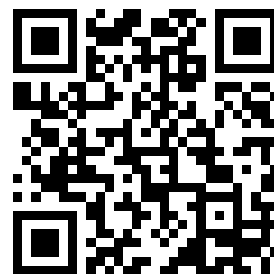

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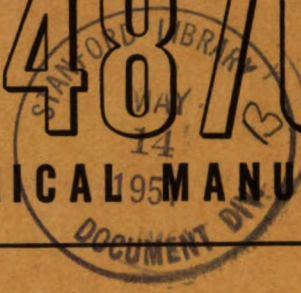
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TM 11-487G

DEPARTMENT OF THE ARMY TECHNICAL MANUAL



DIRECTORY OF SIGNAL CORPS EQUIPMENTS METEOROLOGICAL EQUIPMENT

DEPARTMENT OF THE ARMY

APRIL 1951

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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 11-487G

*This manual supersedes so much of TM 11-487, 2 October 1944
as pertains to meteorological equipment*

DIRECTORY OF SIGNAL CORPS
EQUIPMENTS
METEOROLOGICAL
EQUIPMENT



DEPARTMENT OF THE ARMY

APRIL 1951

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BY ORDER OF THE SECRETARY OF THE ARMY:

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Major General, USA
The Adjutant General

J. LAWTON COLLINS
Chief of Staff, United States Army

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FOREWORD

This is the seventh of a series of nine separate manuals, each covering the standard, substitute standard, and limited standard Signal Corps equipments in a particular field. The nine manuals cover, respectively, radio communication equipment, wire communication equipment, ground radar and recognition equipment, radio direction finding equipment, power equipment, photographic equipment, meteorological equipment, test equipment, and miscellaneous equipment.

This volume is arranged in two chapters. Chapter I includes principal items of equipment; chapter II includes miscellaneous meteorological items. The items of equipment are presented in each chapter by nomenclature type numbers in alphabetical and numerical sequence. The nomenclature type names of the equipments are listed alphabetically in the index at the back of the manual.

An illustration and the following information are given for each item of equipment included in chapter I:

- Nomenclature
- Status
- Signal Corps stock number
- Technical literature
- Description and application
- Technical characteristics
- Principal components
- Weights and volumes

The following information is given for each item of equipment included in chapter II:

- Nomenclature
- Application and brief description
- Signal Corps stock number
- Status

The following abbreviations are used in this manual:

ac.....	alternating current	hr.....	hour
a-m.....	amplitude-modulated	ID.....	inside diameter
amp.....	ampere	in.....	inch
approx.....	approximately	kc.....	kilocycle
C.....	centigrade	lb.....	pound
cps.....	cycles per second	lg.....	long
cu.....	cubic	mb.....	millibar
c-w.....	continuous-wave	mc.....	megacycle
eye.....	cycle	mi.....	mile
dbm.....	decibels below 1 mw	mph.....	miles per hour
dc.....	direct current	mw.....	milliwatt
diam.....	diameter	OD.....	outside diameter
DPDT.....	double-pole, double-throw	p/o.....	part of
F.....	Fahrenheit	psi.....	pounds per square inch
f-m.....	frequency-modulated	r-f.....	radio-frequency
fpm.....	feet per minute	rpm.....	revolutions per minute
ft.....	foot	std.....	standard
h.....	high	ma.....	microampere
Hg.....	mercury	u/w.....	used with
hp.....	horsepower	v.....	volt
		w.....	watt

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CHAPTER I

PRINCIPAL ITEMS OF METEOROLOGICAL EQUIPMENT

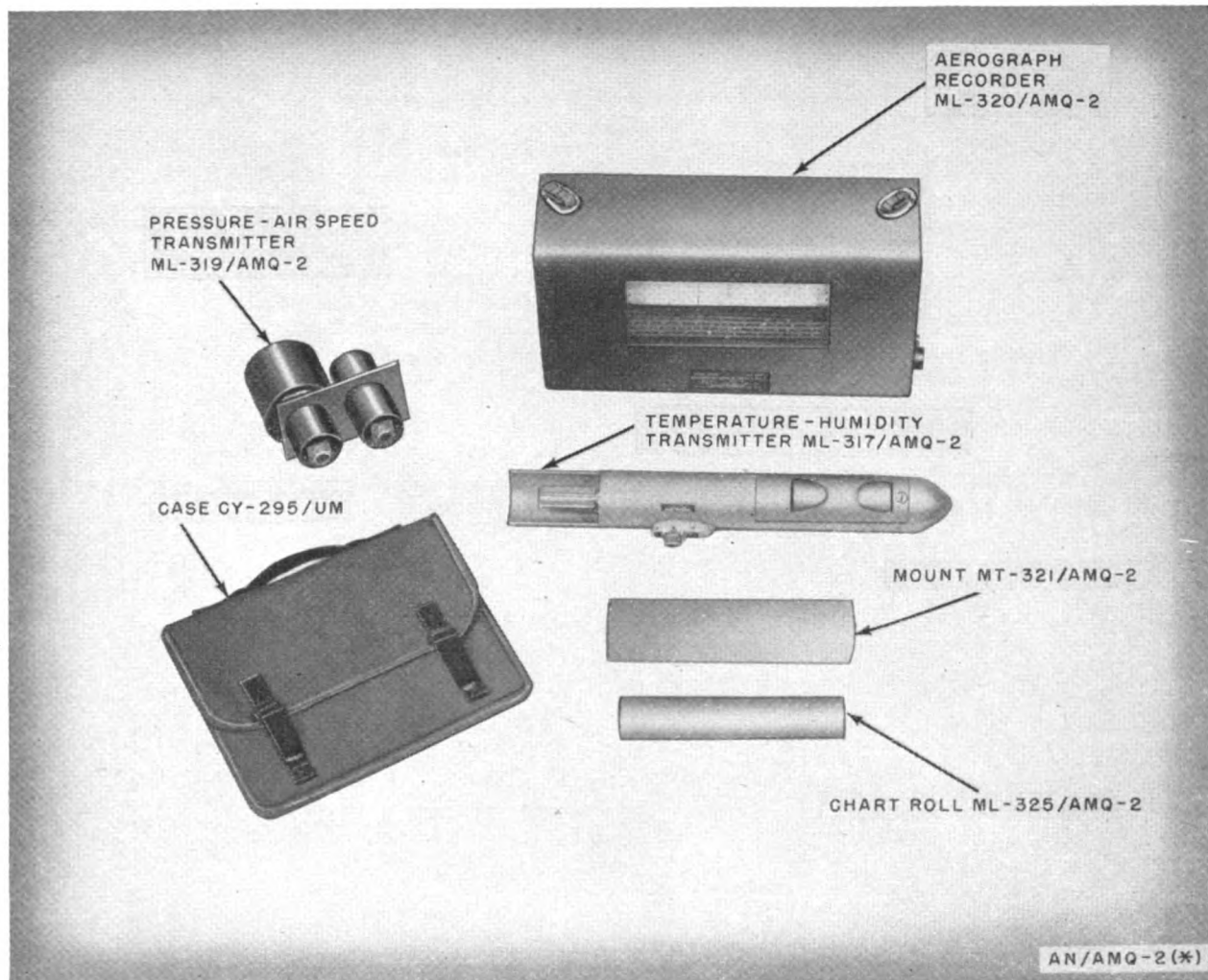


Figure 1. Aerograph Equipment AN/AMQ-2, major components (less scale and calculators).

Status: Substitute/Std. *Stock No.:* 7A7-2.
Reference: TM 11-2408.

Aerograph Equipment AN/AMQ-2(*) represents Aerograph Equipments AN/AMQ-2 and AN/AMQ-2A. Aerograph Equipment AN/AMQ-2(*) is designed for installation on aircraft. It is synchro-type remote indicating equipment used to measure and to provide instantaneous readings and continuous records of the temperature, pressure, and relative humidity of the atmosphere, together with the indicated air

speed of the aircraft on which the equipment is mounted. The data thus obtained are corrected and evaluated for use in weather analysis. Aerograph Equipment AN/AMQ-2(*) consists of a temperature-humidity transmitter, a pressure-air speed transmitter, a remote-indicating recorder, and humidity and temperature indicators. A time-evaluator scale and the calculators necessary for converting and correcting the data obtained from the recorder are included.

TECHNICAL CHARACTERISTICS

Data obtained	Actuating element	Range	Accuracy	Chart trace
Temperature.....	Bimetal Thermometer.....	-70° C to +50° C..	± 1°.....	Red.
Relative humidity.....	Hair hygrometer.....	10% to 100%.....	± 10%.....	Purple.
Atmospheric pressure.....	2-cell aneroid diaphragm, temperature compensated.	200 mb to 1,060 mb..	± 8 mb.....	Green.
Air speed.....	Single-cell, spring-loaded diaphragm, temperature compensated.	70 mph to 300 mph..	± 5 mph.....	Brown.

TRANSMITTING AND RECEIVING UNITS: Self-synchronous type.

CHART DRIVE: Low-inertia, 26-v, 400-cyc motor.

CHART SPEED: 12 in. per hr.

POWER REQUIREMENT: 25-v or 115-v, 400-cyc power source of airplane.

PRINCIPAL COMPONENTS

Temperature-Humidity Transmitter ML-317/AMQ-2.

Pressure-Air Speed Transmitter ML-319/AMQ-2.

Aerograph Recorder ML-320/AMQ-2 (AN/AMQ-2 only).

Aerograph Recorder ML-320A/AMQ-2 (AN/AMQ-2A only).

Mount MT-321/AMQ-2.

Scale ML-321/AMQ-2 (AN/AMQ-2 only).

Scale ML-412/AMQ-2A (AN/AMQ-2A only).

Temperature Indicator ID-271/AMQ-2 (AN/AMQ-2A only).

Humidity Indicator ML-272/AMQ-2 (AN/AMQ-2A only).

Chart Roll ML-325/AMQ-2.

Psychrometric Calculator ML-322/UM.

Pressure Calculator ML-323/UM.

Air Speed Calculator ML-324/UM.

Mixing Ratio Calculator ML-326/UM.

Case CY-295/UM.

WEIGHT

The total weight of this equipment, unpacked, is approximately 42 pounds.

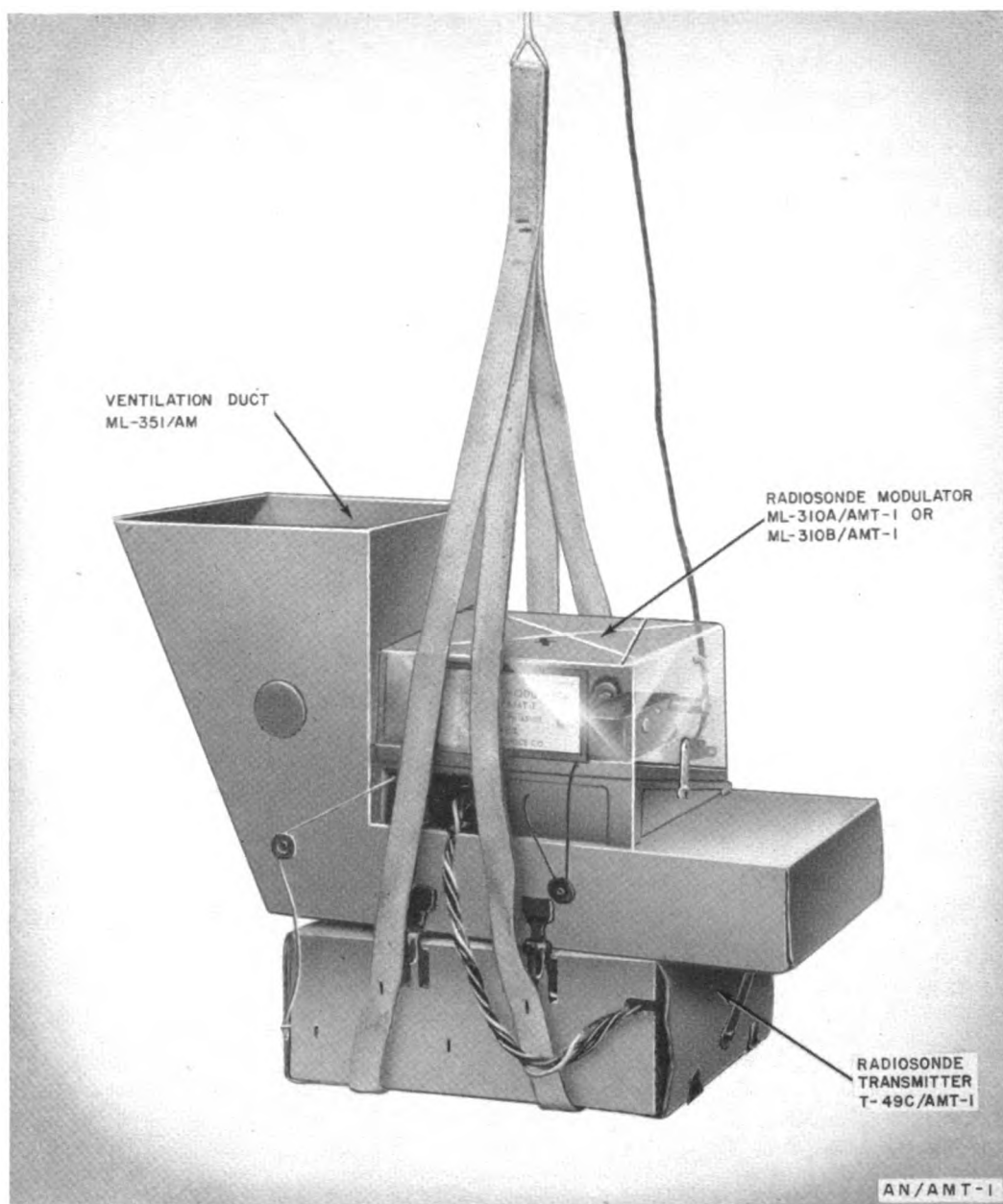


Figure 2. Radiosonde AN/AMT-1; Radiosonde Transmitter T-49C/AMT-1 assembled with Radiosonde Modulator ML-310A/AMT-1 or ML-310B/AMT-1.

Status: Standard. *Stock No.:* 7A8325-1. *Reference:* TM 11-2430.

Radiosonde AN/AMT-1 is a meteorological instrument which is sent aloft, suspended from a free balloon, to obtain soundings of the temperature, pressure, and relative humidity of the upper atmosphere. It automatically transmits amplitude-modulated radio-frequency signals interrupted at a frequency which varies in accordance

with the conditions of temperature and humidity of the atmosphere at the altitude of the radiosonde. A baroswitch connects the circuits to the transmitter successively, so that a repeating sequence of temperature, humidity, and reference signals is transmitted. These signals are received, recorded, and interpreted at a ground receptor station.

TECHNICAL CHARACTERISTICS

RANGE OF MEASUREMENTS

ATMOSPHERIC PRESSURE: 1,060 mb to 10 mb.

TEMPERATURE: +60° C to -90° C.

RELATIVE HUMIDITY: 15 percent to 100 percent.

EFFECTIVE ALTITUDE: Up to 60,000 ft.

RADIOSONDE TRANSMITTER T-49C/AMT-1.

FREQUENCY RANGE: 70 to 74 mc.

PRESET FREQUENCY: 72.2 mc.

TYPE OF SIGNAL: A-m, intermittent continuous wave.

MODULATED BY: Relaxation (squegging) oscillator.

ANTENNA: Dipole, center-fed.

TUBE: 3A5.

POWER SUPPLY: Battery BA-67 (used with, but not furnished with, the radiosondes). Battery Pack BB-208/AMT with storage battery adapter, Sig C

stock No. 2Z303-3, may be used as an emergency substitute for Battery BA-67.

SIGNALS RECEIVED BY: Radiosonde Receptors AN/FMQ-1 and -1A.

PRINCIPAL COMPONENTS

Radiosonde Modulator ML-310/AMT-1 or ML-310A/AMT-1, ML-310B/AMT-1, ML-310D/AMT-1, or ML-310E/AMT-1.

Radiosonde Transmitter T-49C/AMT-1.

WEIGHTS AND VOLUMES

Note. Radiosonde Modulators ML-310/AMT-1 (any model) and Radiosonde Transmitters T-49C/AMT-1 are packed separately, each 24 to a container.

	<i>Export packed</i>	
	<i>Weight</i>	<i>Volume</i>
	<i>(lb)</i>	<i>(cu ft)</i>
Radiosonde Modulator ML-310/AMT-1 (any model)	65	3.82
Radiosonde Transmitter T-49C/AMT-1	61	3.95

AN/AMT-2 (*)

Status: Standard. *Stock No.:* 7A8325-2 (AN/AMT-2), 7A8325-2A (AN/AMT-2A). *Reference:* TM 11-2430 (AN/AMT-2), TM 11-2433 (AN/AMT-2A).

Radiosonde AN/AMT-2(*) represents Radiosondes AN/AMT-2 and AN/AMT-2A. Radiosonde AN/AMT-2 is a meteorological instrument which is sent aloft, suspended from a free balloon, to obtain soundings of the temperature, pressure, and relative humidity of the upper atmosphere. It automatically transmits frequency-modulated, radio-frequency signals interrupted at a frequency which varies in accordance with the conditions of temperature and humidity at the altitude of the radiosonde. A baroswitch connects the circuits to the transmitter successively, so that a repeating sequence of temperature, humidity, and reference signals is transmitted. These signals are received, recorded, and interpreted at a ground receptor station. By tracking the radiosonde with a radio direction finder, wind direction and speed may be determined also. Radiosonde AN/AMT-2A is similar to Radiosonde AN/AMT-2 and serves the same purposes, but differs from it in appearance and design and in certain technical characteristics.

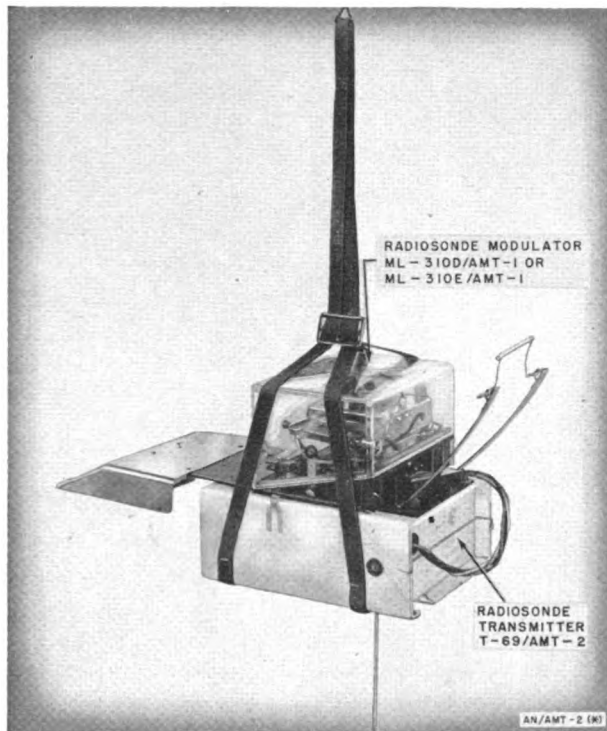


Figure 3. Radiosonde AN/AMT-2; Radiosonde Transmitter T-69/AMT-2 assembled with Radiosonde Modulator ML-310D/AMT-1 or ML-310E/AMT-1.

TECHNICAL CHARACTERISTICS

	AN/AMT-2	AN/AMT-2A
RANGE OF MEASUREMENTS:		
ATMOSPHERIC PRESSURE.....	1,060 mb to 10 mb.....	1,060 mb to 5 mb.
TEMPERATURE.....	+60° C to -90° C.....	+60° C to -90° C.
RELATIVE HUMIDITY.....	15% to 100%.....	15% to 100%.
EFFECTIVE ALTITUDE.....	60,000 ft.....	100,000 ft or more.
TRANSMITTING ELEMENT:		
FREQUENCY RANGE.....	390 mc to 410 mc.....	400 mc to 406 mc.
PRESET FREQUENCY.....	403 mc.....	403 mc.
TYPE OF SIGNAL.....	F-m.....	F-m.
MODULATED BY.....	Relaxation (squegging) oscillator.....	Relaxation (squegging) oscillator.
ANTENNA.....	Half-wave dipole.....	Half-wave dipole.
POWER SUPPLY.....	Battery Pack BB-208/AMT (3 Batteries BB-51 and 1 Battery BB-52).	Battery Pack BA-259.
SIGNALS RECEIVED BY.....	Radiosonde Receptor AN/FMQ-2.....	Radiosonde Receptor AN/FMQ-2.
	Radio Set SCR-658.....	Radio Set SCR-658.

Note. Radiosonde Receptors AN/FMQ-1 and AN/FMQ-1A may be used to record the signals transmitted by Radiosondes AN/AMT-2 and AN/AMT-2A after they have been received by Radio Set SCR-658.

AN/AMT-3

PRINCIPAL COMPONENTS

AN/AMT-2:

Radiosonde Modulator ML-310/AMT-1 or ML-310A/AMT-1, ML-310B/AMT-1, ML-310D/AMT-1, or ML-310E/AMT-1.

Radiosonde Transmitter T-69/AMT-2 (any model).

AN/AMT-2A:

Sensing Element (includes Temperature Element ML-419/AMT-4 and Humidity Element ML-418/AMT-4).

Transmitting Element.

WEIGHTS AND VOLUMES

AN/AMT-2:

Note. Radiosonde Modulators ML-310/AMT-1 and Radiosonde Transmitters T-69/AMT-2 are packed separately, each 24 to a container.

	Export packed	
	Weight (lb)	Volume (cu ft)
Radiosonde Modulator ML-310/AMT-1 (any model)	65	3.82
Radiosonde Transmitter T-69/AMT-2 (any model)	64	4.05



Figure 4. Radiosonde AN/AMT-3, assembled for operation.

Status: Standard. Stock No.: 7A8325-3. Reference: TM 11-2431.

Radiosonde AN/AMT-3 is an instrument designed for taking meteorological soundings of a vertical column of the atmosphere. The radiosonde is dropped from a weather reconnaissance aircraft and descends by parachute. During its descent, the instrument transmits signals in Morse code that provide data from which measurements of the pressure, temperature, and relative humidity of the atmosphere through which the

radiosonde passes can be determined. These signals may be received by the aircraft from which the radiosonde was released or by other suitable receivers within range of the transmitter. Radiosonde AN/AMT-3 is used in arctic or remote ocean areas, where the installation of ground equipment is impractical, to obtain information for use in weather forecasting and aircraft operation planning.

TECHNICAL CHARACTERISTICS

TYPE OF ELEMENT

TEMPERATURE: Bimetal thermometer.

PRESSURE: Double-bellows aneroid cell.

HUMIDITY: Hair hygrometer.

RANGE OF MEASUREMENTS

ATMOSPHERIC PRESSURE: 250 mb to 1,060 mb.

TEMPERATURE: -80° C to +60° C.

RELATIVE HUMIDITY: 15 percent to 100 percent.

EFFECTIVE RANGE: Between 35,000 ft altitude and sea level.

RATE OF DESCENT: 1,200 fpm, or less.

TRANSMITTER

TYPE: Single-tube, crystal-controlled, c-w.

FREQUENCY RANGE: 2 to 6 mc.

PRESET FREQUENCY: 3,135 kc.

TUBE: 3A4.

POWER OUTPUT: Approx .3 w.

RANGE: Up to 200 mi.

ANTENNA: End-fed, half-wave vertical.

POWER SUPPLY: 2 Batteries BA-67 (not furnished with the equipment).

SIGNALS RECEIVED BY: Radio Receiver BC-348 (any model) or any other c-w receiver of suitable frequency range.

WEIGHT AND VOLUME

Unpacked and assembled for flight, Radiosonde AN/AMT-3 weighs approximately 7¼ pounds. The over-all, outside dimensions of each packaged radiosonde are 10½ x 6½ x 19¼ inches (.78 cu ft). Several packaged radiosondes are packed together in a nailed, wooden box.

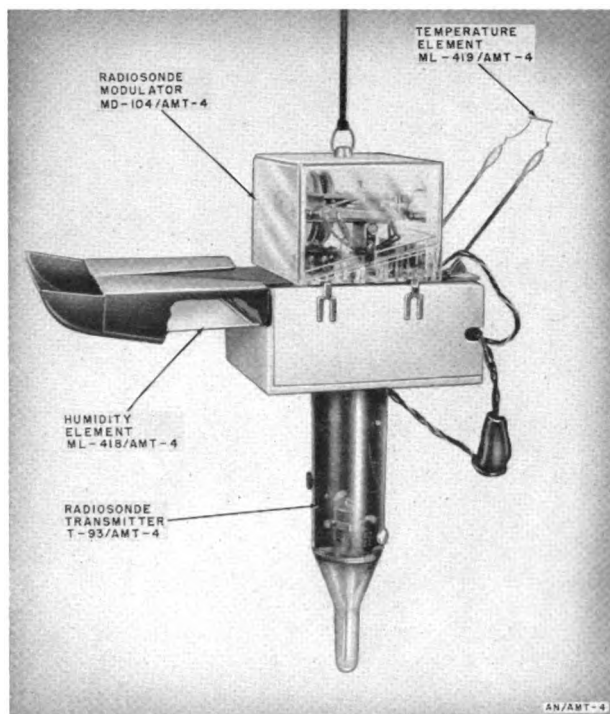


Figure 5. Radiosonde AN/AMT-4.

Status: Standard. *Stock No.:* 7A8325-4. *Reference:* TM 11-2432.

Radiosonde AN/AMT-4 is a meteorological instrument which is sent aloft, suspended from a free balloon, to obtain meteorological soundings of the upper atmosphere. It automatically transmits amplitude-modulated, radio-frequency signals, interrupted at a frequency which varies in accordance with the conditions of temperature and humidity of the atmosphere at the altitude of the radiosonde. A baroswitch connects the circuits to the transmitter successively, so that a repeating sequence of temperature, humidity, and reference signals is transmitted. These signals are received, recorded, and interpreted at a ground receptor

station. Radiosonde AN/AMT-4 produces, also, a signal by means of which it may be tracked by a radio direction finder, so that wind direction and speed may be determined. The data obtained are used in weather forecasting, for planning aircraft operations, and for calculating corrections to compensate for the effects of wind and air density on artillery fire.

TECHNICAL CHARACTERISTICS

RANGE OF MEASUREMENTS

ATMOSPHERIC PRESSURE: 1,060 mb to 5 mb.

TEMPERATURE: +60° C to -90° C.

RELATIVE HUMIDITY: 15 percent to 100 percent.

EFFECTIVE ALTITUDE: Approx 100,000 ft.

RADIOSONDE TRANSMITTER T-93/AMT-4.

FREQUENCY RANGE: 1,600 to 1,700 mc.

PRESET FREQUENCY: 1,680 mc \pm 2 mc.

TYPE OF SIGNAL: A-m.

MODULATED BY: Blocking oscillator.

ANTENNA: Dipole.

TUBES: 5794 (cavity tube) and 1U4.

POWER SUPPLY: Battery Pack BA-259/AM or Battery Pack BB-208/AMT plus 1 additional Battery BB-51 (batteries used with, but not furnished with, the radiosonde).

SIGNALS RECEIVED BY: Rawin Set, AN/GMD-1.

SIGNALS RECORDED BY: Radiosonde Receptor AN/FMQ-1 or AN/FMQ-1A.

PRINCIPAL COMPONENTS

Radiosonde Modulator MD-104/AMT-4 (includes Temperature Element ML-419/AMT-4 and Humidity Element ML-418/AMT-4).

Radiosonde Transmitter T-93/AMT-4.

WEIGHTS

	<i>Unpacked (ea)</i>
Radiosonde Modulator MD-104/AMT-4 . . .	350 grams.
Radiosonde Transmitter T-93/AMT-4	300 grams.
Battery Pack BA-259/AM (not furnished) . . .	500 grams.
Battery Pack BB-208/AMT and 1 Battery BB-51 (not furnished).	686 grams.

Note. For shipment, 24 modulators with accessories and spare parts are packaged together in one shipping container, and 24 transmitters are packaged together in a second shipping container.

AN/FMQ-1(*)



Figure 6. Radiosonde Receptor AN/FMQ-1.

Status: Limited/Std. Stock No.: 7A1326. Reference: TM 11-2403.

Radiosonde Receptor AN/FMQ-1(*) represents Radiosonde Receptors AN/FMQ-1 and AN/FMQ-1A. Radiosonde Receptor AN/FMQ-1(*) is an assembly of electronic and electromechanical devices especially designed to receive, indicate, and record in printed form radio-frequency signals modulated at an audio-frequency rate that are transmitted by radiosondes such as Radiosondes AN/AMT-1 and AN/AMT-2. The receptor can be used independently for 72.2-megacycle operation (AN/AMT-1); for 403-megacycle operation (AN/AMT-2), Radio Set SCR-658 is used in conjunction with the receptor. All the components of Radiosonde Receptor AN/FMQ-1(*), except the antennas, are mounted on one rack.

TECHNICAL CHARACTERISTICS

- RADIOSONDE RECEIVER R-17/FMQ-1**
 TYPE: Superregenerative.
 R-F RANGE: 56 to 85 mc.
 TYPE OF SIGNALS RECEIVED: A-m.
 NUMBER OF TUBES: 8.
 POWER REQUIREMENT: 115-v to 125-v, 60-cyc ac.
- ANTENNA: Coaxial vertical dipole.**
- FREQUENCY METER TS-29/FMQ-1**
 A-F RANGE: 0 to 200 cps.
 NUMBER OF TUBES: 8.
 POWER REQUIREMENT: 115-v, 60-cyc ac.
- RADIOSONDE RECORDER RD-3/FMQ-1**
 CURRENT RANGE: 0 to 500 ma.
 NUMBER OF TUBES: 2.
 RATE OF PAPER FEED: .4 in. per minute.
- AMPLIFIER AM-7/FMQ-1**
 TYPE: Pulse.
 NUMBER OF TUBES: 6.
 POWER REQUIREMENT: 115-v, 60-cyc ac.
- VOLTAGE REGULATOR CN-2/FMQ-1**
 INPUT VOLTAGE: 105 v to 125 v.
 INPUT CURRENT: 2.3 amp.
 INPUT FREQUENCY: 60 ± 2 cps.
 OUTPUT VOLTAGE: 115 v, ± .5 percent.
 OUTPUT CURRENT: 1.3 amp.
 PHASE: Single.
- ANTENNA ASSEMBLY AS-11/FMQ-1**
 TYPE: Coaxial vertical dipole.
 TRANSMISSION LINE: Radio-Frequency Cable RG-11/U, flexible coaxial (solid dielectric); 75-ohm nominal impedance; 200 ft lg.

Note. The technical characteristics listed above for the individual components of Radiosonde Receptor AN/FMQ-1(*) apply equally to any model of the component.

PRINCIPAL COMPONENTS

- Radiosonde Receiver R-17/FMQ-1
- Radiosonde Recorder RD-3/FMQ-1
- Frequency Meter TS-29/FMQ-1
- Amplifier AM-7/FMQ-1
- Voltage Regulator CN-2/FMQ-1
- Rack Assembly MT-47/FMQ-1
- Antenna Assembly AS-11/FMQ-1 (two)

Note. Any model of any of the above equipments may be used as a component of Radiosonde Receptor AN/FMQ-1(*)

WEIGHTS AND VOLUMES

	Domestic packed	Export packed
Total weight (lb).....	1,015	1,309
Total volume (cu ft).....	96	138.1
Ship tons.....		3.45



Figure 7. Radiosonde Receptor AN/FMQ-2, less Radiosonde Receiver R-228/FMQ-2 and Antenna Assembly AS-289/FMQ-2.

Status: Standard. Stock No.: 7A1326-2. Reference: TB 11-2403-4.

Navships 91266

Radiosonde Receptor AN/FMQ-2 is an assembly of electronic and electromechanical devices especially designed to receive, indicate, and record in printed form radio-frequency signals, frequency-modulated at an audio-frequency rate, that are transmitted by radiosondes such as Radiosondes AN/AMT-2, AN/AMT-2A, and AN/AMT-7 (Navy equipment). When wind speed and direction are desired also, Radio Set SCR-658 is used in conjunction with the receptor to track the radiosonde. All the components of AN/FMQ-2, except the antenna, are mounted on one rack.

TECHNICAL CHARACTERISTICS

RADIOSONDE RECEIVER R-228/FMQ-2

TYPE: Superheterodyne.

R-F RANGE: 390 to 410 mc.

INTERMEDIATE FREQUENCY: 21.25 mc.

TYPE OF SIGNALS RECEIVED: F-m and/or pulsed.

NUMBER OF TUBES: 20.

