9) and carefully pull out the antenna control until the SCR switching units are accessible.

(4) Remove the clip lead from the cap of the defective SCR unit. Squeeze and remove the holddown clamp.

(5) Pull the SCR unit straight out.

NOTE

Do not discard the SCR unit. It must be returned to the general service maintenance facility for repair.

(6) Insert the new SCR unit and replace the clip lead.

(7) Perform the balance and sensitivity adjustments to the replaced SCR unit as described in paragraph 2-32. If the adjustments meet the requirements, test the operational capability of the antenna control as described in chapter 3, section II.

(8) After the defective SCR unit has been replaced, turn the MAIN POWER switch to OFF, reinstall the holddown clamp and the clip lead, and return the antenna control to its normal operating location.

5-22. Check and Repair of Cable Assembly

a. Continuity. When measuring for continuity, notice that the ohmmeter leads are often not long enough to be connected to both ends of the cable. Determine the condition of a cable as follows:

(1) At one end of the cable, connect a resistor of known value (50,000 ohms or more) between the wire to be tested and the cable ground (shield). If the cable does not contain a shield ground, select one wire to act as the ground.

(2) Connect the ohmmeter leads between the wire and ground at the other end of the cable.

(3) If the meter indicates approximately 50,000 ohms, the cable has continuity.

(4) If the meter indicates infinite resistance, the cable is open.

(5) If the meter indicates zero resistance, the cable is shorted to ground.

(6) If the meter indicates much less than 50,000 ohms, but not necessarily zero, the cable has a dc leakage path to the ground.

(7) Repeat (1) through (6) above for each wire in the cable.

b. Repair. A damaged cable connector cannot be repaired; it must be replaced. Splice broken cables by placing a male connector on one end of the break and a female connector on the other end. Join the cables by mating the two connectors. Refer the repair of cables and the replacement of connectors to direct support personnel.

5-23. Replacement of Antenna Assembly Components

a. For removal of the mixer assembly, antenna scanner assembly, and reflector, refer to paragraph 7-2. For replacement of the mixed assembly, antenna scanner assembly, and the reflector refer to paragraphs 2-14, 2-13, and 2-12.

b. To remove and replace the telescope mount (fig. 2-28) remove the 12 screws, lockwashers, and nuts that mount to the reflector. To replace the mount, hold the mount in position, replace and tighten the screws, washers, and nuts.

5-24. Replacement of Antenna Control

a. Remove the antenna control from the housing as follows:

(1) Shutdown the rawin set (para 3-7).

(2) Unfasten the 18 captive thumbscrews on the front panel.

(3) Withdraw the antenna control from the housing by pulling it straight out on the slides until the lock is engaged.

(4) Disconnect internal antenna control cable plugs P301 from J601, P303 from J603, and P304 from J604 (fig. 2-37).

(5) Completely remove the antenna control from the housing by pulling out the chassis lock (fig. 5-9) and withdrawing the antenna control.

b. Replace the antenna control in the housing as follows :

(1) Place the antenna control part way in the housing; mate the slides on the antenna control with those in the housing.

(2) Connect P301 to J601, P303 to J603, and P304 to J604 (fig. 2-37).

(3) Pull out on the chassis lock (fig. 5-9) and push the antenna control completely into the housing.

(4) Secure the 18 captive thumbscrews.

5-25. Replacement of Receiver

WARNING

Extremely dangerous voltages (300 volts dc and 750 volts ac) exist in the rawin receiver. Also, electron tube OB2WA is radioactive. Dangers of poisoning from the radioactive materials exist when the tube is broken.

a. Remove the receiver from the housing as follows:

(1) Turn off the MAIN POWER switch on the control-recorder.

(2) Disconnect the IF cable and oscillator cable from IF INPUT and OSC OUTPUT connectors on the receiver panel (fig. 2-40).

(3) Unfasten the 18 thumbscrews on the front panel of the receiver.

(4) Withdraw the receiver from the housing by pulling the receiver straight out on its slides until the lock is engaged.

(5) Disconnect internal receiver cable plug P302 from J1005 (fig. 2-42) (on AN/GMD-1B* models, also disconnect P305 from J1002) in the top of the receiver chassis.

(6) Completely remove the receiver from the housing by pulling out on chassis lock (fig. 5-9) while withdrawing the receiver chassis.

b. Replace the receiver in the housing as follows:

(1) Replace the receiver part way in the housing; mate the slides on the receiver with those in the housing.

(2) Reconnect P302 to J1005 (on AN/GMD-1B* models, reconnect P305 to J1002).

(3) While pulling out on the chassis lock, push the receiver all the way into the housing.

(4) Secure the 18 thumbscrews that hold the receiver to the housing.

(5) Reconnect the IF and oscillator cables to IF INPUT and OSC OUTPUT connectors on receiver panel.

5-26. Replacement of Pedestal Assembly Components

a. Elevation Unit Assembly. Remove the assembly by following the instructions in paragraph 7-5. Replace the elevation unit assembly as described in paragraph 2-10.

b. Housing Assembly. Remove the housing assembly by following the instructions in paragraph 7-6. Replace the assembly as described in paragraph 2-9 *b* through *h*.

c. Replacement of Brushes in the Azimuth and Elevation Drive Motors and Antihunt Generators. Although the gears and mounts are different, the azimuth and elevation units are identical drive motors and antihunt generators. The instructions for replacing brushes in the azimuth assembly are applicable to the elevation assembly, except for location and mounting arrangements.

(1) Remove and replace the azimuth drive motor brushes as follows:

(a) Remove the 17 screws that hold the cover containing the indicator window on the azimuth unit (fig. 1-13).

(b) Remove the two retaining screws (fig. 5-7).

(c) Remove the two clamps.

(d) Unscrew the brush holder caps and remove the brushes.

(e) Replace the brushes and caps.

(f) Replace the two clamps.

(g) Replace the two retaining screws.

(2) Remove and replace the azimuth and antihunt generator brushes as follows:

NOTE

If the antihunt generator involved is part of an azimuth unit from a Rawin Set AN/GMD-1B**, it will be necessary to remove the generator from its mounting to gain access to the brushes. The generator is held in place with three screws and lockwashers.

(a) Remove the two brush holder screws (fig. 5-7).

(b) Remove the brush holder.

(c) Remove and replace the brushes.

(d) Replace the brush holder.

(e) Replace the two brush holder screws.

(3) Replace the cover on the azimuth unit and refasten the 17 screws.

(4) Remove and replace the elevation unit drive motor brushes as follows:

(a) Remove the 26 screws that hold the cover on the elevation unit and remove the cover (fig. 1-15).

(b) To remove and replace the brushes, follow the procedure in *c* (1) *(b)* through (1) *(g)* above.

(c) Replacement of the brushes in the elevation antihunt generator requires removal of the elevation drive assembly from the elevation unit. Refer this replacement to direct support maintenance personnel.

(d) Replace the elevation unit cover and refasten the 26 screws.

d. Replacement of Spirit Levels.

(1) Remove the receiver as described in paragraph 5-25.

(2) Remove the nine screws, nuts, and washers that hold the dust cover immediately above the spirit levels on the housing (fig. 5-9) and remove the dust cover.

(3) Remove the slotted screw holding the far end of the level to the spacer.

(4) Remove the nut that holds the level on the adjustment screw. Lift out the level. Do not disturb the adjustment nut located on the adjustment screw below the level.

(5) Replace the level by placing it on the adjustment screw and the spacer and replacing the nut and slotted screw.

(6) If the azimuth assembly was known to be level before removal of the spirit level, trim the adjustment nut until the bubble is exactly centered in the level. Tighten the upper nut. Rotate the antenna through one revolution in approximately 45° steps. Check to see that the bubble is centered at all positions. If it is not, proceed with (7) below.

(7) To determine whether or not the pedestal is level, observe the level while rotating the antenna in steps as above. If the rawin set is level, the bubble will remain in the same position for all positions of the antenna and you should perform (8) below. If the bubble changes position during antenna rotation, the pedestal is not level and you should perform (9) below.

(8) If the bubble remains steady during antenna rotation but is not centered, loosen the upper nut and adjust the lower nut until the bubble is centered. Tighten the upper but and repeat (7) above.

(9) If the bubble moves during antenna rotation. refer to the leveling procedure in paragraph 2-22.

(10) Replace the dust cover and reinstall and tighten the dust cover screws.

5-27. Removal and Replacement of Control-Recorder

WARNING

Failure of the selenium rectifiers used in Control-Recorder C-577(*)/GMD-1 can result in the liberation of poisonous fumes and the deposit of poisonous selenium compounds. If a rectifier burns out or arcs over, the odor is strong. Immediately provide adequate ventilation. Avoid inhaling the fumes and do not handle the damaged rectifier until it has cooled. Do not connect or disconnet any of the cables of the rawin set while MAIN POWER switch S806 is on.

a. Turn off MAIN POWER switch S806.

b. Disconnect the power cable CX-2043 (W911) from P801 located on the rear of the control-recorder chassis (fig. 5-15).

c. Disconnect the meteorological cable CX-1217/U (W921) from J802 located on the rear of the control-recorder chassis.

d. Disconnect the main cable CX-1216/U (W901) from J801 located on the rear of the control-recorder chassis.

e. To reinstall the control-recorder, reconnect the cables that were disconnected in *b, c,* and *d* above.

