

NAVSHIPS 91727

RESTRICTED
Security Information
(See Page B)

**ELECTRONIC
TEST EQUIPMENT
APPLICATION
GUIDE**

BUREAU OF SHIPS

DEPARTMENT OF THE NAVY

Contract: NObs - 2352

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DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

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Code 993-100
31 July 1952

From: Chief, Bureau of Ships
To: All Activities concerned with the Installation, Operation and Maintenance of the Subject Equipment

Subj: Electronic Test Equipment Application Guide NAVSHIPS 91727

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H. N. WALLIN
Chief of Bureau



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INTRODUCTION

PURPOSE

The primary purpose of this publication is to supply manufacturers of major electronic equipment with technical information concerning preferred electronic test equipment in current Navy use. This information is to be considered as a guide in the selection and application of test equipment to be used in conjunction with prime equipment. Specific information concerning connectors, including charts in many cases, is furnished to aid the manufacturer in recommending adaptors for use with the test equipment.

SCOPE

The material included in the equipment descriptions covers the primary function, electrical and mechanical characteristics, mounting methods, accessories supplied, and other pertinent data. Controls and their markings are explained, and the manner in which test information is presented by the test equipment itself is described.

ARRANGEMENT OF MATERIAL

The equipment descriptions included in this guide were selected from the Catalog of Navy Material, Bureau of Ships Section-Part III, and bear the page numbers of that catalog, i.e., 4.10 OAP: 1-3. The first digits 4.10 are the category and sub-category numbers of that catalog, OAP is the equipment type number, and 1-3 indicates the number of pages of descriptive material for the OAP. The List of Effective Pages in this guide is so arranged that the equipment type numbers are in alpha-numerical sequence, and serves as a table of contents.

The Front Matter includes a Reference Table which lists the equipment types by categories and functional characteristics within each category. The categories, i.e., Ammeter, Fluxmeter, Multimeter are arranged in alphabetical sequence. All models of ammeters or

fluxmeters are grouped within their respective categories. Such data as operating range, accuracy, or other pertinent characteristics appear in the left column of each category. The characteristics most pertinent to the equipment type, such as measurement range or frequency range, are listed in ascending order. The equipment type numbers are located in the right column opposite the applicable characteristics.

A combination type of equipment such as a multimeter is located under its appropriate category, but the ammeter, ohmmeter, and voltmeter characteristics are also listed in the Ammeter, Ohmmeter, and Voltmeter categories respectively.

HOW TO USE THIS GUIDE

When it is desired to obtain information concerning equipment for which the type number is already known, simply refer to the alpha-numerically arranged List of Effective Pages in the Front Matter to determine whether or not it is included in this guide.

When it is desired to learn the type number of an equipment for which the category and major characteristics are known, refer to the Reference Table. For example, to find an ammeter with a range to 900 ma, locate the Ammeter category in the Reference Table and read down the left column which indicates the measurement ranges. The first range in this column which will cover the desired range is 0 to 1000 ma, and in the right column opposite this range is the equipment type number ME-25A/U. To find detailed information concerning this unit, turn to the alpha-numerically arranged descriptions.

SUGGESTIONS

Constructive criticisms, questions, comments, and errors should be reported to the Bureau of Ships, Electronics Publications Section.

REFERENCE TABLE

The categories are arranged in alphabetical sequence. The equipments are grouped within the categories by functional characteristics.

ADAPTER, TUBE SOCKET		ANTENNA PATTERN MEASURING EQUIPMENT	
Adapter for radar tubes; 316A, 703A, 707A, 708A, and GL-446.	49416	(See: Field Intensity Measuring Equipment)	
4, 5, 6, and 7 pin, Octal, Loctal, and Miniature.	49992	ANTENNA, PHANTOM	
		(See: Dummy Load)	
ADMITTANCE METER		AUDIO OSCILLATOR	
(See: Crystal Testers)		(See: Oscillator, Audio)	
AMMETER, DC		BENCH TEST SET, ANTENNA	
0 to 1000 μ a, in 5 ranges; accuracy, $\pm 2\%$.	60107		
0 to 200 ma, in 2 ranges; accuracy, $\pm 5\%$.	TV-3A/U		SU, SU-1
0 to 400 ma, in 4 ranges; accuracy, $\pm 3\%$.	TS-297/U		
0 to 1000 ma, in 6 ranges; accuracy, $\pm 3\%$.	ME-25A/U	BUZZER	
0 to 10 amp, in 8 ranges (100 μ a min); accuracy, $\pm 3\%$.	AN/PSM-4	(See: Noise Generator)	
0 to 10 amp, in 8 ranges (250 μ a min); accuracy, $\pm 3\%$.	TS-352/U	CAPACITANCE METER	
		10 μ mf to 100 μ f; accuracy, $\pm 5\%$.	60007
		1000 μ mf to 100 μ f.	AN/USM-3 (TV-4/U)
AMMETER, RECORDING TYPE		1.0 μ mf to 100 μ f; accuracy, $\pm 1\%$ (2% for very large values).	TS-460A/U
0 to 1 ma, $\pm 1\%$.	RD-49/U	1.0 μ mf to 1100 μ f; accuracy, $\pm 1\%$ (2% for very large values).	TS-460C/U
AMPLIFIER		0 to 50 μ f.	TV-3A/U
Response, 10 cps to 150 kc, +1 db; gain, 3100 (70 db); db scale, 0 to 20 db.	ME-6/U		
(See: Detection Amplifier)		CATHODE RAY OSCILLOSCOPE	
		(See: Oscilloscope)	
ANALYZER, SPECTRUM AND WAVE		CRYSTAL RECTIFIER TESTER	
(See: Spectrum and Wave Analyzers)		Checks 1N21, 1N23, 1N25 Series crystals.	TS-268/U
ANTENNA, DUMMY		Checks 1N23 Series crystals.	TS-311A/UP
(See: Dummy Load)			

REFERENCE TABLE (Cont'd)

CRYSTAL TESTER, FREQUENCY MEASURING		ECHO BOX (Continued)	
500 kc to 12 mc, in 7 ranges.	TS-330/TSM	2900 to 3100 mc.	OBU-1
75 to 1100 kc, in 6 ranges.	TS-537/TSM	3400 to 3700 mc.	TS-275/UP
10 to 140 mc, in 4 ranges.	TS-683/TSM	6250 to 6900 mc.	TS-501/UP
DECADE CAPACITOR		8730 to 8910 mc	TS-311A/UP
100 μ f to 48 μ f; rating, 500 and 450 v DC.	AN/USM-3 (TS-671/U)	8990 to 9610 mc.	TS-488/U
DECADE RESISTOR		ELECTRON TUBE TESTER	
10 W, 1.0 ohm to 12 meg in 1.0 ohm steps.	AN/USM-3 (TS-672/U)	(See: Tube Tester, Electron)	
DECIBEL METER		ELECTRON SWITCH	
0 to 20 dbm (linear).	ME-6/U	Switch rate, 10 to 2000 cps; amplifier response, flat 0 to 5000 cps, down 25% at 25,000 cps.	TS-433A/U
-5 to +17 dbm (linear).	ME-6A/U	ELECTRONIC VOLTMETER	
DETECTOR AMPLIFIER		(See: Voltmeter, Electronic)	
1000 cps to 5 mc; gain, 39.5 db at 5 mc.	AN/UPA-1	FIELD INTENSITY MEASURING EQUIPMENT	
DUMMY LOAD		(See: Noise-Field Intensity Meter and Fluxmeter)	
60 W, 51.5 ohms; accuracy, +5% between 100 and 500 mc.	AN/URM-43	FIELD STRENGTH METER	
50 W, 8600 to 9600 mc.	TS-231/AP	(See: Noise-Field Intensity Meter)	
200 W, 8500 to 9600 mc.	TS-231A/AP	FLUXMETER	
(See: Antenna, Dummy)		1200 to 4500 gauss.	TS-15/AP
ECHO BOX		FREQUENCY METER, ABSORPTION TYPE	
105 to 125 mc; accuracy, +0.25 mc.	OAO	80 to 1200 mc; accuracy, +1 mc; sensitivity, 5 mw.	AN/UPM-2
150 to 240 mc; accuracy, +0.5 mc.	OAA	150 to 230 mc; accuracy, 0.25%.	OAP
910 to 980 mc.	TS-349/UP	155 to 235 mc, 460 to 570 mc; accuracy, +0.25%.	AN/UPM-1B
1150 to 1350 mc.	TS-545/UP	500 to 1500 mc; accuracy, +1 db.	TS-107/TPM-1
2700 to 2900 mc.	TS-270/UP		
2900 to 3100 mc.	AN/UPM-7 (OBU)		

REFERENCE TABLE (Cont'd)

FREQUENCY METER, ABSORPTION TYPE
(Continued)

3400 to 3900 mc; accuracy, +2 mc. TS-295/UP
 8470 to 9630 mc; accuracy, +5 mc. TS-148/UP
 8470 to 9630 mc; output pulse, 50 to 200 v, 1 to 5 μ sec. TS-642/U
 8500 to 9600 mc; accuracy, +5 mc. TS-35A/AP
 8500 to 9600 mc; accuracy, +1 to 5 mc. TS-147/UP
 8500 to 9600 mc; accuracy, +3 mc. TS-230/AP
 8990 to 9170 mc; accuracy, +2 mc. TS-191/UP
 9285 to 9465 mc; accuracy, +2 mc. TS-120/UP

(See: Echo Box)

FREQUENCY METER, CALIBRATOR

TS-202/U

FREQUENCY METER, HETERODYNE TYPE

125 to 250 kc and 2000 to 4000 kc, with harmonics up to 20 mc; accuracy, +0.02%. LM
 160 kc to 15 mc, with harmonics up to 60 mc; accuracy, $\pm 0.003\%$. LR
 7 to 70 kc; stability, accurate within 2% of dial markings. OCP
 500 to 1250 mc, with harmonics from 100 to 10,000 mc. TS-186/UP
 7 to 160 kc; accuracy, +0.1% below 70 kc, +0.5% above. TS-535/U

(See: Echo Box)

IMPEDANCE MEASURING EQUIPMENT,
COMBINATION TYPE

Range, 400 kc to 60 mc; resistance, 0 to 1000 ohm, +1%; reactance, 0 to 500 ohm, +2%. 60094
 Range, 1 to 50 kc; resistance, 1000 ohm to 1.0 meg, +1%; inductance, 1.0 μ h to 100 h, +2%. TS-460A/U
 Resistance, 1.0 ohm to 10 meg, +1.5% on 1 ohm to 1 meg, +5% on 1.0 to 10 meg; capacitance, 10 μ f to 100 μ f; inductance, 100 μ h to 60 h, +2.5% on 0.5 μ h to 5 h, +5% on 5 to 100 μ h; Q, 0.5 to 20. ZM-11/U

IMPEDANCE MEASURING EQUIPMENT,
COMBINATION TYPE (Continued)

Capacitance, 10 μ f to 100 μ f; resistance, 1.0 ohm to 1.0 meg. 60007

INDUCTANCE METER

(See: Impedance Measuring Equipment, Combination R, C, L)

INTERFERENCE REDUCTION TEST SET

(See: Noise-Field Intensity Meter)

LEAKAGE MEASURING EQUIPMENT

(See: Noise-Field Intensity Meter)

MEGGER

(See: Ohmmeter)

MEGOHMMETER

(See: Ohmmeter)

METER

(See: Type of)

MODULATION, AMPLITUDE, CALIBRATED
OUTPUT

(See: Signal Generator)

MULTIMETER, ELECTRONIC

(See: Volt-Ohm-Ammeter, Electronic)

MULTIMETER, NON-ELECTRONIC

(See: Volt-Ohm-Ammeter, Non-Electronic)

NOISE -FIELD INTENSITY METER

14 to 250 kc; accuracy, +10%, 10 μ v/M AN/URM-6
 to 1 v/M; sensitivity, 1.0 μ v/M.

REFERENCE TABLE (Cont'd)

NOISE-FIELD INTENSITY METER (Continued)		OSCILLOGRAPH, STYLUS TYPE	
375 to 1000 mc; sensitivity, 100 to 350 μ v per meter, dependent on frequency.	AN/URM-17	(See: Ammeter, Recording Type)	
150 kc to 25 mc.	AN/PRM-1	OSCILLOSCOPE, CATHODE RAY	
15 to 400 mc.	TS-587/U	Sensitivity, 0.1 v(RMS)/in.; response, +3 db from 30 cps to 2 mc.	OS-8/U
Modification kit enabling Noise-Field Intensity Meter TS-587/U to operate from 12 v DC.	MX-910/U	(See: Synchroscope)	
NOISE GENERATOR		OSCILLOSCOPE, RANGE CALIBRATOR COMBINATION TEST SET	
Random noise for checking circuits and vibration for shocking tubes into oscillation.	AN/USM-3 (SG-23/U)	(See: Waveform Measuring-Time Base Measuring Equipment)	
Random noise for checking circuits and vibration for shocking tubes into oscillation.	60140	PANORAMOSCOPE	
		(See: Spectrum and Wave Analyzer)	
OHMMETER		PHANTOM ANTENNA	
1.0 ohm to 1.0 meg (up to 10 meg with less precision); accuracy, +5%.	60007	(See: Dummy Load)	
0.1 to 10,000 meg.	60089		
10,000 ohms to 100 meg, in 5 ranges; accuracy, +3%.	AN/PSM-4	POWER MEASURING EQUIPMENT, AF AND RF	
0 to 10,000 ohms.	AN/USM-3 (ID-264/U)	100 to 500 mc; 2.0 to 60 W; accuracy, +5%.	AN/URM-43
0 to 1000 meg, in 6 ranges.	ME-25A/U	150 to 230 mc; 0 to 8 W, 0 to 3000 W.	OAP
0 to 100,000 ohm, in 3 ranges; accuracy, +3%.	TS-297/U	150 to 240 mc; 0 to 3000 W peak.	TS-355/UP
0 to 10 meg in 4 ranges; accuracy, +3%.	TS-352/U	155 to 235 and 460 to 570 mc; 0 to 4 W, 0 to 4000 W.	AN/UPM-1B
0 to 100 meg, in 2 ranges; accuracy, +5% at 20° C.	TV-3A/U	500 to 1500 mc; 0.5 to 120 mw; accuracy, \pm 0.5 db.	TS-107/TPM-1
1.0 ohm to 10 meg; accuracy, +0.15%.	ZM-4/U	2400 to 3335 mc; 0 to 4 W; accuracy, +0.5 db.	TS-125/AP
1.0 ohm to 11 meg; accuracy, +1.5% +.03 ohm; (1 to 10 meg; accuracy, +5%).	ZM-11/U	2700 to 3400 mc; 0 to 1000 mw.	TS-155C/UP
OSCILLATOR, CW		3400 to 3900 mc; 0.5 to 250 mw; accuracy, 0.5 db.	TS-295/UP
(See: Signal Generator or Test Oscillator)		8470 to 9630 mc; 1.0 to 1000 mw.	TS-642/U
		8500 to 9600 mc; 0.1 to 1000 mw; accuracy, +2 db.	TS-35A/AP
OSCILLATOR, TEST		8500 to 9600 mc; 5.0 to 1000 mw; accuracy, +2 db.	TS-147/UP
(See: Test Oscillator)			

REFERENCE TABLE (Cont'd)

POWER MEASURING EQUIPMENT, AF AND RF (Continued)		RESISTOR, DECADE	
8500 to 9600 mc; 0.1 to 1000 mw; accuracy, ± 1 db, 0.1 to 1 mw; ± 1.5 db, 1.0 to 1000 mw.	TS-230/AP	(See: Decade Resistor)	
8990 to 9170 mc; 3.0 to 1500 mw; accuracy, ± 1.5 db.	TS-191/UP	SIGNAL GENERATOR	
9285 to 9465 mc; 3.0 to 1500 mw; accuracy, ± 1.5 db.	TS-120/UP	(See: Type of)	
PULSE GENERATOR		SIGNAL GENERATOR, AM OR PULSE MODULATED	
Rate, 60 to 2500 pps; width, 0.5 to 20 μ sec; amplitude, 10 to 120 v.	AN/UPM-1B	7 to 160 kc, $\pm 0.3\%$; output, 0.5 μ v to 1.0 v; mod, 400 cps.	TS-535/U
Rate, 3000 to 6000 pps; width, 3 to 40 μ sec; amplitude, 150 v.	SG-18/U	9.5 kc to 50 mc, $\pm 1\%$ to 3% ; output, 0.5 μ v to 0.1 v; mod, 1000 cps.	LP
Rate, 180 or 540 cps; amplitude, 26 to 50 v peak.	TS-358/UP	10 kc to 50 mc; output, 0.1 μ v to 0.1 v; mod, 400 to 1000 cps.	AN/URM-25
Q METER		1750, 1850, 1900, 1950 kc (Loran); mod, 303.03 pps.	TS-251/UP
Q range, 0.5 to 20.	ZM-11/U	4 to 408 mc; output, 0.1 μ v; mod, 400 to 1000 cps.	AN/URM-26
RANGE CALIBRATOR		40 to 500 mc, $\pm 1\%$; output, 3 mw up to 400 mc and 1 mw above 4000 mc; mod, 1000 cps or 500 pps.	TS-47/APR
Marker, 2000 and 10,000 yd.	OS-4/U	90 to 600 mc; output, 1.0 μ v to 0.1 v; mod, 60 to 2500 pps.	LAF
Marker, 2000 and 10,000 yd.	OS-5/U	100 to 2000 mc; mod, 1000 cps.	TS-202/U
Marker, 1000 and 10,000 yd.	OS-7/U	150 to 230 mc, $\pm 0.25\%$; mod, 60 or 400 cps (linear frequency).	OAP
Marker, 500 yd; trigger: 400, 800, 1600, or 2000 pps.	TS-102/AP	150 to 240 mc; output, -110 to -30 db; mod, 150 pps.	TS-355/UP
Marker, 1, 5, 10, and 50 mi; trigger, 180 or 540 cps.	TS-358/UP	150 to 240 mc; output, -110 to -30 db; mod, 300 pps.	TS-182/UP
RECTIFIER (CRYSTAL) TESTER		155 to 235 mc and 460 to 570 mc; mod, 60 to 2500 cps.	AN/UPM-1B
(See: Crystal Rectifier Tester)		400 to 1000 mc, $\pm 1\%$; output, 0.2 μ v to 0.2 v; mod, 40 to 4000 pps.	TS-418/U
RECTIFIER TEST SET, DRY DISC		520 to 1300 mc; output, 1 μ v to 0.1 μ v; mod, 60 to 2500 pps.	LAE
(See: Ohmmeter)		900 to 2100 mc, $\pm 1\%$; output, 0.22 μ v to 0.16 v; mod, 40 to 4000 pps.	TS-419/U
RESISTANCE METER		1000 to 3500 mc, $\pm 2\%$; output, 10 μ v; mod, 1500 to 2000 pps.	TS-406/UP
(See: Ohmmeter)			

REFERENCE TABLE (Cont'd)

SIGNAL GENERATOR, AM OR PULSE
MODULATED (Continued)

1200 to 4000 mc; output, 1 μ v to 0.1 v;
mod, FM, 0 to 0.2% dev. 60 cps; PM,
60 to 2500 pps. LAG

1800 to 4000 mc, $\pm 1\%$; output, -127 to
0 dbm; mod, FM, dev. $\pm 5\%$; PM, 40 to
4000 pps; rate, equal to line frequency. TS-403/U

2700 to 3400 mc; output, 2 mw; mod,
PM, 80 to 2600 pps. TS-155C/UP

3000 to 11,000 mc, $\pm 2\%$; mod, 1100 to
2000 pps; attenuation, 0 to 100 db. TS-508/UP

3650 to 7300 mc, $\pm 1\%$; output, -127 to
-7 dbm; mod, FM, dev. ± 3 mc; PM,
40 to 4000 pps. TS-621/U

6800 to 10,900 mc, $\pm 1\%$; output, -127 to
-7 db; mod, FM, dev. ± 3 mc; PM, 40 to
4000 pps. TS-622/U

8465 to 9285 mc; mod, FM, dev. 0 to
60 mc; sweep, 0 to 6 mc. TS-120/UP

8470 to 9630 mc; output, -100 to +3
dbm; mod, FM and PM; PRR, 100 to
10,000 pps. TS-642/U

8500 to 9600 mc; output, -72 to 0 db;
mod, FM, dev. 20 mc; PM, 125 pps. TS-35A/AP

8500 to 9600 mc; output, -83 to -23
dbm; mod, FM, dev. 0 to 60 mc;
sweep, 0 to 6 mc. TS-191/UP

SIGNAL GENERATOR, FM OR
WOBBULATOR

5.0 to 100 mc; output, -101 to 0 db;
sweep width, 5.0 to 100 mc. TS-452/U

1200 to 4000 mc; output, 1 μ v to 0.1 μ v;
dev. 0 to 0.2%; sweep width, 0 to 0.2%
of carrier. LAG

1800 to 4000 mc; output, -127 to 0
dbm; sweep width, $\pm 5\%$ of carrier. TS-403/U

3650 to 7300 mc; output, -127 to -7 db;
sweep width, +3 mc, adjustable. TS-621/U

6800 to 10,900 mc; output, -127 to -7
db; sweep width, +3 mc, adjustable. TS-622/U

8465 to 9285 mc; output, -83 to -24
dbm; dev. 0 to 60 mc; sweep width,
0 to 60 mc. TS-120/UP

8470 to 9630 mc; output, -100 to +3 dbm;
sweep width, 0.3 mc. TS-642/U

SIGNAL GENERATOR, FM OR
WOBBULATOR (Continued)

8500 to 9600 mc; output, -72 to 0 db;
sweep width, 20 mc. TS-35A/AP

8500 to 9600 mc; output, -83 to -24
dbm; dev. 0 to 60 mc; sweep width,
0 to 60 mc. TS-191/UP

SIGNAL GENERATOR, UNMODULATED

20 to 200,000 cps, $\pm 2\%$; output, 0 to
100 mw. TS-382A/U

SIGNAL TRACER-TESTER GROUP
TEST SET

Signal Tracer, 47 to 15,000 cps;
output, 0.5 mw. AN/USM-3
(TS-673/U)

Tube Tester, emission type; tests
4-pin, 5-pin, 6-pin, 7-pin large and
small, 8-pin octal, 8-pin loktal, 7-and
9-pin miniature and acorns. AN/USM-3
(TV-4/U)

(See: Standing Wave Indicator, Slotted
Line and Probe Type)

SOUND LEVEL METER

40 to 20,000 cps; attenuation, -40 to
-135 db. AN/PQM-1

SPECTRUM AND WAVE ANALYZER

8470 to 9630 mc. TS-148/UP

SQUARE WAVE GENERATOR

10 to 500 cps; output, 30 v peak-to-
peak. TS-433A/U

STANDING WAVE INDICATOR,
SLOTTED LINE AND PROBE TYPE

100 to 225 mc. OT

STROBOSCOPE

Flashing speed, 600 to 14,400 per min;
range, 100,000 rpm max. 631-B

REFERENCE TABLE (Cont'd)

SYNCHROSCOPE		TUBE TESTER, ELECTRON (Continued)	
Sensitivity, 0.5 v/in.; response, 1.5 cps to 11 mc, 0 to -6 db.	OS-4/U	Peak emission and cut-off point of tube such as 15E, 227, 327, and 8011.	OAW
Sensitivity, 0.266 v(RMS)/in.; response, 200 cps to 3 mc, +3 db.	OS-5/U	Transconductance type; tests 4-pin, 5-pin, 7-pin large and small, 8-pin (octal), 8-pin (loktal), 7-pin miniatures (except OQ), and 5-pin acorns.	OQ
Sensitivity, 2 v/in.; response, 30 cps to 2.5 mc.	TS-34/AP	Emission type; tests 4-pin, 5-pin, 6-pin, 7-pin large and small, 8-pin (octal), 8-pin (loktal), 7-pin miniature, 9-pin miniature, and acorns.	AN/USM-3 (TV-4/U)
Sensitivity, 0.1 v/in.; response, 10 cps to 5 mc, substantially flat.	TS-239/UP	Transconductance type; tests 4-pin, 5-pin, 6-pin, 7-pin, 8-pin octal sockets.	OD
Sensitivity, 0.1 v/in.; sweep, 100 μ sec.	TS-182/UP	Transconductance type; tests 4-pin, 5-pin, 6-pin, 7-pin, 8-pin octal, 8-pin loktal, 7-pin miniature, acorns.	OD-4
TACHOMETER (See: Stroboscope)			
TELEPHONE, TELEGRAPH AND TELETYPEWRITER TEST EQUIPMENT		VACUUM TUBE VOLTMETER (See: Voltmeter, Electronic)	
Teletype repair and test set.	TE-50-A	VIDEO DETECTOR AMPLIFIER (See: Detector Amplifier)	
Teletype test signals with or without distortion.	TS-383/GG	VOLTAGE DIVIDER	
Teletype start-stop signals with or without distortion and signal combinations.	TS-659/UG	100:1, 200 to 2000 v; 1000:1, 2000 to 20,000 v.	TS-89/AP
TEST OSCILLATOR, UNMODULATED		VOLTMETER, ELECTRONIC	
10 to 500 cps, +0.1%; output, 25 v(RMS).	SG-21/U	1 mv to 100 v (RMS), in 5 ranges.	ME-6/U
20 to 20,000 cps, +2%; output, 250 mv.	LAJ	500 μ v to 500 v (RMS), in 6 ranges.	ME-6A/U
(See: Signal Generator)		(See: Volt-Ohm-Ammeter, Electronic)	
TEST SET, OSCILLOSCOPE AND RANGE CALIBRATOR COMBINATION (See: Waveform Measuring-Time Base Measuring Combination Test Set)		VOLTMETER, NON-ELECTRONIC	
TUBE TESTER, ELECTRON		0 to 400 v AC-DC.	AN/USM-3 (ID-265/U)
Transconductance type; tests 4-pin, 5-pin, 6-pin, 7-pin large and small, 8-pin (octal), 8-pin (loktal), 7-pin miniature, 9-pin miniature, acorns, 8-pin sub-miniatures (round) and 7-pin sub-miniatures (flat).	TV-3A/U	(See: Volt-Ohm-Ammeter, Non-Electronic)	

REFERENCE TABLE (Cont'd)

VOLT-OHM-AMMETER, ELECTRONIC

0 to 1000 v AC-DC, in 7 ranges; 0 to 1000 ma in 6 ranges; 0 to 1000 meg in 6 ranges.

ME-25A/U

WAVE ANALYZER

(See: Spectrum Analyzer and Wave Analyzer)

VOLT-OHM-AMMETER, NON-ELECTRONIC

0 to 1000 v AC in 4 ranges, 0 to 1000 v DC in 4 ranges, 0 to 100 meg in 2 ranges, 0 to 200 ma in 2 ranges.

TV-3A/U

WAVEFORM MEASURING EQUIPMENT

(See: Oscilloscope, Cathode Ray and Synchroscope)

0 to 1000 v AC in 6 ranges, 0 to 1000 v DC in 6 ranges, 0 to 100,000 ohms in 3 ranges, 0 to 400 ma in 4 ranges.

TS-297/U

WAVEFORM MEASURING-TIME BASE
MEASURING COMBINATION TEST SET

0 to 1000 v AC in 6 ranges, 0 to 1000 v DC in 6 ranges, 0 to 100,000 ohms in 5 ranges, 0 to 10 amp in 8 ranges.

TS-352/U

Shows shapes of pulses, triggers, and video signals; measures pulse length, rise time, decay time.

OS-4/U

0 to 1000 v AC in 9 ranges, 0 to 4000 v DC in 10 ranges, 0 to 100 meg in 5 ranges, 0 to 10 amp in 8 ranges.

AN/PSM-4

WOBBULATOR

(See: Signal Generator, FM)

WATTMETER, RF

(See: Power Measuring Equipment, AF and RF)

**RESTRICTED
NAVSHIPS 91727**

RESTRICTED SECURITY INFORMATION

UNCLASSIFIED

Time Based Measuring and Counting Equipment

STROBOTAC TYPE 631-B

631-B



Strobotac Type 631-B.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 60 cps, 35 w max.
RANGE.—
 Direct Reading: 600 to 14,400 rpm.
 Indirect Methods: Up to 100,000 rpm approx.
ACCURACY.—±1% above 900 rpm on Standard range, when standardized in terms of frequency controlled power line.
CALIBRATOR.—7200 cpm built-in vibrating reed when used on 60 cps supply.
FLASH.—5 to 10 μsec.
COLOR.—Red-Orange (neon).
PRESENTATION AND CONTROLS.—The “flash-rate” is controlled by a large knob connected to a drum dial which is calibrated directly in frequency from 600 to 14,400 rpm. A smaller knob controls the selector switch for selection of range, line synchronization or range with external contactor. A push button switch is provided to operate the calibration reed. A phone jack provides a means for connecting a Strobolux to provide greater light output. A two circuit female receptacle provides a means of connecting an external contactor.
FITTINGS AND ACCESSORIES.—A seven-foot power cord, a plug to fit the contactor jack, and spare fuses are supplied with the equipment.
CONSTRUCTION.—The equipment is housed in a metal case with a handle mounted on top for ease in carrying. The calibrating reed protrudes through the lamp reflector.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.

TUBE COMPLEMENT

(1) 6X5-GT/G (1) 6N7-GT/G (1) 631-PI

REFERENCE DATA AND LITERATURE

NAVSHIPS 91249X: Operating and Maintenance Instructions for Type 631-B Strobotac.

FUNCTIONAL DESCRIPTION

The General Radio Type 631-B Strobotac is a stroboscopic tachometer which permits rotating, vibrating or reciprocating objects to be viewed intermittently and produces the optical effect of slowing down or stopping motion. The apparent slow motion is an exact replica of the original higher speed motion, so that the motion of a high speed machine can be analyzed while operating under normal conditions. The stroboscope is particularly adapted for the measurement of speed where the end of the shaft is not accessible or in cases of very low-power devices where power is limited. Since mechanical contact with the mechanism being measured is not required, no power is absorbed from the drive. The Strobotac can also be used for stroboscopic observations of moving objects.

RELATION TO OTHER EQUIPMENT

Used to determine speed of electromechanical equipment or to “stop the motion” of rotational or repetitive motions in order to study them.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F18-S-3012-25
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	8.3
F.I.I.N.	

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Strobotac Type 631-B, NT-60175	F18-S-3012-25	7-1/2	9-7/8	8-3/4	8.75
	Including:					
	1 Line Cord		84 lg			
	1 instruction book NAVSHIPS 91249X					
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			9.5

UNCLASSIFIED

January 1953

4.8 631-B: 1

UNCLASSIFIED

Associated Devices For Electronics Test Equipment

ADAPTER SET NAVY TYPE 49416

49416

FUNCTIONAL DESCRIPTION

Adapter Set Navy Type-49416 consists of five different tube socket adaptors designed to permit the testing of certain large tubes when using Vacuum Tube Analyzing Equipments Models OD Series, or Vacuum Tube Testing Equipments Models OQ Series.

RELATION TO OTHER EQUIPMENT

Adapter Set Navy Type-49416 is similar to Adapter Set Navy Type-49598. The latter does not include Adapter NT-49414. Navy Type-49416 provides a means of testing type 316A, 703A, 707A, 708A, and 446 electron tubes with Vacuum Tube Testers Navy Models OD and OQ.

ELECTROMECHANICAL DESCRIPTION

These adaptors are made to withstand a breakdown voltage test of 1000 volts ac, between pin terminals.
 NT-49411.—4 round male contacts one end, 4 round female contacts other end. Adapts 316A tubes to UX four prong socket, straight type.
 NT-49412.—4 round male contacts one end, 4 round female contacts other end. Adapts 703A tubes to standard UX four prong socket, straight type.
 NT-49413.—1 round male contact one end, 4 spring leaf contacts other end. Permits use of 707A tubes without

resonant cavity, straight type. Has a U shaped shell connected to GR type 274 U jack by cable.

NT-49414.—4 round male contacts one end, 4 round female contacts other end. Adapts 708A tubes to UX four prong sockets, straight type.

NT-49415.—1 round male contact one end, spring leaf contact other end. Permits use of GL-446 tubes without coaxial mounting. Straight type, includes cylindrical shell connected to GR type 274U jack by cable.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corp., Newark, N.J.
 Contract NXs-28614.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-A-23982-5701
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	11.2.1
F. I. I. N.	

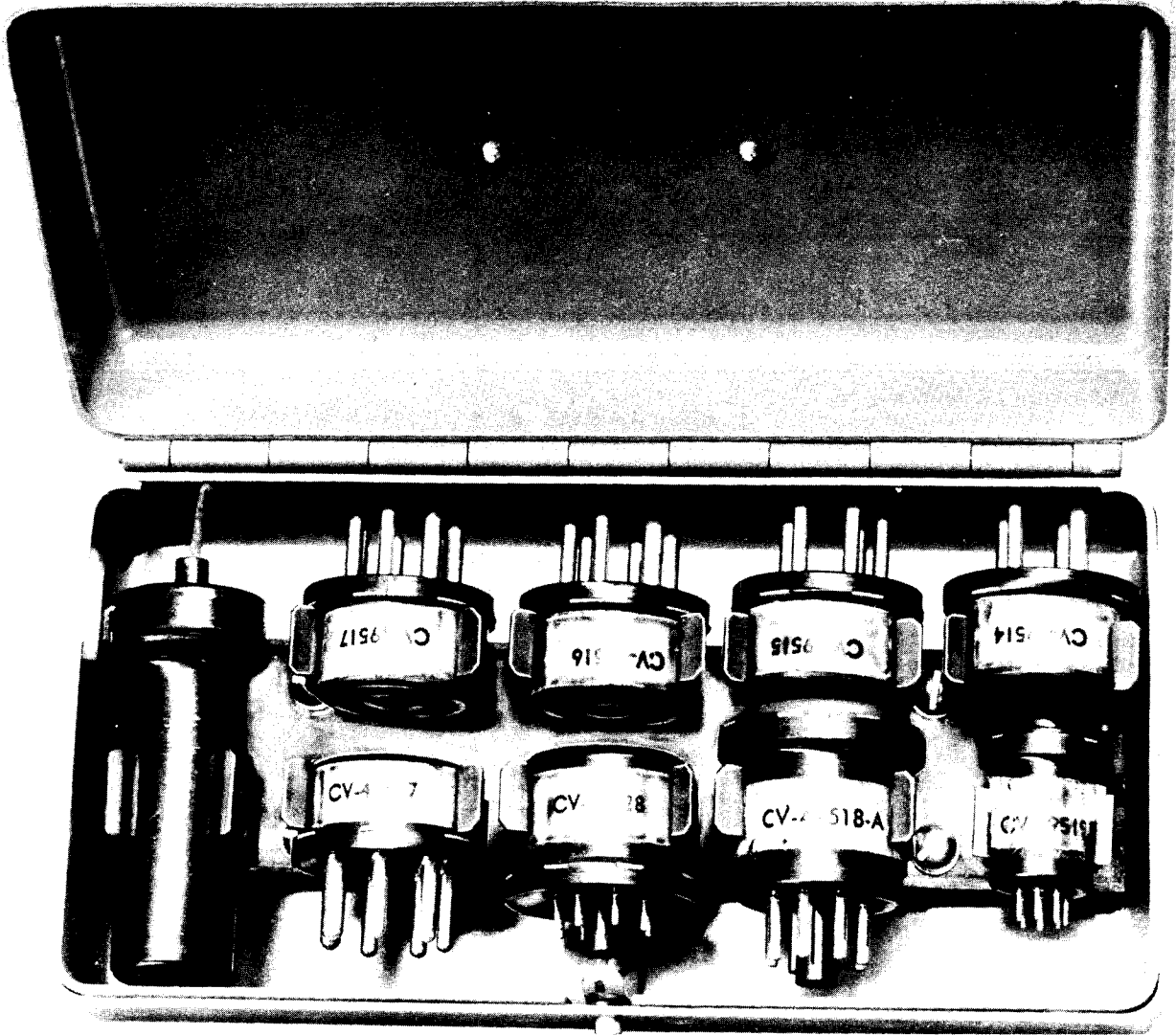
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS inches			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Adaptor 49411	- N16-A-22602-2836	1-5/8	1-1/2 dia		
1	Adaptor 49412	- N16-A-22602-2841	1-5/8	1-1/2 dia		
1	Adaptor 49413	- N16-A-833-52	1-7/8	1-3/8	3/4	
1	Adaptor 49414	- N16-A-22602-2866	1-5/8	1-1/2 dia		
1	Adaptor 49415	- N16-A-22601-3251	1-1/2	1-3/8 dia		
1	Clip Lead	-				
1	Wooden Box	-	4-1/4	2-3/4	7-1/4	
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

UNCLASSIFIED

Associated Devices for Electronics Test Equipment

**ADAPTOR KIT NAVY TYPE
49992****49992***Adaptor Kit NT-49992.***FUNCTIONAL DESCRIPTION**

The Navy Type 49992 adaptor kit is a set of tube socket adaptors which can be placed in tube sockets so that electrical measurements can be made at the tube location. The tube is placed in the adaptor so that the circuit may operate as usual, except for a few VHF and UHF circuits, where tube capacitors are especially important.

RELATION TO OTHER EQUIPMENT

The adaptors in this kit are also a part of Navy Model OE-12 Series Radio Receiver Analyzing Equipment, Field

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-A-23984-1201 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	11.2.1
F.I.I.N.:	

UNCLASSIFIED

4.11 49992: 1

CATALOG OF NAVY MATERIAL

Associated Devices for Electronics Test Equipment

UNCLASSIFIED

NT-49992

change No. 1-49992 provides a metal case so that this adaptor kit may be used as a separate equipment.

ELECTROMECHANICAL DESCRIPTION

The adaptor kit consists of eight adaptors and an adaptor puller. A drilled oak block was originally supplied, but is discarded when Navy Field Change No. 1-49992 is applied. The adaptors are provided with tabs connected to each tube pin for measurement of potential or resistance. They are suitable for use with all commonly used tube types. Navy Field Change No. 1-49992 provides a metal case to stow the adaptors and adaptor puller.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corp., Newark, N.J.
Contract NObsr 39232.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,781(A): Instructions for Adaptor Kit Navy Type CV-49992.
NAVSHIPS 98173: Electronics Field Change Bulletin No. 1-49992.