POWER REQUIREMENT: 115-v \pm 10%, 50/60-cyc, single-phase ac; 1.25 amp.

ANTENNA: Vertical, half-wavelength, concentric dipole.

FREQUENCY METER TS-29B/FMQ-1

AUDIO-FREQUENCY RANGE: 0 to 200 cps.

NUMBER OF TUBES: 8.

POWER REQUIREMENT: 115-v, 60-cyc ac.

RADIOSONDE RECORDERS RD-3B/FMQ-1 and RD-3C/FMQ-1

CURRENT RANGE: 0 to 500 ma.

NUMBER OF TUBES: 2.

RATE OF PAPER FEED: .4 in. per minute.

AMPLIFIER AM-7B/FMQ-1

TYPE: Pulse.

NUMBER OF TUBES: 6.

POWER REQUIREMENT: 115-v, 60-cyc ac.

VOLTAGE REGULATOR CN-2A/FMQ-1

INPUT VOLTAGE: 105 to 125 v.

INPUT CURRENT: 2.3 amp.

INPUT FREQUENCY: 60 \pm 2 cps.

OUTPUT VOLTAGE: 115 v \pm .5 percent.

OUTPUT CURRENT: 1.3 amp.

PHASE: Single.

ANTENNA ASSEMBLY AS-389/FMQ-2

TYPE: Vertical, half-wave, concentric dipole

CHARACTERISTIC IMPEDANCE: 52 ohms

TRANSMISSION LINE: Radio Frequency Cable

RU-8/U, coaxial (solid dielectric); 52 ohms characteristic impedance.

PRINCIPAL COMPONENTS

Radiosonde Receiver R-228/FMQ-2

Radiosonde Recorder RD-3B/FMQ-1 or RD-3C/FMQ-1

Frequency Meter TS-29B/FMQ-1

Amplifier AM-7B/FMQ-1

Voltage Regulator CN-2A/FMQ-1

Rack Assembly MT-678/FMQ-2

Antenna Assembly AS-389/FMQ-2

WEIGHTS

	Domestic packed	Export packed
Total weight (lb, estimated)-----	1,036	1,372

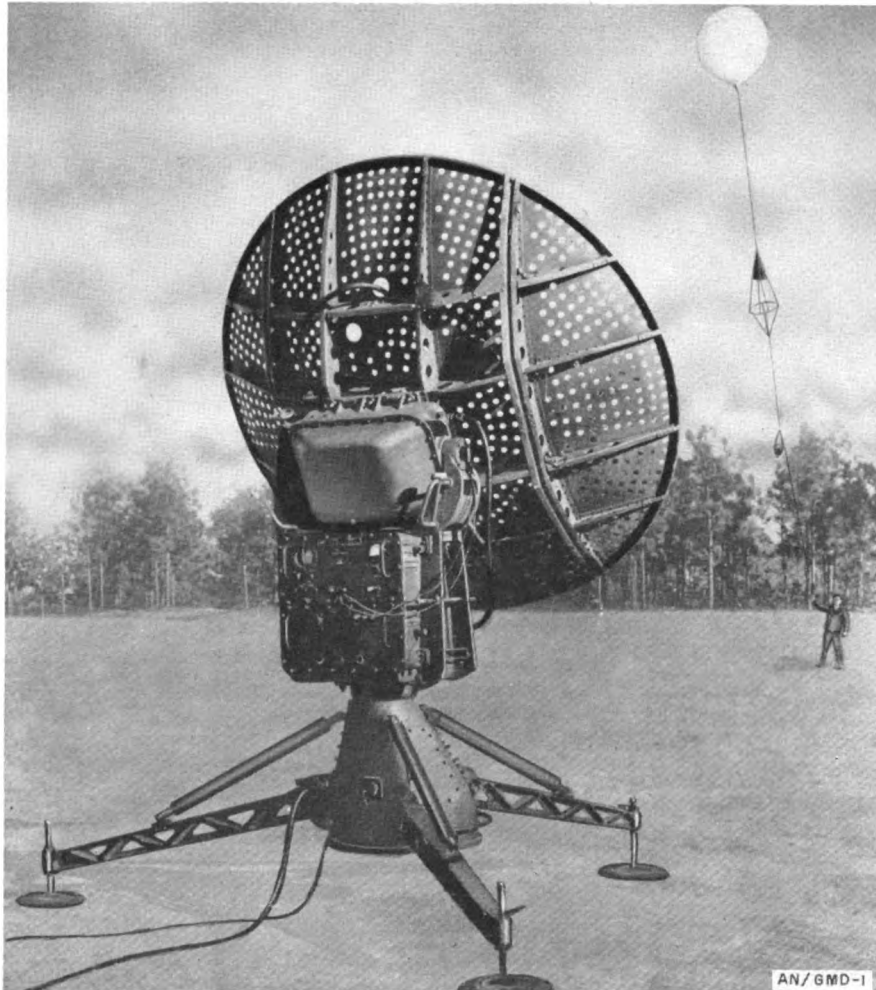


Figure 8. Rawin Set AN/GMD-1, outdoor, over-all view of main assembly.

Status: Standard. *Stock No.* 7A1332. *Reference:* TM 11-271.

Rawin Set AN/GMD-1 is a radio direction finder which is designed to track, automatically, a balloon-borne radiosonde to altitudes in excess of 100,000 feet, over horizontal distances up to 125 miles. The set indicates and records the azimuth and elevation angles of the radiosonde, and receives, amplifies, and passes to a recorder the radiosonde amplitude-modulated signals from which temperature, relative humidity, and atmospheric pressure are computed. Wind direction and speed are determined by plotting the azimuth and elevation angles with the altitude (computed from the temperature and pressure data). The equipment consists of a main assembly and control recorder; the main assembly is composed of a supporting pedestal, a radio receiver equipped with a servo system, an elevation unit assembly, an

antenna assembly, and an antenna control. Rawin Set AN/GMD-1 is part of a rawinsonde system which obtains meteorological information used to make weather forecasts and to make corrections for the effects of atmospheric conditions on the trajectory of projectiles.

TECHNICAL CHARACTERISTICS

EFFECTIVE ALTITUDE: 100,000 ft (when used with Radiosonde AN/AMT-4).

EFFECTIVE HORIZONTAL DISTANCE: 125 mi.

TYPES OF SIGNALS RECEIVED: A-m and f-m.

FREQUENCY RANGE: 1,660 to 1,700 mc.

POWER INPUT: 115-v, 60-cycle ac; 1,500 w.

POWER SUPPLY: Provides 105-v dc, regulated; 6.3-v ac; and 180-v dc for use in various systems.

ANTENNA SYSTEM

TYPE OF ANTENNA: Vertical dipole; 2 sections, each $\frac{1}{4}$ wavelength long at 1,680 mc.

TYPE OF REFLECTOR: Parabolic.

TYPE OF SCANNING: Conical.

SPINNER MOTOR: Induction, capacitor start and run; 115-v, 60-cyc ac; 1,750 rpm.

SPINNER GENERATOR: 1,750 rpm; 15-v, 30-cyc ac; 2 phase, 2 wire, self-excited.

RECEIVING SYSTEM

TYPE OF RECEIVER: Superheterodyne.

NORMAL FREQUENCY: 1,680 mc.

INTERMEDIATE FREQUENCY: 30 mc.

FREQUENCY CONTROL: Automatic.

INPUT IMPEDANCE (receiver): 50 ohms.

C-R OSCILLOSCOPE TUBE: 3JP1.

PRESENTATION (selected by oscilloscope setting):
a Error signal; b Modulated rf; c Relative position of transmitter.

ANTENNA POSITIONING SYSTEM

TRACKING: 3 types; automatic, local manual, remote manual.

DRIVE MOTORS (elevation and azimuth); 60-v dc, 1.4 amp split stator, reversible; 1/20 hp at 5,000 rpm.

TACHOMETER GENERATORS (elevation and azimuth): 2.1-v dc at 100 rpm; self-excited, permanent magnet.

POSITION INDICATION AND RECORDING SYSTEM

SYNCHRO GENERATORS (elevation and azimuth): Type IV single-phase, self-synchronous; energizing voltage 115-v, 60-cyc ac.

SYNCHRO MOTORS (elevation and azimuth): Type V single-phase, self-synchronous; energizing voltage 115-v, 60-cyc ac.

TYPE OF RECORDING: Time, elevation angles, and azimuth angles printed on tape.

PRINTER MOTOR: 115-v, 60-cyc ac, synchronous type; capacitor run; single phase.

USED WITH: Radiosonde AN/AMT-4; Radiosonde Receiver AN/FMQ-1.

PRINCIPAL COMPONENTS

Pedestal AB-159/GMD-1

Antenna Assembly AS-462/GMD-1

Antenna Control C-578/GMD-1

Receiver R-301/GMD-1

Control Recorder CM-577/GMD-1

WEIGHTS AND VOLUMES

	<i>Unpacked</i>	<i>Export packed</i>
Total weight (lb).....	2,140	3,654
Total volume (cu ft).....	155.83 (approx)	242.5
Ship tons.....		6.6

Note. For export shipment, Rawin Set AN/GMD-1 is packed in 11 wooden crates. For domestic shipment, the outrigger assembly, the antenna reflector sections, and the two cable reels are shipped unpacked; the other components are shipped in seven transit cases. Usually, all components are arranged and transported in a 1-ton trailer.

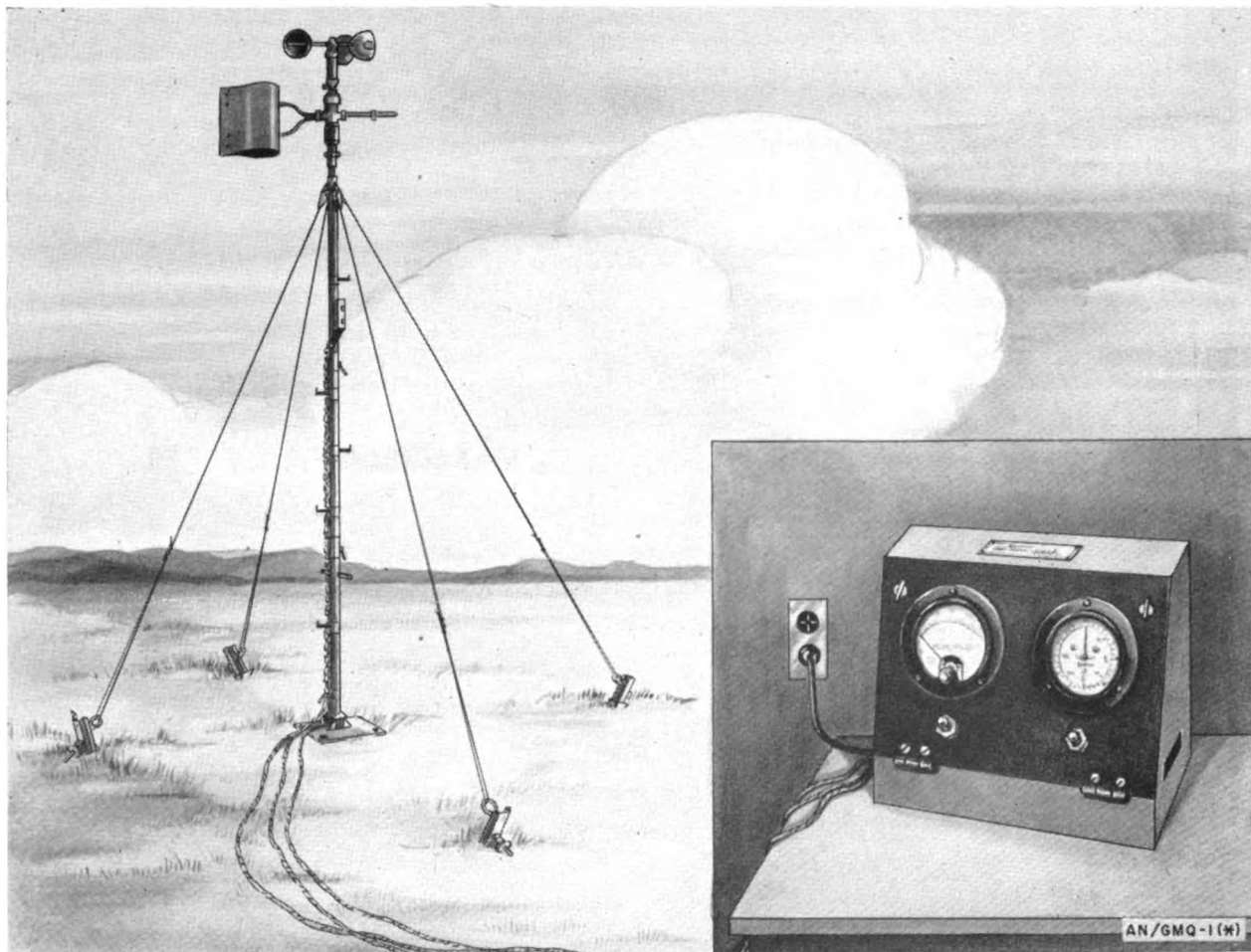


Figure 9. Wind Equipment AN/GMQ-1A in use.

Status: Standard. *Stock No.:* 7A3400-1. *Reference:* TM 11-429.

Wind Equipment AN/GMQ-1(*) represents Wind Equipments AN/GMQ-1 and AN/GMQ-1A. Wind Equipment AN/GMQ-1(*) consists of a support, a wind transmitter (anemometer and wind vane) for measuring, and a wind panel for indicating the instantaneous speed and direction of surface winds. Carrying cases are provided for transporting the equipment. The support may be installed permanently on the roof of a building or semipermanently anywhere on the ground. The wind panel is installed indoors wherever it is convenient. Wind Equipment AN/GMQ-1A has a transmitter made from improved corrosion-resistant material and includes a rectifier power unit and connecting cord which permit operation of the equipment from a 115-volt, 60-cycle power source.

TECHNICAL CHARACTERISTICS

WIND SPEED SYSTEM

ANEMOMETER: Cup-rotor, a-c generator type.

RANGE: 2 to 150 mph.

POWER REQUIREMENT: None.

WIND DIRECTION SYSTEM

WIND VANE ASSEMBLY: Vane shell, vane tail, and counterbalance; includes a rheostat unit.

POWER REQUIREMENT: 4 Batteries BA-30, connected in series-parallel, furnishing 3-v dc; or Rectifier Power Unit PP-196/GMQ-1 (supplied with AN/GMQ-1A only, but when available may be used with AN/GMQ-1) furnishing 24-v dc when connected to a 115-v a-c source.

WIND INDICATING SYSTEM

WIND SPEED METER: Rectifier-type, a-c milliammeter; 2 scales: lower from 0 to 30 mph, graduated in 1 mph intervals; upper from 0 to 150 mph, graduated in 5 mph intervals.

Accuracy: Within 1½ mph up to 30 mph. Within 3 mph from 30 to 75 mph. Within 4 percent of scale reading from 75 to 150 mph.

WIND DIRECTION METER: Low-voltage dc, self-synchronous repeater; scale graduated in 10° intervals, cardinal and intercardinal points designated by letters.

Accuracy: Within 3° at any point of the compass.

SUPPORT: 15-ft, sectional steel mast; includes accessories required for erection.

PRINCIPAL COMPONENTS

- Wind Transmitter ML-203-B
- Wind Panel ML-204-B
- Rectifier Power Unit PP-196/GMQ-1 (AN/GMQ-1A only)
- Cord CX-891/GMQ-1 (AN/GMQ-1A only)
- Support ML-206-A
- Carrying Case ML-207-B
- Carrying Case ML-208-A

WEIGHT AND VOLUME

Total weight, crated (lb)270
Total volume, crated (cu ft).....10

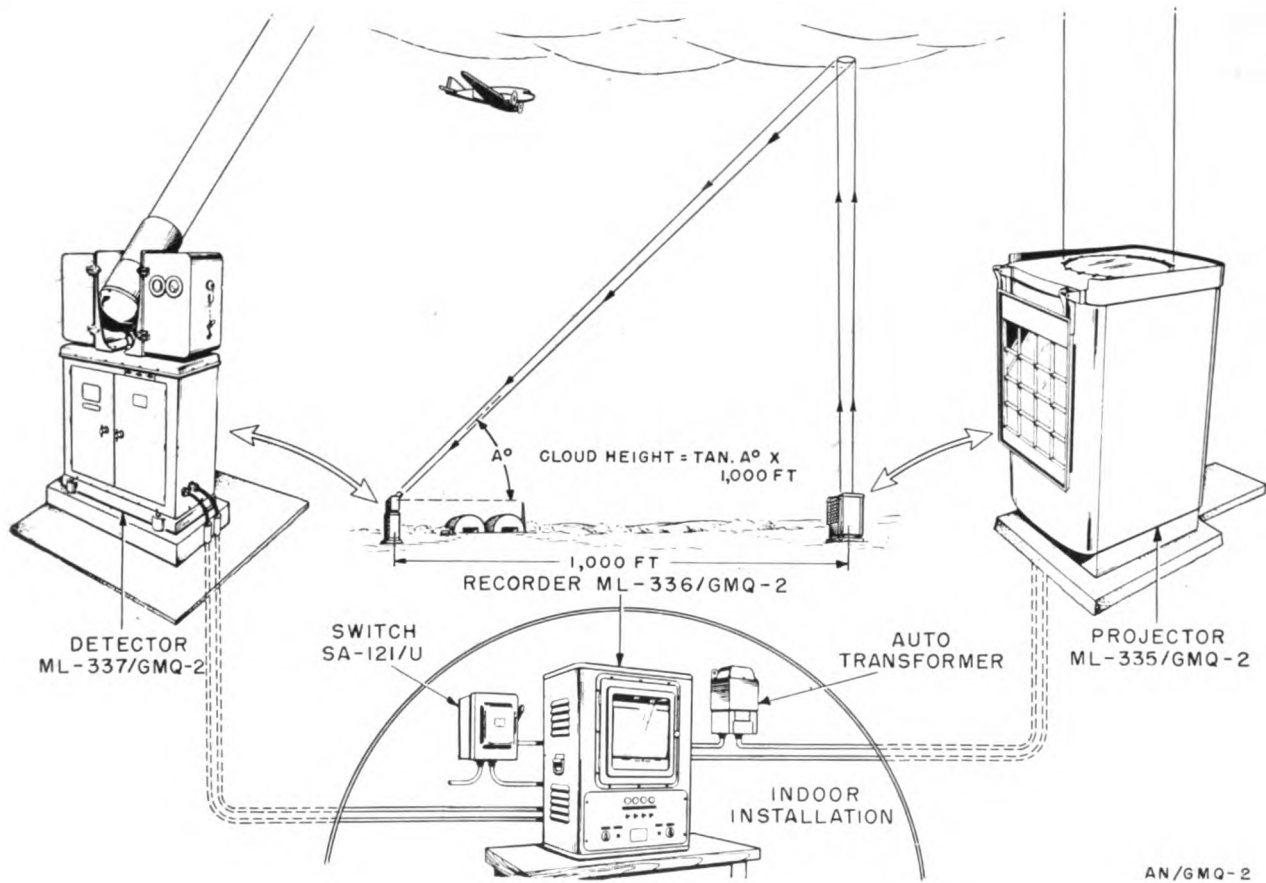


Figure 10. Ceilometer Set AN/GMQ-2, schematic arrangement.

Status: Standard. Stock No.: 7A490-2. Reference: TM 11-2419.

Ceilometer Set AN/GMQ-2 produces, automatically, an accurate record, continuous day and night, of cloud height data. It consists of electric, electronic, and electromechanical devices which measure and permanently record data from which may be calculated the height of a cloud above ground level. The equipment is designed for permanent installation and is used chiefly at air bases to ascertain ceilings.

TECHNICAL CHARACTERISTICS

PROJECTOR

SCANNING ANGLE: 0° to 90° (automatic or manual).
 BEAM CANDLEPOWER: 25,000,000.
 BEAM SPREAD: .8° x 4.8°.
 MODULATION FREQUENCY: 120 cps.
 PERCENT MODULATION: 90 percent.

MIRROR: Parabolic, 24-in. precision; 10-in. focal length.

LAMP: 900 w; GE Type B-H6 Mercury.

LAMP LIFE: 25 hr, average.

AIR COMPRESSOR RATING: 6.4 cu ft free air (sea level) at 17 lb gage pressure at 550 rpm.

MOTOR RATING: ¼ hp capacitor induction, 1,175 rpm, 115-v, 60-cyc, single-phase.

DETECTOR

SENSITIVITY (ratio of daylight intensity to reflected modulated light): 10⁵:1.

AMPLIFIER: Fixed, tuned to 120 cyc; bandwidth 85 to 165 cyc.

AMPLIFIER VOLTAGE GAIN: 2 X 10⁵.

OUTPUT: .50 ua and/or 10 mw at 120 cyc over 100-ohm line.

SCANNING RATE: 1 cycle each 12 minutes.

RECORDER

SIGNAL RECORDER: Ink mechanism.

ANGLE OF INCLINATION RECORDER: Inkless marking mechanism.

CHART SPEED: 3, 6, or 12 in. per hr (regulated by selected gear train).

SWITCH

TYPE: Knife-blade; two-pole, single-throw.

LOAD CIRCUITS: 2; one, fused at 60 amp, supplies projector; the other, fused at 10 amp, supplies detector and recorder.

POWER CHARACTERISTICS

SUPPLY REQUIRED: 115-v, 60-cyc, single-phase ac. (All major units must operate from same phase.)

MAXIMUM STARTING CURRENT: 52 amp.

NORMAL OPERATING CURRENT: 20.5 amp.

DETECTOR HEATER CURRENT: 2.6 amp.

POWER FACTOR (normal operation): 87 percent.

PRINCIPAL COMPONENTS

Name	Dimensions (in., unpacked)
Projector ML-335/GMQ-2	63 x 35 x 47.
Detector ML-336/GMQ-2	29 x 16 x 19½.
Recorder ML-337/GMQ-2	64 x 19 x 39.
Switch SA-121/U	15⅝ x 13⅞ x 7⅛.
Test Set TS-555/GMQ-2.	

WEIGHTS AND VOLUMES

	Unpacked	Domestic packed	Export packed
Total weight (lb)	3,490	4,430	5,610
Total volume (cu ft)	125	220	291
Ship tons			7.27

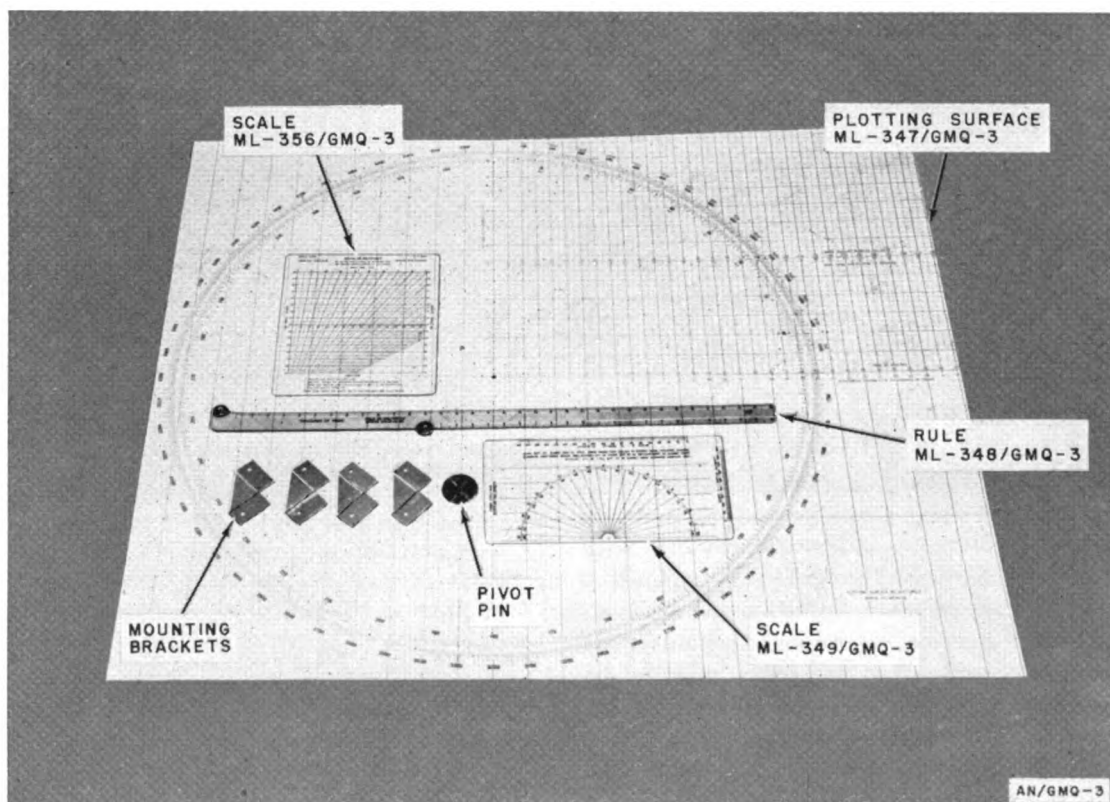


Figure 11. Plotting Set AN/GMQ-3. components.

Status: Standard. *Stock No.:* 7A1283-3. *Reference:* TM 11-2418.

Plotting Set AN/GMQ-3 is used to compute graphically and to plot to scale, from data obtained from meteorological balloon soundings, speed and direction of winds aloft with reference to distance, time, and altitude. The equipment consists of a plotting chart and a variety of scales and rules. It may be used on a table or similar flat surface, or may be mounted on Plotting Board ML-122.

PRINCIPAL COMPONENTS

Plotting Surface ML-347/GMQ-3
 Rule ML-348/GMQ-3
 Scale ML-349/GMQ-3
 Scale ML-356/GMQ-3

WEIGHTS AND VOLUME

	Unpacked	Export packed
Total weight (lb)	1.56	2.5
Total volume (cu ft)		.15

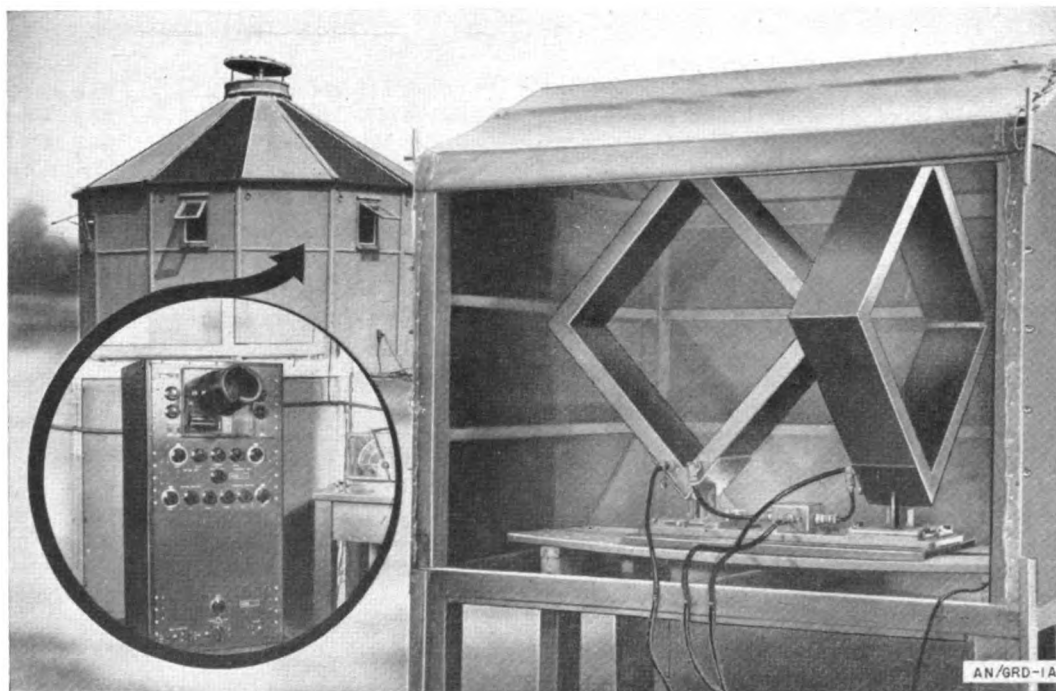


Figure 12. Static Direction Finder AN/GRD-1A, typical installation.

Status: Standard. Stock No.: 7A856-1A. Reference: TM 11-2693.

Static Direction Finder AN/GRD-1A is used to detect and locate static discharges which occur in the atmosphere. The equipment consists of a loop antenna system, an amplification system, a cathode-ray oscilloscope indicator provided with an azimuth scale, and the necessary operating accessories. Two or more simultaneous readings are made with identical equipments separated by several hundred miles and are communicated by radio to a central plotting station where the location of the discharge is determined by triangulation. Plotting Equipment PT-203/GRD-1 is used with Static Direction Finders AN/GRD-1A for plotting the azimuths determined by the direction-finding equipment. Camera PH-557/TFH, Developer PH-559/TFQ, and Viewer PH-558/TFP are used to prepare and observe photographic records of the traces on the oscilloscope screen. These equipments are described in TM 11-487F.

TECHNICAL CHARACTERISTICS

FREQUENCY RANGE: 8 to 12 kc.
 OPERATING RANGE: 2,000 mi.
 NUMBER OF TUBES: 30.
 ANTENNAS: 2, loop type.
 POWER REQUIREMENT: 115-v, 50/60-eyc ac.
 CURRENT CONSUMPTION: 4 amp.

PRINCIPAL COMPONENTS

Name	Over-all dimensions (in.)		
	Length	Height	Depth
Cabinet Assembly OA-16/GRD-1A.	20 $\frac{7}{8}$	41 $\frac{13}{16}$	16 $\frac{59}{64}$
Indicator ID-159/GRD-1A.			
Amplifier AM-107/GRD-1A.			
Rectifier-Oscillator PP-179/GRD-1A.			
Loop Antenna AT-114/GRD-1A (Serial A).	50 $\frac{1}{4}$	54 $\frac{1}{2}$	11
Loop Antenna AT-114/GRD-1A (Serial B).	50 $\frac{1}{4}$	54 $\frac{1}{2}$	11
Mounting MT-436/GRD-1A	48 $\frac{5}{8}$	6 $\frac{1}{16}$	12
Calibrator TS-410/GRD-1A	10 $\frac{11}{16}$	8 $\frac{3}{8}$	9 $\frac{1}{8}$
Chest CY-424/GRD-1A	34 $\frac{3}{4}$	27 $\frac{1}{2}$	19 $\frac{1}{2}$

ASSOCIATED EQUIPMENT

(Used with, but not a part of, Static Direction Finder AN/GRD-1A.)

Timing Unit TD-8/GRD-1A
 Camera PH-557/TFH
 Developer PH-559/TFQ
 Viewer PH-558/TFP
 Plotting Equipment PT-203/GRD-1

WEIGHT AND VOLUME

	Export packed
Total weight (lb).....	1,400
Total volume (cu ft).....	72
Ship tons.....	1.8

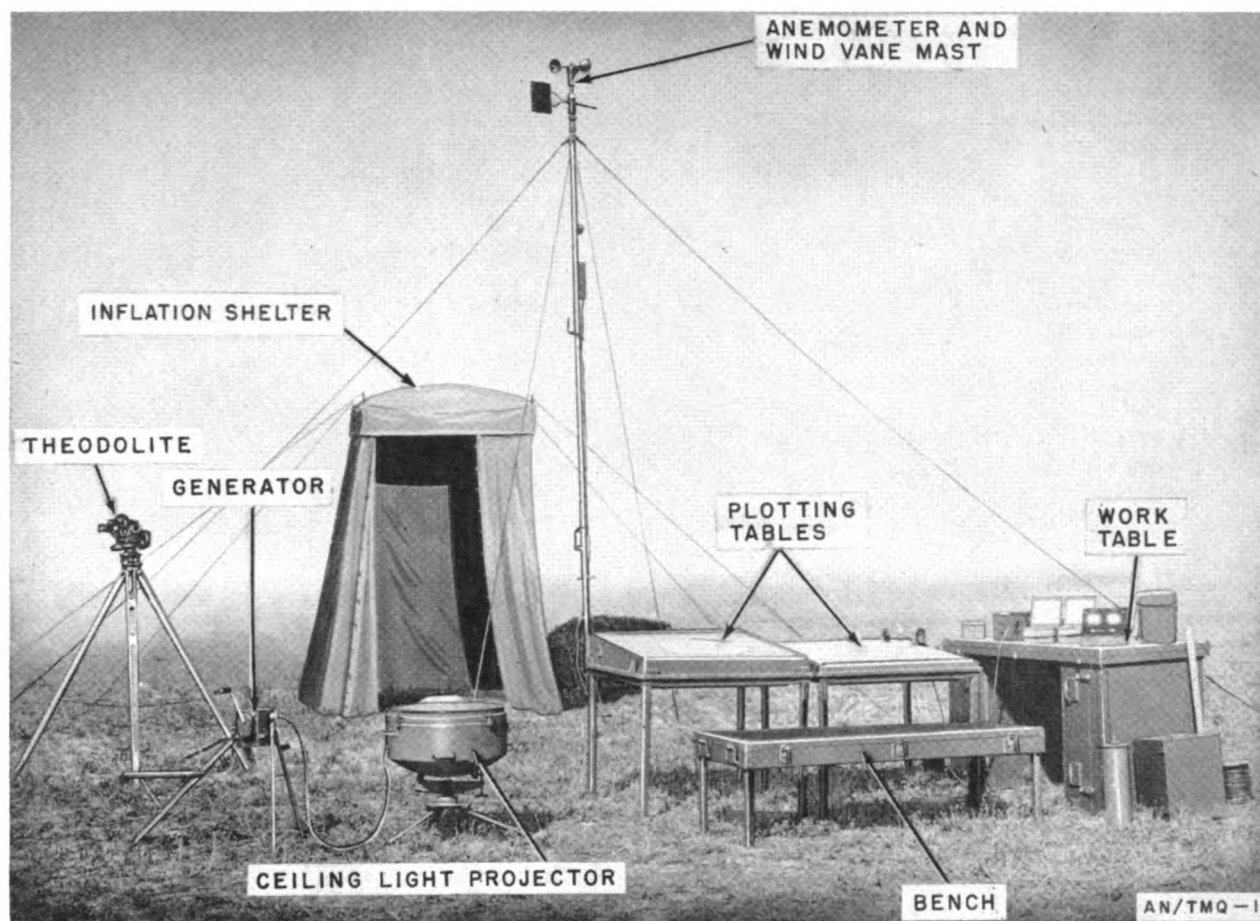


Figure 13. Meteorological Station AN/TMQ-1 set up for operation.

