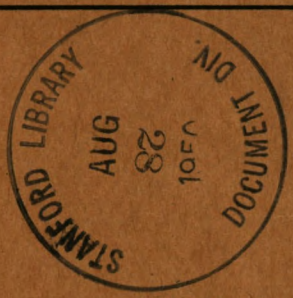
TM 11-304

DEPARTMENT OF THE ARMY TECHNICAL MANUAL



FREQUENCY METER SETS I-129-A AND I-129-B

ABSORPTION TYPE

DEPARTMENT OF THE ARMY JULY 1950

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For explanation of distribution formula, see SR 310–90–1.

CONTENTS

Figure 1. Frequency Meter Set I–129–B (24665–P–49), case cover open and closed.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom the equipment is issued. They contain information on the operation, organizational maintenance, and field maintenance of the equipment as well as a discussion of the theory of operation. They apply only to Frequency Meter Sets I–129–A and –B. Frequency Meter Set I–129–(*), where used in this manual, refers to Frequency Meter Sets I–129–A and I–129–B.

b. The appendix contains a list of current references, including technical manuals and other available publications applicable to the equipment. No identification table of parts is included; I–129–(*) is replaceable as a complete unit.

2. Forms and Records

a. The following forms will be used for reporting unsatisfactory conditions of equipment:

(1) DD Form 6 (Report of Damaged or Improper Shipment) will be filled out and forwarded as prescribed in AR 700–30 or AFR 67–5.

(2) DA AGO Form 468 (Unsatisfactory Equipment Report) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

(3) AF Form 54 (Unsatisfactory Report) will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

b. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Description

(figs. 1 and 2)

a. GENERAL. Frequency Meter Set I–129–(*) is an absorption-type frequency-indicating device designed to measure rf (radio frequency) from 1.5 to 41 mc (megacycles). Each set consists of four frequency meters

(*b* and *c* below) contained in a waterproof carrying case. Each frequency meter will indicate the fundamental frequency (within the specific range of the instrument) of an r-f source. The frequency meter may also be used to determine the order of a harmonic crystal oscillator, frequency doubler, or frequency quadrupler.

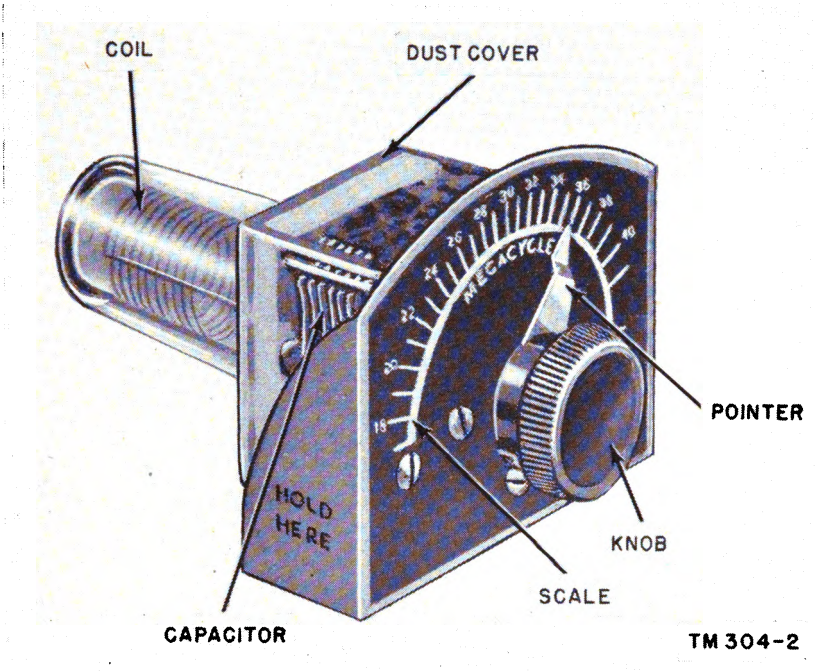

Figure 2. Frequency meter (18 to 41 mc), components.

b. Frequency Meter Set I–129–A.

(1) The four frequency meters of this set are calibrated as follows: 1.5 to 4 mc, 4 to 11 mc, 10 to 20 mc, and 19 to 40 mc. Each frequency meter consists of a coil shunted by a capacitor appropriate for the frequency range indicated on the calibrated scale. A phenolic knob and a pointer are used to vary the capacitance and to indicate the frequency, respectively. A transparent plastic protective housing is used to exclude foreign matter from the capacitor plates and coil surface.

