

TECHNICAL MANUAL

OPERATOR'S MANUAL

RADIOSONDE RECORDERS

AN/TMQ-5 (NSN 6660-00-324-9426)

AN/TMQ-5A (NSN 6660-00-393-2234)

AN/TMQ-5B (NSN 6660-00-393-2234)

AN/TMQ-5C (NSN 6660-00-682-4500)

This copy is a reprint which includes current pages from Changes 1 through 7. The title was changed as shown above by Change 5.

HEADQUARTERS, DEPARTMENT OF THE ARMY
6 OCTOBER 1969

WARNING

HIGH VOLTAGE

is used in this equipment.

DEATH ON CONTACT

may result if operating personnel
fail to observe safety precautions.

DON'T TAKE CHANCES!

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.

CHANGE }
NO. 7 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 9 July 1985

Operator's Manual
RADIOSONDE RECORDERS
AN/TMQ-5 (NSN 6460-00-324-9426)
AN/TMQ-5A (NSN 6660-00-393-2234)
AN/TMQ-5B (NSN 6660-00-393-2234)
AN/TMQ-5C (NSN 6660-00-682-4500)

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3. File this change sheet in front of the publication.

*This change supersedes TM 11-6660-204-ESC, dated May 1969, including all changes.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

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The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-36 literature requirements for AN/TMQ-5 through AN/TMQ-5C

CHANGE }
No. 6 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 14 September 1983

Operator's Manual

RADIOSONDE RECORDERS

AN/TMQ-5 (NSN 6660-00-324-9426)

AN/TMQ-5A (NSN 6660-00-393-2234)

AN/TMQ-5B (NSN 6660-00-393-2234)

AN/TMQ-5C (NSN 6660-00-682-4500)

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1-13 and 1-14.....	1-13 and 1-14
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4-1 through 4.6	4-1 through 4-6
5-1 and 5-2.....	5-1 and 5-2
A.1.....	A-1/(A-2 blank)
B-1, B-2 and B.3	B-1,B-2 and B-3/(B-4 blank)

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CHANGE }
No. 5 }

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**Operator's, Manual
RADIOSONDE RECORDERS
AN/TMQ-5 (NSN 6660-00-324-426)
AN/TMQ-5A (NSN 6660-00-393-2234)
AN/TMQ-5B (NSN 6660-00-393-2234)
AN/TMQ-5C (NSN 6660-00-682-4500)**

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i and ii	i and ii
1-1 through 1-6.1	1-1 through 142
B-1	B-1 through B-2
None	D-1 and D-2

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USAICS (3)	6-302 (1)	57 (1)
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USARMIS (1)		

NG: None

USAR: None

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

Operator's Manual

RADIOSONDE RECORDERS

AN/TMQ-5 (NSN 6660-00-324-9426)

AN/TMQ-5A (NSN 6660-00-393-2234)

AN/TMQ-5B (NSN 6660-00-393-2234)

AN/TMQ-5C (NSN 6660-00-682-4500)

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, New Jersey 07703-5007.

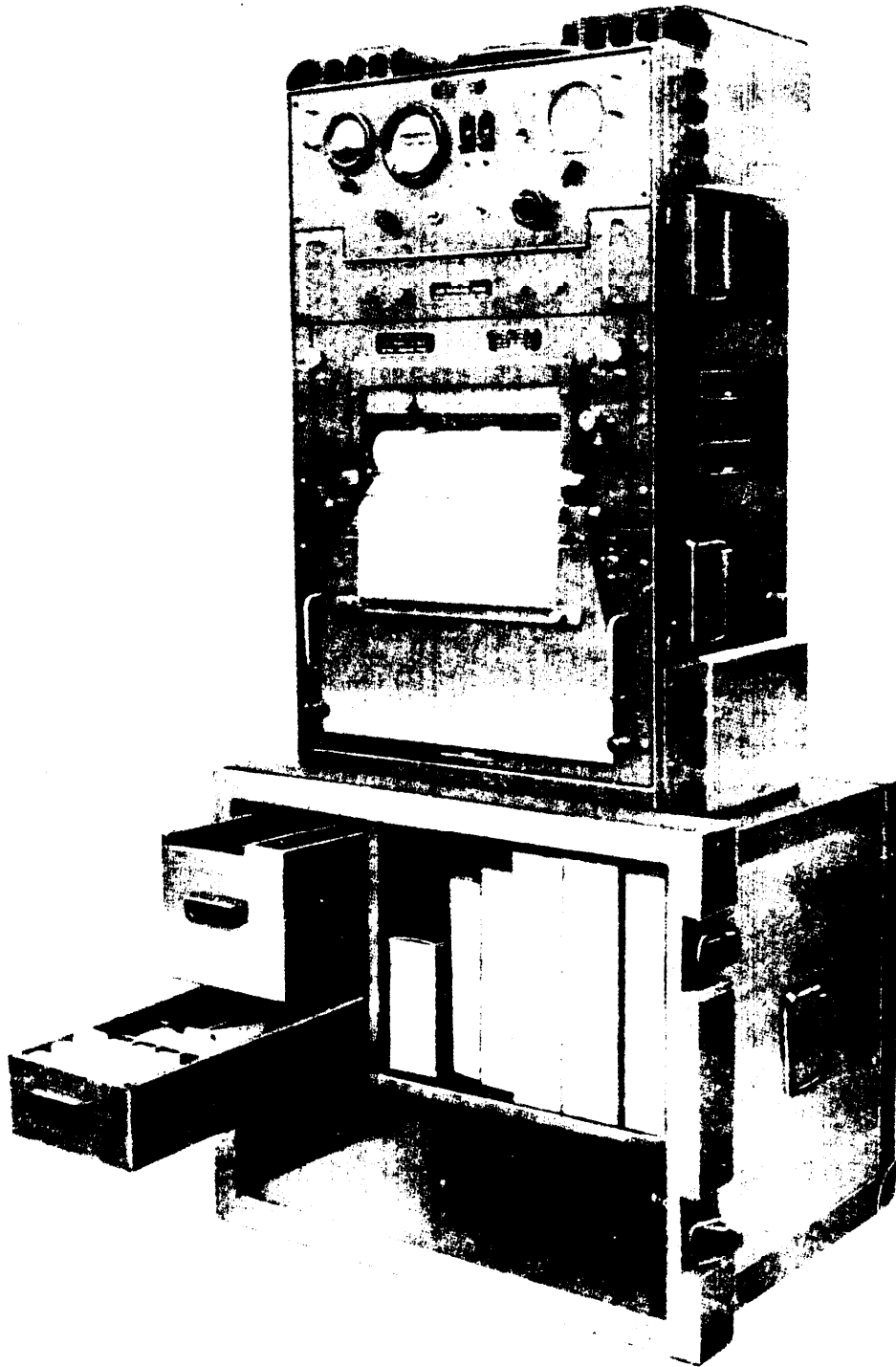
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*This manual supersedes TM 11-2436, 9 March 1955, including all changes.

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EL 6660-204-10-1

Figure 1-1. Radiosonde Recorder AN/TMQ-5().*

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual covers Radiosonde Recorder AN/TMQ-5(*) (fig. 1-1). Included are installation, operating, and operator's maintenance instructions.

b. Official nomenclature followed by (*) is used to indicate all models of the equipment item covered in this manual. Thus Radiosonde Recorder AN/TMQ-5(*) represents Radiosonde Recorder AN/TMQ-5, AN/TMQ-5A, AN/TMQ-5B, and AN/TMQ-5C; Control Panel C-384(*)/TMQ-5 represents Control Panels C-834/TMQ-5 and C834A/TMQ-5; Signal Data Converters CV-146/TMQ-5 and CV-146A/TMQ-5; Power Supply PP-968(*) TMQ-5 represents Power Supplies PP-968/TMQ-5 and PP-968A/TMQ-5; Electrical Equipment Cabinet CY-1390(*)/TMQ-5 represents Electrical Equipment Cabinets CY-1390/TMQ-5 and CY-1390A/TMQ-5; Rawin Set AN/GMD-1(*) represents Rawin Sets AN/GMD-1A, AN/GMD-1B, AN/GMD-1C, and AN/GMD-1C; Radiosonde Set AN/AMT-4(*) represents Radiosonde Sets AN/AMT-4A, B, C, and D; Radiosonde Set AN/AMT-12(*) represents Radiosonde Sets AN/AMT-12 and AN/AMT-12A; Radiosonde Baseline Check Set AN/GMM-1(*) represents Radiosonde Baseline Check Sets AN/GMM-1 and AN/GMM-1A; Computer, Humidity-Temperature CP-223(*)/UM represents Computers, Humidity-Temperature CP-223/UM and CP-223A, B, C/UM; and Control Recorder C-577(*)/GMD-1, represents Control Recorders C-577A/GMD-1, C-577B/GMD-1, and C-577C/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, Maintenance Management Update.

b. *Report of Packaging and Handling Deficien-*

cies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2.

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.

1-3.1. 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 or DA Form 2028(Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. In either case, a reply will be furnished direct to you.

1-3.2. Reporting Equipment Improvement Recommendations (EIR)

If your AN/TMQ-5(*) 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. Tell us why a procedure is hard to perform. Put it on an SF 366 (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.

1-3.3. Hand Receipt

This manual has a companion document with a TM number followed by "-HR". The TM 11-6660-204-10-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, Baltimore, MD, in accordance with the procedures in Chapter 3, AR 310-2, and DA Pam 310-10-2.

1-3.4. 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. Disas-

sembly and repacking of equipment for shipment or limited storage are covered in Chapter 5.

1-3.5. Destruction of Army Electronics Materiel

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

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

a. Purpose. Radiosonde Recorder AN/TMQ-5(*) is an electronic meteorological recording equipment which graphically records weather information that is transmitted by a balloon-borne radiosonde.

b. Use. A signal is transmitted from the radiosonde, which has a transmitter modulated at an audiofrequency (AF) rate determined by the meteorological factors of the atmosphere. The radiated signals are picked up by the rawin receiver, which amplifies and converts them to AF signals of the proper wave shape. These AF signals are then fed to Radiosonde Recorder AN/TMQ-5(*), which converts them to direct current (dc) voltages; the value of the dc voltage at any instant is proportional to the AF that creates it. This dc voltage excites a servosystem that positions a pen in the recorder, and causes a graph to be drawn on calibrated paper. The record is then evaluated in terms of meteorological data, including temperature, pressure, and humidity.

1-5. Technical Characteristics

The general characteristics and performance data of Radiosonde Recorder AN/TMQ-5(*) are listed below.

Power requirements	105 to 125 volts, 50 to 60 cycles single-phase, 225 to 275 watts.
Test signal:	
Sine wave	10 to 220 Hz, 10 volts peak to peak (minimum).
Input signal:	
Negative-going pulse or saw tooth	10 to 220 Hz, 10 to 100 volts peak to peak, 1,000 to 2,500 μ sec wide.
Power supply:	
Positive	Self-contained, full wave, regulated, + 300 volts.
Negative	self-contained, full wave, wave regulated, -175 volts.
Signal data converter output	Nominally 30 mv dc for fullscale deflection of pen.

Reference adjust frequency range	- 163 to 242 Hz.
Chart	
Length	120 ft
Width	10-11/16 in. overall.
Vertical axis	1/2 in. intervals.
Horizontal axis	100 equal divisions.
Speed	1/2 in. per minute for Radiosonde Recorder AN/TMQ5; 1/2 or 1 in. per minute (operator may choose) for Radiosonde Recorders AN/TMQ-5A and AN/TMQ-5B; 1/2, 1, or 2 in. per minute for Radiosonde Recorder AN/TMQ-5C.
Speed of response	2 1/2 seconds maximum, including pen-lifting operation.
Weight	240 lb.
Dimensions	33-7/8 in. high, 22-7/8 in. wide, and 17-3/8 in deep.
Number of tubes	21
Ambient temperature range	40° to + 125° F.

NOTE

Units that include Frequency-Time Recorder RD-88A/TMQ-5 or Frequency-Time Recorder RD-88B/TMQ-5 will operate at either of two different chart speeds, 1/2 and 1-inch per minute, and operate in automatic or manual time-print synchronization with Control Recorder C-577(*)/GMD-1. Radiosonde Recorder AN/TMQ-5C can operate at any of three different chart speeds: 1/2, 1, or 2 inches per minute in automatic or manual time-print synchronization with Control Recorder C-577(*)/GMD-1.

1-6. Components and Dimensions

a. Dimensions of Major Components. Major components, their overall dimensions, weights, and references to figures illustrating these components are listed below.

Item	Overall Dimensions (in.)			Weight (lb)	Reference figure
	Height	Length	Depth		
Control Panel C-834(*)/TMQ-5	10½	19	5	10	1-4
Signal Data Converter (CV-146) (*)/TMQ-5	9¾	19	11 5/8	18	1-4
Power Supply PP-968(*)/TMQ-5	10	19	11 5/8	39	1-4
Frequency-Time Recorder RD-88(*) TMQ-5	8¾	19	10¾	34	1-2, 1-4
Electrical Equipment Cabinet Subassembly MX-1482/TMQ-5	10¼	19	3	5	1-2
Electrical Equipment Cabinet CY-1390(*)/TMQ-5	33 7/8	22 7/8	17	130	1-2, 1-4
Accessories Case CY-930/TMQ-5	21	27¼	19 5/8	66	1-1, 1-7, 1-8

1-6.1. Items Comprising an Operable Equipment

NSN	Qty	Nomenclature, part No., and mfr code	Usable-on code	Fig.
		NOTE The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency; etc.		
		NOTE Number 1 in the usable-on code column refers to items comprising an operable AN/TMQ-5; number 2 refers to items comprising an operable AN/TMQ-5A; number 3 refers to items comprising an operable AN/TMQ-5B; number 4 refers to items comprising an operable AN/TMQ-5C.		
6660-00-324-9426		Radioonde Recorder: AN/TMQ-5		
6660-00-393-2234		Radioonde Recorder AN/TMQ-5A; AN/TMQ-5B		
6660-00-682-4500		Radioonde Recorder AN/TMQ-5C consisting of:		
6660-00-343-0370	1	Cabinet, Electrical Equipment CY-1390/TMQ-5, CY-1390A/TMQ-5.	1,2,3,4	1-6
6660-00-614-9859	1	Cabinet Sub-Assembly, Electrical Equipment MX-1482/TMQ-5.	1,2,3,4	1-6
6660-00-306-2126	1	Cable Assembly, Special Purpose, Electrical CX-2337/TMQ-5.	1,2	
6660-00-170-8777	1	Cable Assembly, Power Electrical CX-1492/U	1,2	
6660-00-503-0671	5	Cable Assembly, Special Purpose, Electrical CX-2338/U.	1,2,3,4	
6660-00-503-0672	1	Cable Assembly, Special Purpose, Electrical CX-2339/U.	1,2,3,4	1-7
6660-00-503-0713	1	Recorder, Frequency Time RD-88A/TMQ-5, RD-88B/TMQ-5.	1,2,3,4	1-4
6660-00-725-7917	1	Recorder, Frequency Time RD-88/TMQ-5 RD-88C/TMQ-5.	1,2,3,4	1-5
		NOTE Number 1 in the usable on code column Refers to items comprising an operable RD-88/TMQ-5; number 2 refers to items comprising an operable RD-S-88A/TMQ-5; number 3 refers to items comprising an operable RD-88B/TMQ-5; number 4 refers to items comprising an operable RD-88C/TMQ-5.		
666-00-663-7917	1	Pen, Recorder: SK-5320-598; 35529	1,2,3,4	■
5129-00-236-2140	1	Screwdriver, SC-A-4225; 80063	1,2,3,4	
		ACCESSORIES, TOOLS, AND TEST EQUIPMENT		
6660-00-370-3725	1	Desk Log SC-D-125505; 80063	1,2,3,4	■
6660-00-377-0176	1	Wire Rope Assembly, Single Leg: SC-B- 125626; 80063.	1,2,3,4	
5120-00-293-1839	1	Wrench, Open End, Fixed: 0.753" and 0.878" openings; SC-B-125071; 80063	1,2,3,4	
6660-00-788-2133	1	Chart Weight Assembly: SC-C- 125081:80063	1,2,3,4	
6660-00-179-5846	1	Computer, Humidity, Temperature, CP-223/UM*	1,2,3,4	
6660-00-503-0669	1	Converter, Signal DATA CV-146/TMQ-5, CV-146A/TMQ-5; SC-DL-125300; 80063.	1,2,3,4	
		NOTE Number 1 in the usable on code column refers to items comprising an operable CV-146A/TMQ-5; number 2 refers to items comprising an operable CV-146/TMQ-5.		
6110-00-546-3094	1	Panel, Control C-834/TMQ-5; C-834A/TMQ-5	1,2,3,4	
6660-00-533-1946	1	Power Supply PP-968/TMQ-5; PP-968A/TMQ-5	1,2,3,4	

•Refer to paragraph 3-16.

1-6.2. Expendable Consumable Items

A list of expendable consumable items required for operation appears in table 1 – 1. The supplies and material listed in this table are required for operation of this equipment and are authorized to be requisitioned by SB 700-50. The NSN for the applicable

unit of issue required can be found in appropriate supply catalog. The FSCM is used as an element in item identification to designate manufacturer, distributor, or Government agency; etc., and is identified in SB 708-42.

Table 1-1. Expendable Consumable Supplies and Material

Item	Description	Ref No.	FSC
Ink, Writing		125070	
Paper, Graph MIL-432A/TMQ-5	Alcohol, Isopropyl:	35529	7510 6660 6505

1-7. Common Names

a. A list of common names for the components of Radiosonde Recorder AN/TMQ-5(*) is given below.

Nomenclature	Common name
Radiosonde Recorder AN/TMQ-5(*)	Radiosonde recorder
Control Panel C-834(*)/TMQ-5	Control panel
Signal Data Converter CV 146(*)/TMQ-5	Converter-amplifier
Power Supply PP-968(*)/TMQ-5	Power supply
Frequency Time Recorder RD-88(*)/TMQ-5	Frequency-time recorder
Electrical Equipment Cabinet Subassembly MX-1482/TMQ-5	Fan panel
Electrical Equipment Cabinet CY-1390(*)/TMQ-5	Cabinet
Accessories Case CY-930/TMQ-5	Accessories case
Electrical Special Purpose Cable Assembly CX-2339/U	Power supply test cable
Electrical Special Purpose Cable Assembly CX-2338/U	Test cable
Electrical Special Purpose Cable Assembly CX-2337/TMQ-5	Signal and power cable
Power Cable Assembly CX-1492/U	Power adapter cab
Graph Paper ML-432/TMQ-5	Chart

b. A list of common names for equipment used with Radiosonde Recorder AN/TMQ-5(*) is given below.

Nomenclature	Common name
Baseline Check Set AN GMM-1(*)	Baseline check set
Rawin Set AN/GMD-1(*)	Rawin set
Rawin Receiver R-301(*)1 GMD-1	Rawin receiver
Radiosonde Set AN/AMT-4(*)	Radiosonde set
Radiosonde Set AN /AMT-12(*)	Radiosonde set with hypsometer

1-8. Description of Equipment

a. *Overall Description.* The major components of Radiosonde Recorder AN/TMQ-5(*) are assembled in a single chart (fig. 1 -2). All chassis and panels are of the plug-in type and are easily removed for maintenance. Test cables enable any or all major units to be operated when they are removed from the cabinet for test or repair.

b. *Description of Major Components.* A description of each major component is contained in (1) through (5) below.

(1) *Control Panel C-834(*)/TMQ-5.* The control panel is located in the upper front portion of the cabinet (fig. 1-2). The upper section of the control panel (fig. 1-3) is hinged and may be opened without

interrupting operation to gain access to the converter-amplifier chassis. The speaker, meters, and majority of operating controls are mounted on the hinged section of the control panel. Four screw-driver adjustments are on the bottom unhinged section of the panel.

(2) *Signal Data Converter CV-146(*)/TMQ-5.* The converter-amplifier chassis is mounted vertically to the upper rear of the cabinet (fig. 1-4), directly behind the control panel. The converter-amplifier converts and amplifies the audiofrequency signals from the rawin set to a dc voltage that is directly proportional to the frequency of the input signal. This dc voltage is amplified further in the power supply chassis and is used to operate the frequency-time recorder.

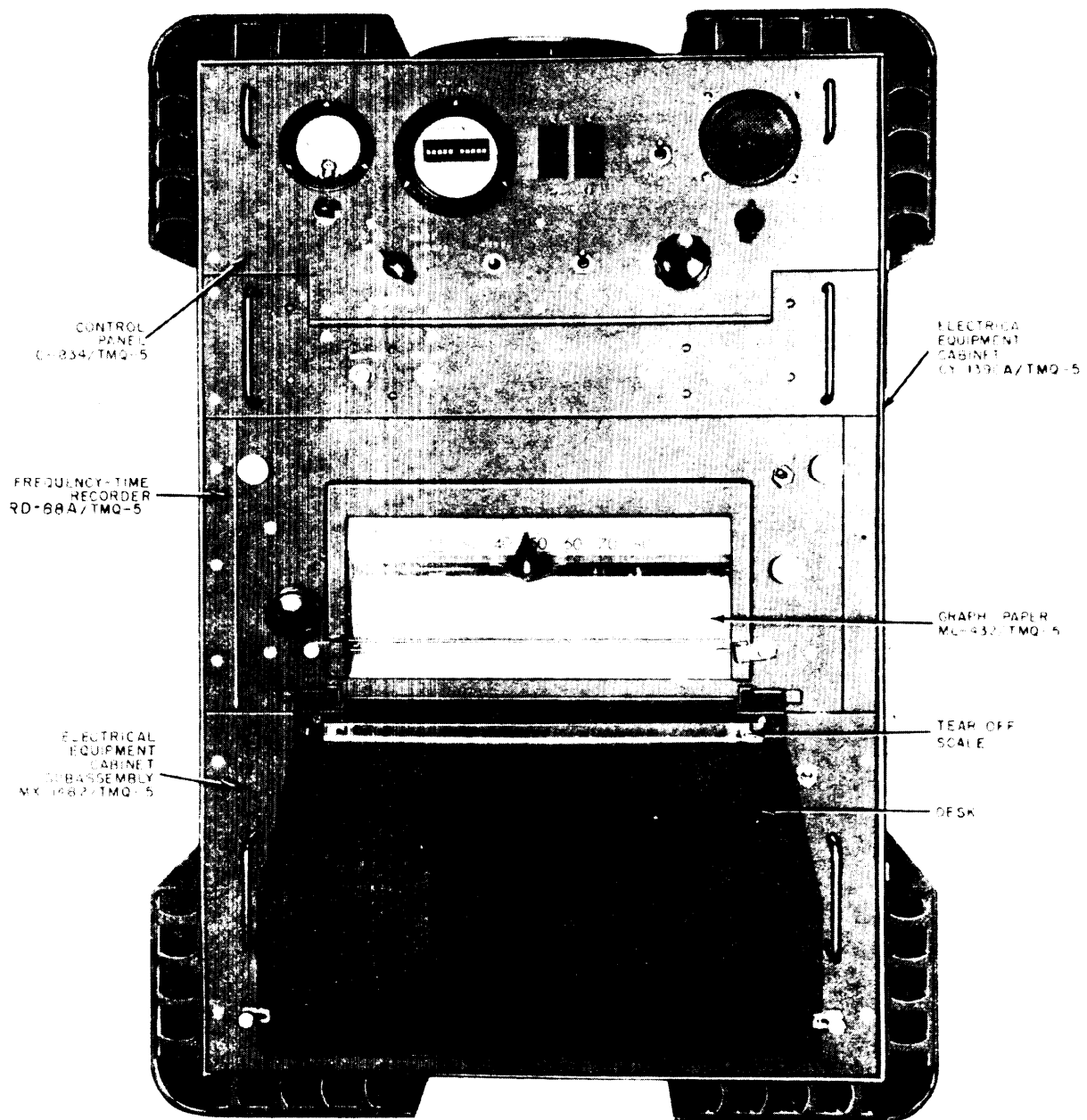
(3) *Frequency Time Recorder RD-88(*)/TMQ-5.* The frequency-time recorder (fig. 1-5) is in the middle of the cabinet (fig. 1-2 and 1-4). It contains the printing mechanism and chart paper. A knob on the left side of the panel is used to advance the chart manually to a desired position. The pen control knob is on the right-hand side of the panel. When this control is locked, it will hold the pen above the chart. The desk (fig. 1-2) is attached to the front of the frequency-time recorder, so the operator may make notations on the chart during operation. When the desk is not in use, it may be placed flush with the cabinet or removed. The frequency-time recorder chassis is mounted on a slide-track assembly, and a short length of cable allows the unit to be drawn part way out of the cabinet without disturbing operation.