CHAPTER 6
AUXILIARY EQUIPMENT

6-1. General

Rawin Set AN/GMD-1(*) is part of a rawinsonde system. The rawin set tracks the balloonborne radiosonde automatically, receives, amplifies, and detects the modulated RF signal of the radiosonde and passes the detected results to a meteorological recorder. The Radiosonde AN/AMT-4(*) or National Weather Service Radiosonde Set J031 is used as the balloon-borne radiosonde that transmits the meteorological information to the rawin set. Radiosonde Recorder AN/TMQ-5(*) can be used to record the meteorological data detected by the rawin set. Paragraphs 6-2 through 6-5 discuss the purpose and use of the radiosonde and meteorological recorder when combined with the rawin set in a rawinsonde system. Complete information on the operation and servicing of these equipments is contained in the technical manuals for the equipment.

6-2. Purpose of Radiosonde

Radiosonde AN/AMT-4(*) or Radiosonde Set J031 is used with the rawin set. The radiosonde is a balloon-borne meteorological instrument. The purpose of the radiosonde is to provide a means by which information related to temperature, pressure, and relative humidity of the upper atmosphere is measured and transmitted to a ground receiving station (rawin set) by means of radio waves. The radiosonde also provides a source of RF signal for checking the rawin set; this is done while the radiosonde is on the ground.

6-3. Use of Radiosonde

Before the launching of the balloon-borne radiosonde takes place, the radiosonde is used to check the rawin set to be sure that the receiver is on frequency and that the tracking circuits can automatically follow the radiosonde after it is launched. After launching takes place and the rawin set locks in on the balloonborne radiosonde, the system operates automatically. Preparation and use of the radiosonde is described in *a* through *d* below. For detailed information concerning the radiosonde, refer to TM 11-6660-228-10.

a. The radiosonde must be prepared for operation by performing the duties listed in (1) through (8) below. These duties are described in the technical manual for the equipment.

(1) Unpacking.

(2) Visual inspection.

(3) Preparation of the battery.

(4) Assembly of the radiosonde.

(5) Power and frequency checks of the radiosonde by using Test Set TS-538(*)/U.

(6) Baseline check of the radiosonde.

(7) Commutator and pin arm adjustment.

(8) Final checks of the radiosonde and receiving equipment.

b. It is during the baseline check of the radiosonde that the rawin set is checked out by the operator to see that it is operating properly. These checks involve those tests made during the starting procedure (para 3-4) and other operational tests (para 4-9) for the rawin set. Since the radiosonde has been checked for power output and frequency, it provides the rawin set with a reference for frequency adjustment and sensitivity check. The automatic tracking circuits of the rawin set can also be checked by manually positioning the reflector slightly away from the radiosonde and then switching to NEAR AUTO thus allowing the circuits of the rawin set to reposition the reflector toward the radiosonde.

c. Preparing and launching the balloon that carries the radiosonde aloft is described in TM 11-6660-218-12. The operators that are assigned to the rawin set and recording equipment place these equipments in operating condition. The meteorological recorder (paras 6-4 and 6-5) is switched to record the detected meteorological information, and the control-recorder (part of the rawin set) is switched to record the position and associated time of the balloon as it rises. The rawin set operator places the rawin set in the NEAR AUTO position so that it will follow the balloon-borne radiosonde automatically.

d. As the radiosonde is carried aloft, the modulated RF signal is transmitted to the ground with its meteorological information. The rawin set receives and detects the RF signal and passes it to the recorders where a paper tape is used to record the data which are later converted for use.

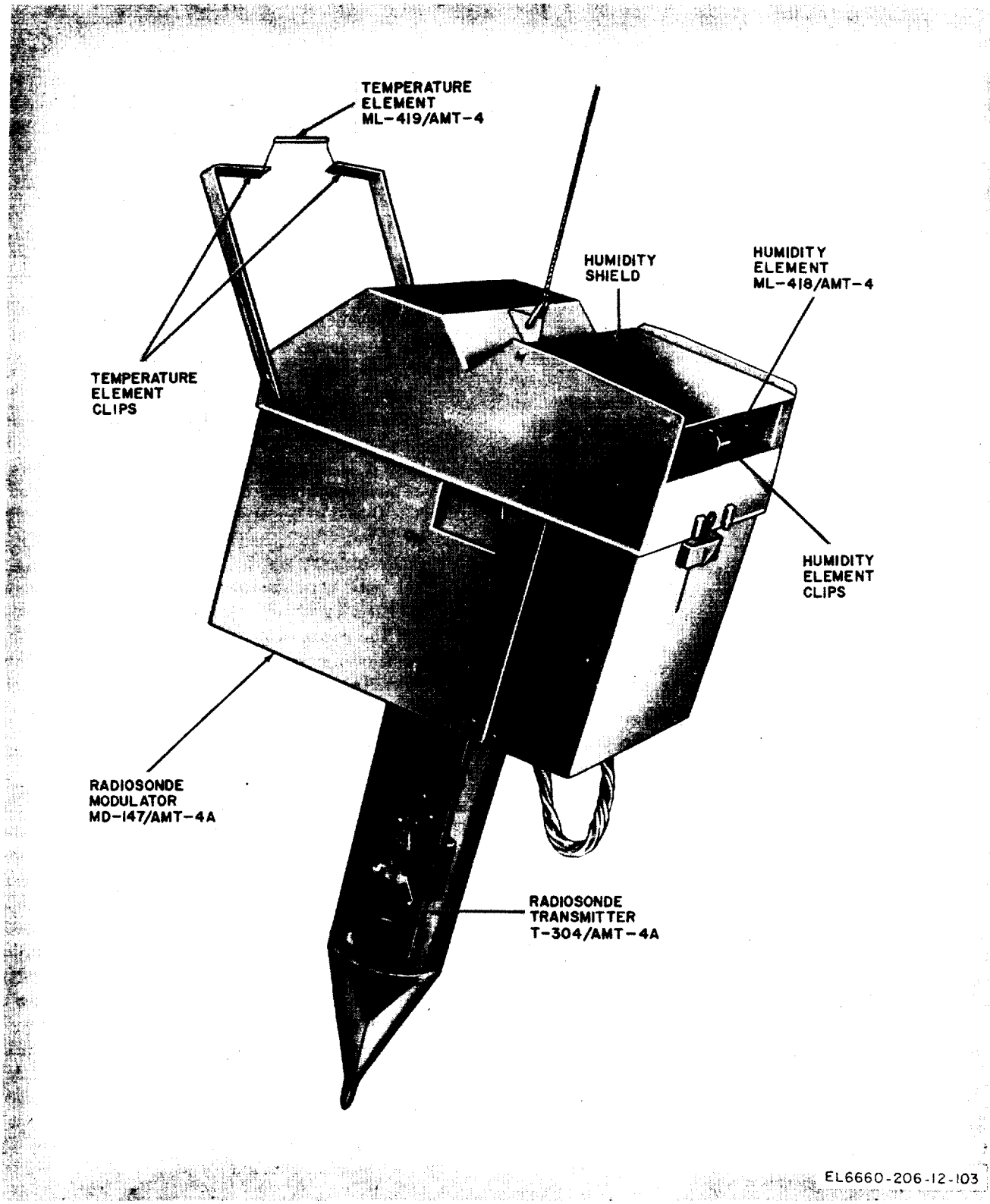
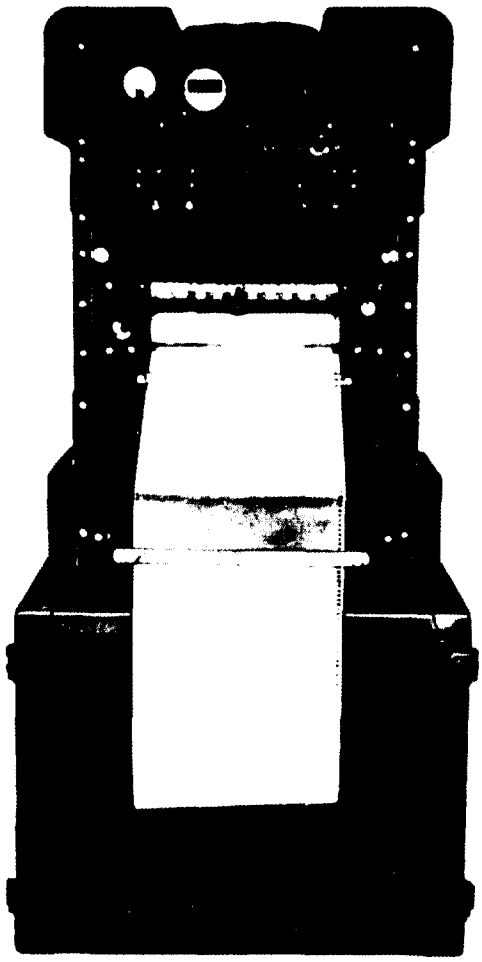


Figure 6-1. Radiosonde AN/AMT-4(*).



EL6660-206-12-104

Figure 6-2. Radiosonde Recorder AN/TMQ-5(*).

6-4. Purpose of Meteorological Recorder

Radiosonde Recorder AN/TMQ-5(*) (fig. 6-2), when used with the rawin set, provides a printed record, on graph paper, of the weather information that is transmitted by the balloon-borne radiosonde set and in turn, received and detected by the rawin set. The recorder also serves as an indicating device while the baseline check is being performed on the radiosonde set.