Status: Standard. *Stock No.:* 7A1124-1. *Reference:* TM 11-2406.

Meteorological Station AN/TMQ-1 is an easily transportable weather station for temporary use in tactical operations. It includes equipment for obtaining and evaluating a wide variety of meteorological data. The major part of the components of the station is packed in six carrying cases which can be assembled into furniture. With the addition of communication facilities, supplies, and local weather maps, the station may be used to plot weather maps and make weather forecasts.

TECHNICAL CHARACTERISTICS

DATA OBTAINABLE: Surface wind direction and speed.
Winds aloft direction and speed.
Surface temperature, atmospheric pressure, and relative humidity.
Cloud height (ceiling).
Amount of precipitation.

SHELTER: None, or any available tent, building, or cargo truck.

PRINCIPAL COMPONENTS

Name	Dimensions (in.)	Weights (lb)	Volumes (cu ft)
Case CY-178/TMQ-1.....	37 x 33 x 13.	160	9.2
1 Plotting Board ML-122.			
1 Rule ML-126.			
1 Scale ML-177.			
1 Slide Rule ML-59.			
Charts, forms, and stationery.			
Case CY-179/TMQ-1.....	31 x 24 x 12.	130	5.2
2 Barometer ML-102.			
1 Gauge ML-217 and Support ML-209.			
2 Psychrometer ML-24.			
1 Telephone EE-8 (component of timing and Telephone Set ML-110).			
1 Wind Transmitter ML-203.			
1 Wind Panel ML-204.			
8 Battery BA-30.			
1 Tool Equipment.			
1 TE-33.			

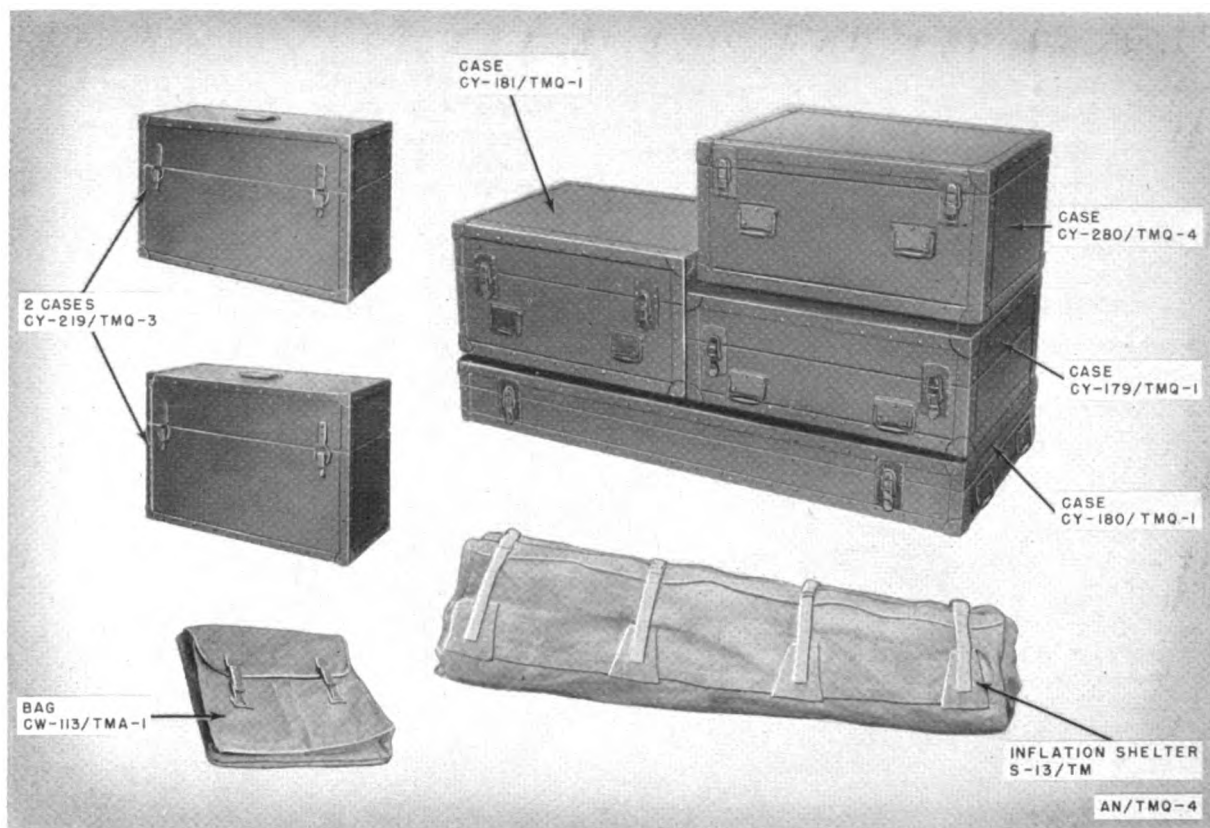


Figure 15. Meteorological Station Set AN/TMQ-4, major components packed for export.

Status: Standard. *Stock No.:* 7A1124-2 (general use), 7A1124-2.1 (tropical use). *Reference:* TM 11-2426.

Meteorological Station Set AN/TMQ-4 is an assemblage of equipment for measuring and computing meteorological data used by ground artillery units to make corrections for the effect of atmospheric conditions on the trajectory of projectiles. The set, designed for rapid installation and removal, can be set up in the open or in any available shelter; three of the six wooden carrying cases can be assembled into furniture. Accessories, equipment, and supplies (for use with radiosonde receiving and recording equipment), and pilot balloon tracking equipment are included.

TECHNICAL CHARACTERISTICS

DATA OBTAINABLE: Surface wind direction and speed.
Winds aloft direction and speed.
Surface temperature, atmospheric pressure, and relative humidity.
Temperature, pressure, and relative humidity of the upper atmosphere.

ASSOCIATED EQUIPMENT: Radiosonde Receptor AN/FMQ-1.
Radio Set SCR-658.
Power Unit PE-75.

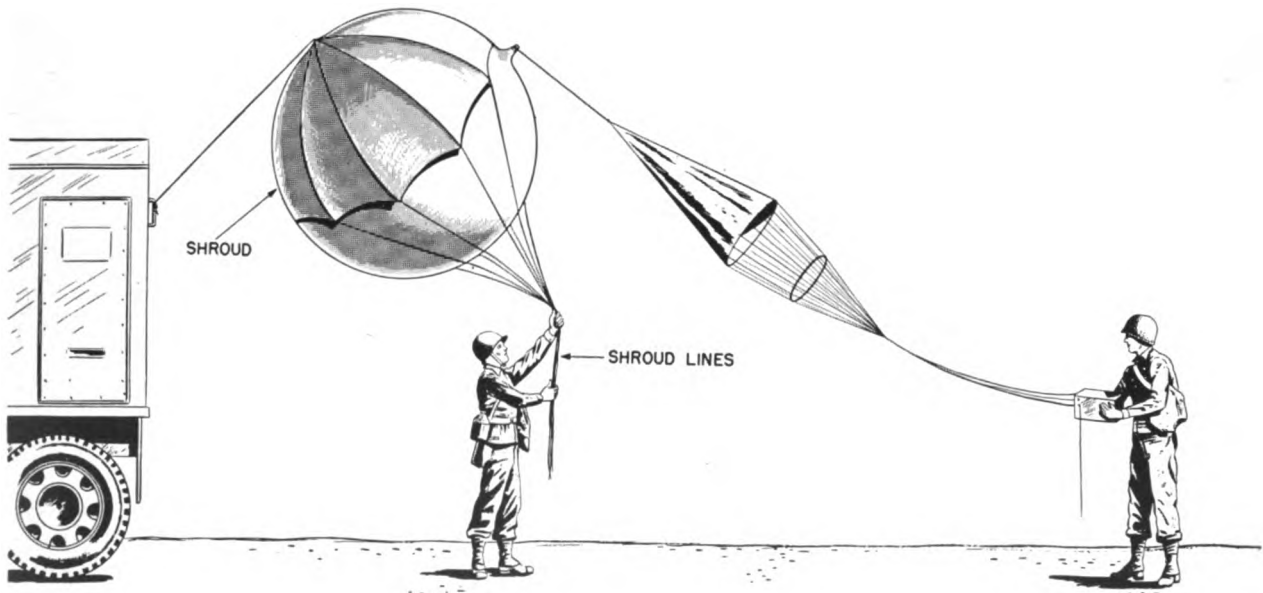
PRINCIPAL COMPONENTS

Name	Dimensions (in.)	Weights (lb)	Volume (cu ft)
Case CY-179/TMQ-1..... Barometer ML-102. Wind Panel ML-204. Wind Transmitter ML-203. Psychrometer ML-24. Psychrometer ML-224. Telephone EE-8. Miscellaneous tools and accessories.	32 x 24 x 12	130	5.2
Case CY-180/TMQ-1..... Support ML-206. Tripod ML-78.	63 x 26 x 7	215	6.65
Case CY-181/TMQ-1..... Theodolite ML-247. Timing and Telephone Set ML-110. Miscellaneous pibal equipment and accessories.	32 x 24 x 15	145	6.66

MC-573

Name	Dimensions (in.)	Weights (lb)	Volumes (cu ft)
Case CY-280/TMQ-4----- Battery Charger PE-163 and accessories. Test Equipment TS-30/FMQ-1. Ballon Shroud MC-573. Miscellaneous accessories.	32 x 21 x 15	150	5.9
Case CY-219/TMQ-3----- Hydrogen Generator set AN/TMQ-3 (2 furnished).	27 x 12 x 18	45	3.5

Name	Dimensions (in.)	Weights (lb)	Volumes (cu ft)
Bag CW-113/TMA-1----- Plotting set AN/TMA-1. Computing and plotting equipment and supplies.	21 x 21 x 5	15	1.3
Inflation Shelter S-13/TM Expendable items in quantity. Radiosonde AN/AMT-2. Battery Pack BB-208/AMT. Calcium Hydride Charges ML-340/TM, ML-304A/TM, ML-305/TM, and ML-305A/TM. Balloons ML-50, ML-51, ML-54, ML-131, ML-159, ML-160, and ML-161. Balloon accessories.	70 x 22 x 12	170	10.7



MC-573

Figure 16. Balloon Shroud MC-573 in use.

Status: Standard. Stock No. 7A202-573. Reference: TM 11-2426.

Balloon Shroud MC-573 is a hemispherical, nylon canopy which is used when the balloon release point is some distance from the inflation shelter, to facilitate handling radiosonde balloons and to protect them from injury during high or gusty winds. The shroud is 6 feet, 6 inches in

diameter and has 11 ropes. It is used with 350-, 700-, and 1200-gram sounding balloons.

WEIGHT AND VOLUME

	<i>Export packed</i>
Total weight (lb).....	8.75
Total volume (cu ft).....	.25

Note. Balloon Shrouds MC-573 are packed eight to a container.

Status: Standard. Stock No.: 7A302. Reference: TM 11-428.

Barometer ML-2-(*) represents Barometers ML-2 through ML-2-G. Barometer ML-2-(*) is a Fortin-type (adjustable cistern) mercurial barometer intended for permanent installation indoors. All models (except the oldest, which has an inch scale only) have both an inch scale and a millibar scale; all are provided with vernier scales and thermometers. Barometer ML-2-(*) is usually installed in Case ML-48 which is designed to provide a safe and convenient means of suspending the instrument and steadying it properly in a vertical position. The case is not furnished with the equipment.

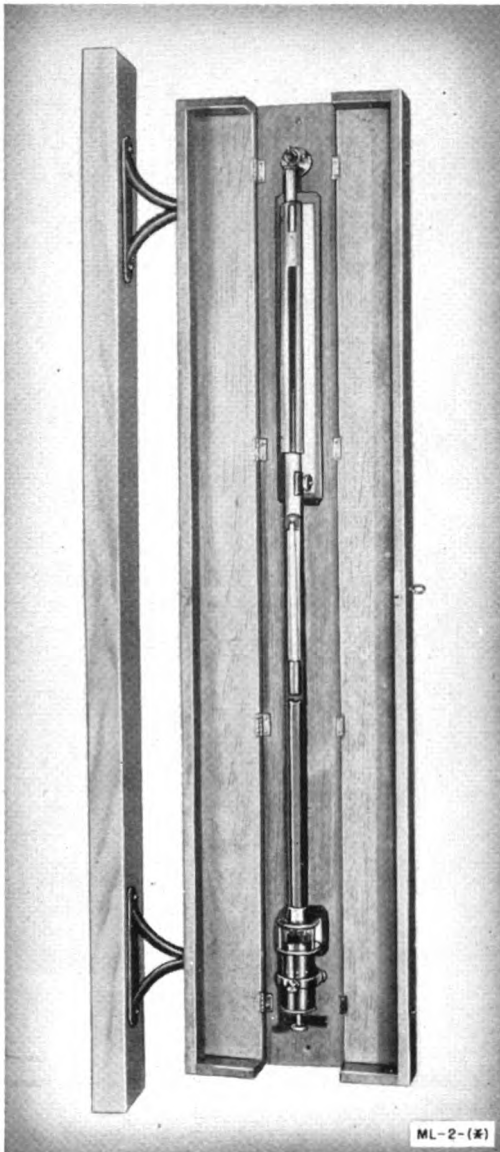


Figure 17. Barometer ML-2-(*) installed in Case ML-48.

TECHNICAL CHARACTERISTICS

BAROMETER

RANGE: From 22 to 32 inches of mercury; from 810 to 1,110 millibars (ranges differ slightly with various models).

INCH SCALE: Graduated in $\frac{1}{20}$ of an inch; each integral inch is numbered.

MILLIBAR SCALE: Graduated in whole millibars; 100-millibar intervals have complete numerical designation, intervening 10-millibar intervals numbered in units of 10.

INCH VERNIER: Permits readings to .002 ($\frac{1}{500}$) inch.

MILLIBAR VERNIER: Permits readings to .05 ($\frac{1}{20}$) millibar.

THERMOMETER

FAHRENHEIT RANGE: -10° to $+100^{\circ}$, graduated in whole degrees.

CENTIGRADE RANGE: -23° to $+38^{\circ}$, graduated in $\frac{1}{2}$ degrees.

WEIGHT AND VOLUME

	<i>Export packed</i>
Total weight (lb).....	20
Total volume (cu ft).....	1.0

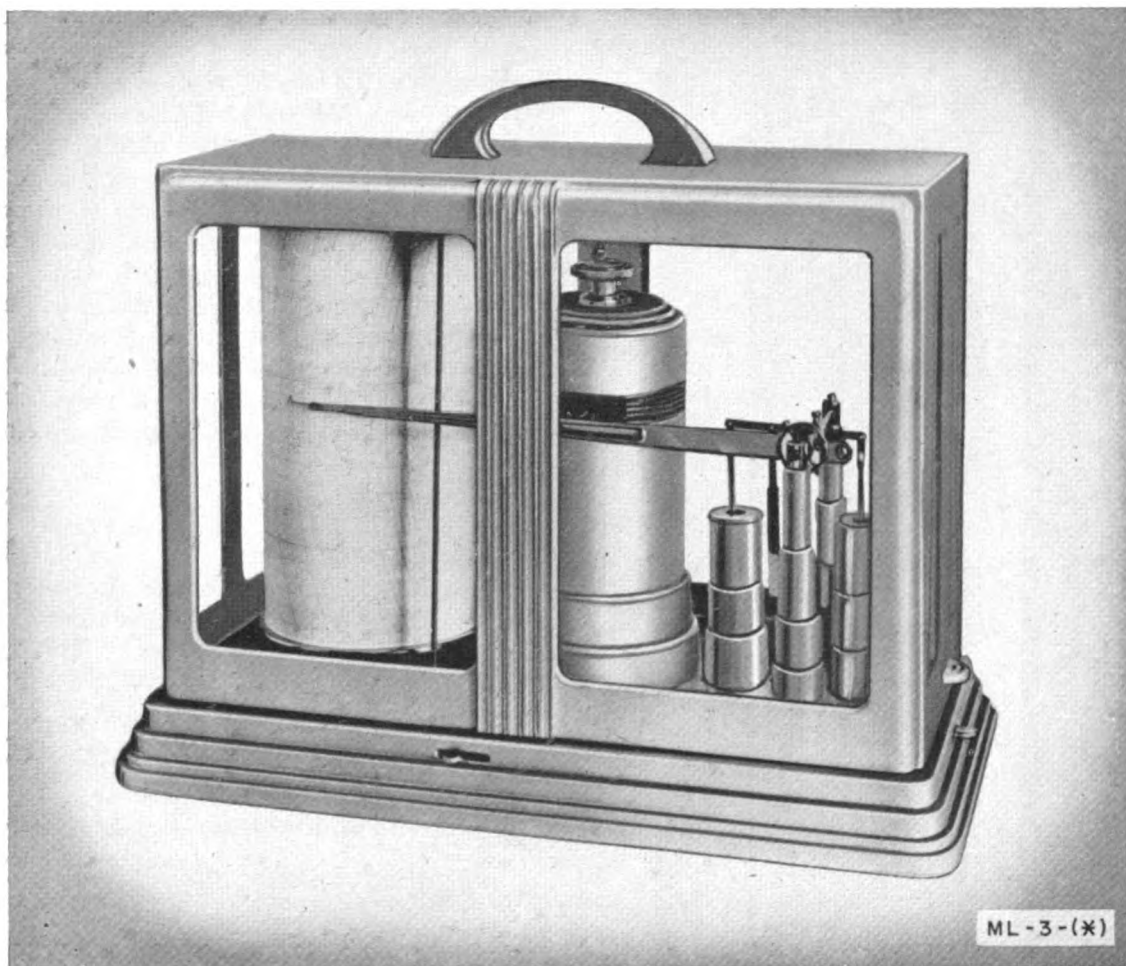


Figure 18. Barograph ML-3-(*).

Status: Standard. *Stock No.:* 7A203A. *Reference:* TM 11-425.

Barograph ML-3-(*) represents Barographs ML-3-A through -D. Barograph ML-3-(*) is a portable, precision instrument which measures and records atmospheric pressure. It makes a continuous, visible record for a 4-day period on a single chart. In locations where physical vibration is excessive, Mounting ML-178 may be used with the barograph; this mounting is not furnished with the equipment.

TECHNICAL CHARACTERISTICS

TYPE OF BAROMETER: Aneroid.

PRESSURE-SENSITIVE UNIT: Two bellows of thin, hard brass.

RANGE: 2.5 in. of mercury; adjustable between 23.5 and 31 in. of mercury.

RECORDING SYSTEM: Pen, actuated through a system of levers, on a paper chart mounted on a rotating cylinder.

CYLINDER DRIVE: Clock ML-145, 8-day type, constant speed; produces 1 revolution of cylinder in approximately 4½ days.

CHART: Barograph Chart MI-236 (Sig C stock No. 7A5292-236).

WEIGHT AND VOLUME

Total weight (lb).	29	<i>Export packed</i>
Total volume (cu ft).	1.52	

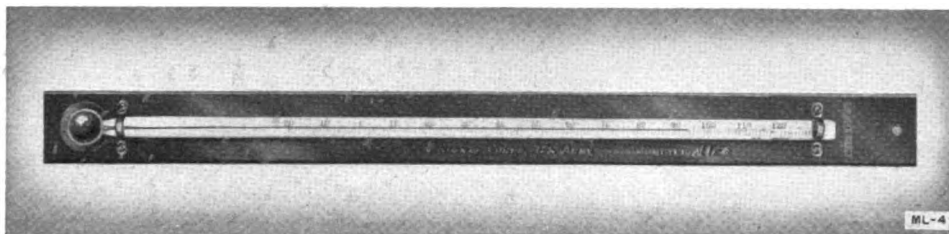


Figure 19. Thermometer ML-4.

Status: Standard. *Stock No.:* 7A1804.1 (general use), 7A1804.2 (tropical use), 7A1804.3 (Arctic use). *Reference:* TM 11-2417.

Thermometer ML-4 is a mercury-in-glass thermometer which registers the highest (maximum) temperature to which it has been exposed after being set. It is graduated in degrees Fahrenheit. Thermometer ML-4 is available in three temperature ranges: general, tropical, and arctic. The thermometer may be mounted on Support ML-54, a special bracket designed to hold Thermometers ML-4 and ML-5; the support is not furnished with the equipment.

TECHNICAL CHARACTERISTICS

TYPE: Maximum registering.

THERMAL ELEMENT: Mercury.

RANGE (approx degrees Fahrenheit):

GENERAL: -10 to +125.

TROPICAL: +10 to +145.

ARCTIC: -35 to +125.

ACCURACY (° F.): ±0.8°, below 0°.

±0.6°, from 0° to +32°.

±4° above +32°.

GRADUATIONS: Intervals of 1° F., etched on glass stem; each multiple of 10° is numbered.

MOUNTING: Metal frame.

OPERATING POSITION: Bulb approximately 5° above the horizontal.

WEIGHT AND VOLUME

Total weight (lb.)	.....	<i>Export packed</i> . 57
Total volume (cu ft)	.....	. 05

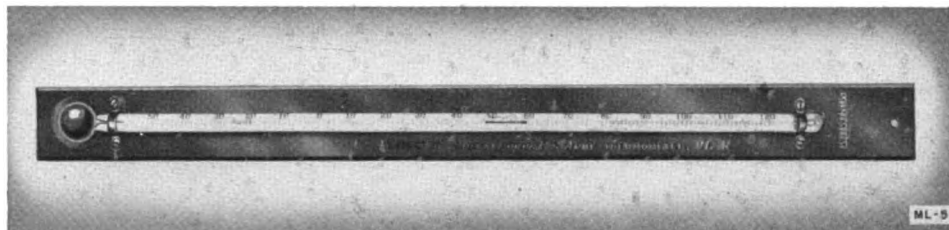


Figure 20. Thermometer ML-5.

Status: Standard. *Stock No.:* 7A1805.1 (general use), 7A1805.2 (tropical use), 7A1805.3 (Arctic use). *Reference:* TM 11-2417.

Thermometer ML-5 is an alcohol-in-glass thermometer which registers the lowest (minimum) temperature to which it has been exposed after being set. It is graduated in degrees Fahrenheit. Thermometer ML-5 is available in three temperature ranges: general, tropical, and Arctic. The thermometer may be mounted on Support ML-54, a special bracket designed to hold Thermometers ML-4 and ML-5; the support is not furnished with the equipment.

TECHNICAL CHARACTERISTICS

TYPE: Minimum registering.

THERMAL ELEMENT: Alcohol.

RANGE (approx degrees Fahrenheit):

GENERAL: -60° to +100°.

TROPICAL: -40° to +120°.

ARCTIC: -90° to +80°.

ACCURACY (° F.): ±1.8°, below -50°.

±1.6°, from -50° to -30°.

±1.2°, from -30° to 0°.

±.8°, from 0° to +32°.

±.4°, above +32°.

GRADUATIONS: Intervals of 1° F., etched on glass stem; each multiple of 10° is numbered.

MOUNTING: Metal frame.

OPERATING POSITION: Bulb slightly below horizontal.

WEIGHT AND VOLUME

Total weight (lb.)	.....	<i>Export packed</i> . 3
Total volume (cu ft)	.....	. 12

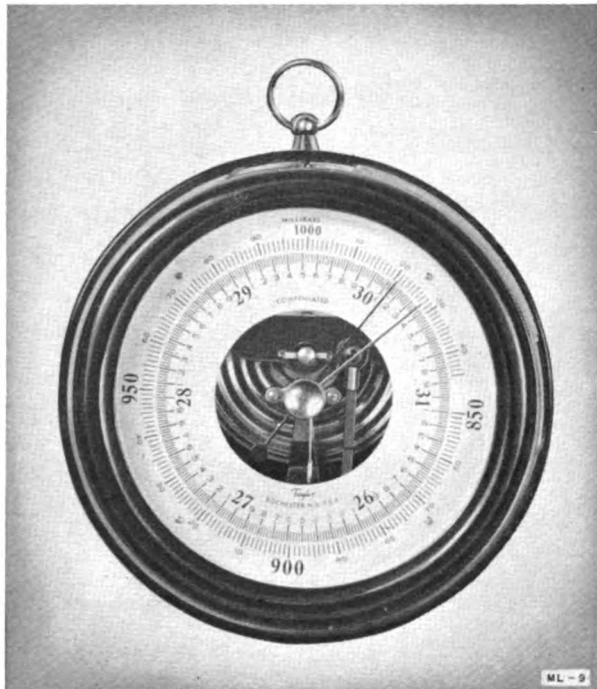


Figure 21. Barometer ML-9.

Status: Limited/Std. Stock No.: 7A309. Reference: TM 3-240.

Barometer ML-9 is a portable, rugged, easy-to-read, aneroid-type barometer which is used under service conditions, and when extreme accuracy is not essential, to determine changes in atmospheric pressure over several hour periods. It indicates atmospheric pressure in inches of mercury and in millibars.

TECHNICAL CHARACTERISTICS

- TYPE: Aneroid.
- PRESSURE-SENSITIVE ELEMENT: Partially evacuated, metal cell.
- INDICATOR: Pointer actuated through a lever system.
- RANGE: 25 to 31 inches of mercury; 850 to 1,045 millibars.
- INCH SCALE: Graduated in $\frac{1}{50}$ of an inch; integral inches and tenths are numbered.
- MILLIBAR SCALE: Graduated in whole millibars; numbered every 10 millibars.

WEIGHT AND VOLUME

Total weight (lb).....	Export packed 3.9
Total volume (cu ft).....	.2

ML-16

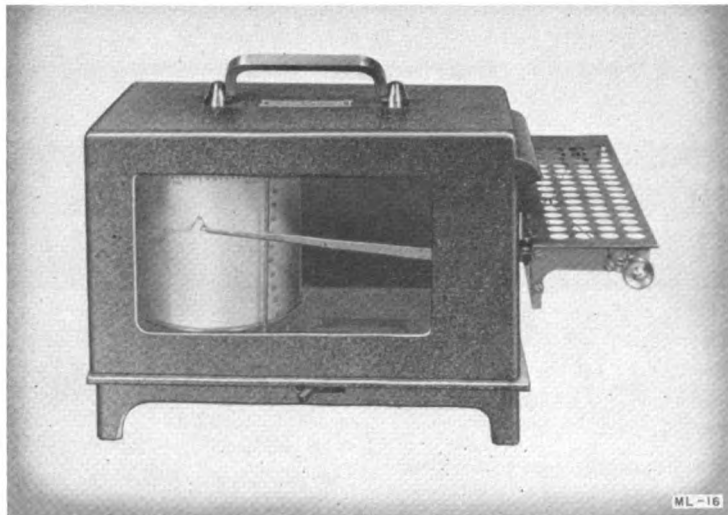


Figure 22. Hygrograph ML-16.

Status: Limited/Std. Stock No.: 7A1016B. Reference: TM 1-235.

Hygrograph ML-16 is a self-contained, portable instrument which measures relative humidity and produces on a chart a continuous, visible record of the measurements. The record may be made continuous over a 1-day or a 7-day period.

TECHNICAL CHARACTERISTICS

RANGE: 0 to 100 percent.

- ACTUATING ELEMENT: Strand of approximately 50 human hairs.
- RECORD: Continuous, 1 day or 7 days.
- RECORDER: Pen, actuated through a system of linkages.
- DRIVE: Clock ML-60-A, with daily and weekly gears and pinions.
- CHART: SC Form 130.

WEIGHT AND VOLUME

Total weight (lb).....	Export packed 17
Total volume (cu ft).....	1.65

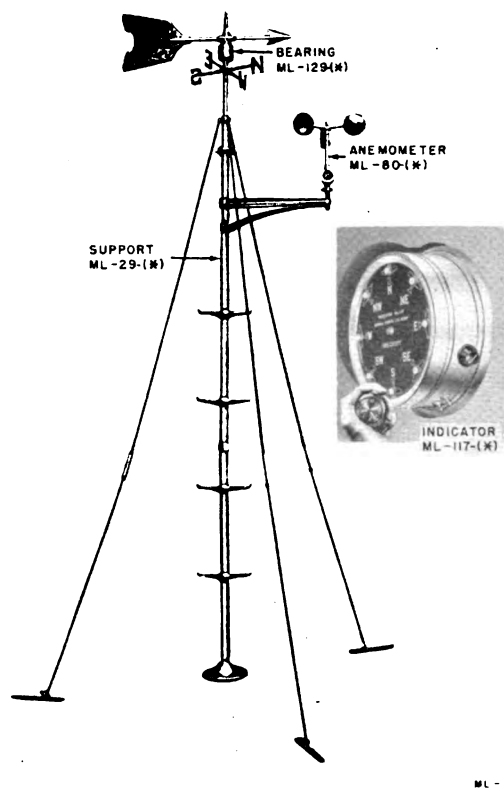


Figure 23. Support ML-29-(*), with Anemometer ML-80.

Status: Limited/Std. Stock No.: 7A1729 (all models except ML-29-C), 7A1729C (ML-29-C). Reference: TM 11-424.

Support ML-29-(*), represents Supports ML-29 through ML-29-E. The models are essentially alike, but have minor differences in construction and technical characteristics. Support ML-29-(*), is a wind-instrument support designed for installation on a roof or elevated platform. It is provided with guys and steps, a wind vane and bearing, four fixed direction arms, and an extended arm and brace for the support of Anemometer ML-80. Most models have provisions for the use of a wind speed and direction indicator. Support ML-29-(*), Anemometer ML-80, and Indicator ML-117, comprise a complete system for determining surface wind direction and for measuring and indicating surface wind speed.