(4) *Power Supply PP-968(*)/TMQ-5.* The power supply chassis is mounted vertically at the rear of the cabinet (fig. 1-4). It contains one positive regulated supply, one negative regulated supply, the servo power amplifiers, and the penlifter circuit. All tubes are replaced from the rear of the cabinet. To gain access to the bottom of the power supply chassis, remove the fan panel on the lower front section of the cabinet.

(5) *Electrical Equipment Cabinet Subassembly MS-1482/TMQ-5.* The fan panel (fig. 1-6) contains a ventilating fan and an associated switch. It is located on the bottom front of the cabinet. When the vent on the top of the cabinet is open, the fan circulates air throughout the equipment.

c. *Description of Minor Components.*

(1) *Accessories Case CY-930/TMQ-5.* The accessories case (fig. 1-7) is made of plywood and aluminum. It contains two drawers and two compartments in which the accessories and running spares are stored. The recorder is mounted on top of the accessories case during operation.



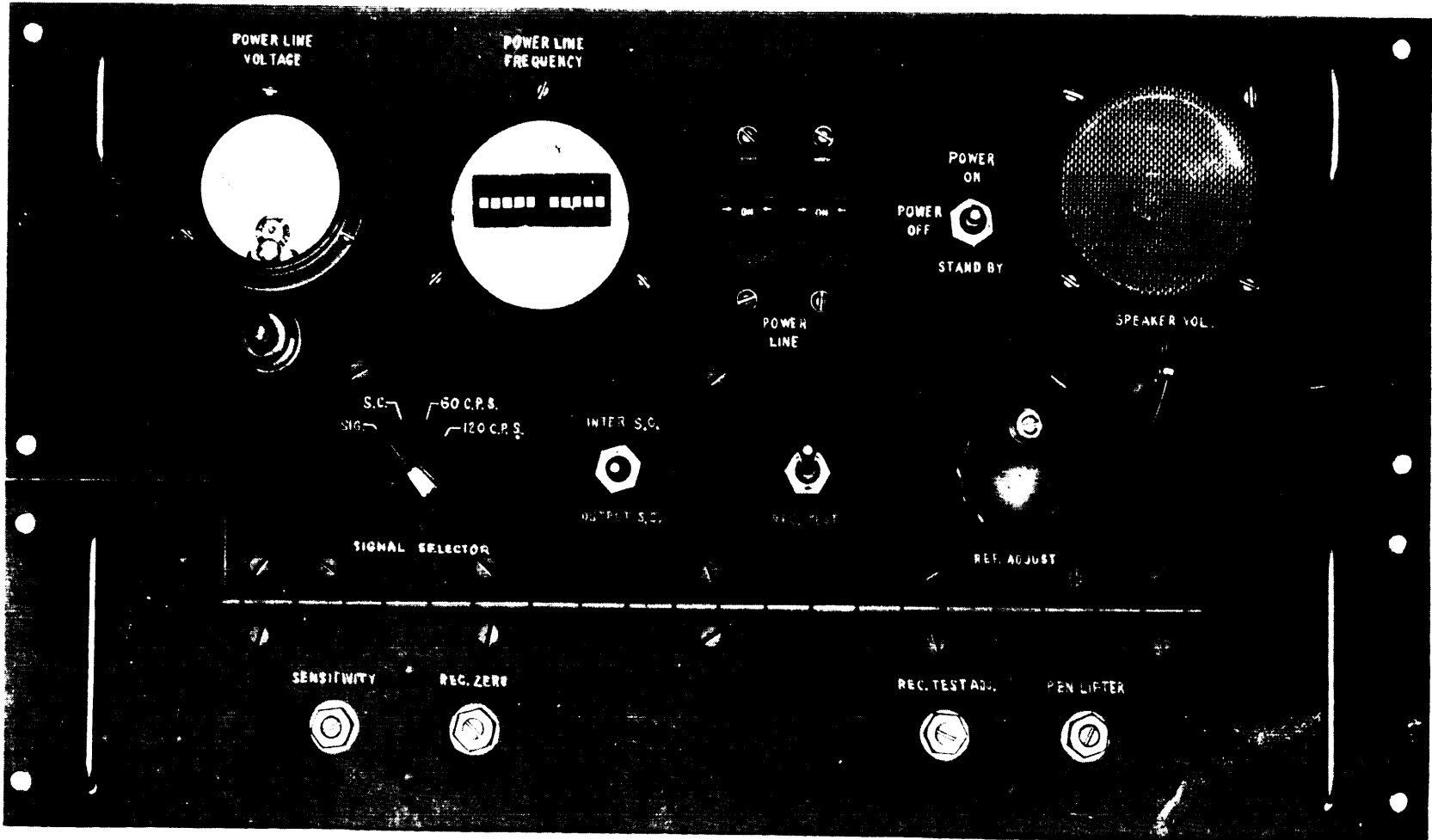
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Figure 1-2. Radiosonde Recorder AN/TMQ-5(*), front view.

(2) *Running spares.* The following group of running spares is supplied with each Radiosonde Recorder AN/TMQ-5(*).

- 1 inverter (vibrator) G301.
- 2 tubes type 12AT7VVA.
- 1 tube type 12AX7.
- 1 tube type 12AY7.
- 1 tube type 5751.
- 1 tube type 5814A.
- 1 tube type 5 R4WGA.
- 1 tube type 6Y6GT.
- 1 tube type 6AU6.
- 1 tube type 5651.

- 1 tube type 6AS7G.
- 1 tube type 6AQ5W.
- 1 tube type 12AU7.
- 2 tubes of ink.
- 1 neon lamp type NE-51.
- 2 incandescent lamps type 44.
- 12 chart rolls.
- 5 fuses, 1/8 ampere, 3 AG, slow blow.
- 5 fuses, 0.3 ampere, slow blow.
- 1 drive cable.
- 1 slide wire contact and hardware.
- 1 pen.



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Figure 1-3. Control Panel C-834(*)/TMQ-5, front view.

1-9. Differences in Models

a. The four models of radiosonde recorder are identical in size, shape, and general appearance. However, the later models have been modified to improve operational features. The differences among the various models are listed in b, c, d, and e below.

b. Frequency-Time Recorder RD-88/TMQ-5 may be used with Electrical Equipment Cabinet CY-139/TMQ-5 or CY-1390A/TMQ-5. In either case, the time-print circuit is inoperative and only one chart speed, 1/2 inch per minute is available.

c. Frequency-Time Recorders RD-88A/TMQ-5 and RD-88B/TMQ-5 may be used interchangeably with both models of the cabinet. However, when the A-or B-model of the frequency-time recorder is

used with Electrical Equipment Cabinet CY-1390/TMQ-5, the time-print circuit is inoperative, although the dual chart speed feature is still available.

d. In Radiosonde Recorder AN/TMQ-5B, ruggedized tubes replace the earlier types at various points in the circuit. These changes are as follows:

(1) In the power supply, rectifiers V401 and V408 are changed from type 5R4GWY to 5R4GWA.

(2) In the converter, tubes V304 through V307, are changed from type 12AT7 to 12 AT7WA; tubes V301 and V303 are changed from type 12AU7 to 5814A; and tubes V302 and V310 are changed from type 12AX7 to 5751.

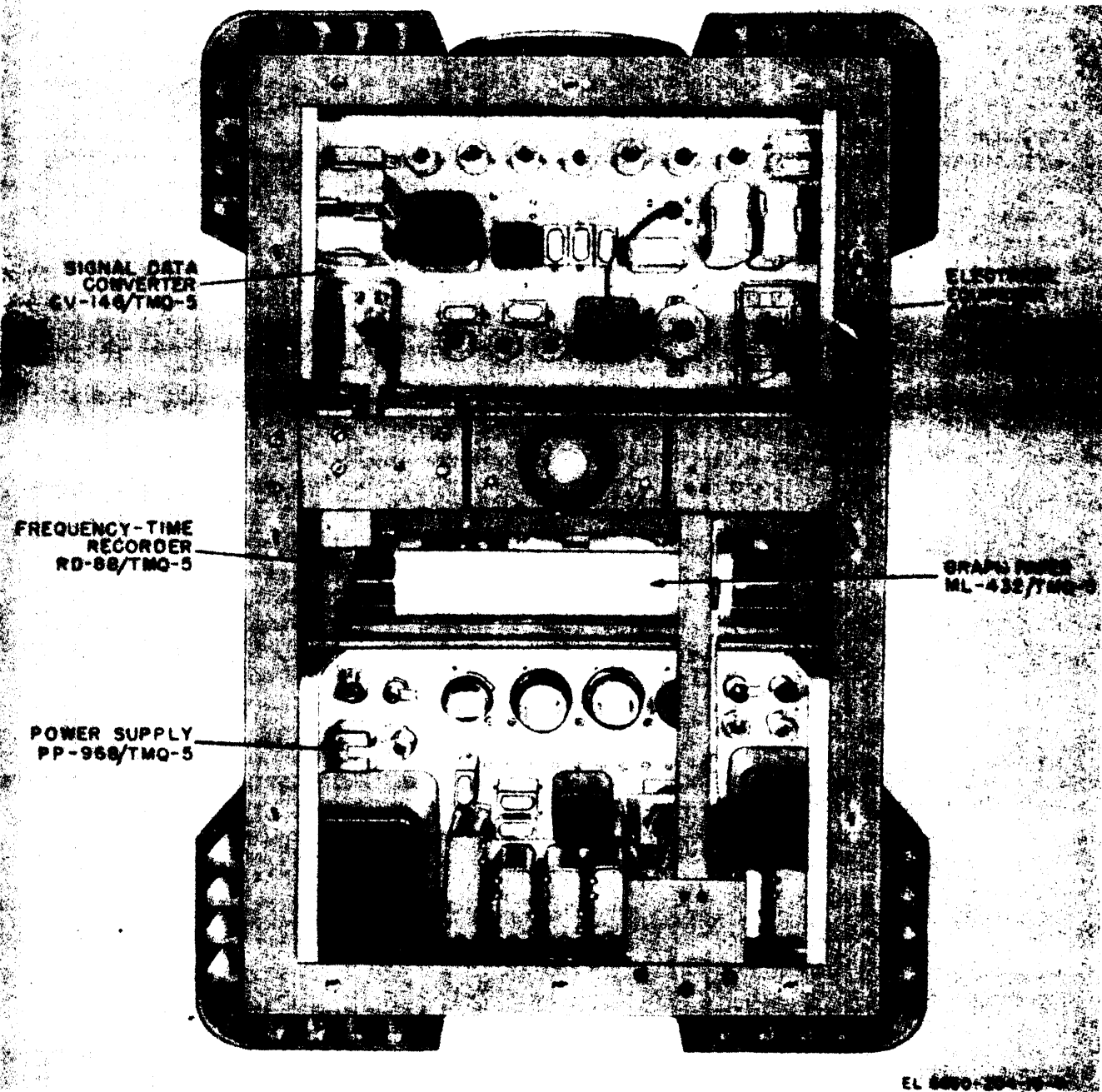


Figure 1-4. Radiosonde Recorder AN/TMQ-5(*), rear view.

6. Differences among models areas follows:

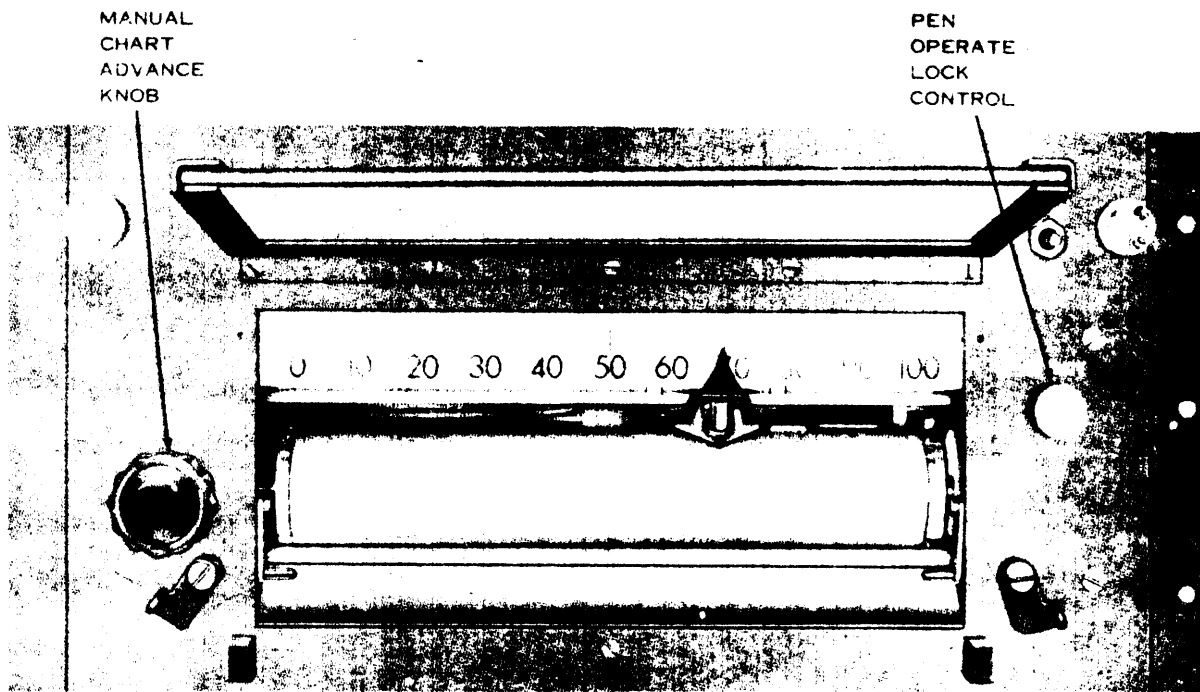
Item	AN/TMQ-5	AN/TMQ-5A	AN/TMQ-5B	AN/TMQ-5C
Control panel	C-834/TMQ-5	C834/TMQ-5	C-334/TMQ-5 is the same as C-834/TMQ-5, except that the resistor bracket contains standard resistors and appropriate mounting hardware. The unit is electrically and physically interchangeable with the C-834/TMQ-5.	Same as AN/TMQ-5B.

Item	AN/TMQ-5	AN/TMQ-5A	AN/TMQ-5B	AN/TMQ-5C
Converter-amplifier	CV-146/TMQ-5	CV-146/TMQ-5	CV-146A/TMQ-5 is the same as CV-146/TMQ-5, except that ruggedized tubes are used, test jacks are color coded, and R331 is a standard resistor with appropriate mounting hardware. The unit is electrically and physically interchangeable with the CV-146/TMQ-5.	Same as AN/TMQ-5B.
Power supply	PP-968/TMQ-5	PP-968/TMQ-5	PP-968A/TMQ-5 is the same as PP-968/TMQ-5, except that ruggedized tubes are used, top-hat tube clamps are installed on the rectifiers, and test jacks are color coded. The unit is electrically and physically interchangeable with the PP-968/TMQ-5.	Same as AN/TMQ-5B.
Frequency-Time recorder.	RD-88/TMQ-5. This unit has a single chart speed of 1/2 inch per minute.	RD-88A/TMQ-5 has selective chart speeds of 1/2 and 1 inch per minute, by means of chart speed switch (fig. 2-4). A time-print switch (mounted on the panel) controls the operation of a camoperated micro-switch, which controls the operation of the time-print circuit of Control Recorder C-577(*)/GMD-1, a part of Rawin Set AN/GMD-1(*).	RD-88B/TMQ-5 is the same as RD-88A/TMQ-5, except that the time-print switch of the frequency-time recorder panel is mounted on a bracket, rather than on the panel itself and a plug and receptacle are installed in the light circuit. These features facilitate removal of the panel.	RD-88C/TMQ-5 is the same as RD-88B/TMQ-5, except that RD-88C/TMQ-5 has pushbutton control (fig. 3-2) to select any of three speeds (1/2, 1, or 2 inches per minute).
Electrical Equipment Cabinet.	CY-1390/TMQ-5	CY-1390A/TMQ-5 is the same as CY-1390/TMQ-5 except that the wiring harnesses are modified to connect the RAWIN TIME PRINT switch to J101.	CY-1390A/TMQ-5 is the same as the CY-1390/TMQ-5 used with Radiosonde Recorder AN/TMQ-5A except that tube pin straighteners are mounted in the bottom of the cabinet and a grounding post is included.	Same as AN/TMQ-5B.
Signal and power cable.	CX-2337/TMQ-5 has a twist-lock male power connector.	CX-2337/TMQ-5 has a twist-lock male power connector.	CX-3711/TMQ-5 uses a standard-type power connector. Designed for use with the CX-3712/U when required.	Same as AN/TMQ-5B.

1-10. System Application

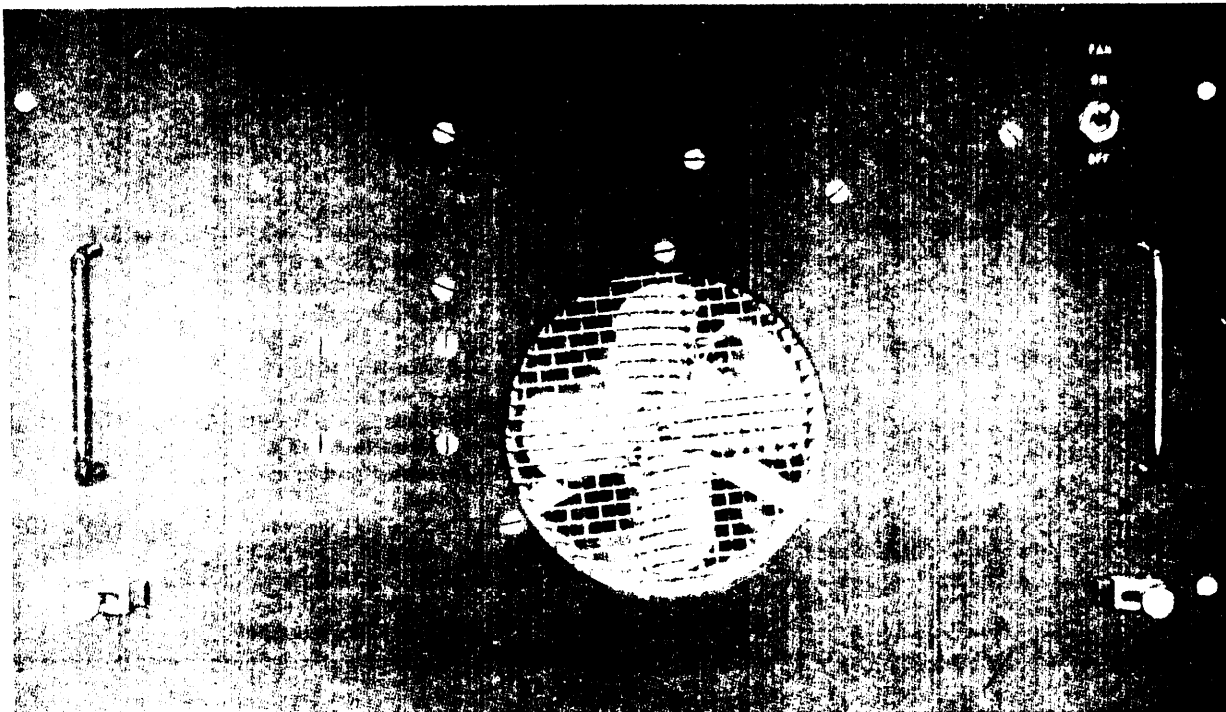
a. General. All rawinsonde systems operate on the same principles. The operation of the radio-

sonde system that comprises Radiosonde Set AN/AMT-4(*), Radiosonde Set AN/AMT-12(*), Rawin Set AN/GMD-1(*), and Radiosonde Re-



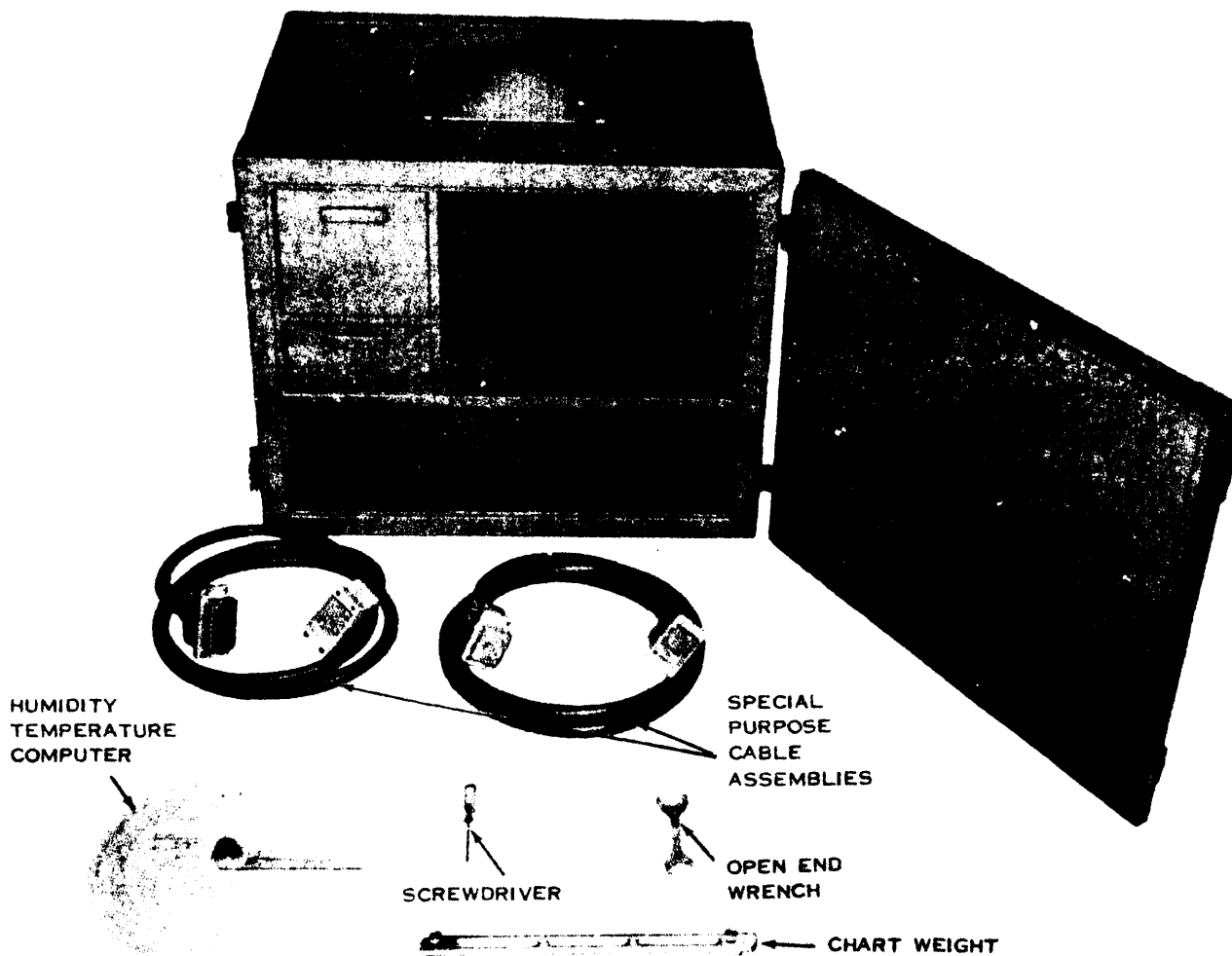
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Figure 1-5. Frequency-Time Recorder RD-88()/TMQ-5, front view.*



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Figure 1-6. Electrical Equipment Cabinet Subassembly MX-1482/TMQ-5.



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Figure 1-7. Accessories Case CY-930/TMQ-5, with some accessories.