EQUIPMENT SUPPLIED

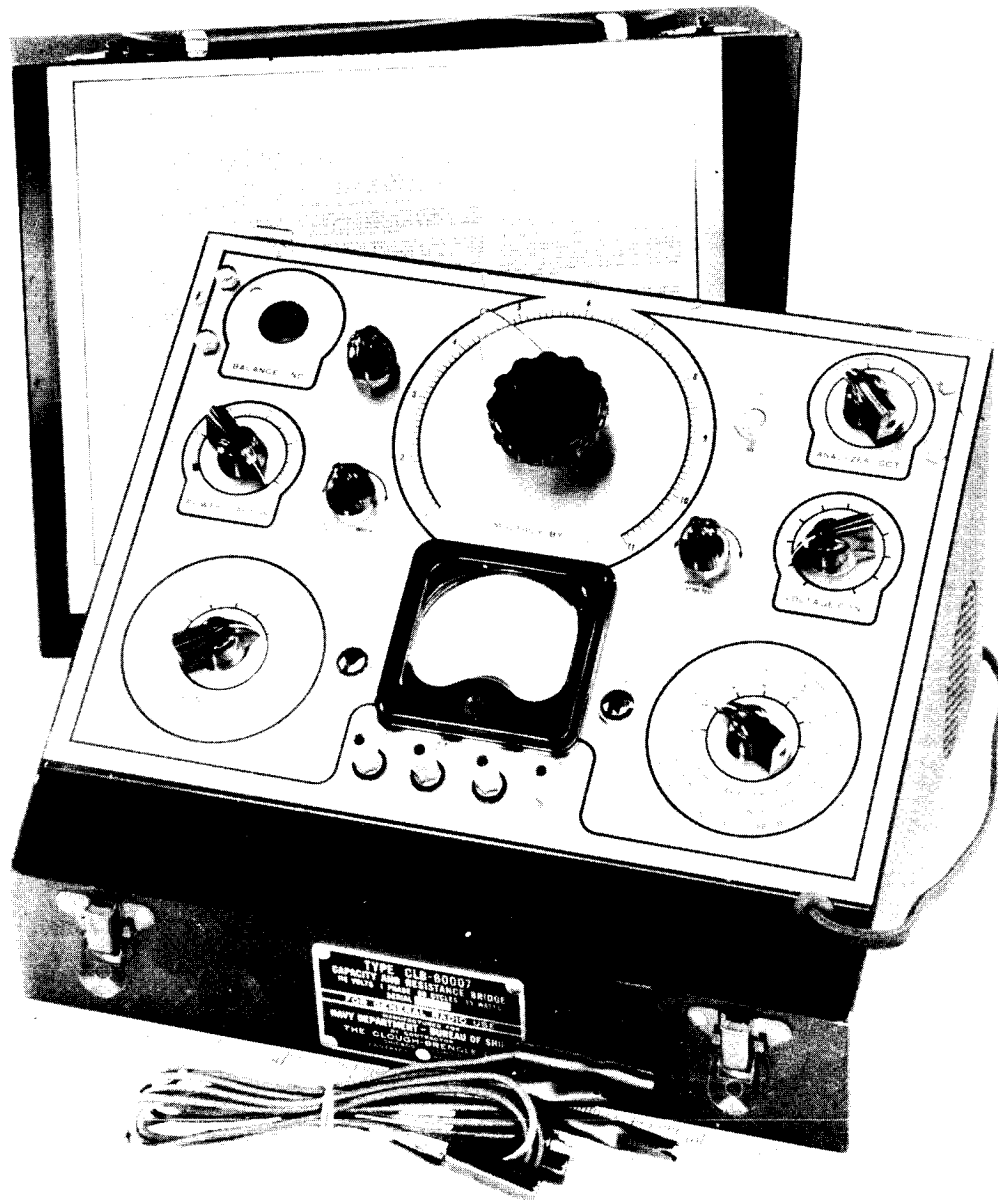
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	4 Prong Adaptor CV-49514	- N16-A-22602-1956	3/4	1-3/8 dia		
1	5 Prong Adaptor CV-49515	- N16-A-22605-6456	3/4	1-3/8 dia		
1	6 Prong Adaptor CV-49516	- N16-A-22609-1951	3/4	1-3/8 dia		
1	7 Prong Adaptor CV-49517	- N16-A-22612-8270	3/4	1-3/8 dia		
1	7 Prong Adaptor CV-49527	- N16-A-22612-8444	3/4	1-3/8 dia		
1	Octal Adaptor CV-49518A	- N16-A-22619-7951	1-3/16	1-1/2 dia		
1	Loctal Adaptor CV-49528	- N16-A-22620-1281	1-1/16	1-3/8 dia		
1	Miniature Adaptor CV-49519	- N16-A-22613-3872	1-1/4	31/32 dia		
1	Adaptor Puller	- - -				
1	Storage Box MS-11968	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Impedance and Standing Wave Ratio Measuring Equipment

CAPACITY AND RESISTANCE BRIDGE NT-60007

NT-60007



Capacity and Resistance Bridge NT-60007.

FUNCTIONAL DESCRIPTION

The Navy Type 60007 Capacity and Resistance Bridge is a self-contained portable equipment. It is a low frequency bridge for the measurement of capacitance, resistance and transformer turns ratio. It contains facilities for polarizing electrolytic condensers while their capacitance and power factor are being determined and also for measuring their direct leakage current. Insulation resistance can be determined up to 2500 megohms.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-B-86231-9031
	(ARMY): 3F4322
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO:	
PROCUREMENT COG.:	Navy, BUSHIPS
DDP IDENT. NO.:	6.1.4.5
E.I.I.N.	

UNCLASSIFIED

4.6 60007: 1

60007

RELATION TO OTHER EQUIPMENT

This equipment has been superseded by Capacitance-Inductance-Resistance Bridge ZM-11/U which is physically smaller and lighter and performs more functions.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 50 to 60 cps, 35 w.
RANGES.—

- Capacitance: 10 $\mu\mu\text{f}$ to 100 μf .
- Resistance: 1.0 ohm to 1.0 meg (reads to 10.0 meg with slightly less precision of balance).
- Transformer Turns Ratio: 0.001 to 1000.
- Insulation Resistance: Up to 2500 meg.
- Polarizing Voltage: 0 to 550 v dc.
- Electrolytic Leakage Current: 0 to 1, 0 to 2.5 and 0 to 5 ma.
- Power Factor: 0 to 50%.
- Accuracy: $\pm 5\%$ nominal.

PRESENTATION AND CONTROLS.—Balance is indicated by an electron ray tube. Power factor and unknown values are read directly from the calibrated dial and multiplier. Voltage applied to the unknown capacitor, leakage current and insulation resistance are indicated on a calibrated meter. The 4 binding posts for

connection of the unknowns will take bare wire or banana plugs.

FITTINGS AND ACCESSORIES.—Three test leads are supplied, which are made of 6 feet of #18 stranded covered wire, with banana plugs on one end, and bronze springtest clips with insulating sleeves on the other end.

CONSTRUCTION.—The equipment is mounted in a metal case with black wrinkle finish. It has a compartment for test leads, a removable cover and a leather carrying handle.

MANUFACTURER'S OR CONTRACTOR'S DATA

Clough-Bregle Co., Chicago, Ill.
Contract NXsr-37247.
Contract NXs-4516, dated 14 September 1943.
Contract NXs-16844.

TUBE COMPLEMENT

(1) 5U4-G (1) 6SJ7 (1) 6E5

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,628: Instruction Book for Type CLB-60007 Capacity and Resistance Bridge.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
	R-C Bridge Navy Type 60007 and accessories	2.9				23.0

EQUIPMENT SUPPLIED

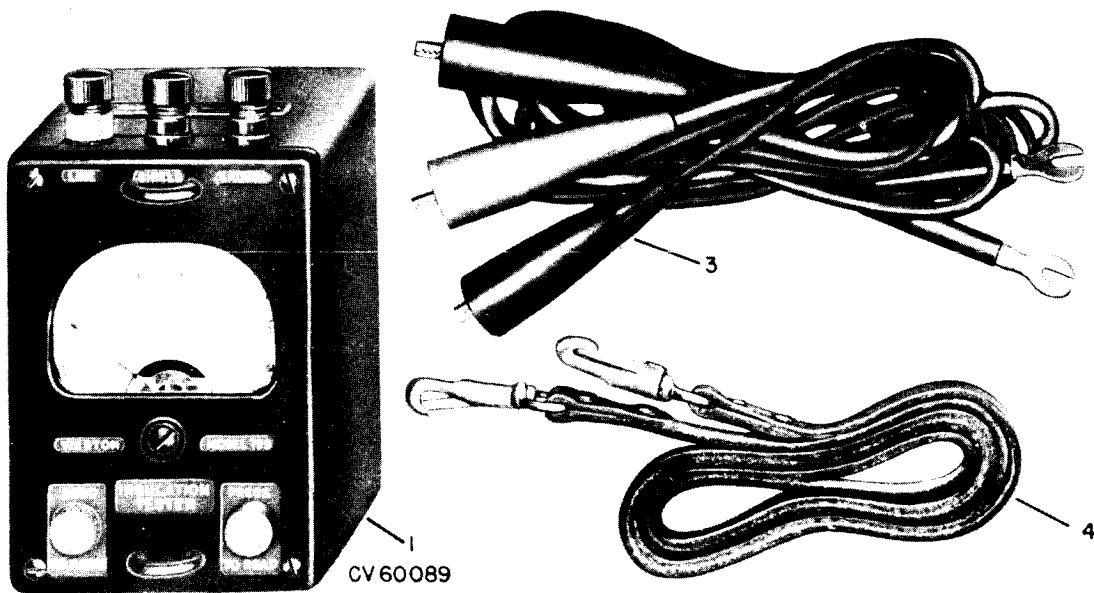
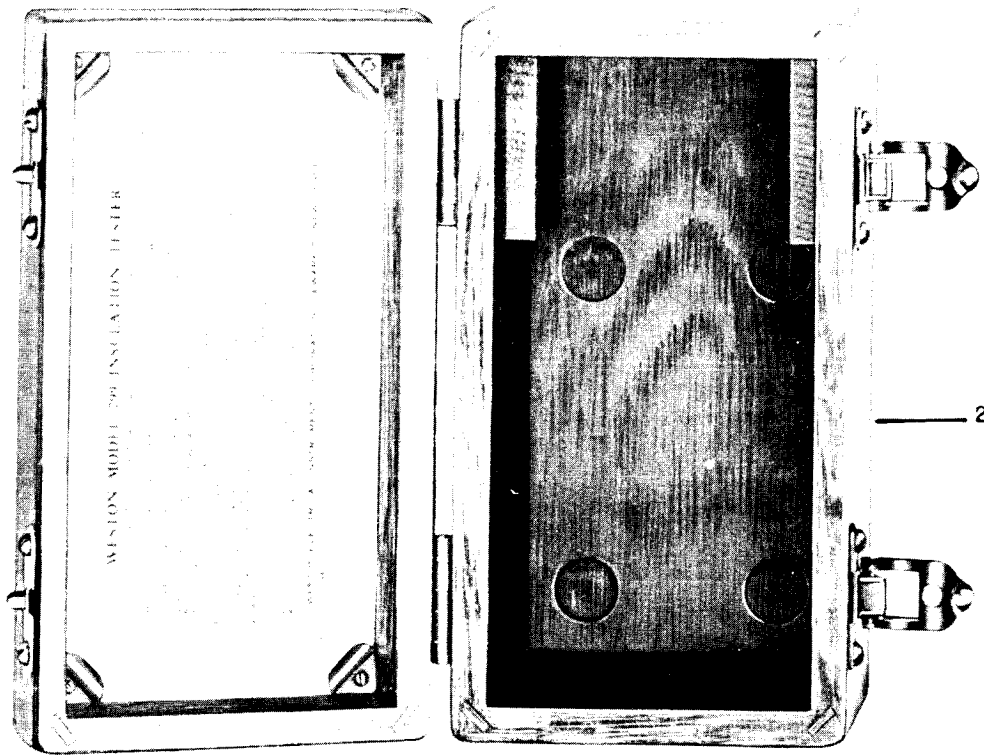
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	R-C Bridge 60007	- - 3F4322	12	10-1/2	7-1/8	18.0
3	Test Leads	- - 3E8001-36	72 lg			
2	Instruction Books NavShips 900,628	- - 6D9142833				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Impedance and Standing Wave Ratio Measuring Equipment

**VACUUM TUBE MEGOHMMETER
NAVY TYPE 60089**

60089



Vacuum Tube Megohmmeter NT-60089.

CATALOG OF NAVY MATERIAL

Impedance and Standing Wave Radio Measuring Equipment

UNCLASSIFIED

60089

FUNCTIONAL DESCRIPTION

The Navy Type 60089 Vacuum Tube Megohmmeter is a single range portable equipment. This equipment is designed to test electrical insulation by indicating its leakage resistance, as well as any resistance value between 0.1 megohm and 10,000 megohms.

ELECTROMECHANICAL DESCRIPTION

POWER INPUT.—1.5 v battery (BA-30) heater; 67.5 v battery (BA-51) plate self-contained batteries.

RANGE.—0.1 to 10,000 meg.

Accuracy: ±1/8 inch of arc at any point on the meter scale.

PRESENTATION AND CONTROLS.—The meter scale is graduated in megohms from 0 to infinite resistance with midscale at ten megohms.

The 50 volts, dc test-voltage (approx) is available between the "line" and "ground" terminals. The "ground" terminal is positive; the "line" terminal is negative.

FITTINGS AND ACCESSORIES.—Three binding posts are provided for connection to circuits under test. In addition to the "line" and "ground" terminals, a "shield" terminal is also available, when making tests on cables and for charging capacitors. The "shield" terminal is linked to a guard ring around the "line" terminal.

Three test leads are supplied, each four feet long, with forked terminals on one end and rubber covered alligator clips on the other end.

CONSTRUCTION.—The meter case is of molded bakelite.

The meter and test leads fit inside the oak carrying case. The A and B batteries are housed inside the bakelite meter case.

The carrying strap can be hooked on two rings located on the front panel of the meter case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corp., Newark, N.J.
Contract NObsr-30147, dated 29 June 1945.
Contract NXsr-59072.

TUBE COMPLEMENT

(1) 1LH4

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,744: Instruction Book for Vacuum Tube Megohmmeter Navy Type 60089.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F17-M-30394-6251
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	6.1.1
F. I. I. N.:	

EQUIPMENT SUPPLIED

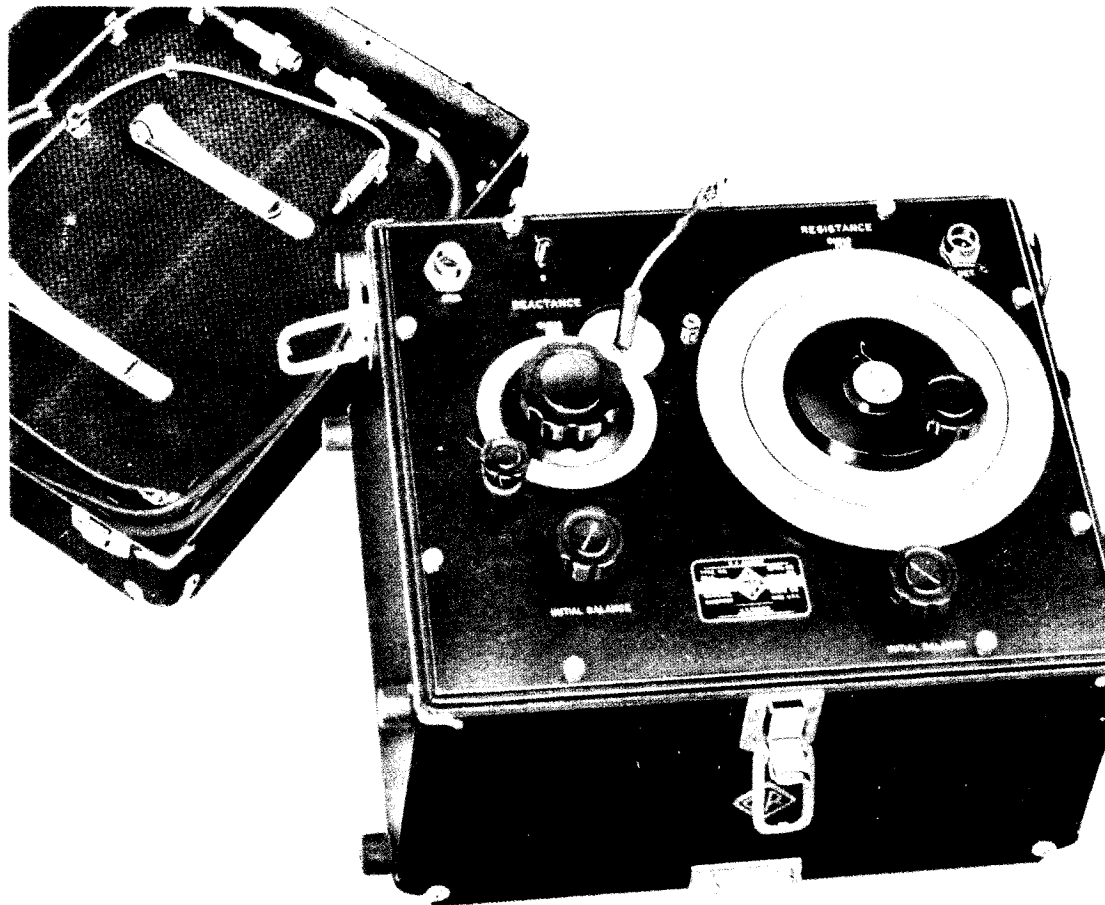
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	DC Megohmmeter Unit	-	5-3/8	4-7/8	3-1/4	3.0
1	Carrying Case	-	7-1/2	6-1/2	4-5/8	2.0
3	Test Leads	-	4 ft lg			0.18
1	Carrying Strap	-	4 ft lg			0.14
					TOTAL	5.32

UNCLASSIFIED

Impedance and Standing Wave Ratio Measuring Equipment

RADIO FREQUENCY BRIDGE NAVY TYPE 60094

60094



Radio Frequency Bridge ST-60094.

FUNCTIONAL DESCRIPTION

The Navy Type 60094 Radio Frequency Bridge is a null-type equipment used in measuring impedance at frequencies from 400 kc to 60 mc. Measurements can be made with decreasing accuracy at frequencies somewhat below and above these nominal frequency units. The resistance component range is from 0 to 1000 ohms; the reactance component range is 0 to 5000 ohms at 1 mc.

RELATION TO OTHER EQUIPMENT

The Navy Type 60094 Radio Frequency Bridge is identical to the General Radio Type 916-A Radio Frequency Bridge. An rf Signal Generator such as RF Signal Generator Set AN/URM-25 or 26, Navy Model LP or LX Series, and a detector such as RADIO RECEIVING EQUIPMENT AN/FRR-22, -23 are required for use with the bridge.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—400 kc to 60 mc.
RESISTANCE COMPONENT, RANGE.—0 to 1000 ohms.
Accuracy: $\pm 1\%$, ± 0.1 ohm.

REACTANCE COMPONENT.—0 to 5000 ohms at 1 mc.

Accuracy: $\pm 2\%$, ± 1 ohm.

INPUT SIGNAL REQUIRED.—1 to 10 v.

DETECTOR SENSITIVITY REQUIRED.—1 to 10 μ v.

PRESENTATION AND CONTROLS.—The main unit of this equipment has a large vernier resistance dial, and a smaller vernier reactance dial with Initial Balance knobs for each component. It has a toggle switch to select L or C components to be measured and coaxial receptacles (GR TYPE 774-G) for the input

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-B-86704-1801
	(ARMY): 3F2009
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	6.1.4.1
F.I.I.N.	

UNCLASSIFIED

4.6 60094: 1

CATALOG OF NAVY MATERIAL

Impedance and Standing Wave Ratio Measuring Equipment

UNCLASSIFIED

60094

signal and the detector. Two banana jacks are provided to connect to the unknown impedances.

FITTINGS AND ACCESSORIES.—To accommodate the frequency range two input transformers are used, one for the range 400 kc to 3 mc and the other, 3 mc to 60 mc. Two leads are supplied for connection to the unknown impedance and two coaxial cables for connecting the Bridge to the signal generator and detector. The signal generator and detector are not part of the equipment. The cables are fitted on each end with General Radio Type 774-M coaxial plugs.

CONSTRUCTION.—The equipment is enclosed in a metal

case with black wrinkle finish fitted with a snap-down latch cover. Cables, accessories and instructions are stored in the cover.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Radio Company, Cambridge 39, Mass.
Contract NXs-62333.

REFERENCE DATA AND LITERATURE

NAVSHIPS 95437: Operating Instructions for Radio Frequency Bridge CAG-60094.

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Bridge Unit	-	13-1/2	17	11-1/8	
1	Test Lead	-	6-1/2 lg			
1	Test Lead	3E4139-2.5	36 lg			
1	Coaxial Cable	-				
1	Coaxial Cable	-				
1	RF Transformer	-				
1	RF Transformer	-				
2	Instruction Book NAVSHIPS	3F2009/B1				
TOTAL LESS MAINTENANCE REPAIR PARTS						35
TOTAL						

UNCLASSIFIED

Voltage and Current Measuring Equipment

DC MICROAMMETER NAVY TYPE 60107

60107

FUNCTIONAL DESCRIPTION

The DC Microammeter Navy Type-60107 is a portable multirange microammeter equipment for use in tuning and adjusting receivers, transmitters, and other electronic equipment.

RELATION TO OTHER EQUIPMENT

It is the same as Simpson commercial model 284.

ELECTROMECHANICAL DESCRIPTION

RANGE.—

DC Microamperes: 0 to 50, 0 to 100, 0 to 250, 0 to 500, 0 to 1000 μ a.

Accuracy: $\pm 2\%$ of full scale.

PRESENTATION AND CONTROLS.—The current is read directly from a calibrated meter with 0 to 50, 0 to 100, and 0 to 250 graduations. The various sensitivities can be selected by means of a selector switch. The meter may be shorted out of circuit by setting the switch to the SHORT position.

FITTINGS AND ACCESSORIES.—Two binding posts (+ and -) are provided for connecting the test leads. Two test leads are supplied.

CONSTRUCTION.—The unit is enclosed in a metal case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Simpson Electric Co., 5200-5218 Kinzie St., Chicago, Ill.
Contract NXsr-71264.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): N17-M-19263-2841 (ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. RE 13A985
PROCUREMENT COG.:	
RDB IDENT. NO.:	1.1.2.3
F.I.I.N.:	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	DC Microammeter Navy Type 60107					

EQUIPMENT SUPPLIED

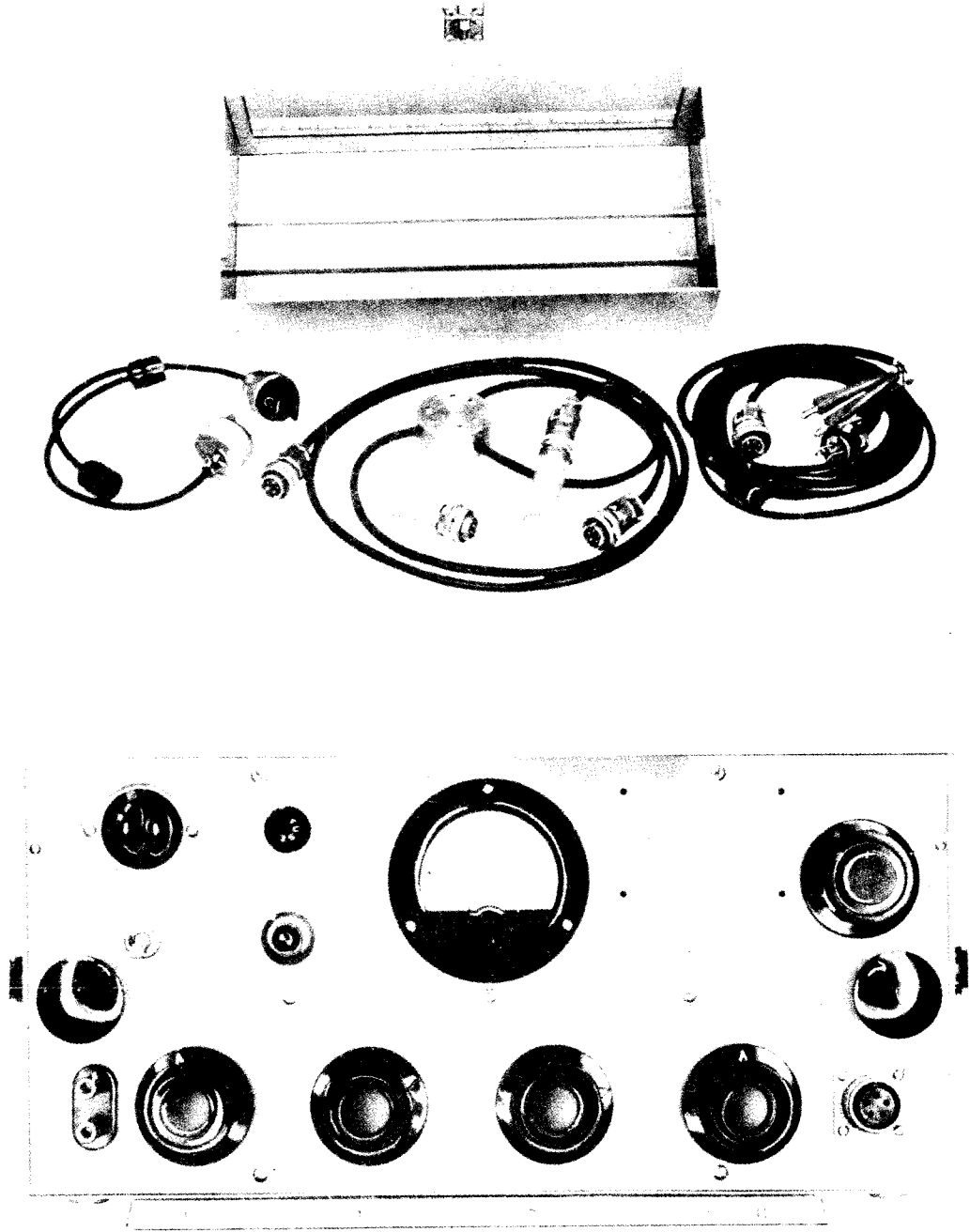
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	DC Microammeter NT-60107	- N17-M-19263-2841	5-1/4	2-7/8	1-3/4	1.33
2	Test Lead	-				
2	Instruction Book	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Signal Generating Equipment

NOISE GENERATOR NAVY TYPE 60140

60140



Noise Generator, NT 60140.

UNCLASSIFIED

4.4 60140: 1

60140

FUNCTIONAL DESCRIPTION

The NOISE GENERATOR Navy Type 60140 is a portable unit supplying adjustable and accurately known noise signals which drop off about 6 db per octave, and thus simulate the energy distribution of target noise through water. Frequency response measurements may be made by using a separate audio oscillator interconnected to the input level calibration meter and attenuation system of the test set.

RELATION TO OTHER EQUIPMENT

This equipment is designed primarily for use in testing the RLI (right-left indicator) section of Navy Model JT Sonar and similar equipment. It can also be used for testing the JP-1, JP-2, JP-3 amplifier and supersonic converter which form a part of the JT system. This noise generator will be superseded by Sonar Test Set AN/PQM-2.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 60 cps, 0.5 amp.
 OUTPUT.—0.316 to 10,000 μ v.
 OUTPUT IMPEDANCE.—1 ohm.
 ATTENUATION.— -40 to -130 db in 1 db steps referred to 1 v across 1 ohm.

Accuracy: $\pm 1\%$ of db reading.
PRESENTATION AND CONTROLS.—All controls and terminals are located on the front panel. The ac voltmeter has a CAL mark on its scale and is used to calibrate the reference output level, together with the CAL ADJ knob. Two switch type attenuator controls are calibrated in db (steps of 1 db and steps of 10 db respectively). A two-position switch is used for the selection of either the internal noise generator unit, or the input signal from an external oscillator. A three-position switch is used for RLI tests. In position C (center), and by varying the output signal with the OUTPUT IN DB BELOW 1 VOLT control, the AVC threshold range of the Sonar RLI console can be measured. In positions R and L, the proper functioning of the corresponding RIGHT and LEFT indications of the RLI console at a set signal level, can be tested. The panel terminals consist of an AC receptacle, two binding posts for the input signal from an external oscillator, and the output connector for the L, C and R calibrated signals.

An ON-OFF switch, pilot lamp and fuse holder are also provided.

FITTINGS AND ACCESSORIES.—One power cord (W-202) is supplied, with two small adaptor cords (W-203, W-204), for various ac source connectors.

One input cord (W-206) is provided for connection to an external oscillator. One output cord (W-205), a "Y" junction box output cord (W-201), one plug type dummy hydrophone (P-202), and one equal-gain plug (P-213) are used for testing the Sonar equipment. (Refer to chart for connector symbols.)

MANUFACTURER'S OR CONTRACTOR'S DATA

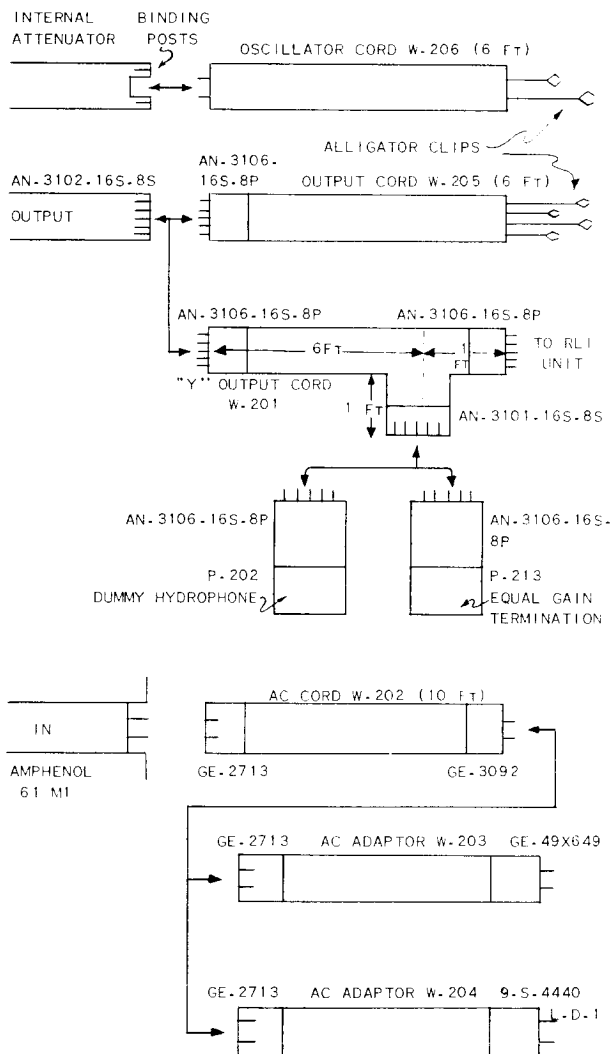
U. S. Navy Underwater Sound Laboratory, Fort Trumbull, New London, Conn.
 Project Order 377/45, dated 15 October 1945.

TUBE COMPLEMENT

(1) 2050 (1) 5Y3-GT (1) 6SJ7 (1) 6AG7

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,786: Instruction Book for Noise Generator Navy Type 60140.



TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-G-59001-1019 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	4.4.2
F. I. I. N.:	

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Signal Generating Equipment

60140

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Noise Generator NT-60140 and Accessories	2.5				35

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Noise Generator Unit	-	7-7/8	17-5/8	13	26
1	Dummy Hydrophone P-202	-				
1	Equal Gain Termination P-213	-				
1	Crocodile Clip Output Cord W-205	-	72 lg			
1	"Y" Junction Box Output Cord W-201	-	84 lg			
1	AC Line Cord W-202	-	120 lg			
1	Polarized Plug Line Cord Adaptor W-203	-	12 lg			
1	Special Navy Plug Line Cord Adaptor W-204	-	12 lg			
1	External Oscillator Connection Cord W-206	-	72 lg			
2	Instruction Book NAVSHIPS 900,786	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			26
			TOTAL			

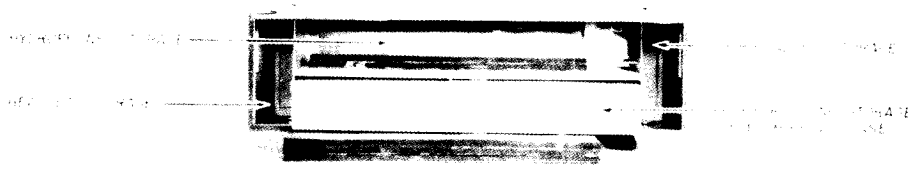
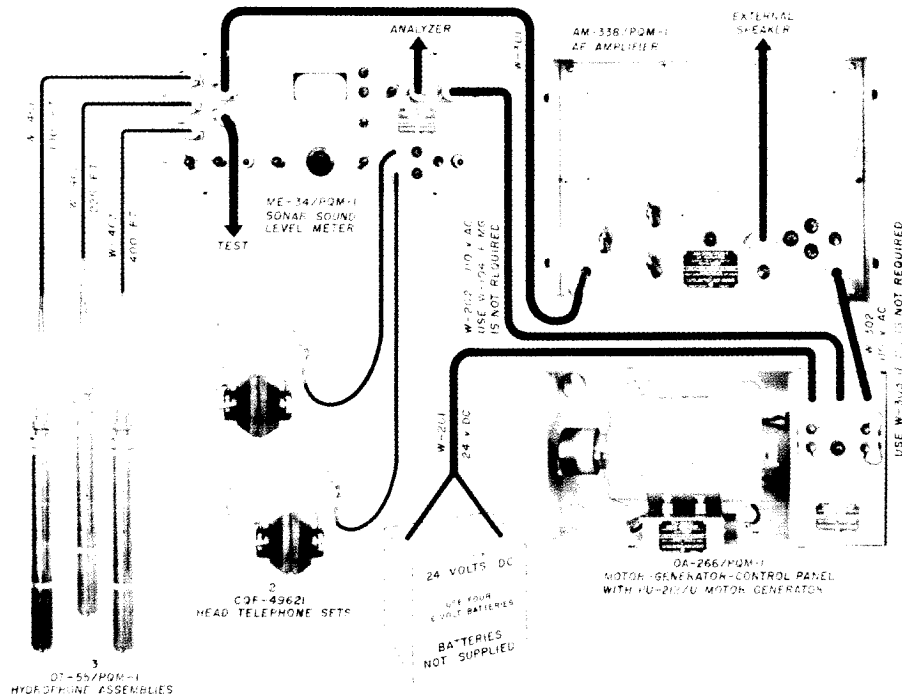
UNCLASSIFIED

UNCLASSIFIED

Field Intensity Measuring Equipment

NOISE MEASURING SET AN/PQM-1

AN/PQM-1



Noise Measuring Set AN/PQM-1.

UNCLASSIFIED

AN/PQM-1

FUNCTIONAL DESCRIPTION

The Noise Measuring Set is designed to measure the sound pressure level of underwater noise. It is intended for use in making the measurements called for in submarine repair procedures toward noise reduction.

RELATION TO OTHER EQUIPMENT

The Noise Measuring Set AN/PQM-1 is very similar to its predecessor the Model OAY Sound Measuring Equipment. It has an extended frequency range, manual selection of 1 of 3 hydrophones and multiple band filters rather than only 1.

ELECTROMECHANICAL DESCRIPTION

SONAR SOUND LEVEL METER ME-34/PQM-1
 POWER SUPPLY.—115 v, 50 to 60 cps, 70 w approx.
 ATTENUATION.—
 Range: -40 to -135 db in 1 db steps.
 Reference Level: 200 μ dynes per square cm.
 Accuracy: 0.15 db change for $\pm 10\%$ variation in line voltage.
 OUTPUT IMPEDANCE.—
 To Each Of 2 Headsets: 600 ohms.
 To Speaker: 500 ohms.
 To Analyzer: 30 ohms.
 To Test-Connector: 500 ohms.
 OUTPUT POWER.—1 mw.
 DISTORTION.—

	Per cent	Output Meter Reading
Total Harmonic:	1.5 rms	+10
	0.75 rms	+ 5
	0.5 rms	0
Intermodulation:	4.15	+10
	1.5	+ 5
	0.7	0

 NOISE, AT 40 DB METER READING.—20 db below signal.
 FREQUENCY RESPONSE.—
 Amplifier:
 At Meter: 0 to -1-1/2 db, 20 cps to 32.5 kc.
 At Phone Jack: 0 to -1-1/2 db, 30 cps to 32 5 kc.
 Low Pass Filter Cutoff Selection: 316, 1000, 3160, and 10,000 cps.
 High Pass Filter Cutoff Selection: 100, 316, 1000, 3160, and 10,000 cps.
 Filter Slope Characteristic: 16 db per octave.
 MOTOR GENERATOR CONTROL PANEL OA-226/PQM-1
 POWER SUPPLY.—
 Voltage and Power: 24 v dc, 22 amp, 528 w in; 110 v ac, 2.73 amp, 270 w out; 60 cps, 1 ϕ .
 Speed: 3600 rpm.
 Temperature: 40° F rise, continuous duty.
 AUDIO FREQUENCY AMPLIFIER AM-338/PQM-1
 POWER SUPPLY.—110 to 120 v ac, 50 to 60 cps, 110 w.
 IMPEDANCE.—
 Input: 500 ohms.
 Output: 4.8 or 15 ohms, for speaker.
 POWER OUTPUT.—10 w, continuous.
 POWER GAIN.—100 db.
 DISTORTION, TOTAL.—3%.
 FREQUENCY RESPONSE.—0 to -1-1/2 db, 40 to 10,000 cps.
 SIGNAL TO NOISE RATIO.—62 db.
 VOLUME CONTROL RANGE.—50 db.
 TONE CONTROL RANGES.—
 Bass Response: 0 to -30 db at 80 cps.
 Treble Response: 0 to -30 db at 10 kc.

HYDROPHONE DT-55/PQM-1
 OUTPUT IMPEDANCE.—300 ohms.
 REFERENCE LEVEL.—1 v for 1 dyne per square cm, open circuit.
 FREQUENCY RESPONSE.—-84, ± 3 db 40 cps to 30 kc.
 HORIZONTAL DIRECTIVITY.—
 At 10 kc: ± 1 db, 360° azimuth.
 At 30 kc: ± 2 db, 360° azimuth.
 VERTICAL DIRECTIVITY.—
 At 5 kc: ± 4 db, 360° elevation.
 At 20 kc: Irregular ± 18 to 20 db, max in vertical and horizontal planes.
 LINEAR RANGE.— -44 to +71 db.
 OVERLOAD.—Above +71 db.
 TEMPERATURE RANGE.—
 Exposure: -15° to +150° F.
 Operating: +28° to +95° F.
 HYDROSTATIC PRESSURE.—250 lb per sq. in.
 Depth of Utility: 7 to 500 ft.
 THERMAL SHOCK.—40° F per minute max.
 PRESENTATION AND CONTROLS.—

The Sonar Sound Level Meter ME-34/PQM-1 is provided with the following controls and fittings on its front panel:
 Hydrophone Selector: Selects one of 3 hydrophones.
 High Pass Filter: 5 ranges of cut-off frequencies and an off position.
 On-Filter In, Off-Filter Out: Pilot indicating filter use.
 HYD #1 300 Ohms, HYD #2 300 Ohms, HYD #3 300 Ohms: Hydrophone input receptacles with protective captive covers.
 AF Amplifier 500 Ohms: AF amplifiers input receptacle with protective captive cover.
 Test CAL 500 Ohms Input 300 Ohms: Test-Calibrate signal input receptacle with protective captive cover.
 Low Pass Filter: 5 ranges of cut-off frequencies and an off position.
 Oscillator Meter ADJ Calibrate: Screwdriver adjustments with "oiler cap" covers.
 DB/.0002 (Meter at 0): Attenuator dial 20 steps, 40 to 135 db in 5 db steps.
 Meter Switch: OSC, CAL and USE positions for meter setting and use.
 Meter Damping: Knob for adjusting meter series resistance for damping.
 Spares: 2 spare cartridge fuses for power input.
 Meter Illumination: Bar knob to vary illumination of meter.
 Analyzer 30 Ohm: Input receptacle for Analyzer attachment with protection captive cover.
 Power 115 v 60 cps, 80 w: Power input receptacle, with protective captive cover.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-114732-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	5.7
F. I. I. N.	