TECHNICAL CHARACTERISTICS

	ML-29	ML-29-A	ML-29-B	ML-29-C	ML-29-D	ML-29-E
HEIGHT (ft).....	7 or 12	12	12	12	12	12
BEARING.....	ML-129	ML-129-A	ML-129-B; ML-129-E.	ML-129-C	ML-129-D	ML-129-B; ML-129-E.
CONTACTS.....	None	4	8	12	8	8
NUMBER OF COM- PASS POINTS.....	None	8	8	16 and 8	8	8
ANEMOMETER.....	ML-80-(*)	ML-80-(*)	ML-80-(*)	ML-80; ML-80-B.	ML-80-A	ML-80; ML-80-B.
INDICATOR.....	None	None	ML-117-(*)	ML-117-(*)	ML-117-A	ML-117-(*)

PRINCIPAL COMPONENTS

- Mast
- Bearing ML-129 (see table above)
- Set of direction arms
- Wind vane

WEIGHTS AND VOLUMES

	Unpacked	Export packed
Total weight (lb).....	102	168
Total volume (cu ft).....	-----	15.5

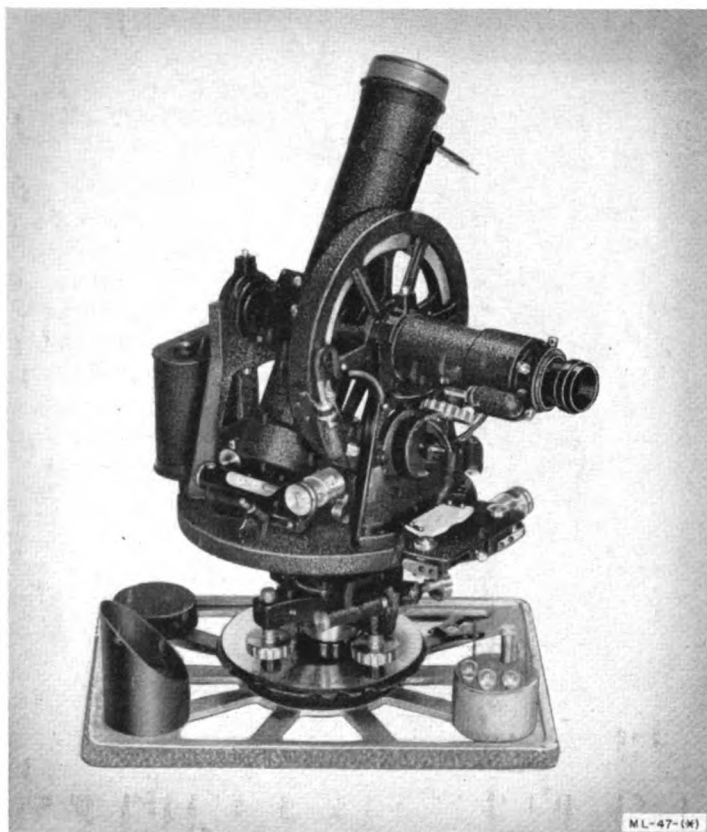


Figure 24. Theodolite ML-47-(C).

Status: Limited/Std. *Stock No.:* 7A1747C.
Reference: TM 11-423.

Theodolite ML-47-(*), represents Theodolites ML-47-C through -R. Theodolite ML-47-(*), is a portable, right-angle-telescope type surveying instrument. It is used to follow and measure the movement of a pilot balloon as it rises through the atmosphere and is carried horizontally by the air flow. Readings of the angle of elevation and the azimuth of the balloon are made at regular intervals to determine the speed and direction of the wind at various levels. Theodolite ML-47-(*), is usually mounted on Tripod ML-78-(*); for fixed installation, it may be mounted on Theodolite Mount ML-180. Compass ML-197 and Telescope ML-146 are attached to Theodolite ML-47-R; they may be fitted to any other model of Theodolite ML-47-(*), (Telescope ML-146 can be installed only by experienced instrument makers having suitable shop facilities).

Note. Theodolite ML-47-R is identical to Theodolite ML-247.

TECHNICAL CHARACTERISTICS

TELESCOPE

TYPE: Right-angle, with prism.
POWER: Approximately 20 diameters.
FIELD: Approximately 2°.
EYEPIECE: Inverting, adjustable, with cross hairs.
FOCUS: Adjustable.

SCALES

ELEVATION: Graduated in whole degrees, vernier reading to .1°.
AZIMUTH: Graduated in whole degrees, vernier reading to .1°; range, 360°.
SIGHTS: Fixed, for sighting vertical angles up to 45°; extension for sighting vertical angles up to 85°.
ILLUMINATION: 3 incandescence lamp assemblies; current supplied by 2 batteries BA-30.
ACCESSORY EQUIPMENT: Tripod ML-78.

Theodolite Mount ML-180.

Compass ML-197 (p/o ML-47-R).

Telescope ML-146 (p/o ML-47-R).

WEIGHTS AND VOLUMES

	Unpacked	Export packed
Total weight (lb).....	40	83
Total volume (cu ft).....	1.8	8.0

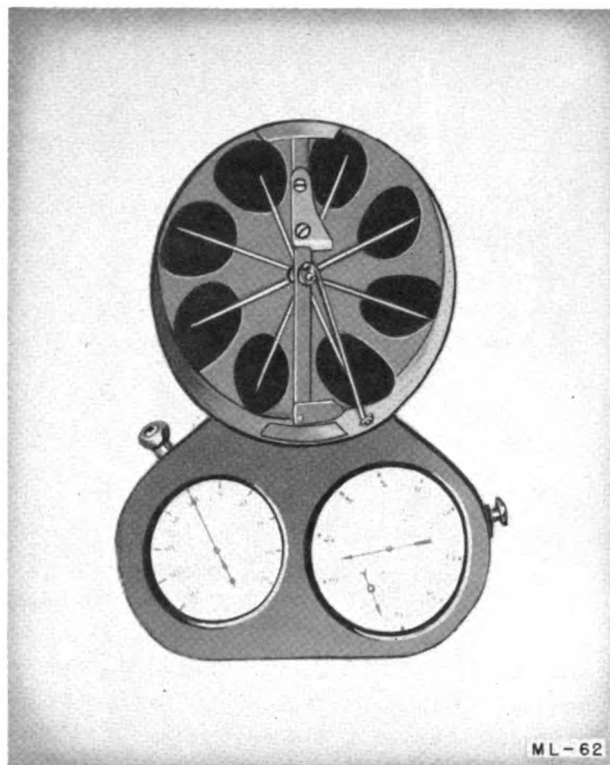


Figure 25. Anemometer ML-62.

Status: Standard. Stock No.: 7A62. Reference: TM 1-235.

Anemometer ML-62 is a hand-held instrument which is used to determine wind speed in areas where the installation of a permanent type of anemometer is impractical. A revolution counter indicates, in meters for the elapsed operating time, total wind movement, from which wind speed may be determined. A stop watch is built into the equipment.

WEIGHT AND VOLUME

Total weight (lb).....	<i>Export packed</i> 5.4
Total volume (cu ft).....	.15

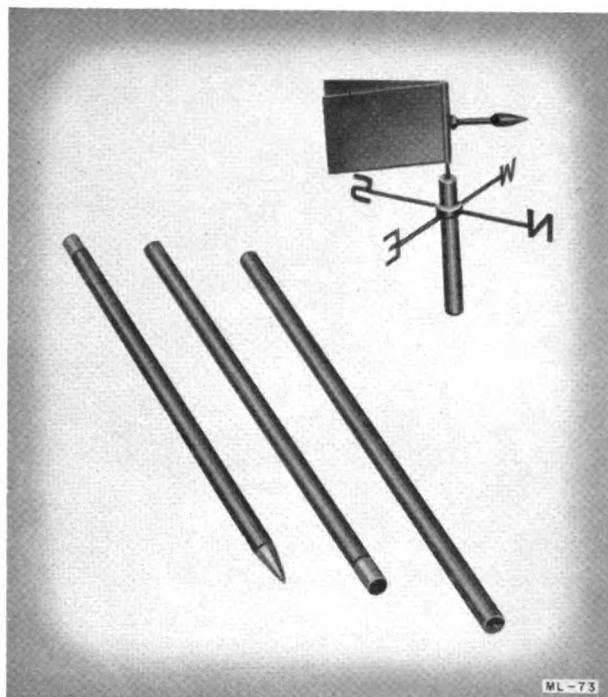


Figure 26. Wind Vane ML-73.

Status: Standard. Stock No.: 7A2073. Reference: TM 1-235.

Wind Vane ML-73 is a portable instrument which is used to determine wind direction in areas where a more permanent installation is impractical. It indicates, but does not record, wind direction. The equipment consists of a wind vane head which includes a direction pointer and four direction arms; a support made up of three separable sections; and two carrying cases.

TECHNICAL CHARACTERISTICS

DATA OBTAINABLE: Surface wind direction only.
SUPPORT

SECTIONS: 3, each 29½ in. lg, provided with socket joints; 1 section pointed for insertion into the ground; either 2 or 3 sections may be used.
HEIGHT: 2 sections, 57 in.; 3 sections, 85 in.

WEIGHT AND VOLUME

Total weight (lb).....	<i>Export packed</i> 7
Total volume (cu ft).....	.75

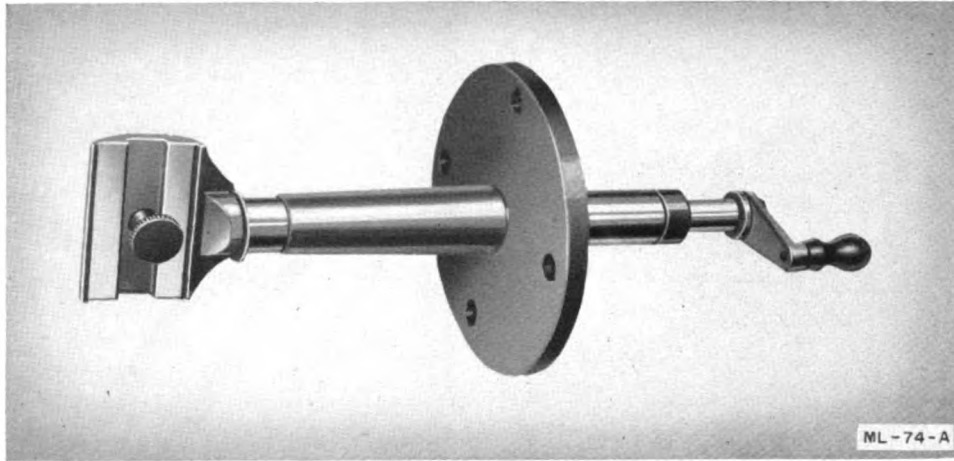


Figure 27. Rotor ML-74-A.

Status: Standard. *Stock No.:* 7A1474A. *Reference:* TM 11-2417.

Rotor ML-74-A is a hand-operated mechanical device for ventilating Psychrometer ML-24 or ML-224; it is designed for use with Shelter ML-41-A or -B, a small, raised, louvered structure which is used to house temperature- and humidity-measuring instruments and which is provided with mounting boards for the installation of Support ML-54 and Rotor ML-74-A. The rotor consists of a steel shaft with a crank handle

on one end and a fixture for attaching the psychrometer on the other end. A metal casing forms a housing for the shaft and provides a means for mounting the rotor on the side wall of the shelter. The shaft extends through a hole in the wall of the shelter and the device is cranked from the outside.

WEIGHT AND VOLUME

	<i>Export packed</i>
Total weight (lb).....	1.67
Total volume (cu ft).....	.08

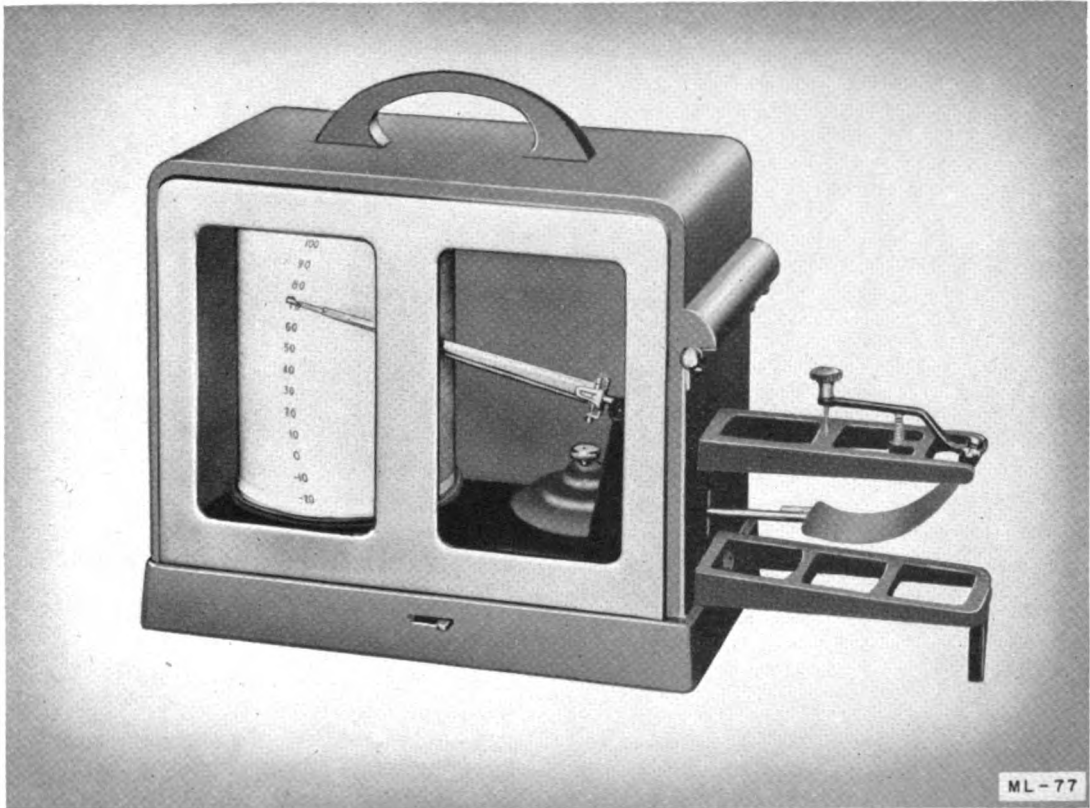


Figure 28. Thermograph ML-77.

Status: Standard. *Stock No.:* 7A1777. *Reference:* TM 11-426.

Thermograph ML-77 is a portable instrument which produces a record, continuous over a period of either 1 day or 1 week, of temperatures within the range between -20° F. and $+120^{\circ}$ F., or between -50° F. and $+80^{\circ}$ F., depending on the adjustment and the chart used. It is intended for general use. Thermograph ML-277, which is similar to Thermograph ML-77, is intended for arctic use and therefore has a bimetal sensing element.

TECHNICAL CHARACTERISTICS

- TEMPERATURE SENSITIVE ELEMENT: Bourdon tube (alcohol in a curved, metal tube).
- RECORDING ELEMENT: Pen, actuated through a system of linkages.
- RANGE OF RECORD: 130° F. (-20° F. to $+110^{\circ}$ F. or -50° F. to $+80^{\circ}$ F.).
- CONTINUITY OF RECORD: 1 week or 1 day, depending on the gears used.
- CHART DRIVE: Clock ML-79-A; 8-day movement with 29-hour and 176-hour gear pinions (the daily gears normally are not used).

CHARTS (Weekly): Thermograph Chart ML-235; range, -20° F. to $+110^{\circ}$ F. Thermograph Chart ML-234; range, -50° F. to $+80^{\circ}$ F.

CHART GRADUATIONS: Temperature, 1° F. divisions, labeled at 10° intervals; a reading to $.1^{\circ}$ F. can be made. Time, 2-hour interval divisions.

ACCESSORY EQUIPMENT: Ink, special register, green (Sig C stock No. 7A1100).
(Used with, but not supplied with, Thermograph ML-77).

Ink, special register, purple (Sig C stock No. 7A1101).

Ink, special register, red (Sig C stock No. 7A1102).

Oil, watch, Grade No. 1 (Sig C stock No. 6G1139.1).

Thermograph Chart ML-234 (Sig C stock No. 7A5291-234).

Thermograph Chart ML-235 (Sig C stock No. 7A5291-235).

WEIGHTS AND VOLUMES

	Unpacked	Domestic packed	Export packed
Total weight (lb).....	10	15	19
Total volume (cu ft).....	.36	1.2	1.5

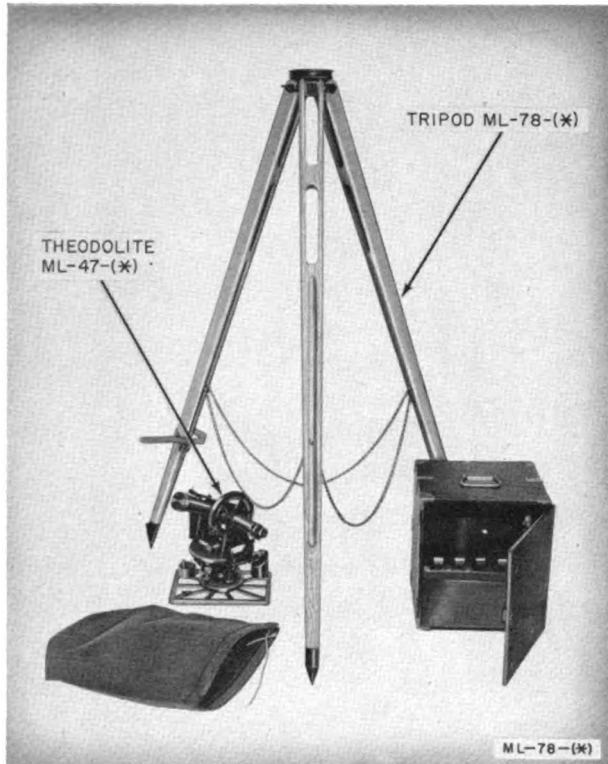


Figure 29. Tripod ML-78-(*).

Status: Standard. Stock No.: 7A1878. Reference: TM 11-423.

Tripod ML-78-(*), represents Tripod ML-78-C through -R. The wooden, nonextension type legs are steel tipped; the threaded metal head is protected by a cap when the tripod is not in use. Tripod ML-78-(*), is used as a portable support for Theodolite ML-47-(*), and Theodolite ML-247.

WEIGHT AND VOLUME

Total weight (lb)-----	<i>Export packed</i> 65.6
Total volume (cu ft)-----	1.85

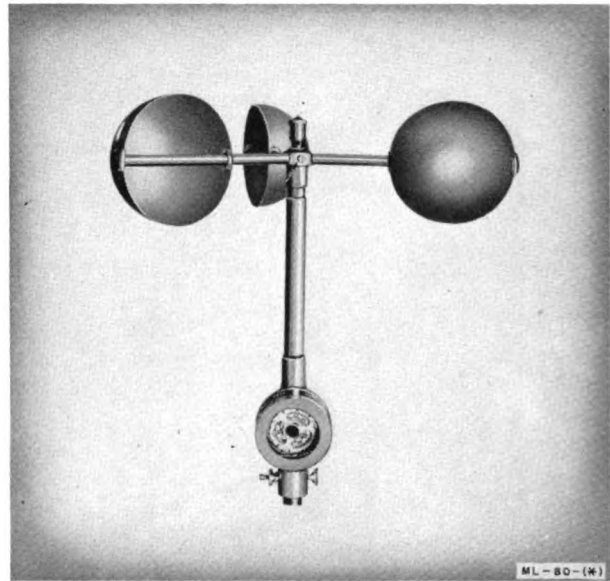


Figure 30. Anemometer ML-80 or ML-80-B.

Status: Limited/Std. Stock No.: 7A80. Reference: TM 11-424.

Anemometer ML-80-(*), represents Anemometers ML-80, ML-80-A and ML-80-B. Anemometer ML-80 or ML-80-B consists of a three-cup rotor mounted on a spindle that is geared to a registering mechanism with a visible dial on which total wind movement can be read in miles, and to an electrical contacting mechanism by means of which wind speed is determined in miles per hour. Anemometer ML-80-A has no visible dial, but otherwise differs from Anemometers ML-80 and ML-80-B in construction only. Anemometer ML-80-(*), is mounted on Support ML-29 and is connected electrically with Indicator ML-117; it may be wired also to a double or quadruple register which records wind speed and direction.

Note. A table which shows the models of Anemometer ML-80, Support ML-29, and Indicator ML-117 that may be used together is included with the data on Support ML-29.

WEIGHT AND VOLUME

Total weight (lb)-----	<i>Export packed</i> 10.9
Total volume (cu ft)-----	1.33



Figure 31. Barometers ML-102-(*), with carrying cases.

Status: Standard. *Stock No.:* 7A312. *Reference:* TM 11-427.

Barometer ML-102-(*) represents Barometers ML-102-B, -D, -E, and -F. Barometer ML-102-(*) is a precision, aneroid barometer intended for use in mobile stations and for transportation by hand or in vehicles. In addition to the principal function of determining changes in atmospheric pressure, it may be used also to determine

approximate differences in elevation. Barometer ML-102-E is provided with a nomograph for determining difference in elevation from barometric pressures, and a temperature-correction chart; Barometer ML-102-D is provided with a temperature-correction and temperature-conversion chart. Carrying cases are furnished with all models of the equipment.

TECHNICAL CHARACTERISTICS

	ML-102-B, -E, -F	ML-102-D
PRESSURE RANGE	22 to 31.5 in. of mercury; 745 to 1,085 mb.	745 to 1,065 mb.
INCH SCALE GRADUATIONS	1/50 (0.2) in. from 26 to 31 in.; 1/10 and integral inches numbered.	(Millibar scale only).
MILLIBAR SCALE GRADUATIONS	2 scales, whole millibars; outer, 895 to 1,085 mb; inner, 745 to 895 mb; numbered every 5 mb.	2 scales, 1/2 millibars: outer, 900 to 1,065 mb; inner, 745 to 900 mb; numbered every 10 mb.
READING POSITION	Vertical	Horizontal.
DIMENSIONS (in., without case)	6 3/4 x 6 3/4 x 4	6 1/4 x 6 1/4 x 4.

WEIGHTS AND VOLUMES

	Un-packed	Export packed
Total weight, including carrying case (lb, approx):		
ML-102-B, -F	7.5	17
ML-102-D	4.5	13.5
ML-102-E	10.5	20
Total volume (cu ft)		.692



Figure 32. Register ML-103-A, cover removed.

continuous record, on a single chart, of wind direction and wind speed. A buzzer, electrically connected with the anemometer, provides a means of determining approximate, instantaneous wind speed.

TECHNICAL CHARACTERISTICS

RECORDS PRODUCED: Wind speed, register electrically connected to 1-mile terminal of Anemometer ML-80.

Wind direction, register electrically connected to cam collar of wind vane.

RECORD: Continuous over a period of 24 hours.

CHART DRUM DRIVE: Clock; produces 4 revolutions of drum in 24 hours.

RECORDERS: 2 wind-direction pens; 1 wind-speed pen.

RECORDER ACTUATION: 5 electromagnets, energized by impulses from the wind instruments.

CHART: SC FORM 97.

INSTANTANEOUS WIND SPEED: Buzzer electrically connected to 1/60-mile terminal of Anemometer ML-80.

POWER REQUIREMENT: 6 v for each circuit.

POWER SOURCE: Battery system, or 110-v ac with step-down transformer and rectifier.

WEIGHT AND VOLUME

Total weight (lb)	68
Total volume (cu ft)	4

Status: Limited/Std. Stock No.: 7A1333A.
Reference: TM 1-235.

Register ML-103-(*), represents Registers ML-103-A and -B. Register ML-103-(*), is a two-purpose, electromechanical recording instrument. When electrically connected to a suitable wind vane and Anemometer ML-80, it produces a

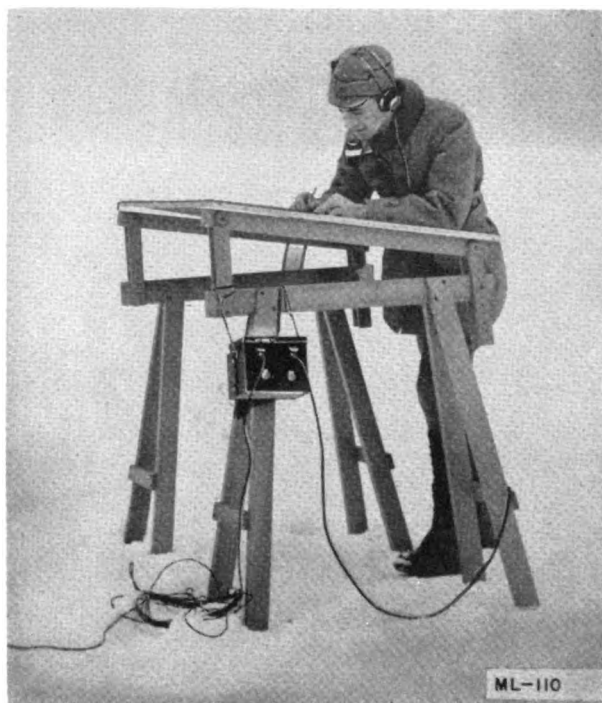


Figure 33. Timing and Telephone Set ML-110 in use.

Status: Standard. *Stock No.:* 7A1850. *Reference:* TM 11-334.

Timing and Telephone Set ML-110 provides two-way voice communication between a plotting station and one or two theodolite observers of pilot balloons. Timing signals are superimposed at regular intervals upon the communication line to assist the observer. The telephone equipment is sound-powered; the tone-generator unit requires battery power. A reel for laying and recovering wire over short distances is included.

TECHNICAL CHARACTERISTICS

COMMUNICATION EQUIPMENT

TRANSMITTER: Lightweight, chest type.

RECEIVER: Single-receiver headset.

POWER: Sound-powered.

RANGE: Up to approximately 3 miles.

INSTALLATION: Outdoors; portable.

TIMING EQUIPMENT

TONE: 1,000 cps; generated by interrupter; volume control provided.

TIMER: Modified 8-day clock.

TONE DURATION: Approximately 7 seconds.

INTERVAL: 1 minute.

POWER: 2 batteries BA-30, or 3-v external battery.

INSTALLATION: Outdoors or indoors; on the ground, hung by strap or mounted on fixed or temporary support.

PRINCIPAL COMPONENTS

- 1 Time Interval Unit ML-138
- 2 Head and Chest Set HS-25, HS-25-A or -B
- 2 Jack JK-54 (one in use, one spare)
- 2 Plug PL-57 (one in use, one spare)
- 1 Strap ST-42
- 1 Reel RL-39 or RL-39-A
- ¼-mile Wire W-130-A

WEIGHT AND VOLUME

	<i>Domestic or export packed</i>
Total weight (lb).....	58
Total volume (cu ft).....	4

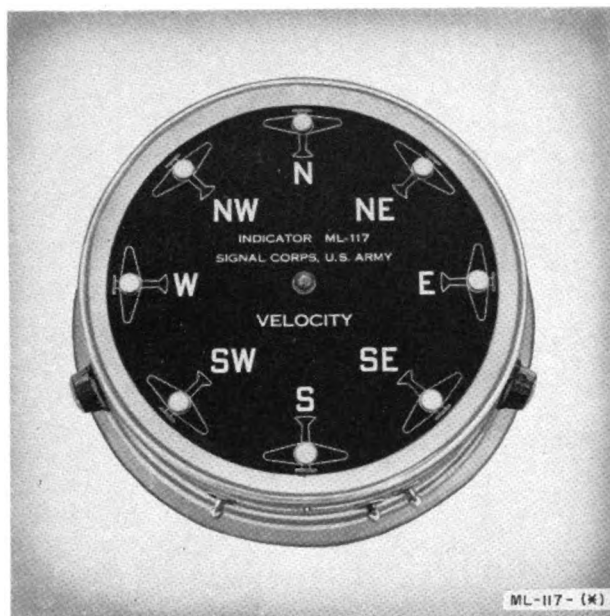


Figure 34. Indicator ML-117 or ML-117-B.

Status: Limited/Std. Stock No.: 7A1090. Reference: TM 11-424.

Indicator ML-117-(*) represents Indicators ML-117, ML-117-A, and ML-117-B. Indicator ML-117-(*) is a wind-indicating instrument used with Support ML-29 and Anemometer ML-80. It provides an indication of wind direction, as

determined by the wind vane, and a means of determining instantaneous wind speed, as determined by the anemometer.

Note. A table which shows the models of Indicator ML-117-(*), Support ML-29, and ML-80 that may be used together is included with the data on Support ML-29.

TECHNICAL CHARACTERISTICS

WIND DIRECTION INDICATION

METHOD: 8 incandescent lamps, 1 indicating each cardinal and intercardinal compass point; connected electrically with 8 sets of contacts on cam collar of wind vane Bearing ML-129 (p/o Support ML-29).
 COMPASS POINTS INDICATED: 16 (2 adjacent lamps lighted simultaneously indicate wind direction between cardinal and intercardinal points).

WIND SPEED DETERMINATION

METHOD: Buzzer or incandescent lamp, selected by its respective toggle switch; number of buzzes or flashes counted in 1 minute indicates wind speed in mph.
 POWER REQUIREMENT: 6-v to 8-v ac or dc, or 110-v, 60-cycle ac (built-in transformer); DPDT switch for supply change-over.
 INSTALLATION: Indoors, up to 300 ft from Support ML-29.

WEIGHTS AND VOLUMES

	Un-packed	Export packed
Total weight (lb).....	5	10
Total volume (cu ft).....	.19	.7

ML-119-(*)

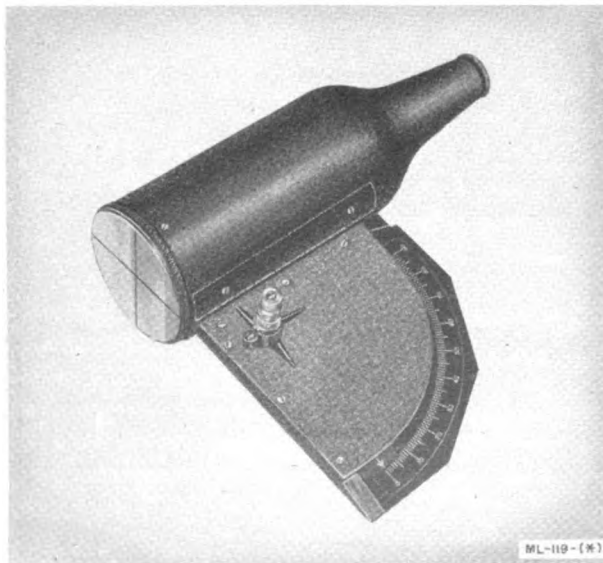


Figure 35. Clinometer ML-119-C.

Status: Standard. Stock No.: 7A509. Reference: TM 11-2423.

Clinometer ML-119-(*) represents Clinometers ML-119-C through -F. Clinometer ML-119-(*) is an optical instrument that consists of a lensless sighting tube with cross wires at the larger end, and a quadrant plate assembly; the quadrant is graduated in whole degrees from 0° to 90°. The clinometer is used by an observer, located at one end of a measured base line, to determine the angle of elevation of a spot of light thrown on a cloud by a ceiling light projector located at the opposite end of the base line. Data thus obtained are used to compute cloud height (ceiling). The equipment, including the carrying case, weighs about 5½ pounds.

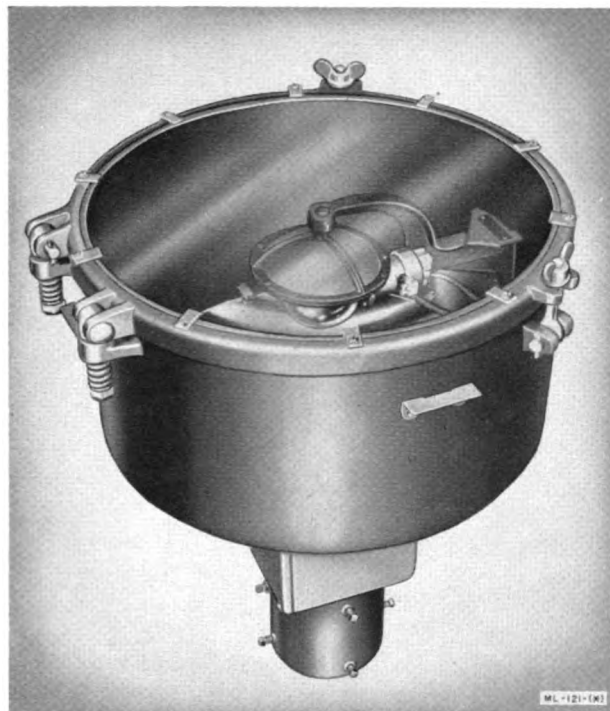


Figure 36. Ceiling Light Projector ML-121-E.

Status: Standard. *Stock No.:* 7A481. *Reference:* TM 11-421.

Ceiling Light Projector ML-121-(*), represents Ceiling Light Projectors ML-121-A through -G. Ceiling Light Projector ML-121-(*), directs a beam of light, concentrated by a reflector system and a focusing arrangement, vertically from the ground to the zenith. It produces a visible,

illuminated spot on the cloud base. Used with Clinometer ML-119, ceiling heights up to 10,000 feet may be computed. This projector is designed for fixed installation and night use. Control Set ML-212, a remote-control system, may be used with Ceiling Light Projector ML-121-(*), to permit controlling the equipment from the point at which observations are being made.

TECHNICAL CHARACTERISTICS

INSTALLATION: Fixed, mounted on 4-in. diam standard iron pipe (not a component of the equipment).

RANGE OF MEASUREMENT: Up to 10,000 ft; night use only.

LAMP: 12-v, 35-amp, 420-w; G-25 bulb, C-2 filament, mogul prefocus base.