6-5. Use of Meteorological Recorder

Cable connection (fig. 2-37) between the rawin set (control-recorder) and Radiosonde Recorder AN/TMQ-5(*) is made by cable CX-1217/U (W921) furnished with the rawin set. The use of the radiosonde recorder is briefly described in *a* and *b* below. For detailed information refer to TM 11-6660-204-10.

a. The meteorological recorder and the rawin set are installed and initially adjusted at the same time by organizational maintenance personnel. The duties of the operator are confined to routine operations as outlined in the technical manual for the equipment. During the preliminary starting procedure the equipment is checked out to see that the recording mechanism is functioning properly. This is done during the time the radiosonde is receiving its baseline check (para 6-3 *a* (6)). At this time, the meteorological recorder provides an indication that the radiosonde is operating satisfactory. After the balloon is launched, the meteorological recorder records data automatically.

b. Radiosonde Recorder AN/TMQ-5(*) contains circuits that receive the detected AF signal from the rawin receiver which are changed to the form necessary to record the weather information on calibrated paper. The record is later evaluated in terms of meteorological data including temperature, pressure, and humidity.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE

7-1. Disassembly

Complete disassembly, except for the separation of the compression bars from the outrigger legs, is required to pack the equipment for short-distance travel. An accessory kit (trailer adapter kit) (para 1-9 *k*) is provided to pack the equipment on a standard 1½-ton Ordnance trailer. Five men are required for converting the equipment for travel. The power is not disconnected until the reflector is removed from the remainder of the equipment. Disassembly of the rawin set is described in paragraphs 7-2 through 7-7. Preparation of the trailer for travel is described in paragraph 7-8.

7-2. Removal of Reflector and Antenna Scanner Assembly

a. Remove the mixer assembly from the antenna scanner assembly as described in (1) through (5) below.

(1) Disconnect the mixer end of IF cable assembly CG-530B/U (W131) from the upper end of the mixer assembly (fig. 7-1), and the opposite end from the receiver.

(2) Disconnect the mixer end of oscillator cable assembly CG-409E/U (W121) from the lower end of the mixer assembly and the opposite end from the receiver.

(3) Loosen the knurled nut of the mounting extension on the mixer assembly.

(4) Disengage the mounting extension coupling from the fitting in the shield of the motor and generator assembly.

(5) Place the mixer assembly, with associated cable assemblies ((1) through (4) above), in the accessories case as indicated on the diagram on the inside surface of the case cover.

b. Position the POWER switch on the antenna control to OFF.

c. Disconnect the spinner cable connector P107 from J301 on the housing.

d. Position the POWER switch on the antenna control to ON.

e. Remove the antenna scanner assembly as described in (1) through (4) below.

(1) Operate one of the ELEVATION controls until the electrical axis of the reflector is in a horizontal position (fig. 2-24).

(2) While one man supports the antenna scanner assembly, use a speed wrench to release the six captive bolts that fasten the antenna scanner assembly to the reflector.

(3) Two men remove the antenna scanner assembly from the reflector by disengaging (lifting) it from the pylon support hook.

(4) Place the antenna scanner assembly in the accessories case an indicated on the diagram on the inside surface of the case cover.

f. Remove the reflector as described in (1) through (5) below.

(1) Operate one of the ELEVATION controls until the electrical axis of the reflector is in a vertical position (reflector is horizontal).

(2) Use a speed wrench to loosen the six mounting nuts on the pivoted eyebolts (fig. 7-2) that hold the reflector to the elevation unit.

(3) Swing the pivoted eyebolts out of the slots in the elevation unit mounting flange and push them into their storage clips.

(4) Four men remove the reflector from the elevation unit. Move the reflector just enough to free the hooks.

(5) Place the reflector face down on the ground.

g. Disassemble the reflector as described in (1) and (2) below.

(1) Use the speed wrench to unfasten the bolts that hold the two wing sections to the center section of the reflector, and secure each bolt to storage clips nearby (fig. 2-21).

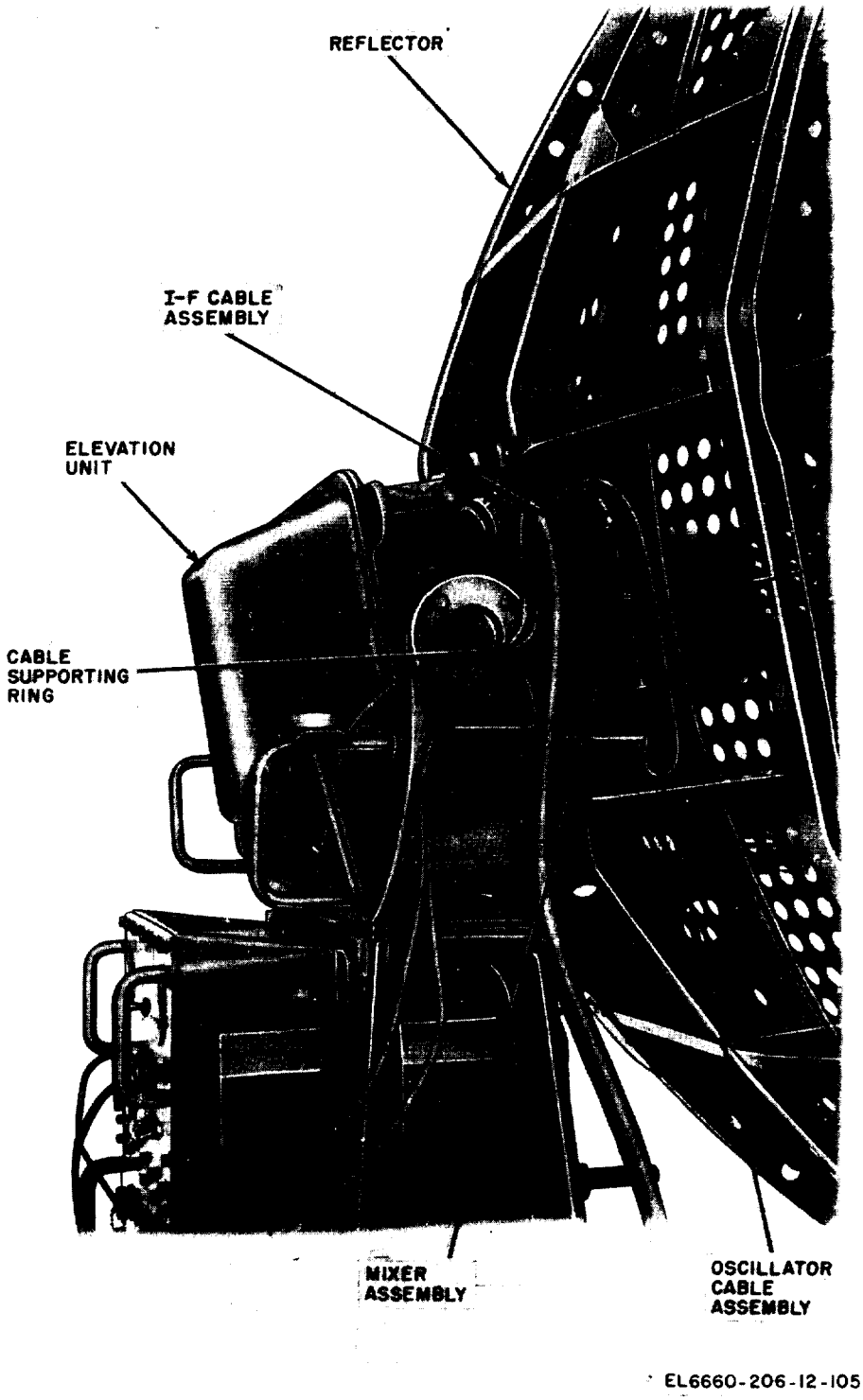


Figure 7-1. Removal of mixer assembly.

(2) Separate the two wing sections from the center section and place all sections face up.

h. With the elevation unit in a vertical position as shown in figure 7-3 engage the elevation stow lock by turning the handwheel clockwise. It may be necessary to reposition the elevation unit to allow the stow lock to engage properly.

i. Turn the POWER switch on the control-recorder to OFF.

j. Shut off all power to the rawin set by turning

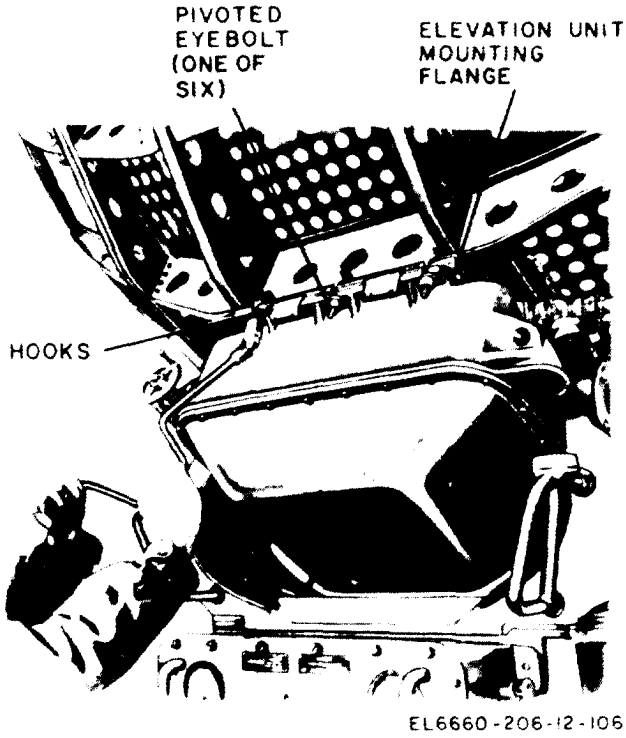


Figure 7-2. Removal of reflector.