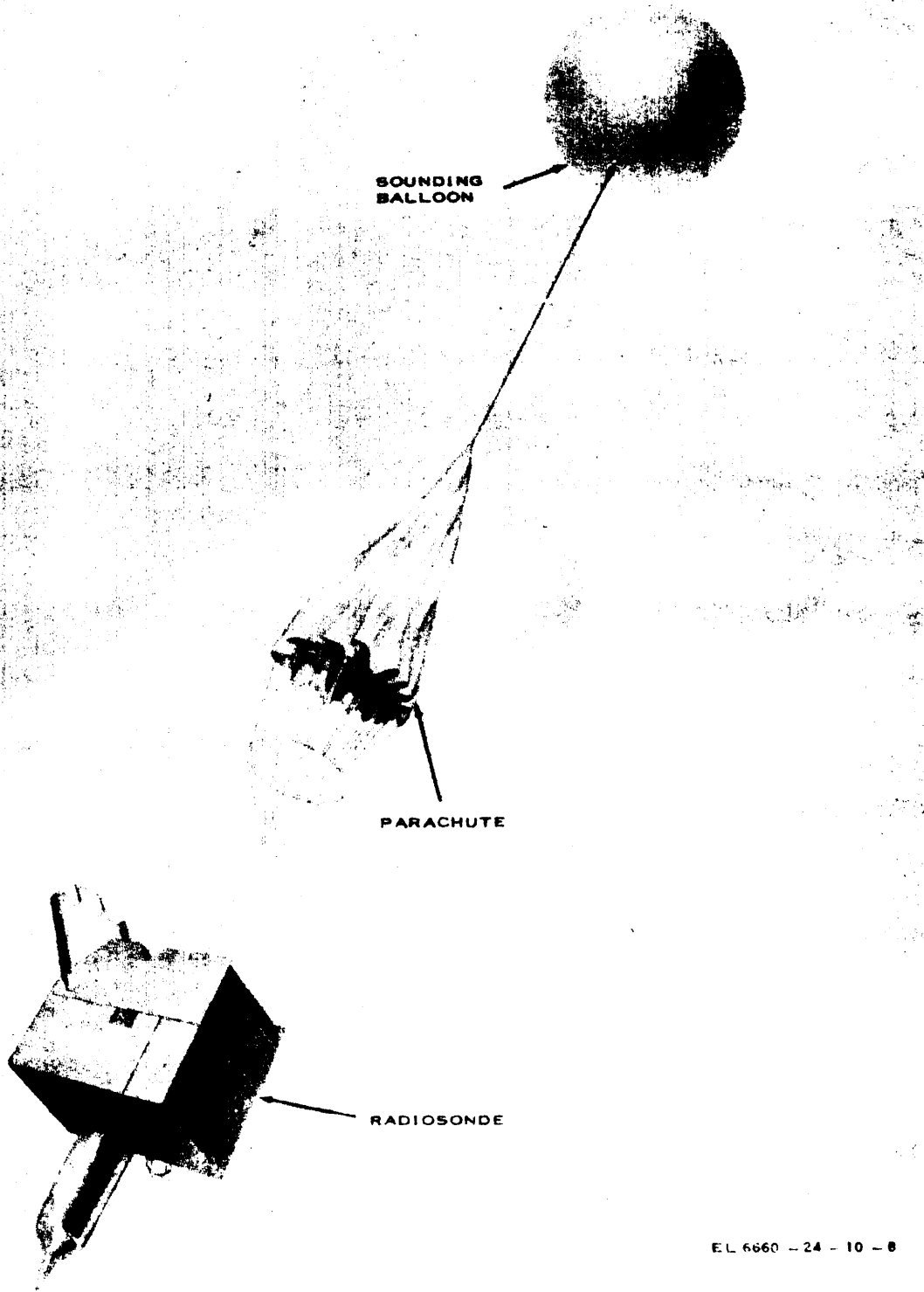
recorder AN/TMQ-5(*) are covered in *b*, *c*, and *d* below.

b. Radiosonde Sets AN/AMT-4() and AN/AMT-12(*)*. Radiosonde Sets AN/AMT4(*) and AN/AMT-12(*) (fig. 1-8) are balloon-borne meteorological instruments that automatically transmit information to a ground meteorological station; this information relates to the pressure, temperature, and humidity of the upper air strata. The radiosonde transmits an amplitude-modulated signal at a carrier frequency of 1,680 (nominal) megacycles per second (MHz). A radiosonde modulator unit contains a pressure-sensitive element (aneroid), a temperature element (fig. 1-9), and a humidity element. A commutator bar is used as a switching arrangement to se-

quence the signals that are transmitted by the radiosonde.

c. Rawin Set AN/GMD-1()*. The rawin set (fig. 1-10) automatically tracks the radiosonde during flight, and receives, amplifies, and demodulates the radiosonde signals to their original audiofrequency.

d. Radiosonde Recorder AN/TMQ-5()*. The AF signal output of the rawin set is applied to the signal converter section of the converter-amplifier in the radiosonde recorder (fig. 1-11). In this section, the AF signals are amplified and shaped to a precise amplitude and form; then they are rectified and filtered to provide a dc voltage that is proportional to their frequency (nominally from 10 to 200 cycles per second (Hz)). A second dc

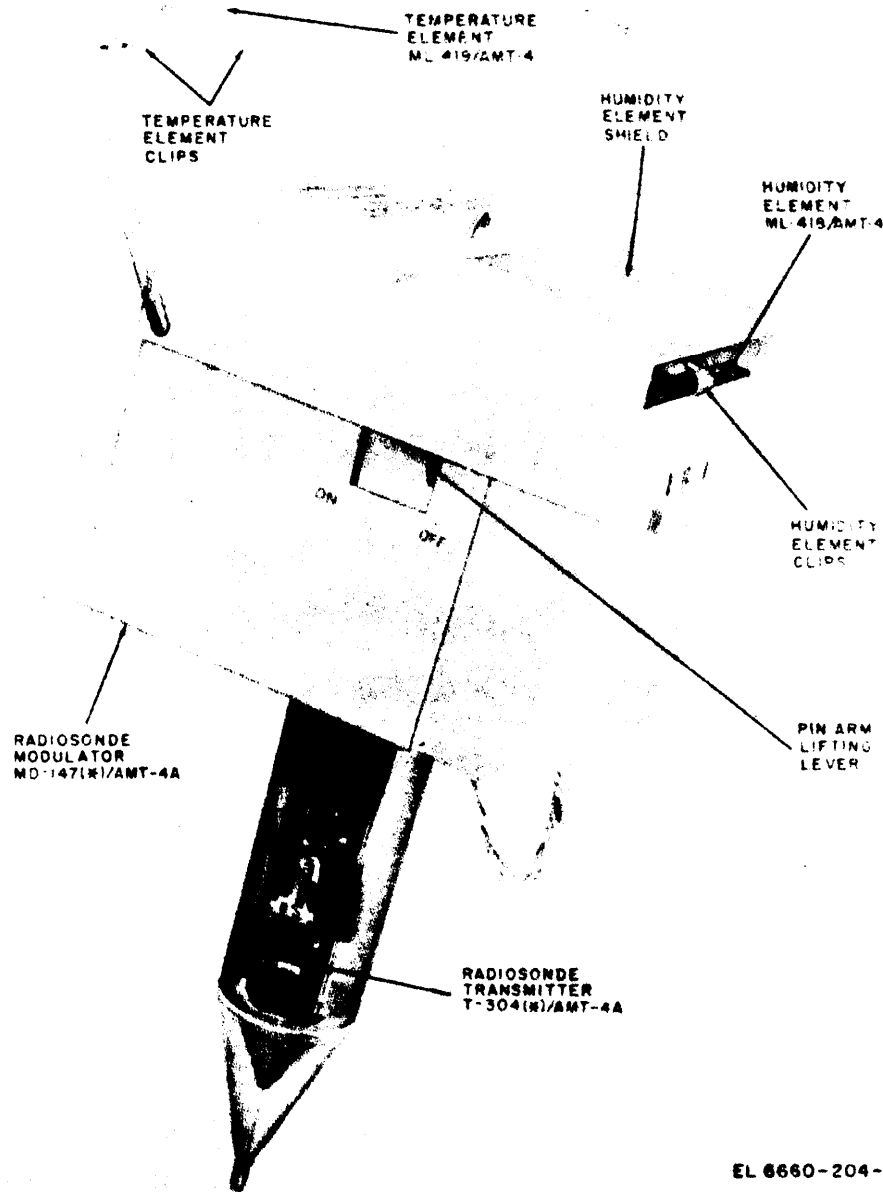


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Figure 1-8. Radiosonde with parachute and sounding balloon.

voltage is supplied by the motor-driven contact of a slide-wire potentiometer. The two dc voltages are applied to a detection circuit, which converts any difference to a 60-Hz error voltage. This error voltage is then amplified to a level that is sufficient to drive the balancing (or servo) motor and

operate the pen-lifting circuit; if the error voltage is present, the pen is lifted while the motor positions it for the next recording. The motor stops when the dc voltage at the moving contact of the slide-wire potentiometer, is equal to that delivered by the rectified signal; the pen is then lowered



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Figure 1-9. Radiosonde modulator and transmitter.

again to the moving paper and a trace is made. The entire operation takes place so the pen always marks the chart at a point which corresponds to

the meteorological information that is received from the radioaonda.

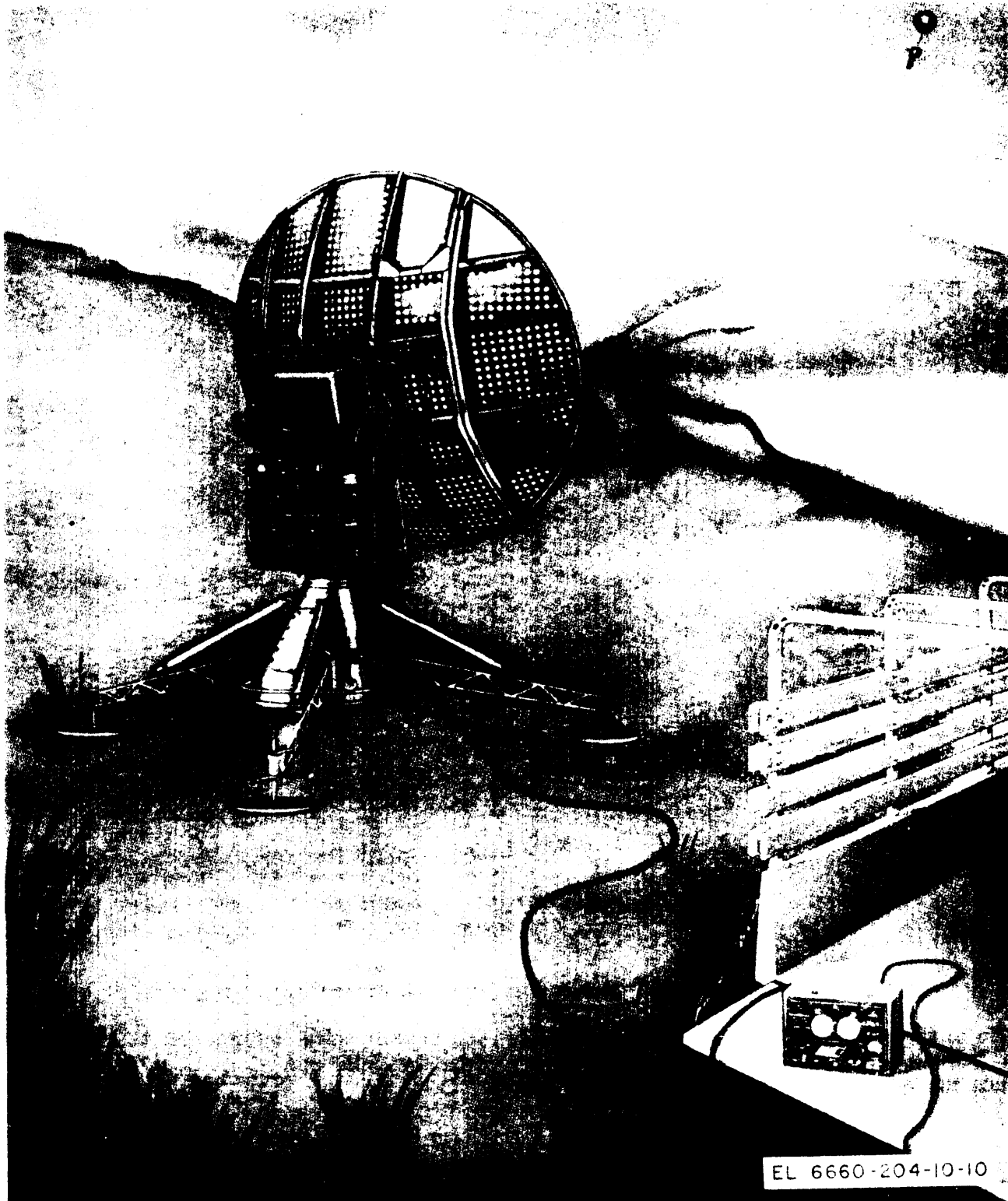
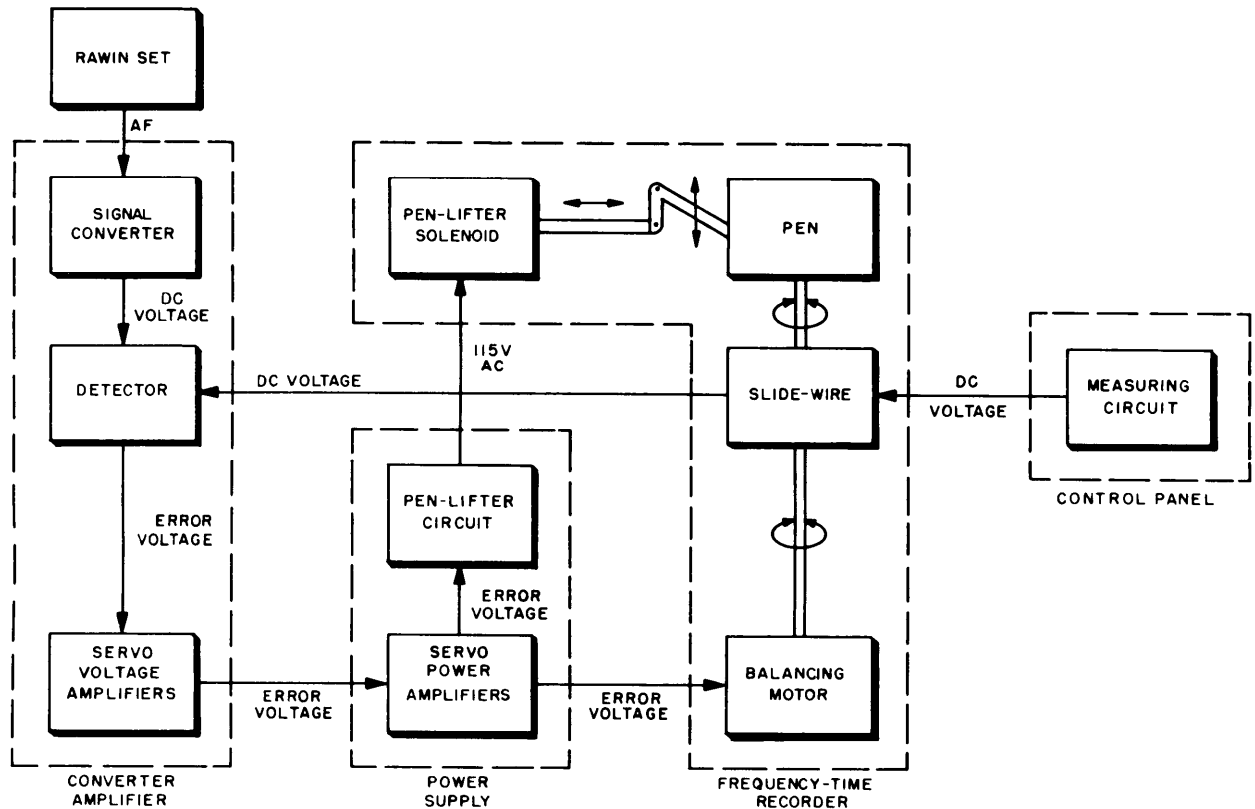


Figure 1-10. Rawin Set AN/GMD-1().*



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Figure 1-11. Radiosonde Recorder AN/TMQ-5, simplified block diagram.

Section III. DESCRIPTION OF ADDITIONAL EQUIPMENT REQUIRED BUT NOT SUPPLIED WITH RADIOSONDE RECORDER AN/TMQ-5(*)

1-11. Radiosonde Sets AN/AMT-4(*) and AN/AMT-12(*)

a. Radiosonde Sets AN/AMT-4(*) and AN/AMT-12(*) (fig. 1-8) are balloon-borne, battery-powered meteorological instruments that automatically transmit radio signals relating to the pressure, temperature, and humidity of the upper air-to-ground receiving equipment.

b. Signals transmitted by Radiosonde Set AN/AMT-4(*) (TM 11-6660-228-10) or Radiosonde Set AN/AMT-12(*) (TM 11-6660-220-10) are received by Rawin Set AN/GMD-1 (*) (TM 11-6660-206-12), which is interconnected to Radiosonde Recorder AN/TMQ-5(*). The radiosonde recorder prepares a flight record on calibrated graph paper that is used to evaluate the information received from the radiosonde set.

c. Meteorological data provided by the radiosonde set is used for analyzing and forecasting

weather conditions, guiding aircraft, planning missions for aircraft, and preparing ballistic correction data for the effect of the atmosphere on the trajectory of artillery projectiles, missiles, and rockets.

d. Each radiosonde set includes a modulator, a transmitter, a temperature and humidity element, and a calibration chart. Radiosonde Set AN/AMT-12(*) has a hypsometer unit which is used to evaluate pressure data at high altitudes, for greater accuracy. Detailed information on the use of radiosonde sets and their accessories are contained in their respective manuals.

1-12. Rawin Set AN/GMD-1(*)

Signals transmitted by the radiosonde set are received by the rawin set tracking the balloon-borne radiosonde set. The signals are amplified by the rawin receiver, demodulated and fed to the radio-

sonde recorder in af pulses ranging from 10 to 200 Hz.

1-13. Baseline Check Set AN/GMM-1(*)

a. The baseline check set provides a chamber to maintain controlled temperatures and humidity conditions for preflight testing of radiosonde sets.

b. The baseline check set makes a complete

check of the temperature and humidity elements of Radiosonde Set AN/AMT-4(*) and Radiosonde Set AN/AMT-12(*). The baseline check set _ indicates whether the radiosonde being tested is operating properly. The meteorological values are transmitted to the radiosonde recorder which records on graphic paper, the temperature, humidity, and reference values for use in setting Computer, Humidity-Temperature CP-223C/UM.

CHAPTER 2 INSTALLATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

NOTE

When the cabinet, control panel, converter-amplifier, frequency-time recorder, power supply, and fan panel are referred to as an integral unit, they will be called the radiosonde recorder.

2-1. Unpacking (Fig 2-1 and 2-1.)

a. General. When new equipment is received, select a location which is convenient to permanent or semipermanent equipment installation, and where the equipment may be unpacked without exposure to the weather. The complete equipment is shipped in two boxes. Be sure that both packing boxes are received and the equipment is undamaged.

CAUTION

Be careful when uncrating, unpacking, and handling the equipment; it is easily damaged. If it becomes damaged or exposed, a complete overhaul may be required or the equipment may be rendered useless. Do not thrust tools into the interior of any container or wrap. Select a site close to the base of operation that is free from dust and excessive moisture.

NOTE

Items may be packaged as shown in table 2-1, depending on the supply channel. In some units, the tubes are installed in the power supply; in other units, the tubes are packaged separately.

b. Packaging Data. When packaged and packed for oversea shipment, Radiosonde Recorder AN/TMQ-5(*) the Accessories Case CY-930/TMQ-5 are packaged in water-resistant fiberboard cartons with all seams and joints sealed with water-resistant, pressure-sensitive tape. Further protection is afforded the radiosonde recorder by packing it in a nailed, wooden box. When packaged and packed for domestic shipment, the methods applied may vary depending on the source. Shipping containers shall comply with the rules and regulations of the carrier, applicable to the mode of transportation.

c. Uncrating Radiosonde Recorder (fig. 2-1). Perform all the steps outlined below when unpacking equipment packaged in wooden boxes. When unpacking equipment in cartons, omit the procedure given in (1) below.

Table 2-1. packaging Data

Box No.	Components	Overall Dimensions (in.)			Volume (cu ft)	Shipping weight (lb)
		Length	Width	Depth		
1	Electrical Equipment Cabinet CY-1390(*)/TMQ-5 The following components are mounted in the cabinets. Control Panel C-384(*)/TMQ-5 Signal Data Converter CV-146(*)/TMQ-5 Frequency-Time Recorder RD-88(*)/TMQ-5, less chart and ink. Power Supply PP-968A/TMQ-5 complete or Power Supply PP-968/TMQ, less the following tubes: V401 5R4W or 5R4WGA V402 6Y6GY V408 5R4WGY or 5R4WGA V409 6AS7G Electrical Equipment Cabinet Sumassembly MX-1482/TMQ-5.	46 1/4	33 1/2	30 1/4	27	490
2	Accessories Case CY-930/TMQ-5. The following items are included in the accessories case: Running spares Accessories Items removed from recorder for shipment	24	30 1/4	21 1/4	9	138

CAUTION

Be careful when unpacking and unpackaging the equipment. Do not thrust tools into the interior of any container or wrap. Select a site close to the base of operation that is free from dust and excessive moisture.

(1) *Unpacking (when received overseas)*. Cut the steel straps just below the box cover, and fold back the cover. Remove the nails from the top, side, and end with a nailpuller and remove the top, side, and end.

(2) *Unpackaging (when received overseas)*. Remove the fiberboard container and cut through the three edges of the container. Remove the contents.

(3) *Unpackaging (when received in CONUS)*. Follow the applicable procedures as specified in (1) and (2) above.

d. Uncrating Accessories Case (fig 2-2). Uncrate the accessories case as follows:

(1) Cut and fold back the steel straps on the nailed, wooden shipping box.

(2) Use a nailpuller to remove the nails. Remove the top and one side of the box. Do not attempt to pry off the side and top; the accessories case may become damaged.

(3) Lift out and cut the moisture-vaporproof barrier along the heat-sealed seam; remove the barrier.

(4) Remove the V2S board carton. Remove the inner carton, and lift out the accessories case.

2-2. Checking Unpacked Equipment

a. Checking Equipment for Completeness. See that the equipment is (complete as listed on the packing slip. If a packing slip is not available see paragraph 1-6.1. Report all discrepancies (para 1-3).

NOTE

Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

b. Checking Equipment for Damage. Inspect the equipment for damage incurred during shipment, as indicated below. Report all damaged equipment (para 1-3).

(1) Carefully inspect the components of the radiosonde recorder for evidence of dents or other damage.

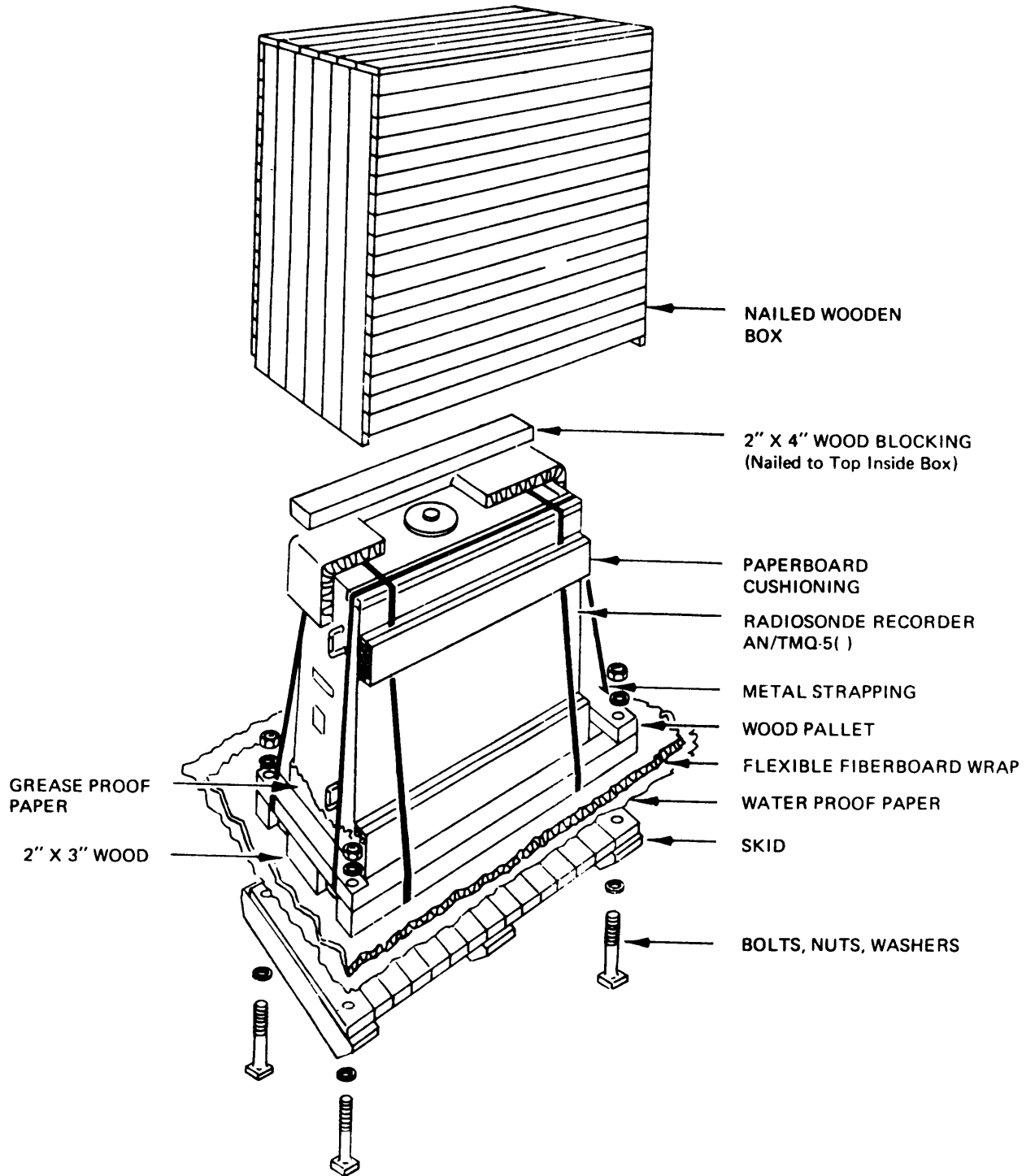
(2) Inspect the contents of the accessories case for damage.