BEAM CANDLEPOWER: 2,000,000.

BEAM SPREAD: 4°.

LIFE OF LAMP: Approx 100 hrs.

POWER SUPPLY: 90-v to 120-v, 60-cyc (ML-121-A requires 25-cyc) ac; taps provided in 5-v steps; transformer capacity, 450 v.

DIMENSIONS: 21½ in. diam by 28¾ in. high.

ACCESSORY EQUIPMENT: Clinometer ML-119. (Not furnished with Ceiling Light Projector ML-121-(*)).

WEIGHTS AND VOLUMES

Total weight (lb):	Do-		Export
	Unpacked	mestic packed		packed
Cast iron:			
ML-121-B, -C, -E, -F, -G	127	185	305
ML-121-D.....	140	180	305
Aluminum alloy:			
ML-121-A, -B.....	82	135	240
ML-121-D.....	90	128	240
Total volume (cu ft).....			19

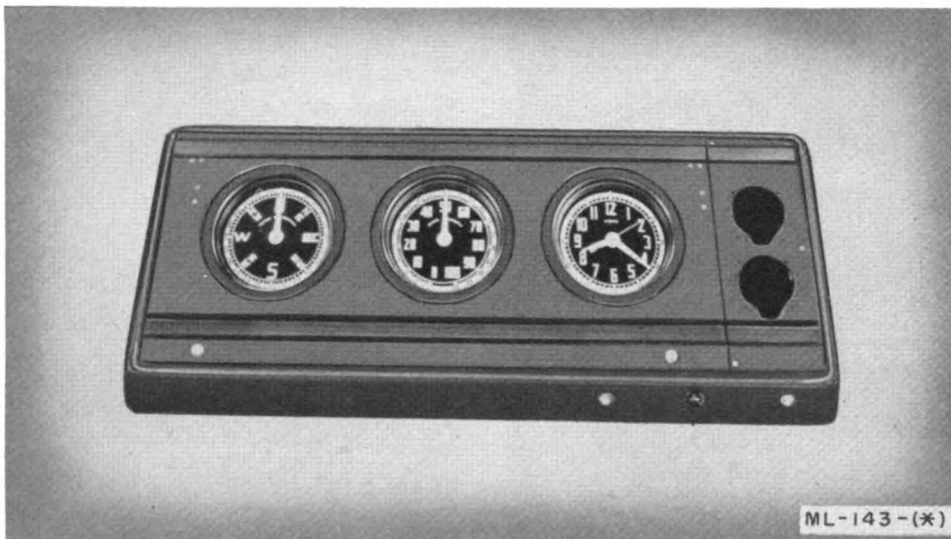


Figure 37. Weather Panel ML-143-B, C, or D.

Status: Standard. *Stock No.:* 7A1943D. *Reference:* TM 11-2414.

Weather Panel ML-143-(* represents Weather Panels ML-143-A through -D. Weather Panel ML-143-(* is designed for use in the control tower of a weather station using a synchro-type wind indicating system. It consists of a wind direction indicator, a wind intensity indicator, and an electric clock, all mounted behind an inclined panel and inclosed in a metal cabinet. Panel cut-outs for the installation of two sensitive altimeters (not furnished with the equipment) are provided; an electric vibrator, which is switched on when the altimeters are to be read, is included. The panel is equipped with indirect-lighting rings controlled by a switch and rheostat. Weather Panel ML-143-(* requires 110-volt, 60-cycle alternating current for operation.

TECHNICAL CHARACTERISTICS

INDICATOR OPERATION: Self-synchronous motor with pointer attached to shaft.

WIND DIRECTION INDICATOR: Range, 360°; dial graduated in 5° intervals, numbered every 15°; lettered at 8 points of the compass.

WIND INTENSITY INDICATOR: Range, 0 to 100

mph; dial graduated in 1 mph intervals; two labeled scales, one numbered every 10 mph, the other every 5 mph.

CLOCK: Self-starting synchronous electric, with sweep second hand, power-interruption signal, and ON-OFF switch.

POWER REQUIREMENT: 110-v, 60-cyc, single-phase ac.

LIGHTING TRANSFORMER: 110/6-v, 60-cyc.

ASSOCIATED EQUIPMENT: Wind Direction Transmitter ML-152-A, -B, -C, or -D.

Wind Intensity Transmitter ML-151-A, -B, -C, or -D.

Weather Panel ML-183-A or -B.

Wind Recorder ML-144-A, -B, -C, or -D.

Terminal Box ML-171.

Junction Box ML-169.

Panel Board ML-170.
Calibrator ML-211.

WEIGHT AND VOLUME

Note. Weather Panel ML-143-(* is packed two panels to a shipping container.

Total weight (lb).....	80
Total volume (cu ft).....	8.7

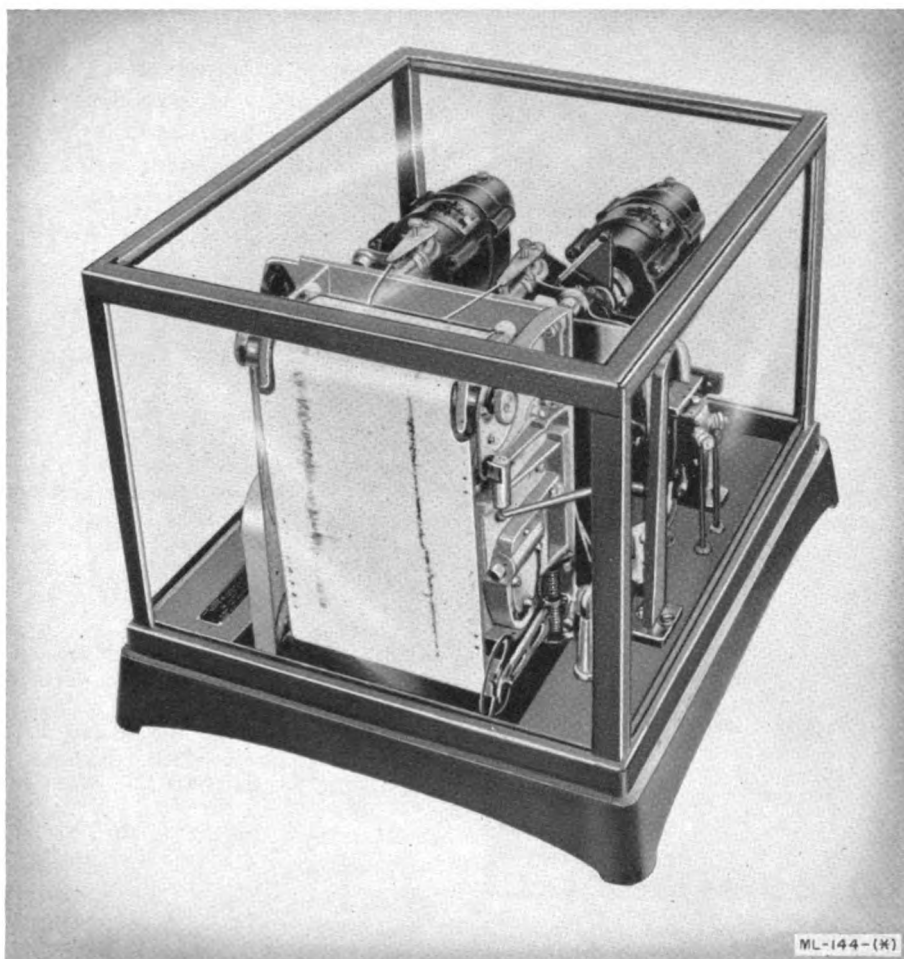


Figure 38. Wind Recorder ML-144-(*).

Status: Standard. *Stock No.:* 7A2008A. *Reference:* TM 11-2414.

Wind Recorder ML-144-(*), represents Wind Recorders ML-144-A through -D. Wind Recorder ML-144-(*), is designed for use in the weather office of a station using a synchro-type wind indicating system. It produces continuous, separate records of wind direction and wind intensity on parallel sections of a single chart. Wind Recorder ML-144-(*), requires 110-volt, 60-cycle alternating current for operation.

TECHNICAL CHARACTERISTICS

RECORDERS: Two pen mechanisms, one for wind direction record, one for wind intensity record.

RECORDER DRIVE: Self-synchronous motor for each pen, interwired with self-synchronous generator of respective transmitter.

CHART DRIVE: Synchronous electric motor.

CHART SPEED: ¼-in., 1½ in., 3 in. (standard), 6 in., or 12 in. per hr.

CHART: Chart Roll ML-172; 93 ft lg, graduated for standard speed of 3 in. per hr.

POWER REQUIREMENT: 110-v, 60-cyc, single-phase ac.

ASSOCIATED EQUIPMENT: Wind Direction Transmitter ML-152-A, -B -C, or -D.

Wind Intensity Transmitter ML-151-A, -B -C, or -D.

Weather Panel ML-143-A, -B, -C, or -D and/or ML-183-A or -B.

Junction Box ML-169.

Terminal Box ML-171.

Panel Board ML-170.

Calibrator ML-211.

WEIGHT AND VOLUME

Total weight (lb).....	110
Total volume (cu ft).....	7.5

*Export
packed*

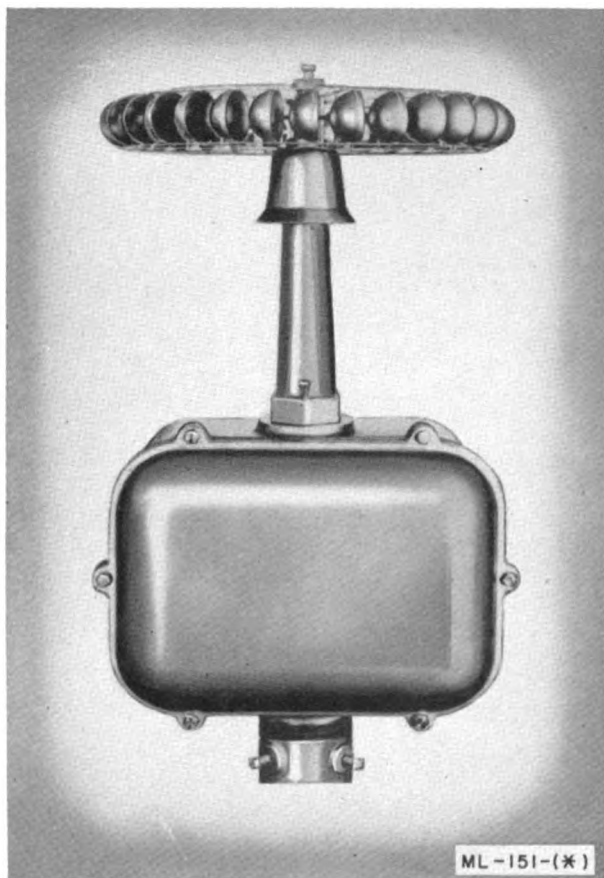


Figure 39. Wind Intensity Transmitter ML-151-(*).

Status: Standard. Stock No.: 7A2007-151A.

Reference: TM 11-2414.

Wind Intensity Transmitter ML-151-(*) represents Wind Intensity Transmitters ML-151-A through -D. Wind Intensity Transmitter ML-151-(*) is an anemometer designed for use in a synchro-type wind indicating system; wind intensities up to 100 miles per hour can be measured. It consists of a multicup, spring-restrained rotor coupled by a direct-gear drive to the shaft of a self-synchronous generator. A plug-jack type terminal block is provided for connecting the transmitter electrically to a weather panel and a

wind recorder located indoors. The transmitter assembly is mounted on a guyed support with a cross arm equipped with obstruction lights. The base plate, steps, guy rod ring, and guy rod anchors are included; the remainder of the support is not furnished with the equipment.

TECHNICAL CHARACTERISTICS

TYPE: Synchro generator.

RANGE: 0 to 100 mph.

ROTOR: Multicup, spring-restrained (bridled); maximum angular movement 330°; oscillations magnetically damped.

GENERATOR: Synchro-type.

CASE: Weatherproof; gasketed front cover, spindle bearing liquid-sealed with mercury.

MOUNTING: Sleeve, fitted with clamp screws for attachment to 2-in. diam pipe support.

LOCATION: On roof of control tower or weather office building, at least 10 ft from the wind direction transmitter and not over 5,000 ft from the most remote receiving unit.

SUPPORT: 2-in. diam pipe; if erected on control tower roof, 8 to 12 ft lg; if erected on weather station roof, 10 to 15 ft lg.

WIRE: Up to 3,000 ft, use No. 14 B & S gage; from 3,000 ft to 5,000 ft, use No. 12 B & S gage.

ASSOCIATE EQUIPMENT: Wind Direction Transmitter ML-152-A, -B, -C, or -D.

Weather Panel ML-143-A, -B, -C, or -D and/or ML-183-A or -B and/or Wind Recorder ML-144-A, -B, -C, -D when 110-v, 60-cyc ac is available.

Weather Panel ML-173-B, and Wind Recorder ML-174-B when 46-v, 25-cyc ac is available.

Junction Box ML-169.

Terminal Box ML-171.

Panel Board ML-170.

Calibrator ML-211.

WEIGHT AND VOLUME

	<i>Export packed</i>
Total weight (lb)	65
Total volume (cu ft)	5.8

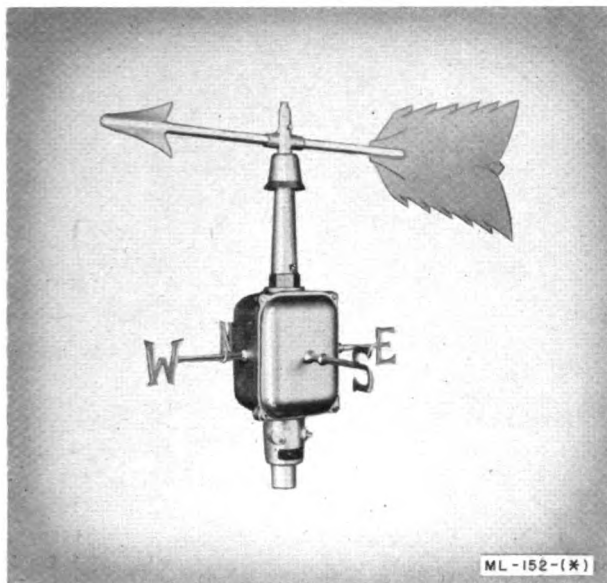


Figure 40. Wind Direction Transmitter ML-152-(*).

Status: Standard. *Stock No.:* 7A2002-152A.
Reference: TM 11-2414.

Wind Direction Transmitter ML-152-(*), represents Wind Direction Transmitters ML-152-A through -D. Wind Direction Transmitter ML-152-(*), is designed for use in a synchro-type wind indicating system. It consists of a metal wind vane mounted on a spindle which is mechanically coupled to the shaft of a self-synchronous generator. A plug-jack type terminal block is provided for connecting the transmitter electrically with a weather panel and a wind recorder located indoors. Wind-direction letters extending from the sides of the transmitter case provide outdoor, visible indication of wind direction. The transmitter assembly is mounted on a guyed support with a cross arm equipped with obstruc-

tion lights. The base plate, steps, guy rod ring, and guy rod anchors are included; the remainder of the support is not furnished with the equipment.

TECHNICAL CHARACTERISTICS

TYPE: Synchro generator.

RANGE: 360°, direction letters N, E, S, and W.

ROTOR: Vane.

GENERATOR: Synchro-type.

CASE: Weatherproof; gasketed front cover, spindle bearing liquid-sealed with mercury.

MOUNTING: Sleeve, fitted with clamp screws for attachment to a 2-in. diam pipe support.

LOCATION: On roof of control tower or weather office building, at least 10 ft from the wind intensity transmitter and not over 5,000 ft from the most remote receiving unit.

SUPPORT: 2-in. diam pipe; if erected on control tower roof, 8 to 12 ft lg; if erected on weather station roof, 10 to 15 ft lg.

WIRE: Up to 3,000 ft, use No. 14 B & S gage; from 3,000 ft to 5,000 ft, use No. 12 B & S gage.

ASSOCIATED EQUIPMENT: Wind Intensity Transmitter ML-151-A, -B, -C, or -D.

Weather Panel ML-143-A, -B, -C, or -D and/or ML-183-A or -B and/or Wind Recorder ML-144-A, -B, -C, or -D when 110-v, 60-cyc ac is available.

Weather Panel ML-173-B and Wind Recorder ML-174-B when 46-v, 25-cyc ac is available.

Panel Board ML-170.

Junction Box ML-169.

Terminal Box ML-171.

Calibrator ML-211.

WEIGHT AND VOLUME

	<i>Export packed</i>
Total weight (lb).....	70
Total volume (cu ft).....	6.2

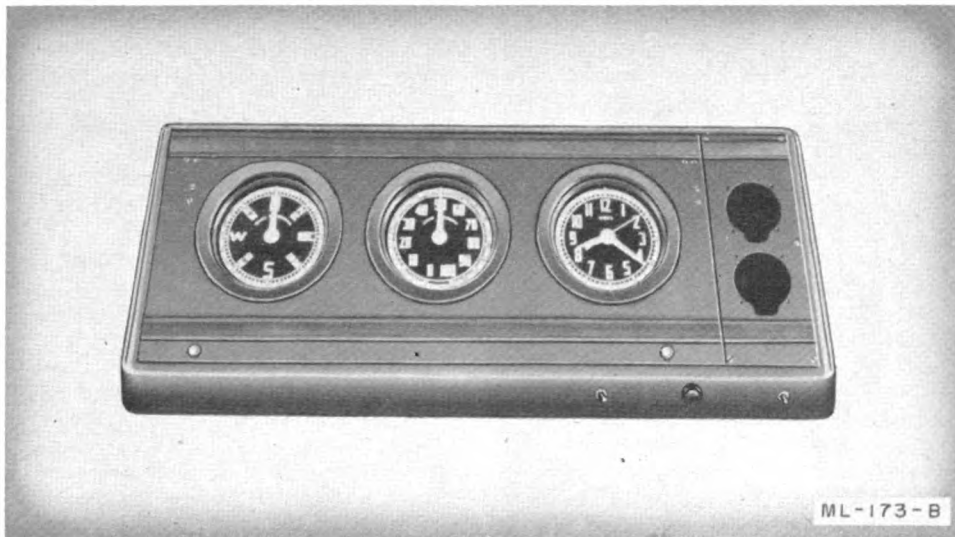


Figure 41. Weather Panel ML-173-B.

Status: Standard. *Stock No.:* 7A1973B. *Reference:* TM 11-2414.

Weather Panel ML-173-B is designed for use in the control tower of a weather station using a synchro-type wind indicating system. It consists of a wind direction indicator, a wind intensity indicator, and an electric clock, all mounted behind an inclined panel and inclosed in a metal cabinet. Panel cut-outs for the installation of two sensitive altimeters (not furnished with the equipment) are provided; an electric vibrator, which is switched on when the altimeters are to be read, is included. The panel is equipped with indirect-lighting rings controlled by a switch and rheostat. Weather Panel ML-173-B requires 46-volt, 25-cycle alternating current for operation.

TECHNICAL CHARACTERISTICS

INDICATOR OPERATION: Self-synchronous motor with pointer attached to shaft.

WIND DIRECTION INDICATOR: Range, 360°; dial graduated in 5° intervals, numbered every 15°; lettered at 8 points of the compass.

WIND INTENSITY INDICATOR: Range, 0 to 100

mph; dial graduated in 1 mph intervals, two labeled scales, one numbered every 10 mph, the other every 5 mph.

CLOCK: Self-starting, synchronous electric, with sweep second hand, power-interruption signal and ON-OFF switch.

POWER REQUIREMENT: 46-v, 25-cyc, single-phase ac (where available power is 115-v, 25-cyc ac, use 115/46-v, 25-cyc step-down transformer).

LIGHTING TRANSFORMER: 46/6-v, 25-cyc.

ASSOCIATED EQUIPMENT: Wind Direction Transmitter ML-152-A, -B, -C, or -D.

Wind Intensity Transmitter ML-151-A, -B, -C, or -D.

Wind Recorder ML-174-B.

Terminal Box ML-171.

Junction Box ML-169.

Panel Board ML-170.

Calibrator ML-211.

WEIGHT AND VOLUME

Note. Weather Panel ML-173-B is packed two panels to a shipping container.

	<i>Export packed</i>
Total weight (lb).....	80
Total volume (cu ft).....	8.7

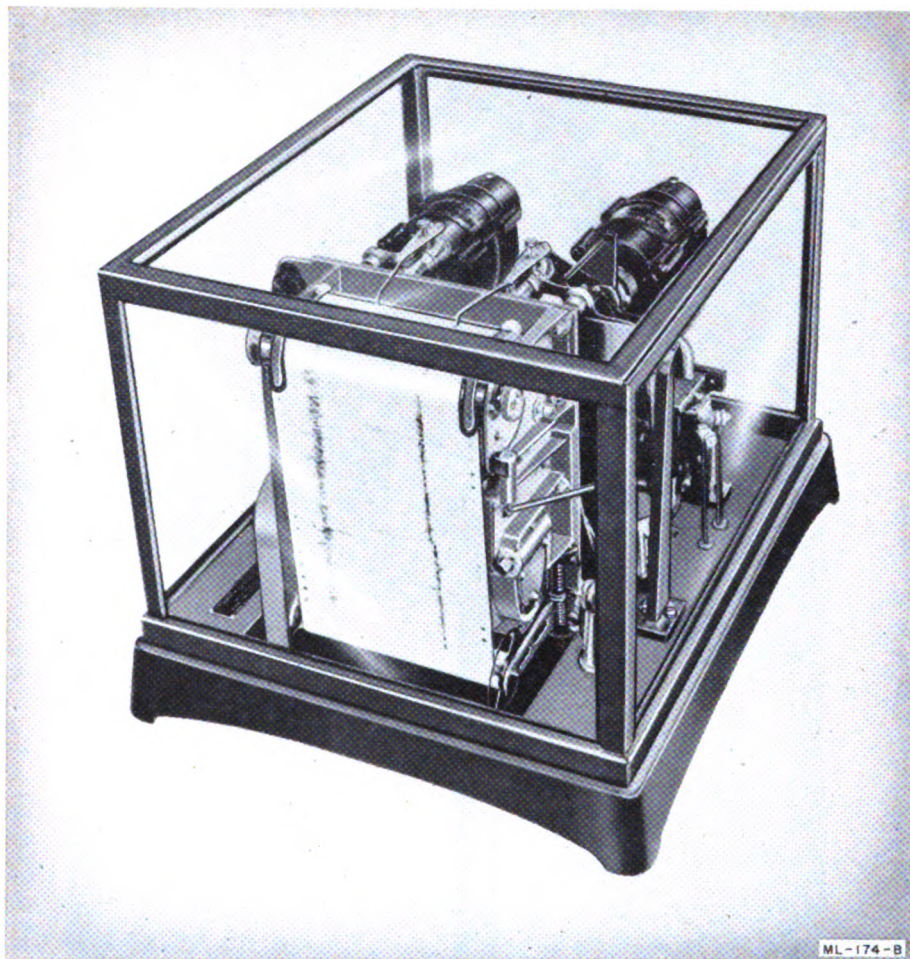


Figure 42. Wind Recorder ML-174-B.

Status: Standard. *Stock No.:* 7A2008-174B.
Reference: TM 11-2414.

Wind Recorder ML-174-B is designed for use in the weather office of a station using a synchro-type wind indicating system. It produces continuous, separate records of wind direction and wind intensity on parallel sections of a single chart. Wind Recorder ML-174-B requires 46-volt, 25-cycle alternating current for operation.

TECHNICAL CHARACTERISTICS

RECORDERS: Two pen mechanisms, one for wind direction record, one for wind intensity record.

RECORDER DRIVE: Self-synchronous motor for each pen, interwired with self-synchronous generator of respective transmitter.

CHART DRIVE: Synchronous electric motor.

CHART SPEED: $\frac{3}{4}$ -in., $1\frac{1}{2}$ in., 3 in. (standard), 6 in., or 12 in. per hr.

CHART: Chart Roll ML-172; 93 ft lg, graduated for standard speed of 3 in. per hr.

POWER REQUIREMENT: 46-v, 25-cyc, single-phase ac (where available power is 115-v, 25-cyc ac, use a 115/46-v step-down transformer).

ASSOCIATED EQUIPMENT:

Wind Direction Transmitter ML-152-A, -B, -C, or -D.

Wind Intensity Transmitter ML-151-A, -B, -C, or -D.

Weather Panel ML-173-B.

Junction Box ML-169.

Terminal Box ML-171.

Panel Board ML-170.

Calibrator ML-211.

WEIGHT AND VOLUME

Total weight (lb).....	110	<i>Export packed</i>
Total volume (cu ft).....	7.5	

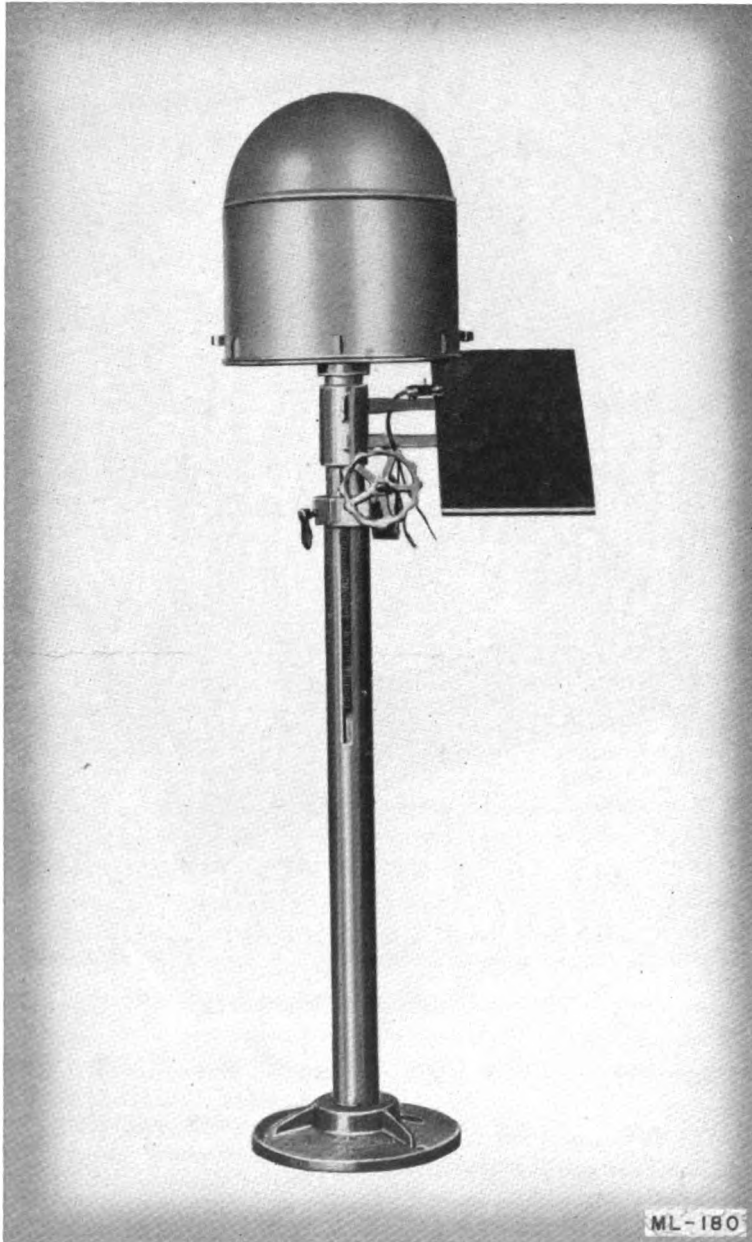
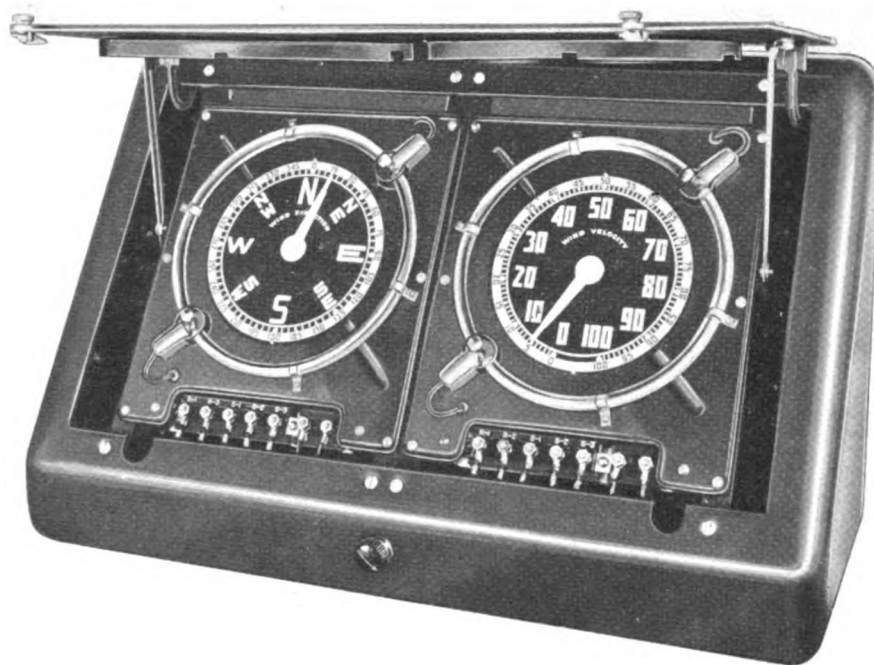


Figure 43. Theodolite Mount ML-180.

Status: Standard. *Stock No.:* 7A1750. *Reference:* TM 11-423.

Theodolite Mount ML-180 is a metal, adjustable-height support for Theodolites ML-47-(*) and ML-247. It is designed for permanent installation on an observation platform. The mount consists of two vertical pipes, one of which telescopes within the other and can be raised or

lowered by means of a wheel. The bottom of the outer pipe is screwed into a mounting base; the top of the inner pipe carries a plate with a screw-threaded tripod head for attaching the theodolite. The equipment includes a metal hood which fits over and protects the instrument, and a data shelf with a lamp. Packed for export, Theodolite Mount ML-180 weighs 19 pounds.



ML-183-(*)

Figure 44. Weather Panel ML-183-(*).

Status: Standard. *Stock No.:* 7A1983A. *Reference:* TM 11-2414.

Weather Panel ML-183-(*), represents Weather Panels ML-183-A and ML-183-B. Weather Panel ML-183-(*), is designed for use in the weather office of a station using a synchro-type wind indicating system. It consists of a wind direction indicator and a wind intensity indicator, both mounted behind an inclined panel and enclosed in a metal cabinet. Each unit is provided with an indirect lighting ring controlled by a rheostat switch. Weather Panel ML-183-(*), requires 110-volt, 60-cycle alternating current for operation.

TECHNICAL CHARACTERISTICS

INDICATOR OPERATION: Self-synchronous motor with pointer attached to shaft.

WIND DIRECTION INDICATOR: Range, 360°; dial graduated in 5° intervals, numbered every 15°; lettered at 8 points of the compass.

WIND INTENSITY INDICATOR: Range, 0 to 100 mph; dial graduated in 1 mph intervals; two labeled

scales, one numbered every 10 mph, the other every 5 mph.

POWER REQUIREMENT: 110-v, 60-cyc, single-phase ac.

LIGHTING TRANSFORMER: 110/6 v, 60 cyc.

ASSOCIATED EQUIPMENT: Wind Direction Transmitter ML-152-A, -B, -C, or -D.

Wind Intensity Transmitter ML-151-A, -B, -C, or -D.

Weather Panel ML-143-A, -B, -C, or -D.

Wind Recorder ML-144-A, -B, -C, or -D.

Terminal Box ML-171.

Junction Box ML-169.

Panel Board ML-170.

Calibrator ML-211.

WEIGHT AND VOLUME

Note. Weather Panel ML-183-(*), is packed two panels to a shipping container.

	<i>Export packed</i>
Total weight (lb).....	80
Total volume (cu ft).....	8.7



Figure 45. Generator ML-185-B.

Status: Standard. Stock No.: 7A975-85. Reference: TM 11-2400.

Generator ML-185-(*), represents Generators ML-185-A, ML-185-B, and ML-185-C. Generator ML-185-(*), includes complete, transportable equipment for generating hydrogen gas to inflate meteorological balloons. The equipment consists of a steel cylinder with plug, outlet and regulating valve, pressure gauge, hose coupling, and safety devices; a support assembly, and the necessary tools and accessories. Hydrogen gas is

generated by the reaction of sodium hydroxide (caustic soda), water, and either ferrosilicon or aluminum. The chemicals are not furnished with the equipment. Sufficient hydrogen gas can be produced in 2 hours to inflate one 350-gram balloon or two to three 100-gram balloons.