CATALOG OF NAVY MATERIAL

Field Intensity Measuring Equipment

UNCLASSIFIED

AN/PQM-1

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Sonar Sound Level Meter ME-34/PQM-1					
2	Audio Frequency Amplifier AM-338/PQM-1					
3	Motor-Generator Control Panel OA-225/PQM-1					
4	Cable Reel (400' Cable) RL-153/PQM-1					
5	Cable Reel Assembly (225' and 100' Cable) RL-154/PQM-1					
6	Hydrophone Case CY-881/PQM-1					
7	Hydrophone Case CY-880/PQM-1					

EQUIPMENT SUPPLIED

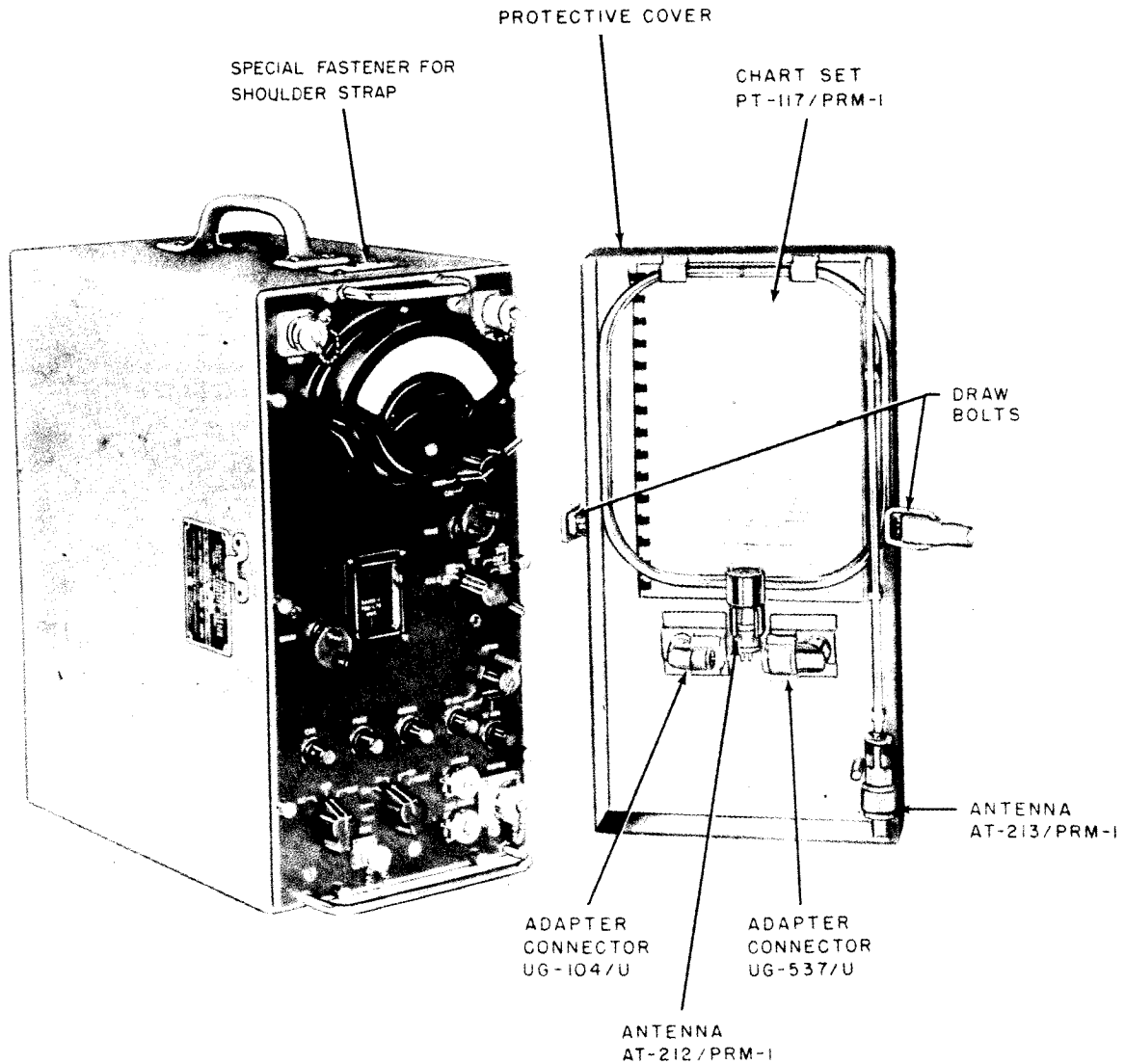
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Sonar Sound Level Meter, ME-34/UPM-1	- F16-R-32677-2487	16-1/8	24-15/16	9-5/8	85
1	Audio Frequency Amplifier AM-338/PQM-1	- F16-A-27984-5973	12-1/16	16-1/4	12-1/8	48
3	Hydrophone Assembly DT-55/PQM-1	- F16-H-99228-4601	3-1/8	24-11/16	3-1/8	10
1	Motor Generator Control Panel OA-226/PQM-1	- F17-M-70732-7201	10-13/16	23-3/4	12-1/8	78
2	Head Telephone Set CQF-49621	- F17-H-51990-5060	6	6	3	1
1	Cable Reel 400 ft RL-153/PQM-1	- N16-R-473712-951	17-1/4	19	12-1/2	85
1	Cable Reel Assy 225 ft / 100 Cable RL-154/PQM-1	- N16-R-473072-151	17-1/4	21-1/4	14-3/4	90
1	Hydrophone Case CY-881/PQM-1	- N16-C-170001-343	10-5/8	36-1/2	10-7/8	85
1	Single Hydrophone Case CY-880/PQM-1	- N16-C-170001-344	3-5/8	27-5/16	4-13/16	22
2	Instruction Book for Noise Measuring Set AN/PQM-1 NAVSHIPS 250-371-1 NAVSHIPS 250-371 April 1951 Noise Survey and Repair Procedures for Submarine Noise Reduction					
TOTAL LESS MAINTENANCE REPAIR PARTS						504
TOTAL						

UNCLASSIFIED

Field Intensity Measuring Equipment

RADIO TEST SET AN/PRM-1

AN/PRM-1



Radio Test Set AN/PRM-1.

FUNCTIONAL DESCRIPTION

Radio Test Set AN/PRM-1 is a radio interference and field intensity measuring equipment designed for field use.

It is a sensitive radio receiver operating as a selective rf voltmeter over the 150 kc to 25 mc band.

It is used for radio interference surveys to determine the source and magnitude of radiated or conducted interference, for adjusting directive antennas or for exploring radiation patterns, where the field intensity may vary over a wide range of values. It can be used as a sensitive two-terminal voltmeter. It is designed for use aboard vessels, aircraft, vehicles or at shore stations.

RELATION TO OTHER EQUIPMENT

When used for extensive survey work, a milliammeter recorder (not supplied) such as Milliammeter Recorder RD-49/U, or Milliammeter Recorder RD-59/U (part of

Radio Test Set AN/URM-6) may be connected to the Ext Meter receptacle of the RI-FI meter and powered from 60 cycle ac.

An oscilloscope may be used for visual monitoring of RI-FI tests. It supersedes Navy Model OF Series.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	5.6
F. I. I. N.:	

UNCLASSIFIED

Field Intensity Measuring Equipment

UNCLASSIFIED

AN/PRM-1

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.— PP-472/PRM-1 PP-472A/PRM-1
 AC: 105 to 125 v ac 105 to 125 v or
 50 to 1600 cps 210 to 250 v ac,
 25 w 50 to 1600 cps,
 25 w.
 DC: 1.5 v, 0.8 amp (2) JAN-BA-35, fil;
 90 v, 30 ma (2) JAN-BA-36, plate;
 *4.5 v (2) JAN-BA-31, bias;
 *1.5 v (2) JAN-BA-58, bias.

*Required whether or not ac is used.

FREQUENCY RANGE.—150 kc to 25 mc; IF, 455 or 1600 kc.

SELECTIVITY.—
 Bandwidth: 3 to 5 kc, 6 db down; 20 to 30 kc, 60 db down.
 Image Rejection: 50 db or better.
 IF Rejection: 50 db or better.

SENSITIVITY.—
 As RF Voltmeter: 1 μ v.
 As Field Intensity Meter: 2 μ v per meter (with rod antenna).

AUDIO OUTPUT.—100 mw min, 600 ohms load (based on 10 μ v rf input, modulated 30% at 1000 cps).

PRESENTATION AND CONTROLS.—

Designation and Function of
 Panel Controls and Receptacles
 IM-37/PRM-1 RI-FI Meter

<u>Designation</u>	<u>Description</u>	<u>Function</u>
Loop	Input Receptacle Captive Cover	Loop and Line Probe Input
Ant	Input Receptacle Captive Cover	Rod Antenna Input
---	Indicating Meter	Output Indica- tion
Ground	Binding Post	For External Ground
Ant, Loop, Cal	Bar Knob	Selects Input to RF Section
Tune	Spinner Crank	Tunes RF Sec- tion
---	Mask Dial	Frequency and Band Indica- tor
---	Attenuator Control	Attenuates Re- ceived Signal in Steps
Band	Spinner Crank	Selects Fre- quency Band
Cal	Knob	Adjusts for Standard Me- ter Indication
Peak	Knob	Control Slide Back voltage
Audio	Knob	Adjusts Volume Level
“B” Adj	Knob	Adjusts Plate Voltage
“A” Adj	Knob	Adjusts Fila- ment Voltage
AC-Off-Batt	Bar Knob	Power Switch
---	Function Switch	Calibrate,Field Intensity (FI) Operate (OP), Peak Diode & Zero

<u>Designation</u>	<u>Description</u>	<u>Function</u>
Audio	Jack Covered with “Oil Filler” Cap	Headphone out- put
Ext Meter	Jack Covered with “Oil Filler” Cap	For connection to Ammeter
Scope	Receptacle Captive cover	For Oscillo- scope connec- tion
Power	Receptacle Captive Cover	For connection to Power- supply
PP-472/PRM-1 or PP-472A/PRM-1 Power Supply		
<u>Designation</u>	<u>Description</u>	<u>Function</u>
Recorder Chart Drive	Receptacle with Captive Cover	For connection to Milliam- meter Re- corder
	Bar Knob	Set for Fre- quency of Source 60 or 50-1600 cps
Power Output	Receptacle	For connection to RI-FI me- ter
Power Input	Receptacle	For connection to external power
Ground	Binding Post	For connection to external ground
3/4 Amp Spare	Fuse Holder Fuse Holder	Line Fuse Spare Line Fuse

FITTINGS AND ACCESSORIES.—Cables and intercon-
 nections (see chart).

The equipment is complete, except for the four bias
 voltage dry batteries (which are not supplied but are
 necessary at all times) and the two filament supply
 and two plate supply dry batteries which are not sup-
 plied but are used when an ac source is not available.

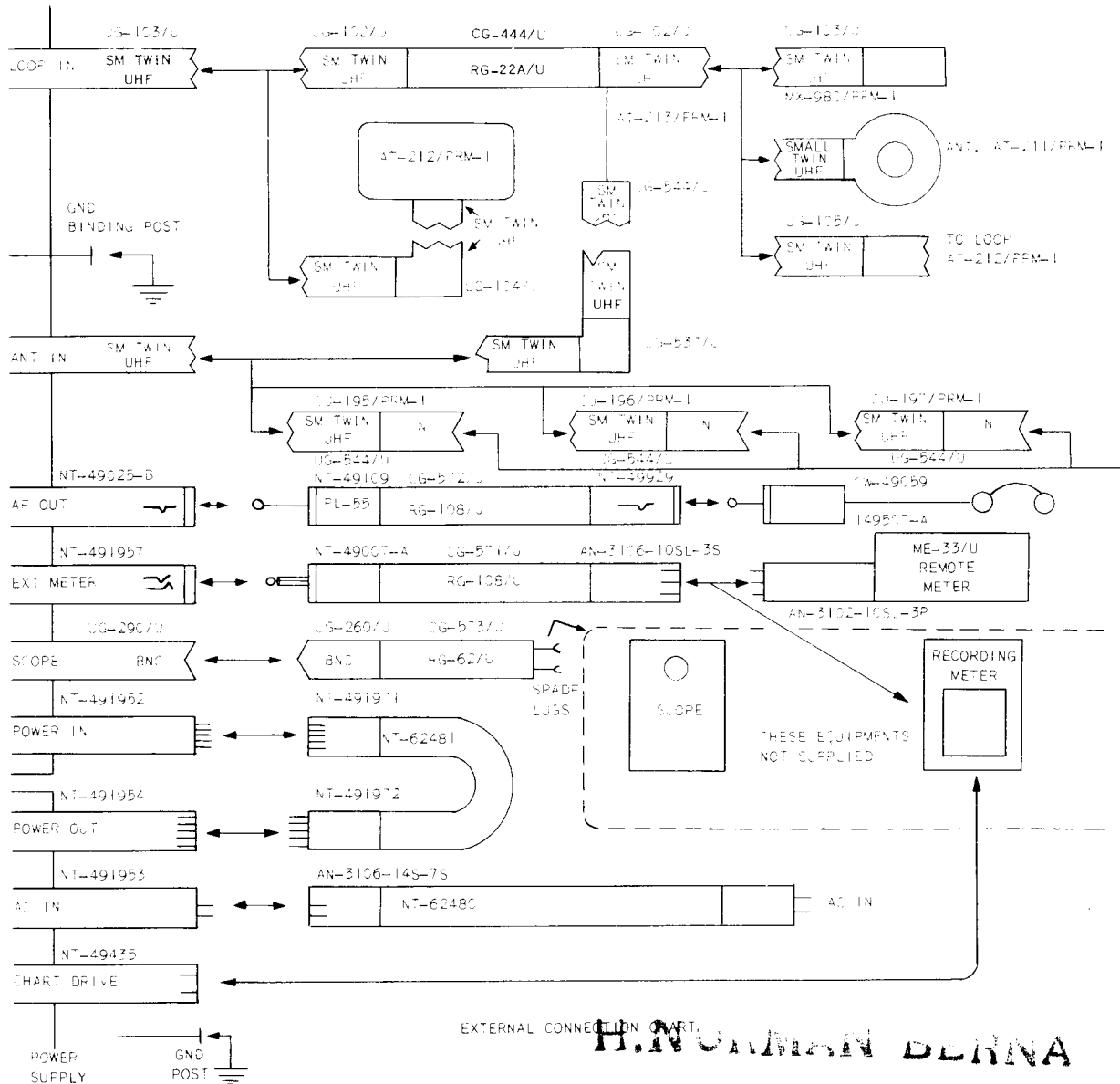
All necessary cables and adaptors are supplied for
 the interconnection of the RI-FI meter, antennas,
 probes, power supply, headset, remote meter and a
 source of ac power (see chart). The RF Probe MX-
 980/PRM-1 is a line probe which permits the use of
 the RI-FI meter as a two-terminal - voltmeter for
 measurement of conducted interference on a line. Ac-
 cess to two spring type binding posts at the probe in-
 put is gained by means of a sliding cover on the probe
 shield - short jumpers are to be connected to one side
 of the line and to ground. Capacitors are included to
 isolate the probe for potentials up to 1000 v ac. A
 small twin UHF type jack is provided for connection
 of cord CG-444/U.

Three Impedance Matching Networks are provided
 to match rf transmission lines, or test equipment
 having N-type plug connectors, directly to the antenna
 input receptacle of the RI-FI meter where they pre-
 sent a capacitive reactance equivalent to that of the
 rod antenna. The 50 ohm CU-197/PRM-1 and the 20
 ohm CU-196/PRM-1 Impedance Matching Networks
 are used for terminating lines or antennas of those
 impedances, and Impedance Matching Network CU-
 197/PRM-1 is an unterminated impedance for use
 with a signal generator or high-impedance antenna
 inputs.

UNCLASSIFIED

Field Intensity Measuring Equipment

AN/PRM-1



A special Small Twin UHF Type Adaptor UG-105/U allows connection of the large loop antenna at the end of the rf cable.

A special cable assembly CG-573/U is provided for connection of the equipment to an oscilloscope for visual monitoring of measurements. A Milliammeter Recorder may be used and connected in place of the remote meter. In this case, a 60 cycle chart drive voltage may be obtained from the power supply box through a special terminal, provided that the ac source is already 60 cycles.

CONSTRUCTION.—The complete equipment is contained in two carrying cases, made of fiber-covered plywood. Each case has a folding grip handle, and draw bolts are used to securely close and lock the cases.

Compartments in the cases are fitted with hooks, racks, blocks, clips, straps, and pads.

A special compartment, located at the back of the RI-FI meter instrument case, is provided to accommodate the dry batteries necessary to its operation. A complete set of spare dry batteries can be housed in compartments provided within the accessory case. A shoulder strap can be used to carry the RI-FI meter during tests.

MANUFACTURER'S OR CONTRACTOR'S DATA

Stoddart Aircraft Radio Company, Hollywood 38, Calif.
 Contract NObsr-39262, dated 27 June 1947.
 Contract NObsr 43370, dated 9 June 1949.

CATALOG OF NAVY MATERIAL

Field Intensity Measuring Equipment

UNCLASSIFIED

AN/PRM-1

TUBE COMPLEMENT

- | | | |
|----------|----------|---------|
| (1) 2A20 | (1) VR75 | (1) IR5 |
| (4) IT4 | (3) 3A5 | (1) IU5 |
| (4) 3V4 | | |

REFERENCE DATA AND LITERATURE

NAVSHIPS 91255: Instruction Book for Radio Test Set AN/PRM-1.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Radio Test Set AN/PRM-1	8.0	21-1/2	28	23	141
1	Maintenance Repair Parts Box	3.0	14-3/4	17-1/2	20	49

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Transmit Case CY-749/PRM-1 Containing:	-	18-3/4	19-1/4	11-3/8	17
1	Ri-Fi Meter IM-37/PRM-1	-	14	7-9/16	16-7/16	37
1	Antenna AT-211/PRM-1	-				
1	Antenna AT-212/PRM-1	-	8-1/4 dia			
1	Antenna AT-213/PRM-1	-	41			
1	RF Probe MX-980/PRM-1	-				
1	Impedance Matching Network CU-195/PRM-1	-				
1	Impedance Matching Network CU-196/PRM-1	-				
1	Impedance Matching Network CU-197/PRM-1	-				
1	Adaptor UG-104/U	-				
1	Adaptor UG-105/U	-				
1	Adaptor UG-537/U	-				
1	Special Purpose (phone extension) Cable Assembly CG-572/U	-	240 lg			
1	Chart Set PT-117/PRM-1	-				
1	Headphones CW-49509	-				
2	Instruction Book NAVSHIPS 91255	-				

UNCLASSIFIED

Voltage and Current Measuring Equipment

MULTIMETER AN/PSM-4**AN/PSM-4***Multimeter AN/PSM-4.***FUNCTIONAL DESCRIPTION**

Multimeter AN/PSM-4 is a portable general purpose multirange ac-dc Volt-ohm-milliammeter designed for general electronic and electrical service work.

RELATION TO OTHER EQUIPMENT

It supersedes Navy Model OE Series and Multimeter TS-352/U Series, and is lighter and more versatile than these equipments. It has a plastic case and an aluminum cover.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Not Classified
STOCK NO.:	(USAF):
	(NAVY): F16-Q-172840-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	1.1.3.2.1
F. I. I. N.	

UNCLASSIFIED

Voltage and Current Measuring Equipment

AN/PSM-4

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—1.5 v dry cell JAN type BA-30; 22.5 v dry cell battery JAN type BA-261.

VOLTAGE RANGES, DC.—0 to 2, 4, 10, 20, 40, 100, 200, 400, 1000, 4000 v full scale.

Sensitivity: 20,000 ohms per v.

VOLTAGE RANGES, AC.—0 to 2, 4, 10, 20, 40, 100, 200, 400, 1000 v full scale.

Sensitivity: 1000 ohms per v.

CURRENT RANGES, DC.—0 to 100 μ a; 0 to 4, 10, 40, 100, 400, 1000 ma; 0 to 10 amp.

OHMMETER RANGES.—

R x 1 mult: 10,000 ohms, center scale 30 ohms.

R x 10 mult: 100,000 ohms, center scale 300 ohms.

R x 100 mult: 1 meg, center scale 3 k.

R x 1000 mult: 10 meg, center scale 30 k.

R x 10,000 mult: 100 meg, center scale 300 k.

ACCURACY OF METER.— $\pm 3\%$ on dc ranges; $\pm 4\%$ on 4000 v, dc range; $\pm 3\%$ on ac ranges; $\pm 3\%$ on ohms and current ranges.

BASIC SENSITIVITY OF METER.—50 μ a (20,000 ohms per v).

PRESENTATION AND CONTROLS.—The meter has a 4-1/2 x 2-1/2 inch frame with three scale arcs of different colors for ohms, dc and ac ranges.

The panel terminal board includes the common, and +V-MA-OHMS pin tip jacks.

Separate jacks are provided for +1000 V DC, 1000 V AC, +10 AMP and +HV MULTIPLIER (1000 to 4000) ranges. To make high voltage measurements, use is made of the high voltage probe and cable which incorporates its own multiplier resistor and a neon lamp indicator.

A function switch with 10 positions is used for the following functions:

DC V: Two positions give "Direct" or "Reverse" polarity readings.

AC V: Small rectifier inserted in meter circuit.

Output: In this function, measurements can be made of ac voltages when dc voltages are also present. Ranges are the same, except for a dc blocking condenser inserted in series with the +V-MA-

OHMS jack.

DC MA-10 AMP: Used with common and +10 AMP jacks for high current measurements.

R x 1, R x 10, R x 100, R x 1000, R x 10,000: Resistance range multipliers.

A range switch (8 positions) is used for the various voltage and current ranges.

The OHMS ZERO ADJ. knob is used on ohms ranges, to zero the meter for slight variations of battery voltage.

Two dry batteries, 1-1.5 v type BA-30 and 1-22.5 v type BA-261 not supplied with the multimeter, are necessary for resistance measurements.

FITTINGS AND ACCESSORIES.—The accessories supplied include:

Two test leads (red and black) with angle pin tip plugs on one end and pin tip probes on the other end.

Two alligator clips which can be attached to the test leads are supplied for convenience.

One high voltage test probe ending in an insulated alligator clip.

One phone plug adaptor having two pin jacks for test lead connections.

CONSTRUCTION.—The multimeter is enclosed in a waterproof, moulded, shock-resistant plastic case with an aluminum box-type cover.

Double latch fixtures on the sides of the case permit the instrument cover to be clamped either over the face of the meter during transportation or storage, or over the back during use. The cover is provided with a hinged carrying handle, and the multimeter with its own "tuck-away" handle. Within the aluminum cover is a small hinged door behind which the accessories can be stored. Operating instructions are printed on this door. The battery compartment is accessible at the rear of the meter case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corporation, Newark, N.J.

Contract NObsr-49273, dated 30 June 1950.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter (AN/PSM-4)					

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter ME-48/U	F16-Q-172840-100	7.38	6.0	4.78	
1	Cover	-				
1	High Voltage Probe	-				
1	Phone Plug	-				

BUREAU OF SHIPS SECTION—Part III

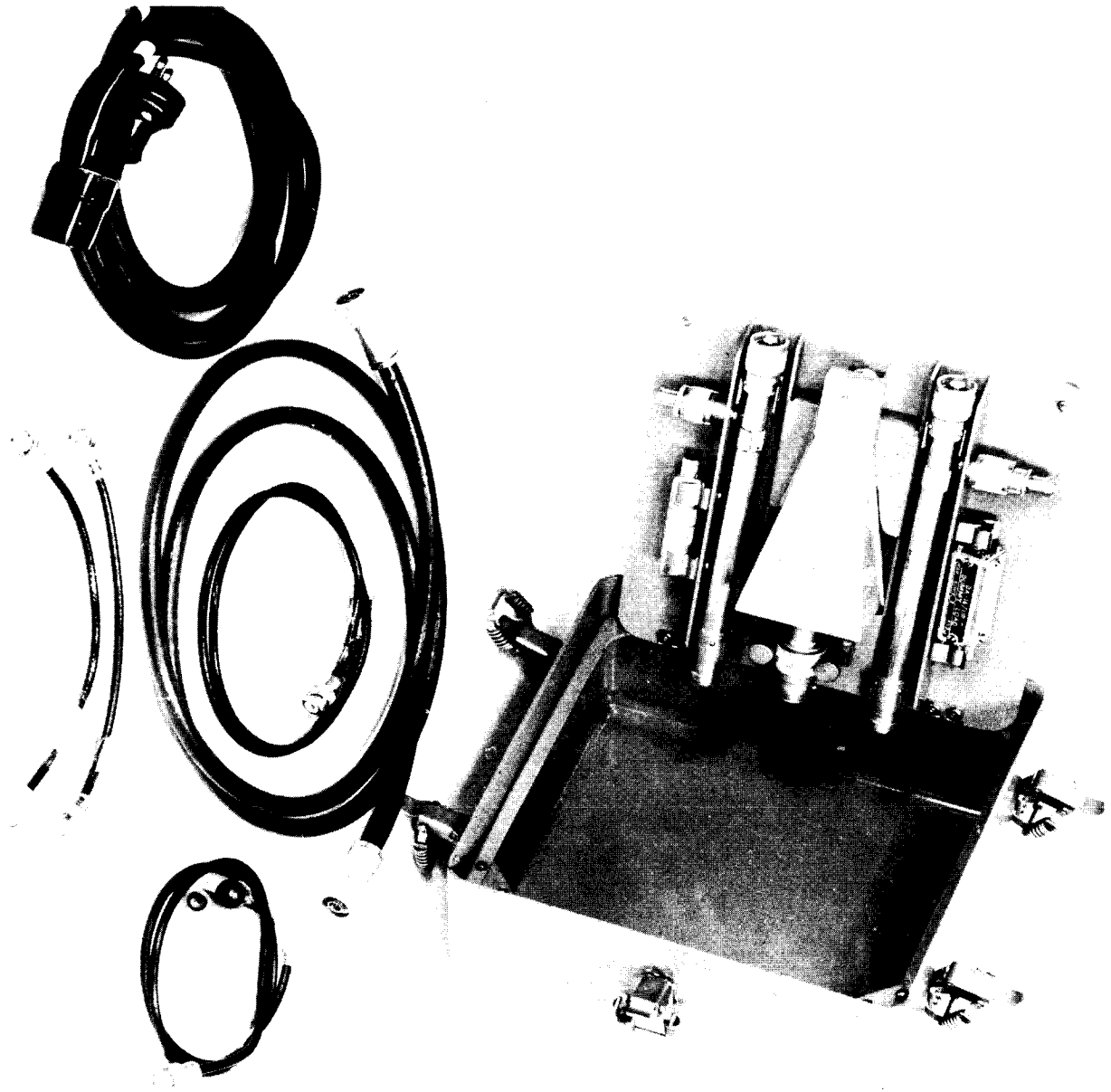
UNCLASSIFIED

Voltage and Current Measuring Equipment
AN/PSM-4

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (<i>inches</i>)			WEIGHT (<i>lbs.</i>)
			HEIGHT	WIDTH	DEPTH	
2	Alligator Clips	-				
2	Instruction Books	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
					TOTAL	5.3

UNCLASSIFIED

Amplifying Equipment for Test Purposes

DETECTOR AMPLIFIER ASSEMBLY AN/UPA-1A AN/UPA-1A*Detector Amplifier AN/UPA-1A.***FUNCTIONAL DESCRIPTION**

Detector Amplifier Assembly AN/UPA-1A is an equipment designed to pick up, detect, and amplify modulated rf signals whose video components may be between 175 cps and 6 mc. It is intended as a means of examining the envelope of transmitted radar, or other rf signals, on the screen of an oscilloscope. The video amplifier can be used independently of the detector to provide amplification of video signals within the above noted range.

RELATION TO OTHER EQUIPMENT

It supersedes and is smaller than Detector Amplifier

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Substitute Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F17-T-3316I-1035
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	7.10
F. I. I. N.:	

UNCLASSIFIED

4.7 AN/UPA-1A: 1

AN/UPA-1A

Assembly AN/UPA-1. It is superseded by Detector Amplifier Assembly AN/UPA-1B, which is enclosed in a combination case.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 50 to 1700 cps, 50 w.
FREQUENCY RANGE.—
 RF: 15 to 11,000 mc.
 Video: 175 cps to 6 mc.
GAIN.—0 to 39 db.
MAXIMUM PERMISSIBLE RF INPUT POWER (into RF Probe).—1.25 mw, into 50 ohms.
RF ATTENUATOR PADS.—10 db (with CN-86/U), 20 db (with CN-87/U).
RF PROBE CHARACTERISTICS.—
 Input Impedance: 51 ohms.
 Design Load Impedance: 1000 ohms, shunted by 25 μ f max.

OUTPUT IMPEDANCE.—120 ohms, at dummy load end.
PRESENTATION AND CONTROLS.—The controls, located on the front panel, include INPUT and OUTPUT jacks, GAIN control, ON-OFF switch, a pilot light, and two fuse holders. The ac cord is permanently attached to the equipment.

FITTINGS AND ACCESSORIES.—Either a horn type pick-up Antenna AT-48/UP (5200 to 11,000 mc), or a dipole type Antenna Assembly AS-23/AP (1550 to 5200 mc) is used as a pick-up device. In case of necessity, the 10 db Attenuator CN-86/U, or the 20 db Attenuator CN-87/U may be installed immediately after the Antenna.

A 6 foot Antenna Cable is then used to feed the rf signal at low power to the rf probe, and the resulting video pulse is then taken to the INPUT receptacle by means of the 10-inch Detector Cable. The amplified output signal can be fed to a synchroscope cable. Use is made eventually of the dummy load, with synchrosopes having a high input impedance, in order to provide proper load to the video amplifier output. One adaptor cable, two connector adaptors and a test cable are supplied for use with external equipments not fitted with the proper connectors. The detail of these connections is given on the attached chart.

CONSTRUCTION.—The detector-amplifier assembly is enclosed in a rectangular metal cabinet provided with a folding carrying handle on the top. The front panel has two guard handles, and a gain calibration chart is clamped on the top of the case. For transportation, the equipment and its accessories are stored in a transit case made of sheet aluminum and provided with carrying handles and spring latches.

MANUFACTURER'S OR CONTRACTOR'S DATA

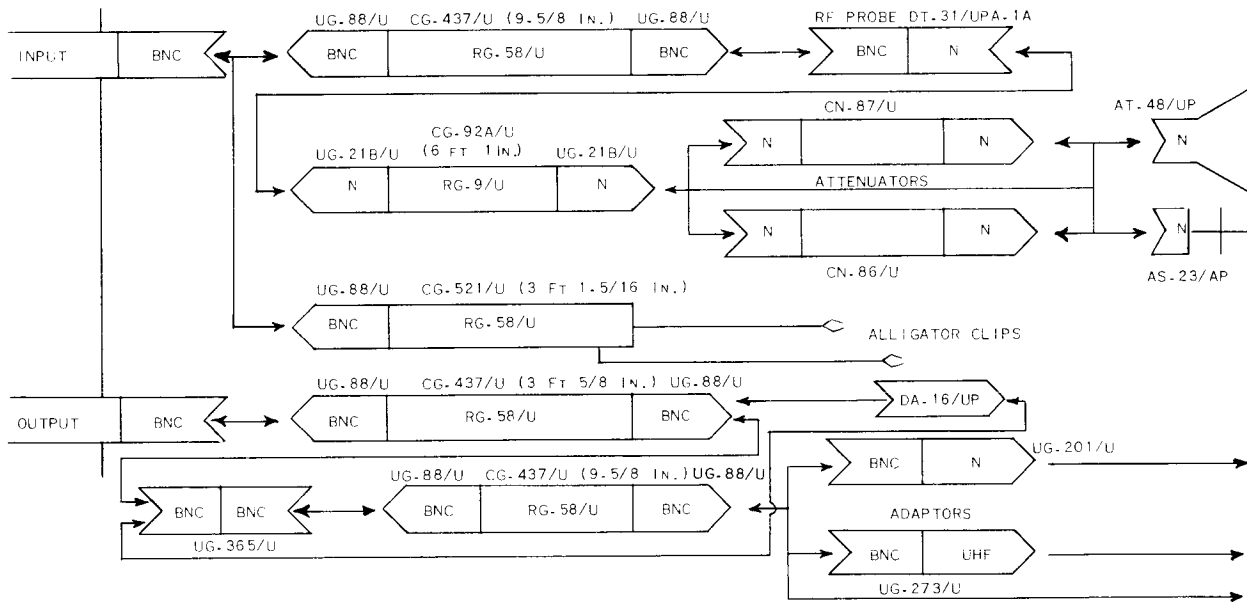
Hazeltine Electronics Corp, New York, N.Y.
 Contract NObsr-39332, dated 26 June 1947.

TUBE COMPLEMENT

(3) 6AK5 (2) 6J6 (1) 6X4

REFERENCE DATA AND LITERATURE

NAVSHIPS 91049: Instruction Book for Detector-Amplifier Assembly AN/UPA-1A.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Detector Amplifier Assembly AN/UPA-1A and Accessories	6.12	27-1/2	26-1/2	14-1/2	124
1	Equipment Spare Parts	3.31	23-1/2	20-1/4	12	66

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Amplifying Equipment for Test Purposes

AN/UPA-1A

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Video Amplifier AM-242/UPA-1A	-	9-5/8	6-11/16	15-1/2	21
1	RF Probe DT-31/UPA-1A	-	21/32 dia x	2-3/4		0.2
1	Transit Case CY-660/UPA-1A	-	11-1/2	22	22-1/4	23
1	Pick-up Antenna AT-48/UP	-	5-1/2	2-1/2	2	0.5
1	Antenna Assembly AS-23/AP	-	3-7/8	2-1/4	1-1/8	0.2
1	RF Attenuator CN-86/U	-	13/16 dia x	8-5/16		0.2
1	RF Attenuator CN-87/U	-	13/16 dia x	8-5/16		0.5
1	Adaptor BNC/UHF UG-273/U	-	23/32 dia x	1-5/16		0.1
1	Adaptor BNC/M UG-201/U	-	3/4 dia x	1-9/16		0.1
1	Dummy Load DA-16/UP	-	3-3/16	1	7/8	0.2
1	Cable Assembly CG-92A/U	-	6 ft 15/16 in. lg			1.0
2	Cable Assembly CG-437/U	-	9-5/8 in. lg			1.0
1	Test Cable Assembly CG-521/U	-	3 ft 5/16 in. lg			2.0
1	Cable Assembly CG-437/U	-	3 ft 5/8 in. lg			2.0
1	Accessories Box	-				
2	Instruction Book NAVSHIPS 91049	-				
1	Equipment MR Parts Box	-	9-3/8	19-1/8	16-3/16	39.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			52.0
			TOTAL			91.0

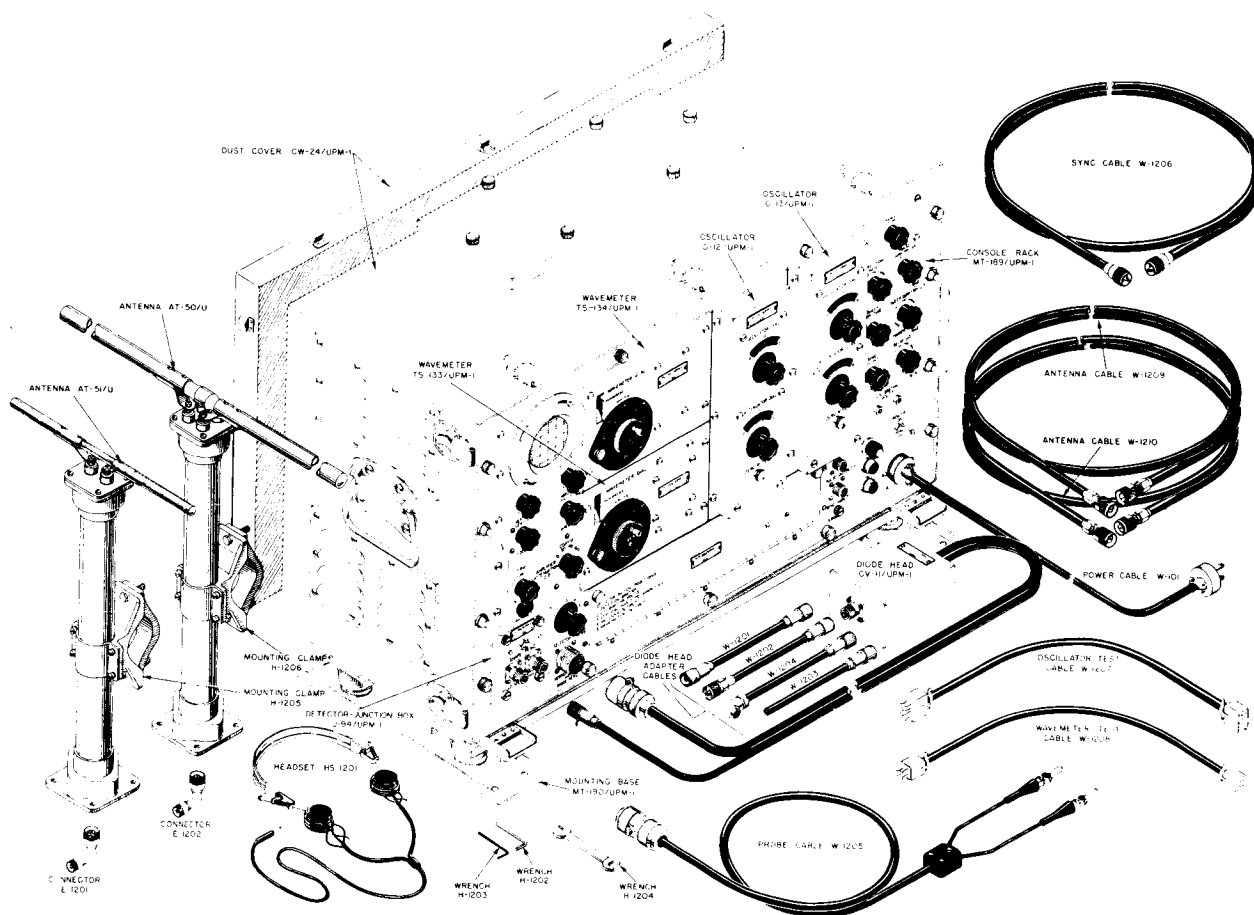
UNCLASSIFIED

RESTRICTED
Security Information

Combination and Group Test Set

**RADAR MAINTENANCE
EQUIPMENT MODEL AN/UPM-1B**

AN/UPM-1B



Radar Maintenance Equipment AN/UPM-1B.