2-3. Siting

The ideal site for the operation of the radiosonde recorder is as close as possible to the rawin receiver with which it is used. To facilitate maintenance, provide a minimum access space of approximately 3 feet on the front, and 1 foot on the sides and rear of the recorder.

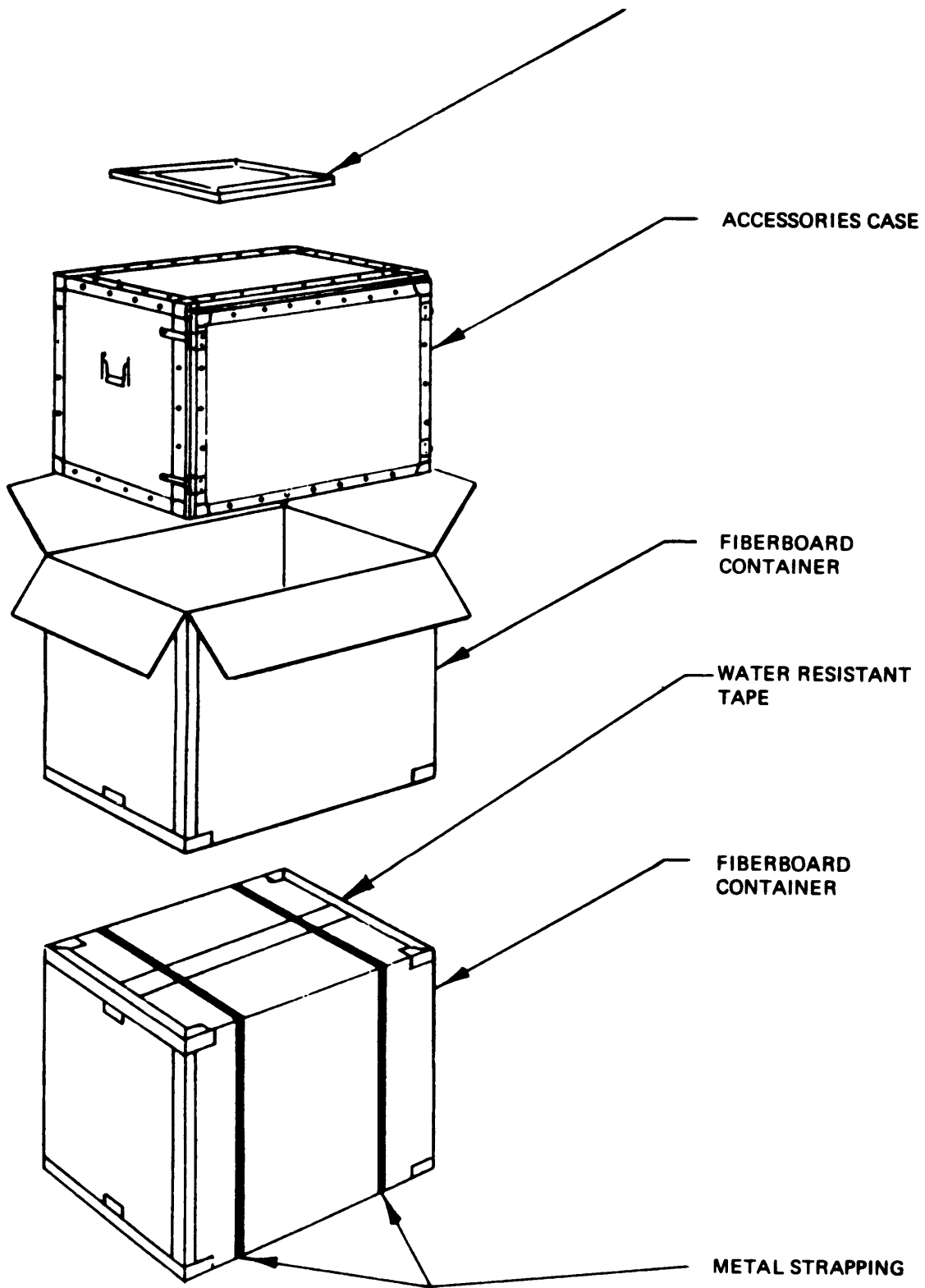
a. Select a distance from the operating location, that will not exceed the length of interconnection and test cables to the radiosonde recorder.

b. Locate the radiosonde recorder it will be subjected to as little vibration as possible.



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Figure 2-1. Packaging, Radiosonde Recorder AN/TMQ-5(*).



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Figure 2-2. Packaging, Accessories Case CY-930/TMQ-5.

Avoid locations near electrical machinery, high-tension lines, and other electrical noise-producing equipment.

c. Select a reasonably quiet location to permit the monitoring loudspeaker to be heard.

d. Mount the radiosonde recorder on the accessories case or in Shop Van M-109 (para 2-9).

24. Shelter Requirements

The radiosonde recorder should be sheltered in a suitable enclosure, such as a tent or building, to provide environmental protection. Distance from the power unit is limited only by the availability of a suitable power cable.

2-5. Interconnections

Interconnections are made as part of the installation procedure and are described in paragraph 2-7.

2-6. Tools and Test Equipment Required for Installation

a. *Tools.* The tools necessary for unpacking and installing the radiosonde recorder are listed below.

- (1) Hammer, claw.
- (2) Nailpuller
- (3) Cutting pliers.
- (4) Knife.

b. *Special Installation Tools.*

(1) Two-inch screwdriver, H631, mounted in the frequency-time recorder chassis (figs. 2-3 and 2-4).

(2) Double-end wrench, H605 (3/4 inch at one end and 7/8 inch at the other end (two supplied, fig. 1-7)). These wrenches are stored in the accessories case.

c. *Test Equipment.* There are no requirements for test equipment during installation

d. *Materials.* All required materials are supplied and listed in the BILL (app. B).

2-7. Component Installation

a. After the equipment has been unpacked and a location selected, use the following procedure to install the components of Radiosonde Recorder AN/TMQ-5(*).

(1) Place the accessories case in the location selected for the installation.

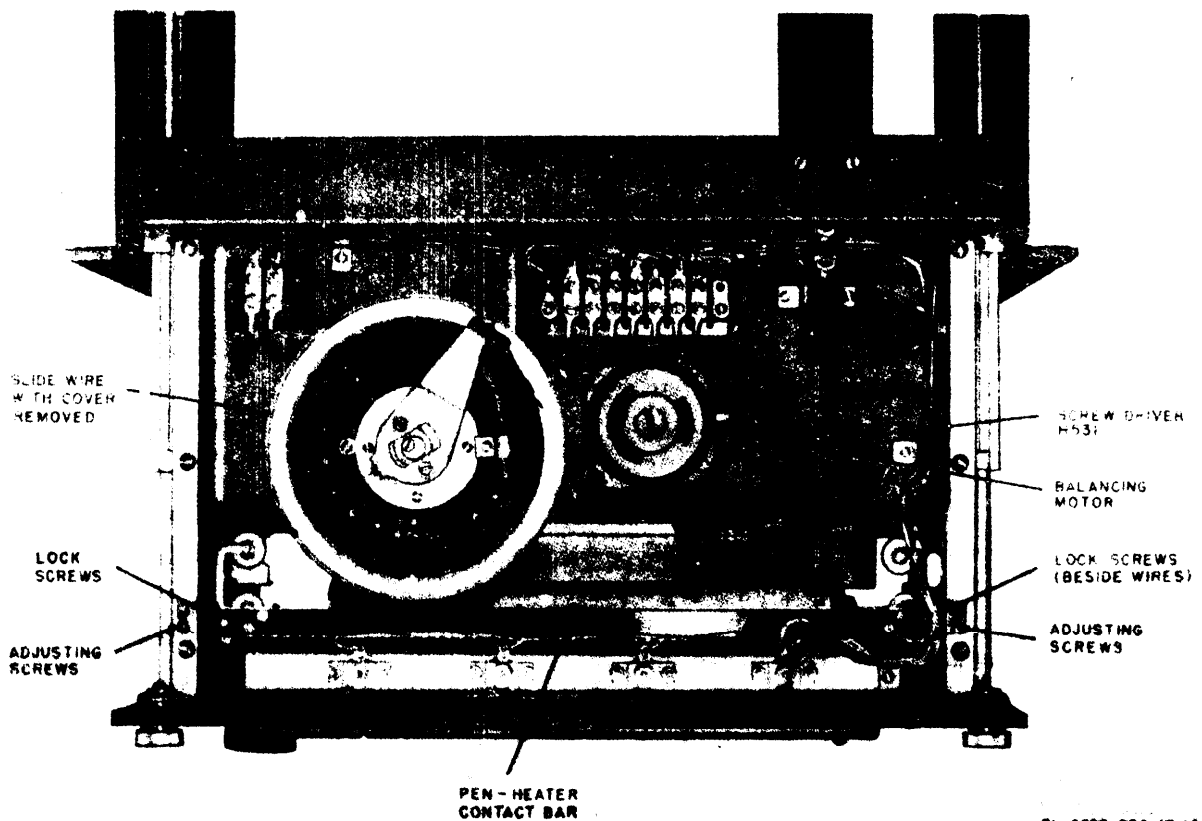


Figure 2-3. Frequency-Time Recorder RD-88/TMQ, top view

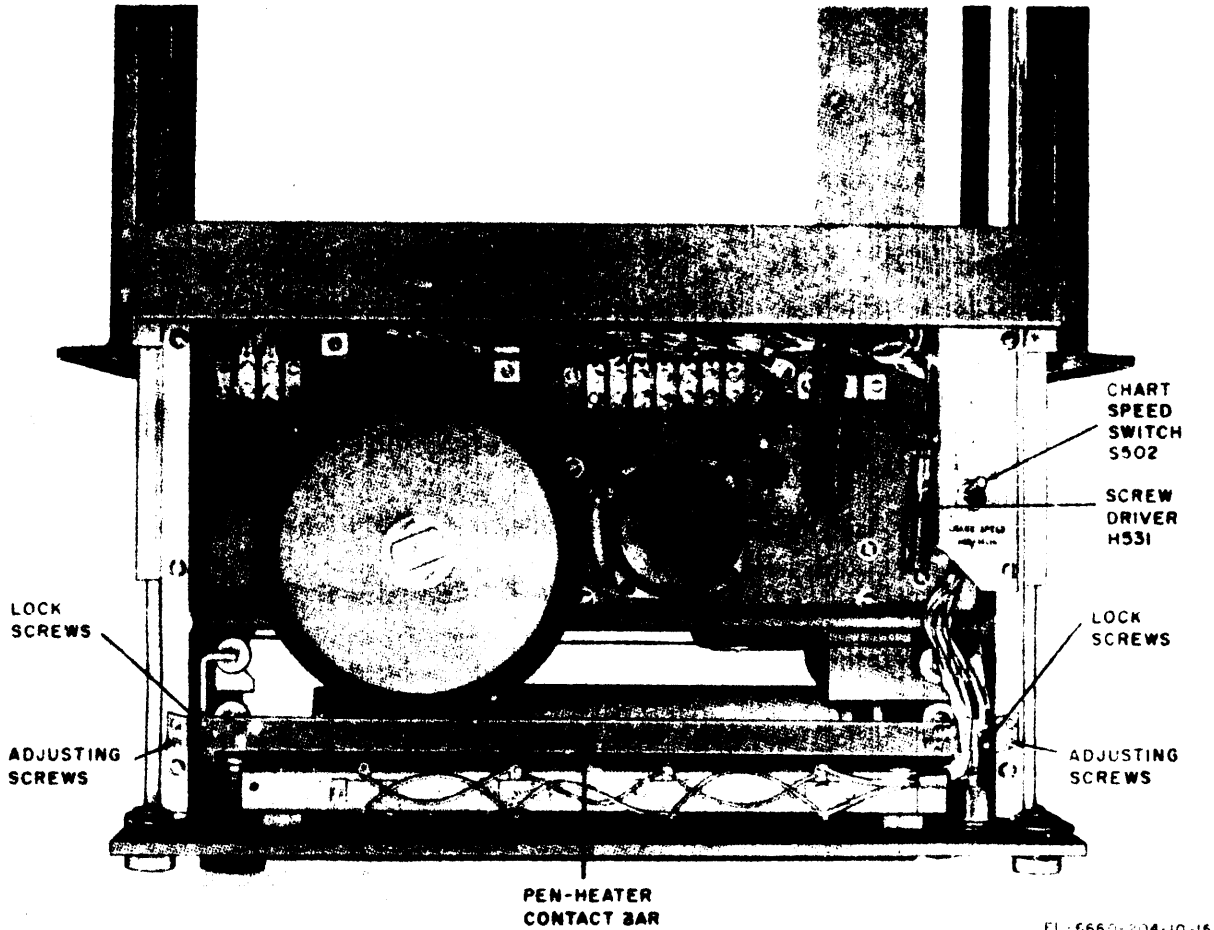


Figure 2-4. Frequency-Time Recorder RD-88A/TMQ-5, top view.

(2) Lift the radiosonde recorder to the top rear of the accessories case, and slide the recorder forward so that the shock mounts will fit under the bracket on top of the accessories case.

(3) Remove the wooden bar that secures the window latches of the frequency-time recorder.

(4) Loosen the two desk latches that secure the desk to the fan panel.

(5) Open the frequency-time recorder drawer by turning the two panel latch knobs (fig. 1-5) opposite to that of the arrows marked on the knobs.

(6) Remove the wooden bar from under the chart roller.

(7) Cut the lacing that holds the solenoid linkage and balancing motor gears on the underside of the frequency-time recorder.

(8) Remove the rear panel by unfastening the 12 Camloc fasteners.

(9) Remove the block of wood from under the power transformer (fig. 2-5) in the bottom of the cabinet.

b. Notify organizational maintenance that the following items (found in the accessories case) should be installed:

(1) Tubes V402, type 6Y6G; V409, type 6AS7G; V401 and V408, type 5R4WGY; in the power supply (fig. 2-5).

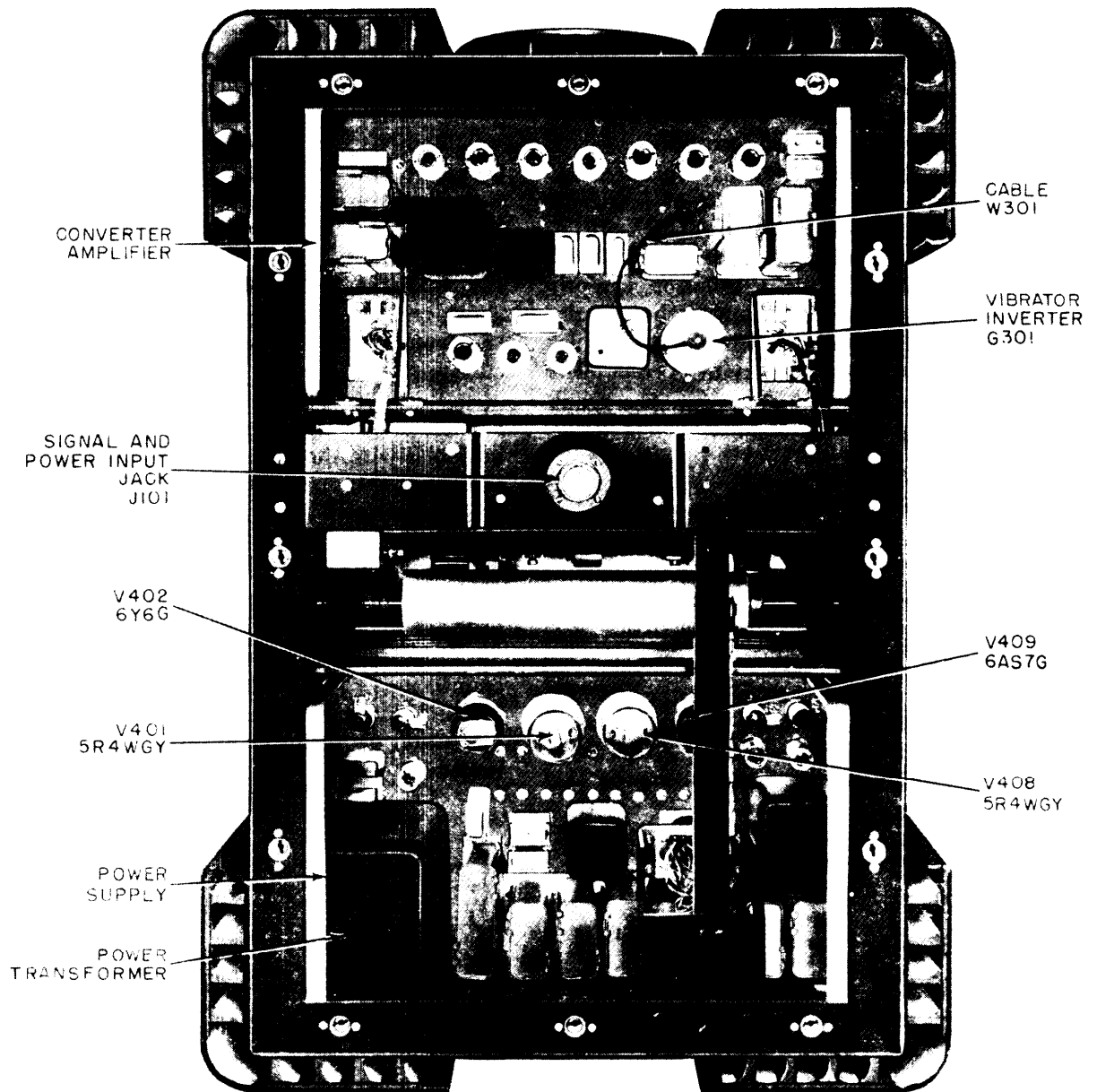
(2) Vibrator inverter G301 in the converter-amplifier chassis (fig. 2-5). Connect cable W301 to the top of the vibrator inverter.

c. Replace the rear of the cabinet.

2-8. Cable Installation

Radiosonde Recorder AN/TMQ-5(*) is used with Rawin Set AN/GMD-1(*) (fig. 2-6). Cable installation instructions are as follows:

a. *Location of cables.* Obtain cable W921 or Special Purpose Cable Assembly CX-1217/U and the



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Figure 2-5. Radiosonde recorder, rear view.

meteorological cable adapter, which consists of the switchbox and a 5-foot length of coaxial cable; these are located in the accessories case of the rawin set.

b. Connections for Radiosonde Recorder AN/TMQ-5. Connect one end of Special Purpose Cable Assembly CX-1217KJ to socket J101 of the radiosonde recorder, and connect the other end to J802 of Control Recorder C-577(*)/GMD- 1 of the rawin set. In this installation, the primary power for the

recorder is supplied through the rawin set. If the switchbox that operates the time-print mechanism of the control recorder is required in this installation, proceed as follows:

(1) Connect signal and power cable W601 to J 101 of the radiosonde recorder.

(2) Connect the power cable branch of cable W601 to the ac power source (110 to 125 volts, 58 to 62 CPS).

(3) Connect the signal cable branch of cable W601 to the 5-foot length of coaxial cable from the switchbox.

(4) Connect one end of Special Purpose Cable Assembly CX-1217/U into the switchbox, and the other end into J802 of the control recorder.

c. Connections for Radiosonde Recorder AN/TMQ-5A, AN/TMQ-5B, and AN/TMQ-5C (fig. 2-6). Connect Special Purpose Cable Assembly CX-1217/U between J101 of the radiosonde recorder and J802 of the control recorder. In this installation, the primary power circuit, signal circuit, and time-print circuit are completed through the special purpose cable. The operation of the time-print circuit is controlled either automatically or manually from the front panel of Frequency-Time Recorder RD-88A/TMQ-5.

2-9. Mounting Radiosonde Recorder in Shop Van M-109

NOTE

Before beginning the mounting procedures below, be sure to read the instructions thoroughly.

The operator is not permitted to install the support in the shop van. This is the responsibility of the organizational maintenance personnel. After Support MT-1355/TMQ has been installed, mount the

radiosonde recorder as follows:

a. Remove the clamp strips from the horizontal arms (fig. 2-7) and lay the strips aside. Mount the arms on the upright members but do not tighten the nuts completely.

b. Remove the lower clamp strips from the support shelf and lay them aside.

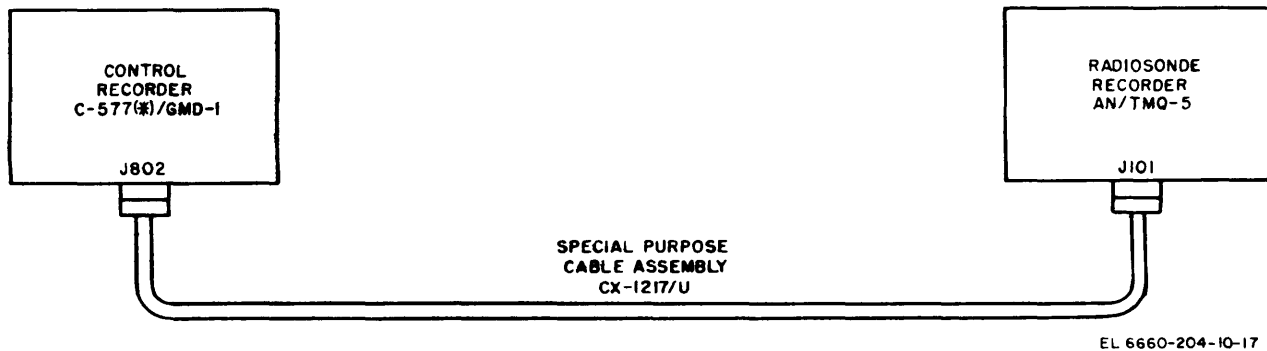
c. Place the recorder (rear side to wall) on the shelf. Slide it back until it is against the angle stops on the shelf.

d. Slide the lower clamp strips through the bottom shock mounts and align the boltholes with those in the shelf. Insert the bolts and tighten the nuts securely.

e. Slide the upper clamp strips through the side section of the upper shock mounts and align the boltholes with those in the horizontal arms. Bolt the strips securely to the arms and tighten the nuts that hold the arms to the upright members.

2-10. Checking Installation

After installation of components and cables have been accomplished, check the mechanical security of all items installed (para 2-7); then check the cable connections (para 2-8). Do not apply power until initial adjustments (para 2-11 and 2-12) have been made and operating instructions (ch. 3) have been reviewed.



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Figure 2-6. System connections.