TECHNICAL CHARACTERISTICS

CYLINDER

TYPE: Seamless steel.

SIZE: 9 $\frac{1}{16}$ in. OD; 56 in. lg.

CAPACITY 11 $\frac{1}{2}$ gal (approx 2,600 cu in).

PRESSURE: Body will withstand 5,000 psi.

SAFETY DEVICES: 2 (1 cylinder, 1 valve); rupture at pressures exceeding 3,000 psi.

PRESSURE GAUGE: Range 0 to 3,000 psi, calibrated in pounds per square inch.

HYDROGEN GAS YIELD

FERROSILICON PROCESS: 85 to 90 cu ft in 2 hours with air temperature 70° F to 90° F.

ALUMINUM PROCESS: 120 cu ft in 2 hours with air temperature 60° F. to 90° F.

MAXIMUM PRESSURE

FERROSILICON PROCESS: 1,600 to 2,100 psi when generator is hot; 1,200 to 1,500 psi when generator is cold.

ALUMINUM PROCESS: Approx 2,300 psi when generator is hot.

CHEMICAL CHARGE

FERROSILICON PROCESS: 5 lbs sodium hydroxide (Sig C stock No. 6G197), 4 $\frac{1}{2}$ lb ferrosilicon (Sig C stock No. 6G550).

ALUMINUM PROCESS: Caustic Soda Charge ML-388/UM (Sig C stock No. 7A476-388).

Aluminum Charge ML-389/UM (Sig C stock No. 7A43-389).

WATER: Fresh or sea.

CYLINDER SUPPORT: Two, folding, metal A-frames.

WEIGHTS AND VOLUMES

	Un- packed	Domestic pack
Total weight (lb).....	500	620
Total volume (cu ft).....	-----	22.6

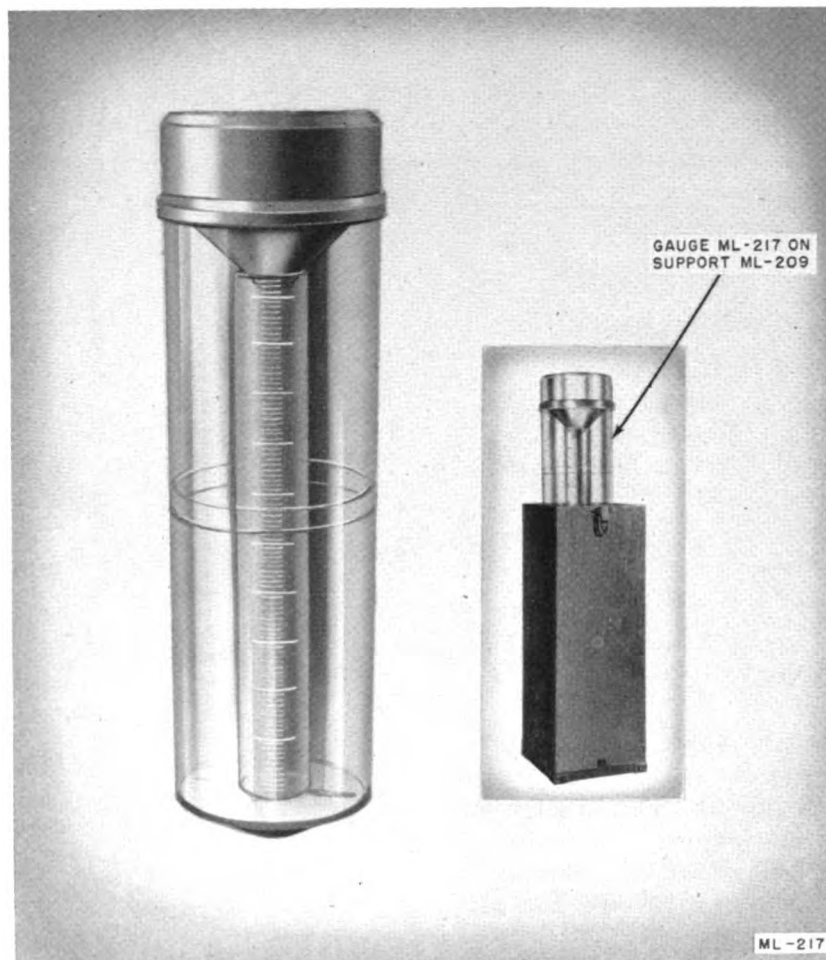


Figure 46. Gauge ML-217 on Support ML-209.

Status: Standard. *Stock No.:* 7A937. *Reference:* TM 11-2406.

Gauge ML-217 is a nonrecording gauge used at portable weather stations to measure precipitations of rain, snow, or hail in terms of inches of rainfall. The gauge is fabricated of transparent plastic; graduations, in steps of .01 inch, from 0 up to 1 inch, are engraved on the measuring tube, enabling the observer to read the amount of precipitation directly from the gauge. Support

ML-209, which serves also as a carrying case, is used with Gauge ML-217, but is not a part of the equipment.

WEIGHTS AND VOLUMES

	Un- packed (net)	Export packed (including carrying case)
Total weight (lb).....	1.25	7.5
Total volume (cu ft).....	.2	.72

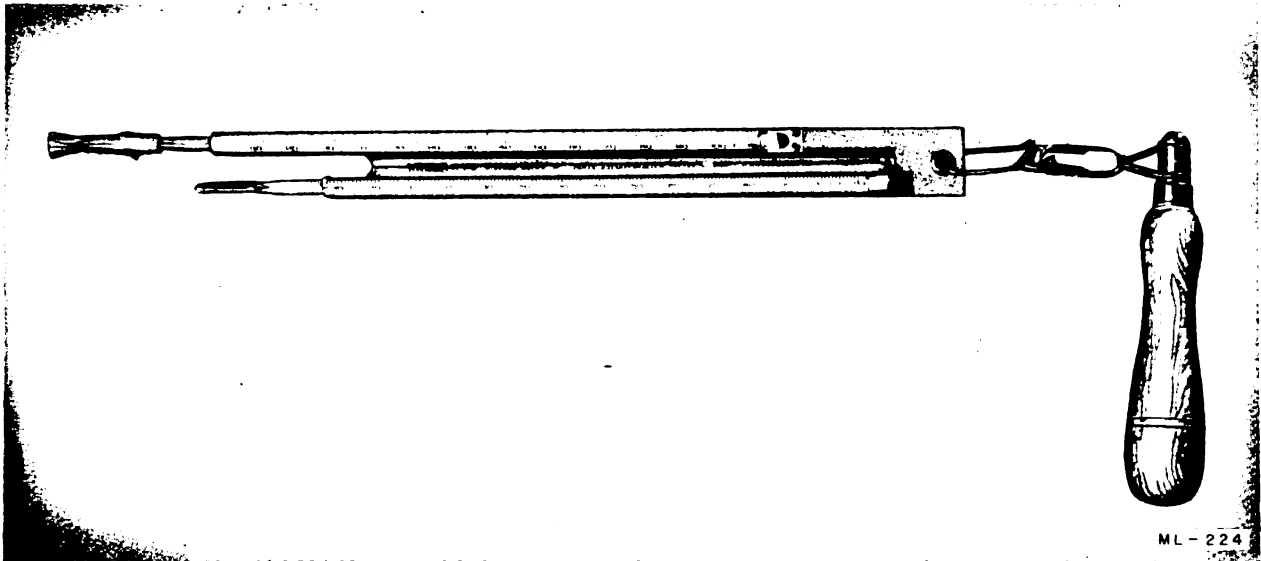


Figure 47. Psychrometer ML-224.

Status: Standard. Stock No.: 7A1324-224. Reference: TM 11-2417.

Psychrometer ML-224 consists of two, identical, mercury-in-glass thermometers mounted parallel to each other on a metal back which is attached, by means of a link and swivel, to a hardwood handle. In use, the bulb of one thermometer is covered with a wet cloth (wick) and the psychrometer is rotated rapidly about an axis at right angles to its length. From the two differing temperature readings thus obtained, the relative humidity, dew point, and the vapor pressure of the atmosphere may be calculated. Psychrometer ML-224 is available with thermometers having general or tropical temperature ranges. Psychrometer ML-24 is identical to Psychrometer ML-224 except that the scale of the former is

graduated in degrees Fahrenheit and that of the latter is graduated in degrees centigrade.

TECHNICAL CHARACTERISTICS

TYPE OF THERMOMETERS: Mercury-in-glass.

SCALE GRADUATIONS: Whole degrees centigrade, numerical designation at each multiple of 10°.

TEMPERATURE RANGE (approximate degrees C):

General, -37° to +46°.

Tropical, -12° to +63°.

ACCURACY (° C): ±.4°, below -18°.

±.3°, from -18° to 0°.

±.2°, above 0°.

VENTILATION: Accomplished by hand sling or by use of Rotor ML-74-A.

WEIGHT AND VOLUME

Total weight (lb).....	Export packed 2.1
Total volume (cu ft) .....	.15

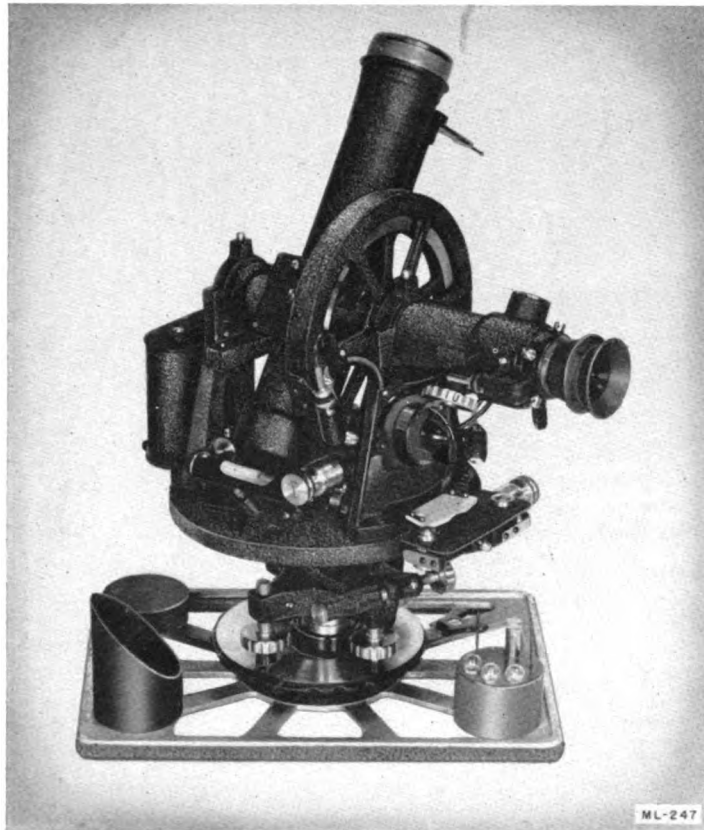


Figure 48. Theodolite ML-247.

Status: Standard. *Stock No.:* 7A1747-247.
Reference: TM 11-423.

Theodolite ML-247 is a portable, right-angle-telescope type surveying instrument provided with a compass and with an auxiliary object lens which widens the field and is particularly useful in making night observations. The theodolite is used to follow and measure the movement of a pilot balloon as it rises through the atmosphere and is carried horizontally by the air flow. Readings of the azimuth and elevation of the balloon are taken at regular intervals to determine the speed and direction of the wind at various levels. Theodolite ML-247 is usually mounted on Tripod ML-78-(*); for fixed installation, it may be mounted on Theodolite Mount ML-180; the tripod and mount are not included with the equipment.

Note. Theodolite ML-247 is identical to Theodolite ML-47-R.

TECHNICAL CHARACTERISTICS

TELESCOPE (main)

TYPE: Right-angle, with prism.
POWER: Approximately 20 diameters.
FIELD: Approximately 2°.

EYEPIECE: Inverting, adjustable, with cross hairs.
FOCUS: Adjustable.
TELESCOPE (auxiliary).
POWER: Approximately 4 diameters (in combination with eyepiece of main telescope).
FIELD: Approximately 10°.

SCALES
ELEVATION: Graduated in whole degrees, vernier reading to .1°.
AZIMUTH: Graduated in whole degrees, vernier reading to .1°; range, 360°.

SIGHTS: Fixed, for sighting vertical angles up to 45°; extension, for sighting vertical angles up to 85°.

ILLUMINATION: 3 incandescent lamp assemblies; current supplied by 2 Batteries BA-30.

ACCESSORY EQUIPMENT: Tripod ML-78-(*).
Theodolite Mount ML-180.

PRINCIPAL COMPONENTS

Theodolite ML-47-(*), (any model except ML-47-R)
Compass ML-197
Telescope ML-146

WEIGHTS AND VOLUMES

	Unpacked	Export packed
Total weight (lb).....	41.2	85.9
Total volume (cu ft).....	1.8	3.9

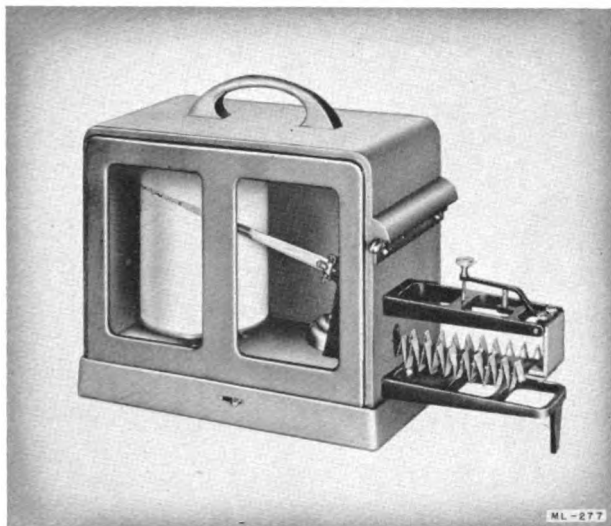


Figure 49. Thermograph ML-277.

Status: Standard. *Stock No.:* 7A1797. *Reference:* TM 11-426.

Thermograph ML-277 is a portable instrument which produces a record, continuous over a period of 1 day or 1 week, of temperatures within the range between -80° F. and $+50^{\circ}$ F. or between -50° F. and $+80^{\circ}$ F. Thermograph ML-277 is intended for arctic use; it is similar to Thermograph ML-77 which is designed for general use.

TECHNICAL CHARACTERISTICS

TEMPERATURE-SENSITIVE ELEMENT: Bimetallic strip, Invar and brass; early models have corrugated radiation fins.

RECORDING ELEMENT: Pen, actuated through a system of linkages.

CHART DRIVE: Clock ML-279; 8-day movement with 29-hour and 176-hour gear pinions (the daily gears normally are not used).

CHARTS (Weekly): Thermograph Chart ML-234, range -50° F. to $+80^{\circ}$ F.

Thermograph Chart ML-233, range -80° F. to $+50^{\circ}$ F.

CHART GRADUATIONS: Temperature: 1° F. divisions, labeled at 10° intervals; a reading to $.1^{\circ}$ F. can be taken. Time: 2-hour interval divisions.

CONTINUITY OF RECORD: 1 week or 1 day, depending on gears used.

RANGE OF RECORD: 130° F. (-80° F. to $+50^{\circ}$ F. or -50° F. to $+80^{\circ}$ F.).

ACCESSORY EQUIPMENT: Ink, low temperature (Sig C stock No. 7A1099). (Not furnished with ML-277.)

Oil, low temperature (Sig C stock No. 7A1977/01).

Thermograph Chart ML-234, -50° F. to $+80^{\circ}$ F. (Sig C stock No. 7A5291-234).

Thermograph Chart ML-233, -80° F. to $+50^{\circ}$ F. (Sig C stock No. 7A5291-233).

WEIGHTS AND VOLUMES

	Unpacked	Export packed
Total weight (lb).....	10	18
Total volume (cu ft).....	.36	1.2 (approx)

ML-307(*)/AP

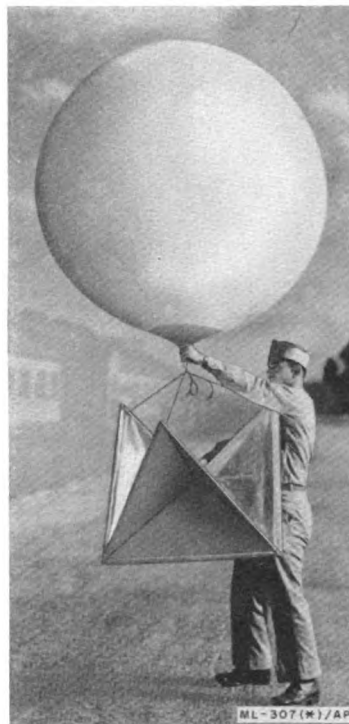


Figure 50. Pilot Balloon Target ML-307/AP or ML-307A/AP ready for flight.

Status: Standard. *Stock No.:* 7A1237. *Reference:* TM 1-235.

Pilot Balloon Target ML-307(*)/AP represents Pilot Balloon Targets ML-307/AP, ML-307A/AP, and ML-307B/AP. Pilot Balloon Target ML-307(*)/AP is a reflector which is attached to a 100- or 350-gram pilot balloon to assist in tracking it by radar. It is composed of a combination of triangular-shaped surfaces constructed of light, paper-backed aluminum foil supported by balsa sticks; it weighs approximately 100 grams. The target folds into a flat triangle for shipment. Pilot Balloon Target ML-307(*)/AP is designed to function best with Radio Sets SCR-584 (any model), SCR-545 (tracking components), and SCR-614 (any model). The targets are packed 24 to a shipping container.

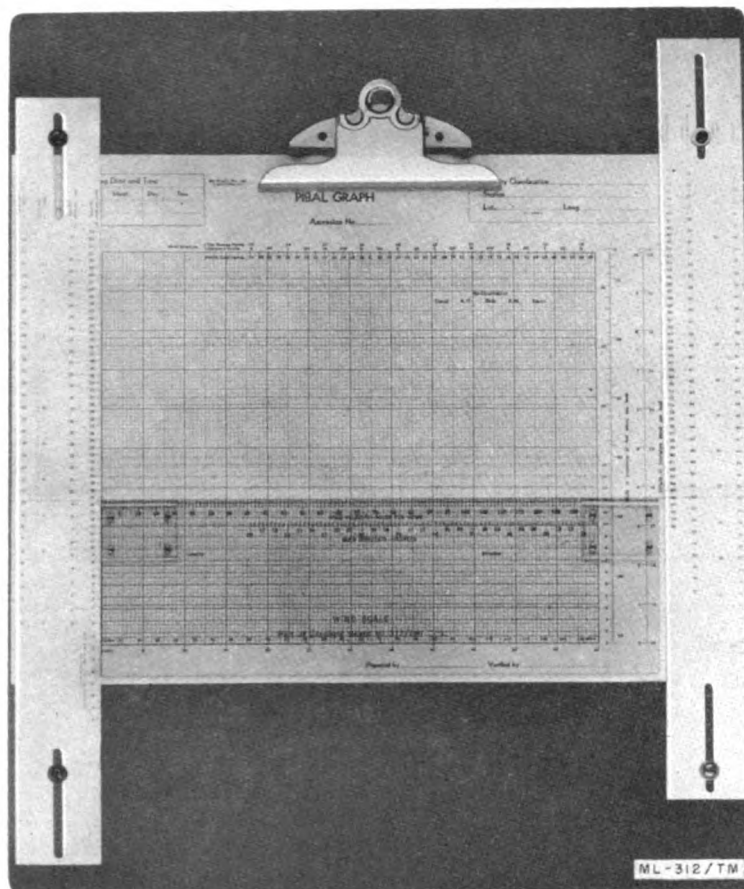


Figure 51. Graphing Board ML-312/TM.

Status: Standard. *Stock No.:* 7A979-312. *Reference:* TM 11-2429.

Graphing Board ML-312/TM is meteorological plotting equipment designed specifically for plotting wind-direction and wind-speed curves directly on Winds Aloft Graph, SC Form 426A (Sig C stock No. 6D426A), which is prepared from winds aloft observations, or on Form WBAM-20A. The

graphing board has provisions for securing the graph in the proper position and includes scales for plotting data obtained by rawin or by 30- or 100-gram balloon pibal observations. Velocities of winds at standard levels readily can be obtained from the wind-direction and wind-speed curves of a completed graph.

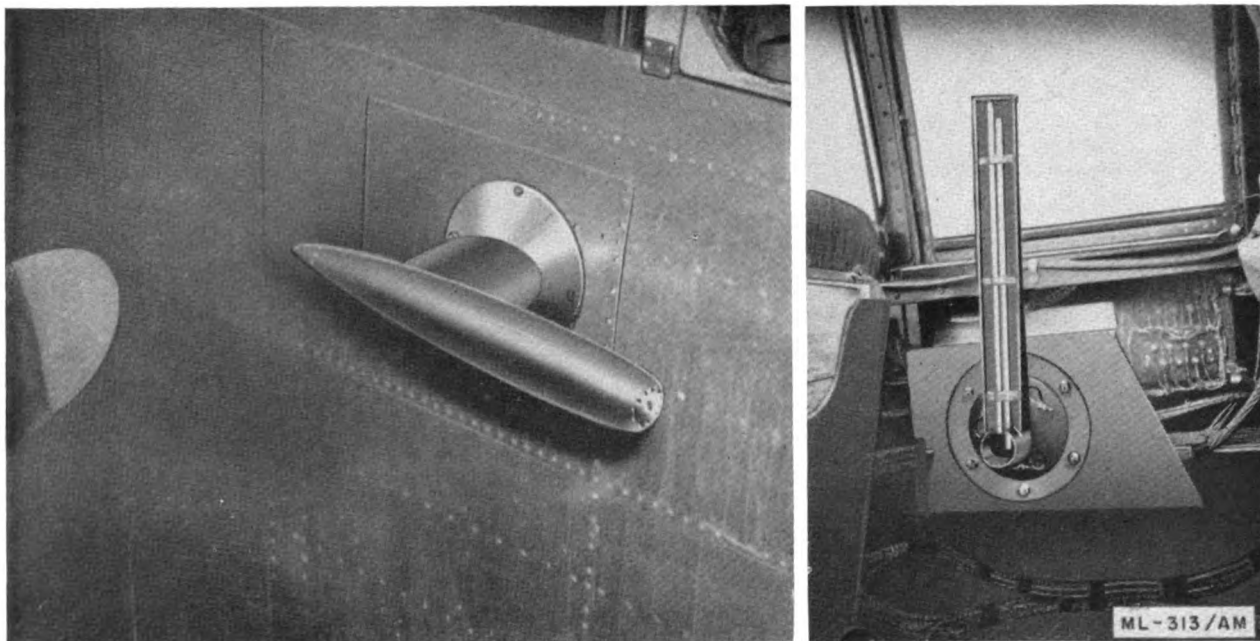


Figure 52. Psychrometer Equipment ML-313/AM, components.

Status: Standard. *Stock No.* 7A1322-313. *Reference:* TM 11-2415.

Psychrometer Equipment ML-313/AM is designed for installation on aircraft. A ventilator mounted on the fuselage holds a psychrometer support so that the two thermometer bulbs (a wet and a dry) are exposed in the air stream and the thermometer scales are inside the cabin where they can be read easily. Calculating devices are provided as part of the equipment to simplify the evaluation of the observed data. The relative humidity, dew point, vapor pressure, and temperature of the atmosphere at the level of flight can be determined from the thermometer readings. The data thus obtained are used as standards to calibrate aerographs or other airborne humidity and temperature measuring devices.

TECHNICAL CHARACTERISTICS

THERMOMETERS

TYPE: Right-angle; mercury-in-glass; wet-bulb and dry-bulb.

RANGES: From -35°C to $+15^{\circ}\text{C}$; from $-.2^{\circ}\text{C}$

to $+50^{\circ}\text{C}$ (thermometers are provided in two ranges).

ACCURACY: $\pm .1^{\circ}\text{C}$.

SCALES: Centigrade, graduated in intervals of $.1^{\circ}$.

SUPPORT: Aluminum; lucite retainers and clamps; wire thermometer guards; bayonet-clutch type attachment to ventilator.

VENTILATOR: Aluminum; streamlined; double, conical air passage.

PRINCIPAL COMPONENTS

- 5 Thermometers, $-.2^{\circ}\text{C}$ to $+50^{\circ}\text{C}$ (3 spares) (Sig C stock No. 7A1322-313/T1).
- 5 Thermometers, -35°C to $+15^{\circ}\text{C}$ (3 spares) (Sig C stock No. 7A1322-313/T2).
- 2 Supports
 - 1 Ventilator
 - 1 Carrying case
 - 1 Air Speed Calculator ML-324/UM
 - 1 Pressure Calculator ML-323/UM
 - 1 Psychrometer Calculator ML-322/UM
 - 1 Case CY-295/UM (not supplied with all equipments)

WEIGHT AND VOLUME

Total weight (lb).....	72	<i>Domestic packed</i>
Total volume (cu ft).....		6.5

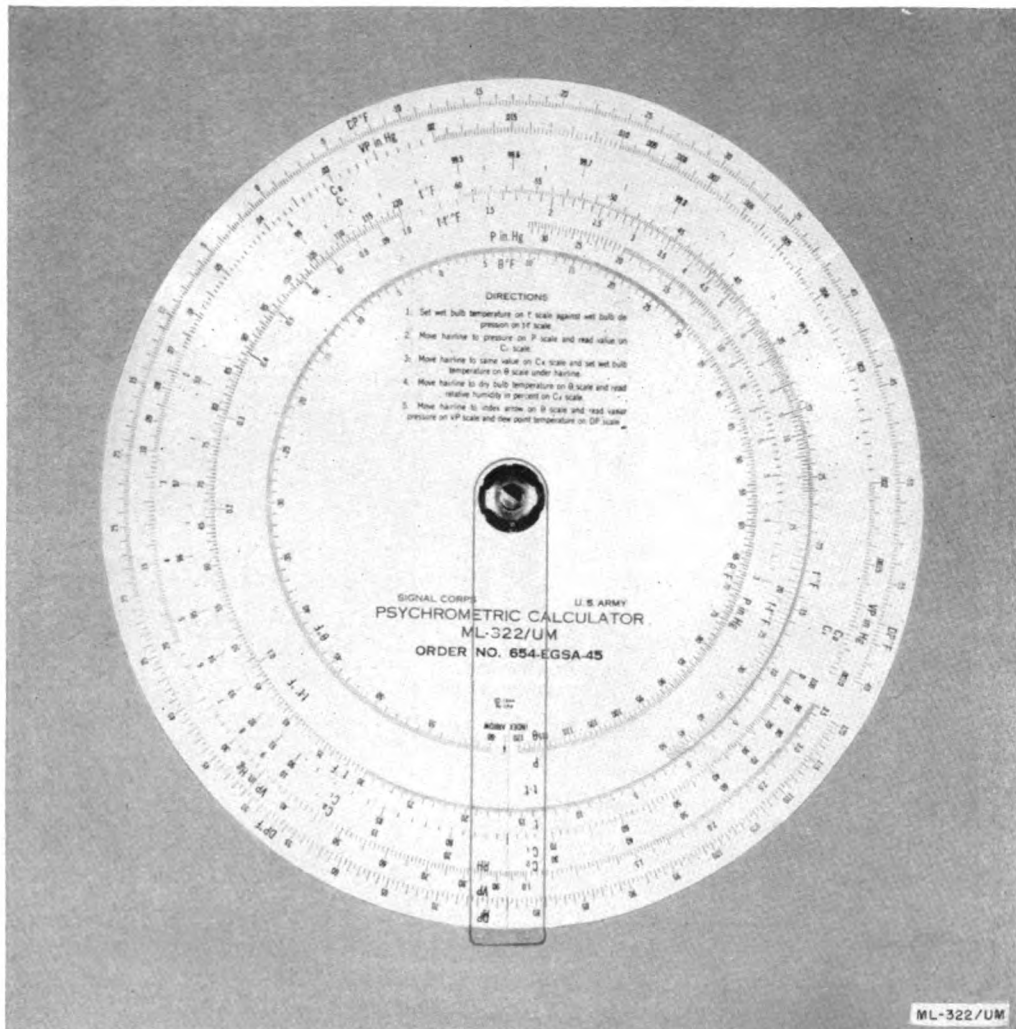


Figure 53. Psychrometric Calculator ML-322/UM, front.

Status: Standard. *Stock No.:* 7A5895-322. *Reference:* TM 11-2422.

Psychrometric Calculator ML-322/UM is a special, circular slide rule which eliminates most of the mathematics usually involved in using psychrometric tables or applying psychrometric formulas. It is used primarily to compute relative humidity, dew point, and vapor pressure from observed dry- and wet-bulb thermometer readings and atmospheric pressure readings. It is used, also, with airborne humidity-measuring devices to correct the indicated values of relative humidity for the dynamic effects of air speed. The calculator may be used for centigrade—Fahrenheit conversions, for millibar—_inches or millibar—millimeters of mercury conversions, and for ordinary multiplication and division. Directions for its use are printed on the calculator. Psychrometric

Calculator ML-322/UM is a component of Aerograph Equipments AN/AMQ-2(*) and AN/AMQ-3 and of Psychrometric Equipment ML-313/AM.

TECHNICAL CHARACTERISTICS

- RANGES:** Temperature in degrees F., -60° to $+120^{\circ}$.
 Pressure in in. of mercury, 3.0 to 32.5.
 Temperature in degrees C, -40° to $+50^{\circ}$.
 Pressure in mb, 100 to 1,000.
- READINGS:** Temperature scales can be read to .1°.
 Pressure scales can be read to .1 in. Hg and to nearest 5 mb.
 Vapor pressure scales can be read to 3 significant figures in both in. Hg and mb.
 Relative humidity can be read to nearest whole percent; fractions of a percent can be estimated.
- ACCURACY:** Relative humidity, ± 1 percent.
 Dew point, $\pm .2$ percent.
 Vapor pressure, ± 5 in third significant figure.

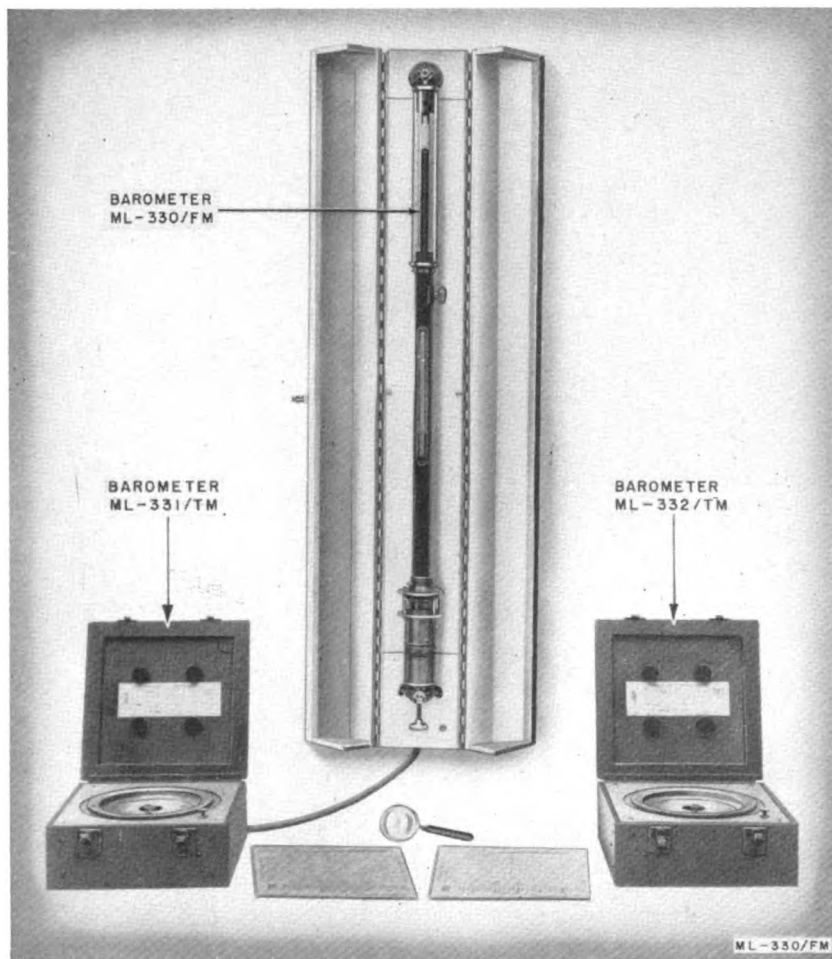


Figure 54. Set of barometers (ML-330/FM, ML-331/TM, and ML-332/TM) for use in weather squadron headquarters.