FUNCTIONAL DESCRIPTION

This equipment is a self-contained Radar Test Set operating in the 155 to 235 mc and 460 to 570 mc bands. It contains a pulse and sweep generator, a video amplifier, an oscilloscope, two oscillators, two wavemeters, a detector-junction box and pick-up devices such as antennas, diode head, and probe cable. Its functions are mainly:

- Setting or measuring frequency;
- Measuring pulse power and pulse width;
- Observing waveforms;
- Monitoring transponders, measuring their sensitivity and recovery period;
- Signal tracing.

It can be synchronized by, and can trigger, equipment under test.

RELATION TO OTHER EQUIPMENT

It is designed to perform maintenance tests on Mark 3 IFF equipment and to monitor radar beacons such as Navy Model YJ, YJ-1 and YJ-2. The Radar Maintenance Equipment Model AN/UPM-1 has no antenna supplied, the Radar Maintenance Equipment Model AN/UPM-1A has no mounting base supplied. Otherwise these equipments are identical.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—80 to 115 v or 230 v ac, 50 to 1000 cps, 156 to 193 w.

FREQUENCY RANGE.—

Oscillator O-13/UPM-1, Wavemeter TS-134/UPM-1: 460 to 570 mc, $\pm 0.25\%$ of true frequency.

Oscillator O-12/UPM-1, Wavemeter TS-133/UPM-1: 155 to 235 mc, $\pm 0.25\%$ of true frequency.

Resettability: $\pm 0.1\%$ of original frequency.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): 7CAC-801319-2175 (NAVY): F16-T-20126-1701 (ARMY): 3F-4042-1B
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F.I.I.N.:	

RESTRICTED

Combination and Group Test Set

RESTRICTED
Security Information

AN/UPM-1B

EXTERNAL SYNCHRONIZATION REQUIREMENTS, SYNC IN.—

- Repetition Rate: 0 to 6000 pps.
- Pulse Width: 0.5 to 20 μ sec.
- Pulse Amplitude: 10 to 120 v, positive.
- Rise Time: 10 v, within 2 μ sec.
- Impedance, Input: 100,000 ohms min, 40 μ f.
- Frequency Range: 1000 cps to 2.5 mc.

INTERNAL SYNCHRONIZATION.—

- Repetition Rate: 60 to 2500 pps, \pm 30%.
- Pulse Width: 2 μ sec, plus 60% or minus 30% or 7 μ sec, \pm 30%.
- Pulse Amplitude, Video Output: 50 v min, no load or 25 v across 500 ohms load.
- Pulse Rise and Delay Time, Sync Out: 0.5 μ sec max at 30% max amplitude and 2 μ sec max at 90% max amplitude.
- Sweep Duration: 40, 200 and 2000 μ sec, \pm 30% (2000 μ sec sweep may be used only with 60 and 250 pps).
- Sweep Calibration Markers: 5, 20, or 200 μ sec.
- Pulse Delay, Int Mod Only: 25, 100, or 800 μ sec, \pm 30%.

VIDEO AMPLIFIER.—

- Gain: 70 db min from 30 cps to 750 kc.
- Impedance, Input: 100,000 ohms, 100 μ f, from 30 cps to 1.5 mc.
- Attenuation: 0, 20, 40, or 60 db below 1 v in steps, 0 to 20 db below 1 v continuous, 80 db max.

SIGNAL GENERATORS.—

- Frequency Ranges: 155 to 235 mc and 460 to 570 mc.

Output, High Band: 0.1 v, rms max during pulse into 50 ohm load.

Output, Low Band: 0.5 v, rms max during pulse into 50 ohm load.

Attenuation, RF: 90 db max below 1 v rms during pulse.

Paired Pulse Widths: 2 μ sec, plus 60% or minus 30% or 7 μ sec, \pm 30%.

Rise Times: 0.7 μ sec between 30% and 90% max amplitude.

Interval Between Paired Pulses: 25, 100 or 800 μ sec, \pm 30%.

SENSITIVITY.—

Vertical Deflection: 0.1 in. with 500 μ w rf pulse power at min attenuation.

POWER MEASUREMENT.—

Diode Head: 4 w avg, 4000 w pulse peak.

Detector Junction Box: 1 w avg, 100 w pulse peak.

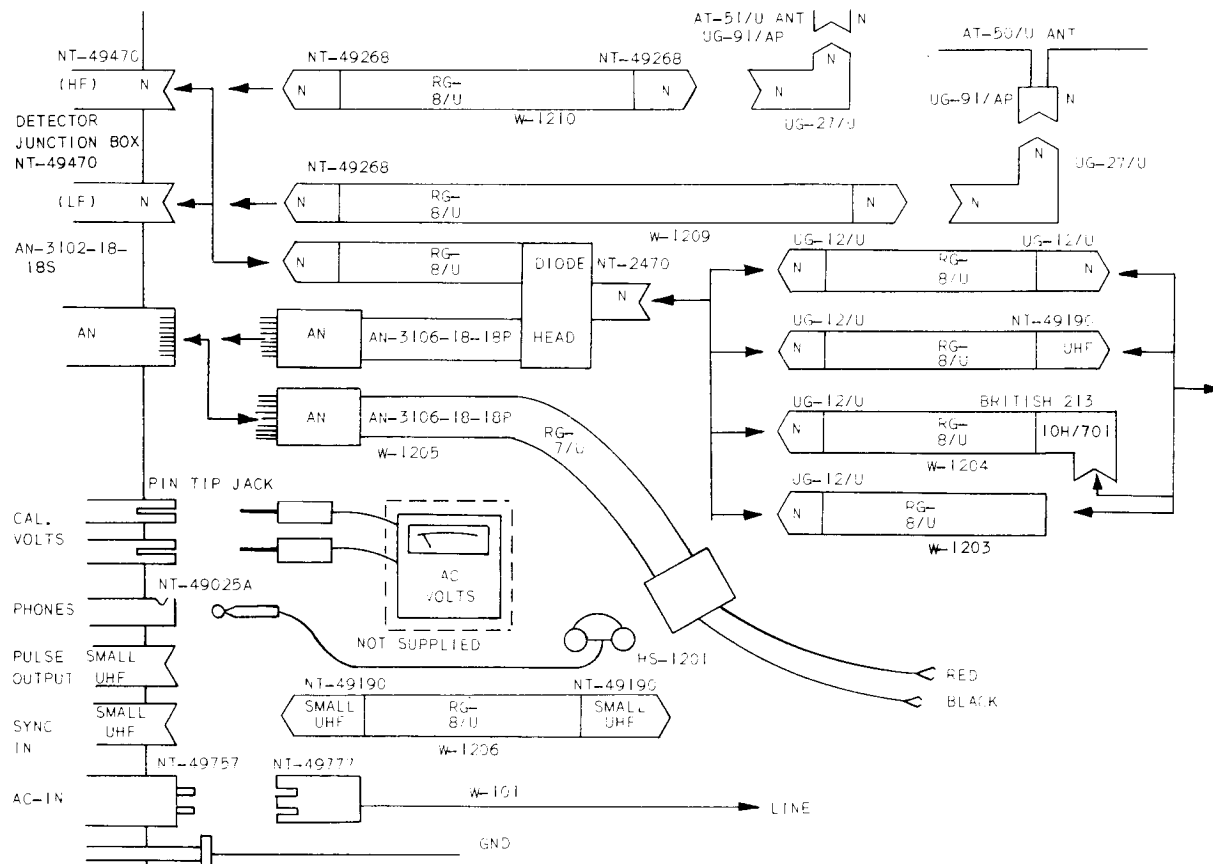
ANTENNAS.—

SWR, AT-51/U (500 to 520 mc): 2 to 1 max.

SWR, AT-50/U (170 to 180 mc): 2 to 1 max.

PRESENTATION AND CONTROLS.—Wave forms are presented as oscilloscope traces, frequencies are presented by drum and disc dial settings of the wavemeters with the scope trace as a resonance indicator. Oscillator frequencies are presented by a calibrated disc dial. The various controls are pictured on the equipment panel view.

FITTINGS AND ACCESSORIES.—The following chart shows the use of the accessory fittings, cables, etc.



BUREAU OF SHIPS SECTION — Part III

RESTRICTED
Security Information

Combination and Group Test Set

AN/UPM-1B

CONSTRUCTION.—The main console of this equipment is contained in a metal cabinet with a latched cover. It has end louvers for ventilation and a shock-mounted base. All controls, dials and cables are available at the front panel. The wavemeter and oscillators are individual units removable from the front panel. The diode-junction box located at the lower left of the panel is also removable as a unit. A top compartment in the cover contains storage space for certain of the accessories. The antennas are half-wave dipoles, base or side clamp mounted. The scope is provided with a telescoping visor.

Contract NXsr-33782.
Contract NXsr-45455.

TUBE COMPLEMENT

(2) 9006	(2) 6SH7	(1) 2X2
(1) 6AG7	(1) 3BP1	(3) 6C4
(9) 6SN7GT	(2) 6J6	(1) 5U4G
(1) OD3/VR-150	(3) 9005	

REFERENCE DATA AND LITERATURE

CO-AN 08-30 UPM-1-2: Handbook of Maintenance Instructions for AN/UPM-1.

SHIPS 236: Preliminary Instruction Book for Radar Maintenance Equipment Models AN/UPM-1 and AN/UPM-1B.

MANUFACTURER'S OR CONTRACTOR'S DATA

Hazeltine Electronics Corporation, New York, N.Y.
Contract NXsa-36958.

EQUIPMENT SUPPLIED

QUANTITY PFR EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Console Rack MT-189/UPM-1 (Including power cable)	7CAC-586600 R16-AN-MT-189/UPM-1 2Z6763-190	17-1/2	30	12-1/4	60.
1	Wavemeter TS-134/UPM-1	7CAC-979572 R16-AN-TS-134/UPM-1 3F4325-134	8-1/8	6	6	4.0
1	Wavemeter TS-133/UPM-1	- R16-AN-TS-133/UPM-1 -	8-1/8	5-1/2	8-1/8	4.5
1	Oscillator O-13/UPM-1	7CAC-363966 R16-AN-O13/UPM-1 3F3583-13	5-1/8	8-3/4	11-1/2	9.5
1	Oscillator O-12/UPM-1	7CAC-363956 R16-AN-O12/UPM-1 3F3583-12	5-1/8	8-3/4	11-1/2	9.5
1	Diode Head CV-11/UPM-1	7CAC-441030 - 2C802-11	6	3-3/4	11-1/2	3.
1	Detector Junction Box J-94/UPM-1	7CAC-002910-46 - 2Z5600-94	3-7/8	4	3-9/16	1.25
1	Dust Cover CW-24/UPM-1	7CAC-226247 R16-AN-CW-24/UPM-1 2Z3350-24	32	20-1/4	14-1/2	31.0
1	Mounting Base MT-190/UPM-1	7CAC-586600 R16-AN-MT-190/UPM-1 2Z6763-190	30	14-3/4	2-5/8	6.5
1	Antenna AT-51/U	7CHE-A3426 R16-HZL-A3426 2A203-51	12-1/2	20-3/4	3-3/4	9.25
1	Antenna AT-50/U	7CNE-A3425 R16-HZL-A3425 2A203-50	32-1/2	20-3/4	3-3/4	10.0
	ACCESSORIES					
1	Sync Cable W-1206	- - -		120 lg		1.15
1	Probe Cable W-1205	- - R16-C-2746-20 -		42 lg		0.5
1	Headset HS-1201	- - -	7-1/2	7-1/2	2	1.0
1	Visor O-1201	- -	3-9/16	4		0.25

RESTRICTED

4.10 AN/UPM-1B: 3

CATALOG OF NAVY MATERIAL

Combination and Group Test Set

RESTRICTED
Security Information

AN/UPM-1B

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	DIODE HEAD ADAPTOR CABLES WITH CONNECTORS					
1	JAN-UG-12/U W-1203	3300-294732145 -	12 lg			0.15
		2Z7390-12				
1	JAN-UG-12/U JAN-UG-12/U W-1201	- - -	12 lg			0.25
1	JAN-UG-12/U 49190 W-1202	- - -	12 lg			0.25
1	JAN-UG-12/U (British IOH/701) W-1204	- - -	12 lg			0.25
1	Oscillator Test Cable W-1207	- -	25 lg			0.40
1	Wavemeter Test Cable W-1208	- -	25 lg			0.25
1	Allen Head Wrench #8	R41-S-2446 -	3/4	2-1/4	5/64	0.03
1	Allen Head Wrench #6	- R41-W-2445 -	1-3/4	1/2	1/16	0.03
1	Open End Wrench 1/2"	- -	4-1/2	1-1/16	5/32	0.12
2	Antenna Right Angle Connector UG-27/U	- -	1-15/16	1-5/8	3/4	0.15 ea
2	Antenna Cable (49268-RG-8/U-49268) W-1209 W-1210	- -	600 lg			5.40 ea
TOTAL LESS MAINTENANCE REPAIR PARTS						164.25
TOTAL						

UNCLASSIFIED

Frequency Measuring Equipment

WAVEMETER TEST SET AN/UPM-2

AN/UPM-2

**CARRYING CASE
CY-194/UPM-2**

**SPARE CRYSTAL
RECEPTACLE**

**ANTENNA
AT-63/UPM-2**

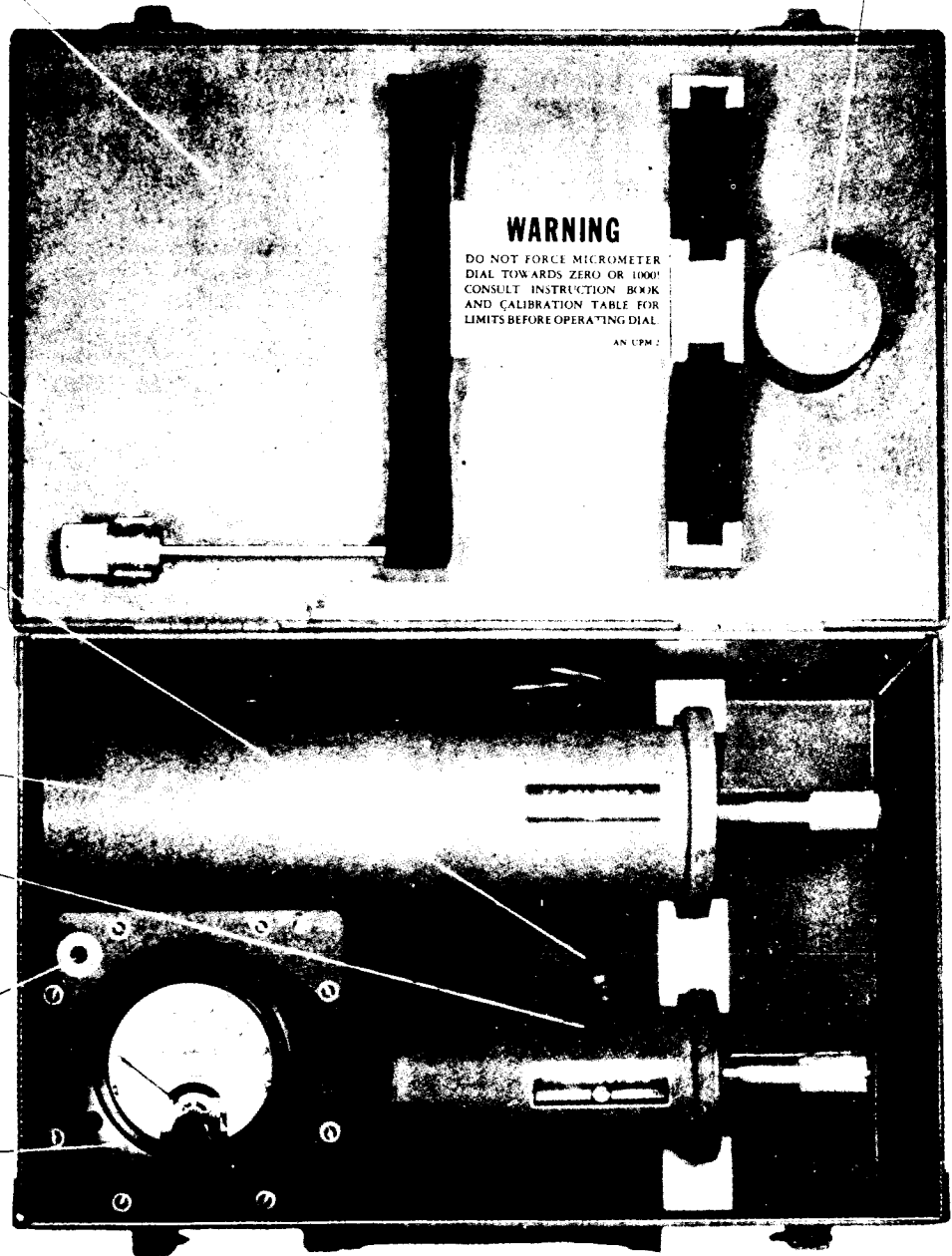
**CONNECTING
CORD**

**FREQUENCY METER
TS-211/UPM-2**

**FREQUENCY METER
TS-212/UPM-2**

**VIDEO OUTPUT
JACK**

0.1 MILLIAMETER



Wavemeter Test Set AN/UPM-2.

UNCLASSIFIED

AN/UPM-2

FUNCTIONAL DESCRIPTION

Wavemeter Test Set AN/UPM-2 is a portable absorption type wavemeter test set covering frequencies from 80 to 1220 mc.

It incorporates two tunable quarter-wave resonant lines which cover overlapping portions of this frequency band.

RELATION TO OTHER EQUIPMENT

It was originally designed for cw frequency measurements of jamming transmitters or radar countermeasure systems.

Wavemeter Test Set AN/UPM-2 can be used with a Cathode Ray-Tube Oscilloscope for visual determination of resonance.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—

Total: 80 to 1220 mc in two ranges.

FREQUENCY METER.—

TS-211/UPM-2: 80 to 360 mc.

FREQUENCY METER.—

TS-212/UPM-2: 330 to 1220 mc.

ACCURACY.—±1 mc.

SENSITIVITY.—5 mw.

PRESENTATION AND CONTROLS.—Each frequency meter is tuned by means of a micrometer having 1000 divisions, and the frequency determined from calibration charts. Correct tuning is indicated by a pronounced "dip" on a meter. Alternatively, a cathode-ray oscilloscope will indicate a minimum deflection at the correct tuning.

FITTINGS AND ACCESSORIES.—The AN Type coaxial male plug on the meter cable mates an AN Type coaxial female jack on either frequency meter. The antenna plugs into the top of either unit and is clamped in position with a knurled threaded collar which is part of the antenna. The video jack is a telephone-type jack.

CONSTRUCTION.—The complete set is self-contained in a metal carrying case, with hinged cover, locks and handle. The 0-1 milliammeter and video cable are attached to, and part of, the case. All delicate components - rod antenna, frequency meters, spare crystals - have convenient spring grip or felt padded housings inside the case.

MANUFACTURER'S OR CONTRACTOR'S DATA

G. Kalart Co., Stamford, Conn.

Contract NXsa-64107, dated 1944.

Contract NXsr-53379, dated 25 October 1944.

TUBE AND CRYSTAL COMPLEMENT

Two crystal rectifiers 1N21 are necessary. The 1N21 has been replaced by high burn-out crystal 1N25 by Field Change No. 1-AN/UPM-2.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,452-1B: Instruction Book for Wavemeter Test Set AN/UPM-2.

AN-08-30/UPM2-2: Handbook of Maintenance Instruction, Frequency Meter AN/UPM-2.

TYPE	(USAF): Not Classified
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Not Classified
STOCK NO.:	(USAF): 1800-266506498
	(NAVY): F16-0-121570-200
	(ARMY): 3F4325-214
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	2.2.2
F.I.I.N.	

EQUIPMENT SUPPLIED

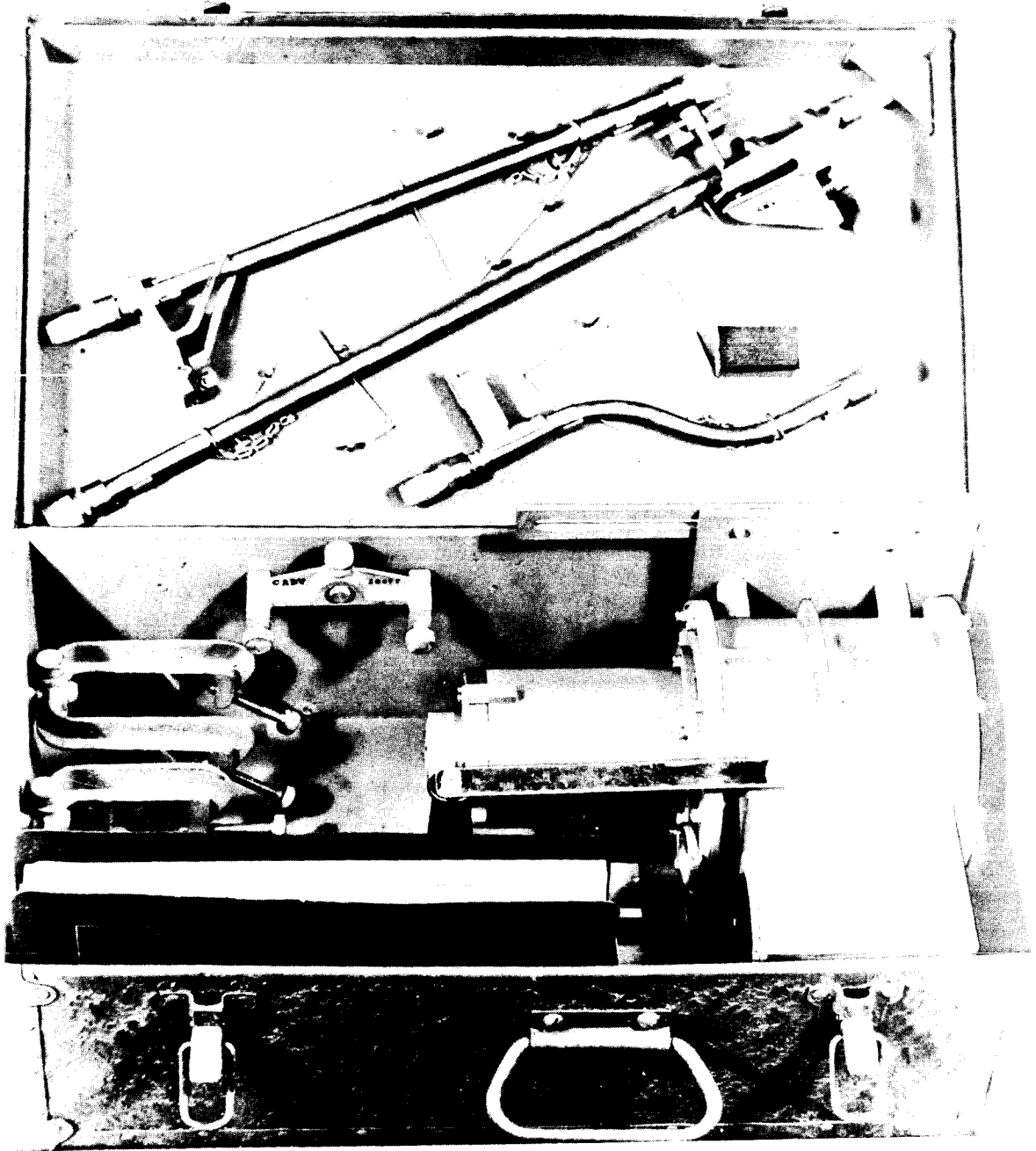
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Frequency Meter TS-211/UPM-2	- R16-AN-TS211/UPM-2	4-3/4	3	12-5/16	3.75
1	Frequency Meter TS-212/UPM-2	- R16-AN/TS212/UPM-2	4-1/2	2-1/2	7-9/16	2.5
1	Carrying Case CY-194/UPM-2	- R16-AN/CY-194/UPM-2	5-5/8	8-3/4	13-1/16	11.1
1	Antenna AT-63/UPM-2	- R16-AN-AT-63/UPM-2	5-5/16	1 1/16 dia		.1
5	Crystal Rectifier (Instrument spares) 1N21	- - -				
TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL						17.4

RESTRICTED
Security Information

Frequency Measuring Equipment

TEST KIT AN/UPM-7

AN/UPM-7

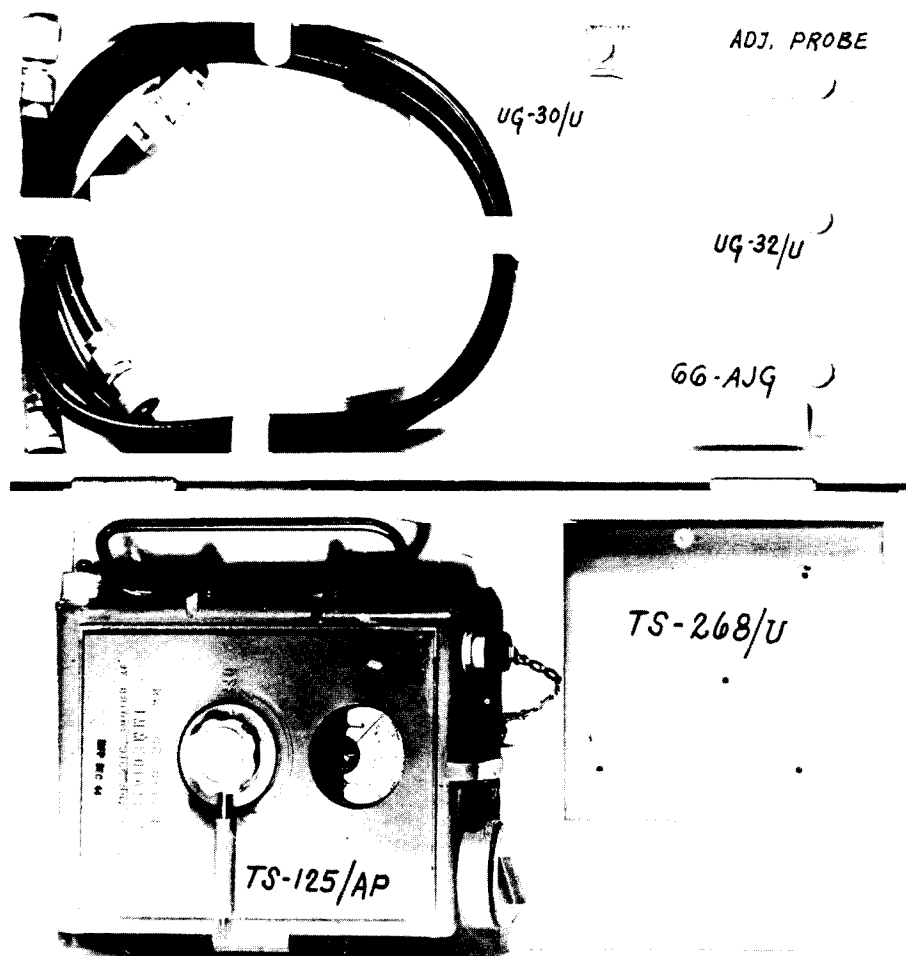


Test Kit AN/UPM-7 (Case 1).

Frequency Measuring Equipment

RESTRICTED
Security Information

AN/UPM-7



Test Kit AN/UPM-7 (Case 2).

FUNCTIONAL DESCRIPTION

Test Kit AN/UPM-7 is a test equipment used for periodical checks of the performance of radars operating in the 2700 to 3100 mc frequency band. The equipment consists of an echo box, a power meter and crystal checker, a pick-up dipole together with jacks, cables, plumbing and hardware for mounting antennas on specific shipboard radars.

It is well to check transmission line losses, to measure the frequency of a radar system, to measure antenna patterns and standing wave ratios, for rough spectrum analysis and for checking radar crystals.

RELATION TO OTHER EQUIPMENT

Test Kit AN/UPM-7 includes Power Meter TS-125/AP and Crystal Rectifier Test Set TS-268/U which are described in detail elsewhere in this catalogue under their own type nomenclature. The kit also includes Echo Box Navy Type 14ABA-1 which is part of Radar Test Equipment OBU-4.

This test set is particularly adaptable to the following radar types:

- SG, SG-a, SG-1, SF, SF-1, SO, SO-a, SO-b, SO-1, SO-2, SO-8, SO-9, SO-13, SL, SL-a, SL-1, SV, SJ-a, SJ-1.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F17-T-33161-1045
	(ARMY): 3F4042-7
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2
F. I. I. N.	

RESTRICTED
Security Information

Frequency Measuring Equipment

AN/UPM-7

ELECTROMECHANICAL DESCRIPTION

(This description covers Echo Box NT-14ABA-1 only as the other items are described elsewhere.)

FREQUENCY RANGE.—

As Echo Box: 2900 to 3100 mc.

As Wavemeter: 2830 to 3170 mc.

SENSITIVITY.—80 yds per db, ringing time.

Temperature Coefficient: +1% per -10° F.

Frequency Factor: +1% per 10 mc.

Spurious Response: 500 yds max, from 2830 to 3170 mc.

Meter Accuracy: ±1%.

OVERALL ACCURACY.—

Performance Tests: ±5 db.

Frequency Tests: ±6 mc.

PRESENTATION AND CONTROLS.—On the Echo Box NT-14ABA-1, a tuning knob actuates the plunger inside the resonant cavity as well as a vernier calibrated frequency dial. A meter indicator with a 0 to 100 microampere scale indicates the relative amount of power absorbed by the cavity over the tuning range and thus indicates resonance. The echoed spectrum can then be analyzed on the PPI scope of the radar system.

The other units are described under their own nomenclature.

FITTINGS AND ACCESSORIES.—The input terminal of the echo box is a type N jack (NT-49795) which fits a UG-21/U or similar type N plug. A 15 or 20 ft length of RG-8/U cable, with a UG-21/U plug at each end

(not supplied) is used for connecting the echo box to the pick-up dipole, using any of the supporting brackets supplied. Alternately, the echo box may be connected to a directional coupler if such has already been installed on the radar under test. Some of the usual arrangements are indicated in the chart below.

A standing wave probe, NT-49977 for measuring VSWR at slotted line sections and UG-29/U and UG-8/AT adaptors for attaching the power meter to cables, are provided.

CONSTRUCTION.—The supporting bracket for the echo box unit of this test equipment is made to fit various radar antenna reflectors. The cast metal echo box is fastened to the platform of the supporting bracket by means of a shockproof mounting base. The echo box has a carrying handle and two hooks to attach the carrying strap used by radar operators when climbing the antenna tower.

MANUFACTURER'S OR CONTRACTOR'S DATA

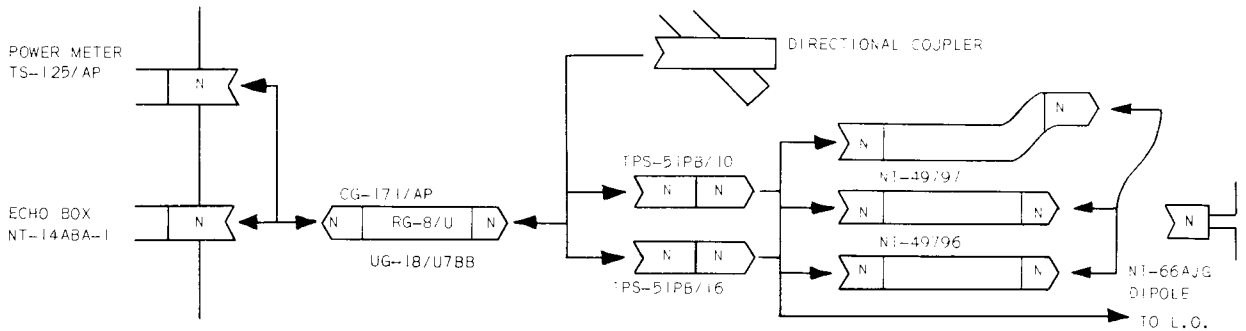
Johnson Service Company, Milwaukee, Wisconsin.
Contract NXsr-86351, dated 3 January 1945.

TUBE COMPLEMENT

None used.

REFERENCE DATA AND LITERATURE

SHIPS 344(A): Instruction Book for Test Kit Model AN/UPM-7.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
2	Test Kit, AN/UPM-7 complete with two carrying cases	10.3				

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Carrying Case Containing:	-	20-1/2	12	8-1/2	10
	1 Echo Box	-	11-9/16	7-13/16	11-1/8	

RESTRICTED

CATALOG OF NAVY MATERIAL

Frequency Measuring Equipment

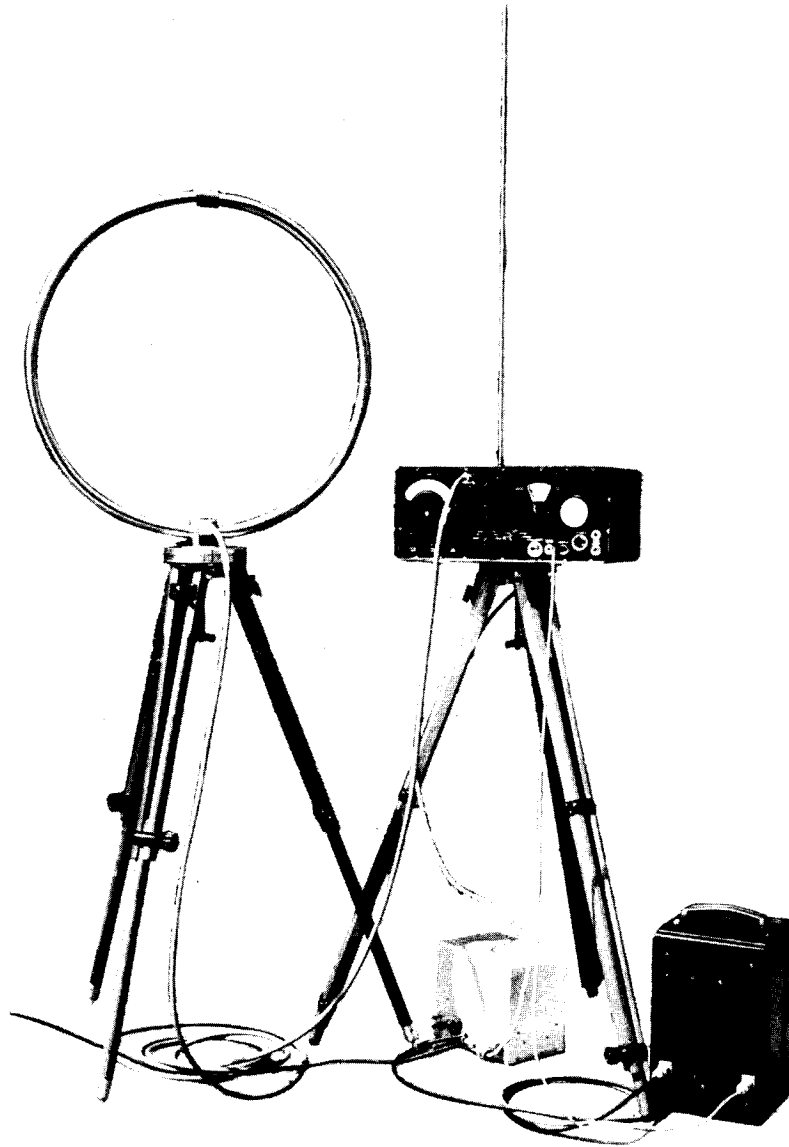
RESTRICTED
Security Information

AN/UPM-7

QTY PER EQUIP	NAME AND NOMENCLATURE	EQUIPMENT SUPPLIED STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Shock Mounting	-	12	8	13/16	1.75
1	Supporting bracket (for echo box) NT-10474	16-B-750001-109				
1	Carrying Strap	-				
1	Wrench, socket	-				
1	Wrench, spanner	-				
1	Gauge, plunger positioning	-				
1	Bracket SOI Pendleton NT-10475	16-C-306499-165				
1	Bracket SOI Wentworth or SG NT-10476	-				
1	Bracket SO NY-49798	-				
1	Bracket SL NT-49796	-				
1	Bracket SF NT-49797	-				
1	Bracket SJ NT-10477	-				
	Equipment Spare Box Containing:		18	8-1/2	5	
1	Connecting Cable (RG-8/U)	-	5 ft lg			
1	Pick-up Dipole NT-66AJG	-				
1	Cable, calibrated 7 db (RG-21/U) CG-171/AP	1690-322850522 R16-A-4934 3E6015-171		111		
1	Calibrated 10 db pad/TPS-51PB/10 or CN-42/UP	1690-286075247 - 2Z394.14		5		
1	Calibrated 16 db pad TPS-51PB/16 or CN-43/UP	1690-286075428 - 2Z394.13		5		
1	Crystal checker TS-268/U	1690-329001392 R16-AN-TS-268/U 3F4325-268	3	6	7	3.0
1	Power Meter TS-125/AP	1690-327879477 R16-AN-TS-125/A 3F4325-125	10	7-7/8	5-5/16	12.0
1	Standing Wave probe NT-49977	-				
1	Adaptor N Jack to N Jack UG-29/U	-				
1	Adaptor N jack to Holmdel UG-8/AP	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
					TOTAL	

UNCLASSIFIED

Field Intensity Measuring Equipment

RADIO TEST SET AN/URM-6**AN/URM-6***Radio Test Set AN/URM-6.***FUNCTIONAL DESCRIPTION**

Radio Test Set AN/URM-6 is a radio interference and field intensity meter (RI-FI) designed for field use, in the 14 to 250 kc band. It is a highly sensitive radio receiver operating as a selective RF voltmeter over a wide range of field intensity.

It can be used for radio signal or interference surveys, to determine the source of conducted or radiated signals, to adjust directive antennas or explore radiation fields. It is intended for installation ashore or aboard vessels, aircraft or vehicles.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	5.6
C.I.T.N.:	

UNCLASSIFIED

4.5 AN/URM-6: 1

UNCLASSIFIED

Field Intensity Measuring Equipment
AN/URM-6

FUNCTIONAL DESCRIPTION

POWER SUPPLY.—

AC Operation: 105 to 125 v, or 210 to 250 v, ac, 50 to 1600 cps, 100 w.