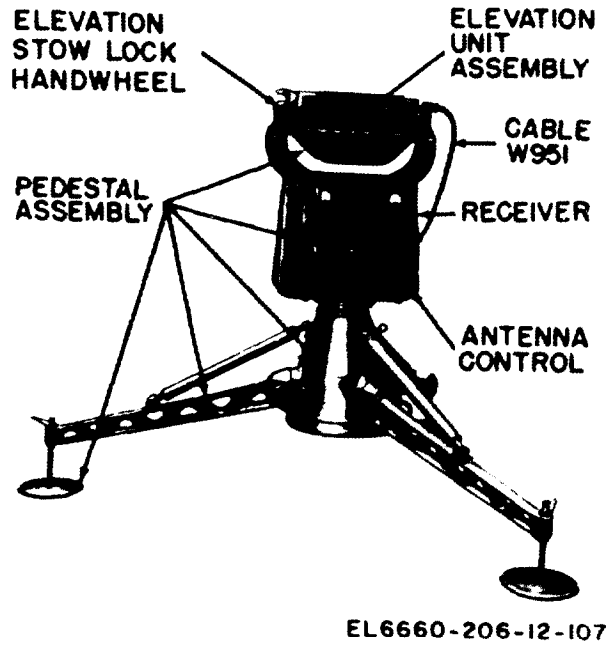


Figure 7-3. Elevation unit in vertical position.

off all main line circuit breakers or by stopping the individual power unit (if separate power unit is used).

7-3. Removal of Cable Assemblies

CAUTION

Do not connect or disconnect cable assemblies while the POWER switch on the control-recorder is at ON.

a. Remove elevation unit cable CX-1285/U (W951, fig. 2-37) between the elevation unit and housing and meteorological cable CX-1217/U (W921) between the control-recorder and the radiosonde recorder; store them in the accessories case as directed by the diagram inside the case cover.

b. Remove main cable CX-1216/U (W901) from the azimuth unit and control-recorder; rewind on Cable Reel RL-137/GMD-1.

c. Remove power cable CX-2043/U (W911) from the control-recorder and the source of power; rewind on Cable Reel RL-138/GMD-1. If adapter cable CX-1492/U was used, disconnect it from cable CX-2043/U and store in components case CY-1157/GMD-1A.

d. Remove the ground rod from the ground and disconnect the ground cable (W961) from the azimuth unit; place the ground rod cable assembly in the accessories case as directed by the diagram inside the case cover.

7-4. Removal of Control-Recorder

Two men are required to remove the control-recorder from its operating position and place it in Case CY-737A/GMD-1

7-5. Removal of Elevation Unit Assembly

Remove the elevation unit assembly from the housing and store it in Case CY-734/GMD-1 as follows :

a. Check that the MAIN POWER switch on the control-recorder is off.

b. Use the speed wrench to release the four captive mounting bolts that hold the elevation unit to the housing (fig. 2-19).

c. Use four men to lift the assembly from the top of the housing. Use the handles on the yoke when lifting the assembly.

CAUTION

Before placing the elevation unit assembly in Case CY-734/GMD-1, be sure that the elevation stow lock handwheel is turned to the limit of its clockwise position (completely engaged). Do not allow

the weight of the assembly to rest on the handwheel. Be sure that the assembly is firmly held in a fixed position in the case.

d. Place the elevation unit assembly in Case CY-734/GMD-1.

7-6. Removal of Receiver, Antenna Control, and Housing

The receiver, antenna control, and housing are removed and stored as one unit. Separate and remove this unit from the azimuth unit as directed in *a* through *e* below.

a. Engage the azimuth stow lock, in the position where the stow lock assembly (fig. 2-15) is facing the side of the azimuth unit with the longest slope.

b. Remove the two cables that connect to the rear of the housing and install the caps to the ends of the cables.

c. Use the speed wrench to loosen the four mounting nuts from the pivoted eyebolts that fasten the housing to the azimuth unit.

d. Swing the four pivoted eyebolts out of the slots in the mounting plate and push them into their clips for storage.

e. Use four men to lift the housing from the top of the azimuth unit and place in Case CY-736/GMD-1; use the handles on the front panel of the receiver and on the side and rear of the housing.

7-7. Disassembly of Azimuth Unit and Outrigger Assembly

a. Place Cable Reel RL-137/GMD-1 under the azimuth unit so that the unit will rest on it when the outrigger assembly is removed.

b. Remove the outrigger assembly from the azimuth unit as described in (1) through (7) below.

(1) Loosen all six locking plates (fig. 2-12).

(2) Use a speed wrench to turn each jackscrew counterclockwise until the azimuth unit rests on Cable Reel RL-137/GMD-1. (Refer to *a* above.)

(3) Remove the three jack plates from under the jackscrews.

(4) Use the speed wrench to loosen the bottom mounting screws (fig, 2-11) on each of the compression bars.

CAUTION

When removing the outrigger legs, do not allow the weight of the outrigger leg to exert force on the screws as they are being removed ((5) and (6) below).

(5) While one man supports the lower end of one of the outrigger legs, use the speed wrench to remove the top mounting bar.

(6) A second man supports the upper end of the outrigger leg and the compression bar, removes the tapered end screw and securing screw (fig. 2-9) and separates the outrigger leg from the azimuth unit. The compression bar remains attached to the outrigger leg.

(7) Repeat (5) and (6) above for the removal of the other two outrigger legs.

7-8. Repacking in Trailer

a. *Loading the Trailer*. The sequence for loading the rawin set into the trailer is described in (1) through (27) below.

(1) Strip the trailer of all its accessories, such as the tarpaulin, bows, front and side racks, and the rear rack.

(2) Release the lower tailgate of the trailer.

(3) Place the CY-734/GMD-1 in the left front corner of the trailer, oriented as shown in figure 7-4.

(4) Place the CY-737A/GMD-1 in the front right-hand corner of the trailer.

(5) Place the CY-898/GMD-1 (AN/GMD-1A) or CY-1895/GMD-1 (AN/GMD-1B(*)) between the roadside wheel well and CY-737A/GMD-1.

(6) Place the cable reel RL-138/GMD-1 next to the CY-734/GMD-1 in the front of the trailer.

(7) Place the RL-137/GMD-1 next to the RL-138/GMD-1 in the front of the trailer.

(8) Place reel holder MT-1421/U upside down over the RL-138/GMD-1.

(9) Place the CY-735(*)/GMD-1 directly behind the cable reels.

(10) Place the wood blocks on the wheel wells with the notched edge facing up and in to accommodate the leg frame.

(11) Loosen the two thumbscrews that hold the leg clamp (fig. 1-24) at one end of the leg frame and remove the leg clamp.

(12) Remove the jack plate holder (fig. 1-24) by releasing the four Dzus fasteners that hold it in place.

(13) Place the three outrigger legs, with associated compression bars, into the leg frame with the jackscrew toward the end of the leg frame from which the leg clamp was removed ((11) above).

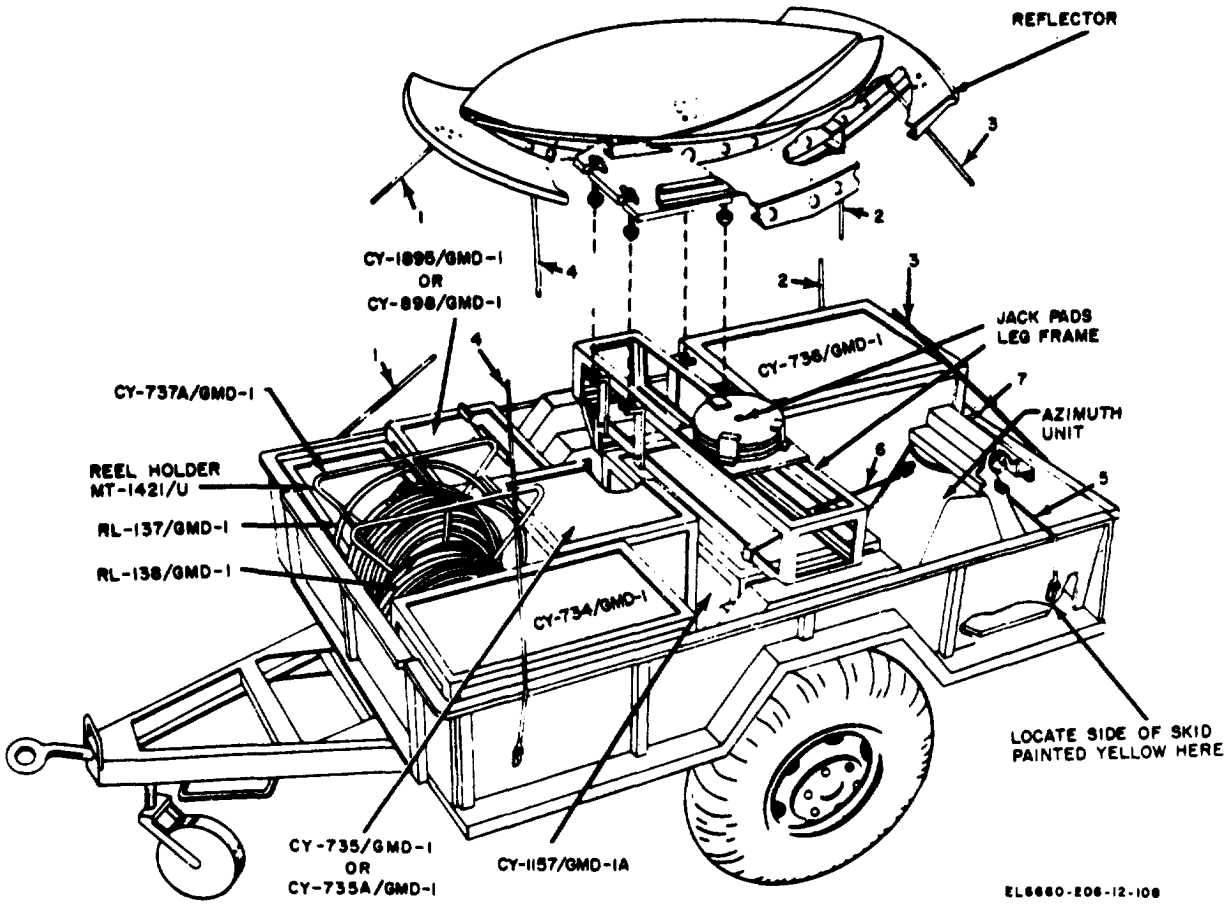


Figure 7-4. Equipment location for loading rawin set into Ordnance trailer.