Status: Standard. *Stock No.:* 7A317-330. *Reference:* TM 11-2421.

Barometer ML-330/FM is a mercurial barometer of laboratory precision which is individually calibrated by comparison with the United States Army primary-standard barometers at Evans Signal Laboratory. It is available in two ranges, one for general use and one for use in high altitudes. It is mounted in a metal case which is equipped with fluorescent lights that illuminate the upper part of the glass tube and the cistern of the barometer; a thermometer is attached to the casing. A special carrying case for transporting the barometer is provided. Barometers ML-331/TM, ML-332/TM, and ML-333/TM, precision aneroid barometers which have different ranges, are used

- Actual scale range*
1. { 23.5 to 32.8 in. Hg (9.3 in.).
800 to 1,110 mb (310 mb).
 2. { 21.2 to 32.8 in. Hg (11.6 in.).
717 to 1,110 mb (393 mb).

in conjunction with Barometer ML-330/FM. Three barometers, one Barometer ML-330/FM and a pair of these aneroid barometers (in any combination of ranges), comprise a set of standard reference barometers; a set is used in each weather squadron headquarters of the Air Weather Service. Barometer ML-330/FM is installed permanently in the weather squadron headquarters as the standard for the region; the pair of aneroid barometers is used in the field to check station barometers.

TECHNICAL CHARACTERISTICS

TYPE: Mercury, Fortin-type (adjustable cistern).
RANGE OF SCALES (Barometer ML-330/FM is issued in one of two scale ranges):

- Effective scale range*
- 23.7 to 31.3 in. Hg (7.6 in.).
 - 805 to 1,060 mb (225 mb).
 - 21.5 to 31.3 in. Hg (9.8 in.).
 - 725 to 1,060 mb (335 mb).

INCH SCALE: Graduated in twentieths of an inch; each integral inch is numbered.

MILLIBAR SCALE: Graduated in whole millibars; 100-millibar intervals have complete numerical designation, intervening 10-millibar intervals are numbered in units of 10.

INCH VERNIER: Permits reading to .002 ($\frac{1}{500}$) in.

MILLIBAR VERNIER: Permits reading to .05 ($\frac{1}{20}$) mb.

THERMOMETER: Fahrenheit range -30° to $+130^{\circ}$; scale graduated in $\frac{1}{2}^{\circ}$ F intervals.

Centigrade range 0° to $+55^{\circ}$; scale graduated in $.2^{\circ}$ C intervals.

ASSOCIATED EQUIPMENT: Barometer ML-331/TM.
Barometer ML-332/TM.
Barometer ML-333/TM.

WEIGHT AND VOLUME

Total weight (lb) packed for transportation (Barometer ML-330/FM must be hand carried)..... 40
Total volume (cu ft)..... 1.9

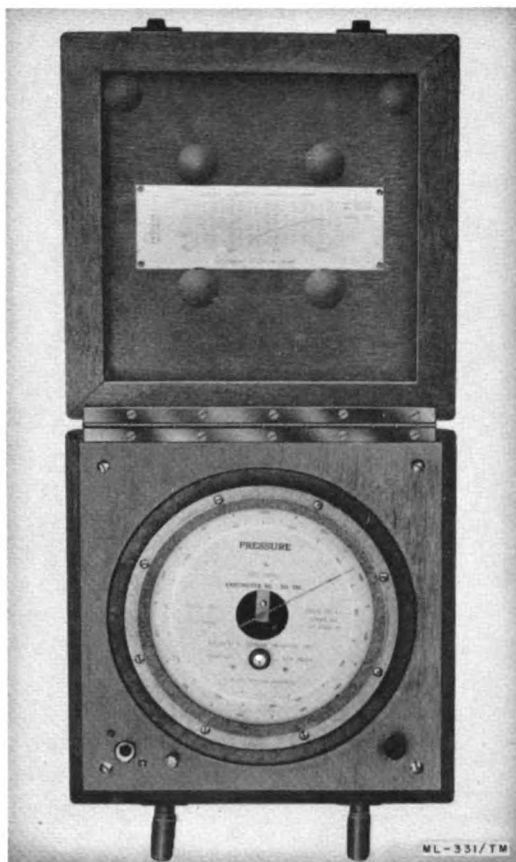


Figure 55. Barometer ML-331/TM.

Status: Standard. *Stock No.:* 7A316-331 (ML-331/TM), 7A316-332 (ML-332/TM), 7A316-333 (ML-333/TM). *Reference:* TM 11-2421.

Barometers ML-331/TM, ML-332/TM, and ML-333/TM are precision aneroid barometers identical except for their ranges and the maximum elevation at which they can be used. The aneroid mechanism, dial, and pointer of each are sealed in a metal case with a plate-glass cover. There are provisions for completely sealing this case from the outside air and for controlling the air pressure within the case when it is sealed.

The metal case is shock-mounted in a hardwood case; a padded, canvas carrying case is provided. A scale calibration chart, which represents the deviation of the instrument from the United States Army primary-standard barometers at Evans Signal Laboratory, is prepared at the laboratory for each individual instrument and supplied with it. Mercurial Barometer ML-330/FM is used in conjunction with Barometers ML-331/TM, ML-332/TM, and ML-333/TM. Three barometers, one Barometer ML-330/FM, and a pair of the aneroid barometers (in any combination of ranges), comprise a set of standard reference barometers; a set is used in each weather squadron headquarters of the Air Weather Service. Barometer ML-330/FM is installed permanently in the weather squadron headquarters as the standard for the region; the pair of aneroid barometers is used in the field to check station barometers.

TECHNICAL CHARACTERISTICS

TYPE: Aneroid; beryllium-copper, corrugated cell without spring.

RANGE:

Model	Extent of scale (mb)	Range (mb)	Approx max elevation at which instrument can be used (ft)
ML-331/TM.....	840 to 1,040.....	200	5,000
ML-332/TM.....	745 to 1,040.....	295	8,000
ML-333/TM.....	540 to 1,030.....	490	16,000

SCALE: Millibar only; graduated in half-millibars; full numerical designation every 10 millibars.

ASSOCIATED EQUIPMENT: Barometer ML-330/FM.

WEIGHT AND VOLUME

Total weight (lb) packed for transportation (Barometers ML-331/TM, ML-332/TM, and ML-333/TM must be hand-carried)..... 14
Total volume of this equipment (cu ft)..... .6

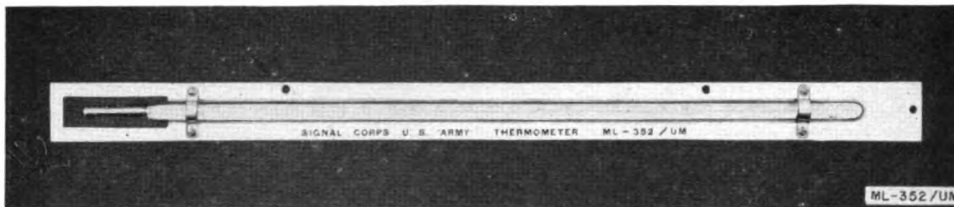


Figure 56. Thermometer ML-352/UM.

Status: Standard. Stock No.: 7A1814/352.

Thermometer ML-352/UM is a thallium amalgam-in-glass thermometer intended for arctic use. It has a range from -65°F . to $+35^{\circ}\text{F}$.; a chamber in the top of the tube permits expansion of the thermal element in temperatures up to $+160^{\circ}\text{F}$. without damage to the instrument.

TECHNICAL CHARACTERISTICS

THERMAL ELEMENT: Thallium amalgam.

SCALE: Range, -65°F . to $+35^{\circ}\text{F}$.

Graduations, whole degrees and half degrees.

ACCURACY: $\pm 3^{\circ}\text{F}$.

REPEATABILITY: $\pm .02^{\circ}\text{F}$.

READABILITY: $\pm .02^{\circ}\text{F}$., throughout range.

ML-353/AM

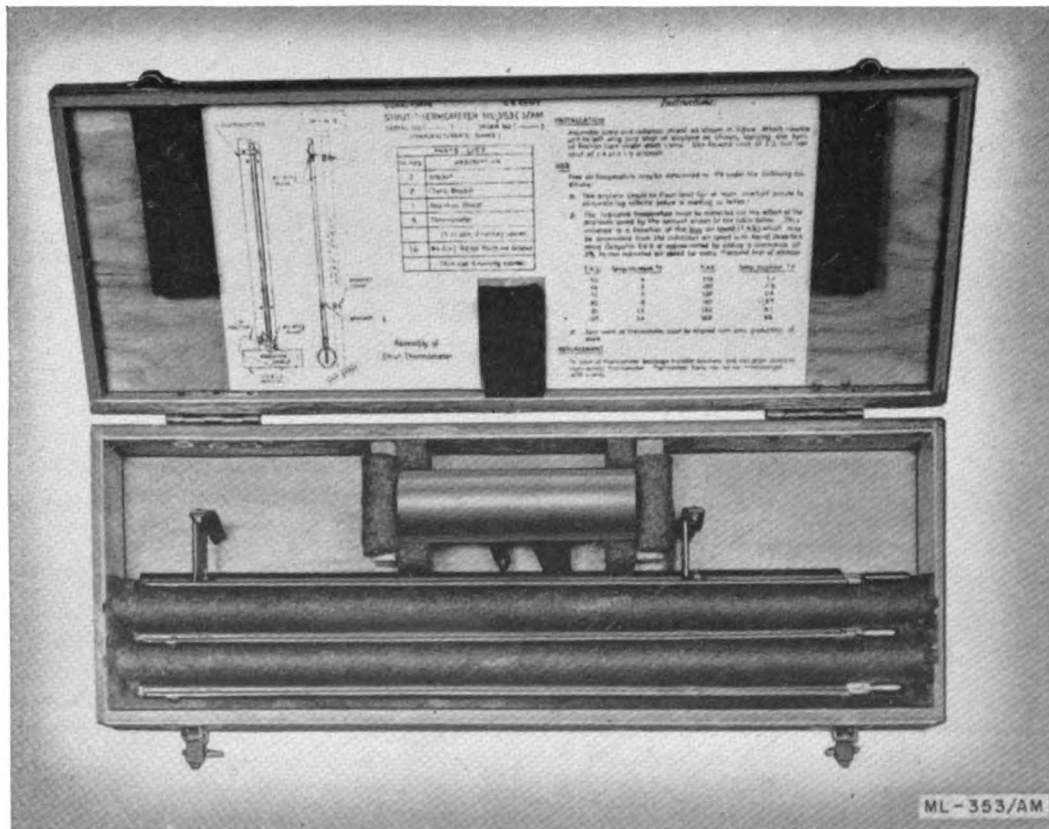


Figure 57. Strut Thermometer ML-353/AM, in carrying case.

Status: Standard. Stock No.: 7A1815-353.

Strut Thermometer ML-353/AM is a lens-type, liquid-in-glass thermometer with a radiation shield. It is mounted externally on L-2, L-4, or L-5 aircraft to measure the temperature of the free air. The range of the thermometer is between -40°F and $+120^{\circ}\text{F}$. The equipment includes

two spare thermometers and a carrying case. Instructions for the installation and use of the thermometer are mounted in the lid of the case.

WEIGHT AND VOLUME

Total weight (lb)	Unpacked 6 (approx)
Total volume (cu ft) .....	.38



Figure 58. Mobile Meteorological Station SCM-1, in use.

Status: Standard. *Stock No.:* 7A1200-1A. *Reference:* TM 11-2409.

Mobile Meteorological Station SCM-1 is a complete weather station designed for making observations in the field. All the equipment is contained and transported in, or transported in or on, a van-type, 2½-ton, 6 by 6 truck (certain of the components must be removed from the truck and set up outside for operation). Meteorological data can be obtained on the direction and speed of surface winds and winds aloft, barometric pressure, air temperature, relative humidity, amount of precipitation, and ceiling height. Communication facilities, map-display equipment, and the necessary charts, tables, and supplies for preparing weather forecasts are included. Four cabinets, a storage chest, and a plotting table are built into the truck; there are provisions for the inclusion of teletypewriter and radiosonde equipment. The station may be operated from an ordinary, 110- to 115-volt, alternating-current power source or from an independent power unit that is supplied with the station.

PRINCIPAL COMPONENTS

Barograph ML-3, modified, and Mounting ML-178, modified.

Barometer ML-2, mounted in Case ML-48, modified.

Barometer ML-102.

Ceiling Light Projector ML-318/TMQ-2.

Clinometer ML-119.

Clock.

Gauge ML-217 and Support ML-209.

Pibal equipment, including meteorological balloons and associated equipment; Generator ML-185 and associated equipment; Inflation Shelter S-13/TM; and Plotting Board ML-122 with Rule ML-126 and Scale ML-177.

Power Unit PE-75-().

Psychrometer ML-24.

Theodolite ML-247 and Tripod ML-78 (*).

Timing and Telephone Set ML-110.

Truck K-53.

Wind indicating equipment, including Wind Transmitter ML-203-B, Wind Panel ML-204-B, and Support ML-206-B.

AUXILIARY EQUIPMENT

Note. Space and suitable mountings are provided in the truck for the following equipment which is not furnished with Mobile Meteorological Station SCM-1:

Radiosonde AN/AMT-1.

Radiosonde Receptor AN/FMQ-1.

Teletypewriter TG-7-B.

WEIGHT AND VOLUME

Total weight (lb).....	16,000
Total volume (cu ft).....	1,600
Ship tons.....	40

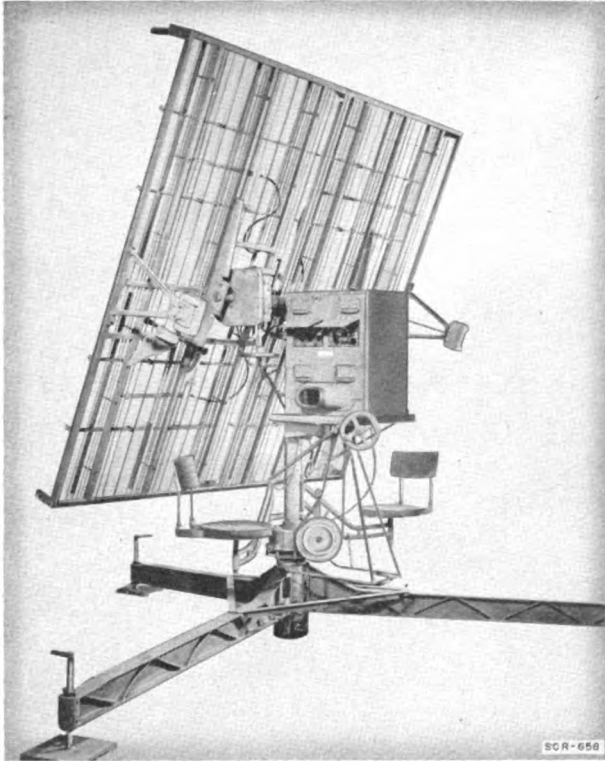


Figure 59. Radio Set SCR-658, less power unit.

Status: Standard. *Stock No.:* 7A1331-658. *Reference:* TM 11-1158A.

Radio Set SCR-658 is a transportable radio direction finder used to track balloon-borne radio transmitters. It is designed to operate as part of a meteorological system which determines direction and speed of winds aloft; used with a frequency-modulated radiosonde and the proper radiosonde recorder, the system also furnishes data concerning relative humidity, temperature, and atmospheric pressure at various altitudes. The information obtained is used by the United States Air Force to forecast weather conditions and to aid pilots and navigators; it is used by

ground artillery units to make corrections for the effect of atmospheric conditions on the trajectory of projectiles. The equipment consists principally of a directional receiving antenna with a lobe-switching assembly, a receiver-indicator with an oscilloscope indicator and a frequency-modulated radio receiving channel, and a power unit. Radio Set SCR-658 can be disassembled and transported on a 1-ton trailer or by airplane.

TECHNICAL CHARACTERISTICS

SIGNALS RECEIVED: F-m and c-w.

FREQUENCY RANGE: 400 to 406 mc; normal operating frequency, 403 mc.

TYPE OF PRESENTATION: 4 vertical pips on oscilloscope screen; 2 indicate azimuth, 2 elevation.

ANTENNA: Directional receiving; vertically polarized dipole array with screen reflector; consists of thirty-two $\frac{1}{2}$ -wavelength elements spaced $\frac{1}{2}$ wavelength apart, arranged in 4 bays.

ANTENNA SWITCH: Provides lobe switching for double-tracking in both azimuth and elevation; driven by synchronous-type, 1,800-rpm motor.

POWER REQUIREMENT: 115-v or 230-v, 50- to 70-cyc ac.

POWER CONSUMPTION: 245 w (approx).

POWER SOURCE: PE-214-B or commercial.

OPERATORS REQUIRED: 1 or 2.

USED WITH: Radiosondes AN/AMT-2 and AN/AMT-2A.

Radiosonde Receptors AN/FMQ-1, AN/FMQ-1A, and AN/FMQ-2.

PRINCIPAL COMPONENTS

- 1 Antenna AN-159
- 1 Support FT-478
- 2 Antenna Switch Assembly SW-231 (1 spare)
- 2 Receiver Indicator BC-1364 (1 spare)
- 2 Power Unit PE-214-B (1 spare)
- 1 Shelter HO-29
- 1 Trailer Adapter Kit (Sig C stock No. 7A1331-658-K1)
- 8 Chests (for transporting equipment)

WEIGHTS

	Unpacked	Domestic Packed	Export Packed
Total weight (lb).....	1,000	2,129	5,511

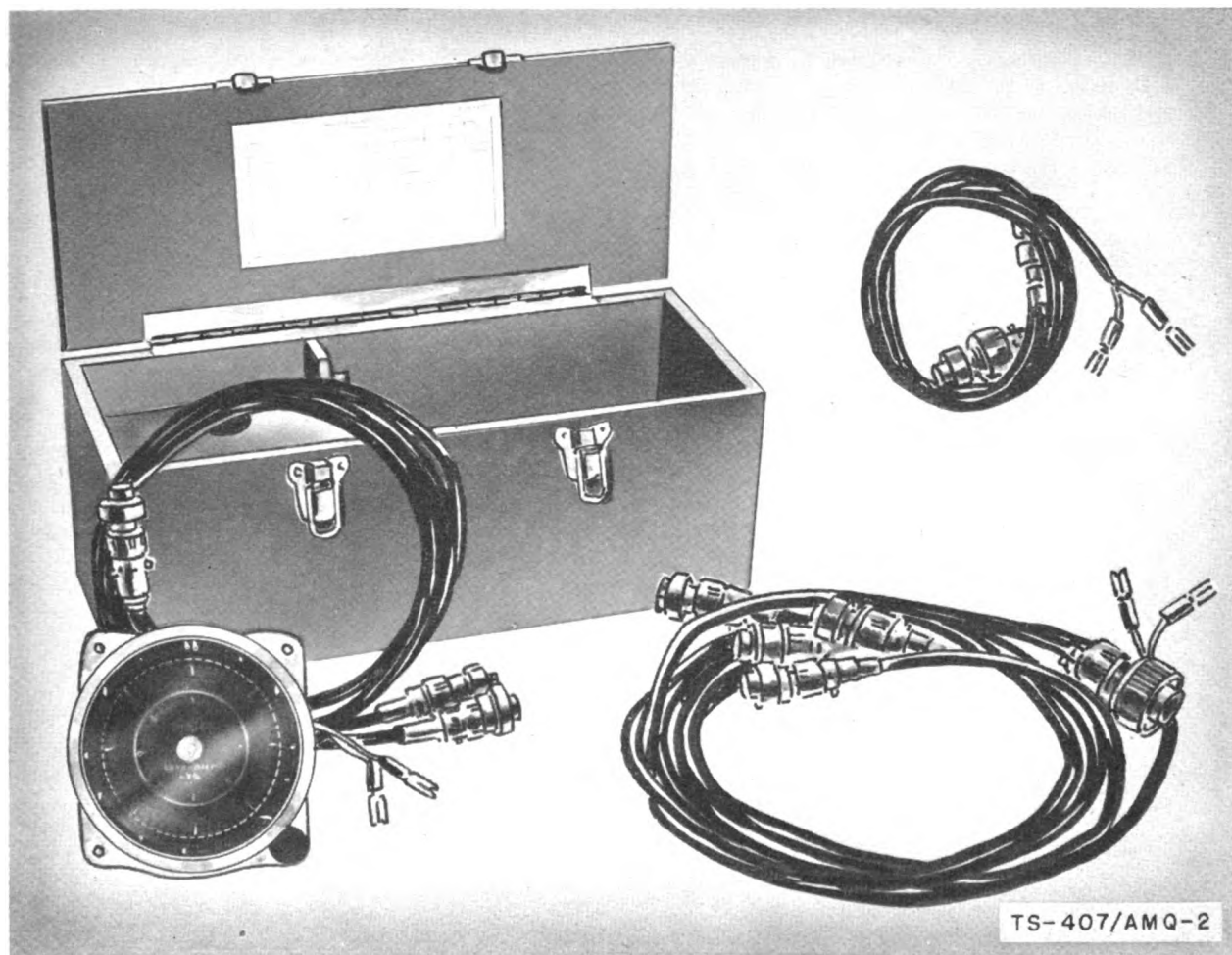


Figure 60. Aerograph Calibration Set TS-407/AMQ-2.

Status: Limited/Std. *Stock No.:* 7A8114-407.
Reference: TM 11-2428.

Aerograph Calibration Set TS-407/AMQ-2 is used exclusively to test and calibrate the self-synchronous transmitter, receiver, and indicator units of Aerograph Equipments AN/AMQ-2 and AN/AMQ-2A. The major component of the set is a master self-synchronous test unit which contains a self-synchronous motor with a pointer attached to the end of the rotor shaft. The pointer operates over a dial with five concentric scales, four calibrated for the various functions of the aerograph equipment, the fifth, a reference scale for the others. The unit may be used as a master transmitter or as a master indicator. Flexible cables for making electrical connections between the master self-synchronous unit and the instruments to be tested or calibrated are provided. The equipment is contained in a wooden carrying case.

Note. Aerograph Calibration Set TS-643/AMQ-2A (Sig C stock No. 7A8114-643) is identical to Aerograph Calibration Set TS-407/AMQ-2 except for the spacing of the temperature scale markings on the dial. It has the same characteristics and serves the same purposes.

TECHNICAL CHARACTERISTICS

FUNCTIONS

TESTS OR CALIBRATES: Temperature-Humidity Transmitter ML-317/AMQ-2 (both functions).
Pressure-Air Speed Transmitter ML-319/AMQ-2 (both functions).
Aerograph Recorder ML-320/AMQ-2.
Aerograph Recorder ML-320A/AMQ-2.
Temperature Indicator ML-271/AMQ-2.
Humidity Indicator ML-272/AMQ-2.

SCALES

FIRST (outside scale): Graduated in degrees of a circle, from 0° to 360°, in 1° intervals; numerical designations at 20° intervals; used as a reference for all other scales.

SECOND: Graduated in millibars from 200 mb to 1060 mb, in 5 mb intervals; numerical designations at 100 mb intervals; used for atmospheric pressure indications.

THIRD: Graduated in degrees centigrade, from -70° to +50°, in 1° intervals numerical designations at 10° intervals; used for temperature indications.

FOURTH: Graduated in miles per hour from 70 mph to 300 mph, in 5 mph intervals; numerical designations at 50 mph intervals; used for air-speed indications.

FIFTH: Graduated for percent relative humidity, from 10 percent to 100 percent; each interval represents 5 percent; numerical designations every second interval; used for indications of relative humidity.

ACCURACY: To $\pm\frac{1}{2}^\circ$ of arc; to $\pm\frac{1}{4}^\circ$ of arc (required for pressure and temperature functions) with use of correction card.

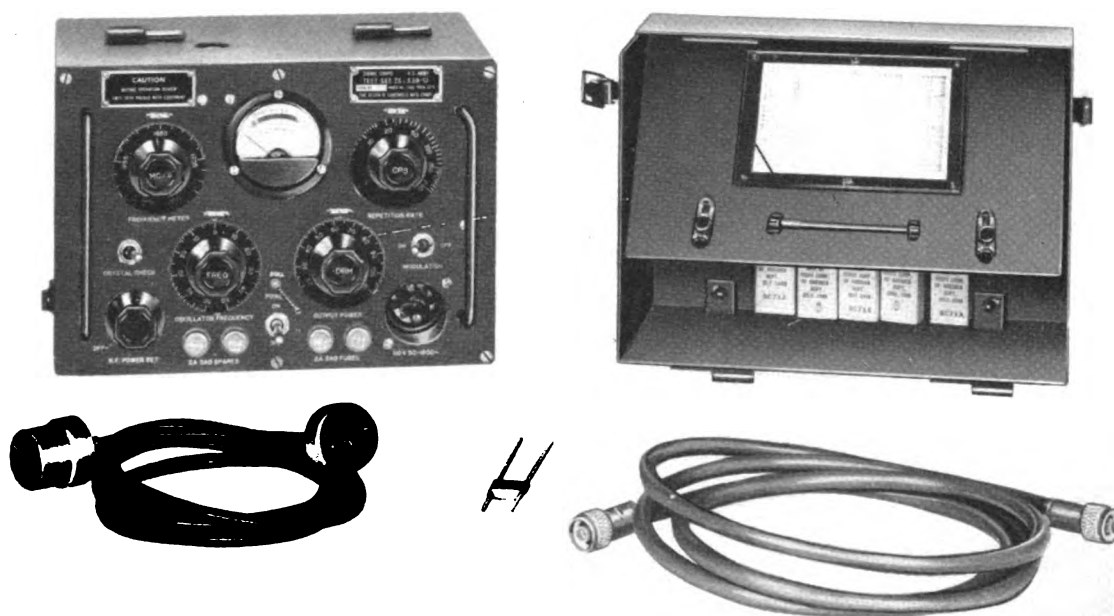
POWER REQUIREMENT: Transmitters—26-v or 40-v, 400-cyc ac.

Recorders—40-v, 400-cyc ac (Use the voltage for which the recorder is wired, 26-v or 115-v, 400-cyc ac; the transformer of the recorder will deliver 40-v, 400-cyc ac to the unit).

Indicators—26-v, 400-cyc ac only.

WEIGHTS AND VOLUMES

	<i>Unpacked</i>	<i>Export packed</i>
Total weight (lb).....	9.75	12
Total volume (cu ft).....	.36	.5



TS-538/U

Figure 61. Test Set TS-538/U, with accessories.

Status: Standard. Stock No.: 3F4325-538.
Reference: TM 11-5014.

Test Set TS-538/U is a portable, self-contained unit designed for use as a signal generator, frequency meter, and power monitor. It is used to test the operation of radiosonde equipment and may be used also to check the power output of transmitters and the bandwidth, alignment, and sensitivity of receivers which operate within its frequency range. Test Set TS-538/U is intended specifically to measure the frequency and power output of Radiosonde Transmitter T-93/AMT-4 (part of Radiosonde AN/AMT-4) and to measure the sensitivity, bandwidth, and tracking accuracy of Rawin Set AN/GMD-1.

TECHNICAL CHARACTERISTICS

- OSCILLATOR OUTPUT FREQUENCY: 1,630 to 1,730 mc.
- TYPES OF OSCILLATOR OUTPUT: Cw or interrupted cw.
- DURATION OF INTERRUPTION: Adjustable, from 40 to 60 microseconds.

- FREQUENCY OF INTERRUPTION: 5 to 200 times per second (depends on duration of interruption).
- OUTPUT POWER: -20 to -107 dbm (controlled by calibrated attenuator).
- ATTENUATOR ACCURACY: ± 1 dbm from -20 to -70 dbm.
 ± 3 dbm from -70 to -107 dbm.
- RANGE OF FREQUENCY METER: 1,630 to 1,730 mc.
- ACCURACY OF FREQUENCY METER: ± 2 mc.
- POWER MONITOR SENSITIVITY: 150 to 250 mw at 10 inches.
- TYPES OF TUBES: Blocking oscillator 6J6.
Multivibrator 6J6.
Cathode follower 6J6.
R-f oscillator A-2352.
Voltage regulator 0B2.
Rectifier 6X4.

POWER REQUIREMENT: 117-v ± 10 percent, 50 to 1,600 cps ac.

WEIGHTS AND VOLUMES

	Unpacked	Export packed
Total weight (lb).....	23.5	40
Total volume (cu ft).....	.7	2.9

CHAPTER II

MISCELLANEOUS METEOROLOGICAL ITEMS

AM-7()/FMQ-1, Amplifier: Electronic, includes preamplifier unit; feeds Radiosonde Recorder RD-3(*)/FMQ-1; mounts in Rack Assembly MT-47(*)/FMQ-1 or MT-678/FMQ-2; 10 x 19 x 8½ in. P/o Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2.

Sig C stock No.: 7A46-7.

Status: Standard.

AS-11()/FMQ-1, Antenna Assembly: Receiving, dipole type; frequency, 72.2 mc; input impedance 75 ohms; 200-ft coaxial transmission line feed; 1-piece metal construction, approx 11 ft lg x 5 in. diam. P/o Radiosonde Receptor AN/FMQ-1(*).

Sig C stock No.: 7A1326/A1.

Status: Limited/Std.

AS-389/FMQ-2, Antenna Assembly: Receiving; vertical, half-wave, concentric dipole-type composed of two quarter-wavelength sections; center frequency 400 mc; characteristic impedance approx 52 ohms; 100-ft coaxial transmission line feed with characteristic impedance of 52 ohms. P/o Radiosonde Receptor AN/FMQ-2.

Sig C stock No.: 2A264-389.

Status: Standard.

CN-2()/FMQ-1, Voltage Regulator: Regulates 90-v to 130-v a-c input to constant 115-v a-c output under load; 5¼ x 13 x 5¼ in. P/o Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2.

Sig C stock No.: 7A1680.

Status: Standard.

CY-295/UM, Case (fig. 64): Canvas; designed for carrying Psychrometric Calculator ML-322/UM, Air Speed Calculator ML-324/UM, Pressure Calculator ML-323/UM, and forms and stationery; 14½ x 12 x 2 in. P/o Psychrometer Equipment ML-313/AM and Aerograph Equipment AN/AMQ-2(*).

Sig C Stock No.: 7A451-295.

Status: Standard.

MC-191, Typewriter: Standard, nonportable typewriter fitted with special keys and type bars; lower-case position agate type, all capitals; upper-case position numerals and weather symbols. Used to make copies of material received

via, or for transmission via, weather teletype networks:

Sig C stock No.: 7A1933-191.

Status: Standard.

MK-27/FMQ-1 Expendable Hardware Items: Cable, connectors, clamps, lugs, and hardware for field maintenance and repair of radiosonde Receptors AN/FMQ-1(*) and FMQ-2.

Sig C stock No.: 7A980-27

Status: Standard.

ML-27, Register: Four-purpose, electromechanical recording instrument; produces continuous record, on single chart, of wind direction, wind speed, rainfall, and duration of sunshine (sunshine recorder not used); includes means of determining approx instantaneous wind speed. U/w Support ML-29, Gauge ML-30, and Anemometer ML-80.

Sig C stock No.: 7A1327.

Status: Limited/Std.

ML-30, Gauge: Tipping-bucket type, electromechanical rain gauge; measures precipitation in increments of .01 in. U/w Register ML-27 to determine amount and rate of rainfall.

Sig C stock No.: 7A930.

Status: Limited/Std.

ML-64-(), Balloon: 30-gram pilot balloon; rubber, 6-in. spherical; red.

Sig C stock No.: 7A164.

Status: Standard.

ML-81, Hose (fig. 63): Grade A, heavy rubber tubing used in inflation of meteorological balloons; ¾-in. OD x ½-in. wall thickness; 5-ft and 6-in. lengths p/o Hydrogen Generator Set AN/TMQ-3; 15-ft length u/w Balloon ML-391/AM.

Sig C stock No.: 7A981 (5-ft length); 7A981-6 (6-in. length); 7A981-10 (10-ft length); 7A981-15 (15-ft length).

Status: Standard.

ML-90, Candle (fig. 65): Stearic acid and paraffin; ¾-in. diam x 1¼ in. lg; u/w Lantern ML-91 for pilot-balloon night flights in all climatic regions.

Sig C stock No.: 7A401.

Status: Standard.