DC Operation: 6 v, dc at 4.1 amp (filaments, from one battery NT-6V-SBMD-175AH); 225 v, dc at 55 ma (plates, from five batteries JAN-BA-26, NT-19004A); 67.5 v, dc at 8 ma (bias, from one battery JAN-BA-26, NT-19004A and one battery JAN-BA-2, NT-19033). These batteries are not supplied with the equipment.

Observer Compass: 3 v, dc (two batteries JAN-BA-30).

These batteries (not supplied) are required when operating from either ac or dc.

FREQUENCY RANGE.—14 to 250 kc.

SELECTIVITY.—6 db down at 100 cps at lower rf; 6 db down at 600 cps at higher rf; 60 db down for 2000 cps at any rf.

IMAGE REJECTION.—50 db down min.

IF REJECTION.—60 db down min, if = 12.5 kc.

SENSITIVITY.—

As a Voltmeter: 1 μ v.

As a Field Intensity Meter: 1 μ v/M.

With Short Rod Antenna: 10 μ v/M.

AF SENSITIVITY.—10 μ v for 100 mw output.

ACCURACY, INTENSITY RANGE.— $\pm 10\%$, 10 μ v/M to 1 v/M.

PRESENTATION AND CONTROLS.—The following controls are mounted on the panels of the referenced units.

Receiver:

“Loop” and “Antenna” input terminals.

Input Switch:

Loop (calibrate-operate) positions.

Antenna (calibrate-operate) positions.

Peak control (slide back voltage) and Peak indicator (Tuning eye).

Audio volume control.

Band selector switch and tuning knob.

BFO “On-Off” switch.

“Cal” knob (meter standard-RF-signal calibration).

Function switch (Cal-FI-Quasi peak-Peak).

Attenuator switch (Cal or x 1, x 10, x 10², x 10³ x 10⁴).

Ground post:

“Power in” terminal.

Remote meter jack.

Recorder jack.

Scope jack.

Two “adui out” jacks.

Power Supply:

“Power in” terminal and pilot light.

“115-230 v” reminder tag, On-Off switch.

Ground post:

Recorder chart drive jack.

Power out jack.

Fuses and spare fuse holders.

The Milliammeter-Recorder requires a 115 volts, 60 cycles supply for the drive motor. Such voltage is automatically obtained from the Power Supply PP-449/URM-6 when it operates from a 60 cycle source delivering either 115 or 220 volts.

FITTINGS AND ACCESSORIES.—The attached chart shows the connections and designations of the various adaptors, cables and accessories used with this equipment. The Radio Test Set is complete and self-contained, except for the dry batteries required for the illumination of the observer compass and the battery pack required when an ac source is not available.

CONSTRUCTION.—The equipment is contained in four carrying cases (black fibre on plywood) and a canvas bag (tripod). One of the cases' tops is a folding table. The receiver and power supply come in drip-proof metal cabinets with grey wrinkle finish. The receiver can be mounted on one tripod. The tripods extend to sixty nine inches.

MANUFACTURER'S OR CONTRACTOR'S DATA

Stoddart Aircraft Radio Company, Hollywood 38, Calif.
Contract NObsr-39263, dated 27 June 1947.

TUBE COMPLEMENT

(2) OC3/VR-105	(1) 6AT6	(3) 6C4
(1) 5Y3-GT	(6) 6AU6	(1) 6E5
(1) 6AL5	(1) 6BE6	(1) 6J6
(1) NE32	(1) NE2	(1) 6X4

REFERENCE DATA AND LITERATURE

NAVSHIPS 91196: Instruction Book for Radio Test Set AN/URM-6.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Radio Test Set AN/URM-6	26.2	25-1/2	37-1/2	47-1/2	297

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Case (Transit) CY-706/URM-6	-	14-1/2	10-7/8	34-1/2	30
1	Containing: "RI-FI" Meter IM-36/URM-6	-	8	19-13/16	10-3/8	26
1	Power Supply PP-449/UURM-6	-	7-31/32	9-29/32	19-3/4	24.75

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Field Intensity Measuring Equipment

UNCLASSIFIED

AN/URM-6

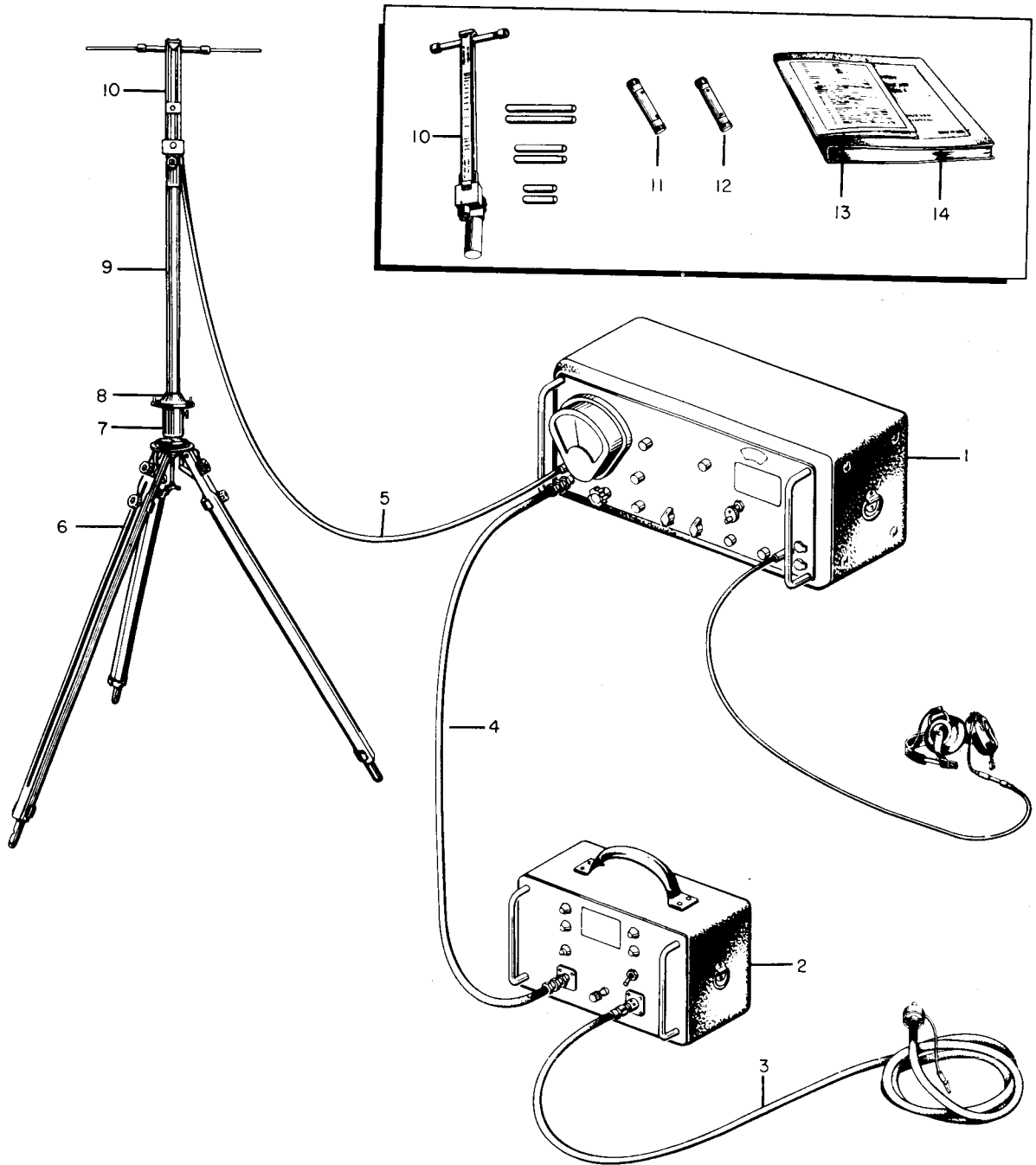
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Antenna, short rod AT-203/URM-6	-	51			
1	Antenna, long rod AT-204/URM-6	-	84			
1	Antenna, small loop AT-205/URM-6	-	5 dia			
1	Adaptor, right angle UG-537/U	-				
1	RF cable assembly CG-577/URM-6	-				
1	Power Cable assembly NT-62480	-	72 lg			
1	Special purpose cable assembly NT-62481	-	120 lg			
1	Chart PT-107/URM-6	-				
1	Clipboard	-				
1	Headphones CW-49509	-				
2	Instruction Books NAVSHIPS 91196	-				
1	Case, (accessory) CY-707/URM-6 Containing:	-	21-1/8	6-3/4	27-3/4	
1	Observer-Compass Mark I Mod 0	-	4-3/4	10-7/8	4-7/8	
1	Ammeter ME-31/U	-				
1	Antenna (probe) AT-207/URM-6	-				
1	RF probe MX-951/URM-6	-				
1	Impedance matching network (50 Ω) CU-184/URM-6	-				
1	Impedance matching network (20 Ω) CU-185/URM-6	-				
1	Impedance matching network (general purpose) CU-186/URM-6	-				
1	Cord CG-444/U	-		240 lg		
1	Cable assembly (remote meter) CG-571/U	-		240 lg		

UNCLASSIFIED

Field Intensity Measuring Equipment

RADIO TEST SET AN/URM-17

AN/URM-17



- | | |
|--|---|
| 1. Radio Interference-Field Intensity Meter IM-52/URM-17 | 8. Azimuth Dial Pointer Assembly CADV-90045-1 |
| 2. Power Supply PP-530/URM-17 | 9. Antenna Mast Section AB-189/URM-17 |
| 3. Power Cable Assembly CADV-62480 (6' 0") | 10. Antenna AT-255/URM-17 |
| 4. Special Purpose Cable Assembly CADV-62481 (10' 0") | 11. R.F. Probe DT-56/URM-17 |
| 5. R.F. Cable Assembly CG-678/U (20' 0") | 12. Impedance Matching Network CU-227/URM-17 |
| 6. Tripod CADV-10545 | 13. Chart Set PT-210/URM-17 |
| 7. Azimuth Dial Assembly CADV-90044-1 | 14. Instruction Book |

Radio Test Set AN/URM-17, Relationship of Units.

UNCLASSIFIED

Field Intensity Measuring Equipment

AN/URM-17

FUNCTIONAL DESCRIPTION

Radio Test Set AN/URM-17 is a Radio Interference and Field Intensity measuring equipment designed for field use.

It is a sensitive radio receiver which can be used as a sensitive selective radio frequency voltmeter over the 375 to 1000 mc band.

It is used for radio interference surveys to determine the source and magnitude of radiated or conducted interference, for adjusting directive antennas or for exploring radiation fields, where their intensity may vary over a wide range of values. It is designed for use aboard vessels, aircraft, vehicles or at shore stations.

RELATION TO OTHER EQUIPMENT

It is frequently used with a headphone set such as Navy Type 49509 for aural monitoring, and with observer compass Mark 1 Mod 0, for alignment of dipole antennas. These equipments are not supplied.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, or 210 to 250 v ac, 50 to 1600 cps, 110 w.

BATTERY PACK (not supplied).—6.3 v dc, 3.4 amp for heaters NT-6V-SBMD-175 AH.

Plate: 225 v, 99 ma (5) JAN-BA-26(NT-19004A).

Bias: 22.5, 6.9 ma (1) JAN-BA-2 (NT-19033).

FREQUENCY.—375 to 1000 mc.

INPUT IMPEDANCE.—50 ohms.

SELECTIVITY.—1.8 mc bw at 1000 mc, 3 db down; 1.0 mc bw at 370 mc, 3 db down; 4.5 mc bw at 1000 mc, 60 db down; 3.0 mc bw at 370 mc, 60 db down.

IMAGE REJECTION.—40 db or better.

SPURIOUS RESPONSE REJECTION.—40 db or better.

IF REJECTION.—60 db or better, 60 mc IF.

SENSITIVITY.—

As an RF Voltmeter: 10 μ v.

As an "FI" Meter: 100 to 350 μ v per meter depending on frequency.

AUDIO OUTPUT.—100 mw min for 600 ohms load based on output reading of 10 with rf input modulated 30% at 1000 cps.

PRESENTATION AND CONTROLS.—The following controls are provided with this equipment.

Receiver tuning knob and associated frequency dial. "RF Trim" and "Mixer Trim" vernier knobs.

Peak control - Audio volume, control.

"Tuning aid" - "OFF" - "Pulse Stretcher," control.

Function switch with Adjust-Calibrator-F1-Quasi peak-Peak, positions.

Attenuator control, Pull-Tune-Push and "adjust"

calibrator output knob, with related meter.

Power input socket, RF input jack.

Remote meter output Jack, 2 audio output jacks (600 ohms).

Dipole Antenna, has 3 sets of dipole elements: length depending on tuned frequency, 5-5/8 in. (375-460 mc), 3-7/8 in. (450-650 mc), 2-5/32 in. (660-1000 mc). Sliding shorting bar is used to tune the dipoles.

Power Supply Box: Power input socket, Power output jack, On-off switch, ground post, fuses and spare fuse holders, pilot light.

FITTINGS AND ACCESSORIES.—All cables and accessories for connection of equipment to an ac source and for linking the receiver to the antenna and to the power supply box are supplied.

An RF probe is included for conducted radiation measurements.

An impedance matching network and cable-end adaptor are supplied for work on 20 ohm circuits.

CONSTRUCTION.—The receiver and power supply are mounted in sturdy metal cabinets with handles. The dipole antenna is mounted on a folding wooden tripod. All major units and accessories fit into two dripproof carrying cases made of fibre-covered plywood, and one zipper canvas bag.

MANUFACTURER'S OR CONTRACTOR'S DATA

Stoddart Aircraft Radio Co., Hollywood 38, Calif.

Contract NObsr-42430, dated 30 June 1948.

TUBE COMPLEMENT

(2) 6AL5	(8) 6BH6	(1) 9005
(1) 6AR5	(1) 12AU7	(2) 6C4
(1) 6AS7-G	(1) NE32	(2) 6F4

REFERENCE DATA AND LITERATURE

NAVSHIPS 91388: Instruction Book for Radio Test Set AN/URM-17.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-123638-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	5.6
F.I.I.N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Radio Test Set AN/URM-17	8.3	18-1/4	43-1/2	19	170

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Field Intensity Measuring Equipment

AN/URM-17

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Transit Case CY-866/URM-17	-	16-1/4	23-3/4	10-7/8	25
	Containing:	-				
	1 Radio Interference Field Intensity Meter IM-52/URM-17	-	9-3/16	19-13/16	10-3/8	30
	1 Chart Set PT-210/URM-17	-				
1	Case (accessory) CY-865/URM-17	-	14-5/8	15-1/2	10-1/8	17
	Containing:	-				
	1 Power Supply PP-530/URM-17	-	7-31/32	9-29/32	19-3/4	16
	1 Antenna AT-255/URM-17	F16-A-45194-7901				
	1 RF Probe DT-56/URM-17	N16-P-87008-4021	3 ft lg			
	1 Impedance Matching Net Work - CU-227/URM-17	N16-N-30826-1073				
	1 Power Cable Assembly NT-62480	N17-C-48293-9599		72		
	1 Special Purpose Cable Assembly NT-62481	N17-C-48703-5521		120		
	1 RF Cable Assembly CG-678/U	N16-C-11957-3021		240		
	1 Glow Lamp (spare)	N16-L-1233 2Z5952				
	1 Ballast Lamp (spare)	-				
	1 Cable Connector, 20 ohm	N17-C-71414-5764				
1	Bag (tripod) CW-218/URM-17	-	39-3/4	x 6-1/4 dia		3.25
	Containing:	-				
	1 Tripod NT-10545	N16-T-802001-107				
	1 Antenna Mast Section AB-189/URM-17	-				
1	1 Azimuth Dial Assembly	N16-I-21801-1045				
	1 Azimuth Dial Pointer	N16-K-701645-401				
TOTAL LESS MAINTENANCE REPAIR PARTS						109.25
TOTAL						

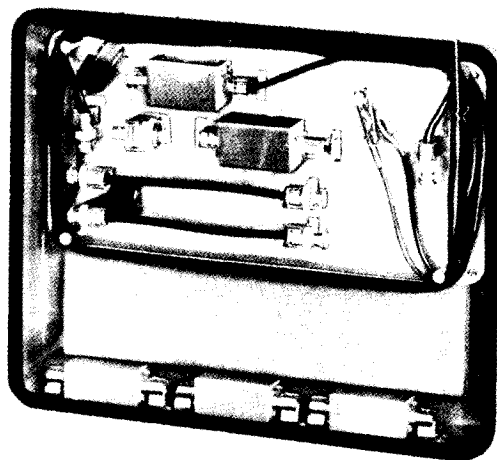
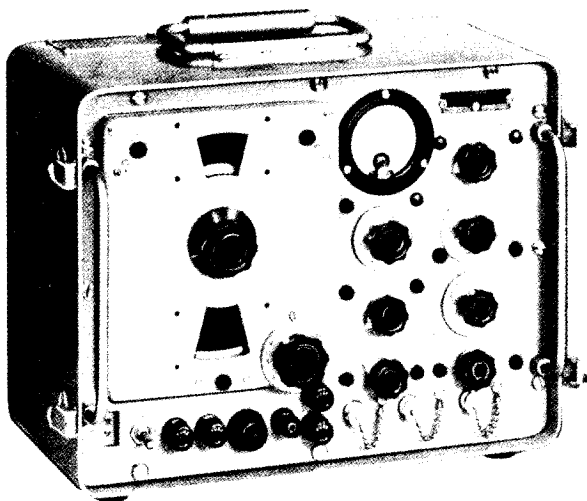
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Signal Generating Equipment

RF SIGNAL GENERATOR SET AN/URM-25

AN/URM-25



RF Signal Generator Set AN/URM-25.

FUNCTIONAL DESCRIPTION

RF Signal Generator Set AN/URM-25 is designed to generate CW or AM signals in the 10 kc to 50 mc frequency band and over a wide range of output voltage. It is used generally to test sensitivity, selectivity and audio response of receivers, to align rf and if stages and to provide a signal which can be used when measuring receiver gain and output power.

RELATION TO OTHER EQUIPMENT

This equipment supersedes Navy Model LP Series equipment. It is superseded by RF Signal Generator Set AN/URM-25B, which includes a crystal controlled calibrator.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, $\pm 10\%$, 50 to 1600 cps, 45 w.

FREQUENCY RANGE.—10 kc to 50 mc, $\pm 0.5\%$.

MODULATION.—

Amplitude Range: 0 to 80%, $\pm 10\%$.

Internal: 400 or 1000 cps, $\pm 5\%$.

External: 100 to 15,000 cps.

OUTPUT.—

Voltage: 0.1 μ v to 0.1 v, $\pm 10\%$, continuously variable across 53.5 ohm external load; 2 v, open circuit; 1 v, across 500 ohm external load.

Impedance, X Mult: 53.5 ohms at rf output jack.

X 20,000: 500 ohms at rf output jack.

PRESENTATION AND CONTROLS.—The frequency range is covered in 8 bands with a band switch and tuning

dial. Modulation is controlled by the MOD SELECTOR dial with four positions, OFF, Ext, 400 INT and 1000 INT and by the per cent MODULATION control.

A meter with MICROVOLTS (0 to 100) and per cent MCD (0 to 100%) scales is brought into the proper circuit of a VTVM bridge by means of the METER READS dial, having three settings, BALANCE, per cent MOD, RF VOLTS. Proper carrier level for balancing the meter with standard output is adjusted by the CARRIER CONTROL knob. Output voltage at both RF OUTPUT X MULT and RF OUTPUT X 20,000 terminals can be adjusted by the MICROVOLTS control knob.

An rf attenuator varies the output at the RF OUTPUT X MULT terminal, 0.01, 0.1, 1, 10, 100, 1,000 times the indicated microvolt reading on the meter.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	4.1.2
F. I. I. N.	

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4.4 AN/URM-25: 1

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Signal Generating Equipment

AN/URM-25

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Signal Generator SET AN/URM-25 with Spares (BUSHIPS and Coast Guard Shipments)	4.5	16	25	19	55
	Without Spares (BUAER Shipments)	2.2	14	17	15	44

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Signal Generator Set AN/URM-25	-	10-1/4	13	10-1/4	35
	Including:	-				
1	RF Signal Generator SG-44/URM-25	-				
1	Power Supply PP-562/URM-25	-				
1	Impedance Adaptor MX-1074/URM-25	-				
1	Antenna Simulator SM-35/URM-25	-				
1	5/1 Fixed Attenuator CN-132/URM-25	-				
1	10/1 Fixed Attenuator CN-136/URM-25	-				
1	Test Lead CX-1363/U	-				
1	RF Cable Assembly CG-409/U	-	48 lg			
2	RF Cable Assembly CG-409/U	-	7 lg			
1	AC Line Cable Assembly	-				
1	Coaxial Adaptor UG-201/U	N17-C-67990-2447				
1	Instruction Book NAVSHIPS 91283	-				
1	Maintenance Repair Parts (Not included on BUAER Shipments)	-	6	9	12	8.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			35
			TOTAL			43

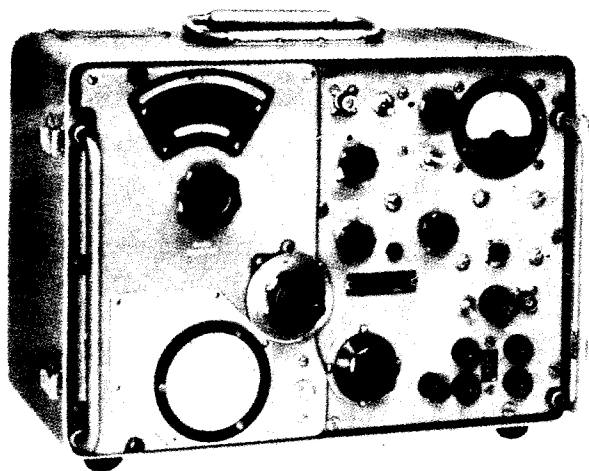
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Signal Generating Equipment

RF SIGNAL GENERATOR SET AN/URM-26

AN/URM-26



RF Signal Generator Set AN/URM-26.

FUNCTIONAL DESCRIPTION

RF Signal Generator Set AN/URM-26 is a compact general purpose signal generator designed to produce modulated or unmodulated RF signals in the 4 to 408 mc frequency band.

It can be modulated internally (AM) by a source of sine wave, or externally (PM) by pulsed voltages.

It is intended for use in the alignment and sensitivity tests of radio receivers, and for other test applications where a source of CW or MCW signals is required.

RELATION TO OTHER EQUIPMENT

This signal generator supersedes Navy Model LX Series UHF Signal Generators.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, $\pm 10\%$, 50 to 1600 cps, 60 w.
FREQUENCY RANGE.—4 to 408 mc.

Frequency Accuracy: $\pm 0.5\%$ or better.

MODULATION, SINE WAVE.—

Amplitude: 0 to 50%.

Accuracy Amplitude: $\pm 10\%$ up to 100 mc, $\pm 20\%$ from 100 mc to 408 mc.

Internal: 400 or 1000 cps.

External: 100 to 20,000 cps.

Spurious FM: Less than .035% at 15% modulation, or .08% at 30% modulation.

MODULATION, PULSE EXT.—

Amplitude: 40 v min.

Pulse Rate: 50 to 5000 pps.

Pulse Width: 2 to 40 μ sec up to 100 mc; 1 to 40 μ sec from 100 to 408 mc.

RF OUTPUT VOLTS.—0.1 μ v to 100,000 μ v (–127 dbm to –7 dbm).

Attenuation Accuracy: $\pm 10\%$ to 100 mc; $\pm 20\%$ from 100 to 408 mc.

Load Impedance: 50 ohms.

PRESENTATION AND CONTROLS.—The Carrier frequency is set by means of the band selector switch (6 steps) and the fine tuning dial.

The output reference level is set by rotating the index marker for a reading of 20 on the meter indicator. Final adjustment of output is made with the "Output Microvolts" knob, which displaces the microvolt disc scale in relation to the standing index marker.

The meter can be set to zero by way of the "Zero Set" knob, and is made to read "RF" load or "% Mod", depending on the position of the "Meter Reads" switch.

A "Mod Selector" switch (OFF-Ext-400-1000), a "Pulse-Normal" toggle switch, and a "% Mod" knob are used to select and/or calibrate the modulating voltages applied to the carrier.

When external pulses are used to trigger the carrier oscillator a "Pulse Threshold" knob is used to adjust the oscillator circuit for different amplitudes of pulses.

Panel terminals are the "Ext Mod" and "Pulse Input", the "RF Output" and the AC Jack.

Fuse holders, "On-Off" switch and ground connector, complete the operating controls of the set.

FITTINGS AND ACCESSORIES.—All terminals and cable connectors are of the BNC type (see chart on following page).

All necessary cables and accessories are supplied to connect the signal generator to the receiver under test, with various possible solutions to impedance matching problems. When using an external source of modulation, other means of connection than those provided must be used.

CONSTRUCTION.—The equipment is self-contained and is enclosed in a metal cabinet with a carrying handle, locks, and four rubber stands. The hinged detachable box lid accommodates all the cables and accessories.

The power pack is a separate sub-assembly of its own (for ease in servicing). It is located inside the cabinet, and is connected to the signal generator assembly by means of the 10 contact power distribution cable assembly.

MANUFACTURER'S OR CONTRACTOR'S DATA

Federal Mfg. and Engineering Corp., Brooklyn 5, N.Y.
Contract NObsr-43410, dated 30 June 1949.

TUBE COMPLEMENT

(1) 12AU7 (1) VR-150 (1) 6AQ5
(1) 6F4 (2) 6X4

REFERENCE DATA AND LITERATURE

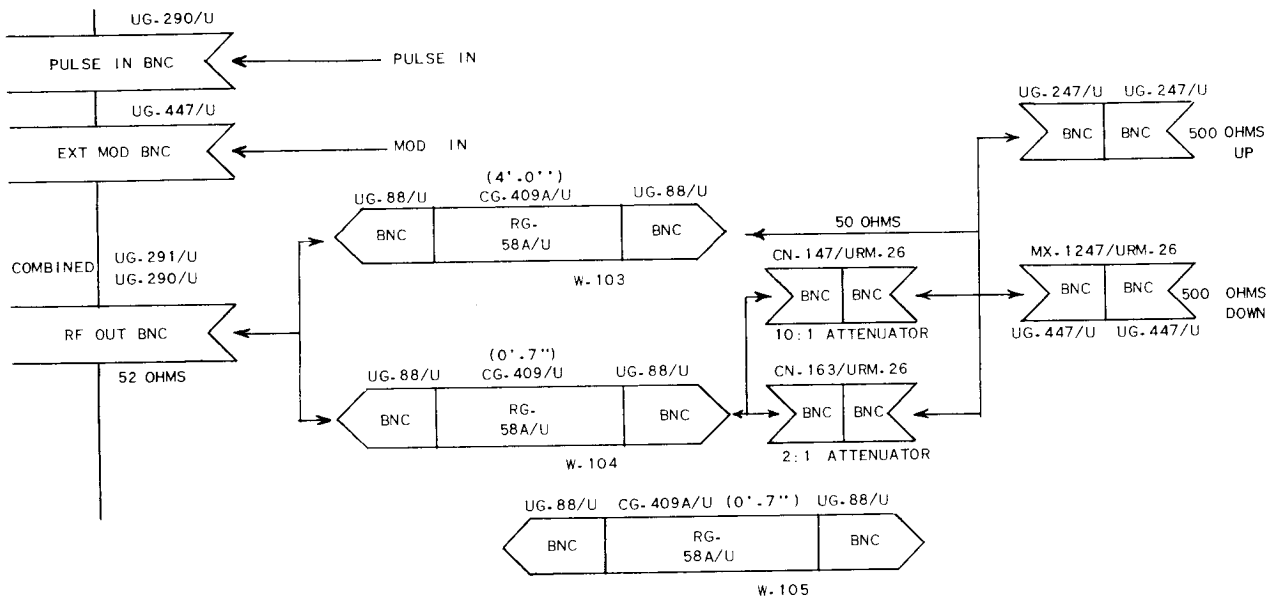
NAVSHIPS 91474: Instruction Book for RF Signal Generator AN/URM-26.

TYPE	(USAF):	
CLASSIFICATION:	(NAVY):	Standard
	(ARMY):	Not Classified
STOCK NO.:	(USAF):	
	(NAVY):	F16-Q-123655-200
	(ARMY):	3F4036-26
DESIGN COGNIZANCE:		Navy, BUSHIPS
PROCUREMENT INFO.:		Navy Spec. MIL-S-15463(Ships)
PROCUREMENT COG.:		Navy, BUSHIPS
ROB IDENT. NO.:		4.1.2
F. I. I. N.		

UNCLASSIFIED

Signal Generating Equipment

AN/URM-26



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Signal Generator Set AN/URM-26		16	25	19	

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Signal Generator Set AN/URM-26 Complete, Including:	-	10	14	10	36
1	RF Signal Generator SG-45/URM-26	-				
1	Power Supply PPR-644/URM-26	-				
1	Test Adaptor MX-1247/URM-26	N16-A-22081-1009				
1	10:1 Fixed Attenuator CN-147/URM-26	N16-A-96184-1163				
1	2:1 Fixed Attenuator CN-163/URM-26	N16-A-96075-4871				
1	RF Cable Assembly (4 ft 0 in) CG-409/U	N16-C-11944-2021				
2	RF Cable Assembly (0 ft 7 in) CG-409/U	N16-C-11943-2350				
1	AC Line Cable, W-101	N17-C-48225-4590				

BUREAU OF SHIPS SECTION — Part III

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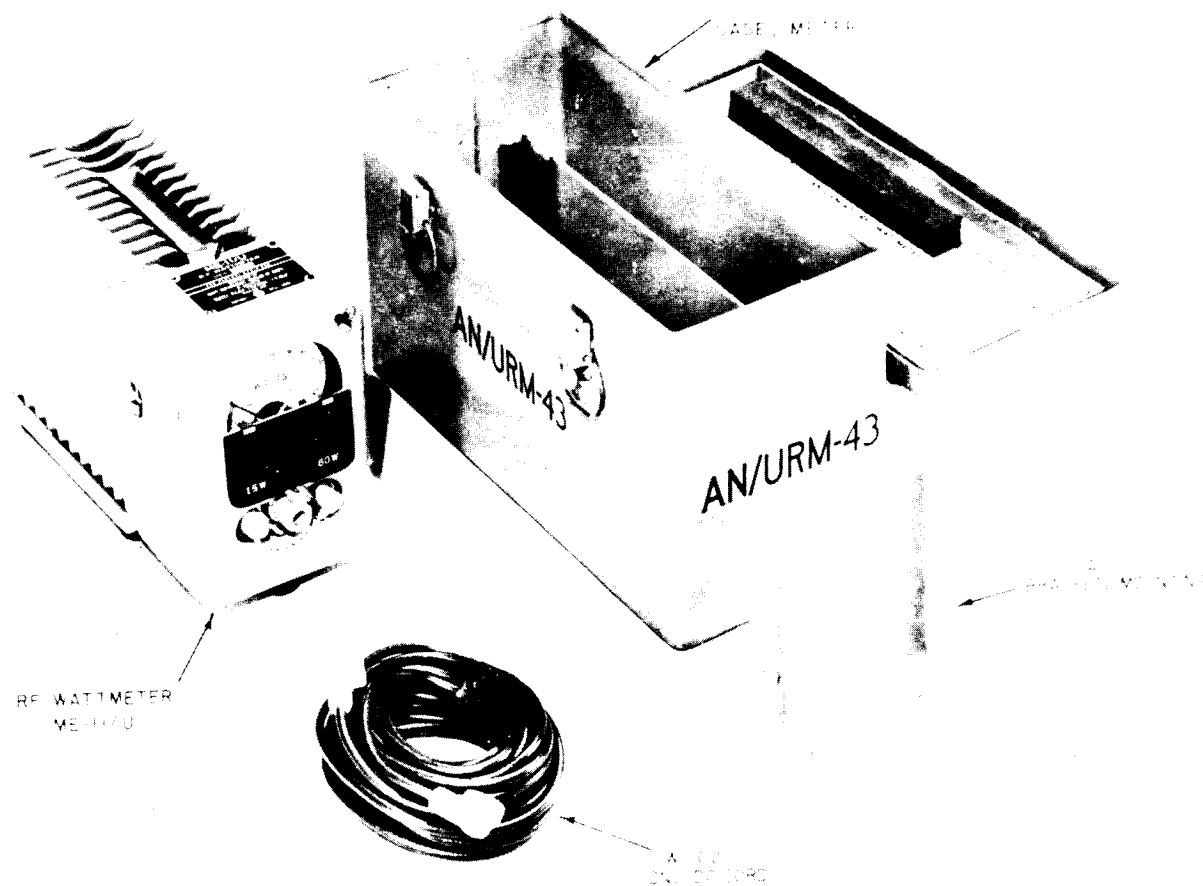
Signal Generating Equipment

AN/URM-26

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	1 Accessory Power Cable, W-102	-	6	9	12	8
	2 Instruction Book NAVSHIPS 91474	-				
	Equipment Maintenance Repair Parts	-				
		-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			38.0
			TOTAL			46

UNCLASSIFIED

Power Measuring Equipment

WATTMETER AN/URM-43**AN/URM-43**

Wattmeter AN/URM-43.

FUNCTIONAL DESCRIPTION

The Wattmeter AN/URM-43 is designed to measure output power and to facilitate the tuning of transmitters. It may be used as a dummy load of 51.5 ohms up to 60 watts, as a modulation monitor, as an accurate rf resistance and for loss measurements on transmission lines.

It is an absorption wattmeter built around an accurate coaxial resistor. Power is measured under nonradiating conditions by a dual range crystal rectifier voltmeter arrangement.

RELATION TO OTHER EQUIPMENT

This equipment supersedes RF WATTMETER ME-11/U which did not include the carrying case or the mounting bracket.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE, AS WATTMETER.—100 to 500 mc, direct reading; 30 to 600 mc, with corrections from calibration chart.

POWER RANGE MAXIMUM.—2 to 60 w (0 to 15 and 0 to 60 range).

Accuracy: $\pm 5\%$ of full scale, between 100 and 500 mc.

INPUT IMPEDANCE.—51.5 ohms.

TYPES OF MODULATION.—CW, AM, FM or Television, not designed for use on pulsed signals.

USED AS A DUMMY LOAD.—

Frequency Range: From zero frequency (dc) to highest frequency usable with coaxial line.

Power Range: Same as for wattmeter function.

Impedance: 51.5 ohms.

PRESENTATION AND CONTROLS.—With the Meter Box fastened on the Resistor-Voltmeter Unit, the front panel of the instrument shows the meter, with its 0 to 60 watts and volts scales, the rf input receptacle, and the two crystal rectifier housings, one of which is used for the low range (15 w) and the other for the

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-0-172862-200 (ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	14.2
F. I. I. N. I.:	

UNCLASSIFIED

4.14 AN/URM-43: 1

AN/URM-43

high range (60 w) measurements. The crystal is inserted in either the low range or the high range housing.

The Meter Box has its own dc cable (short) connected to it and to the corresponding dc jack on the Voltmeter Housing of the Resistor-Voltmeter Unit. For remote meter operation, the long dc cable is used instead of the short dc cable.

FITTINGS AND ACCESSORIES.—The rf input jack is an N type connector which will mate any Type N plug.

The long dc cable is a 25 ft section of RG-58/U coaxial cable terminated by a Navy Type 491859 plug on each end.

CONSTRUCTION.—The Resistor-Voltmeter Unit includes the coaxial load resistor in an oil filled metal cylinder surrounded by the finned coaxial structure. A sliding handle is attached to the radiator. The Meter Box is made of aluminum and is fastened on the radiator and

around the Voltmeter Housing by means of four heat insulated seats and a spring latch. It contains the short dc cable. The complete equipment with the long dc cable and the mounting bracket are carried inside the Transit Case CY-1135/U.

MANUFACTURER'S OR CONTRACTOR'S DATA

Bird Electronic Corp., Cleveland, Ohio.
Contract NObsr-52121, dated 13 December 1950.
Contract NObsr-52667, dated 20 June 1951.

TUBE AND CRYSTAL COMPLEMENT

(2-specially selected 1N21B crystals).

REFERENCE DATA AND LITERATURE

NAVSHIPS 91118: Instruction Book for Wattmeter AN/URM-43.

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Wattmeter AN/URM-43	- F17-M-36513-6176	6-1/2	3-3/4	9-1/2	7.35
1	Case CY-1135/U	-	7-5/8	6-1/4	12-1/4	3.5
1	Bracket	-	4-1/2	4-3/8	5-3/4	0.9
1	DC Cable (Long)	-	300 lg			0.75
2	Instruction Books NAVSHIPS 91118	-	11-1/2	1/4	9	0.6
TOTAL LESS MAINTENANCE REPAIR PARTS						13.10
TOTAL						

UNCLASSIFIED

Miscellaneous Test Equipment

TEST-TOOL SET AN/USM-3**AN/USM-3***Test-Tool Set AN/USM-3.***FUNCTIONAL DESCRIPTION**

Test-Tool Set AN/USM-3 is a portable kit assembly of tools and test equipments including tube tester, signal tracer, interference generator, RF probe, high voltage and resistance indicators, decade resistor and decade capacitor.

It is specifically designed for emergency test and repair of electronic and electrical equipment although many of the items may be used for general service work.

ELECTROMECHANICAL DESCRIPTION**MAJOR TEST UNITS****TUBE TESTER TV-4/U.—**

Power Supply: 105 to 125 v, 50 to 1600 cps, 25 w.

Measurements: (1) Tests all tubes listed in Tube Data Index for filament continuity, emission, shorted elements and open elements. (2) Capacities from 0.001 to 100 microfarads when operated from 60 cps power supply.

SIGNAL TRACER TS-673/U.—

Power Supply: 105 to 125 v, 50 to 1600 cps, 7 w.

AF Range: 47 to 15,000 cps.

RF Range: Audio modulated signals 15 kc to 400 mc.

Audio Sensitivity: 0.002 v audible in earphone; 0.004 v for 1/2 scale indication on built in meter.

RF Sensitivity: 0.005 v of 50% modulated rf audible in earphone; 0.05 v of 50% modulated rf for 1/2 scale indication on built-in meter.

INTERFERENCE GENERATOR SG-23/U.—

Power Supply: 1-1/2 v battery (JAN BA-58).

Current: 0.2 amp.

Frequency: Audio approx 2000 cps, harmonics to approx 400 mc.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-123990-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	12.12
F. I. I. N.	