(14) Place the leg clamp on the end of the leg frame and tighten the two thumbscrews that hold it.

(15) Place the jack plate holder on the top of the leg frame and tighten the four Dzus fasteners that hold it.

(16) Place the three jack plates into the jack plate holder by releasing the removable bracket; then retighten the bracket in place.

(17) Four men load the leg frame; place in the notches on the wooden blocks with the jack plate holder toward the roadside wheel well.

(18) Use the four attached bolts to secure the antenna wing frame (fig. 1-24) over the center hole in the center section of the reflector (fig. 7-4); orient in such a manner that the long sides are parallel with the straight edges of the center section.

(19) Lift the wing sections of the reflector to engage the hooks on the antenna wing frame and secure by using the bolts attached to the reflector wing sections.

(20) Four men load the reflector on the leg frame and fasten it with the eyebolts attached to the reflector stiffeners.

(21) Install guy assemblies 1, 2, and 4 (fig. 7-4) but do not tighten at this time.

(22) Slide the CY-1157/GMD-1A underneath the leg frame oriented as shown in figure 7-4.

(23) Place the CY-736/GMD-1 in the space at the right rear of the trailer, close to tailgate.

(24) Place the azimuth unit on the azimuth unit skid (fig. 1-24) so that the azimuth stow lock assembly points toward the left side of the skid as it is illustrated in figure 1-24. Lock in place with the four captive thumbscrews.

(25) Place the azimuth unit, mounted on the skid, into the trailer so that the azimuth stow lock faces the left side of the trailer and the yellow stripe on the skid faces the left rear corner of the trailer (fig. 7-4).

(26) Install the turntable cover (fig. 1-24) on the top of the azimuth unit by sliding over the stow lock assembly and securing it with the attached thumbscrew.

(27) Raise and secure the tailgate.

(28) Install guy assemblies 3, 5, 6, and 7 (fig. 7-4), It may be necessary to loosen the

thumbscrews ((24) above) to connect guy assembly 5.

b. Checking Trailer for Proper Loading. Check all guy assemblies as described in (1) through (5) below.

(1) Guy assemblies 1, 2, 3, and 4 should be fastened between the reflector and the four corners of the trailer.

(2) Guy assemblies 5 and 7 should run between the compression bar mounting lugs of the azimuth unit and outside hooks on the trailer.

(3) Guy assembly 6 should run between a compression bar mounting lug and bottom of the leg frame.

(4) After making sure that the guy assemblies are properly installed, tighten the turnbuckles.

(5) Replace the racks, bows, and the tarpaulin on the trailer.

7-9. Limited Storage

When packed as described in paragraph 7-8, Rawin Set AN/GMD-1(*) can be placed in open or closed storage areas for limited periods of time. If long term storage is required, the rawin set should be packaged and packed for storage in accordance with current regulations (para 2-1).

Paragraph 7-10 deleted.

Paragraph 7-11 deleted.

Paragraph 7-12 deleted.

Paragraph 7-13 deleted.

All data on page 7-7 deleted.

APPENDIX A

REFERENCES

AR 385-70	Unmanned Free Balloons, Moored Balloons and Kites, Unmanned Rockets, and Derelict Friendly Airborne Objects.
DA Pam 310-1	Consolidated Index of Army Publications and-Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
SB 38-100	Preservation, Packaging, and Packing and Marking Materials, Supplies, and Equipment used by the Army.
TB SIG 255	Radioactive Electronic Tube Handling.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM 11-6625-213-12	Operator's and Organizational Maintenance Manual: Test Sets TS-538/U, TS-538A/U, TS-538B/U, and TS-538C/U (NSN 6625-00-243-5174).
TM 11-6625-366-15	Operator's , Organizational, Direct Support, General Support, and Depot Maintenance Manual; Multimeter, TS-352B/U (NSN 6625-00-553-0142).
TM 11-6660-204-10	Operator's Manual Radiosonde Recorders AN/TMQ-5 (NSN 6660-00-324-9426); AN/TMQ-5A and AN/TMQ-5B (NSN 6660-00-393-2234), and AN/TMQ-5C (NSN 6660-00-682-4500).
TM 11-6660-204-10-HR	Hand Receipt Manual Covering Content of Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) for Radiosonde Recorders, AN/TMQ-5 (NSN 6660-00-324-9426), AN/TMQ-5A and AN/TMQ-5B (NSN 6660-00-393-2234), and AN/TMQ-5C (NSN 6660-00-682-4500).
TM 11-6660-204-24P-1	Organization Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Recording Set, Weather Data, AN/TMQ-5C (NSN 6660-00-682-4500).
TM 11-6660-204-25	Organizational Direct Support, General Support and Depot Maintenance Manual, Including Depot Overhaul Standards; Radiosonde Recorders, AN/TMQ-5 (NSN 6660-00-324-9426), AN/TMQ-5A and AN/TMQ-5B (NSN 6660-00-393-2234), and AN/TMQ-5C (NSN 6660-00-682-4500).
TM 11-6660-204-25P	Organizational, Direct Support, General Support and Depot Maintenance Repair Parts and Special Tools List: Radiosonde Recorders, AN/TMQ-5 (NSN 6660-00-324-9426), AN/TMQ-5A and AN/TMQ-5B (NSN 6660-00-393-2234), and AN/TMQ-5C (NSN 6660-00-682-4500).
TM 11-6660-218-12	Operator's and Organizational Maintenance Manual: Meteorological Station Manual AN/TMQ-4 (NSN 6660-00-537-9195).
TM 11-6660-218-25P	Organization Field, and Depot Maintenance Repair Parts and Special Tools List for Meteorological Station, Manual, AN/TMQ-4 (NSN 6660-00-537-9195).
TM 11-6660-219-12	Operator's and Organizational Maintenance Manual for Radiosonde Baseline Check Sets, AN/GMM-1 and AN/GMM-1A (NSN 6660-00-527-8392).
TM 11-6660-219-12-HR	Hand Receipt Manual Covering Contents of Components of End Item (COEI), Basic Issue Item (BII), and Additional Authorization List (AAL), for Radiosonde Baseline Check Sets, AN/GMM-1 and AN/GMM-1A (NSN 6660-00-527-8392).
TM 11-6660-219-20P	Organizational Maintenance Repair Parts and Special Tools List for Radiosonde Baseline Check Sets, AN/GMM-1 and AN/GMM-1A (NSN 6660-00-527-8392).
TM 11-6660-219-34	Direct Support and General Support Maintenance Manual for Radiosonde Baseline Check Sets, AN/GMM-1 and AN/GMM-1A (NSN 6660-00-527-8392) with Radiosonde Test Set, TS-1348/GMM-1A (NSN 6625-00-924-0327).

TM 11-6660-219-34P	Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Radiosonde Baseline Check Sets, AN/GMM-1 and AN/GMM-1A (NSN 6660-00-527-8392).
TM 11-6660-222-12	Operator's and Organizational Maintenance Manual: Meteorological (T.O. 45A2-2-1-2) (AR) (NSN 6660-00-239-4015), and ML-7 (NSN 6660-00-239-4010); Psychrometers, ML-24 (NSN 6660-00-223-5083), and ML-224 (NSN 6660-00-223-5084); Instrument Shelter, Meteorological, S-101/UM (NSN 5410-00-222 0507); Support, Instrument Shelter, MT-1426/UM (NSN 5410-00-408-4807), and Launching Equipment.
TM 11-6660-228-10	Operator's Manual for Radiosonde Sets, AN/AMT-4D and AN/AMT-4E (NSN 6660-00-542-1964).
TM 11-6660-238-15	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Balloon Inflation and Launching Device, ML-594/U (NSN 6660-00-999-2663) (T.O. 31M1-2U-2).
TM 11-6660-238-20P	Organizational Maintenance Repair Parts and Special Tools List for Balloon Inflation and Launching Device, ML-594/U (NSN 6660-00-999-2663).
TM 11-6660-238-25P	Organizational, Direct Support, General Support, and Depot Maintenance Repair Parts and Special Tools List Balloon Inflation and Launching Device ML-594/U (NSN 6660-00-999-2663).
TM 11-6660-245-15	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Meter, Volume, Hydrogen-Helium, ML-605/U (NSN 6660-00-999-2661) (T.O. 31M1-2U-12).
TM 11-6660-245-20P	Organizational Maintenance Repair Parts and Special Tools List for Meter, Volume, Hydrogen-Helium, ML-605/U (NSN 6660-00-999-2661).
TM 11-6660-245-34P	Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Meter, Hydrogen-Helium, ML-605/U (NSN 6660-00-999-2661).
TM 11-6660-263-10	Operator's Manual, Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 11-6660-263-10-HR	Hand Receipt Manual Covering Contents of Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 11-6660-263-20P	Organizational Repair Parts and Special Tools List for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), OL-192A/GMD-1 (NSN 6660-01-065-4466), and OL-274-TNS-10 (NSN 1290-01-119-7313).
TM 11-6660-263-24-1	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 11-6660-263-24-2	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), OL-192A/GMD-1 (NSN 6660-01-065-4466), and Calculator, Programmable, CP-1387/U (NSN 7420-01-026-2686) (HP9825A Desk Top Computer).
TM 11-6660-263-24-3	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), OL-192A/GMD-1 (NSN 6660-01-065-4466), and Reader-Perforator, RP-263/GMD-1 (NSN 6660-01-068-8642) (Remex Model RAB612XBA).
TM 11-6660-263-24-4	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), OL-192A/GMD-1 (NSN 6660-01-065-4466), and Cable Assembly, Special Purpose, CX-13096/U (HP 98032A 16-Bit Interface).