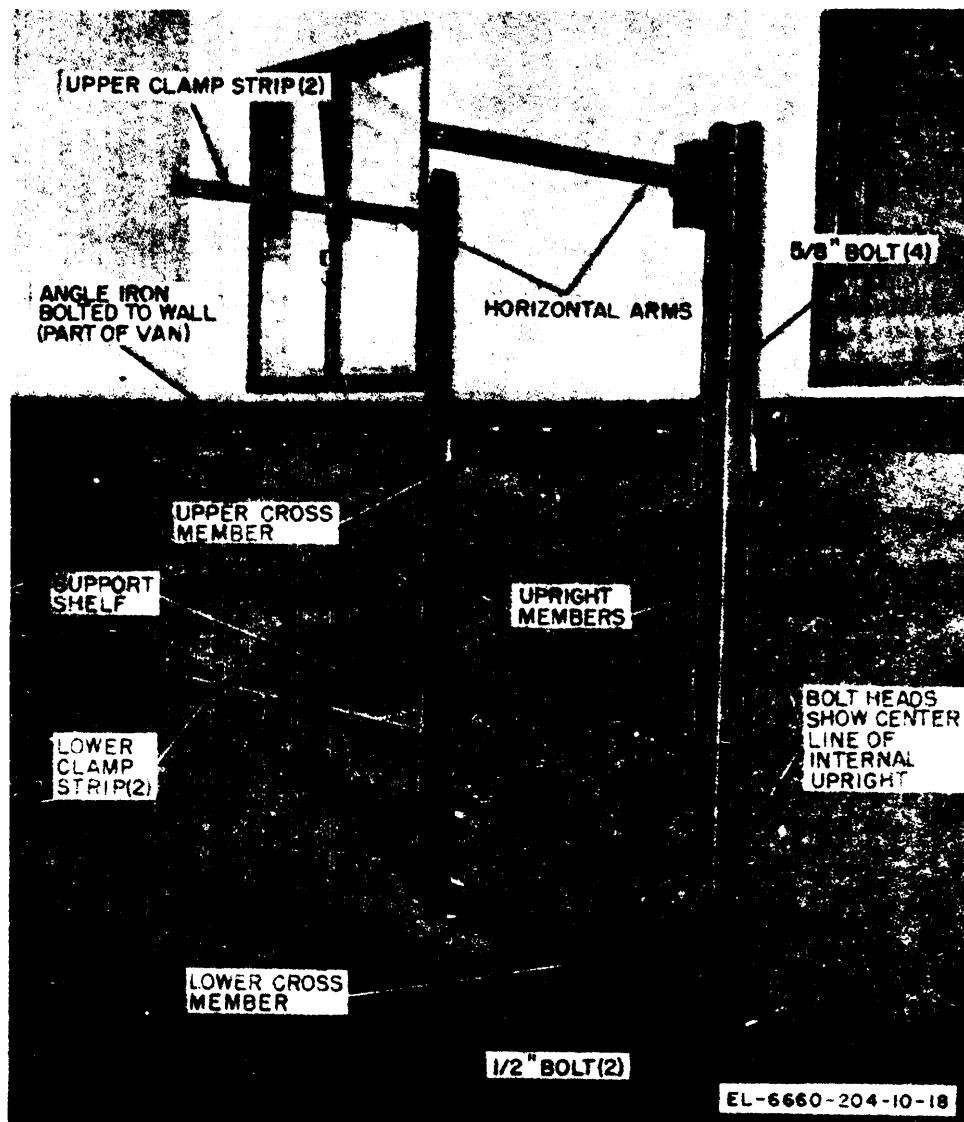


Figure 2-7. Support MT-1855/TMQ-5 mounted in Shop Van M-109.

Section II. INITIAL ADJUSTMENT OF EQUIPMENT

2-11. Leveling

Wherever mounted, the radioisotope recorder must be leveled as accurately as possible to prevent errors in calibration and recording. The use of a spirit level is necessary to accomplish this.

2-12. Operational Check Settings

Use the chart (para 3-2) as a checklist to determine the correct control settings and meter indications prior to operation

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. OPERATOR'S CONTROLS AND INDICATORS

3-1. Damage From Improper Settings

Haphazard operation or improper setting of the controls may cause damage to the electronic equipment and record inaccurate data; therefore, it is important to know the function of every control. The actual operation of the equipment is discussed in this chapter.

NOTE

To avoid improper actuation of control recorder time-print circuit, adjust radiosonde recorder reference control for recording reference signals in vicinity of 95 chart divisions (ordinates).

3-2. Controls and Indicators

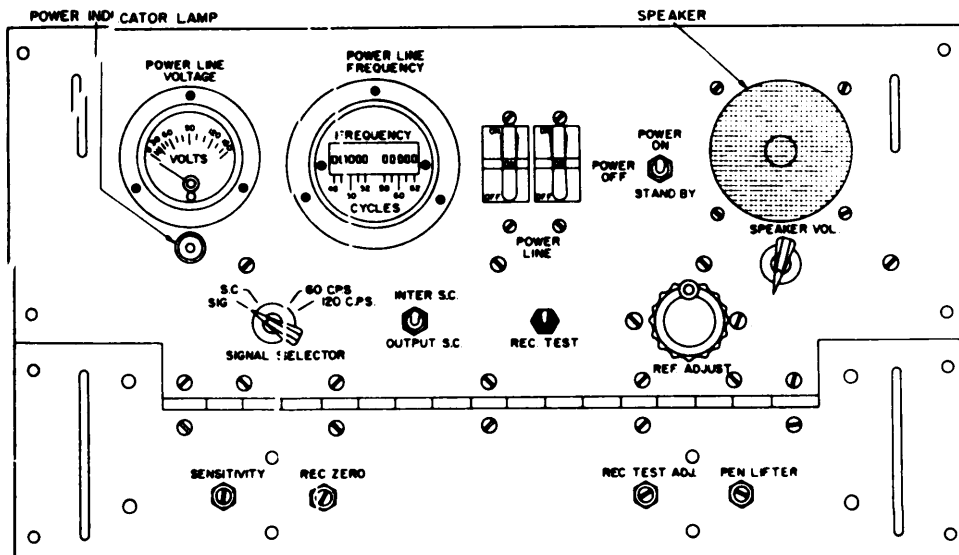
The following chart lists the controls and indicators of the radiosonde recorder and the function of each item. The majority of the controls and meters are mounted on the control panel (fig. 3-1).

Control or Indicator	Function
POWER LINE VOLTAGE meter (0 to 150 volts ac).	Indicates ac line voltage.
POWER LINE FREQUENCY meter (vibrating-reed type).	Indicates ac line frequency between 48 to 52 and 58 to 62 CPS.
SIGNAL SELECTOR (switch).	In SIG. position, switch connects signal from radiosonde receiving system to input circuit of signal converter. In S.C. position, a short circuit prevents any signal from entering converter-amplifier. In 60 C.P.S. position, switch selects 60 cps voltage from T401 to be used as a signal for calibration and tests. In this position, pen marks chart at 30 ordinates (60 cps), if line frequency is 60 Cpa.

Control or Indicator	Function
SPEAKER VOL. control.	In 120 C.P.S. position, switch selects 120 cps ripple voltage that is present at input; to filter circuit of positive power supply; this signal is used for calibration and tests. In this position, pen marks chart at 60 ordinates (120 cps) if line frequency is 60 cps. A potentiometer that adjusts audio level of monitoring speaker. Adjustment of this control has no effect on recorded signal. On some earlier units, control has switch that disconnects speaker, when control shaft is extreme counterclockwise.
POWER LINE circuit breakem.	Circuit breakers, one in each side of powerline, that are preset to open at 4 amperes.
POWER ON--POWER OFF STAND BY (power) switch.	Switch is in series with circuit breakers; when on, supplies power to the recorder system. In STAND BY position, power is applied to all circuits, except chart-drive motor and pen-lifting solenoid.
INTER S.C.-OUTPUT S.C. switch.	Used for localization of trouble. INTER S.C. position shorts any incoming signal at input to univibrator. OUTPUT S.C. position shorts any dc output voltage.
REC. TEST switch-----	During normal operation, this switch should be in the center position. Switch is momentary type, used to check operation of the frequency-time recorder. It disconnects signal from signal converter and substitute test voltage.

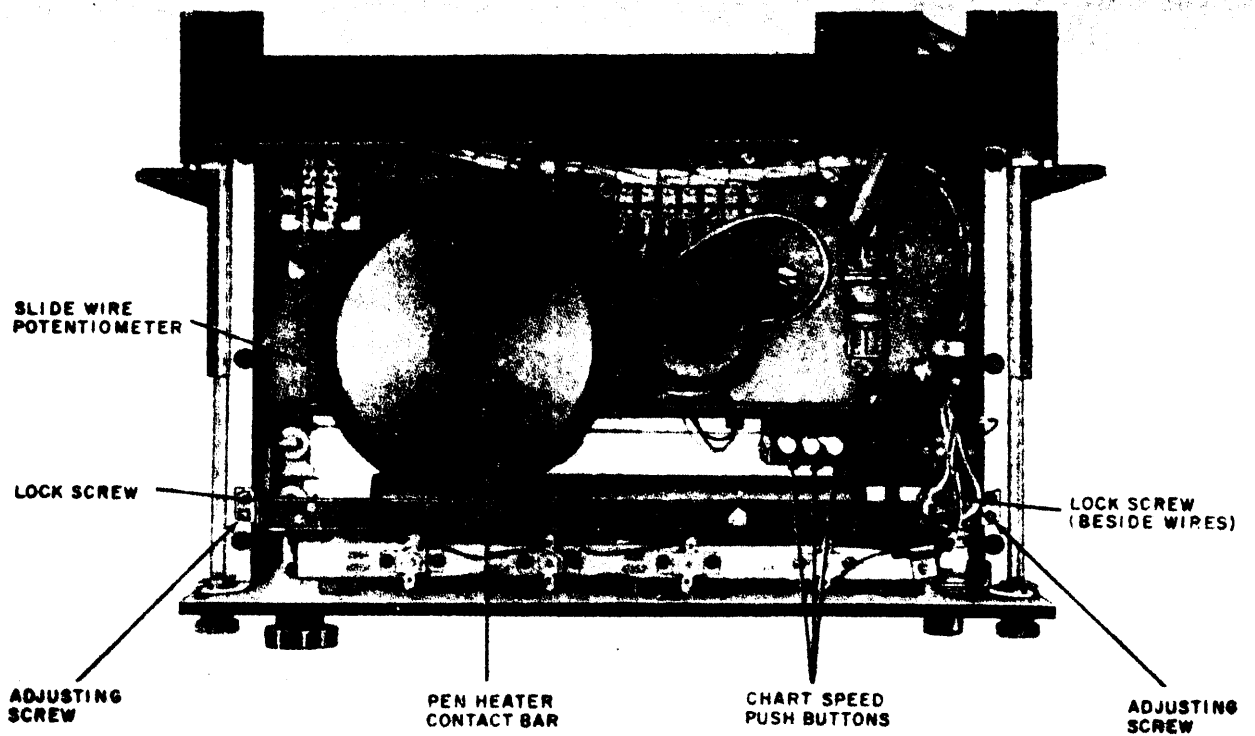
Control or Indicator	Function
REF. ADJUST knob-----	Vernier potentiometer that may be rotated through 10 revolutions. Adjust the pen position for exact recording of the low meterence signal during the ground check.
Power indicator lamp-----	Lights when power switch is in POWER ON or STAND BY position.
FAN switch (fig. 1-6)-----	Mounted on the fan panel: controls operation of fan.
Manual chart advance knob (fig. 3-5).	Unmarked control, mounted at the left side of chart roller; advances chart manually.
CHART SPEED INS/MIN. 1/2-1 (chart speed) (fig. 2-4) (in RD-88A/TMQ-5 and RD-88B/TMQ-5 only.)	Chart speed switch allows manual selection of chart speed, shown by panel marking. It is not included in first model of the recorder (RD-88/TMQ-5).
Rawin time-print AUTO-OFF-MAN (fig. 3-5).	In OFF position, switch causes printed time record from Control Recorder C-577(*)/GMD-1 to occur at regular predetermined rate, as selected by position of controls on control recorder. In MIAN. position (momentary), an additional time print is recorded by control recorder.

Control or Indicator	Function
CHART SPEED pushbuttons (RD-88C/TMQ-5 only, fig. 8-2).	In AUTO. position, an additional time-print is recorded by control recorder each time upward excursion of pen reaches 90 ordinates on the scale. These additional time-prints of control recorder are distinguished by an asterisk, which is also printed when time-print only circuit is energized.
SENSITIVITY control (screwdriver-adjusted) potentiometer.	Allow manual selection of 3 possible chart speeds (1/2, 1, or 2 inches per minute). Controls gain of servo amplifier.
REC. ZERO control (screwdriver-adjusted) potentiometer.	Aligns recorder pen on zero when SIGNAL SELECTOR switch is in S.C. position.
REC. TEST ADJ. control (screwdriver-adjusted) potentiometer.	Select amount of necessary voltage to make pen indicate 95 on scale, when REC. TEST switch is depressed.
PEN LIFTER control (screwdriver-adjusted) potentiometer.	Control amount of voltage fed by power amplifier tubes on pen-lifter circuit.
OPERATE-LOCK control----	In LOCK position, this control clamps pen carriage rod, and prevents pen from touching paper or vibrating.



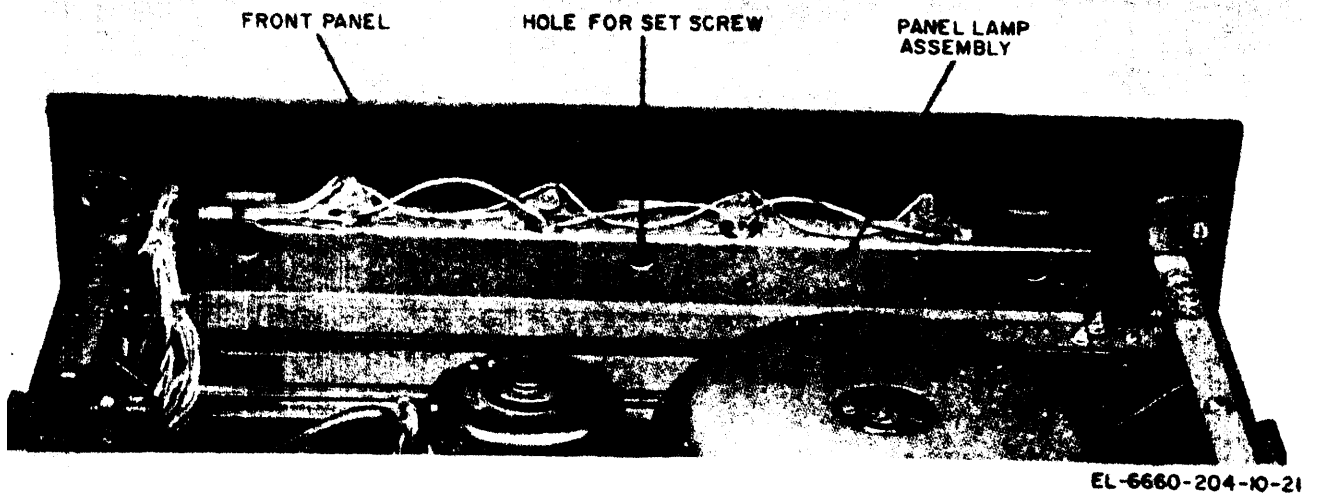
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Figure 3-1. Control Panel C-834/TMQ-5, front view.



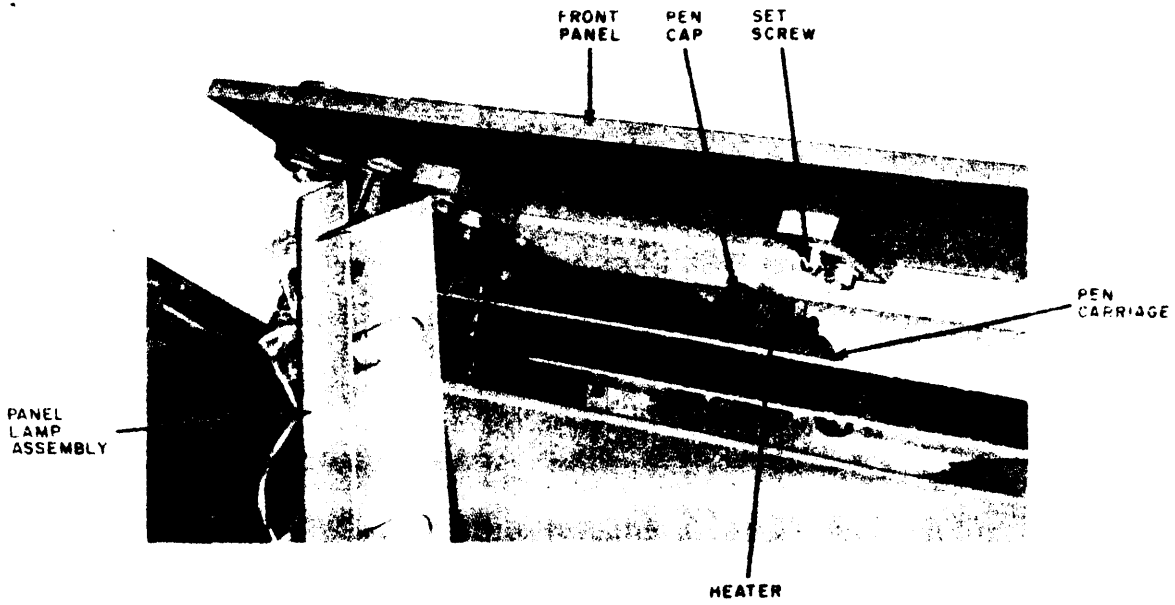
EL-6660-204-10-20

Figure 3-2. Frequency-Time Recorder RD-88C/TMQ-5, top view.



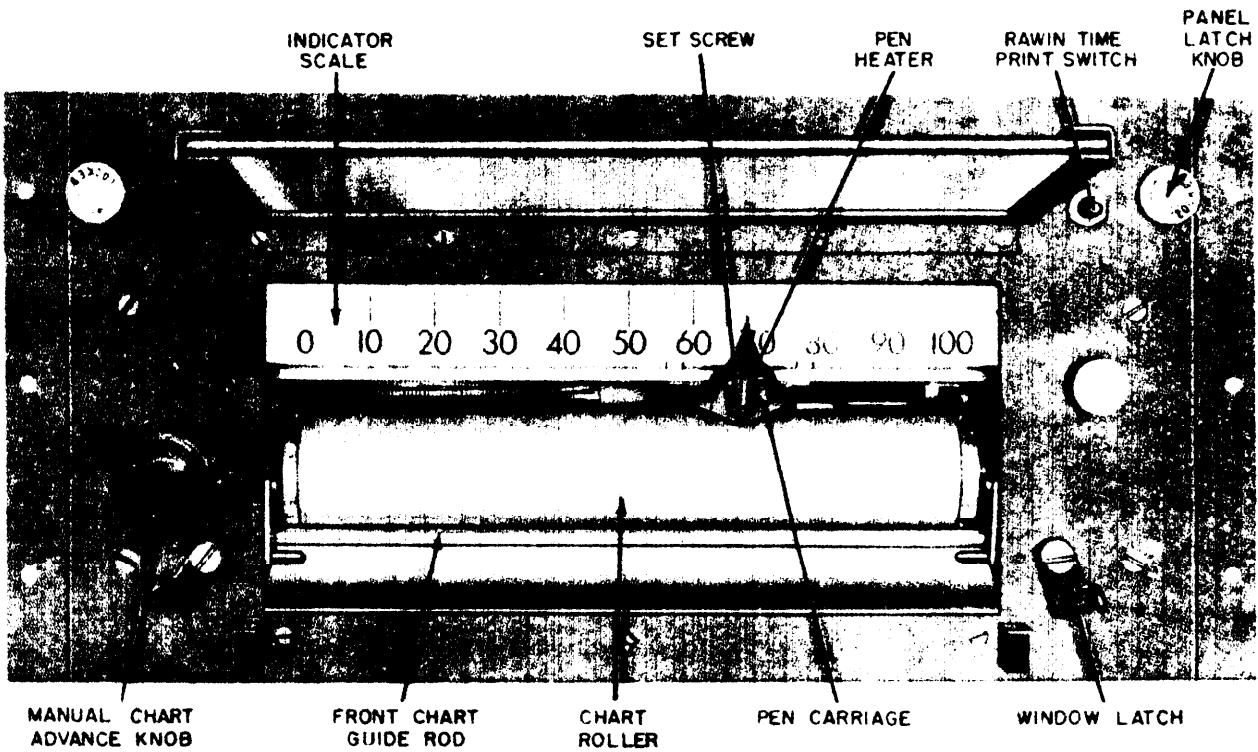
EL-6660-204-10-21

Figure 3-3. Frequency-Time Recorder, RD-88C/TMQ-5, rear of panel.



EL-6660-204-10-22

Figure 3-4. Pen assembly.



EL-6660-204 10-23

Figure 3-5. Frequency-Time Recorder RD-88/TMQ-5, front view.

Section II. PRELIMINARY PROCEDURES

3-3. Filling Pen

Use the following procedure to fill the pen. (During shipment, the pen is in the accessories case.)

a. Open the frequency-time recorder drawer and remove the screwdriver (figs. 2-3 and 2-4) from the right-hand side of the chassis. Loosen the setscrews that secure the panel lamp assembly (fig. 3-3). Do not remove the setscrews. Raise the panel lamp assembly and lay it to one side (fig. 3-4).

b. Open the recorder window to loosen the small setscrew in front of the pen carriage (fig. 3-5).

c. Carefully raise the pen from the pen carriage and unscrew the pen cap (fig. 3-4). Slide the pen heater from the pen barrel; be careful not to break the pen heater connecting wires.

d. While holding the pen in the left hand at approximately a 45° angle, insert the spout of the ink tube into the pen barrel until the spout touches the bottom. Squeeze the tube until the barrel is three-fourths full of ink. This method will force out air bubbles in the ink chamber.

e. Replace the pen heater and pen cap. Be sure the venthole in the cap is not clogged.

f. Replace the pen in the pen carriage; be sure the pen is seated firmly, and the barrel is in a vertical position.

g. Tighten the setscrew and dress the pen heater leads away from the carriage shaft and indicator scale. Close the radiosonde recorder window.

h. Replace the panel lamp assembly and tighten the setscrews to secure the panel lamp assembly.

i. Replace the screwdriver (fig. 2-3) and close the frequency-time recorder drawer.

3-4. Actuating Pen Heater

(fig. 2-3)

a. To prevent the ink from freezing, a heating wire element is wound around the pen barrel. This heater is automatically turned on and off, as required, by a thermostat. Because the pen must cover too great a distance for flexible feed wires to be practical, a trolley system (pen-heater contact bar) is installed to supply electrical power to the heater element. Such a feature is unnecessary

in warm weather. To allow the pen to move freely throughout its excursion, the trolley system is lowered into position to make contact only when weather conditions demand. The thermostat is located at the right-hand end of the pen-heater contact bar.

b. If the temperature drops to 40° F or below, lower the contact bar to make contact with the moving contractors mounted on the pen carriage. The adjusting screws on top of the bar are factory-adjusted, and should not be changed unless necessary. Loosen the two lockscrews on each end of the bar, and allow the bar to drop as far as the adjusting screws permit. Check the sliding contacts of the pen heater by sliding the pen carriage from one end of the scale to the other, first in the up position of the pen and then in the down position. While sliding the pen carriage, be sure that the sliding contacts make good electrical contact throughout the excursion. Tighten the lockscrews.

3-5. Chart Installation

a. Step 1.

(1) Release the panel latch knobs (fig. 3-5). Pull the frequency-time recorder chassis forward.

(2) Release the two window latches, and open the frequency-time recorder window.

(3) Pull the front chart guide rod forward (away from the chart roller).

(4) Push back the spring-loaded intermediate chart guide rod (fig. 3-6). The right and left ends are accessible behind the lower portion of the front panel.

(5) Loosen the right-hand knurled screw that holds the tear-off scale (fig. 1-4) to the writing desk.

(6) While holding the writing desk, remove the writing desk by withdrawing the two spring-loaded knurled rods at the ends of the hinge axis.

b. Step 2.

(1) Unwind about 2 feet of the new chart roll.

(2) With the printed side up, place the core of the chart roll over the right rear chart roll bearing (fig. 3-6). This bearing is spring-loaded and must be compressed to the right to follow the directions given in (3) below.

(3) Place the left end of the chart roll over the left rear chart roll bearing. Be sure to engage the guide pin on the bearing with the core slot.

(4) Feed the chart under the rear and intermediate chart guide rods.

(5) Feed the chart over the chart roller and under the front chart guide rod (fig. 3-5). Engage the punched guide holes on the left side of the chartpaper with the teeth on the roller.

(6) Check to be sure that the horizontal line of the chart is parallel with the front chart guide rod.

(7) Check to see that the paper is against the chart guide collar located on the intermediate guide rod; then push this guide rod (both sides) and the front guide rod into their respective operating positions.

NOTE

If only one side of the intermediate chart guide is engaged, the chart paper will not feed correctly.

(8) Replace the writing desk.

c. *step 8.*

(1) Close the recorder window, and secure the window latches.