UNCLASSIFIED

4.12 AN/USM-3: 1

AN/USM-3

VOLTAGE INDICATOR-PROBE ID-265/U.—
 Measurements: 0 to 400 v ac or dc, dc polarity.
 Frequency Range AC: 10 to 10,000 cps.
 Input Impedance: 500,000 ohms.

RF INDICATOR-PROBE ID-263/U.—
 Useful Frequency Range: 100 kc to 400 mc.
 Sensitivity: 25% full scale for 1 v rf direct connected.
 Sensitivity, Approx With Extension Rod In RF Field:
 5 v per meter for 25% full scale.
 Max RF Signal: 10 v across crystal diode.

RESISTANCE INDICATOR-PROBE ID-264/U.—
 Measurements: 0 to 10,000 ohms.
 Power Supply: 1-1/2 v battery (JAN BA-58).

DECADE RESISTOR TS-672/U.—
 Power Rating: 2 w per resistor, 10 w for unit.
 Tolerance: ±5%.
 Range: 1 ohm to 12 meg in 1 ohm steps.

DECADE CAPACITOR TS-671/U.—
 Range: 0.0001 to 48 μf.
 Tolerance (paper): ±10%.
 Voltage Rating (paper): 500 v dc.
 Tolerance (electrolytic): -0, +75%.
 Voltage rating (electrolytic): 450 v dc.

TEST PROD MX-934/U (Used with Signal Tracer TS-673/U).—
 Maximum RF Signal: 20 v.
 Voltage Rating: 300 v dc.

TEST PROD MX-933/U (Used with Signal Tracer TS-673/U).—
 Maximum AF Signal: 100 v.
 Voltage Rating: 400 v dc.
 Input Resistance: 1 meg.
 Input Capacitance: 0.001 μf.

TOOLS AND ACCESSORIES

ELECTRICAL LEADS (NT-491899 and NT-491899A).—
 Two black and two red 30 inch leads with miniature banana plugs at one end and a pin jack plug on the other.

ADAPTOR CONNECTOR (NT-491897).—Four each supplied, to adapt banana plug to pin jack.

ELECTRICAL LEADS (NT-491895).—Twelve each supplied, eight inch long, with combination banana plug and female connector at each end.

BATTERY AND BULB CASE.—Storage space for four 1.5 volt batteries, BA-58, two flashlight bulbs, 10 feet hook up wire and 1 foot 50/50 rosin core solder. (All supplied except four BA-58 batteries).

FUSE PULLER (H-914).—Flat dual size.

PILOT LIGHT EXTRACTOR (H-916).—Fitted with rubber cup device for large and small pilot lights.

HEX HEAD WRENCH SET (H-904 to H-909).—0.050, 1/16, 5/64, 3/32, 1/8 and 5/32.

FLASHLIGHT (0-901).—5/8 in. dia x 5-9/16 in. lg uses 2 BA-58 batteries and 2.2 v 0.25 amp bulb.

FLASHLIGHT EXTENSION (0-902).—3/8 in. dia lucite rod x 6-7/8 in. lg.

MIRROR (0-903).—Insulated dental type, fits flashlight extension (0-902).

SOCKET WRENCH SET (H-910).—3/6, 7/32, 1/4, 9/32, 5/16, 11/32, 3/8 and 7/16, with handle.

NEON TEST LIGHT (I-901).—200,000 ohms impedance, 60-500 volts.

AC AND 90-500 VOLTS DC.—Test for presence of voltage.

COMBINATION SCREWDRIVER (H-903).—Interchangeable 1/4 inch slot drive bit and #2 Phillips drive, stubby size.

SCREWDRIVER (H-901).—4 in. lg. 3/16 in. blade. .

SCREWDRIVER (H-902).—2 in. lg., 3/32 in. blade.

SOLDERING IRON (H-919).—Pen type, 115 volts, 50 to 1600 cycles, chisel and round bit.

ALIGNMENT TOOL (H-917).—Insulated, low capacitance screwdriver, for trimmer capacitors. Can be used as tuning wand.

EXTENSION ROD (0-904).—For use with all probe units. Metal center conductor and plastic exterior.

RECEIVER, TELEPHONE (NT-491898).—500,000 ohms impedance. Used with Signal Tracer TS-673/U.

BATTERIES REQUIRED.—A total of four dry batteries JAN type BA-58 (1.5 volts) are required to operate the following units:
 (2) Flashlight (0-901).
 (1) Interference Generator SG-23/U.
 (1) Resistance Indicator Probe ID-264/U.

CONSTRUCTION.—Test tool set AN/USM-3 is complete and self-contained. It is entirely housed in case CY-703/U, a metal case made of two hinged covers with latches, fittings and a handle.

The tools are secured in a plastic tray situated within the top cover. The various test units fit into the bottom half of the case where they can be quickly moved into operating position.

The tube tester is permanently connected to the bottom half of the case and can be tilted forward for use.

MANUFACTURER'S OR CONTRACTOR'S DATA

Radio Frequency Laboratories, Inc., Boonton, N.J.
 Contract NObSr-42100, dated 17 February 1948.

TUBE COMPLEMENT

(1) 3A4 (2) 12AX7 (1) 6AL5

REFERENCE DATA AND LITERATURE

NAVSHIPS 91146: Instruction Book for Test-Tool Set AN/USM-3.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test-Tool Set AN/USM-3	5.9				53.

BUREAU OF SHIPS SECTION -- Part III

UNCLASSIFIED

Miscellaneous Test Equipment

AN/USM-3

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
MAJOR UNITS						
1	Case CY-703/U	- N16-C-170001-104 221800.99	7	9-3/4	10-1/2	5.0
1	Tool Holder CY-704/U	- N17-78201-1002 6052184	3/4	9-1/4	9-1/4	
1	Tube Tester TV-4/U	- F16-T-21380-2429 3F3930-4	5-1/2	8-1/4	5-1/2	9.0
1	Signal Tracer TS-673/U	- F16-A-27109-5501 3F325-673	3-1/2	3	5-3/4	2.0
1	Interference Generator SG-23/U	- F16-G-59001-1001 3F3835-23		3/4 dia	5-3/4	
1	Voltage Indicator Probe ID-265/U	- F17-P-84881-7666 3F3711-265		1 dia	6	
1	RF Indicator-Probe ID-263/U	- F17-P-84881-7676 3F3711-263		1 dia	6	
1	Resistance Indicator-Probe ID-264/U	- F17-P-84841-1831 3F3711-264		1 dia	6	
1	Decade Resistor TS-672/U	- F16-R-44647-9999 3F4325-672	3/4	4-3/4	4-3/8	
1	Decade Capacitor TS-671/U	- F16-C-55176-1417	1-1/4	4-3/8	4-3/4	
ACCESSORIES						
1	Test Prod MX-933/U	- N17-P-84825-7076 3F3711-267				
1	Test Prod MX-934/U	- N17-P-84877-4451 3F3711-266				
1	RF Cable Assembly CG-570/U	- N16-C-11943-8231 1F430-570.36		36		
1	Telephone Receiver NT-491898	- N17-R-43438-8601				
1	Head Band NT-491901	- N17-H-46173-4801 2B742				
1	Power Cable Assembly NT-62472	- N17-C-48219-3251 3E7350.1-57				
2	Electrical Lead -- Red NT-491899	- N17-L-62826-2101 3E7998.30.1				
2	Electrical Lead -- Black NT-491899-A	- N17-L-62826-2201 3E7998.30				
4	Adaptor Connector NT-491897	- N17-C-67988-1282 2Z307-75				
12	Electrical Lead NT-491895	- N17-L-62668-6801 3E7998-8.1				
1	Extension Rod G-304	- N17-R-00001-101 3F3798-10				

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

AN/USM-3

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Cord and Test Lead Holder H-918	- N17-R-150048-571 6Z5250				
1	Battery and Bulb Case A-901	- N16-C-170001-103 2Z1800.98				
1	Accessory Case A-902	- N16-C-170001-102 2Z1800.100				
1	Technician's Handbook N-901	- N16-B-670001-102 6D6998-27				
1	Tube Data Index N-101	- N16-B-670001-101 6D6998-28				
	TOOLS					
3	Alligator Clips E-902	- N17-C-802609-101 2Z2708.28				
2	Spade Lugs E-903	- N17-C-67992-4685 3Z12073-18.1				
1	Screwdriver (4-inch) H-901	- N41-S-1101-1050 6R15626				
1	Screwdriver (2-inch) H-902	- N41-S-1099-20 6R15194				
1	Combination Screwdriver H-903	- N41-S-1064-5000 6R15195				
1	Hex Head Wrench Set H-904 H-905 H-906 H-907 H-908 H-909	- N41-W-2444-25 N41-W-2445-25 N41-W-2446-25 N41-W-2449-25 N41-W-2450-25 N41-W-2451-25				
1	Socket Wrench Set H-910	- N41-W-2965-500 6R-24330-1				
1	Socket Wrench Handle H-911	- N16-H-150001-101 6R51205-5				
1	Long Nose Pliers H-912	- N41-P-1909-82 6R4710-4.4				
1	Side Cutting Pliers H-913	- N41-P-1711-1040 6R4730-4.5				
1	Fuse Puller H-914	- N17-P-91801-1001 6R7382-4				
1	Insulated Tweezers H-915	- N41-T-4229-500 6R46206.2				
1	Pilot Light Extractor H-916	- N17-E-850271-101 6Q36920-5				
1	Alignment Tool H-917	- N16-T-751655-847 6R38476-2				

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Miscellaneous Test Equipment

AN/USM-3

EQUIPMENT SUPPLIED

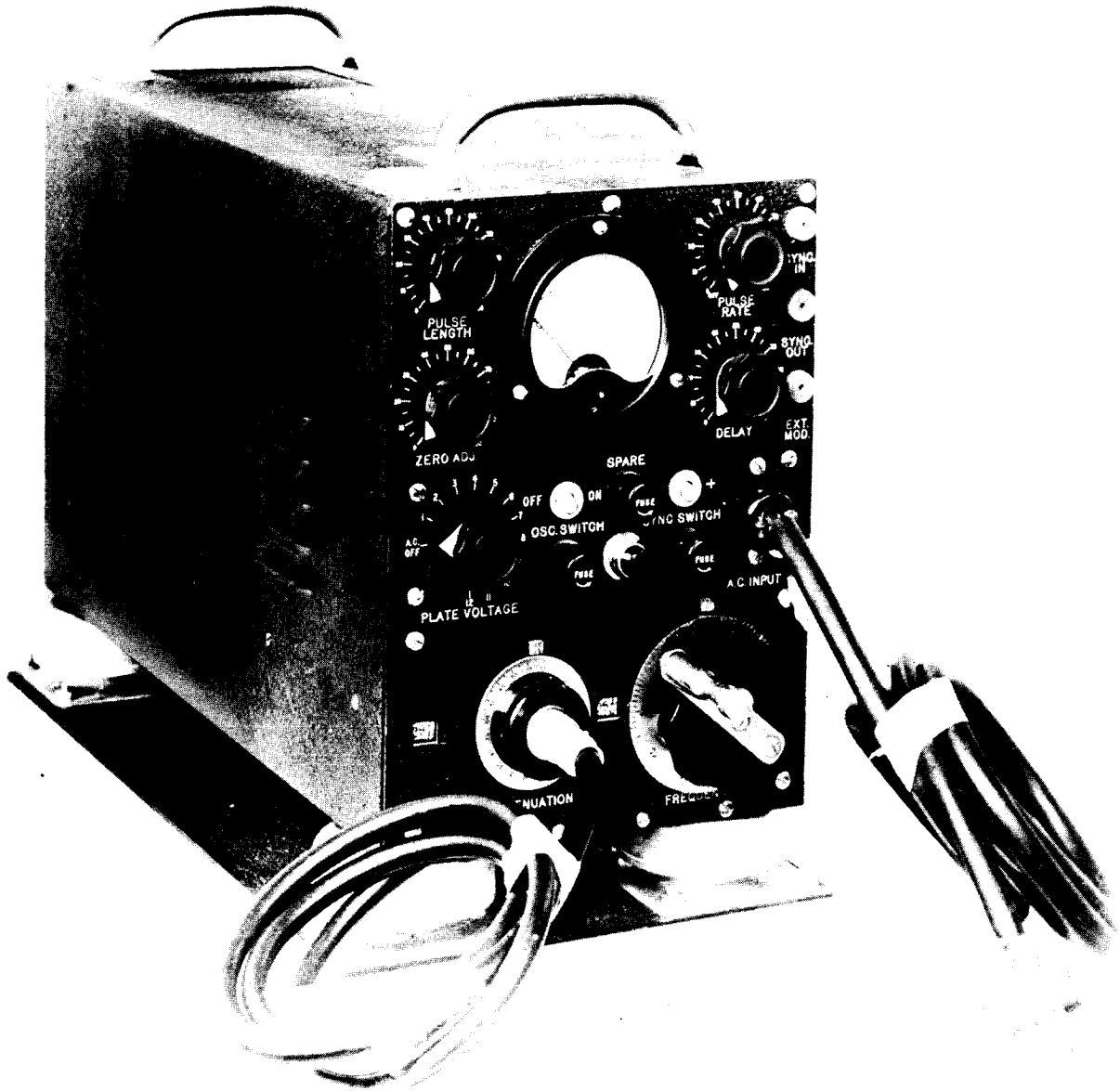
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Soldering Iron Handle H-919	- N17-H-150001-102 6Q51185-5.2				
1	Soldering Iron Tip (small chisel) H-920	- N41-T-2325-40 6R36764-2				
1	Soldering Iron Tip (small round) H-921	- N41-T-2325-175 6R36764-3				
1	Soldering Iron Tip Holder H-922	- N17-H-78201-1001 6Q52188-1				
1	Neon Test Light 1-901	- N17-L-78719-7301 2Z5991-109				
1	Flashlight 0-901	- N17-F-13468-850 6Z3996.19				
1	Flashlight Extension 0-902	- N17-R-68001-102 6Z6924-10				
1	Mirror 0-903	- N17-M-250354-941 6Z7085				
2	Instruction Book Navships 91146					
			TOTAL LESS MAINTENANCE REPAIR PARTS			
					TOTAL	23.0

UNCLASSIFIED

Signal Generating Equipment

MODEL LAE SERIES SIGNAL GENERATOR EQUIPMENT

LAE SERIES



Model LAE Series Signal Generator Equipment.

UNCLASSIFIED

Signal Generating Equipment

LAE SERIES

FUNCTIONAL DESCRIPTION

The Model LAE Series Signal Generator Equipment operates over the frequency range of 520 to 1300 mc. The equipment is designed to produce a calibrated rf signal voltage which may be either unmodulated (CW) or pulse modulated. The output may also be pulse or amplitude modulated by using an internal source of modulation. The equipment is used for precision frequency measurements and aligning ultra-high frequency receivers.

RELATION TO OTHER EQUIPMENT

All Signal Generators in the LAE series are similar in general arrangement and theory of operation but differ in physical construction. Models LAE-3 and LAE-4 have interchangeable spare parts and only very minor differences.

They are superseded by a newer series of Signal Generators. Signal Generator TS-418/U (400 to 1000 mc) and Signal Generator TS-419/U (900 to 2100 mc) cover the frequency range of the Navy Model LAE Series Signal Generators.

ELECTROMECHANICAL CHARACTERISTICS

POWER SUPPLY.—105 to 125 v ac, 50 to 60 cps, 120 w.
 FREQUENCY RANGE.—520 to 1300 mc.

ATTENUATION, 50 OHM LOAD.—0 to 100 db (-7 to -107 dbm).

OUTPUT IMPEDANCE.—50 ohms.

RF OUTPUT.—

Continuous Wave: 1 μ v to 0.1 v continuously variable.

Amplitude Modulations: Up to 30%.

Pulse Modulation: From internal pulser.

SYNCHRONIZATION.—By internal or external pulses.

Pulse Repetition Rate: 60 to 2500 pps.

Pulse Length: 2 to 30 μ sec continuously variable.

Pulse Delay: 3 to 300 μ sec continuously variable.

External: By positive or negative trigger.

ACCURACY.—

Stabilization Time: 30 minutes.

RF Output: $\pm(1 \text{ db } +1\%)$ of attenuator reading.

Frequency: $\pm 1\%$ of calibration curve.

Stray Leakage: 1 μ v max.

Frequency Change Due To Shock: .01% max.

VENTILATION.—Fan driven by shaded pole induction motor.

PRESENTATION AND CONTROLS.—The frequency tuning control registers the number of turns of the handcrank on a three digit counter and a vernier dial which is divided into a hundred divisions. The frequency is obtained from the calibration curves of frequency vs. counter reading (chart 1013). Similarly, the attenuation control turns a three digit counter and has a vernier dial. The attenuation counter and vernier indicates the amount of attenuation of the output voltage directly in decibels. This may be converted to output in microvolts by using the calibration curves of counter reading vs. output in microvolts (charts 1033 and 1034). This reading must be corrected for frequency and room temperature by using the output correction factors (chart 1035). The type of output is determined by the "CW-PULSE-OFF" switch which provides continuous-wave, pulse or standby operation. The "PULSE LENGTH," "PULSE RATE" and "DELAY" controls are all uncalibrated, continuously variable controls. The "SYNCH" switch adjusts the equipment for use with a positive or negative external synchronizing pulse source.

LAE

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Limited Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): (NAVY): F16-Q-166816-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LAE-1

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Limited Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): (NAVY): F16-Q-166834-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LAE-2

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Limited Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): (NAVY): F16-Q-166854-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LAE-3

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Limited Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): (NAVY): F16-Q-166857-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LAE-4

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Limited Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): (NAVY): F16-Q-166858-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

UNCLASSIFIED

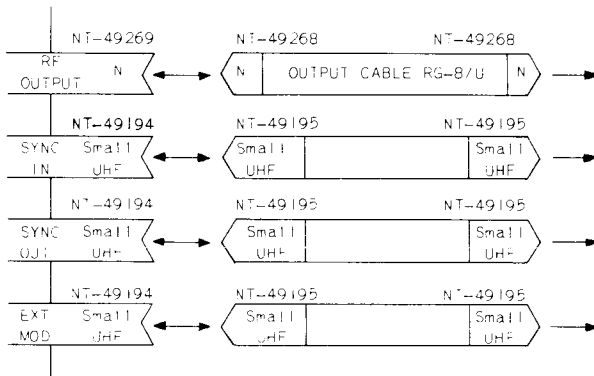
Signal Generating Equipment

LAE SERIES

The ac power to the equipment is turned on or off by the "PLATE VOLTAGE" control which also provides continuously variable adjustment of the voltage applied to the plate of the oscillator tube.

The red pilot indicates whether the ac power is on or off and is provided with a shutter to vary the degree of illumination. The dc microammeter is used to indicate the output power level so the oscillator output may be set at the calibration reference level. The "METER ZERO" adjusts the zero reading of the dc microammeter with the oscillator turned off.

FITTINGS AND ACCESSORIES.—The cables that are supplied match the connectors on the equipment as shown below



CONSTRUCTION.—The Model LAE Series Signal Generators are housed in metal cabinets having a black wrinkle finish. Two handles are mounted on top of the cabinets for ease in handling. All controls, meter and output plugs are located on the front panels. The power cord and fuses are located on the rear panels and are reached through a sliding door.

MANUFACTURER'S OR CONTRACTOR'S DATA

Airadio Inc., Stamford, Conn.

LAE:

Contract NXsr-37598, dated 19 September 1943.

LAE-1:

Contract NXsa-43378.

LAE-2:

Contract NXsr-56786, dated 19 April 1944.

Contract NXsr-95147, dated 18 April 1945.

LAE-3, 4:

Contract N5sr-5946, dated 12 June 1945.

Contract NObsr-39270, dated 24 June 1947.

TUBE COMPLEMENT

LAE

- (1) 6J5 (1) 884 (1) 6SN7
- (1) 6AG7 (2) 6AC7 (1) 5Z4
- (2) VR-150 (1) 446A

LAE-1

- (1) 6J5 (1) 884 (1) 6SN7
- (1) 6AG7 (2) 6AC7 (1) 5Z4
- (2) VR-150 (1) 446A

LAE-2

- (1) 6J5 (1) 884 (1) 6AG7
- (1) 6SN7-GT (2) 6AC7 (1) 5Z4
- (2) OD3/VR-150 (1) 446A or 2C40

LAE-3, 4

- (1) 6J5 (1) 884 (1) 6SN7-W
- (1) 6AG7 (1) 6AC7 (1) 5Y3-GT
- (2) OD3/VR-150 (1) 2C40

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,311: Instruction Book for Navy Model LAE RF Signal Generator.

AN-08-45-7: Handbook of Maintenance Instructions for Signal Generator Model LAE-1.

NAVSHIPS 900,518: Instruction Book for Signal Generator Equipment Model LAE-2.

NAVSHIPS 900,806: Instruction Book for Signal Generator Equipment Navy Models LAE-3 and LAE-4.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator LAE, with Spare Parts and Accessories (Crated)	6.877	25-7/8	25-7/8	17-3/4	183.0
1	Signal Generator Model LAE-1	3.36	18-3/4	11-3/8	27-1/4	80 (packed in paper cartons)
1	Signal Generator, LAE-2 with Spare Parts and Accessories (Crated)	5.35	29-5/8	25-3/4	12-1/8	198.0
1	Signal Generator LAE 3 with Spare Parts and Accessories (Crated)	5.35	29-5/8	25-3/4	12-1/8	198.0

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

LAE SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	LAE Signal Generator Unit Shock Mounted	-	12-15/16	9	21-3/8	
1	Power Cord	-				
1	Output Coaxial Cable	R16-AD0-AS-1235	78 lg			
1	Output Coaxial Cable	R16-AD0-AS-1220	48 lg			
3	Cable Connectors	R16-AD0-AS-1219	48 lg			
1	Set Calibration Charts	-				
1	Instruction Book NAVSHIPS 900,311	-				
1	Set Maintenance Repair Parts in Box	-	9-1/8	10-7/16	19-1/8	47.5
TOTAL LESS MAINTENANCE REPAIR PARTS						66.0
TOTAL						113.5
1	LAE-1 Signal Generator LAE-1	-	11-7/8	8	21-1/2	62.25
1	Output Cable Coaxial W-105	-	49 1/2	3		.63
1	Power Cord W-107	-	80 1/2	3		.71
3	Connector	-	49 1/2	3		1.31
1	Handbook of Maintenance Instructions	-				
1	Set of Maintenance Repair Operating Spares	-	3	10-1/2	26-1/2	5.00
TOTAL LESS MAINTENANCE REPAIR PARTS						
TOTAL						64.90
1	LAE-2 LAE-2 Signal Generator Shock Mounted	-	13-1/4	9-1/2	22-3/4	75.00
1	Output Coaxial Cable W-101	-	49 1/2	3 lg		0.63
1	Power Cord W-107	-	80 1/2	3 lg		0.70

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Signal Generating Equipment

LAE SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
3	Connector Cables W-106	- - -	49½	3 1g		1.31
1	Set of Calibration Charts	- - -				
1	Set Maintenance Repair Parts in Box	- - -	9-1/8	10-7/16	19-1/8	52.00
2	Instruction Book NAVSHIPS 900,518	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			77.64
			TOTAL			129.64
	LAE 3 & 4					
1	Signal Generator LAE-3 Shock Mounted	- - -	13-1/4	9-1/2	22-3/4	75.00
1	Output Cable Coaxial W-105	- - -	49½	3		.63
1	Power Cord W-107	- - -	80½	3		.70
3	Connector Cables	- - -	49½	3		1.31
1	Set Calibration Charts	- - -				
2	Instruction Books	- - -				
1	Set Maintenance Repair Parts in Box	- - -	9-1/2	19-1/8	10-1/4	50.00
			TOTAL LESS MAINTENANCE REPAIR PARTS			77.64
			TOTAL			127.64

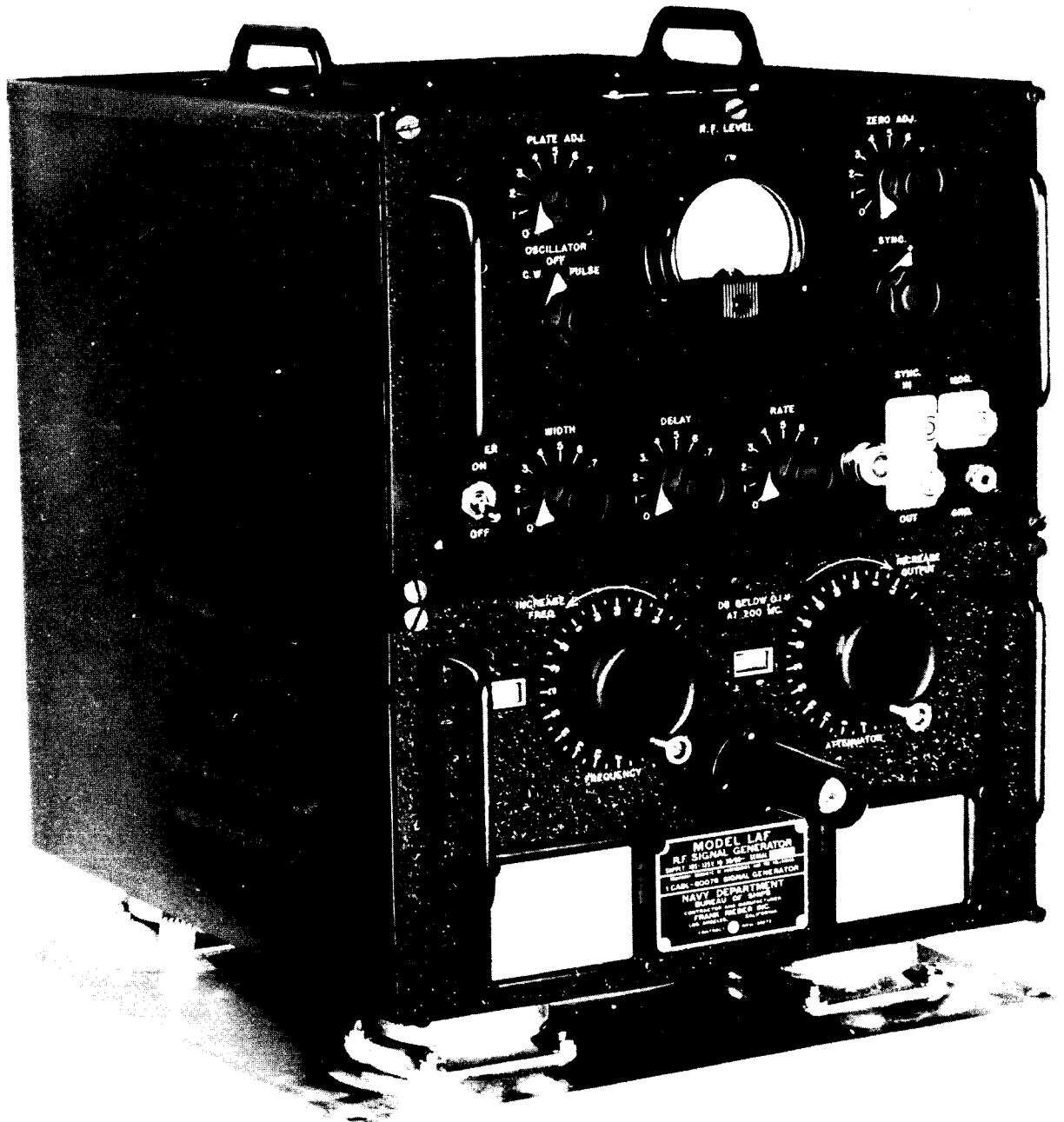
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UNCLASSIFIED

Signal Generating Equipment

RF SIGNAL GENERATOR EQUIPMENT
NAVY MODELS LAF thru LAF-3

LAF SERIES



RF Signal Generator LAF.

UNCLASSIFIED

4.4 LAF: 1

LAF SERIES

FUNCTIONAL DESCRIPTION

The rf signal generators of the Navy Model LAF Series are all similar in design and identical in function. They are designed to generate cw or pulse mcw signals within the 90 to 600 megacycle band of frequencies, and over a wide range of output power. The delay of the output pulses, relative to the internal rate pulses, can be varied by a controllable amount. Provision is made for modulation of the rf carrier either by an internal modulator or by external series of af or hf alternations. Synchronizing pulses from an external source, of either polarity with respect to ground, can be made to trigger the internal rate pulser. Also, the internal leading rate pulse can be used for synchronization of some external equipment. These equipments are commonly used to test, align, and service radio and radar receivers.

RELATION TO OTHER EQUIPMENT

These equipments are superseded by a later series of signal generators: RF Signal Generator Set AN/URM-26 (3-403 mc) and Signal Generator TS-418/U (400 to 1000 mc). The essential differences between equipments of the LAF Series are shown in the following chart.

	LAF	LAF-1	LAF-2 and 3
Serial No. 1 to 45	Separable Frame		
Serial No. 46 to 121	No Frame		
All Serial Nos.		No Frame	No Frame
Mounting		Shock Mount	
Bolometer	Fuse Type	Thermistor Type	Thermistor
Power Line Frequency	50 to 60 cps	50 to 1600 cps	50 to 1600 cps
Meter	Microammeter	Milliammeter	Milliammeter

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 120 w (see table under "Relation to Other Equipment" for power line frequency).

FREQUENCY RANGE.—90 to 600 mc.

Stability: $\pm 17^\circ$, 0.05% per $^\circ\text{C}$ (-10°C to $+50^\circ\text{C}$) max.

RF OUTPUT.—

Attenuation: 0 to -10 db from 0.1 v at 200 mc.

Output Impedance: 50 ohms.

PULSE MODULATION.—100% square wave.

Rate: 60 to 2500 pps.

Width: 2 to 30 μsec .

Delay: 3 to 300 μsec from leading rate pulse.

EXTERNAL MODULATION.—30% max by sine waves or by signal source having components from 100 cps to 100 kc.

Input Impedance: 5000 ohms.

EXTERNAL SYNCHRONIZATION.—

Amplitude: ± 10 v min.

Rate: 60 to 2500 pps.

Width: Up to 30 μsec below 150 mc.

Input Impedance: 10,000 ohms.

PRESENTATION AND CONTROLS.—The bottom rack is used for the rf oscillator and attenuator. The generator is tuned by means of the frequency control knob and counter. Frequencies corresponding to readings are given by the frequency calibration curve. Attenuation down from the reference level is controlled by the attenuator knob and counter. The output correction factor curve indicates corrections to be made with regard to frequency settings.

LAF (60076)

TYPE (USAF): Standard
 CLASSIFICATION: (NAVY): Limited Standard
 (ARMY):
 STOCK NO.: (USAF):
 (NAVY): F16-G-63899-4451
 (ARMY): 3F3821-1
 DESIGN COGNIZANCE: Navy, BUSHIPS
 PROCUREMENT INFO.: BUSHIPS Spec No. RE-9187
 PROCUREMENT COG.: Navy, BUSHIPS
 RDB IDENT. NO.: 4.1.2
 F.I.I.N.:

LAF (60119)

TYPE (USAF): Standard
 CLASSIFICATION: (NAVY): Limited Standard
 (ARMY):
 STOCK NO.: (USAF):
 (NAVY): F16-G-63899-4466
 (ARMY):
 DESIGN COGNIZANCE: Navy, BUSHIPS
 PROCUREMENT INFO.: BUSHIPS Spec No. RE-9187
 PROCUREMENT COG.: Navy, BUSHIPS
 RDB IDENT. NO.: 4.1.2
 F.I.I.N.:

LAF-1

TYPE (USAF): Standard
 CLASSIFICATION: (NAVY): Limited Standard
 (ARMY):
 STOCK NO.: (USAF):
 (NAVY): F16-G-63899-4421
 (ARMY):
 DESIGN COGNIZANCE: Navy, BUSHIPS
 PROCUREMENT INFO.: BUSHIPS Spec No. RE-9187
 PROCUREMENT COG.: Navy, BUSHIPS
 RDB IDENT. NO.: 4.1.2
 F.I.I.N.:

LAF-2

TYPE (USAF): Standard
 CLASSIFICATION: (NAVY): Limited Standard
 (ARMY):
 STOCK NO.: (USAF):
 (NAVY): F16-G-63899-4436
 (ARMY):
 DESIGN COGNIZANCE: Navy, BUSHIPS
 PROCUREMENT INFO.: BUSHIPS Spec No. RE-9187
 PROCUREMENT COG.: Navy, BUSHIPS
 RDB IDENT. NO.: 4.1.2
 F.I.I.N.:

LAF-3

TYPE (USAF): Standard
 CLASSIFICATION: (NAVY): Limited Standard
 (ARMY):
 STOCK NO.: (USAF):
 (NAVY): F16-G-63899-4481
 (ARMY):
 DESIGN COGNIZANCE: Navy, BUSHIPS
 PROCUREMENT INFO.: BUSHIPS Spec No. RE-9187
 PROCUREMENT COG.: Navy, BUSHIPS
 RDB IDENT. NO.: 4.1.2
 F.I.I.N.:

UNCLASSIFIED

Signal Generating Equipment

LAF SERIES

The top rack is used for the pulse modulator, synchronizer, output level meter, and power supply. The internal bridge circuit is adjusted by means of the "Zero Adj." knob. The meter reference level is adjusted by means of the "Plate Adj." control.

The "oscillator" switch permits "cw" or "pulse" operation.

The "width," "rate," and "delay" of the output pulse are adjusted by the corresponding control knobs.

For external synchronization, the "Sync." switch will be set either on "-" or "+" position, according to polarity. The "On-Off" switch and pilot lamp are located on the front panel. The ac input receptacle and fuse boxes are located at the back of the cabinet.

FITTINGS AND ACCESSORIES.—

LAF and LAF-3:

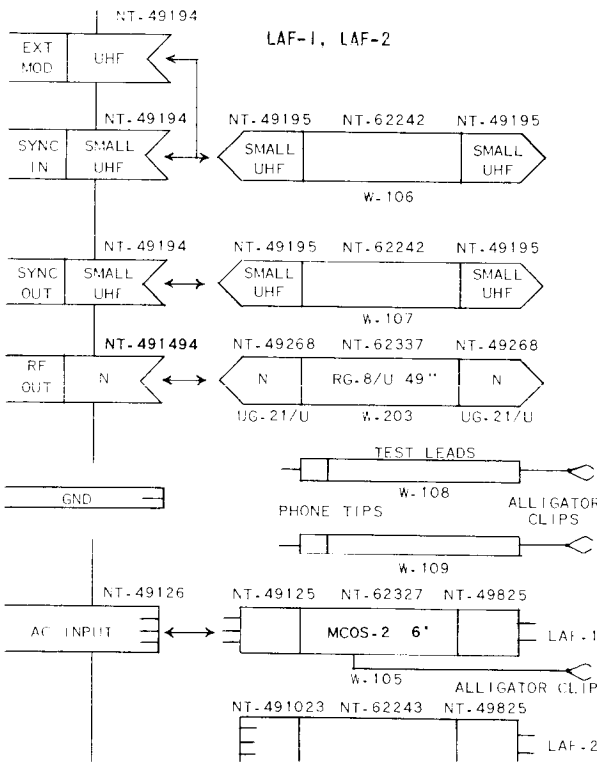
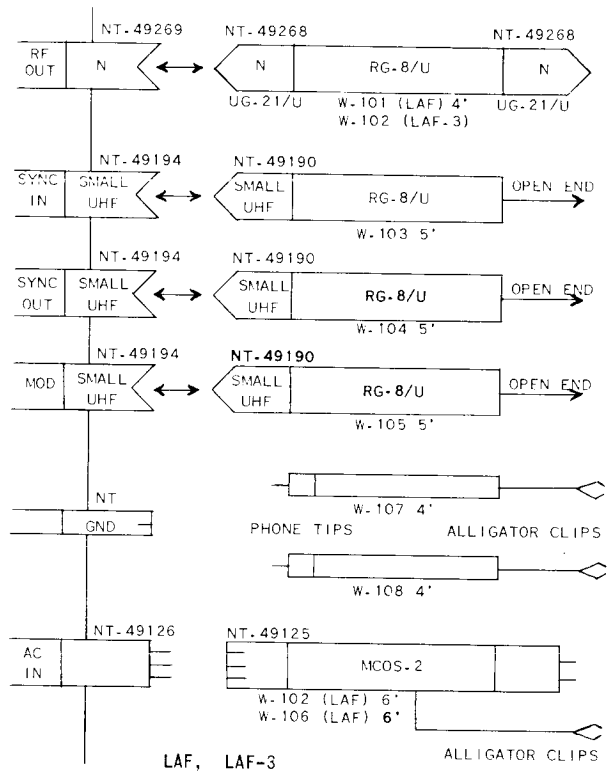
Receivers under test may be connected to the generator through the 4-foot-long rf output cable (N-Type plug at both ends), into the rf output receptacle (N-Type jack).

To connect external sources of modulating voltage or synchronizing pulses, or external equipment for synchronizing to the generator, use may be made of the three 5-foot-long coaxial cables.

The far ends of these cables (RG-8/U) are not terminated, and the proper connectors must be procured and assembled. The panel ends have small UHF-Type plugs which mate the small UHF-Type jacks of the "Ext. Mod.", "Sync. In" and "Sync. Out" terminals.

Two test leads (phone tip, alligator clip) are provided for miscellaneous test purposes.

The front panel ground connector is a combination banana jack/binding post. The ac cord ends in the usual ac plug and a ground clip.



LAF-1 and LAF-2:

Receivers under test may be connected to the generator through the rf output cable fitted with N-Type plugs at both ends, into the rf output receptacle, which is an N-Type jack.

External sources of modulating voltages or synchronizing pulses, and external equipment in need of synchronizing can be connected to the generator by making use of the two connector cables, which are fitted with small UHF-Type plugs at both ends.

Two test leads terminated by phone tips are provided, as well as two alligator clips.

The front panel ground connector is a combination banana jack/binding post. The ac cord is terminated by an ordinary ac plug and a ground clip.

CONSTRUCTION.—The signal generator is arranged in two rack-type sub-assemblies enclosed in a metal cabinet. The whole assembly rests on a mounting plate with shock mounts, with the exception of the Model LAF-2 which has no shock mount. Model LAF is slightly smaller in size and its cabinet is of a simpler design. All other models are enclosed in box-type cabinets, Model LAF-3 being slightly taller than the others.

The output receptacle with its protective tubing is part of the attenuator, and moves back and forth when the attenuator setting is being adjusted. Rack panel guard handles and carrying handles are provided.

MANUFACTURER'S OR CONTRACTOR'S DATA

Frank Reiber, Inc., Los Angeles, Calif.
LAF (CABL-60076): 1 to 45, NXsr-39273, dated 3 November 1943.

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

LAF SERIES

LAF (CABL-60110): 46 to 121, NXsr-39273, dated 3 November 1943.

LAF-3 (CABL-60114): 1 to 250, NXsr-53363, dated 23 March 1944.

LAF-3 (CABL-60114): 251 to 405, NXsr-65319, dated 30 June 1944.