TM 11-6660-263-34P	Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Meteorological Data Processing Groups, OL-192/GMD-1 (NSN 6660-01-065-4467), OL-192A/GMD-1 (NSN 6660-01-065-4466), and OL-274/TNS-10 (NSN 6290-01-119-7313).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-5-3	Meteorological Equipment Data Sheets.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the AN/GMD-1( ). to help you inventory items required for safe and efficient operation.

B-2. General

This Components of End Item List is divided into the following sections:

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the AN/GMD-1( ) and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the AN/GMD-1( ) in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the AN/GMD-1( ) during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration on which the item is shown.

(2) *Item number.* The number used to identify item called out in the illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. Following the part number, the Federal Supply Code for Manufacturers (FSCM) is shown in parentheses.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving onto an adjacent area.

f. Usable on Code. Not applicable. "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in these lists are:

Code	*Used on*
1	AN/GMD-1A
2	AN/GMD-1B
3	ANIGMD-1C
4	AN/GMD-1D

g. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during an inventory. Under the Rcvd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

(Next printed page is B-2)

SECTION II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER (FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQD	(7) QUANTITY RCVD	DATE
1-1		6660-00-497-8501	ANTENNA AS-462A/GMD-1 OR		1, 3	1		
1-1		6660-00-497-8501	ANTENNA AS-462C/GMD-1 C/O:		2, 4	1		
1-3		6660-00-253-1605	REFLECTOR, CENTER, RIGHT AND LEFT WING SECTIONS		1 thru 4	1		
1-25		6660-00-774-8432	SPINNER CUP AND RADOME ASSEMBLY (ANTENNA SCANNER)		1 thru 4	1		
1-3		6660-00-191-9773	CABLE ASSEMBLY, SPECIAL PURPOSE CX-1216/U		1 thru 4	1		
1-25		6660-00-160-5889	CABLE ASSEMBLY, SPECIAL PURPOSE CX-1217/U		1 thru 4	1		
2-37		6660-00-170-8777	CABLE ASSEMBLY, POWER ELECTRICAL CX-1492/U		1 thru 4	1		
1-25		6660-00-498-3355	CABLE ASSEMBLY, POWER ELECTRICAL CX-1493/U		1 thru 4	1		
1-3		6660-00-255-2059	CABLE ASSEMBLY, POWER ELECTRICAL CX-2043/U		1 thru 4	1		
1-3		6660-00-372-2675	CONTROL ANTENNA C-578A/GMD-1		1, 3	1		
1-3		6660-00-372-2675	CONTROL ANTENNA C-578C/GMD-1		2, 4	1		
1-3		6660-00-498-9650	CONTROL RECORDER C-577B/GMD-1		1, 3	1		
1-3		6660-00-498-9650	CONTROL RECORDER C-577D/GMD-1		2, 4	1		
1-1		6660-00-256-8328	PEDESTAL , ANTENNA AB-159B/GMD-1 OR		1, 3	1		
			PEDESTAL AB-159C/GMD-1					
1-1		6660-00-752-5801	PEDESTAL, ANTENNA AB-159(D)(E)/GMD-1 C/O:		2, 4	1		
1-3			AZIMUTH ASSEMBLY		1 thru 4			
1-25		6660-00-170-4499	CABLE ASSEMBLY CX-1285/U		1 thru 4	1		
1-3		6660-00-285-0214	LEG SUPPORT (COMPRESSION BAR)		1 thru 4	2		
1-3		6660-00-257-4799	LEG SUPPORT (COMPRESSION BAR)		1 thru 4	1		
1-3		6660-00-774-8411	ELEvATION ASSEMBLY		1 thru 4	1		
1-3		5985-00-356-7385	HOUSING		1 thru 4	1		
1-3		6660-00-031-0215	LEG ASSEMBLY (INCLUDES OUTRIGGER, JACK SCREWS, AND LOCKING NUTS)		1 thru 4	3		
1-3		6660-00-404-2998	PLATE , TRIPOD		1 thru 4	3		
1-8		5820-00-537-9205	RECEIVER R-301(C)/GMD-1		1, 3	1		
1-8		5820-00-537-9205	RECEIVER R-301(D)/GMD-1 C/O:		2, 4	1		
1-25		6660-00-504-2437	CABLE ASSEMBLY, RADIO FREQUENCY CG-409/U		1 thru 4	1		
1-25		5995-00-251-3848	CABLE ASSEMBLY, RADIO FREQUENCY CG-530/U		1 thru 4	1		
1-7		5895-00-519-5569	MIXER STAGE, FREQUENCY		1 thru 4	1		
1-25		5975-00-240-3860	ROD, GROUND & CABLE ASSEMBLY		1 thru 4	1		
1-27		6660-00-568-9987	TELESCOPE, ELBOW M17		1 thru 4	1		
1-25		6660-00-243-5174	TEST SET TS-538( )/U		1 thru 4	1		
1-25		5120-00-596-8653	SCREWDRIVER, FLAT TIP (PHASING TOOL)		1 thru 4	1		
1-25		5120-00-393-0056	WRENCH, SPEED 15/16 IN. SOCKET, UNIVERSAL		1 thru 4	2		
1-25		5935-00-201-3089	ADAPTER, CONNECTOR SC-C-93555		2, 4	1		
1-3.1		6660-01-065-4466	METEROLOGICAL DATA PROCESSING GROUP		1 thru 4	1		
			OL-192A/GMD-1*					
1-3.1		6660-01-065-4467	METEROLOGICAL DATA PROCESSING GROUP		1 thru 4	1		
			OL-192/GMD-1*					
			*REFER TO TM 11-6660-263-10					

(1) ILLUSTRATION (A) FIG NO,	(1) ILLUSTRATION (B) ITEM NO,	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER (FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQD	(7) QUANTITY RCVD	(7) QUANTITY DATE
1-3		6660-00-497-9770	CASE CY-734/GMD-1		1 thru 4	1		
1-3		6660-00-318-4231	CASE, CY-735(A)/GMD-1		1 thru 4	1		
1-3		6660-00-038-0847	CASE, CY-736/GMD-1		1 thru 4	1		
1-3		6660-00-497-9773	CASE, CY-737(A)/GMD-1		1 thru 4	1		
1-3		6660-00-356-3912	CASE, COMPONENTS CY-1157/GMD-1A		1 thru 4	1		
		6660-00-333-2688	CASE, CY-898/GMD-1 (RUNNING SPARES)		1, 3	1		
1-3		6660-00-333-2688	CASE, STANDARDIZED COMPONENTS, ELECTRICAL CY-1895/GMD-1 (RUNNING SPARES)		2, 4	1		
1-3		3895-00-510-4761	HOLDER, CABLE REEL MT-1421/U		1 thru 4	1		
1-3		8130-00-498-8366	REEL, CABLE RL-137/GMD-1		1 thru 4	1		
1-3		8130-00-061-8203	REEL, CABLE RL-138/GMD-1		1 thru 4	1		
1-24		6660-00-735-6464	ACCESSORY KIT (TRAILER ADAPTER KIT) C/O:		1 thru 4	1		
1-24		6660-00-355-8972	ANTENNA WING FIXTURE		1 thru 4	1		
1-24		6660-00-356-5138	SKID, AZIMUTH UNIT		1 thru 4	1		
1-24		5975-00-284-8299	GUY SC-D-84302 GR1		1 thru 4	1		
1-24		5975-00-284-8302	GUY SC-D-84302 GR2		1 thru 4	1		
1-24		5975-00-284-5796	GUY SC-D-84302 GR3		1 thru 4	1		
1-24		5975-00-284-8301	GUY SC-D-84302 GR4		1 thru 4	1		
1-24		5975-00-284-8304	GUY SC-D-84303		1 thru 4	1		
1-24		5975-00-284-8303	GUY SC-D-84304		1 thru 4	1		
1-24		5975-00-567-2322	GUY SC-D-84305		1 thru 4	1		
1-24		6660-00-356-5069	FRAME LEG ASSEMBLY SM-D-192298		1 thru 4	1		
1-24		6660-00-025-3908	SUPPORT WOOD SC-D-84307		1 thru 4	2		
1-24		6660-00-392-8716	TURNTABLE COVER		1 thru 4	1		

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists additional items you are authorized for the support of the Rawin Set AN/GMD-1( ).