(2) The carrying case for Frequency Meter Set I–129–A is constructed of wood and is equipped with a leather handle and two metal hasps. A waterproofing gasket under the lid prevents the entry of dirt and moisture. All corners of the case are reinforced with metal guards.

c. Frequency Meter Set I–129–B. Frequency Meter Set I–129–B procured on Order No. 24665–P–49 differs from earlier procurements of

the I–129–B in minor respects (1) and (2) below). The nomenclature I–129–B, when used in this manual, refers to both models. Reference to a specific model will be made as follows: Frequency Meter Set I–129–B (early model) or Frequency Meter Set I–129–B (24665–P–49).

(1) *I–129–B (early model).*

(*a*) The frequency meters of this set are calibrated as follows: 1.5 to 3.5 mc, 3.5 to 8 mc, 8 to 18.5 mc, and 18 to 41 mc. In general, the frequency meters provided with this set are similar to those provided with the I–129–A (*b*(1) above) except that the words HOLD HERE are imprinted on both sides of each frequency meter to designate the two places where the operator's fingers must be placed during operation of the device.

(*b*) The carrying case for the I–129–B (early model) is made of metal and is equipped with a metal handle and a single metal hasp. The inside of the cover has four cut-outs to admit the frequency meter knobs when the cover is in the closed position. A waterproofing gasket is used under the cover to prevent the entry of moisture and dust.

(2) *I–129–B (24665–P–49).*

(*a*) The four frequency meters provided with this set are identical to those provided with earlier models ((1) (*a*) above). However, starting with the lowest frequency range, these meters bear identifying panel markings as follows: METER NO. 1, METER NO. 2, METER NO. 3, and METER NO. 4. The meters for the I–129–A and I–129–B (early model) are not so identified.

(*b*) The carrying case for the I–129–B (24665–P–49) is constructed of wood and is provided with metal reinforced corners and a canvas carrying handle. Two tension-type metal hasps are used to insure adequate pressure on the waterproofing gasket which seals the junction between the cover and the body of the case.

4. Table of Components

The lists given below are for general information only. See appropriate publications for information pertaining to requisition of spare parts.

a. Frequency Meter Set I–129–A.

Quantity	Name of component	Dimensions (in.)			Weight (lb)
		Length	Height	Depth	
4	Frequency meter.....	3	2 5/8	2 13/16	5/16
1	Carrying case.....	13 1/2	5 3/4	3 1/2	4

Note. Over-all weight of equipment is 5¼ pounds.

b. FREQUENCY METER SET I–129–B (EARLY MODEL).

Quantity	Name of component	Dimensions (in.)			Weight (lb)
		Length	Height	Depth	
4	Frequency meter.....	3¾	3	2½	5/16
1	Carrying case.....	12⅞	5⅜	3	2¼

Note. Over-all weight of equipment is 3½ pounds.

c. FREQUENCY METER SET I–129–B (24665–P–49).

Quantity	Name of component	Dimensions (in.)			Weight (lb)
		Length	Height	Depth	
4	Frequency meter.....	3	4½	2½	5/16
1	Carrying case.....	13⅜	6⅜	3⅞	4⅛

Note. Over-all weight of equipment is 5⅜ pounds.

CHAPTER 2

OPERATING INSTRUCTIONS

5. Knob

(fig. 2)

The knob is used to vary the capacitance of the frequency meter capacitor-coil combination (L–C ratio) in order to resonate the frequency meter within the range indicated on the calibrated scale. The adjustable pointer is used to indicate the resonant frequency (in mc) of the capacitor-coil combination.

6. Operating Procedure

a. Select the frequency meter within the frequency range of the circuit to be measured.

b. Connect a milliammeter of appropriate range in either the plate or grid circuit of the oscillator or other r-f power generating device to be measured.

c. Grasp the sides of the frequency meter (marked HOLD HERE) with the thumb and forefinger of one hand (fig. 3) and place the frequency meter coil near the end of the coil (usually the oscillator tank coil) of the equipment under measurement.

d. Rotate the knob slowly in either direction until the milliammeter indicator rises or falls sharply. At this time, move the frequency meter *away* from the circuit under measurement and continue to rock the knob. The fundamental frequency of the circuit under measurement will be indicated on the frequency meter scale when the milliammeter indication shows barely perceptible changes with the frequency meter held at the greatest distance away from the circuit under measurement.

Note.—If the frequency meter is held too closely to the circuit under measurement the scale reading will be broad and unusable.

e. If the frequency of the circuit under measurement is unknown, start with the frequency meter of the lowest range. The lowest frequency at which indication of resonance is obtained is either the fundamental frequency of the circuit or a harmonic of it (if the fundamental frequency is below the range of the frequency meter).

f. If no change in plate or grid current is indicated on the milliammeter check the following:

(1) Equipment not operating satisfactorily (low or no r-f output).
(2) Frequency meter held too far from equipment (too loose coupling).
(3) R-f output either above 41 mc or below 1.5 mc.

g. Avoid coupling the frequency meter too closely to tank coils of power oscillators. High r-f voltages built up across the frequency meter coil may cause permanent damage. Maximum flux density (magnetic field) occurs at the end of the coil and minimum flux density at the middle of the coil.