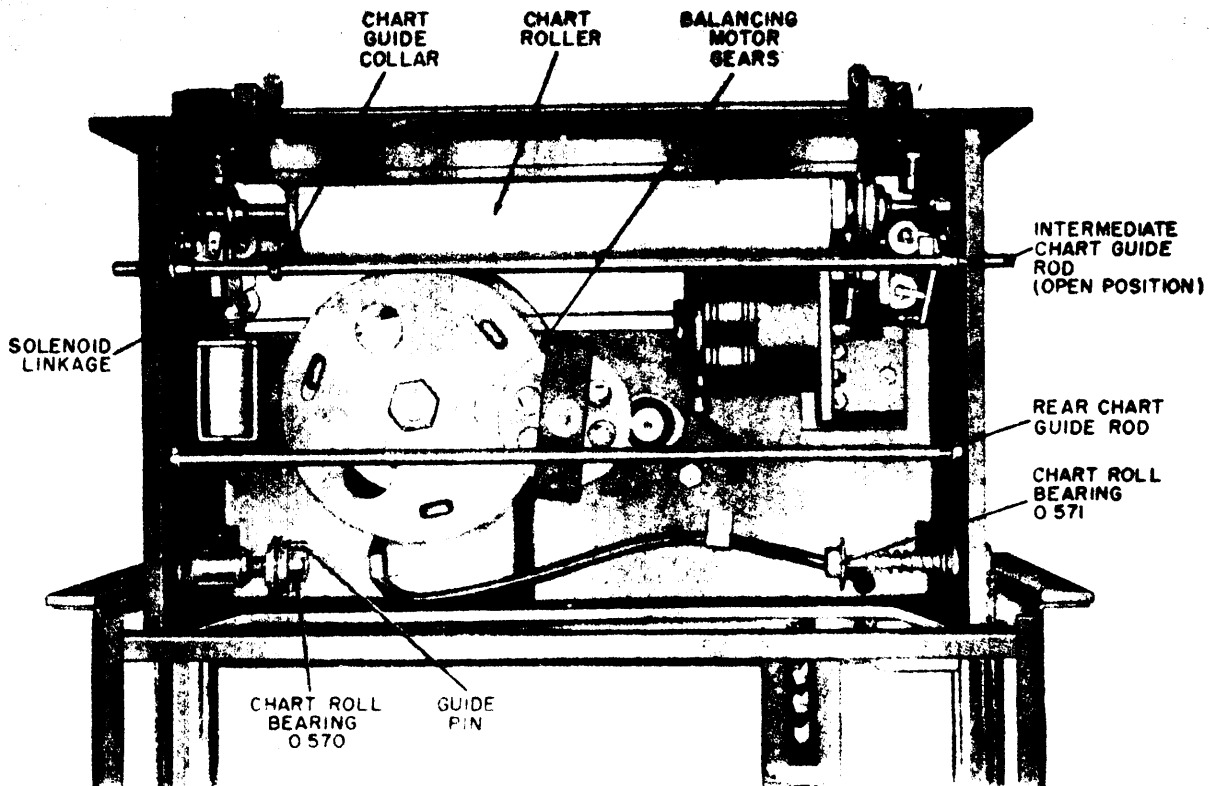
(2) Rotate the manual chart advance knob and slide the frequency-time recorder back into position, and lock the panel latch knobs.

(3) Slide the chart paper under the tear-off scale, and aline the scale graduations with the chart graduations by laterally positioning the tear-off scale. Then tighten the right-hand knurled screw that holds the tear-off scale to the desk.

(4) Place the chart weight (fig. 1-7) on the chart with the knurled thumbscrews toward the front.

NOTE

As the chart advances, the chart weight will move toward the floor. Release the clamping pressure of the chart weight and slide it up toward the desk. If the weight tends to slip on the paper, use a small paper shim to increase the thickness between the clamping bars. Do not use pliers on the knurled nuts. If the weight is not added to the chart, the intake of the fan assembly (located below the writing table) will hold the paper against the cabinet and may cause the chart roll to jam in the frequency-time recorder.



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Figure 3-6. Frequency Time Recorder RD-88/TMQ--5, bottom view showing main chart drive item.

Section III. OPERATION UNDER USUAL CONDITIONS

3-6. Preparatory and Presetting Procedure

a. Prepare the radiosonde recorder for operation; refer to the applicable publication for the radiosonde, listed in appendix A.

b. Prepare the rawin set; refer to the applicable publication for the rawin set, listed in appendix A.

c. Check to be sure that installation has been properly accomplished (para 2-7) and cables have been properly connected (para 2-8).

d. Check to be sure that the pen is full; if filling is required, refer to paragraph 3-3.

e. Check to be sure that there is sufficient reserve chart for the anticipated operating time. Footage markers are located on the side of the recorder roll-chart. At least 5 feet of chart is required for a flight. If chart installation is required, refer to paragraph 3-5.

f. Open the vent on top of the cabinet by running the knurled knob counterclockwise until it is loose. Spring action will open the cover.

g. Unfasten the two desk latches, and place the desk in the inclined position by pulling the bottom edge of the desk forward.

h. Check the chart feed mechanism for smooth movement and drift-free feed by turning the manual chart advance knob clockwise. Instructions to correct any drift are given in paragraph 4-12.

i. Set the power switch to POWER OFF.

j. Operate the SIGNAL SELECTOR switch to S.C.

k. Place the two POWER LINE circuit breakers to ON.

l. Deleted.

m. Deleted.

n. If the frequency-time recorder is type RD-88A/TMQ-5 or RD-88B/TMQ-5, operate the CHART SPEEDS switch to the desired position. In Frequency-Time Recorder RD-88C/TMQ-5, press the push-button corresponding to the speed desired (1/2, 1, or 2 inches per minute).

o. If the RD-88A/TMQ-5 or RD-88B/TMQ-5 is used, operate the rawin time-print switch to the AUTO. or OFF, as desired.

3-7. Preliminary Starting and Warmup Procedure

After the presetting procedure (para 3-6) has been accomplished, perform the following preliminary starting and warmup procedure:

a. Deleted.

b. Set the power switch to STAND BY.

c. Read the POWER LINE FREQUENCY and POWER LINE VOLTAGE meters. If the frequency is not stable at a value between 50 to 65 Hz, and the

voltage is not between 105 and 125 volts, the performance of the equipment will be affected. If the voltage is normal, but the frequency is not, determine the line frequency from the POWER LINE FREQUENCY meter. When the frequency is some value other than 60 Hz, the frequency of the test voltage is available through the SIGNAL SELECTOR switch also will be different. The 60 C.P.S. position of the switch will deliver a frequency that is equal to the powerline frequency, and the 120 C.P.S. position will deliver a frequency that is equal to twice the powerline frequency. The chart readings for these frequencies will vary accordingly.

d. Set the FAN switch to ON. Allow approximately 10 minutes for the recorder to warm up.

e. Place the OPERATE-LOCK control in the OPERATE position.

f. Ensure that the INTER S.C.-OUTPUT S.C. switch is in the center position.

3-8. Starting Procedure

NOTE

The values discussed below are the normal operation under normal powerline conditions. If an abnormal result is obtained, refer to qualified maintenance personnel,

a. After the warmup period, set the power switch to POWER ON. The pen should record at zero on the chart (the SIGNAL SELECTOR switch still in S.C. position). If the pen does not record at zero, rotate the REC. ZERO control until the pen does record at zero.

b. Hold the REC. TEST switch in its down position; the pen should go to 95 ordinates and mark the chart. If the pen does not go to 95, rotate the REC. TEST ADJ. control until the pen does go to 95. Release the switch, and the pen should return to zero and again mark the chart.

c. Rotate the SIGNAL SELECTOR switch to 60 C.P.S. The pen will go to 30 ordinates on the chart, or will be adjustable to 30 by rotating the REF. ADJUST. (This reading is one-half the line frequency). A 60-Hz signal is heard in the speaker. Adjust the SPEAKER VOL. to obtain the desired loudness from the speaker. If REF. ADJUST control setting was changed, recheck REC. TEST.

d. Rotate the SIGNAL SELECTOR switch to 120 C.P.S. The pen will travel to 60 graph divisions (ordinates) on the chart, or will be adjustable to 60 divisions by rotating the REF. ADJUST knob; a 120-Hz signal will be heard in the speaker.

e. Rotate the SIGNAL SELECTOR switch to

SIG. The radiosonde recorder is now ready to receive and record signals.

3-9. Sensitivity Check

Recorder sensitivity is the ability of the radiosonde recorder to respond and return to the same ordinate value when recording small data changes, either upscale or downscale on the chart. The sensitivity of the radiosonde recorder affects the baseline check; therefore, a sensitivity record check will be made prior to a baseline check and will not be changed during or after the baseline check.

a. The operator will perform the following in sequence to record the sensitivity check.

(1) Rotate the SIGNAL SELECTOR switch to 60 C.P.S.

(2) Using the REF. ADJUST control, move the pen upscale on the chart to a value 5 to 10 ordinates higher than that obtained in the 60 C.P.S. check. Record the pen traces for approximately 10 seconds.

(3) Rotate the SIGNAL SELECTOR switch to S. C.; momentarily move the pen downscale (do not allow the pen to reach the end of the scale).

(4) Return the SIGNAL SELECTOR switch to 60 C. I? S.; record the pen trace for 10 seconds.

(5) Press the REC. TEST switch; momentarily move the pen upscale (do not allow the pen to reach 91 ordinates), release the REC. TEST switch, and record the pen trace for 10 seconds.

(6) Repeat the procedures in (1) through (5) above until three or more traces on each side of the rest point have been recorded.

(7) The recorder should operate at maximum sensitivity with no indications of instability or hunting.

(8) If the operator cannot obtain a sensitivity check of 0.2 ordinates or better by adjusting the SENSITIVITY control and repeating the above tests, maintenance personnel will be notified to perform a sensitivity calibration check.

b. When the sensitivity check has been completed, turn the REF. ADJUST control until the pen is recording on 30 ordinates or to a position equal to one-

half of the line frequency, then rotate the SIGNAL SELECTOR switch to the S.C. positions; the pen should return to zero. The zero check trace should be at least 1/2 inch long.

c. A record of the sensitivity check and zero check will be included as part of the recorder record for each radiosonde observation. A linearity calibration test will be performed by qualified maintenance personnel and a linearity calibration correction chart will be constructed at least each 30 days. This procedure is covered in detail in TM 11-6660-204-25.

3-10. Evaluation of Ground Check (Baseline Check)

a. *Baseline Check.* The baseline check is required to establish a relationship between radiosonde transmitted value of temperature and humidity (recorded in terms of ordinate values) and observed values of temperature and humidity (read from the psychrometer upon completion of the baseline check). The temperature-humidity ordinate relationship is necessary to convert the ordinate values of temperature and humidity, recorded during the flight, to actual temperature and humidity. It is important that a satisfactory baseline check be accurate or the values obtained during flight are not valid.

b. *Temperature and Humidity Requirements in Baseline Check Box.* The relative humidity in the baseline check set should fall within 20 to 70 percent. If the relative humidity does not fall within this range, refer to TM 11-6660-219-12 for humidity control procedures. The temperature should be stable within $\pm 5^{\circ}\text{C}$ and the humidity stable within $\pm 5\%$ during a 5-minute period.

c. *Recorder Traces.* The radiosonde set is automatically switched through the cycles of reference, temperature, and humidity in the following order: low reference, temperature, low reference, humidity, and repeat. When the temperature and humidity traces are recording near the same ordinate value, the operator must remember that the temperature trace follows after the low reference trace.

NOTE

Switching, using manual operation, will be made in the same sequence listed above when necessary.

d. Evaluation Requirements. Adjust the first low reference to read 95.0 ordinates, and each successive low reference trace to 95.0 ordinates, until the requirements listed below are met.

(1) The upper left edge of all low reference traces must be recorded at 95.0 ordinates without adjustment of controls. If an adjustment is made, a new series of traces for temperature and humidity will be required.

(2) Relative humidity traces must be aligned so a line connecting the top left edge of the last two traces is parallel with the ordinate value, or three consecutive traces must show a trend in the same direction, and the three traces must fall on a straight line, covering no more than 0.3 of an ordinate spread.

NOTE

If a manual baseline check is made, the three consecutive traces must fall in a straight line covering not more than 1 ordinate.

(3) Temperature traces must be aligned so that a line connecting the left top edge of the last two traces is parallel with the ordinate value.

NOTE

If a manual baseline check is made, the last three consecutive traces must show a trend in the same direction and cover no more than 0.5 of an ordinate.

e. Evaluation of Ground Check (Baseline).

(1) Advance the chart manually, if necessary, and draw a horizontal line across the radiosonde recorder record parallel to the horizontal lines printed on the paper and at the top of the last baseline relative humidity trace.

(2) Draw straight lines connecting the top left-hand edges of temperature, humidity, and low reference traces to make them continuous plots (fig. 3-7).

(3) At the tenth ordinate on the horizontal line, enter the notation BASELINE CHECK (fig. 3-7) followed by the Greenwich Mean Time (GMT) time (to the nearest whole minute) of the completion of the baseline check.

(4) Read the temperature ordinates to the nearest tenth and enter the value on the hori-

zontal line immediately to the right of the line connecting the left edge of the temperature traces. Following the temperature ordinate, if frequency-time recorder correction is necessary, enter an equal sign and the corrected temperature ordinate value. Enter another equal sign followed by the baseline check dry bulb temperature value. *Example:* 71.5-0.1 = 71.4 = 23.6° C.

(5) Read the humidity ordinate value at the intersection of the horizontal line and the line connecting the left edges of the humidity traces. Enter this value below the horizontal line under the temperature ordinate value, followed by the applicable recorder correction, if necessary, an equal sign, and the corrected ordinate. Enter another equal sign, followed by the baseline check psychrometric humidity value. Enter all values in parentheses as shown in the following example: (77.3-0.3 = 77.0 = 34%).

(6) Use the values for temperature and humidity for the lock-in of Computer, Humidity-Temperature CP-223C/UM.

3-11. Final Preflight Procedure

a. Preparation. Prepare the radiosonde set for launching; refer to the applicable publication for the radiosonde set as listed in appendix A.

b. Release Procedures. When a fast rising balloon is used with Radiosonde Recorder AN/TMQ-5A or B, place the chart speed switch in the 1 position (1 inch per minute). When Radiosonde Recorder AN/TMQ-5C is used, select by push-button, either the 1 or 2 inches per minute paper feed.

(1) Make a visual check of the radiosonde balloon train.

(2) Place RECORDS CONTROL switch on the control recorder to standby.

(3) Turn the radiosonde recorder SIGNAL SELECTOR switch to the SIG. position. Insure that the power switch is set to POWER ON position.

(4) Place the rewintime print switch in the AUTO. or Man. POSITIONS AS DESIRED.

(5) When the operator at the radiosonde recorder is satisfied with the operation, signal the observer to release the radiosonde balloon train.

c. Marking Release. The operator of the radiosonde recorder

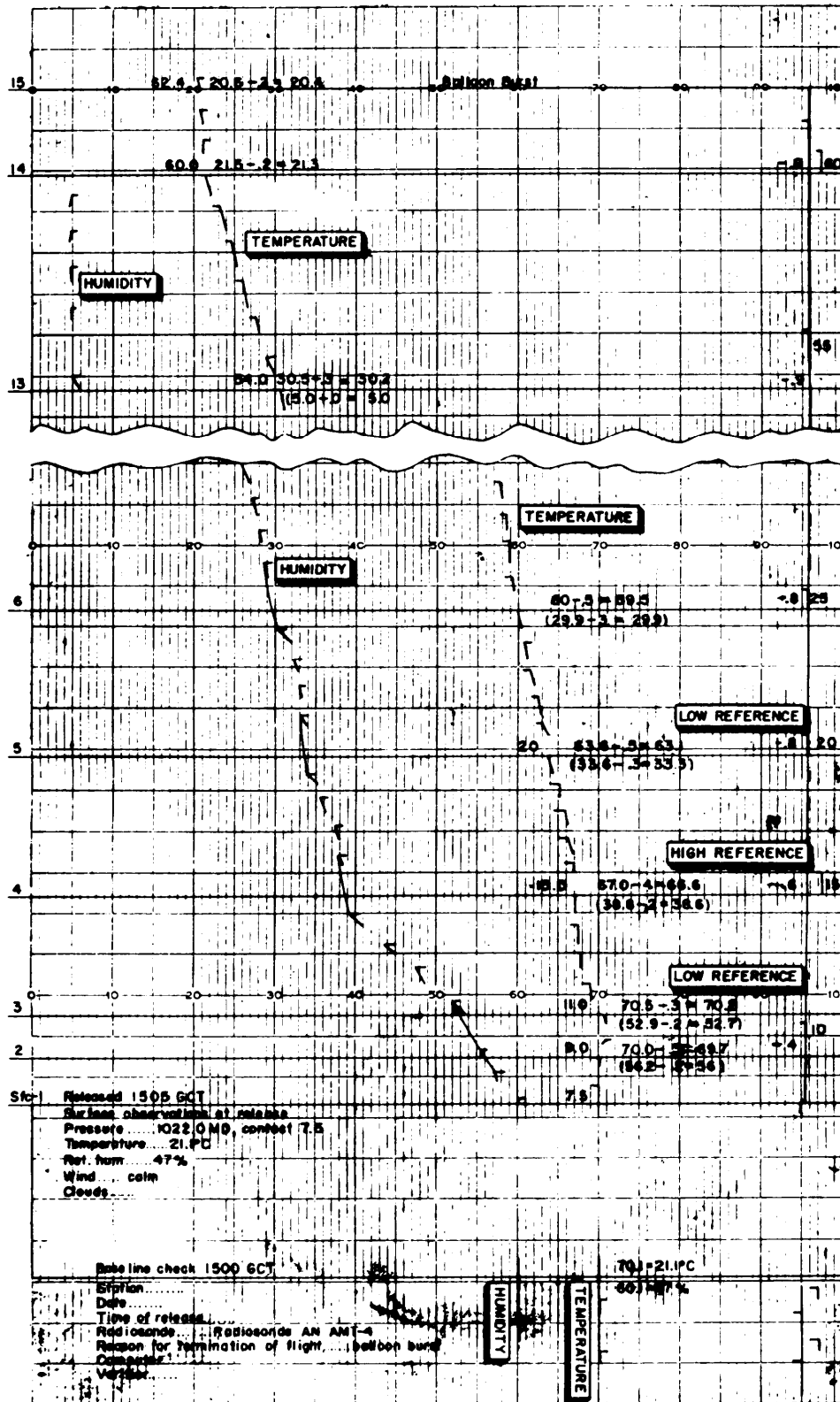


Figure 3-7. Sample of flight record for Radiosonde Sets AN/AMT-4, AN/AMT-4A, and AN/AMT-4B.

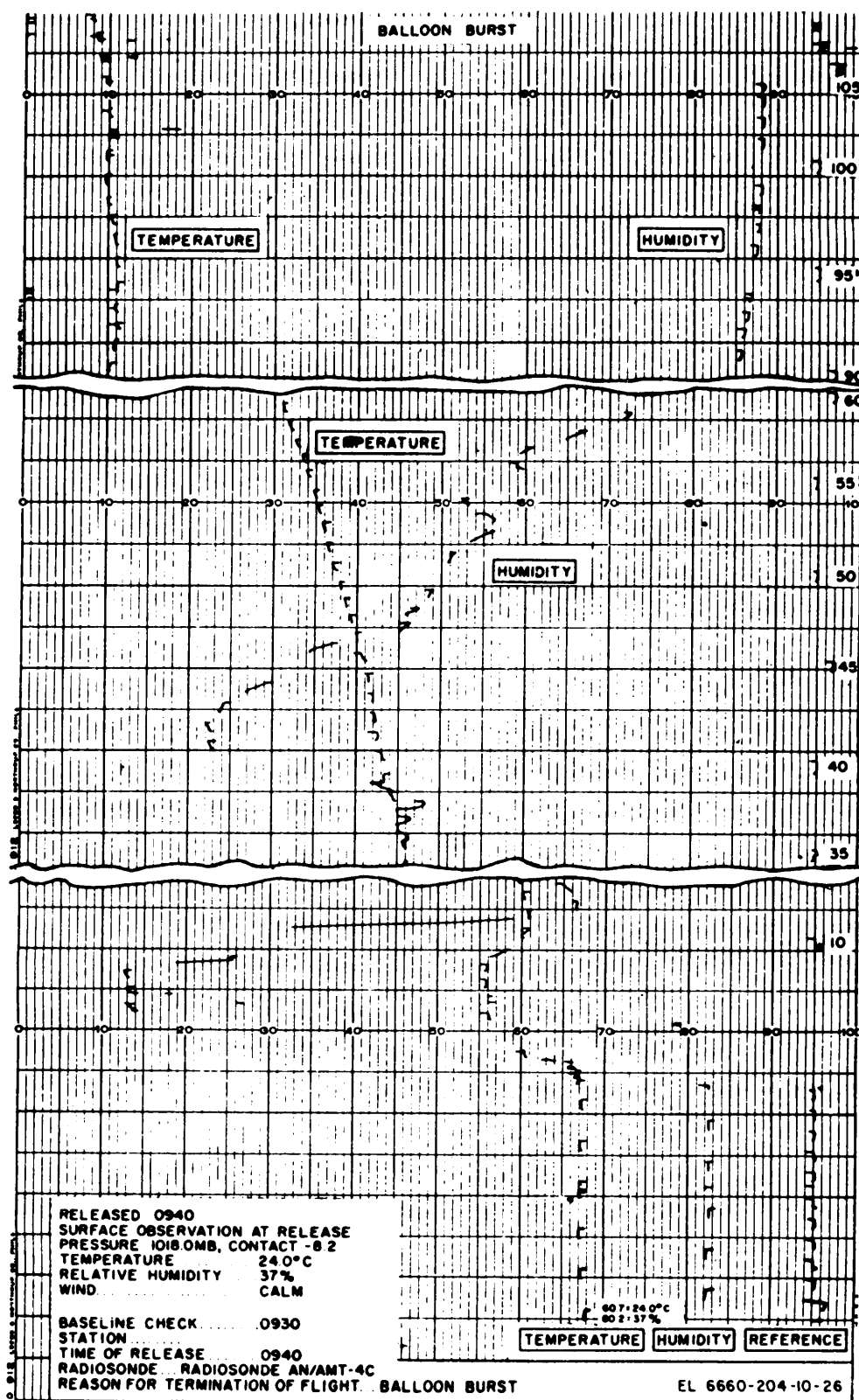


Figure 3-8. Sample of flight record for Radiosonde Sets AN/AMT-4C and AN/AMT-4D.

will mark the frequency-time recorder graph record by turning the radiosonde recorder SIGNAL SELECTOR switch back to the SIG. position at the exact moment of release. Turn the rawin RECORDS CONTROL switch on the Control recorder to the ON or FLIGHT position at the moment of release, and note the release time.

NOTE

For further details on launching other types of balloons with radiosonde sets, refer to the applicable publications listed in appendix A.

3-12. Operating Procedure

a. As each low reference signal is received, note whether the trace is being recorded clearly; then, if required adjust the low reference to 95.0 graph divisions (ordinates) with the REF. ADJUST knob.

(1) Insure that the adjustment is completed and a portion of the adjusted trace is recorded before the signal switches to a temperature trace.

(2) The low reference will never be adjusted before the trace needing adjustment is recorded.

(3) If the ascension rate is fast and the recorded low reference traces are too short to provide a readable record, both before and after adjustment, no adjustment will be made.

(4) If the reference trace was adjusted to 95.0 graph divisions (ordinates) and the temperature trace appears before a portion of the adjusted trace could be recorded, make a notation at the point of adjustment.

(5) Wait for the next low reference signal trace to complete the adjustment.

b. Once the radiosonde set is in flight, any drift will be considered as a drift for all signals and proportionate to the frequency being recorded. Corrections for this proportionate drifting will be applied while completing flight record. Do not readjust the REF. ADJUST knob except under the condition stated in a above.

c. Because of the reflecting effect of nearby objects, a rapid drift may occur immediately after release of the radiosonde set; therefore, the first low reference signal in flight may be expected to record off the 95 ordinate line. This rapid drift (or shift) is accounted for later in the application of corrections, the same as the more gradual drifts of the higher altitude traces.

d. The operator must determine whether the frequency variation of the low reference signal occurs as a drift or a shift. Shifts occurring between low reference signals may be spotted in the temperature and humidity traces. A sudden change in the audio note from the loudspeaker (not caused by a changeover in data recording) indicates a shift and informs the operator of the time of occurrence. Drifts are created by gradual changes within the radiosonde set and show up as such on all traces. A shift either in the temperature or humidity trace that does not show up in the other traces indicates a significant change in meteorological information. It is important that the operator give the equipment continuous attention during a recording.

e. When an automatic time print is required for evaluation of wind data, place the rawin time-print switch in the AUTO. position. When additional time-prints are required of intermediate points, the rawin time-print switch is operated in the MAN. position for each time-print.