C-2. General

This list identifies items that do not have to accompany the Rawin Set AN/GMD-1( ) and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. Explanation of Listing

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description. If item required differs for different models of this equipment, the model is shown under the "Usable on" heading in the description column. These codes are identified as:

Code	*Used On*
1	AN/GMD-1A
2	ANIGMD-1B
3	AN/GMD-1C
4	AN/GMD-1D

(Next printed page is C-2)

SECTION II ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER AND FSCM	USABLE ON CODE	(3) UNIT OF MEAS	(4) QTY AUTH
	RADIOSONDE RECORDER, AN/TMQ-5 (*)	1,2,3,4	EA	1
	* ALL MODELS OF EQUIPMENT			
6660-00-324-9426	RADIOSONDE RECORDER AN/TMQ-5			
6660-00-393-2234	RADIOSONDE RECORDER AN/TMQ-5A AND AN/TMQ-5B			
6660-00-682-4500	RADIOSONDE RECORDER AN/TMQ-5C			

APPENDIX D

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

D-1. General.

This appendix provides a summary of the maintenance operations for AN/GMD-1( ). It authorizes categories of maintenance for specific maintenance functions on repairable 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.

D-2. Maintenance Function.

Maintenance functions will be limited 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 or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. 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) in a manner to allow the proper functioning of the equipment or system.

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

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, 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.

D-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 Functions. 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(s), 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 (assembly, subassembly, component, module, end item or system) to a 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. Subcolumns of column 4 are as follows:

C-Operator/Crew
O-Organizational
F-Direct Support
H-General Support
D-Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool 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 alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

D-4. Tool and Test Equipment Requirements (Sect. III).

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

b. Maintenance Category. The codes in this column indicate 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.

D-5. Remarks (Sect. IV).

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.

(Next printed page is D-3)

SECTION II MAINTENANCE ALLOCATION CHART
FOR

AN/GMD-1A , AN/GMD-1B , AN/GMD-1C , AN/GMD-1D

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
00	RAWIN SET AN/GMD-1( )	Service	0.2						P
		Service		0.5					M
		Adjust	0.5					8	
		Adjust		0.5				5, 8, 12	Q
		Repair		1.0				5, 8, 10, 12	C, E, I
		Repair			2.0			1, 2, 3, 6, 8, 10, 11, 13, 14	
		Repair				4.0		1, 3 thru 6, 8, 10, 11, 13, 14	
		Overhaul					160.0	1 thru 6, 9, 10, 11, 13, 14	
01	ANTENNA AS-462( )/GMD-1	Service		0.5				12	M
		Repair		2.5				5, 12	A, N
		Repair			4.0			5, 8, 11	
		Repair				5.0		3, 5, 8, 11	N
		Overhaul					16.0		K
0101	REFLECTOR, ANTENNA	Replace		1.0				12	
		Repair			4.0			11	
010101	MOUNTING ASSEMBLY, TELESCOPE	Repair			1.3			11	
0102	SPINNER CUP AND RADOME ASSEMBLY	Replace		0.5					
		Repair			1.4			3, 8, 11	
		Repair				6.0		3, 5, 8, 11	B, N
010201	CABLE ASSEMBLY, POWER ELECTRICAL (W101)	Repair			0.7			5, 11	B
010202	MOTOR-GENERATOR ASSEMBLY	Repair				2.0		3, 5, 11	N
01020201	GENERATOR, AC ASSEMBLY (G150)	Repair				1.5		3, 5, 11	
01020202	MOTOR ASSEMBLY (B118)	Repair				1.5		3, 5, 11	
02	CABLE ASSEMBLY, SPECIAL PURPOSE , ELECTRICAL CX-1216/U (W901)	Replace		0.1					
		Repair			1.0			5, 11	
03	CABLE ASSEMBLY , SPECIAL PURPOSE, ELECTRICAL CX-1217/U (W927)	Replace		0.1					
		Repair			1.0			5, 11	
04	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-1492/U (W971)	Replace		0.1					
		Repair			1.0			5, 11	
05	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-1493/U (W941)	Replace		0.1					
		Repair			1.0			5, 11	
06	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-2043/U (W911)	Replace		0.1					
		Repair			1.0			5, 11	
07	CASE ASSEMBLY CY-734/GMD-1	Replace		0.1					
		Repair					1.0	11	K
08	CASE ASSEMBLY CY-735A/GMD-1	Replace		0.1					
		Repair					1.0	11	K
09	CASE ASSEMBLY CY-736/GMD-1	Replace		0.1					
		Repair					1.0	11	K
10	CASE ASSEMBLY CY-737A/GMD-1	Replace		0.1					
		Repair					1.0	11	K
11	CASE ASSEMBLY CY-1157/GMD-1	Replace		0.1					
		Repair					1.0	11	K
12	CASE ASSEMBLY CY-1895/GMD-1	Replace		0.1					
		Repair					1.0	11	
13	ANTENNA CONTROL C-578( )/GMD-1	Repsir		0.5				12	C
		Repair			2.0			5, 10, 11	
		Repair					2.0	5, 10, 11	K, O
		Adjust		0.5				5, 11	
1301	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 601)	Repair			0.7			5, 11	
1302	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 602)	Repair			0.7			5, 11	

SECTION II MAINTENANCE ALLOCATION CHART
FOR

AN/GMD-1A , AN/GMD-1B , AN/GMD-1C , AN/GMD-1D

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
1303	RESISTOR BOARD ASSEMBLY (TB 603)	Repair			0.7			5, 11	
1304	RESISTOR BOARD ASSEMBLY (TB 604)	Repair			0.7			5, 11	
1305	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 605)	Repair			0.7			5, 11	
1306	SCR SWITCHING UNIT	Replace Repair		0.3			2.0	5, 11	D, K
1307	CHASSIS ASSEMBLY	Repair			1.0			11	E
14	CONTROL RECORDER C-577( )/GMD-1	Service Service Repair Repair	0.2	0.5 0.5	3.5			12 5, 11	P M C
1401	ELECTRICAL EQUIPMENT CABINET	Repair			1.0			11	
1402	CONTROL-RECORDER ASSEMBLY	Repair			2.0			5, 11	
140201	FOLDING TABLE	Repair			.5			11	
140202	MAIN CHASSIS ASSEMBLY	Repair Repair			3.7	3.5		5, 11 5, 11	
14020201	TIME TYPE ASSEMBLY	Repair Repair			1.0	2.0		5, 11 5, 11	
14020202	MOTOR ASSEMBLY (B101) (B102)	Replace Repair			1.1	2.3		5, 11 5, 11	
14020203	INDICATOR, AZIMUTH	Replace Repair			1.1	3.0		5, 11 5, 11	
14020204	INDICATOR, ELEVATION	Replace Repair			1.3	3.0		5, 11 5, 11	
14020205	SHAFT ASSEMBLY	Replace Repair			1.0	1.0		11 11	
14020206	PAPER ROLLER ASSEMBLY	Replace Repair			1.0	1.5		11 11	
14020207	TENSION UNIT ASSEMBLY	Replace Repair			1.1	1.5		11 11	
14020208	PRINT HAMMER ASSEMBLY	Replace Repair			1.2	1.3		11 11	
14020209	CAM ASSEMBLY	Repair			2.0			11	
14020210	RIBBON PRINTING ASSEMBLY	Replace Repair			1.0	1.5		11 11	
14020211	AZIMUTH PRINTER ASSEMBLY	Replace Repair			1.0	2.0		11 11	
14020212	ELEVATION PRINTER ASSEMBLY	Replace Repair			1.0	2.0		11 11	
140203	PANEL CONTROL ASSEMBLY	Repair Repair		0.5	1.5			5, 11	C
140204	CHASSIS ASSEMBLY	Repair			1.5			11	
15	GROUND ROD AND CABLE ASSEMBLY	Repair		1.0				12	C
16	TELESCOPE M-17 (MODIFIED)	Repair Repair		1.0			4.0	12	K
17	TEST SET TS-538( )/U								S
18	HOLDER, CABLE REEL MT-1421/U	Replace Repair		0.3	0.5			11	
	REEL, CABLE RL-137/GMD-1	Replace		0.3					F

SECTION II MAINTENANCE ALLOCATION CHART
FOR

AN/GMD-1A, AN/GMD-1B , AN/GMD-1C, AN/GMD-1D

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
	REEL, CABLE RL-138/GMD-1	Replace		0.3					F
19	PACKING KIT	Repair		0.7				12	E
		Repair			0.7			11	E
20	PEDESTAL AB-159( )/GMD-1	Service		0.7					
		Repair		0.5				5, 12	C
		Repair			2.5			5, 11	
		Repair				4.0		5, 11	
		Repair					16.0		K, L
2001	HOUSING AND FRAME ASSEMBLY	Repair			2.0			5, 11	
200101	SWING LINK ASSEMBLY	Repair			1.0			5, 11	
2002	ELEVATION ASSEMBLY	Repair			2.5			5, 11	G
		Repair				4.0		5, 11	
200201	DRIVE ASSEMBLY	Repair			2.5			5, 11	G
		Repair				4.0		5, 11	
200202	ELEVATION INDICATOR ASSEMBLY	Repair				2.0		11	
200203	STOW LOCK ASSEMBLY	Repair			2.5			11	H
200204	COUNTER BALANCE, ASSEMBLY	Repair				1.5		11	
2003	AZIMUTH ASSEMBLY	Repair		1.0				5, 12	A, I
		Repair			2.0			5, 11	
		Repair				4.0		5, 11	
		Repair					8.0		K
200301	INDICATOR ASSEMBLY	Repair			1.0			11	
		Repair				2.0		11	
20030101	INDICATOR ASSEMBLY, AZIMUTH	Repair			1.0			11	
		Repair				2.0		11	
200302	STOW LOCK ASSEMBLY	Repair			1.5			11	H
200303	ELEVATION DRIVE ASSEMBLY	Repair			1.0			5, 11	J
		Repair				2.0		5, 11	
		Repair					8.0	5, 11	K, L
20030301	MOTOR GENERATOR ASSEMBLY	Repair			1.5			5, 11	
20030301	DRIVE ASSEMBLY	Repair			0.7			11	
200304	TURNTABLE ASSEMBLY	Repair				2.0		11	
		Repair					15.0		K, L
200305	CONTACT FINGER ASSEMBLY	Repair				1.5		5, 11	
200306	COVER ASSEMBLY	Repair			1.0			11	
2004	CABLE ASSEMBLY, SPECIAL PURPOSE CY-1285/U (W951)	Replace		0.1					
		Repair			1.0			5, 11	
21	RAWIN RECEIVER R-301( )/GMD-1	Service		0.3					M
		Repair		1.0				5, 10, 12	
		Repair			2.0			2, 3 thru 6, 8, 10, 11	
		Repair				1.5		2, 3, 5, 6, 8, 10, 11, 13, 14	
2101	CABLE ASSEMBLY, RF CG-409/U (W121)	Replace		0.2					
		Repair			1.0			5, 11	
2102	CABLE ASSEMBLY, RF CG-530/U (W131)	Replace		0.2					
		Repair			1.0			5, 11	
2103	MIXER STAGE ASSEMBLY	Replace		0.3					
		Repair			1.0			5, 11	
2104	CABLE ASSEMBLY, RF (W501)	Repair			0.7			5, 11	
2105	CABLE ASSEMBLY, RF (W502)	Repair			0.7			5, 11	