LAF-3 (CABL-60014): 406 to 516, NXsr-86333, dated 4 December 1944.

Airadio, Inc., Stamford, Conn.

LAF-1: Contract NXsr-41050, dated 19 November 1943.

LAF-2: Contract NXsr-43378.

LAF-1 and LAF-2

(1) OD3/VR-150	(1) 5Y3-GT	(1) 2C40
(1) 6SN7-W	(1) 6AG7	(2) 6AC7
(1) 6J5	(1) 884	

LAF-3

(1) OD3/VR-150	(1) 5Y3-GT	(1) 2C40
(1) 6SN7-GT	(2) 6AG7	(1) 6AC7
(1) 6J5	(1) 884	

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,516: Instruction Book for RF Signal Generators Model LAF and LAF-3.

NAVSHIPS 900,585(A): Instruction Book for Signal Generator Equipment Model LAF-1.

AN 08-45-32: Handbook of Maintenance Instructions for Signal Generator Model LAF-2.

TUBE COMPLEMENT

LAF

(1) OD3/VR-150	(1) 6SA7-GT	(1) 446
(1) 5Y3-GT	(1) 6J5	(1) 884
(2) 6SN7-GT	(2) 6AG7	(2) 6AC7

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Model LAF Signal Generator NT-60076	7	25-3/4	19-1/2	24	135
1	Equipment Spare Parts	4.7				100
1	Model LAF Signal Generator NT-60110	7	25-3/4	19-1/2	24	142
1	Equipment Spare Parts	4.7				
1	Model LAF-1 Signal Generator NT-60082	7.58	26-3/4	25-3/4	19	161
1	Equipment Spare Parts Box	2.52	12-3/4	21-3/4	15-3/4	76
1	Model LAF-2 Signal Generator NT-60099 (no spares)					
1	Model LAF-3 Signal Generator NT-60014	7	25-3/4	19-1/2	24	151
1	Equipment Spare Parts	4.7				95

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	LAF (1 to 45) Signal Generator NT-60076	-	18-5/8	14-5/8	19-1/2	93
3	Coaxial Cable, W-103, W-104, W-105	-	60 lg			
1	RF Cable W-101	3300-294732191	48 lg			
1	Power Cable W-102	227390-21	72 lg			
2	Test Cords, W-107, W-108	-	48 lg			
5	Calibration Chart	-				
2	Instruction Book NAVSHIPS 900,516	-				58
1	Set of Spares	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			58
			TOTAL			58

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Signal Generating Equipment

LAF SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	LAF (46 to 121) Signal Generator NT-60110	-	14-3/8	16-1/4	19-1/2	100
3	Coaxial Cables, W-103, W-104, W-105	-	60 lg			
1	RF Cable W-101	3300-294732190	48 lg			
1	Power Cable W-102	227390-21	72 lg			
2	Test Cords, W-107, W-108	-	48 lg			
5	Calibration Chart	-				
1	Set of Spares	-				58
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			
1	LAF-1 Signal Generator NT-60082 (with shock-mounts)	-	17-3/4	14-3/4	21-1/8	82
1	Output Cable NT-62337	-				
2	Connector Cable NT-62242	-				
1	Power Cable NT-62327	-				
2	Test Leads W-108, W-109	-				
2	Alligator Clip w/Pin Jacks	-				
5	Calibration Chart	-				
1	Equipment Spare Parts Box	-	9-5/8	19-1/8	10-1/4	37 (full)
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			
1	LAF-2 Signal Generator NT-60099	-	16-7/16	13-1/8	19-1/2	76
1	Output Cable NT-62337	-				
2	Connector Cable NT-62327	-				
1	Power Cable NT-62243	-				
2	Test Leads, W-108, W-109	-				

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

LAF SERIES

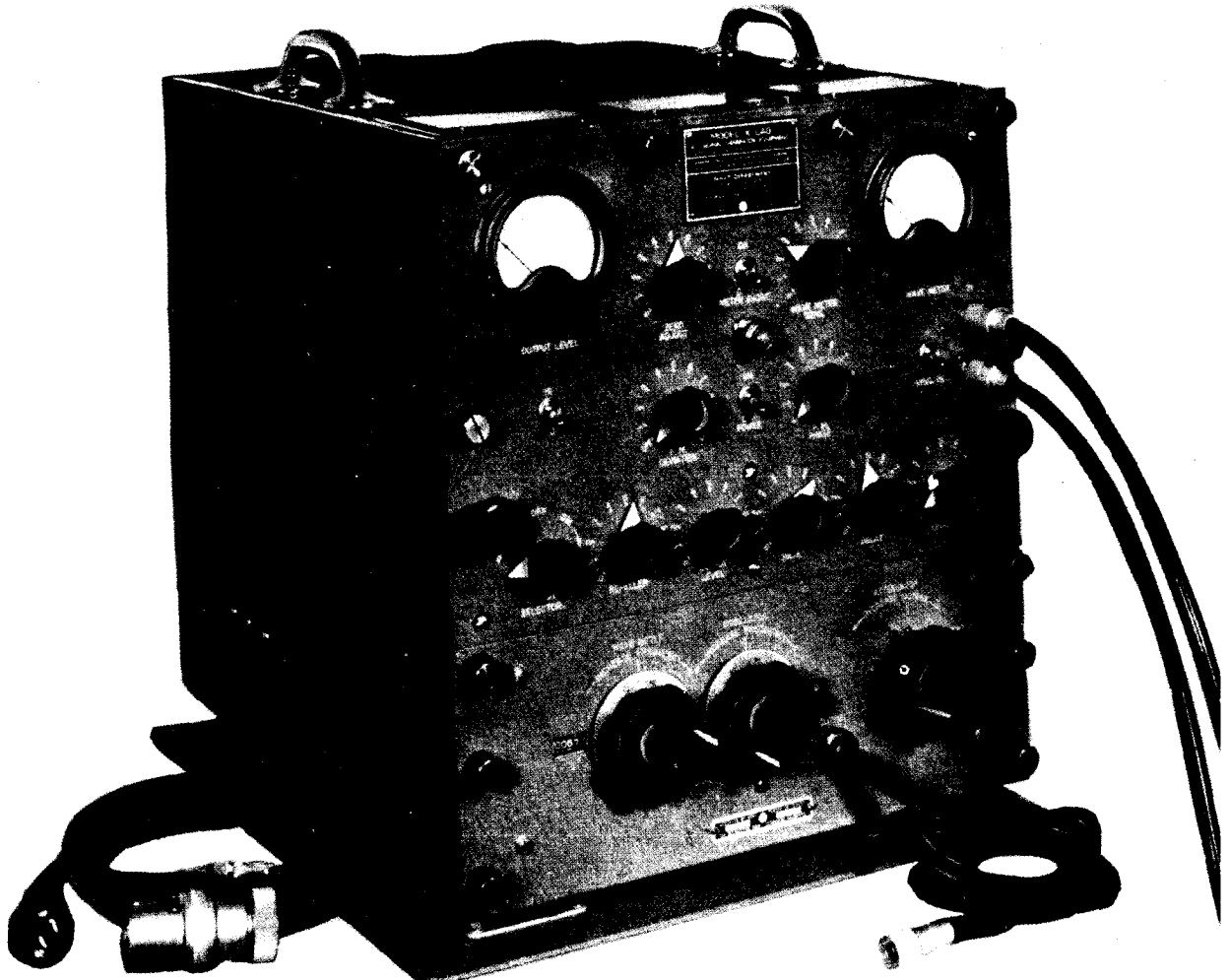
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
2	Alligator Clip w/Pin Jacks	-				
5	Calibration Chart	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			
1	LAF-3 Signal Generator NT-60114	-	20-3/4	16-1/4	19-1/2	102
3	Coaxial Cables, W-103, W-104, W-105	-	60 lg			
1	RF Cable W-102	3300-294732190	48 lg			
		227390-21				
1	Power Cable W-106	-	72 lg			
2	Test Cords W-107, W-108	-	48 lg			
5	Calibration Chart	-				
1	Set of Spares	-				53
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Signal Generating Equipment

RF SIGNAL GENERATOR EQUIPMENT
NAVY MODELS LAG and LAG-1

LAG, LAG-1

RF Signal Generator LAG.

FUNCTIONAL DESCRIPTION

The Navy Models LAG and LAG-1 RF Signal Generators are designed to furnish an rf signal for the calibration and alignment of radar receivers, and for general laboratory work within the range of 1200 to 4000 mc. An unmodulated, pulse modulated, or frequency modulated signal may be selected.

RELATION TO OTHER EQUIPMENT

The Navy Model LAG and LAG-1 RF Signal Generator Equipments differ only in the nameplate, the feet and shock mounting plate, and the mounting of the spare 707B tube. These equipments are superseded by a later series of signal generators: Signal Generator TS-419/U (900 to 2100 mc) and Signal Generator TS-403/U (1800 to 4000 mc).

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 60 cps, 2 amps.
 FREQUENCY RANGE. 1200 to 4000 mc.

ATTENUATION.—0 to 100 db.

OUTPUT.—

Amplitude (at end of output cable with attenuator at max): Greater than 40,000 μ v.

Impedance: 50 ohms.

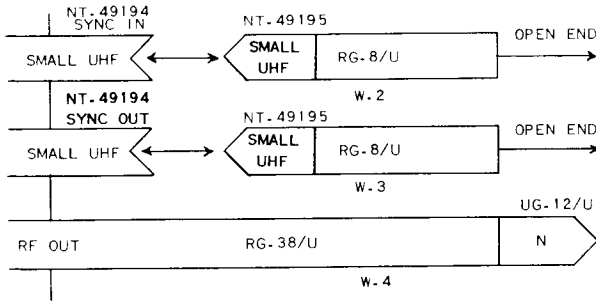
TYPE	(USAF):
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F. I. I. N.	

UNCLASSIFIED

4.4 LAG: 1

H. N. D. M. A. B. B. A.

LAG, LAG-1



MODULATION, FREQUENCY.—

Deviation: 0 to 0.2%.
 Rate: 60 cps.
 Phase (with respect to 60 cps supply): 0 to 180°.

MODULATION, PULSE.—

Rate: 60 to 2500 pps.
 Length: 2 to 30 μsec.
 Delay (with respect to external trigger): 3 to 300 μsec.

SYNCHRONIZATION.—

Input Polarity: Positive or negative.
 Impedance: 10,000 ohms shunted by 30 μμf.
 Output Polarity: Positive.

PRESENTATION AND CONTROLS.—The frequency is determined from the wavemeter dial reading and calibration curves. The output level is determined from

the output level meter and calibration curves. The wavemeter gives a maximum reading when tuned to the oscillator frequency.

FITTINGS AND ACCESSORIES.—Cables and fittings, and their relationship to the equipment, are shown in the chart above.

CONSTRUCTION.—The Navy Model LAG or LAG-1 RF Signal Generator is housed in a metal case equipped with two metal carrying handles. The case is mounted on a shock mount plate. All controls, meters, and jacks (except power) are mounted on the front panel. The power input jack and fuses are located on the back panel.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Communication Co., 681 Beacon St., Boston, Mass.
 Contract NXsr-55642, dated 7 April 1944.

TUBE COMPLEMENT

- | | | |
|------------------|--------------|----------|
| (1) 6SN7-GT/W | (1) 6J5-GT/G | (1) 884 |
| (5) OD3/VR-150 | (4) 6AC7/W | (1) 6Y6G |
| (3) 5U4G or 5Y3G | (1) 6AG7 | (1) 707B |

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,645: Handbook of Maintenance Instructions for Models LAG and LAG-1 RF Signal Generators.

EQUIPMENT SUPPLIED

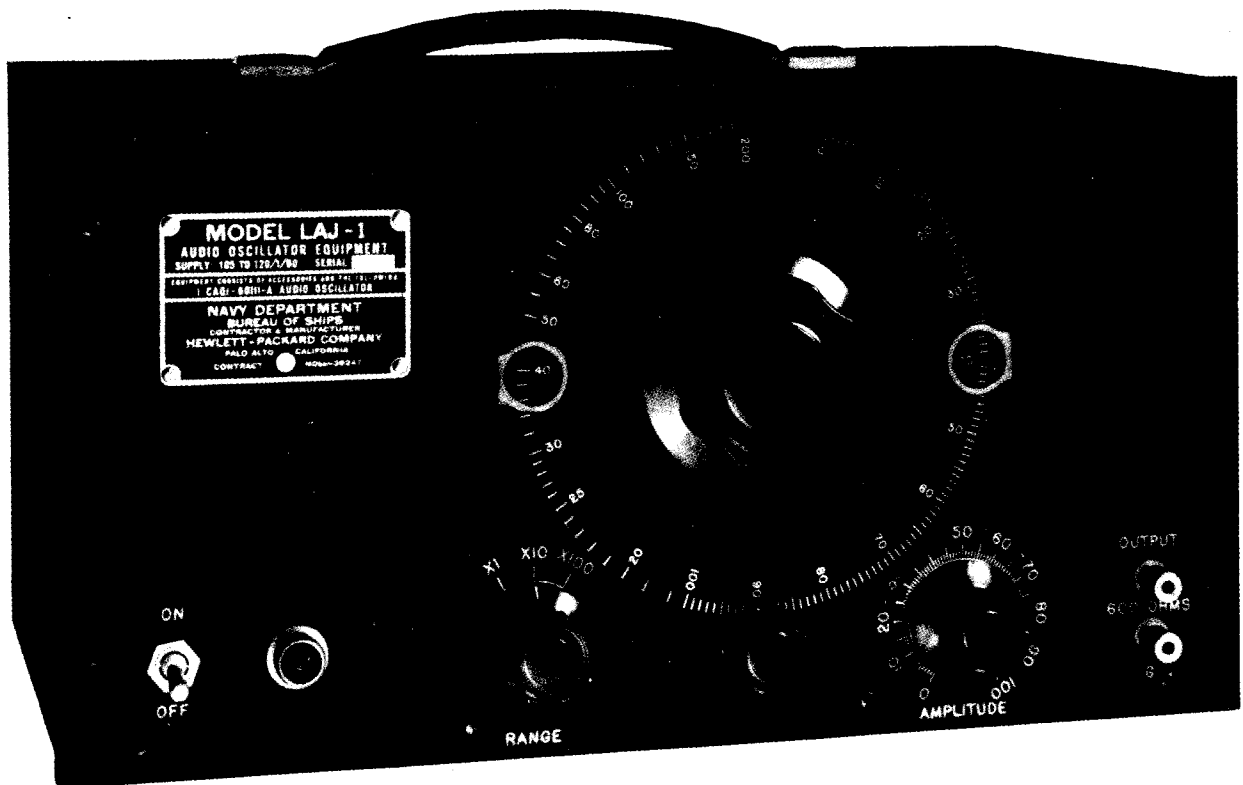
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator	- R16-NAV-LAG	19	16-13/16	20-11/16	130
1	Power Cord	-	89 lg			
1	Sync In Cable	-	60 lg			
1	Sync Out Cable	-	60 lg			
1	RF Cable	-	84 lg			
2	Set Calibration Curves	-				
2	Instruction Book NAVSHIPS 900,645	-				
2	Allen Wrench	-				
2	Spare Fuse	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Signal Generating Equipment

AUDIO OSCILLATOR EQUIPMENT NAVY MODELS LAJ, LAJ-1

LAJ, LAJ-1



Audio Oscillator Equipment LAJ-1.

FUNCTIONAL DESCRIPTION

The Audio Oscillators Navy Models LAJ and LAJ-1 are general purpose portable test equipments designed to generate frequencies in the audio spectrum. The oscillator section of the circuit is of the resistance-capacitance type.

RELATION TO OTHER EQUIPMENT

The Navy Models LAJ and LAJ-1 are mechanically the same and electrically equivalent. They supersede Navy Model LO Series. They are superseded by Navy Model LAJ-2 (small size; uncalibrated output) and Audio Oscillator TS-382A/U and higher (for calibrated output).

ELECTROMECHANICAL DESCRIPTION

POWER INPUT.—105 to 125 v ac, 50 to 60 cps, 60 w.

FREQUENCY RANGE.—20 to 20,000 cps in 3 ranges.

Accuracy: $\pm 2\%$ of dial reading; ($\pm 3\%$ at 20 cps).

POWER OUTPUT.—250 mw or 12.2 v min into a load of 600 ohms.

Distortion: Less than 1%.

Hum Level: Less than 60 db.

RATED LOAD.—600 ohms.

PRESENTATION AND CONTROLS.—The frequency dial is calibrated in frequency 20 to 200 nonlinear divisions and 0 to 100 linear divisions. The amplitude dial has linear divisions from 0 to 100. The output terminals are binding posts suitable for wire or banana plug connections.

CONSTRUCTION.—The equipment is enclosed in an aluminum case with black wrinkle finish and a leather carrying handle on top.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-G-54567-6887
	(ARMY): 3F3875-3
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. RF-3373-B
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1
F. I. I. N.:	

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-G-54567-6878
	(ARMY): 3F3875-3
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec No. RF-3373B
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	4.1
F. I. I. N.:	

UNCLASSIFIED

4.4 LAJ: 1

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

LAJ, LAJ-1

MANUFACTURER'S OR CONTRACTOR'S DATA

Hewlett-Packard Co., Palo Alto, Calif.

LAJ:

Contract NXsr-62347, dated 29 May 1944.

LAJ-1:

Contract NObsr-30125, dated 24 June 1946.

Contract NObsr-39247, dated 17 June 1947.

TUBE COMPLEMENT

LAJ or LAJ-1

(1) 6SJ7 (2) 6V6-GT/G (1) 6J5 (1) 5Y3-GT/G

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,378-A: Instruction Book for Audio Oscillator Equipment Navy Model LAJ.

NAVSHIPS 900,956: Instruction Book for Audio Oscillator Equipment Navy Model LAJ-1.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Audio Oscillator Navy Model LAJ	3.3	14	26	15-1/2	50.0
1	AF Signal Generator Navy Model LAJ-1 (NObsr-30125)	3.3	14	26	15-1/2	50.0
1	AF Signal Generator Navy Model LAJ-1 including Maintenance Repair Parts (NObsr-39247)	5.0	14	26	22-1/2	105.0

EQUIPMENT SUPPLIED

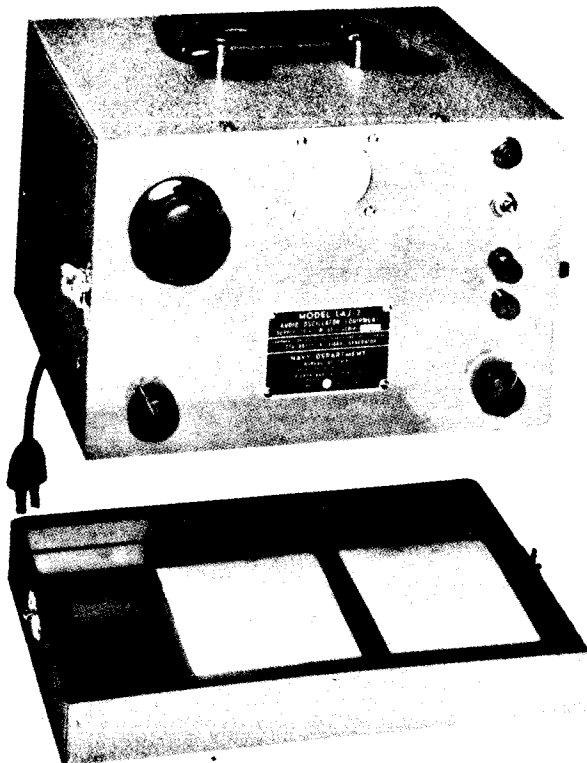
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	LAJ Audio Oscillator Navy Type 60111	- - -	10-1/4	15	9-7/16	36.0
2	Instruction Books NAVSHIPS 900,378-A	- 6D9867 -				
					TOTAL	36.0
1	LAJ-1 AF Signal Generator Navy Model 60111-A	- - -	10-1/4	15	9-7/16	37.0
1	Maintenance Repair Parts (NObsr-39247 only)	- - -	6-1/8	18-5/8	12-5/8	43.0
1	Instruction Book NAVSHIPS 900,956	- 6D9867-1 -				
					TOTAL LESS MAINTENANCE REPAIR PARTS	37.0
					TOTAL	80.0

UNCLASSIFIED

Signal Generating Equipment

**AUDIO OSCILLATOR
EQUIPMENT NAVY MODEL
LAJ-2**

LAJ-2



Audio Oscillator Equipment, Navy Model LAJ-2.

lighter than Navy Models LAJ and LAJ-1. It supersedes Navy Models LO, LAJ and LAJ-1 Audio Oscillator Equipment. It is superseded by Audio Oscillator TS-382A/U for applications needing a calibrated output where size and weight are not important.

ELECTROMECHANICAL DESCRIPTION

POWER INPUT.—105 to 125 v ac, 50 to 60 cps, 45 w.
FREQUENCY RANGE.—20 to 20,000 cps in 3 ranges.
 Accuracy: $\pm 2\%$ of dial reading ($\pm 3\%$ at 20 cps).
POWER OUTPUT.—250 mw or 12.2 v into a load of 600 ohms.
ATTENUATION.—0 to -50 db (600 ohm "T" pad).
PRESENTATION AND CONTROLS.—The frequency dial is calibrated in frequency 20 to 200 non-linear divisions and 0 to 100 linear divisions. The output terminals are binding posts suitable for wire or banana plug connections.
CONSTRUCTION.—The equipment is enclosed in a metal case with a removable front cover, with a plastic carrying handle on top.

MANUFACTURER'S OR CONTRACTOR'S DATA

Triumph Mfg. Co., Chicago, Ill.
 Contract NObsr-42432, dated 17 June 1948.

TUBE COMPLEMENT

(2) 6AQ5 (2) 6AU6 (1) 6X4

REFERENCE DATA AND LITERATURE

NAVSHIPS 91143: Instruction Book for Audio Oscillator Equipment Navy Model LAJ-2.

FUNCTIONAL DESCRIPTION

The Audio Oscillator Equipment Navy Model LAJ-2 is a portable, ac powered test equipment designed to generate frequencies in the audio spectrum. The oscillator section of the circuit is of the resistance-capacitance type.

RELATION TO OTHER EQUIPMENT

This equipment is electrically the same as Navy Models LAJ and LAJ-1. It is mechanically smaller and

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-G-54567-6845
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4,1
F.I.I.N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Audio Oscillator Equipment Navy Model LAJ-2	1.46	12	14-1/2	14-1/2	36.

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	AF Signal Generator Navy Type 60171	- F16-G-54567-6845	8	11-1/2	11	25.
2	Instruction Books NAVSHIPS 91143	-	TOTAL LESS MAINTENANCE REPAIR PARTS			25.
			TOTAL			

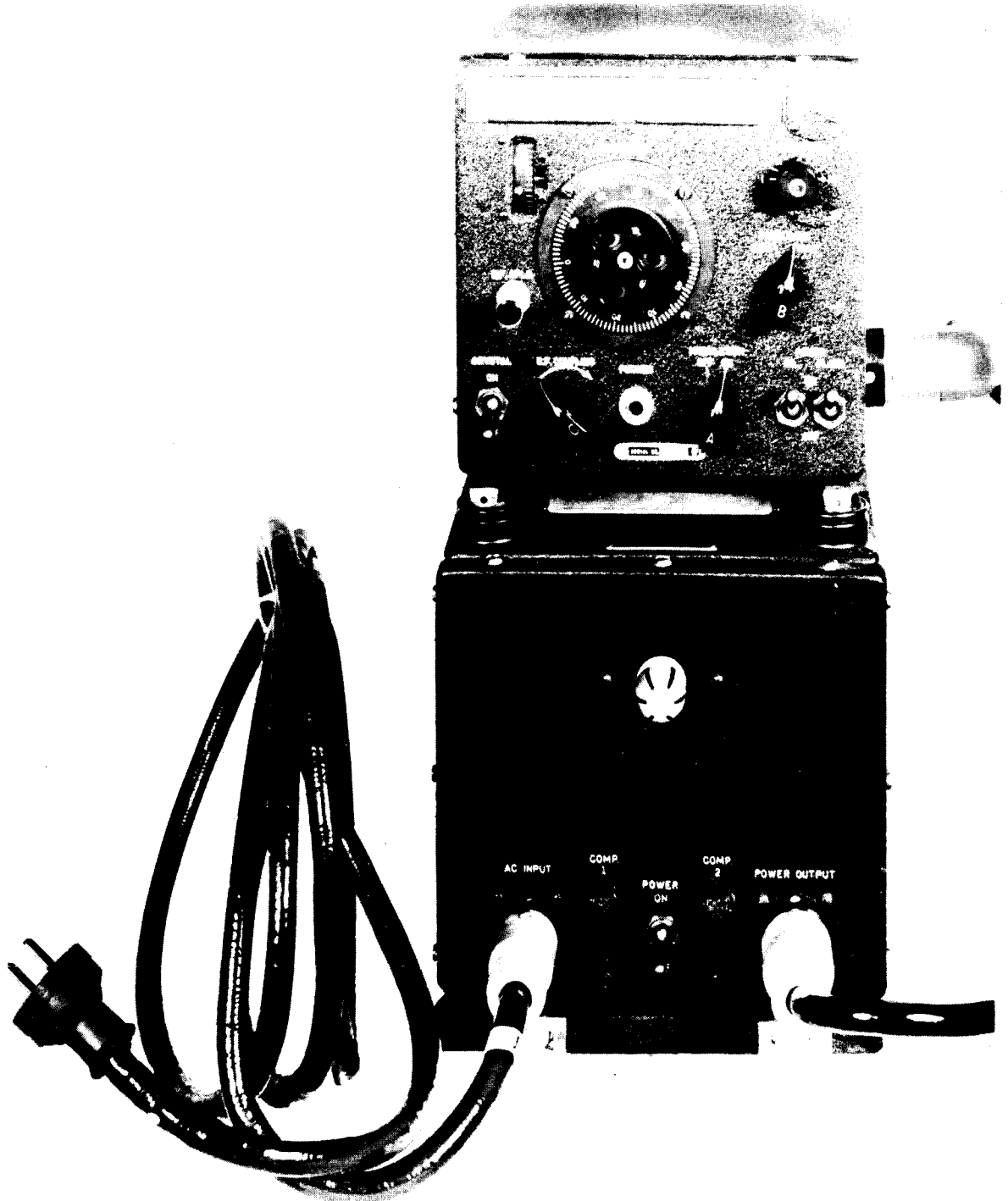
UNCLASSIFIED

UNCLASSIFIED

Frequency Measuring Equipment

**NAVY MODEL LM SERIES
CRYSTAL CALIBRATED FREQUENCY
INDICATING EQUIPMENT**

LM SERIES



Navy Model LM-15 Crystal Calibrated Frequency Indicating Equipment.

UNCLASSIFIED

4.2 LM: 1

LM SERIES

FUNCTIONAL DESCRIPTION

This equipment provides a simple and reliable frequency indicating source between 125 kc and 20 mc for frequency setting and measurement of receivers, transmitters, signal generators, or any electronic devices where the frequency must be known. It is a heterodyne type of unit having a variable oscillator which may be point-checked against an internal crystal oscillator and its harmonics at frequent settings. An external signal may be mixed with the variable oscillator output by a wire or antenna connection to a binding post. A jack provided on the front panel permits the use of phones for listening to the heterodyne. The variable oscillator signal may be internally modulated.

RELATION TO OTHER EQUIPMENT

This equipment will be superseded by Frequency Meter FR-4/U. The various models of LM Series Equipment fall into three categories, according to their power supplies, as follows:

MODEL	POWER INPUT	MECHANICAL DESIGN	REMARKS
i. Self-contained batteries			
LM-13	Self Contained Batteries	Same as LM-10 less shock mount base	Mounted in Type CRR-10111 Carrying Case with Batteries
LM-17	Self Contained Batteries	Same as LM-10	Mounted in Type CKB-10111 Carrying Case and CKB-10110 Canvas Bag complete with batteries
ii. DC supplied from other equipment			
LM-10	12/14-24/28 200/260-260/475	Minor Mechanical revisions	LF Het. Osc. fund. freq. changed
LM-12	12-14/24/28 200/260-260/475	Same as LM-10	Included in Type CRR-10086 Waterproof Carrying Case
LM-14	12/14-24/28 200/260-260/475	Same as LM-10	
LM-16	12/14-24/28 200/260-260/475	Same as LM-10	Included in Type CKB-10086 Waterproof Carrying Case
LM-19	12/24-24/28 200/260-260/475	Same as LM-10	Included in Type CRR-10086 Waterproof Carrying Case
LM-20	12/24-24/28 200/260-260/475	Same as LM-10	Included in Type CRR-10086 Waterproof Carrying Case
iii. AC operation with rectifier unit			
LM-11	Rectifier Power Unit CRR-20104 or CRR-20104A	Same as LM-10	
LM-15	Rectifier Power Unit Type CKB-20104 or CKB-20104A	Same as LM-10	
LM-18	Rectifier Power Unit CRR-20104A	Same as LM-10	

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—

Self-Contained Batteries, i: 12 to 14 v dc, 0.6 amp or 24 to 28 v, dc, 0.3 amp and 200 to 260 v dc, 10 ma or 260 to 475 v dc, 30 ma.

External DC Supply, ii: Same as for i above.
Rectifier Power Unit, iii: 105 to 125 v ac, 60 cps, 27 w.

FREQUENCY COVERAGE.—

Range: 125 to 20,000 kc.
Fundamental: 125 to 250 kc and 2000 to 4000 kc.
Crystal Oscillator: 1000 kc.
Modulation: 500 cps.
Accuracy: ±.02%, 125 to 20,000 kc; ±.01%, 2 to 20 mc between -32° and +65°C ambient temp.

PRESENTATION AND CONTROLS.—The drum and disc dials are precision ganged for accurate frequency readings. A panel trimmer is provided for setting the variable oscillator at any check point by heterodyne with the crystal oscillator or its harmonics. A headphone jack for a 600 ohm audio output is mounted on the front panel.

FITTINGS AND ACCESSORIES.—The rf coupling terminal is a single binding post. A Navy Type 49025 Telephone Jack is used.

CONSTRUCTION.—The waterproof carrying case provided is made of aluminum with an olive drab wrinkle finish. The frequency meter case is made of aluminum with a black wrinkle finish.

MANUFACTURER'S OR CONTRACTOR'S DATA

Bendix Radio Division, E. Joppa Rd., Towson 4, Md.
Contract NXsr-23485, dated 2 June 1943.
Contract NXsr-33637, dated 30 June 1943.
Contract NXsr-40987, dated 9 November 1943.

TUBE AND CRYSTAL COMPLEMENT

(1) 76 (1) 77 (1) 6A7
(1) Oscillator crystal type CRR-40023B

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,217-1B: Handbook of Maintenance Instructions for Navy Model LM-19 and LM-20 Crystal Calibrated Frequency Indicating Equipment.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY): Not Classified
STOCK NO.:	(USAF):
	(NAVY): LM-10: F16-Q-160476-200
	(ARMY): LM-11: F16-Q-160480-200
	LM-12: F16-Q-160482-200
	LM-13: F16-Q-160484-200
	LM-14:
	LM-15: F16-Q-160488-200
	LM-16: F16-Q-160490-200
	LM-17: F16-Q-160492-200
	LM-18: F16-Q-160494-200
	LM-19: F16-Q-160496-200
	LM-20: F16-Q-160498-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUAER
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	2.1.3
F. I. I. N.:	

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Frequency Measuring Equipment

LM SERIES

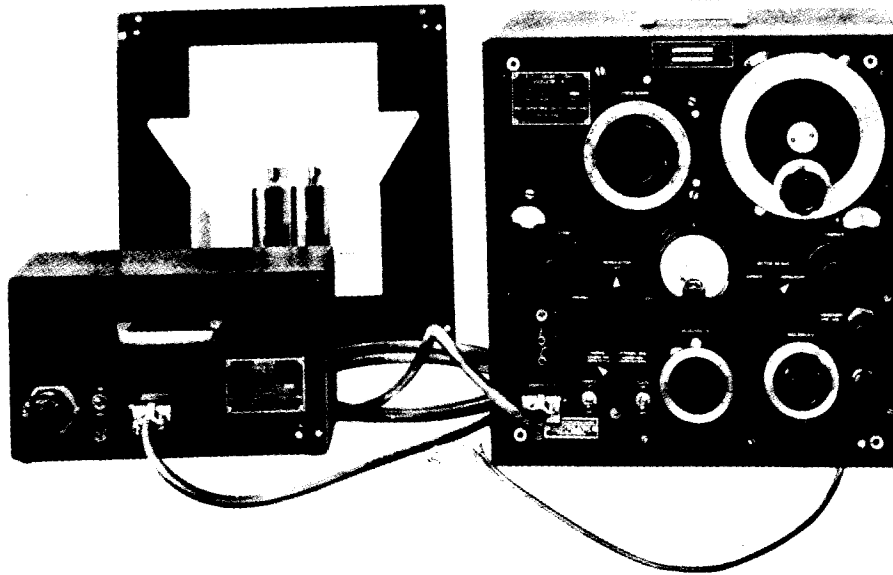
POWER SUPPLY CATEGORY		iii	ii	iii	i	iii	ii	iii	i	ii	iii	iii
NAVY MODEL	LM	10	11	12	13	14	15	16	17	18	19	20
	LBS											
Heterodyne Frequency Meter, F16-F-92111-2390 CRR-74028 with Tubes plus CRR-40023B Crystal 8-5/8 x 8-1/8 x 8-1/2	11.5											
Frequency Meter Mounting N16-M-64851-1001 Base CRR-10121 7 x 7-7/8 x 1-1/2	.5											
Shielded Power Cable 5 Cond, 9 ft Bendix AL71723-3 8 Cond, 9 ft Bendix AL75220												
4 Cond, 9 ft Mission Bell 15-0A001-3	1.9											
Calibration Book												
Instruction Book		2	2	2			2	2	2	2	2	2
NAVAER 08-50-		-35	-36	-37	-38	-45	-48					
NAVSHIPS								95 626	998, 903	900, 002- 1B	900, 217- 1B	900, 217- 1B
Waterproof Slip Cover	.25											
Spare Parts (Bulk Supply)	15.25	1/3			1/3							
Rectifier Power Unit CRR-20104 or CRR-20104A 8-3/16 x 8-15/16 x 8-3/16	13.6											
Shockproof Mounting Base for Rectifier CRR-10120 7-7/8 x 8-7/16 x 11/16	.5											
AC Input Cable, Shielded 3 Cond, 10 ft Bendix AL72091-2												
4 Cond, 10 ft Mission Bell 15-0A002-3	1.9											
Waterproof Carrying Case CRR-10086 9-5/16 x 10-9/16 x 11-27/32	7.5											
Carrying Case CRR-10111 9-5/8 x 9-3/4 x 15-7/16	13.5											
Waterproof Canvas Bag and Strap CMQ-10110	4.0											
TOTAL LESS MR PARTS		14.15	29.9	21.4	34.0	14.15	29.8	21.4	29.0	29.8	21.4	21.4
TOTAL												

UNCLASSIFIED

UNCLASSIFIED

Signal Generating Equipment
LP SERIES

**RADIO FREQUENCY STANDARD SIGNAL
GENERATOR EQUIPMENT MODEL
LP SERIES**



RF Standard Signal Generator Equipment Model LP-3.

LP

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-162200-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LP-3

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-162203-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LP-1

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-162201-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LP-4

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-162210-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LP-2

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-162894-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

LP-5

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-162210-200 (Nobsr 39320)
	F16-Q-162200-200 (Nobsr 42500)
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

UNCLASSIFIED

LP SERIES

FUNCTIONAL DESCRIPTION

This equipment is a generator of rf signals within the range from 9.5 to 30,000 kilocycles (50,000 kilocycles with additional step). The output is continuously variable between 0.5 microvolt and 0.1 volt and may be obtained either modulated or unmodulated. Modulation is either internal at 1000 cps or can be derived from an external source.

RELATION TO OTHER EQUIPMENT

Models LP, LP-1, LP-2, LP-3 and LP-4 are identical except for the nameplate. Model LP-5 has improved tube sockets and slight internal changes. These equipments are superseded by rf signal generator set AN/URM-25 Series.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v, ac 60 cps, 42 w.

Dry Battery Operation: 200 v, 40 ma and 6.0 v, 1.7 amp.

FREQUENCY RANGE.—9.5 to 30,000 kc in seven bands.

Accuracy: ±1%.

Extended Range: 30 to 50 mc.

Accuracy: ±3%.

POWER OUTPUT.—

Fixed: 1 v.

Variable: 0.5 μv to 0.1 v.

Accuracy: ±10% max.

OUTPUT IMPEDANCE.—

Of Generator, Below 0.01 v: 10 ohms (first four positions of multiplier).

Of Generator, above 0.01 v: 50 ohms.

At End of Cable: 90 ohms.

MODULATION.—

Internal: 1000 cps, 0 to 50%.

External: 0 to 1000 cps, over the entire range.

Amplitude: 4 v for 30% mod.

Input Impedance: 4000 ohms.

PRESENTATION AND CONTROLS.—

The tuning of the carrier is accomplished by means of the band switch and vernier tuning dial. The carrier amplitude is adjusted by means of the CARRIER control knob. The output is controlled by the MICROVOLTS (0 to 10) knob and the MULTIPLIER switch (1 to 10,000 in decade steps). A MODULATION selector switch (INT-OFF-EXT) and MODULATION percentage adjusting knob are provided. A meter with a SET CARRIER calibration mark and a 0 to 50% modulation scale is used together with a METER READS selector for the setting of these values. Another selector switch is used to set the signal generator for either NORMAL operation (external modulation frequencies limited to 1000 cps or no modulation) or EXTERNAL MODULATION (for carrier frequencies above 300 kc).

A POWER ON-OFF switch and PLATE ON-OFF switch are also provided. A special receptacle located near the tuning dial can be used for the connection of an external modulator condenser where it is desired to modulate the carrier in frequency.

FITTINGS AND ACCESSORIES.—

The following front panel terminals are provided:

Ground Connector:	Binding Post
External Modulation:	Twin binding post
RF Output Jack:	Concentric jack
Constant 1 Volt Output Jack:	Concentric jack
Frequency Modulation Jack:	Concentric jack
Power Input Receptacle:	6 terminal fixed plug

Power Input Receptacle on the Power Unit:	6 terminal fixed plug
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The following accessories are supplied:

A power interconnecting cable W101, 10-1/2 feet long, which is used between the Signal Generator unit and either the Power Unit or a set of dry batteries (not supplied). This cable is fitted at each end with Jones type 6 contact female connectors.

An rf output cable P102, 20 in. long terminated at one end by a concentric plug and at the other end by two crocodile clips.

An rf concentric plug P-101 for use in connection with either the rf output jack or the frequency modulation jack.

A Dummy Antenna NT-66017, of standard design, and fitted with one concentric plug on one side and one concentric jack on the other side.