3-13. Chart Drift

To avoid inaccuracies caused by possible drift of the chart paper, check the zero line at the end of the descent record. With the SIGNAL SELECTOR switch on S.C., the trace still should lie exactly on the chart zero line. For accurate chart alignment, refer to paragraph 4-11.

3-14. Record Evaluation

a. General. Accomplish the radiosonde recorder sensitivity and zero check as described in paragraph 3-9. The final ordinate values for the temperature and humidity traces are affected by corrections for both linearity and low reference drift. The levels at which evaluations are made (significant levels) are specified by the using service. Ground check observations (para 3-10) are entered on the chart (figs. 3-7 and 3-8). These data include the station pressure, temperature, relative humidity, and pressure contact (commutator setting) at release, time of release, and any other information specified by the using service. Enter

the actual pressure contact setting next to the release trace, enter circled dots on the first level (SFC) and label each as "T" and "RH" as appropriate.

b. Selection, Identification, and Evaluation of Significant Levels.

(1) Significant levels are placed on the radiosonde recorder record to mark the boundaries of strata having differences in temperature lapse rates or vertical humidity gradients (fig. 3-7).

(2) A significant level is drawn completely across the radiosonde recorder record at that point and each level is numbered consecutively.

(3) The first significant level is always the release point. Determine the contact number (to the nearest tenth) at release, and enter this on the surface level slightly to the left of the temperature trace. Do not enter ordinate values for temperature or relative humidity on the surface level.

(4) At each significant level selected, enter the pressure contact number (to the nearest tenth) to the left side of the temperature trace. Enter the ordinate value (to the nearest tenth) of the temperature trace on the top of the line drawn for the significant level, just to the right of the trace. Enter the ordinate value (to the nearest tenth) of the humidity value under the line drawn for the significant level, below the temperature ordinate.

NOTE

Contact values are counted vertically, starting with the top of the temperature trace, or bottom of the humidity trace. This value is considered the beginning of the contact, and the full contact will extend to the top of the next temperature trace or the bottom of the next humidity or reference trace.

c. Preparation of Data.

(1) At each high and low reference trace on the chart, enter the contact number to the right of the reference trace. However, above the 105th contact, number only the high references.

(2) Connect each low reference trace on the chart with a straight line (termed a drift line), drawn from the upper end of one low reference trace to the lower end of the next trace (fig. 3-7). Normally, this will be a straight line that will coincide with the 95th abscissa line. This line indicates a constant reference frequency of 190 Hz. If a drift occurs in this reference frequency, record-

ings will be affected along the abscissa line, by an amount that is proportionate to the position of the recording between 0 to 95. Consider such drifts when evaluating the flight record.

(3) To correct for a drift in the low reference frequency, the following example is typical. Assume that the low reference trace has shifted downward to 93.7, and the temperature trace for the same altitude level is 38.6. The decrease at the reference level is $95 - 93.7 = 1.3$. Multiply the temperature ordinate value (38.6) by the drift (1.3); this figure is equal to 50.18. Divide the product by the ordinate value of the low reference drift line (93.7). The quotient (.54) is the drift correction. Because the drift was to the left of 95.0, the correction must be added to the temperature ordinate ($38.6 + .54 = 39.14$). (When a definite shift in the temperature and or humidity traces occurs, without a corresponding shift in the low reference trace, the recorded data above the level are questionable.)

3-15. Pressure Evaluation

Each radiosonde modulator is supplied with a pressure calibration chart, having a serial number which corresponds to the serial number of the radiosonde modulator. The calibration chart of one radiosonde modulator cannot be used to evaluate the flight of another.

a. The low reference, high reference, temperature, or humidity trace that occurs at any point of the chart corresponding to a particular contact on the commutator identifies the pressure at that point.

b. Read the contact indication from the frequency-time recorder chart for the significant level selected. On a strip-type calibration chart, read vertically on the right-hand side until the contact value is matched. Read the millibar pressure on the left side. When a graph-type chart is used (hypsometer), read vertically along the graph line that represents the contact to the calibration curve. Read the pressure from the horizontal line at the intersection of the contact line and the calibration curve.

c. Check the release contact setting on the chart by counting back from the first complete reference after release. The fractional value of the contact at release can be estimated by comparing it with the length of the following contact.

(1) If the difference between the actual setting and the indicated setting is .5 contact or less,

the pressure contact for significant levels should be corrected by the amount of the contact discrepancy.

Example: The record show that the radiosonde was released with the contact point set at contact 8.4, but the calibration chart indicates that the setting should have been 8.2. The difference is .2 contact. Because the actual setting is higher than the correct setting (as obtained from the calibration chart), .2 should be subtracted from the contact value at the surface and at all significant levels. If the actual setting is low, add the difference to the contact values at the surface and at all significant levels.

(2) If the difference between the actual setting and the indicated setting is greater than .5 contact, the correction method described in (1) above may be applied. However, because of the difference in the physical dimensions of the intermediate conducting segments, using this method may cause slight pressure errors.

NOTE

Contact discrepancies greater than .5 contact are caused by careless ground procedures.

3-16. Temperature-Humidity Computation (fig. 3-9)

Computer, Humidity-Temperature CP-223(*)/UM is used to translate the recorded data into temperature in degrees Celsius and relative humidity percentage. The computer consists of three discs. The outermost disc is graduated in degrees Celsius. The middle disc is graduated in units that represent recorder chart frequency ordinates. The inner disc contains curved relative humidity lines. A cursor having a hairline is provided for aligning points on the discs. The cursor is also graduated in degrees Celsius.

NOTE

The plain, the "A" model, and "B" model computers should be converted to the "C" model by changing the top (humidity) disc. The top disc for the "C" model is shown in Fig. 3-10 and is labelled CP-223 C/U M. To change the disc, requisition

new disc (NSN 6660-00-179-5846) and change discs by unscrewing the knurled nut. Discard old disc.

a. Temperature Setting and Determination.

(1) Loosen the knurled knobs enough to permit the disks to be rotated easily. If the knobs are backed off too far, the disks may become unentered. Check to see that -4°C on the cursor is always on the innermost circle.

(2) Set the hairline of the cursor at the ground check temperature on the outermost disk.

(3) Rotate the recorder divisions middle disk until the ordinate value that corresponds to the ground check temperature trace intersects the hairline of the cursor.

(4) Lock the two disks together by turning the inside knurled knob.

(5) Opposite any temperature ordinate on the CP-223C/UM, read the corresponding temperature in degrees centigrade.

b. Humidity Setting and Determination.

(1) Set the hairline of the cursor at the ordinate value on the CP-223C/UM divisions middle disk that corresponds to the ground check humidity trace.

(2) Rotate the inside humidity disk until the line corresponding to the ground check relative humidity intersects the hairline at the ground check temperature on the cursor. Interpolate between the curved lines on the humidity disk as necessary.

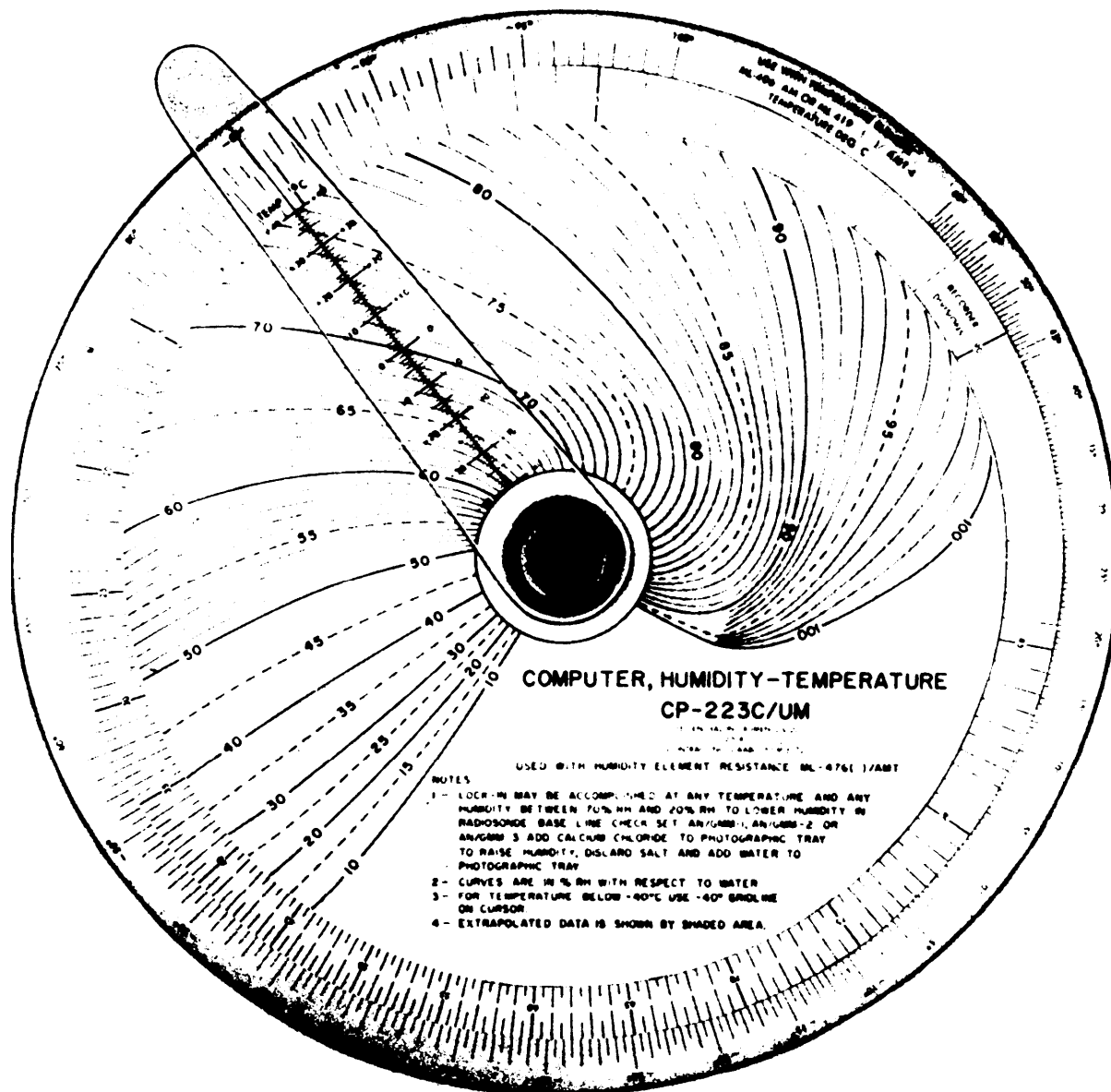
(3) Lock the two disks together by turning the collar-type outside knurled knob.

(4) To prevent the disks from slipping during flight evaluation, place a small piece of masking tape across the adjoining surfaces of the disks.

(5) For any humidity value, set the hairline on the cursor at the humidity ordinate value and read the humidity under the temperature value on the cursor, interpolating as necessary between the curved lines.

3-17. Temperature Record Evaluation

a. Perform the procedure for locking in the ground check temperature data (para 3-16a).



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Figure 3-9. Computer, Humidity - Temperature CP-223C/UM.

b. Move the cursor until the hairline is over the corrected temperature ordinate that is determined for the temperature trace at the desired significant level (para 3-14b).

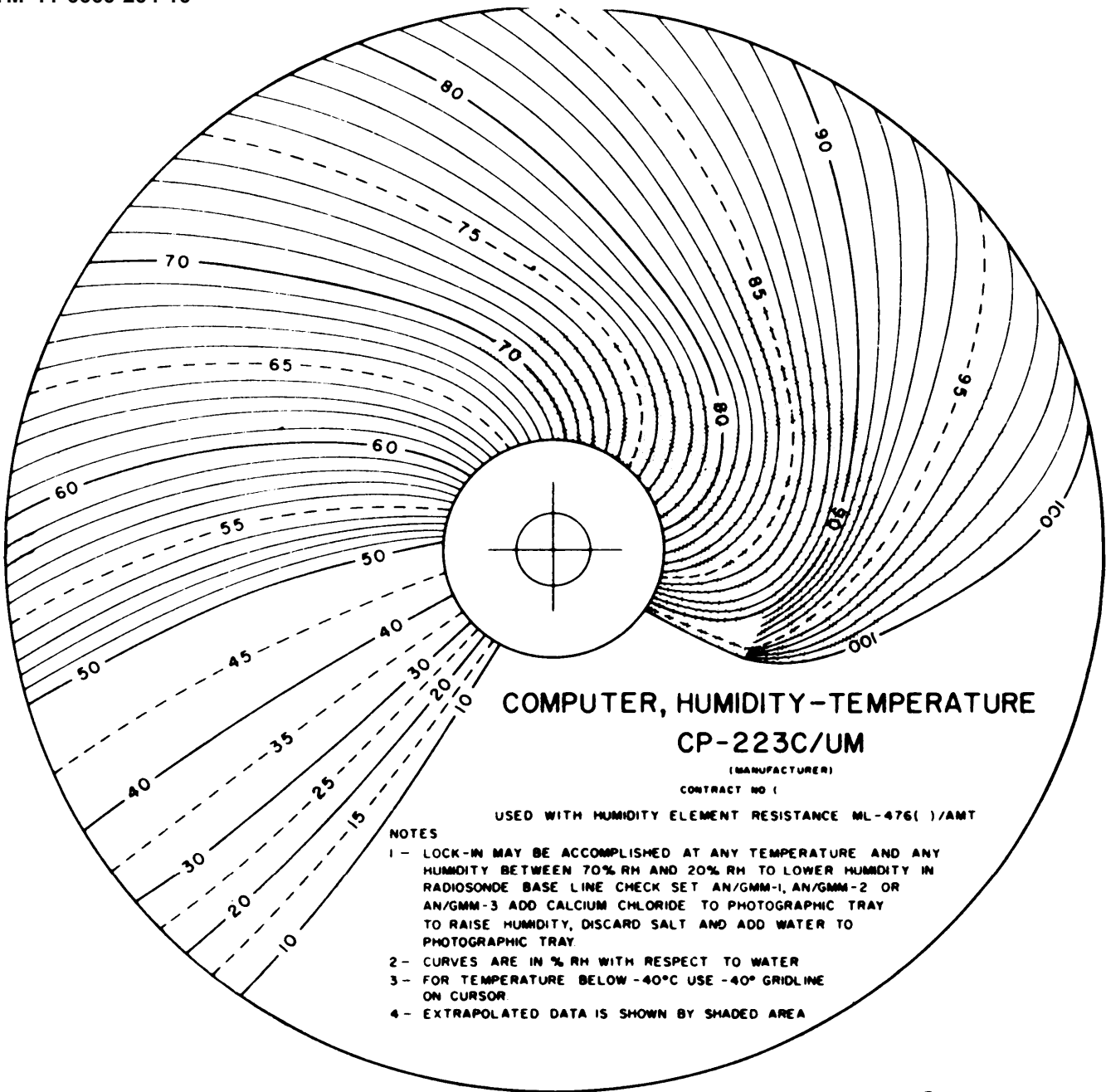
c. Determine the value of the temperature on the temperature plate, as indicated by the cursor hairline. This is the actual temperature at the significant level on the chart.

Example: At the time of release, the ground check temperature was 19.3°C and the temperature trace, as read on the recorder chart, was 66.1 ordinates. At the desired significant level, the temperature trace is 42.3 ordinates. To obtain the

correct temperature, lock the ground check temperature at the ground temperature trace (para 3-15). Rotate the cursor until the hairline is at 42.3 recorder ordinates. The actual temperature is then read as -14.6 °C.

CAUTION

Loosen the knurled knobs enough to permit the disks to be rotated easily. If the knobs are backed off too far, the disks may become unentered. Check to see that -40°C on the cursor is always on the innermost circle.



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Figure 3-10. Top disk for Computer, Humidity - Temperature CP-223C/UM

3-18. Humidity Data Evaluation

a. General. Generally, the humidity traces on the chart will show greater variations than the temperature traces. They usually are evaluated at a point where the significant levels intercept the tops of the traces, or where the levels intercept a straight line that connects the top ends of the humidity traces above and below the significant level. Therefore, draw a straight line that connects the top of each humidity trace to the top of the succeeding humidity trace. Connect all consecutive humidity traces for the entire flight.

NOTE

For exceptions to the following procedure, refer to Federal Handbook #3 Radiosonde Observations, January 1969, U.S. Department of Commerce, with applicable amendments and addenda,

b. Data Record.

- (1) Read the humidity ordinate in tenths of a recorder division of the recorder chart.
- (2) Read the corrected humidity ordinate at the intersection of the humidity curve and the sig-

nificant level. The procedure for correcting the humidity trace is given in paragraph 3-14c(3). Be sure to select the humidity trace, rather than the temperature trace, when finding the proportional drift of the humidity trace.

c. Humidity Evaluation.

(1) Lock-in the humidity setting for ground check humidity data (para 3-15c).

(2) Move the cursor until the hairline lines up with the corrected humidity trace (para 3-14(3)) that is determined at the specific significant level under evaluation.

(3) Locate the point on the graduated cursor that identifies the value of the temperature at this same significant level.

(4) Read the value of the relative humidity for this level from that curve, in the family of black curves, that intersects the hairline of the cursor at this temperature. If no curve intersects the hairline, the humidity value can be determined by interpolation between humidity curves.

NOTE

Interpolation between humidity lines is made along the hairline of the cursor.

Example: At a given level, the humidity reading is 69.5 recorder divisions. The temperature at the same level is -7° C. The humidity reading at

ground is 80.2 recorder divisions, corresponding to a ground humidity of 71 percent and ground temperature of 19.3° C. Give the indicated relative humidity.

Solution: Rotate the cursor until its hairline is aligned with the 80.2 recorder division mark. Move the center disk until the correct humidity curve, corresponding to the true relative humidity of 71 percent, intersects the hairline graduations of the ground temperature (19.3° C). Lock the two plates by turning the outside knurled knob. Move the cursor until the hairline is at 69.5 recorder divisions. The relative humidity when using Computer, Humidity-Temperature CP-223C/UM (figs. 3-9 and 3-10) is approximately 76.5 percent.

3-19. Flight Termination

After the record has been completed, operate the recorder with the SIGNAL SELECTOR switch in the S.C. position to obtain a zero check. Stop the recorder by setting the power switch to the POWER OFF position. Advance the chart, with the manual advance knob, until the zero trace is approximately halfway past the lower edge of the tear-off scale; leave enough of the zero trace to indicate correct calibration. Carefully rip the chart against the lower edge of the tear-off scale. Enter the reason for termination of the sounding slightly above the last ascent level evaluated.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

3-20. General

The operation of Radiosonde Recorder AN/TMQ-5(*) may be difficult in regions where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. Instructions for minimizing the effect of unusual operating conditions are given in paragraphs 21 through 23.

3-21. Operation in Arctic Climates

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

a. Handle the equipment carefully.

b. Keep the equipment warm and dry. Check to see that the pen heater is operating properly. Leave the power switch at STAND BY when the set is not used, unless this will overtax the alternating current (ac) power source.

c. Locate the equipment inside a heated inclosure, where there is no danger of a cold draft striking the glass tubes. A sudden draft of cold air may shatter the glass envelope of a heated tube. If the inclosure is so constructed that this precaution is impossible, place a blanket or some barrier between the source of the draft and the equipment.

d. When equipment that has been exposed to the cold is brought into a warm room, condensation will form until it reaches room temperature. Open the vent on top of the radiosonde recorder and start the fan. The circulating air will dry the equipment.

3-22. Operation in Tropical Climates

a. For operation in tropical climates, the equipment may be installed in tents, huts, or, when necessary, in underground dugouts. In the tropics, when equipment is installed below ground, or when it is set up in swampy areas, moisture condi-

tions are acute. Ventilation is usually very poor, and the high relative humidity causes condensation of moisture on the equipment whenever its temperature becomes lower than that of the surrounding air. To minimize this condition, keep the fan in operation and the vent open.

b. During periods of inactivity, the lower viscosity of the ink (caused by high temperature) allows it to seep by the ball point and form a drop. If this drop becomes large enough to reach the chart, capillary (blotting) action starts. In sufficient time, this action will drain the ink supply and necessitate a cleaning operation. Avoid this condition by placing a piece of metal foil directly under the pen point. The foil should be from 1 to 2 inches square; it is usually available in protective coverings such as cigarette, gum, and candy wrappings.

3-23. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use

the same protective measures to insure proper operation of the equipment.

b. The main problem that arises with equipment operation in desert areas is the large amount of sand, dust, or dirt that enters the moving parts of the recorder, such as motors and linkage. The ideal preventive precaution is to house the equipment in a dustproof shelter. Since such a building is seldom available and would require air conditioning, the next best precaution is to make the building in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows and doors, cover the inside walls with heavy paper, and secure the side walls of tents with sand to prevent their flapping in the wind.

c. Never tie power cords, signal cords or other wiring connections to either the inside or the outside of tents. Desert areas are subject to sudden wind squalls, which may jerk the connections loose or break the lines.

d. Keep the equipment as free as possible from dust. Make frequent preventive maintenance checks.

CHAPTER 4

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE

4-1. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of Radiosonde Recorder AN/TMQ-5(*) are listed below together with references to the paragraphs covering specific maintenance functions.

a. Operator's preventive maintenance checks and services (para 4-5).

b. thru *d.* (Deleted)

e. Cleaning (para 4-9).

f. Operator's troubleshooting (para 4-12).

g. Repairs and adjustments (para 4-13).

(1) Chart alignment.

(2) Replacement of humidity-temperature computer.

(3) Replacement of power indicator lamp.

(4) Replacement of filament indicator lamp.

(5) Replacement of chart (Graph Paper ML-432/TMQ-5).

(6) Replacement of recorder pen ink.

4-2. Tools, Test Equipments, and Materials

No tools or test equipments are required for operator's maintenance. Materials for maintenance that the operator is authorized to perform is limited to the following:

a. Computer, Humidity-Temperature CP-223C/UM.

b. Lamp, glow NE-51.

c. Lamp LM-27.

d. Trichlorotrifluoroethane.

Section II. OPERATOR'S PREVENTIVE MAINTENANCE

4-3. Operator's Preventive Maintenance

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.

The procedures given in paragraph 4-5 and 4-9 cover routine systematic care and cleaning essential to proper upkeep and operation of equipment.

4-4. Preventive Maintenance Checks and Services

Preventive maintenance checks and services of Radiosonde Recorder AN/TMQ-5(*) are required on a daily, weekly, and monthly basis.

a. Paragraph 4-5 specifies preventive maintenance checks and services that must be accomplished and under the special conditions listed below.

(1) *Vehicular installations.*

(*a*) Before the vehicle starts on a mission.

(*b*) When the equipment is initially installed.

(*c*) When the equipment is reinstalled after removal for any reason.

(*d*) At least once each week if the equipment is not used daily, but is maintained in a standby condition.

(2) *Fixed, transportable, and mobile installations.*

(*a*) When the equipment is initially installed.

(b) When the equipment is reinstalled after removal for any reason.

b. Paragraph 4-5 specifies the preventive maintenance that must be performed.

(c) At least once a week, if the equipment is not used daily, but is maintained in a standby condition.

4-5. Operator’s 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	Item to be inspected Procedure	Equipment is not ready/available if:
	B		
1	*	Recorder pen. Ensure that pen is clean and filled with ink as explained in paragraph 3-3.	Equipment fails to support assigned mission.
2	a.	Radiosonde Recorder AN/TMQ-5(*) performance check. Perform operational tests described in paragraph 4-11.	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.

4-6. Deleted

4-7. Deleted

4-8. Deleted

4-9. Cleaning Checks

a. Inspect the exterior of the radiosonde recorder. The exterior surfaces should be clean, free of dust, dirt, grease, and fungus. Interior cleaning is not to be performed by the operator. When it becomes necessary to clean the interior of the equipment, refer the equipment to authorized maintenance personnel.

b. Inspect the interior by pulling the frequency-time recorder chassis forward and opening the recorder window. The interior should be free of dust, dirt, grease, fungus, and ink splashes. If cleaning is necessary, refer the equipment to qualified maintenance personnel.

c. While inspection of the interior is being made, the operator should carefully inspect the pen assembly for cleanliness. If the need for cleaning is apparent, it should be done by qualified maintenance personnel.