SECTION II MAINTENANCE ALLOCATION CHART
FOR

AN/GMD-1A, AN/GMD-1B, AN/GMD-1C, AN/GMD-1D

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
2106	CABLE ASSEMBLY, RF (w104)	Repair			0.7			5, 11	
2107	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 1001A)	Repair			0.8			5, 11	
2108	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 1009A)	Repair			0.8			5, 11	
2109	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 1010A)	Repair			0.8			5, 11	
2110	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 1012A)	Repair			0.8			5, 11	
2111	CAPACITOR-RESISTORBOARD ASSEMBLY (TB 1013A)	Repair			0.8			5, 11	
2112	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 1014A)	Repair			0.8			5, 11	
2113	CAPACITOR-RESISTOR BOARD ASSEMBLY (TB 1015A)	Repair			0.8			5, 11	
2114	TUNER RF ASSEMBLY	Repair Repair			1.0	2.0		5, 11 5, 11	
211401	RESISTOR BOARD ASSEMBLY	Repair			1.0			5, 11	
211402	OSCILLATOR, RF ASSEMBLY PLUNGER ASSEMBLY	Replace Repair			0.8	1.5		11 11	
2115	AMPLIFIER IF, ASSEMBLY	Repair Repair		0.3		2.0		10, 12 2, 3, 5, 6, 10, 11, 13, 14	C
211501	AMPLIFIER, IF CHASSIS ASSEMBLY	Repair				2.0		2, 3, 5, 6, 10, 11, 13, 14	
2116	RECEIVER, RADIO PANEL AND CHASSIS ASSEMBLY	Repair			1.0			11	
22	METEOROLOGICAL DATA PROCESSING GROUP OL-192( )/GMD-1	Replace		0.2					R

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
Rawin Sets AN/GMD-1(A), AN/GMD-1(B), AN/GMD-1(C) and AN/GMD-1(D)

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL NATO STOCK NUMBER	TOOL NUMBER
1	F, H, D	CRYSTAL RECTIFIER TEST SET TS-268E/U	6625-00-669-1215	
2	F, H, D	GENERATOR, SIGNAL AN/USM-44	6625-00-669-4031	
3	G, H, D	MULTIMETER, ME-26B/U	6625-00-646-9409	
4	H, D	MULTIMETER, ELECTRONIC ME-30A/U (VOLTMETER)	6625-00-643-1670	
5	O, F, H, D	MULTIMETER, TS-352B/U	6625-00-242-5023	
6	F, H, D	OSCILLOSCOPE AN/USM-281A	6625-00-228-2201	
7	D	WAVEMETER FR-91/U	6625-00-532-4232	
8	O, F, H, D	TEST SET TS-538/U (Issued with AN/GMD-1( ))	6625-00-243-5174	
9	D	TEST SET, ELECTRON TUBE TV-2/U	6625-00-699-0263	
10	O, F, H	TEST SET, ELECTRON TUBE TV-7/U	6625-00-376-4939	
11	F, H, D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
12	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
13	H, D	GENERATOR, SIGNAL SG-336/U	6625-00-669-2395	
14	H, D	ATTENUATOR CN-796	5985-00-087-2547	

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	BY REPLACING REFLECTOR SPINNER CUP.
B	BY REPAIRING CABLE ASSEMBLY W101.
C	BY REPLACING FUSES, TUBES, LAMPS, SCR SWITCHING UNIT.
D	REQUIRES DEPOT FABRICATION OF TEST FIXTURE.
E	BY REPLACING PARTS INDICATED IN TECHNICAL MANUALS AND RPSTL.
F	SHOWN FOR INFORMATIONAL PURPOSES ONLY. NOT A REPAIRABLE ITEM.
G	BY REPLACING COMPONENTS INCLUDING DRIVE MOTOR (B201), ANTI-HUNT GENERATOR (G201) AND ELEVATION SYNCHRO-GENERATOR (B202).
H	FGC 210203 AND 210302 ARE SIMILAR.
I	BY REPLACING BRUSHES ON GENERATOR, TACHOMETER G701, SC-B-93283 USED ON AB-159B and AB-159C.
J	BY REPLACING B701, B702 AND G701.
K	REPAIR UTILIZING DEPOT FACILITIES.
L	REPAIR BY REPLACING TURNTABLE ASSEMBLY OR REPAIRING CONTACT RINGS.
M	BY LUBRICATING.
N	SYSTEM OR SYSTEM COMPONENTS REQUIRED FOR TESTING.
O	REPAIR OF SCR SWITCHING UNIT.
P	BY REPLACING PAPER AND RIBBONS.
Q	ADJUSTING OF ANTENNA CONTROL C-578/GMD-1.
R	REFER TO TM 11-6660-206-24-1.
S	REFER TO TM 11-6625-213-12 AND TM 11-6625-213-34P.

INDEX

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

USASA (2)
CNGB (1)
ACSC-E (2)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USAARENBD (2)
USAMB (10)
USAFABD (2)
USACDC (2)
USACDC Agcy (1)
USAMC (1)
CONARC (5)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Cored (4)
LOGCOMD (5)
USAMICOM (4)
USATECOM (2)
USASTRATCOM (4)
USAESC (70)
MDW (1)
Armies (2)
Corps (2)
1st Cav Div (3)
Svc Colleges (2)
USASESS (5)
USAADS (2)
USAFAS (60)
USAARMS (2)
USAIS (2)
USAES (2)
USAINTS (3)
WRAMC (1)
USACDCEC (10)
Instl (2) except
  Fort Gordon (10)
  Fort Huachuca (10)
  Fort Carson (21)
  WSMR (3)
Army Dep (2) except
  LBAD (14)
  SAAD (30)
  TOAD (14)
  LEAD (7)
  NAAD (5)
  SVAD (5)
  ATAD (10)
Gen Dep (2)
Sig Sec Gen Dep (5)
Sig Dep (10)
Sig FLDMS (2)
ATS (1)
USAERDAA (2)
USAERDAW (5)
USACRREL (2)
MAAG (1)
USARMIS (1)
APG (5)
DPG (5)
JPG (5)
Units org under fol TOE:
  (2 copies each)
  6-100
  6-185
  6-186
  6-200
  6-201
  6-300
  6-302
  6-525
  6-526
  6-575
  6-700
  6–701
  7
  7-100
  11-117
  11-158
  11-500 (AA-AC)
  17
  17-100
  29-134
  29-136
  37
  37-100
  39-51
  47
  57
  67
  6-767

NG: State AG (3); units—same as Active Army except allowance is one (1) copy to each unit.
USAR: None.
For explanation of abbreviations used, see AR 310-50

☆ U.S. GOVERNMENT PRINTING OFFICE: 1992 - 311-831/44019

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

THEN . . . JOT DOWN THE DOPE ABOUT IT ON THIS FORM, FOLD IT, AND DROP IT IN THE MAIL!

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT . . . PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

PS--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

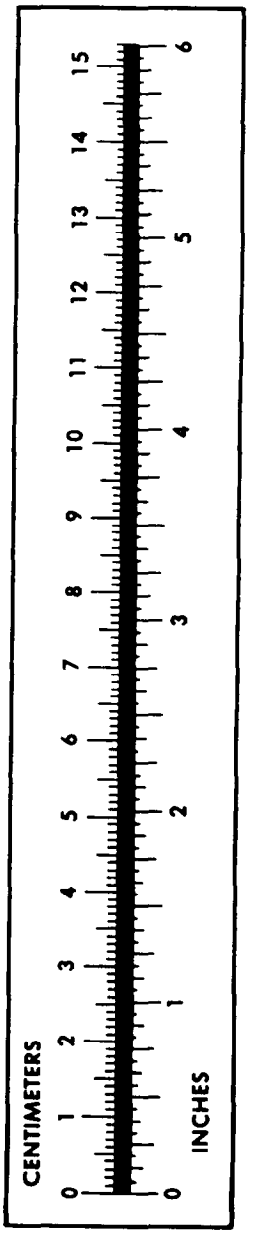
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN: 016176-003