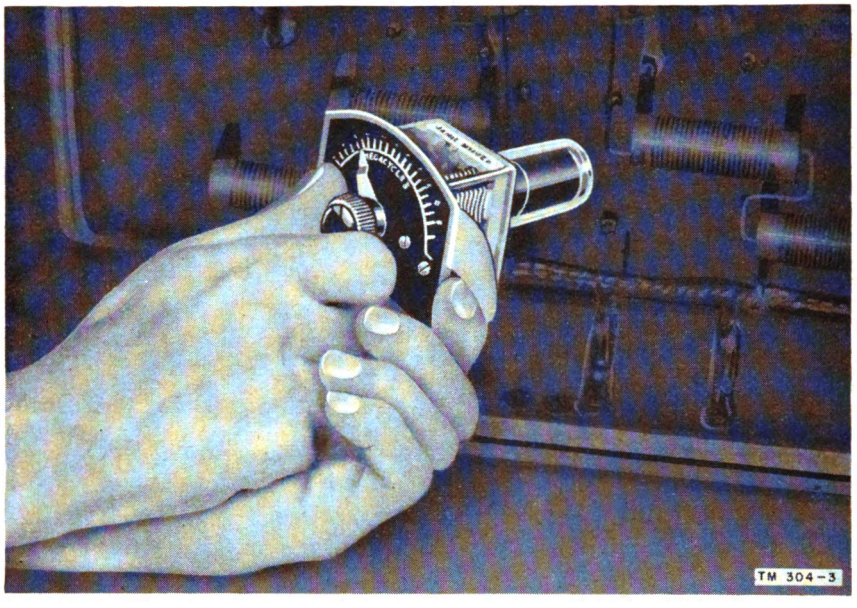

Figure 3. Frequency meter in operation.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

7. Weatherproofing

a. GENERAL. Frequency Meter Set I–129–(*), when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials used in the construction of the frequency meter.

b. TROPICAL MAINTENANCE. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. (Frequency Meter Set I–129–B (24665–P–49) is tropicalized.) This treatment is fully explained in TB SIG 13 and TB SIG 72.

c. WINTER MAINTENANCE. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are fully explained in TB SIG 66.

d. DESERT MAINTENANCE. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 75.

8. Preventive Maintenance

a. DEFINITION. Preventive maintenance is work performed on equipment to keep it in good working condition so that breakdowns and needless interruptions in service will be kept at a minimum.

b. CHECKLIST.

What to check	When to check	How to check
Screws, capacitor plates.	Quarterly.	Inspect for loose screws and mountings;
Connections.	Quarterly.	broken connections and frayed insulation;
Dust cover.	Quarterly.	broken or cracked panel or dust cover.
Calibration.	Semiannually.	Refer to paragraph 11.

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Note. The instructions that follow are to be used by field maintenance personnel in the repair and calibration of Frequency Meter Set I–129–(*). The scope of service that may be performed by a unit having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of assigned personnel. Maintenance parts are not stocked.

9. Theory of Operation

a. Each frequency meter consists of a coil shunted by a variable capacitor which is rotated by the knob on the panel (figs. 2 and 4).

b. Within the frequency range of a particular frequency meter, there is one point on the scale where the r-f power absorbed from the circuit being measured by the frequency meter is greatest. At this point, the capacitance-inductance combination of the frequency meter is such that the capacitive and inductive reactances are equal, opposite in effect, and cancel each other. The frequency meter is now resonant and in tune with the circuit whose frequency is indicated on the scale.

c. The capacitance-inductance combinations vary inversely with the frequency of the r-f power to be measured. When measuring the lowest frequencies, the frequency meter with the highest capacitance and inductance is used. When measuring the highest frequencies, the frequency meter with the lowest capacitance and inductance is used.

d. Extension of the metal front panel of the frequency meter around to the sides of the instrument provides additional shielding area and minimizes the effect of hand capacitance during operation of the frequency meter. This effect is more pronounced at the higher frequencies.

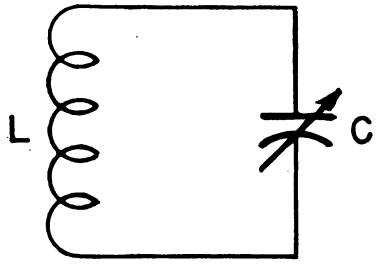

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Figure 4. Frequency meter component, schematic diagram.