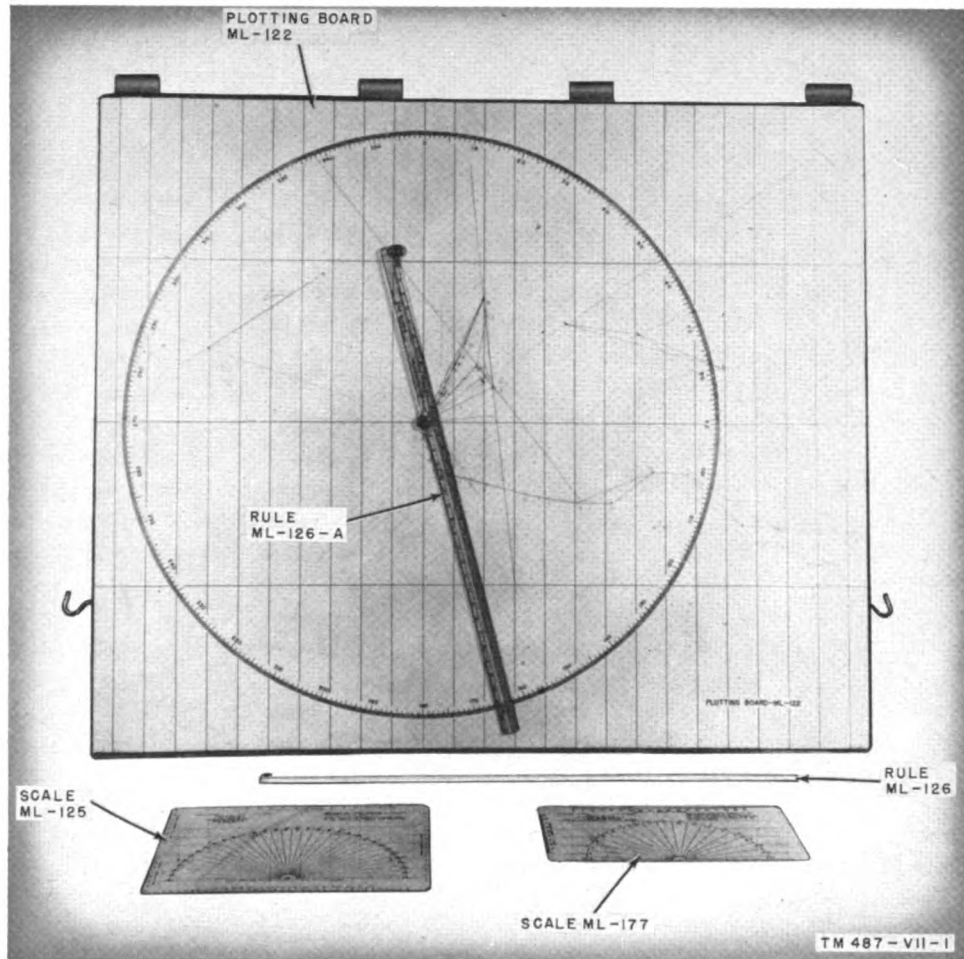


Figure 62. Pibal plotting equipment.

ML-91, Lantern (fig. 65): Paper; used with Candle ML-90 for pilot-balloon night flights.

Sig C stock No.: 7A1105.

Status: Standard.

ML-106, Chart: Equivalent potential temperature diagram, with isobars and isotherms of the condensation level. U/w meteorological ground station equipment.

Sig C stock No.: 7A506.

Status: Limited/Std.

ML-122, Plotting Board (fig. 62): Portable; plywood with phenolic surface inscribed with horizontal and vertical grid lines and an azimuth circle graduated in intervals of $.2^\circ$; 30 x 35 in. P/o Meteorological Station AN/TMQ-1 and Mobile Meteorological Station SCM-1; u/w Plotting Set AN/GMQ-3, Scale ML-125, and Rule ML-126.

Sig C stock No.: 7A1262.

Status: Standard.

ML-125, Scale (fig. 62): Used, when observations are made with 30-gram pilot balloons, with Plotting Board ML-122 to determine wind direction and speed for each zone as measured from the plot of zone winds on the plotting board.

Sig C stock No.: 7A1625.

Status: Standard.

ML-126, Rule (fig. 62): Brass (tropical use) or vinyl resin (general use); used to plot horizontal projection of balloon position for each minute after release. Approx 23 x $1\frac{1}{4}$ x $\frac{1}{8}$ in. P/o Plotting Board ML-122.

Sig C stock No.: 7A1500-126 (tropical use); 7A1500-126A (general use).

Status: Standard.

ML-129-(), Bearing: Bearing for wind vane; most models include contacts providing means of transmitting wind direction to an indicator. P/o Support ML-29-(*); a table showing models

of Bearing ML-129-(*) and Support ML-29-(*) used together is included with data on ML-29-(*).

Sig C stock Nos.: 7A367; 7A367A; 7A367B; 7A367C.

Status: Limited/Std.

ML-146, Telescope: An auxiliary object lens and swinging mirror attached to the eyepiece tube of theodolites to widen the field of view. P/o Theodolites ML-47-R and ML-247.

Sig C stock No.: 7A1760-146.

Status: Standard.

ML-155, Balloon: 30-gram pilot balloon; rubber, 6-in. spherical; orange.

Sig C stock No.: 7A175.

Status: Standard.

ML-156, Balloon: 30-gram pilot balloon; rubber, 6-in. spherical; yellow.

Sig C stock No.: 7A176.

Status: Standard.

ML-157, Balloon (fig. 63): 10-gram ceiling balloon; 3½ in. spherical; black, dark blue, or purple.

Sig C stock No.: 7A177.

Status: Standard.

ML-158, Balloon (fig. 63): 10-gram ceiling balloon; 3½ in. spherical; red.

Sig C stock No.: 7A178.

Status: Standard.

ML-159-(), Balloon (fig. 65): 100-gram pilot balloon; rubber or substitute, 16-in. spherical; white or uncolored.

Sig C stock No.: 7A179.

Status: Standard.

ML-160, Balloon: 100-gram pilot balloon; 16-in. spherical; black.

Sig C stock No.: 7A180.

Status: Standard.

ML-161, Balloon: 100-gram pilot balloon; 16-in. spherical; red.

Sig C stock No.: 7A181.

Status: Standard.

ML-162, Balloon: 700-gram sounding balloon; 48-in. spherical; uncolored.

Sig C stock No.: 7A182.

Status: Standard.

ML-169, Junction Box: Part of the wiring equipment of a synchro-type wind-indicating system; furnished completely assembled. U/w Wind Intensity Transmitter ML-151-(*) and Wind Direction Transmitter ML-152-(*).

Sig C stock No.: 7A1149A.

Status: Standard.

ML-170, Control Panel: 250-v, 30-amp general

control panel for synchro-type wind-indicating equipment; includes four 30-amp fuses, 2-pole tumbler switch with plug fusing; 20 x 19½ x 4½ in.

Sig C stock No.: 7A1220A.

Status: Standard.

ML-171, Terminal Box: Part of the accessory wiring equipment for synchro-type wind-indicating equipment; includes one 6-pole, one 2-pole, and one 5-pole, single-throw, no-fuse, knife-type battery switches. U/w Weather Panels ML-143-(*), ML-173-B, and ML-183-(*); and Recorders ML-144-(*) and ML-174-B.

Sig C stock No.: 7A1771A.

Status: Standard.

ML-177, Scale (fig. 62): Used with Plotting Board ML-122 to obtain speed and direction of wind from pilot-balloon observations; transparent plastic, 10 x 5 in.

Sig C stock No.: 7A1677.

Status: Standard.

ML-178, Mounting: Special shockmount for Barograph ML-3-(*).

Sig C stock No.: 7A1199-178.

Status: Standard.

ML-182, Chart Roll: Recording chart; paper roll 20 yd lg. U/w Radiosonde Recorder RD-3(*)/FMQ-1; (p/o Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2).

Sig C stock No.: 7A507-182.

Status: Standard.

ML-186, Nozzle (fig. 63): Used to connect 10-gram balloons to source of gas; wooden cylinder 1½ in. diam x 2½ in. h, with end fittings for attaching balloon and ¼-in. rubber tubing.

Sig C stock No.: 7A1199A-186.

Status: Standard.

ML-187, Coupling (fig. 63): Reducing fitting for connecting Hose ML-81, leading from gas source, to ¼-in. tubing leading to inflation nozzle. U/w Nozzle ML-186.

Sig C stock No.: 7A850-187.

Status: Standard.

ML-188, Tubing (fig. 63): Rubber; for inflation of ceiling balloons; ¼-in. ID, ½-in. wall, 24 in. lg. U/w Nozzle ML-186 and Coupling ML-187.

Sig C stock No.: 7A1928.

Status: Standard.

ML-193, Hydrogen Regulator (fig. 65): Consists of high-pressure gage indicating pressures from 0 to 3,000 psi, a diaphragm-type reducing valve, a low-pressure gage indicating pressures from 0 to 50 psi, and fittings for attachment to

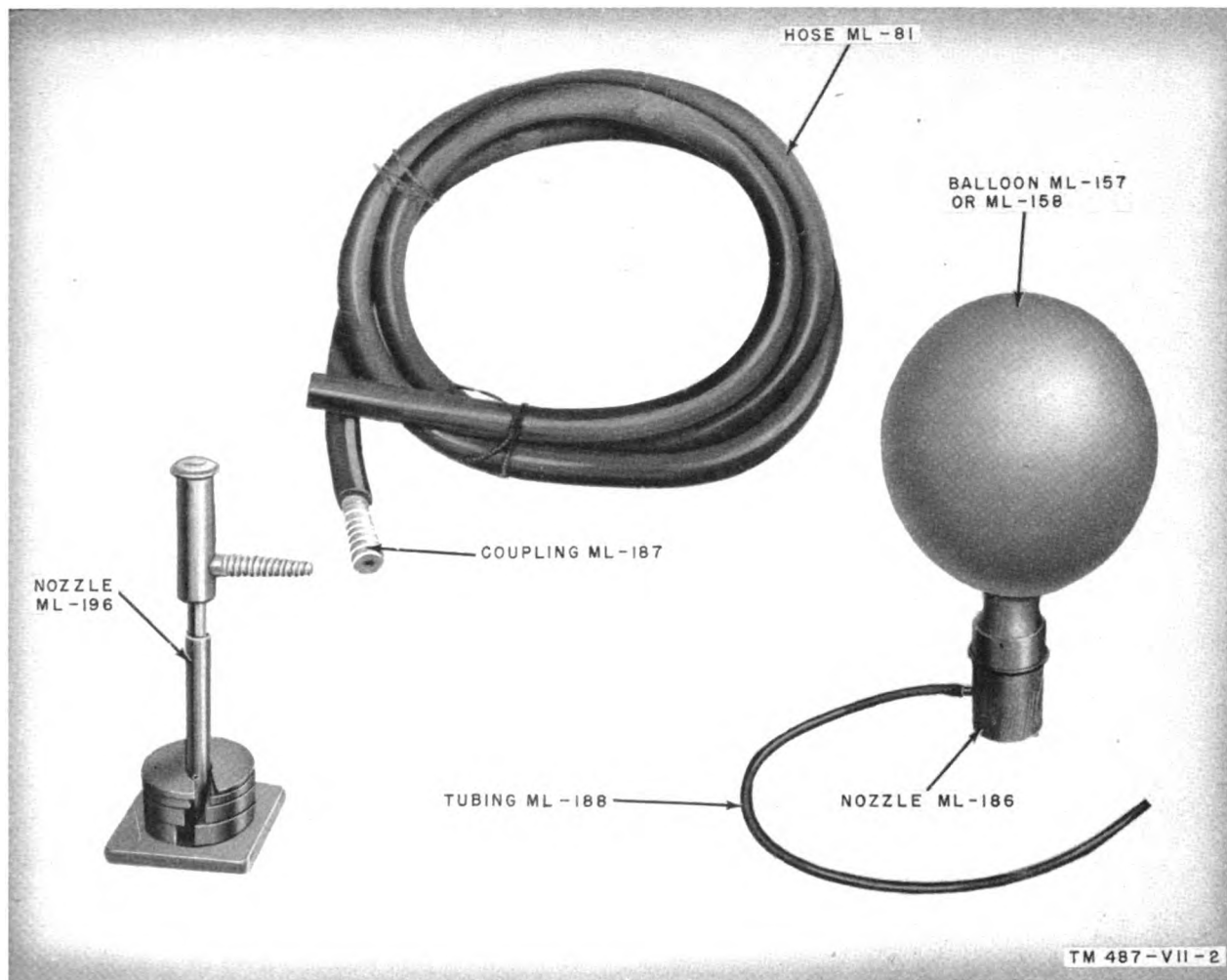


Figure 63. Balloon inflation equipment.

standard hydrogen gas cylinder (cannot be used with a hydrogen generator) and for attachment of Hose ML-81 and/or Coupling ML-49. Provides an indication of pressure within the gas cylinder, a means of throttling the rate of gas discharge, and an indication of rate of inflation of balloons.

Sig C stock No.: 7A1334-193.

Status: Standard.

ML-196, Nozzle (fig. 63): Used for inflation of sounding balloons; includes 5 extra weights. U/w Balloon ML-131 and Hose ML-81.

Sig C stock No.: 7A1199A-196.

Status: Standard.

ML-209, Support: Wooden, box-type support with removable top cover; approx 5½ x 5½ x 14 in. Used as support and shipping container for Gauge ML-217.

Sig C stock No.: 7A1743-209.

Status: Standard.

ML-211, Calibrator: Mechanical device for testing the accuracy of Wind Intensity Transmitter ML-151-(*); includes a torque wheel for installation in place of the rotor, and 12 assorted weights representing various wind intensities; components, including necessary tools, packed in carrying case.

Sig C stock No.: 7A390.

Status: Standard.

ML-212, Control Set: A remote-control system utilizing existing telephone or other circuits; consists of switch with pilot light, a heavy-duty relay, a transformer, a 12-v relay and a master switch; installation diagram included U/w Ceiling Light Projector ML-121-(*).

Sig C stock No.: 7A792.

Status: Standard.

ML-216, Hose: Braided copper, flexible, high pressure; 8 ft lg with identical couplings each end which fit Generator ML-185-(*) and standard hydrogen gas cylinder; used to transfer gas from generator to storage cylinder. U/w Hydrogen Generator ML-185-(*).

Sig C stock No.: 7A986-216.

Status: Standard.

ML-304A/TM, Calcium Hydride Charge: 90 percent calcium hydride in metal can with scored holes; threaded for attachment to Hydrogen Generator ML-303/TM. Generates hydrogen gas to inflate one 30-gram balloon to produce free lift of 155 grams. U/w Hydrogen Generator ML-303-TM and Hydrogen Generator Set AN/TMQ-3.

Sig C stock No.: 7A384-304A.

Status: Standard.

ML-305A/TM, Calcium Hydride Charge: 90 percent calcium hydride in metal can with scored holes; threaded for attachment to Hydrogen Generator ML-303/TM. Generates hydrogen gas to inflate one 100-gram balloon to produce free lift of 650 grams. U/w Hydrogen Generator ML-303/TM and Hydrogen Generator Set AN/TMQ-3.

Sig C stock No.: 7A384-305A.

Status: Standard.

ML-315/GM, Pressure-Height Slide Rule: Special slide rule, 15 in. square with movable, circular scale; rule arm has scales for pressure, temperature, altitude, and vertical temperature corrections.

Sig C stock No.: 7A1661-315.

Status: Substitute/Std.

ML-317()/AMQ-2, Temperature-Humidity Transmitter: Instrument used with associated indicator and/or recorder to measure temperature and relative humidity of the atmosphere; electrically connected to Aerograph Recorder ML-320/AMQ-2; contained in Mounting MT-321/AMQ-2 and mounted externally on aircraft. P/o Aerograph Equipment AN/AMQ-2(*).

Sig C stock No.: 7A8158-317.

Status: Substitute/Std.

ML-319()/AMQ-2, Pressure-Air Speed Transmitter: Instrument connected to the pitot-static line of an airplane to measure air speed of aircraft on which it is mounted and atmospheric pressure at level of flight; electrically connected to Aerograph Recorder ML-320/

AMQ-2. P/o Aerograph Equipment AN/AMQ-2(*).

Sig C stock No.: 7A1842-319.

Status: Substitute/Std.

ML-320/AMQ-2, Aerograph Recorder: Provides indication of immediate values and a permanent record of data obtained and transmitted by Temperature-Humidity Transmitter ML-317(*)/AMQ-2 and Pressure-Air Speed Transmitter ML-319(*)/AMQ-2; prints on Chart Roll ML-325/AMQ-2. P/o Aerograph Equipment AN/AMQ-2 (Aerograph Equipment AN/AMQ-2A uses Aerograph Recorder ML-320A/AMQ-2).

Sig C stock No.: 7A8126-320.

Status: Substitute/Std.

ML-321/AMQ-2, Scale: Determines, from record of Aerograph Recorder ML-320/AMQ-2, values of temperature, relative humidity, atmospheric pressure, and air speed that existed simultaneously at any selected time. P/o Aerograph Equipment AN/AMQ-2 (Aerograph Equipment AN/AMQ-2A uses Scale ML-412/AMQ-2A).

Sig C stock No.: 7A5950-321.

Status: Substitute/Std.

ML-323/UM, Pressure Calculator (fig. 64): A circular slide rule with special scales; used to obtain true atmospheric pressure, in millibars, at the level of flight from given values of the altitude setting in inches of mercury and the altimeter reading in feet. P/o Aerograph Equipments AN/AMQ-2(*) and AN/AMQ-3 and Psychrometer Equipment ML-313/AM.

Sig C stock No.: 7A5896-323.

Status: Standard.

ML-324/UM, Air Speed Calculator (fig. 64): A circular slide rule with special scales; converts indicated air speed to true air speed, using temperature and pressure data. P/o Aerograph Equipments AN/AMQ-2(*) and AN/AMQ-3 and Psychrometer Equipment ML-313/AM.

Sig C stock No.: 7A5896-324.

Status: Standard.

ML-325/UM, Chart Roll: Recording chart used with Aerograph Recorder ML-320(*)/AMQ-2; 10¼ in. wd x 100 ft lg. P/o Aerograph Equipment AN/AMQ-2(*).

Sig C stock No.: 7A5200-325.

Status: Substitute/Std.

ML-326/UM, Mixing Ratio Calculator: A calculating device for computing the mixing ratio; scale ranges: mixing ratio, 1 to 40 grams per kilo-

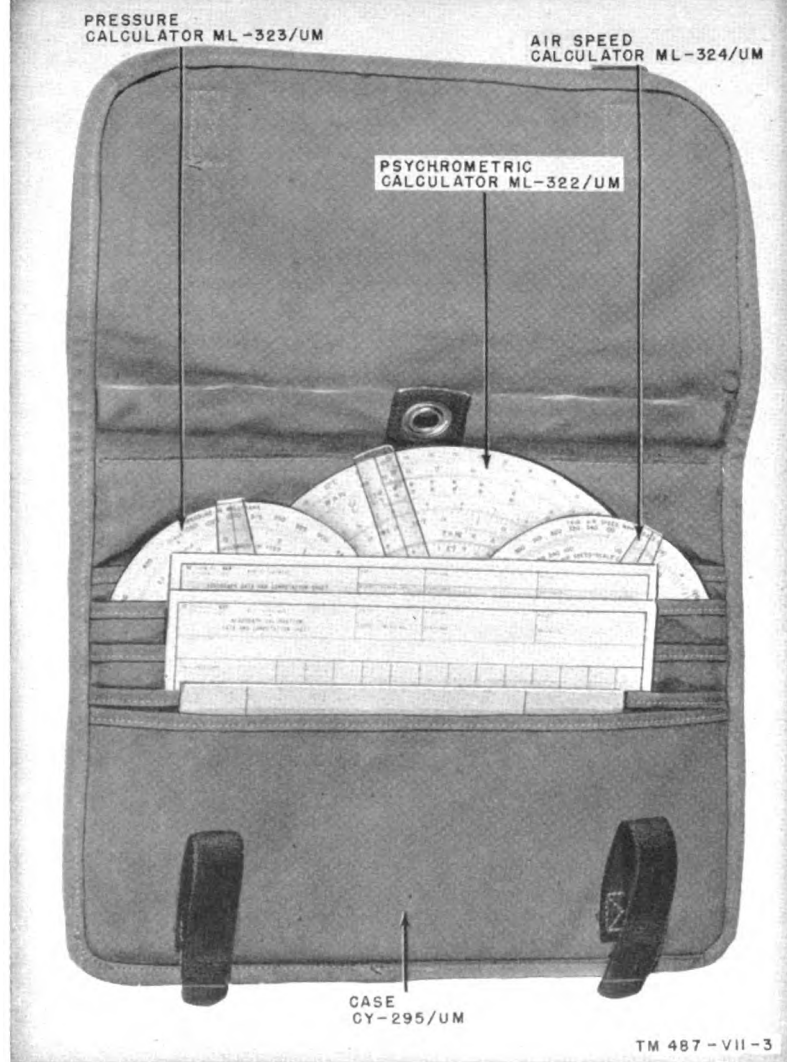


Figure 64. Case CY-295/UM, with calculators.

gram; temperature, -40°C to $+45^{\circ}\text{C}$; relative humidity, 1 percent to 100 percent; atmospheric pressure, 100 mb to 1,060 mb. P/o Aerograph Equipment AN/AMQ-2(*).

Sig C stock No.: 7A5900.

Status: Standard.

ML-351/AM, Ventilation Duct: Right-angle duct constructed of aluminum-foil-covered corrugated board; provides air circulation and protection from weather for temperature and humidity elements of Radiosonde Modulators ML-310/AMT-1, ML-310A/AMT-1, and ML-310B/AMT-1. P/o Radiosondes AN/AMT-1 and AN/AMT-2.

Sig C stock No.: 7A1935-351.

Status: Standard.

ML-357/GM, Straight Edge: Plain, transparent plastic straight edge, 12 in. lg. U/w Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2 in the evaluation of records.

Sig C stock No.: 7A1326/S1.

Status: Standard.

ML-358/GM, Straight Edge: Scoring or creasing rule; corrosion-resistant steel, 18 in. lg.; used in preparation of adiabatic charts. U/w Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2 in the evaluation of records.

Sig C stock No.: 7A1326/S2.

Status: Standard.

ML-366/UM, Scale: Vinylite scale with indications top and bottom of mean altitudes of various artillery zones in the upper air; de-

signed to be used with weather, altitude, pressure, density chart WRC-10-1.
Sig C stock No.: 7A1638-366.
Status: Standard.
ML-367/AM Launching Reel: A device on which the cord attaching a sounding balloon to a radiosonde is wound; facilitates launching balloon-borne radiosondes in winds exceeding 15 mph.
Sig C stock No.: 7A1109-367.
Status: Standard.
ML-373/GM, Balloon Nozzle: An inflation device consisting of a valve with inlet connection for attaching Hose ML-81, and two outlet nozzles; used to inflate and weigh off 30- and 100-gram meteorological balloons.
Sig C stock No.: 7A201-373.
Status: Standard.
ML-378/AM, Temperature Element: Ceramic-type resistance thermometer connected into the temperature-measuring circuit of a radiosonde modulator to measure the temperature of the upper atmosphere; range, -90° C to $+60^{\circ}$ C. P/o Radiosonde Modulators ML-310A/AMT-1 and ML-310B/AMT-1.
Sig C stock No.: 7A597A-378.
Status: Standard.
ML-380/AM, Humidity Element: Resistance-type hygrometer connected into the humidity-measuring circuit of a radiosonde modulator to measure the relative humidity of the upper atmosphere; range, 15 percent to 100 percent through temperature range of -40° C to $+60^{\circ}$ C. P/o Radiosonde Modulator ML-310(*)/AMT-1.
Sig C stock No.: 7A399-380.
Status: Standard.
ML-391/AM, Balloon: 1,400-gram sounding balloon, extremely high-altitude bursting; neoprene latex, spherical; uncolored. Used for daytime radiosonde ascents only.
Sig C stock No.: 7A183.
Status: Standard.
ML-429/UM, Psychrometric Calculator: A circular slide rule with special scales; used to compute dew point and relative humidity from observed dry- and wet-bulb thermometer temperature values and atmospheric pressure values; two temperature ranges: low, from -60° F to $+32^{\circ}$ F.; high, from -10° F. to $+85^{\circ}$ F. U/w ground psychrometric instruments.
Status: Standard.

MT-47()/FMQ-1, Rack Assembly: Inclosed, steel, relay cabinet, service door in back, folding writing table in front; mounts Radiosonde Receiver R-17(*)/FMQ-1, Frequency Meter TS-29 (*)/FMQ-1, Radiosonde Recorder RD-3(*)/FMQ-1, Amplifier AM-7(*)/FMQ-1, and Voltage Regulator CN-2(*)/FMQ-1. P/o Radiosonde Receptor AN/FMQ-1(*).
Sig C stock No.: 7A8337-47.
Status: Standard.
MT-321/AMQ-2, Mounting: A streamlined strut used to contain Temperature-Humidity Transmitter ML-317/AMQ-2 and to attach it to the exterior of aircraft. P/o Aerograph Equipment AN/AMQ-2(*).
Sig C stock No.: 7A1130-321.
Status: Substitute/Std.
MT-678/FMQ-2, Rack Assembly: Inclosed, steel relay cabinet, service door in back, folding writing table in front; mounts Radiosonde Receiver R-228/FMQ-2, Frequency Meter TS-29B/FMQ-1, Radiosonde Recorder RD-3B/FMQ-1 or RD-3C/FMQ-1, Amplifier AM-7B/FMQ-1, and Voltage Regulator CN-2A/FMQ-1. P/o Radiosonde Receptor AN/FMQ-2.
Sig C stock No.: 2Z7383-678.
Status: Standard.
R-17()/FMQ-1, Radiosonde Receiver: Superregenerative type; receives a-m signals; includes built in rectifier and loudspeaker; 8 tubes; frequency range 56 to 85 mc; 28 x 26 x 12 in. P/o Radiosonde Receptor AN/FMQ-1(*).
Sig C stock No.: 7A8340-17.
Status: Limited/Std.
R-228/FMQ-2, Radiosonde Receiver: Superheterodyne type; receives f-m or pulsed signals; includes built-in loudspeaker, cathode-ray tuning indicator, and full-wave rectifier; 20 tubes; frequency range 390 to 410 mc; intermediate frequency 21.25 mc. P/o Radiosonde Receptor AN/FMQ-2.
Sig C stock No.: 2C4180-228.
Status: Standard.
RD-3()/FMQ-1, Radiosonde Recorder:* Records in code on Chart Roll ML-182 audio-modulated radiosonde signals representing atmospheric pressure, temperature, and relative humidity; includes preamplifier stage for connection to Amplifier AM-7(*)/FMQ-1; mounts in Rack Assembly MT-47(*)/FMQ-1 or MT-678/FMQ-2; 20½ x 18 x 19 in. P/o Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2.

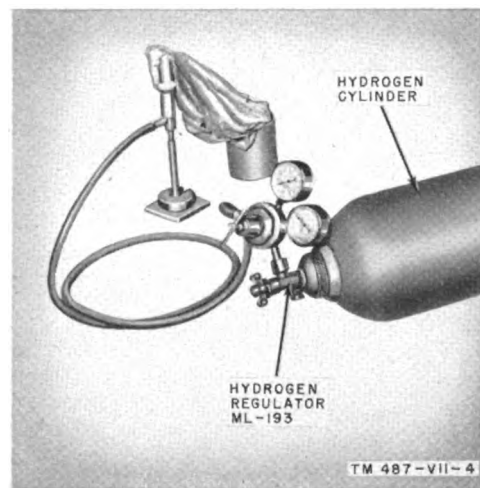
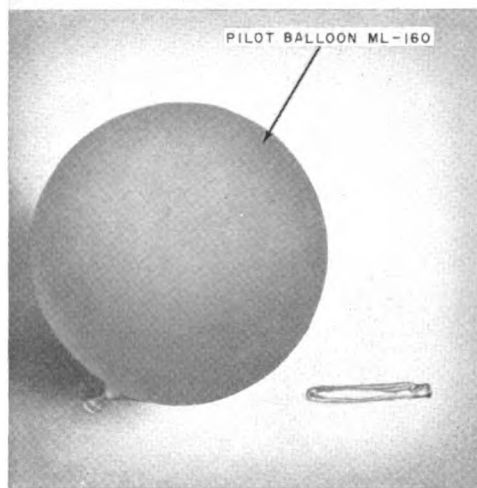
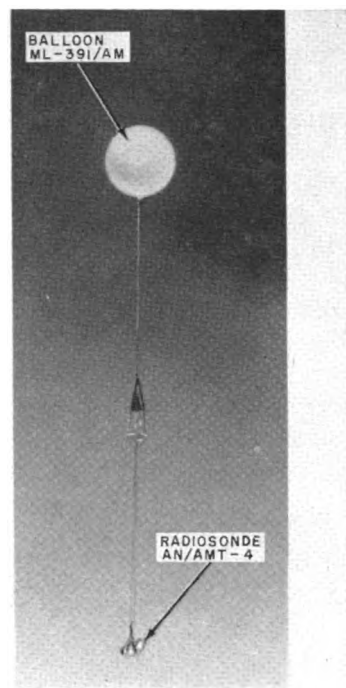
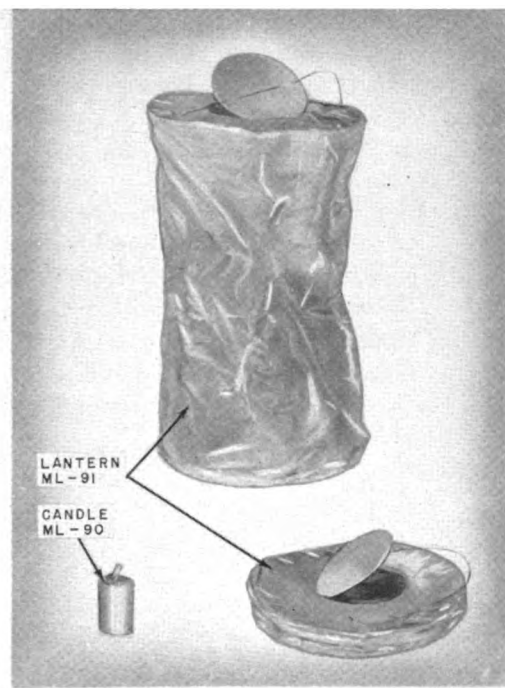


Figure 65. Miscellaneous pilot and sounding balloon equipment.

Sig C stock No.: 7A1326-3.

Status: Standard.

SCM-12, Meteorological Observation Set: An assemblage of equipment for making and evaluating pilot-balloon observations; includes balloons and accessories, hydrogen generator and charges, psychrometer, theodolite, timing and telephone set, plotting equipment, and supplies. Used by the Field Artillery to make meteorological observations to determine the direction and speed of winds aloft and to compute ballistic winds.

Sig C stock Nos.: 7A1200-SCM-12 (general use);

7A1200-SCM-12.1 (tropical use).

Status: Standard.

TK-17()/FMQ-1, Tool Equipment: Tools for field maintenance and repair of Radiosonde Receptor AN/FMQ-1(*); packed in two chests, weight approx 200lb. U/w, not p/o, Radiosonde Receptor AN/FMQ-1(*).

Sig C stock No.: 7A1856-17.

Status: Standard.

TS-29()/FMQ-1, Frequency Meter: Electronic; indicates output frequency of Radiosonde Re-

ceiver R-17(*)/FMQ-1 on panel meter; converts a-f output of receiver to dc proportional in value to output frequency of receiver and supplies this controlling current to Radiosonde Recorder R-3(*)/FMQ-1; mounts in Rack Assembly MT-47(*)/FMQ-1 or MT-678/FMQ-2; 28 x 26 x 12 in. P/o Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2.

Sig C stock No.: 7A889-29.

Status: Standard.

TS-65()/FMQ-1, Frequency Standard: Portable, self-contained equipment used to aline and calibrate Frequency Meter TS-29(*)/FMQ-1 and Radiosonde Recorder RD-3(*)/FMQ-1; delivers audio frequency of 10, 20, 40, 60, 80,

100, 120, 140, 160, 180, or 190 cps, as selected P/o Maintenance Equipment MK-8(*)/FMQ-1; u/w Radiosonde Receptors AN/FMQ-1(*) and AN/FMQ-2.

Sig C stock No.: 7A889-65.

Status: Standard.

TS-287()/GM, Battery Tester: Self-contained, dual-scale, d-c voltmeter used to test the closed-circuit voltages of radiosonde batteries; ranges 0 to 7.5-v and 0 to 150-v dc; used to test Battery BA-67; 3 x 3 x 3 in. U/w Radiosonde Transmitter T-49C/AMT-1 (p/o Radiosonde AN/AMT-1) and Radiosonde AN/AMT-3.

Sig C stock No.: 7A1325/V1.

Status: Standard.

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