4-10. Operational Tests

a. *General.* Determination of operational capability is accomplished by means of the operational tests chart (para 4-11). The chart gives the item to be tested, the conditions under which the item is tested, the normal indications of correct operation, and the corrective measures the operator can take. To use

this chart, follow the items in numerical sequence.

b. *Action or Condition.* For some items, the information given in the *Action or condition* column of the chart consists of various switch and control settings under which the item is to be tested (para 2-12). For other items, it represents an action that must be taken to allow the operator to look for normal indications given in the Normal indications column.

c. *Normal Indications.* The normal indications listed in the chart include the visible and audible signs that the operator should observe when the items are tested. If the indications are not normal, the operator should apply the recommended corrective measures.

d. *Corrective Measures.* The corrective measures listed are mainly those the operator can make without turning in the equipment for repairs. If the equipment is completely inoperative, or if the recommended corrective measures do not yield results, troubleshooting is necessary and repairs should be referred to authorized maintenance personnel. However, if the tactical situation requires that the set be kept in operation and the set is not completely inoperative, the operator must maintain the set in operation as long as possible.

4-11. Operational Test Procedures

Item No.	Item	Action or condition	Normal indications	Corrective measures
1	Signal and power cable(s).	Cable(s) connected in accordance with paragraph 2-8.		
2	Circuit breakers.	Set to ON.		
3	SIG SEL switch.	Rotate to S.C.		
4	SPEAKER VOL. control.	Set to desired amount of volume.		
5	OPERATE-LOCK control.	Rotate OPERATE-LOCK control to OPERATE position.		
6	Vent.	Opened.		
7	FAN switch.	Set to OFF.		
8	POWER switch.	Set to OFF.		
9	Chart feed.	Rotate manual chart advance knob clockwise.	Chart advances smoothly and without drift.	Check chart installation and alignment. Refer to higher category of maintenance.
10	POWER switch and FAN switch.	Change POWER switch from OFF to STANDBY and place the FAN switch to ON.	Voltmeter indicates between 105 and 125 volts. Frequency meter indicates between 50 and 65 hertz. Power jewel indicator illuminates. Fan motor starts and forces air from vent at top of recorder. Recorder pen goes to zero (approximately) but remains lifted from the chart.	Check circuit breakers, cabling, and power source. Refer to higher category of maintenance. Replace lamp. Refer to higher category of maintenance. Check vent and filter. Refer to higher category of maintenance. Check installation of pen. Refer to higher category of maintenance.

NOTE

The accuracy of items 11 through 18 are determined by a satisfactory warmup time of 10 to 15 minutes depending on the ambient temperature.

Item No.	Item	Action or condition	Normal measures	Corrective
11	POWER switch.	Change from STAND-BY to ON.	Chart motor starts and drives the chart. Pen sets down and marks the chart at zero.	Refer to higher category of maintenance. If pen does not ride against the chart, check the position of the intermediate chart guide rod, the OPERATE-LOCK control, SENSITIVITY, PEN LIFT control, and pen installation. If pen rides against the chart but does not print, clean and/or fill the pen.
12	REC ZERO control.	Rotate REC ZERO control between limits. Adjust to cause the pen to print at zero.	Pen records below and above zero. Final setting produces a print at zero on the chart.	Refer to higher category of maintenance.
13	REC TEST switch.	Press until check is finished, then release.	Pen lifts and moves to 95 and marks the chart. When switch is released, pen returns to previous setting.	If pen comes to rest above or below 95, check setting of REC TEST ADJ. Refer to higher category of maintenance.
14	60 C.P.S. check.	Rotate SIG SEL switch to 60 C.P.S. (Adjust SPEAKER VOL. as desired.)	Pen lifts from the chart and moves upscale, then sets down and marks the chart at 30 or to a position corresponding to one-half of the line frequency.	If pen comes to rest above or below 30, check setting of REF ADJ. control. Refer to higher category of maintenance.
15	SPEAKER VOL.	Vary the setting of the of the SPEAKER VOL. control.	A 60 hertz tone is heard from the speaker. Loudness of tone from the loudspeaker changes. Control operates smoothly without producing noise in the tone.	Refer to higher category of maintenance. Refer to higher category of maintenance.
16	REF ADJUST control.	Rotate the REF ADJ. hand-wheel fully clockwise. When check completed, re-adjust as for item 14.	Pen moves upscale and records 35 ordinates or higher.	Refer to higher category of maintenance.
17	120 C.P.S. check.	Rotate SIG SEL switch to 120 C.P.S.	Pen lifts from the chart and moves upscale and marks the chart at 60 or to a position corresponding to the line frequency.	Refer to higher category of maintenance.
18	SIG check. (If a signal source is not available from the rawin set or frequency standard, omit this step and leave the switch to either the 60 or 120 C.P.S. setting.)	Rotate SIG SEL switch to SIG.	Pen records at values equal to one-half the input frequency. The audio tone is heard from the speaker. Pen lifts each time the signal frequency is changed.	Check cable connections, signal source. Refer to higher category of maintenance.
19	INTER S.C.-OUTPUT S.C. switch.	Set INTER S.C.-OUTPUT S.C. switch to OUTPUT S.C. Hold until pen stops. Set switch to INTER S.C. Hold until pen stops.	Pen goes to zero. Pen goes to zero.	Refer to higher category of maintenance. Refer to higher category of maintenance.
20	CHART SPEED INS/MIN. (Frequency-Time-Recorders RD-88A/TMQ-5 and RD-88B/TMQ-5 have two-speed (1/2 and 1) chart drive mechanisms. RD-88C/TMQ-5 has three speed capabilities (1/2, 1, and 2).)	Set at 1/2. Set at 1. Set at 2. (RD-88C/TMQ-5 only.)	Chart advances 1/2 inch per minute. Chart advances 1 inch per minute. Chart advances 2 inches per minute.	Refer to higher category of maintenance for defects in the chart speed.

Item No.	Item	Action or condition	Normal indications	Corrective measures
21	Rawin time-print (TPO). A U T O . - O F F - M A N switch. (If the recorder is not connected to the rawin set, omit this test).	Set to OFF.	Control recorder TPO (Time- Print-Only) does not oper- ate for any pen position on the scale.	Refer to higher category of main tenance.
		Set to AUTO.	Control recorder produces TPO when pen exceeds 89 to 91 chart ordinates.	Refer to higher category of main. tenance.
		Depress switch to MAN.	Control recorder produces TPO each time switch is de- pressed.	Refer to higher category mainte- nance.
22	POWER switch.	Set POWER switch.	Jewel power indicator lamp goes out and VOLTAGE and FREQUENCY meters indicate zero.	Refer to higher category of main- tenance.

4-12. Operator's Troubleshooting Chart

All corrective measures that the operator can perform are given in the *Checks and corrective actions* column. If the action does not correct the fault, additional maintenance must be performed by maintenance personnel. The operator should note on the

repair item how the equipment performed and what corrective measures were taken. Follow each step in the order given to locate the trouble; however, if trouble is suspected in a particular area, start checking at that point and continue with the steps in sequence.

Item No.	Trouble symptom	Probable trouble	Checks and corrective actions
1	Chart creeps to either side	Chart misalignment.....	Align as described in paragraph 4-14.
2	Power indicator lamp does not light with circuit breaker at ON and power switch in POWER ON or STAND BY position.	a. If POWER LINE VOLTAGE and POWER LINE FREQUENCY meters indicate voltage and frequency, power indicator lamp is defective. b. If POWER LINE VOLTAGE and POWER LINE FREQUENCY meters do not indicate, radiosonde recorder is not receiving power.	a. Replace as described in paragraph 4-16. b. Check cable to power source and repair or replace as required.
3	POWER LINE VOLTAGE meter does not indicate between 105 to 125 volts.	Power source voltage	Check cable to power source. Adjust, repair, or replace as necessary.
4	POWER LINE FREQUENCY meter does not indicate between 50 to 65 cycles.	Power source frequency out of limits	Adjust power source if a generator is used; otherwise, refer to higher category of maintenance.
5	Pen does not record at zero with the SIGNAL SELECTOR switch in the S.C. position.	REC. ZERO potentiometer is out of adjustment.	Adjust as described in paragraph 3-8.
6	Pen goes above 96 on chart when REC. TEST switch is depressed.	REC. TEST potentiometer is out of adjustment.	Adjust as described in paragraph 3-8.

**Section III. ADJUSTMENT, REPAIR, AND REPLACEMENT
OF PARTS**

4-13. Repair and Adjustment

a. Repairs. Any repair necessary with the exception of those removals, replacements, and adjustments listed in paragraphs 4-14, 4-15, and 4-16 is to be performed by authorized maintenance personnel only and not the operator.

b. Adjustments. Normal adjustments for presetting, preliminary starting, and starting newly installed equipment replacements are to be made by the operator. Procedures for these adjustments are

found in paragraphs 3-6 through 3-11. After a repair has been made, the operator will determine if any adjustments are necessary by following the steps outlined in *a* through *d* below, after allowing for the initial warmup period of the recorder (para 3-7).

(1) *Step 1.*

(a) Set the power switch to POWER ON. The pen should record at zero on the chart (SIGNAL SELECTOR switch still in S.C. position).

(b) If the pen does not record at zero, adjust the REC. ZERO control until the pen does record at zero.

(c) Hold the REC. TEST switch in the down position; the pen should go to 95 graph divisions and mark the chart.

(d) Release the REC. TEST switch; the pen should return to zero and mark the chart.

NOTE

If this movement is sluggish, adjust the SENSITIVITY control.

(2) *Step 2.* Rotate the SIGNAL SELECTOR switch to 60 C.P.S. The pen will go to 30 on the chart or will be adjustable to 30 by rotating the REF. ADJUST knob. A 60-cycle signal is heard in the speaker,

(3) *Step 3.* Rotate the SIGNAL SELECTOR switch to 120 C.P.S. The pen will go to 60 on the chart or will be adjustable to 60 by rotating the REF. ADJUST knob. A 120-cycle signal should be heard in the speaker,

(4) *Step 4.* Rotate the SIGNAL SELECTOR switch to SIG. The recorder is now ready to receive and record signals,

4-14. Chart Alignment

If the chart creeps to the right or left (as shown by increasing misalignment between the punched holes and the roller teeth on the left-hand end of the roller) as it advances, make the following adjustments:

a. Loosen the nut on the threaded stud that supports the left-hand chart roll bearing (fig. 3-6).

b. Reposition the stud in a direction opposite that of the chart misalignment; estimate the amount of shift required for a trial,

c. Tighten the nuts (be sure that the stud does not turn and disturb the new alignment).

d. Align the chart on the roller again, Check the guide collar on the intermediate guide rod; it should just contact the left edge of the chart. If the guide collar requires repositioning, contact organizational maintenance personnel.

e. Make another trial run of the chart, and repeat the preceding adjustments until the chart advances properly.

f. These adjustments may be necessary each time a new chart is installed.

4-15. Removal and Replacement of Humidity-Temperature Computer
(fig. 3-9)

a. *Removal.*

(1) Loosen and remove the inner knurled locknut by turning it counterclockwise.

(2) Carefully lift the cursor and top disk from the assembly.

b. *Replacement.*

(1) Place disk onto assembly.

(2) Install cursor onto assembly.

(3) Replace and finger tighten knurled locknut by turning clockwise,

4-16. Removal and Replacement of Power Indicator Lamp
(fig. 3-1)

a. *Removal.*

(1) Remove lens by unscrewing in a counterclockwise direction.

(2) Remove bayonet type NE-51 lamp by grasping lamp with fingers, pushing into socket, and turning slightly in the counterclockwise direction.

b. *Replacement.*

(1) Install lamp by pushing into socket and turning clockwise.

(2) Replace lens by screwing clockwise.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE

5-1. Field Packaging Instructions

As a guide in preparing Radiosonde Recorder AN/TMQ-5(*) for shipment and limited storage, use the following instructions (fig. 2-1 and 2-2).

a. Detail Requirements.

(1) Packaging. Package Radiosonde Recorder AN/TMQ-5(*) as follows:

(a) *Technical manual.* Package each technical manual within a close-fitting bag fabricated of waterproof wrapping paper. Seal the bag securely with Waterproof, pressure-sensitive tape.

(b) *Electrical Equipment Cabinet CY-1390(*)/TMQ-5 with contents.* Block and brace all components in place within the cabinet with pads or cells of corrugated fiberboard. Position cabinet corners and secure the fastenings. Cushion each cabinet with paperboard cushioning and secure the cushioning with gummed paper tape. Overwrap each cushioned cabinet with waterproof paper and secure the waterproof paper with water-resistant tape.

(c) *Accessories Case CY-930/TMQ-5 with contents.* The accessories case shall be placed within a

fiberboard box.

(2) *Packing.* Pack Radiosonde Recorder AN/TMQ-5(*) as follows.

(a) Place Electrical Equipment Cabinet CY-1390(*)/TMQ-5 in a nailed wooden box.

(b) No packing is required for Accessories Case CY-930/TMQ-5.

(c) Strap each nailed wooden box only for intertheater shipment.

(3) *Marking requirements.* Boxes shall be marked as prescribed in MIL-STD-129 and pertinent instructions contained in the movement directive.

b. Estimated Material Requirements.

Item	Quantity
Waterproof wrapping paper.....	48 sq ft
Paperboard cushioning material.....	46 sq ft
Tape, pressure-sensitive, adhesive waterproof (2").....	28 ft
Tape, paper gummed, sealing and securing.....	16 ft
Fiberboard carton.....	1
Strapping, flat steel (5/8 × 0.020).....	68 ft
Wooden shipping boxes.....	1 ft

c. Packed Weight and Dimensions. Packed weight and dimensions are as follows.

Box No.	Item and Type No.	Inside dimension (in.)			Outside (cu ft)	Lumber ^a (board ft)	Packed weight (lb)
		Length	Width	Depth			
1	Radiosonde Recorder AN/TMQ-5(*). Electrical Equipment Cabinet CY-1390(*)/TMQ-5 with contents.	44	31	28	27	88	490
2	Accessories Case CY-930/TMQ-5 with contents.....	23	29 1/4	21	9		138

^aNominal 1" lumber.

d. Specification, Standards, and Other Publications. Applicable publications for shipping are as follows.

Specification number	Title	Type	Grade	Class	Federal stock number
QQ-S-781.....	Strapping, Flat Steel Seal, Steel Strapping	1	2	B	8135-283-0667
UU-T-111.....	Tape Paper, Gummed.....	.....	.....	2	8135-236-9842
UU-P-271.....	Wrapping Paper L-2 Waterproof.....	.....	.....	.....	8135-598-6097
PPP-P-291.....	Paperboard.....	.....	.....	.....	8135-171-0980
PPP-T-60.....	Wrapping Tape, Pressure Sensitive.....	III	.....	2	8135-281-3970
MIL-STD-129.....	Marking for Shipment and Storage.	.....	.....	.....	8135-281-2700

5-2. Administrative Storage

For instructions on administrative storage of Ra-

diosonde Recorder AN/TMQ-5(*), refer to paragraph 1-3.4.

Section II. Deleted.

APPENDIX A

REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
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.
TM 11-6660-20A-24P-1	Organizational, 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 11-6660-206-12	Operator's and Organizational Maintenance Manual for Rawin Sets AN/GMD-1A (NSN 6660-00-224-6137), AN/GMD-1B (NSN 6660-00-599-8257), AN/GMD-1C (NSN 6660-01-077-7797), and AN/GMD-1D (NSN 6660-01-072-9995).
TM 11-6660-219-12	Operator and Organizational Maintenance Manual, Radiosonde Baseline Check Sets AN/GMM-1 and AN/GMM-1 A (NSN 6660-00-527-8392).
TM 11-6660-220-10	Operator's Manual Radiosonde Sets AN/AMT-12 and AN/AMT-12A.
TM 11-6660-222-12	Operator's and Organizational Maintenance Manual: Meteorological (TO 45A2-2-1-2) (AR) (6660-00-239-4015) and ML-7 (6660-00-239-4010); Psychrometer, ML-24 (6660-00-223-5083) and ML-224 (6660-00-223-5084); Instrument Shelter, Meteorological, S-101/UM (5410-00-222-0507); Support, Instrument Shelter, MT-1426/UM (5410-00-408-4807) and Launching Equipments.
TM 11-6660-228-10	Operator's Manual, Radiosonde Sets AN/AMT-4D and AN/AMT-4E (NSN 6660-00-542-1964).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B COMPONENTS OF END ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the ANITMQ-5(*) 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/TMQ-5(*) 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/TMQ-5(*) in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the AN/TMQ-5(*) 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 Na-

tional stock number assigned to the item and which will be used for requisitioning.

c. *Description.* Indicates the Federal item name and, if required, a minimum description to identify the item. The 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. *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 on to an adjacent area.

e. *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/TMQ-5
2	AN/TMQ-5A
3	AN/TMQ-5B
4	AN/TMQ-5C

f. *Quantity Required (Qty Reqd).* This column lists the quantity of each item required for a complete major item.

g. *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.

(Next printed page is B-2)

SECTION II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER (FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQD	(7) QUANTITY	
(A) FIG NO.	(B) ITEM NO.						RCVD	DATE
1-4		6660-00-343-0370	CABINET, ELECTRICAL EQUIPMENT: (80063) CY-1390/TMQ-5		1	1		
1-2		6660-00-343-0370	CABINET, ELECTRICAL EQUIPMENT: (80063) CY-1390A/TMQ-5		2,3,4	1		
1-2		6660-00-614-9859	CABINET, SUB-ASSEMBLY, ELECTRICAL EQUIPMENT (80058) MX-1482/TMQ-5		1 thru 4	1		
1-6		6660-00-306-2126	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: (80058) CX-2337/TMQ-5		1,2	1		
		6660-00-306-2126	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: (80058) CX-2337/TMQ-5		3,4	1		
		6660-00-170-8777	CABLE ASSEMBLY, POWER ELECTRICAL: (80058) CX-1492/U		1,2	1		
1-7		6660-00-788-2133	CHART WEIGHT ASSEMBLY: SC-B-125081 (80063)		1 thru 4	1		
1-7		6660-00-752-7794	COMPUTER, HUMIDITY, TEMPERATURE: (80063) CP-223A/UM		1 thru 4	2		
1-4		6660-00-503-0669	CONVERTER, SIGNAL: CV-146/TMQ-5 (80063)		1,2	1		
1-4		6660-00-503-0669	CONVERTER, SIGNAL: CV-146A/TMQ-5 (80063)		3,4	1		
1-2		6660-00-370-3725	DESK LOG: SL-0-125505 (80063)		1 thru 4	1		
1-2		6660-00-569-0403	PANEL, CONTROL: C-834/TMQ-5		1,2	1		
1-3		6660-00-569-0403	PANEL, CONTROL: C-834A/TMQ-5		1 thru 4	1		
1-4		6660-00-553-1946	POWER SUPPLY: PP-96B/TMQ-5 (80063)		1,2	1		
		6660-00-553-1946	POWER SUPPLY: PP-96A/TMQ-5 (80063)		3,4	1		
1-1		6660-00-324-9426	RADIOSONDE RECORDER: AN/TMQ-5 (80058)		1	1		
1-1		6660-00-393-2234	RADIOSONDE RECORDER: AN/TMQ-5A (80058)		2	1		
1-1		6660-00-393-2234	RADIOSONDE RECORDER: AN/TMQ-5B (80058)		3	1		
1-1		6660-00-682-4500	RADIOSONDE RECORDER: AN/TMQ-5C (80058)		4	1		
2-3		6660-00-725-7917	RECORDER, FREQUENCY TIME: (80058) RD-88/TMQ-5		1			
1-2		6660-00-503-0713	RECORDER, FREQUENCY TIME: (80058) RD-88A/TMQ-5		2			
1-5								
1-2		6660-00-503-0713	RECORDER, FREQUENCY TIME: (80058) RD-88B/TMQ-5		3			
3-2		6660-00-725-7917	RECORDER, FREQUENCY TIME: (80058) RD-88C/TMQ-5		4			
1-7		5120-00-236-2140	SCREWDRIVER: SC-A-4225 (80063)		1 thru 4	1		
		6660-00-377-0176	WIRE ROPE ASSEMBLY, SINGLE LEG: (80063) SC-B-125626		1 thru 4			
1-7		6120-00-293-1839	WRENCH, OPEN END, FIXED: 0.753" AND (80063) 0.878" OPEN ENDS: SC-B-125071		1 thru 4	2		
		6660-00-663-7917	PEN, RECORDER SK-5320-598 (31922)		1 thru 4	1		

SECTION III BASIC ISSUE ITEMS

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER (FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQD	(7) QUANTITY	
(A) FIG NO.	(B) ITEM NO.						RCVD	DATE
1-7		6660-00-503-0671	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: CX-2338/U (80058)		1 thru 4	5		
1-7		6660-00-503-0672	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: CX-2339/U (80058)		1 thru 4	1		
1-7		6660-00-537-7902	CASE, ACCESSORIES: CY-930/TMQ-5 (81350)		1 thru 4	1		
		6660-00-377-2923	COVER, REAR: SC-D-125704		1 thru 4	1		
		6660-00-392-5691	COVER, FRONT: SC-D-125703		1 thru 4	1		
			DRIVE CABLE					
		5960-00-262-0167	ELECTRON TUBE: 12AT7WA (81349)		1 thru 4	2		
		5960-00-827-8782	ELECTRON TUBE: 12AX7WA (81349)		1 thru 4	2		
		5960-00-188-0933	ELECTRON TUBE: 12AY7 (81349)		1 thru 4	1		
		5960-00-082-4139	ELECTRON TUBE: 5751 (81349)		1 thru 4	1		
		5960-00-262-0210	ELECTRON TUBE: 5814A (81349)		1 thru 4	1		
		5960-00-284-5823	ELECTRON TUBE: 5R4W6A (81349)		1 thru 4	1		
		5960-00-617-6097	ELECTRON TUBE: 6Y6GT (81349)		1 thru 4	1		
		5960-00-167-0389	ELECTRON TUBE: 5651 (81349)		1 thru 4	1		
		5960-00-166-7674	ELECTRON TUBE: 6AS76 (81349)		1 thru 4	1		
		5960-00-166-7663	ELECTRON TUBE: 12AU7 (81349)		1 thru 4	1		
		5960-00-166-7676	ELECTRON TUBE: 6AU6WB (81349)		1 thru 4	1		
		5960-00-669-6861	ELECTRON TUBE: 6005/6AQ5W (81349)		1 thru 4	1		
			FUSES, 0.5 AMP, 3AG SLOW-BLOW		1 thru 4	5		
			FUSES, 0.3 AMP, SLOW-BLOW		1 thru 4	5		
		6240-00-057-2887	INCANDESCENT LAMPS TYPE 44		1 thru 4	2		
		6130-00-330-9728	INVERTER, VIBRATOR: STD-3338-2A (35529)		1 thru 4	1		
		6240-00-223-9100	LAMP, GLOW: T3-1-4 (24446)		1 thru 4	1		
			SLIDE WIRE CONTACT AND HARDWARE		1 thru 4	1		

APPENDIX D EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. Stops

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/TMQ-5(*). These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. Explanation of Columns

a. Column 1 – Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., “Use cleaning compound, item 5, App. D”).

b. Column 2- Level. This column identifies the lowest level of maintenance that requires the listed item.

- C — Operator/Crew
- O — Organizational Maintenance/Aviation Unit Maintenance
- F — Direct Support Maintenance/Aviation

Intermediate Maintenance

H — General Support Maintenance

c. Column 3 –National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4 – Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by a part number.

e. Column 5- Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

(Next printed page is D-2)

SECTION II EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NO AND FSCM	(5) UNIT OF MEAS
	C	6605-00-149-1439	ALCOHOL, ISOPROPYLE: 5024 (89875)	1 qt
	C	7510-00-270-6168	INK, LEEDS AND NORTHRUP: 125070 (31922)	2 BTL
	C	6660-00-682-6510	PAPER, GRAPH MIL-432A/TM9-5: SMD-347544 (80063)	13 RL

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By Order of the Secretary of the Army:

W. C. WESTMORELAND,
*General, United States Army,
 Chief of Staff.*

Official:

KENNETH G. WICKHAM,
*Major General, United States Army,
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NG: State AG (3); units—same as active Army except allowance is one (1) copy per unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

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.

TEAR ALONG PERFORATED LINE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F Fahrenheit temperature 5/9 (after subtracting 32) Celsius temperature °C

PIN: 016170-000