10. Service Procedure

(fig. 2)

a. Inspect the meters for broken leads, deterioration, and condition of dust cover.

b. Replace the frequency meter that has a damaged coil winding, coil form, and bent or broken capacitor plate(s).

c. Calibrate frequency meters whose pointer or knob setscrews have loosened enough to permit shaft slippage.

11. Calibration

a. Required Equipment.

(1) A signal generator capable of delivering modulated output within the range of 1.5 to 41 mc.

(2) A radio receiver capable of receiving a signal within the range of the frequency meter being calibrated and of amplifying that signal enough to energize an output meter or other output indicating device.

(3) A 0.001-uf (microfarad) capacitor which is used to couple the signal generator output to the antenna terminal of the receiver.

b. Equipment Set-Up.

(1) Connect the signal generator and receiver to the line, and ground both units.

(2) Connect the a-c voltmeter (output meter) to the receiver output circuit and arrange the voltmeter controls for a 0–15 volt scale indication.

(3) Connect the signal generator output through a 2- or 3-turn coil (1½-inch diameter) to the receiver antenna terminal. Use a short piece of wire for this purpose and insert the 0.001-uf capacitor in series with this wire.

(4) After a 15-minute warm-up period adjust the receiver volume control and signal generator for a 0-10 volt reading on the output meter at the desired frequency as indicated on the signal generator dial.

c. Calibration Procedure.

(1) Grasp the frequency meter as shown in figure 3 and place the end of the coil about 2 or 3 inches away from the pick-up coil in series with the antenna wire.

(2) Rotate the frequency meter knob slowly and stop rotating when the output meter indicator reaches its lowest reading. Compare the indication on the frequency meter scale with the frequency indicated on the signal generator dial. If the readings are within ±3 percent of each other the frequency meter is calibrated satisfactorily.

(3) If the frequency meter indication is more than 3 percent of the signal generator indication, loosen the frequency meter pointer

setscrew and retighten after the pointer is moved to a point on the scale that corresponds to the signal generator indication. Check the frequency meter at two more points on its scale.

Note.—Make sure the frequency meter shaft does not move while the setscrew is being loosened and tightened. Always recheck after tightening.

(4) If the output meter indication rises instead of dipping while tuning the frequency meter, either the receiver volume control is set too high, or the frequency meter is placed too closely to the pick-up coil (too tight coupling).

(5) If the output meter indication does not change while tuning the frequency meter, the receiver gain or signal generator may be set too low or the frequency meter is too loosely coupled (too far from the pick-up coil).

CHAPTER 5

DEMOLITION OF MATÉRIEL TO PREVENT ENEMY USE

12. General

The demolition procedure outlined in paragraphs 13 and 14 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished *only* upon order of the commander.

13. Methods of Destruction

a. Smash. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, and heavy tools.

b. Cut. Use axes, handaxes, and machetes.

c. Burn. Use gasoline, kerosene, oil, flame throwers, and incendiary grenades.

d. Explosives. Use firearms, grenades, and TNT.

e. Other. Use anything immediately available for destruction of this equipment.

f. Disposal. Bury in slit trenches, fox holes, and other holes. Throw in streams. Scatter.

14. Destruction of Components

a. Smash the panel, dust cover, rotor plates, stator plates, etc.

b. Cut all wiring.

c. Burn all instruction books, circuit diagrams, insulation, etc.

d. Bury or scatter all remaining parts of the equipment.

e. Destroy everything.

APPENDIX

REFERENCES

Note.—For availability of items listed, check the SR 310–20 series.

1. Publications

TM 1–455	Electrical Fundamentals.
TM 11–5026	Test Equipment IE–9–C.
TM 38–650	Basic Maintenance Manual.

2. Army Regulations

AR 380–5	Safeguarding Military Information.

3. Supply Publications

SB 11–47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11–64	Maintenance Equipment Replenishment.
SB 11–76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

4. Painting and Preserving

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.

5. Packaging and Packing Instructions

a. Joint Army-Navy Packaging Specifications.

JAN–D–169	Desiccants, Activated.
JAN–P–100	General Specification.
JAN–P–106	Boxes, Wood, Nailed.
JAN–P–116	Preservation, Methods of.
JAN–P–125	Barrier-Materials, Waterproof, Flexible.
JAN–P–131	Barrier-Material, Moisture-Vaporproof, Flexible.

b. U. S. Army Specifications.

100–2E	Marking Shipments by Contractors (and Signal Corps Supplement thereto).

100–14A	Army-Navy General Specification for Packaging and Packing for Overseas Shipment.

c. SIGNAL CORPS INSTRUCTIONS.

720–7	Standard Pack.
726–15	Interior Marking.

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