A 10:1 Attenuator NT-63710, including a 1.11 ohm resistor, to be plugged into the rf output jack for the first four positions (1-10-100-1000) of the MULTIPLIER switch. It is fitted with one concentric plug on one side and one concentric jack on the other side.

CONSTRUCTION.—The Oscillator Unit is built into a metal case provided with a protective cover. Accessories are stowed inside the case. The cables are wound around the threaded posts on the front panel to hold the cover in place.

The Oscillator Unit and the Power Unit both have carrying handles.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Radio Co., Cambridge, Mass.

Contract NOs-64711, dated 21 January 1939 (LP).

Contract NOs-72178, dated 9 April 1940 (LP-1).

Contract NOs-86070, dated 21 May 1941 (LP-2).

Contract NXs-13820, dated 5 October 1942 (LP-3).

Federal Manufacturing and Engineering Co., Brooklyn, N.Y.

Contract NXsr-40979, dated 14 December 1943 (LP-5).

Contract NXsr-62309, dated 25 May 1944 (LP-5).

Contract NObsr-39320, dated 26 June 1947 (LP-5).

Contract NObsr-42500, dated 30 June 1948 (LP-5).

TUBE COMPLEMENT

(2) 76	(2) 84	(1) 89	(1) 955
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REFERENCE DATA AND LITERATURE

NAVSHIPS 95112, 95113, 95114, 95115, 900,425: Instructions for Radio Frequency Standard Signal Generator Equipment Models LP to LP-5.

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Signal Generating Equipment

LP SERIES

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Signal Generator Equipment, Model LP (or LP-1, -2, -3, -4)	6.4				124
1	RF Signal Generator Equipment Model LP-5	8.5	31	24	19	169

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	MODELS LP, LP-1, LP-2, LP-3, LP-4 RF Standard Signal Oscillator Unit NT-60006	- F16-G-62503-9589	17	15	11-1/2	55
1	Rectifier Power Unit, NT-20080	- F16-P-67425-1501	7	12	6	20
1	Dummy Antenna Unit, NT-66017	- N16-N-30826-1053				
1	10:1 Attenuator Unit, NT-63710	- N16-A-97146-7256				
1	Set of Accessories	- - -				
2	Instruction Book NAVSHIPS 95112	- -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			75
			TOTAL			
1	MODEL LP-5 Signal Generator Unit, NT-60006-A	- F16-G-62503-9604	17	15	11-1/2	55.0
1	Rectifier Power Unit, NT-20080-A	- N16-P-67434-2001	7	12	6	20.0
1	Dummy Antenna Unit, NT-66017	- N16-N-30826-1053				0.3
1	10:1 Attenuator Unit NT-63710	- N16-A-97146-7254				0.3
1	Interconnecting Cable, 10 ft 9 in.) NT-62409	- N17-C-48374-6682	129 lg			0.5
1	Output Test Cord (20 in.) CG-506/U	- N16-C-12392-2295	20 lg			0.2
1	Patch Cord RG-11/U	- - -				0.5
1	Concentric Plug UG-424/U	- N17-C-71115-5675				0.1
1	Power Input Plug NT-491830	- N17-C-71134-5634				0.1
			TOTAL LESS MAINTENANCE REPAIR PARTS			77.0
			TOTAL			

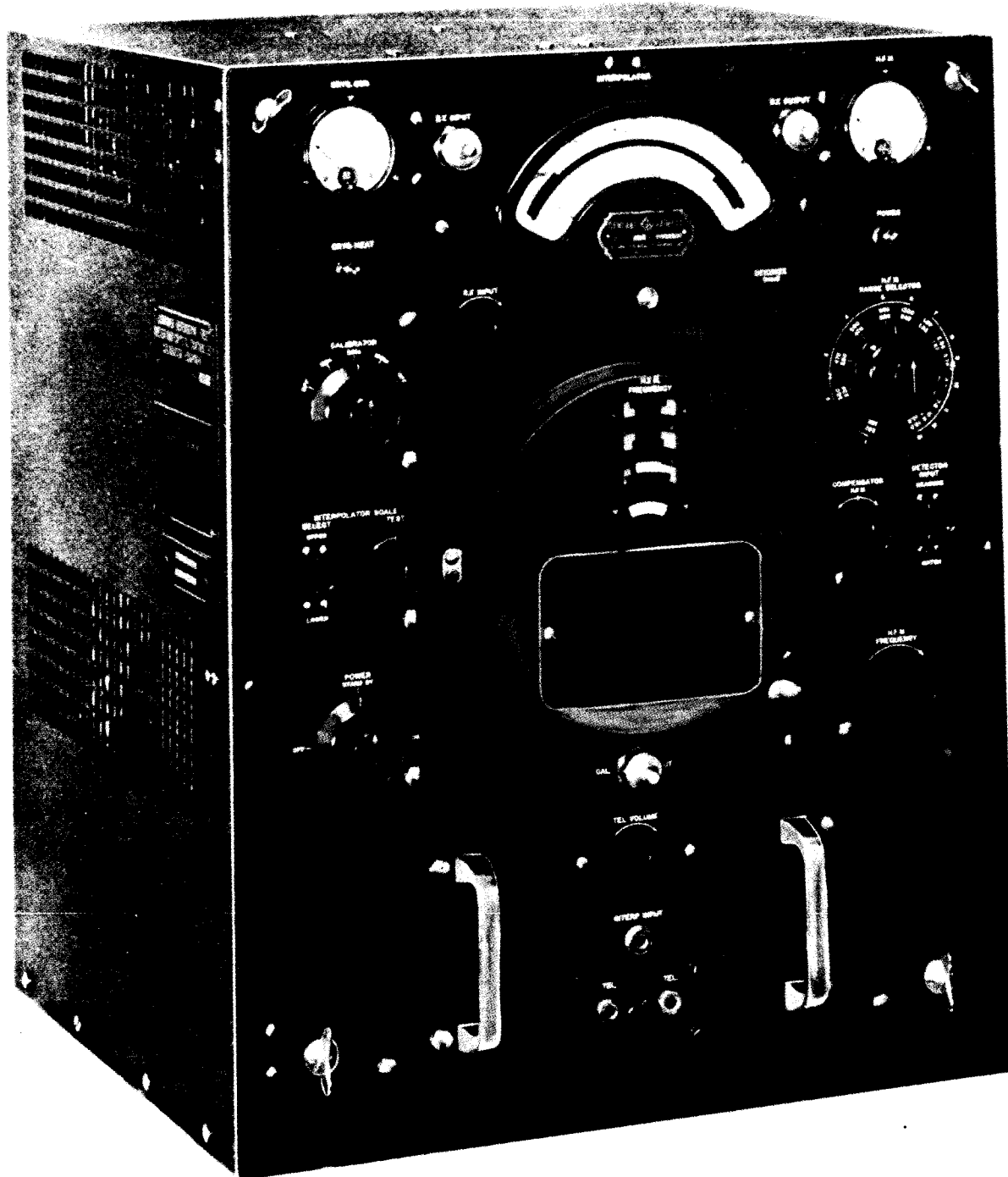
UNCLASSIFIED

UNCLASSIFIED

Frequency Measuring Equipment

**COMBINED HETERODYNE FREQUENCY
METER AND CRYSTAL CONTROLLED
CALIBRATOR EQUIPMENT NAVY
MODEL LR SERIES**

LR SERIES



Combined HF Meter and Crystal-Controlled Calibrator Equipment Navy Model LR.

UNCLASSIFIED

4.2 LR: 1

LR SERIES

FUNCTIONAL DESCRIPTION

Navy Models LR, LR-1, LR-2 and LR-3 combined Heterodyne Frequency Meter and Crystal-Controlled Calibrator Equipment are intended for measuring the frequency of radio transmitters, or for setting radio receivers to desired frequencies, in the range of 160 kc to 30 mc. By harmonic extension, frequencies above 30 mc may be measured. The equipment consists of a single unit which includes all power supply equipment, heterodyne frequency meter, crystal-controlled calibrator, detector-audio amplifier and interpolator.

RELATION TO OTHER EQUIPMENT

Navy Models LR, LR-1, LR-2 and LR-3 are all identical except for minor production changes. They will be superseded by Frequency Meter AN/USM-29.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—110 to 120 v, ac, 60 cps; 43 w, standby; 160 w, operate.

FREQUENCY METER RANGE.—

Direct Calibration: 160 kc to 15 mc.

Usable To: 60 mc.

Accuracy: ±0.003%.

CRYSTAL CALIBRATOR.—

Crystal Frequency: 100 kc.

Accuracy: ±1 cps.

Temperature Coefficient: 1 part per million per °C, approx.

Oven Temperature: 50°C, ±2.5°C.

MULTIVIBRATOR FUNDAMENTALS.—

Frequency Ranges: 10, 20 and 100 kc.

INTERPOLATION METER RANGE.—0 to 5.5 kc.

PRESENTATION AND CONTROLS.—The heterodyne frequency meter dial is calibrated directly in frequency from 160 kc to 15 mc and a Harmonic Range and Multiplier Chart is attached to the panel to select the sired range for frequencies up to 60 mc. The appropriate scale is exposed by a mask automatically operated by the 13 position range switch. A scale of equal parts and a vernier scale on the precision capacitor shaft is exposed at all times.

The COMPENSATOR HFM knob is provided for bringing the direct-reading dial into agreement with the calibrator. The INTERPOLATOR SCALE-TEST knob is provided for producing a smoothly controllable change in frequency of the heterodyne frequency meter to determine the sense, or sign, of the beat frequency indication given by the interpolator. The INTERPOLATOR SCALE-SELECT is used to select the correct 0 to 5 kc scale on the interpolation meter.

The CALIBRATOR knob changes the fundamental frequency of the multi-vibrator. The DETECTOR INPUT switch is used on the MATCH position to get a zero beat between the unknown signal and the heterodyne frequency meter and it is used on the MEASURE position to determine the frequency of the heterodyne frequency meter. The DEIONIZE switch is used to deionize the two thyratrons in the event that they should both ionize at the same time. The RF INPUT knob controls the amplitude of the rf supplied to the heterodyne frequency meter.

The TEL VOLUME knob controls the amplitude of the audio signal available at the TEL jacks. Two 0 to 3 ma meters are on the front panel; one indicates the crystal oscillator screen grid current and the other indicates the heterodyne frequency meter oscillator plate current. A CRYSTAL HEAT indicator light is lit

when the crystal oven heater is on. An RF INPUT jack is provided to connect the unknown signal to the heterodyne frequency meter. An RF OUTPUT jack makes the heterodyne frequency meter oscillator signal available at the panel. A jack marked CAL OUT makes the calibrating signal available at the panel.

The INTERP INPUT jack permits the interpolator to be used for indicating or measuring the frequency of an external audio frequency source. Two TEL jacks are provided for headsets, and two telephone line terminals, located under the instrument cover, can be used for the connection of a remote-telephone line (at transmitter site).

LR

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-163620-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec RE-13A401, 16Fi
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.1.3
F.I.I.N.	

LR-1

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Not Classified
STOCK NO.:	(USAF):
	(NAVY): F16-Q-163624-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec RE-13A401, 16Fi
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.1.3
F.I.I.N.	

LR-2

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-163644-200
	(ARMY): 3F-3962-2
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec RE-13A401, 16Fi
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.1.3
F.I.I.N.	

LR-3

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-163644-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy, Spec RE-13A401, 16Fi
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.1.3
F.I.I.N.	

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Frequency Measuring Equipment

LR SERIES

FITTINGS AND ACCESSORIES.—No cables are supplied either for the test of external equipment or for connection of the equipment to an ac source. The servicing cable is supplied to permit operation of the equipment when taken out of its case.

The ac power input, as well as the audio output terminals to be used for the remote-telephone line are both located on the left-hand side of the main base casting, within the cover. These terminals are in the form of binding posts with cable clamps. The RF OUTPUT JACK, RF INPUT JACK, and CAL OUT jack are all Navy Type 49120 concentric connector jacks. The INTERP INPUT jack and the two TEL jacks are all Navy Type 49021A jacks.

CONSTRUCTION.—The equipment is housed in a metal cabinet finished with black wrinkle paint, and suitable for bench installation. The equipment pulls forward from the case on a slide carriage.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Radio Co., Cambridge, Mass.
 Contract NOs-67373, dated 30 June 1939 (LR).
 Contract NOs-83891, dated 7 April 1941 (LR-1).
 Contract NXss-21092, dated 11 January 1943 (LR-2).
 Contract NXsr-40999, dated 12 November 1943. (LR-3).

TUBE COMPLEMENT

(2) 6C6	(2) 884	(9) 76
(1) 84	(1) 83	(1) 75
(4) VR-105/30	(1) 6SK7	

REFERENCE DATA AND LITERATURE

NAVSHIPS 95116: Instruction Book for Model LR.
 NAVSHIPS 95117: Instruction Book for Model LR-1.
 NAVSHIPS 91136: Instruction Book for Model LR-3.
 NAVSHIPS 95118: Instruction Book for Model LR-2.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Combined Heterodyne Frequency Meter and Crystal-Controlled Calibrator Equipment, Navy Model LR, LR-1, LR-2 or LR-3	4.6				300

EQUIPMENT SUPPLIED

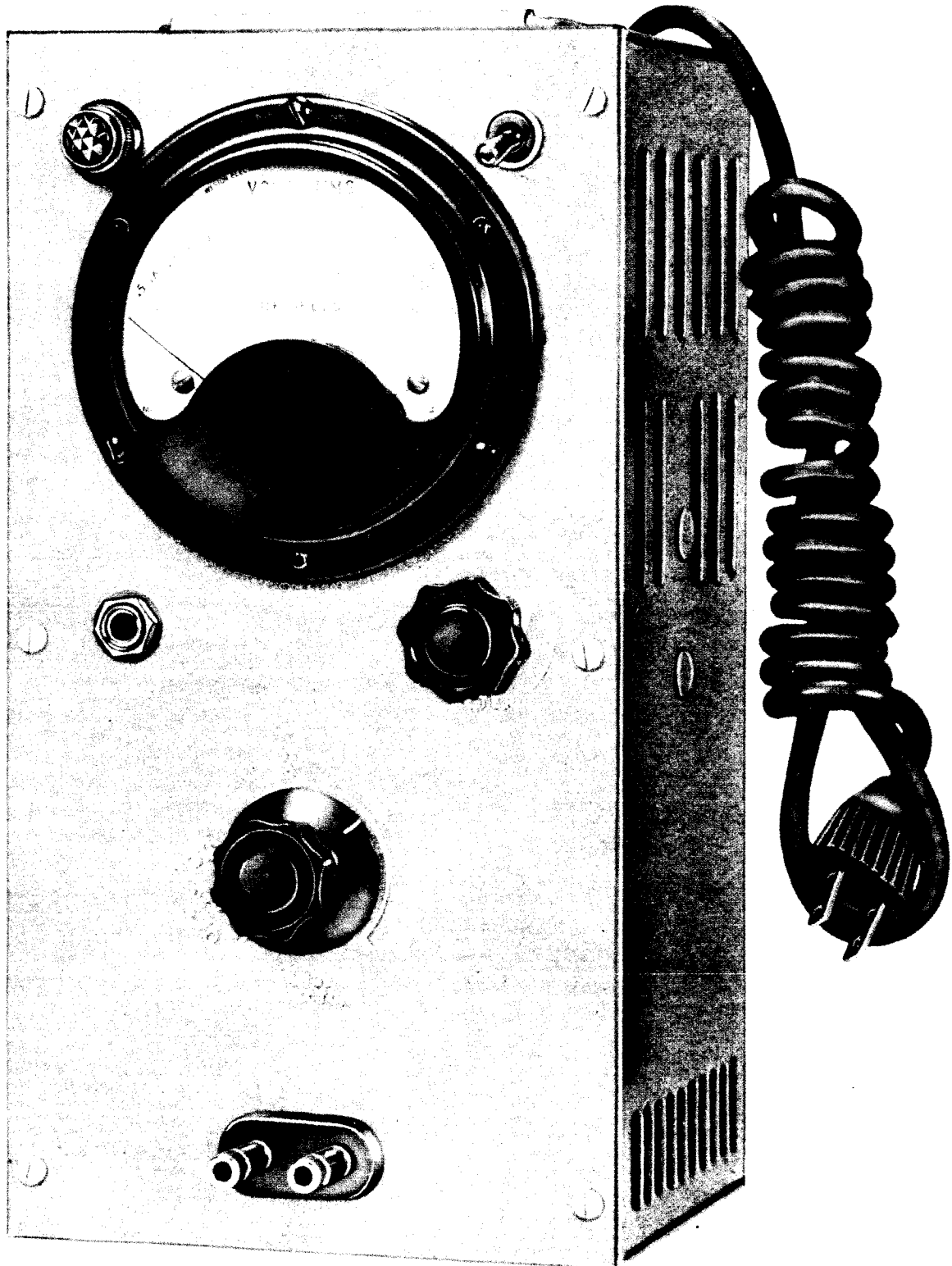
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Frequency Meter Unit	-	23	18	17-1/2	155
1	Service Cable NT-62314	-	22 1g			
2	Instruction Books	N17-C-48652-7101 3E4139-22				
			TOTAL LESS MAINTENANCE REPAIR PARTS			155
			TOTAL			

UNCLASSIFIED

Voltage and Current Measuring Equipment

**ELECTRONIC MULTIMETER MODELS
ME-6/U SERIES**

ME-6/U SERIES



Electronic Multimeter ME-6A/U.

UNCLASSIFIED

ME-6/U SERIES

FUNCTIONAL DESCRIPTION

Electronic Multimeter Model ME-6()/U is a portable, electronic ac voltmeter useful over a frequency band of 10 cps to 150 kc or more, and having a large voltage range covered in decade steps. The multimeter has a logarithmic voltage scale and a linear decibel scale. It responds to the average ac values, making it suitable for rms voltage readings of sine wave voltages. The amplifier section can be used independently for amplifying ac voltages. It is used for measuring the gain of audio amplifiers, transmission losses in telephone circuits (including carrier systems), background noise at low level, ripple voltage in rectifier systems or in dc generators, and similar applications.

RELATION TO OTHER EQUIPMENT

Electronic Multimeter ME-6/U is part of Radio Test Set AN/URM-4A and Navy Model OCM Mobile Electronic Repair Truck. It is similar to Ballantine Model 300-A and is essentially a commercial equipment. It is superseded by Electronic Multimeters ME-6A/U and ME-6B/U which contain JAN parts and have an extended voltage range. These meters will be superseded by Multimeter ME-74/U, a full military version.

ELECTROMECHANICAL DESCRIPTION

ME-6/U:
POWER SUPPLY.—110 to 120 v ac, 60 cps, 0.5 amp fuse.
FREQUENCY RANGE AND RESPONSE.—10 cps to 150 kc, ±1 db.
VOLTAGE RANGE.—1 mv to 100 v, rms in 5 decade steps (log scale).
DECIBEL SCALE.—0 db to 20 db (linear scale) based on 1 mw in 600 ohms.
INPUT IMPEDANCE.—0.5 meg shunted by 30 μmf.
OUTPUT IMPEDANCE.—0 to 15,000 ohms.
AMPLIFIER GAIN.—3100 (70 db).

ME-6A/U and ME-6B/U:
POWER SUPPLY.—117 v, ±10%, 50 to 400 cps, 31 w.
FREQUENCY RANGE AND RESPONSE.—10 cps to 250 kc, ±2%.
VOLTAGE RANGE.—500 μv to 500 v, rms in 6 decade steps (log scale).
DECIBEL SCALE.— -5 db to +17 db (linear scale) based on 1 mw in 600 ohms.
INPUT IMPEDANCE.—2 meg shunted by 15 μmf.
OUTPUT IMPEDANCE.—0 to 2000 ohms.
AMPLIFIER GAIN.—1600 (63 db).

PRESENTATION AND CONTROLS (ME-6A/U AND ME-6B/U).—All controls and terminals are located on the front panel, except for the ac cord and plug which is permanently attached to the instrument case.

The Meter has two scales: One logarithmic Voltage scale, graduated from 0.5 to 5, on which equal percentages of voltage variation will cause equal amounts of needle deviation. One linear decibel scale, graduated from -5db to +15 db. A Range Selector switch with 6 positions permits the choice of the desired voltage decade for voltage measurements, or of the + or -db to be added algebraically to the dbmeter reading, for measurements of voltage increments, the reference power level being 1 mw in 600 ohms. A function switch and control knob is provided for operating the Multimeter as an ac voltmeter (ac position) or to control the attenuation of the output signal from the amplifier (Variable resistor). An input receptacle, with one side grounded, an output jack with grounded sleeve

contact, an ON-OFF switch and pilot lamp are also provided.

FITTINGS AND ACCESSORIES.—No cables or other accessories, for connection to external equipment, are supplied. The ac cord is permanently attached to the top of the case. The two input connectors are combination banana-jacks-binding posts (SNSN: 17-P-69136-7295). The output connector is a J 1 contact phone jack (SNSN: 17-J-39144-3559).

CONSTRUCTION.—The Multimeter is housed in a black wrinkle finish metal case, with louvers for ventilation, embossed feet and metal carrying handle. The ac cord is 6 feet long, and has a standard male ac plug.

MANUFACTURER'S OR CONTRACTOR'S DATA

Ballantine Laboratories, Inc., Boonton, N.J. (ME-6/U).
 Contract NObsr-39230.
 Instrument Electronics Corporation, Little Neck, L.I., N.Y. (ME-6A/U).
 Contract NObsr-43357, dated 3 June 1949.
 A. F. Smuckler and Co., Inc., Brooklyn, N.Y. (ME-6B/U).
 Contract NObsr-49174, dated 6 June 1950.

ME-6/U

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY): Standard
STOCK NO.:	(USAF):
	(NAVY): F16-Q-172852-200
	(ARMY): 3F100-3
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	1.1.1.1
F.I.I.N.	

ME-6A/U

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Substitute Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-172853-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	1.1.1.1
F.I.I.N.	

ME-6B/U

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-172854-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	1.1.1.1
F.I.I.N.	

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Voltage and Current Measuring Equipment

ME-6/U SERIES

TUBE COMPLEMENT

ME-6/U
 (1) 1620 or 6J7 (2) 6SJ7 (1) 6H6
 (1) 6X5 (2) 991

ME-6A/U
 (4) 6AK5 (1) 6X4

ME-6B/U
 (1) 6AQ5 (2) 6J6 (1) 5651

REFERENCE DATA AND LITERATURE

NAVSHIPS 95564: Instruction Book for Electronic Multi-meter ME-6/U.
 NAVSHIPS 91269: Instruction Book for Electronic Multi-meter ME-6A/U.

SHIPPING DATA

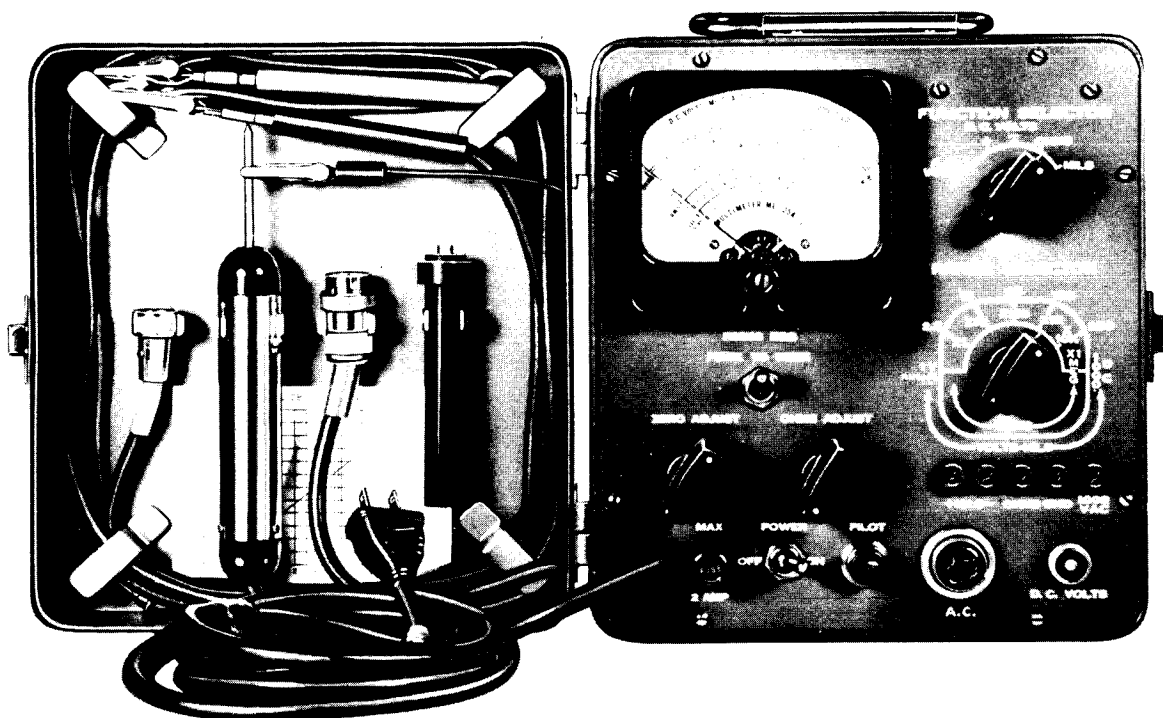
NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Electronic Multimeter ME-6/U, or ME-6A/U, or ME-6B/U	1.8	11-5/8	12-1/2	20	30

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Electronic Multimeter ME-6/U	3F6073-20.6 F17-M-27051-8001 3F8100-3	11	5-3/4	4-1/2	9.5
2	Instruction Book NAVSHIPS 95564	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			
1	Electronic Multimeter ME-6A/U	- - -	11-5/16	5-3/4	5-7/8	9.5
2	Instruction Book NAVSHIPS 91269	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			
1	Electronic Multimeter ME-6B/U	- - -	11-3/16	5-3/4	5-7/8	9.5
2	Instruction Book	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			

UNCLASSIFIED

Voltage and Current Measuring Equipment

MULTIMETER ME-25A/U**ME-25A/U**

Multimeter ME-25A/U.

FUNCTIONAL DESCRIPTION

Multimeter ME-25A/U is a portable combination electronic volt-ohm-milliammeter. It is capable of measuring ac voltages expressed in rms or peak-to-peak values. Circuit design permits measurements to well over 100 mc with a high input impedance. In addition, direct current and power frequency ac high voltage measurements may be made in the conventional manner.

RELATION TO OTHER EQUIPMENT

This equipment supersedes Navy Model OBQ Series and Multimeter ME-25/U (earlier versions, with ac measurements based on peak volts and having less voltage ranges).

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 1600 cps, 12 w; 1.5 v dc from dry cell for ohms measurements. One JAN Type BA-30 (Navy Type 19031), not supplied.

VOLTS, AC (MEASURED IN PEAK-TO-PEAK, CALIBRATED IN PEAK-TO-PEAK AND RMS).—0 to 1, 2.5, 10, 25, 100, 250 v, rms; 0 to 2.5, 10, 25, 100, 250, 1000 v, peak-to-peak.

Input Impedance: 13 meg shunted by 7 μ f.

Frequency Range: 50 cps to 100 mc.

Accuracy: $\pm 5\%$ of full scale.

VOLTS, AC (MEASURED IN AVERAGE VALUE, CALIBRATED IN RMS).—0 to 1000 v.

Input Impedance: 5 meg shunted by 10 μ f.

Frequency Range: 50 to 3000 cps approx.

Accuracy: $\pm 5\%$ of full scale.

VOLTS, DC.—0 to 1 v, 2.5 v, 10 v, 25 v, 100 v, 250 v, 1000 v; 0 to 5,000 v (using auxiliary high voltage adaptor probe).

Input Impedance: 13.3 meg (66.5 meg with probe).

Accuracy: $\pm 4\%$ of full scale on 4 lower ranges; $\pm 5\%$ of full scale on 250 v, 1000 v, and 5000 v ranges.

RESISTANCE.—

R x 1: 1000 ohms, center scale 10 ohms.

R x 10: 10,000 ohms, center scale 100 ohms.

R x 100: 100,000 ohms, center scale 1000 ohms.

R x 1K: 1 meg, center scale 10,000 ohms.

R x 10K: 10 meg, center scale 100,000 ohms.

R x 1 Meg: 1000 meg, center scale 10 meg.

Accuracy: Within 3° arc from absolute value of resistance indicated on meter scale.

DIRECT CURRENT.—0 to 2.5, 10, 25, 100, 250, 1000 ma.

Accuracy: $\pm 3\%$ of full scale.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Not Classified
STOCK NO.:	(USAF):
	(NAVY): F16-Q-170888-200
	(ARMY): 3F3324-9
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy
PROCUREMENT COG.:	
RDB IDENT. NO.:	1.1.3.1.1
F.I.I.N.:	

UNCLASSIFIED

4.1 ME-25A/U: 1

CATALOG OF NAVY MATERIAL

Voltage and Current Measuring Equipment

UNCLASSIFIED

ME-25A/U

PRESENTATION AND CONTROLS.—All controls and terminals are located on the front panel. The meter (4 in. x 3-3/4 in.) has multiple, multi-color scales. The function selector sets the instrument for ac volts, dc volts (positive or negative) ohms or mils measurements. The range selector is used to obtain the desired scale sensitivity. A ZERO ADJUST knob is used to balance the meter bridge circuit and an OHMS ADJUST knob for ohms measurement (dry cell current). Sockets and lead input terminals are provided for the AC PROBE, DC VOLTS, + and - MILS, OHMS, GROUND, and 1000 v AC. A spring loaded switch is used for peak-to-peak readings. The ac cord and plug are permanently attached to the instrument. An ON-OFF switch, pilot lamp and fuse holder are included.

One 1.5 v dry cell, JAN Type BA-30, Navy Type 19031 is supplied with the Multimeter and located within the case under the chassis, where spring contacts are provided.

FITTINGS AND ACCESSORIES.—The ac probe cable is terminated by a Navy Type 49928 plug which mates the Navy Type 49658 jack on the front panel. A ground lead is supplied, with an alligator clip on one end and a threaded stud on the other end, for use as ground connection on the ac probe.

The shielded dc cable has a test probe, and a Navy

Type 49660 connector which fits the Navy Type 49659 receptacle on the front panel.

Two test leads (red and black), 48 in. lg, have test probes on one end and tip plugs on the other, to mate the Navy Type 491874 receptacles of the front panel. Two alligator clips are supplied, with threaded sleeves, to adapt to the test probe tips, if desired.

The high voltage adaptor is screwed on the dc test probe for 5000 v measurements.

CONSTRUCTION.—The equipment is all enclosed in a smooth gray lacquered steel case, with a carrying handle and a hinged, removable box type cover. All cables and accessories are housed in the cover, with the help of metal clips.

MANUFACTURER'S OR CONTRACTOR'S DATA

The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio.
Contract NObsr-43313, dated 19 May 1949.

TUBE COMPLEMENT

(1) 12AU7 (1) 6X4 (1) 6AL5

REFERENCE DATA AND LITERATURE

NAVSHIPS 91415: Instruction Book for Multimeter ME-25A/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter ME-25A/U (including spare parts box)	1.9	13-1/2	12-1/2	19-1/2	41

EQUIPMENT SUPPLIED

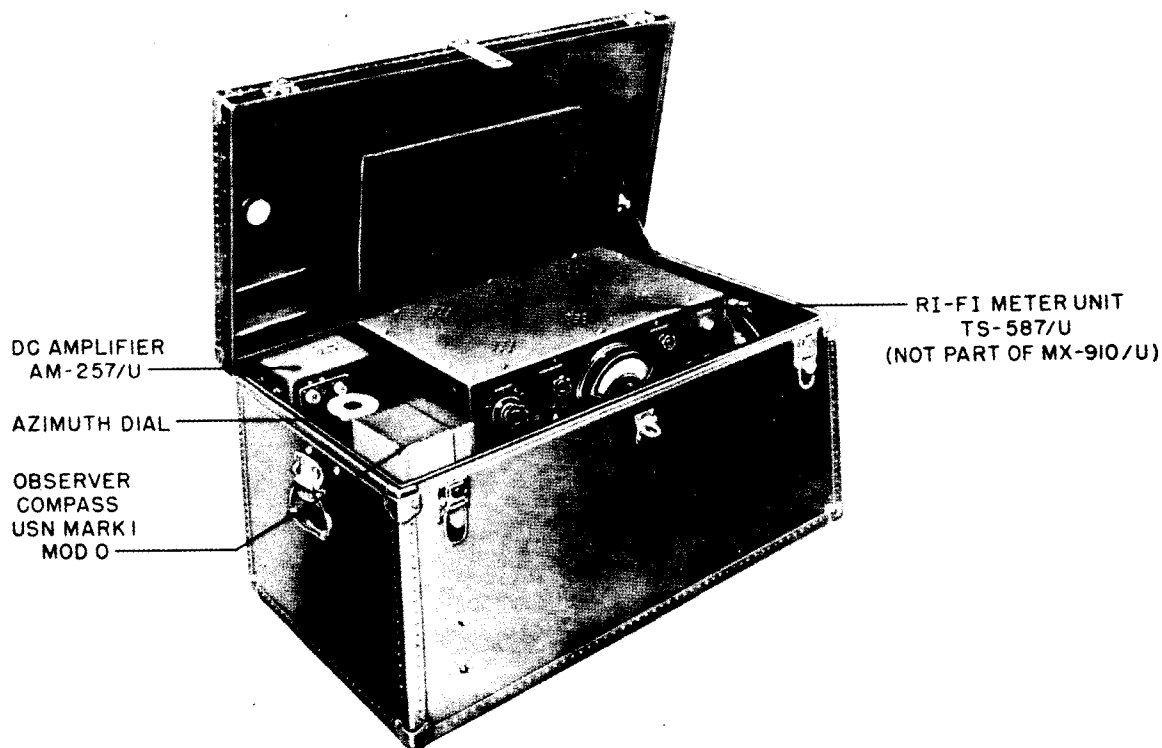
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter ME-25A/U including the following accessories:	- F17-M-28071-1551 3F3324-9	9-3/4	8-7/8	6-5/8	13
1	AC Probe and Cable Assembly W-101	- N17-L-63205-7691 3E8000-48.13	48 lg			
1	Ground Lead W-105	- N17-L-63205-4190 3E8000-48	48 lg			
1	Test Lead, shielded W-102	- N17-L-63205-8851 3E8000-44.2	48 lg			
1	Test Lead, unshielded W-103	- N17-L-63205-4185 3E8000-48.1	48 lg			
1	Ground Lead, W-104	- N17-L-63386-2427	3 1/4 lg			
1	High Voltage Adaptor MX-1101/U	- N17-P-84837-7361 3F3705-19	5/8 dia x	5-3/16 lg		
2	Alligator Clips	- N17-C-802585-401 3Z1087-15	7/16	2-5/16	5/16	
2	Instruction Books	-				
		-				
		-				
		-	TOTAL LESS MAINTENANCE REPAIR PARTS			13
			TOTAL			

UNCLASSIFIED

Modification Kit

MODIFICATION KIT MX-910/U

MX-910/U



Modification Kit MX-910/U.

FUNCTIONAL DESCRIPTION

Modification Kit MX-910/U is used to modify the Noise-Field Intensity Meter TS-587/U enabling the RI-FI Meter Unit to operate from dc. A dc amplifier is included to amplify the output of the RI-FI meter to enable it to operate a 0-1 ma recording instrument such as the RD-59/U (not furnished). The Azimuth Circle Assembly permits the reading, directly in degrees of azimuth, of the angular position of the antenna. The Observer Compass USN MK 1 Mod 0 enables the operator to orient the azimuth dial so that the dial indicates true bearings from magnetic north. A Transit Case CY-673/U which will house all accessories furnished except the Rotary Converter PU-151/U, and which may also be used to house the TS-587/U RI-FI meter unit is furnished.

The rotary converter was designed to supply power for the RI-FI instrument only. The added power required for the operation of the dc amplifier and a recorder-milliammeter necessitates approximately 20% overload. Under overload conditions intermittent service only is possible without danger of overheating.

RELATION TO OTHER EQUIPMENT

This Modification Kit is used with and modifies Noise-Field Intensity Meter TS-587/U.

ELECTROMECHANICAL DESCRIPTION

ROTARY CONVERTER PU-151/U INPUT (FULL LOAD).—12 v dc at 17 amp.
OUTPUT.—

Continuous: 115 v ac, 60 cps, 100 w, 100% pf.

25% Overload: Intermittent duty (5 minutes on 15 minutes off).
Heat Dissipation: 104 w.
SPEED.—3600 rpm.
VOLTAGE REGULATION (FULL LOAD TO NO LOAD).—33%.
TEMPERATURE RISE FOR CONTINUOUS OPERATION.—50°C.
INPUT AND OUTPUT FILTERS.—150 kc to 400 mc, attenuated.
DC AMPLIFIER AM-257/U.—
Power Input: 105 to 125 v ac, 50 to 1600 cps, 17 w.
Input Impedance: 0.1 meg.
Output Impedance: 60,000 ohms.
Amplitude: 0 to 1 ma.
OBSERVER COMPASS MK 1 MOD 0, BATTERY DRAIN.—0.3 amp at 2.5 v.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F17-M-384501-146
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	5.6.1
F. I. I. N.	

UNCLASSIFIED

Modification Kit

UNCLASSIFIED

MX-910/U

BATTERIES USED.—Rotary Converter, (2) Storage battery Navy Type 6V-SBMD-175AH, SNSN 17-B-9536; Two in series to give 12 v, 175 amp-hr; Observer Compass, (2) Dry Cells SNSN 17-B-7210-BA-(non-magnetic cell construction shall be selected).

PRESENTATION AND CONTROLS.—The Rotary Converter PU-151/U has an input for a battery cable and an ac outlet. The DC Amplifier AM-257/U has a panel containing two ac outlets, one for the recording meter and one for the ac supply for the Noise-Field Intensity Meter TS-587/U. It also has receptacles for an ac power input from an external source, a signal input and an output to drive the recording meter pen. Line fuses and a spare are also provided.

An azimuthal dial and pointer are provided for the antenna, and an observer's compass is provided.

FITTINGS AND ACCESSORIES.—3 cables and one plug are supplied and are connected as shown below.

CONSTRUCTION.—The rotary converter is housed in a metal case with screen sides and ends for ventilation. A carrying handle is provided on top of the case.

The dc amplifier is housed in a small black-finished metal case with rings on the ends for lashing to a support. The controls are on the front of the case and the outlets and connectors are on the back of the case.

The observer compass is stored in a mahogany case. The transit case is built of plywood with an outer covering of black fiber and has a carrying handle on each end.

MANUFACTURER'S OR CONTRACTOR'S DATA

Stoddart Aircraft Radio Co., Hollywood 38, Calif.

Contract NObsr-30088, dated 10 May 1948.

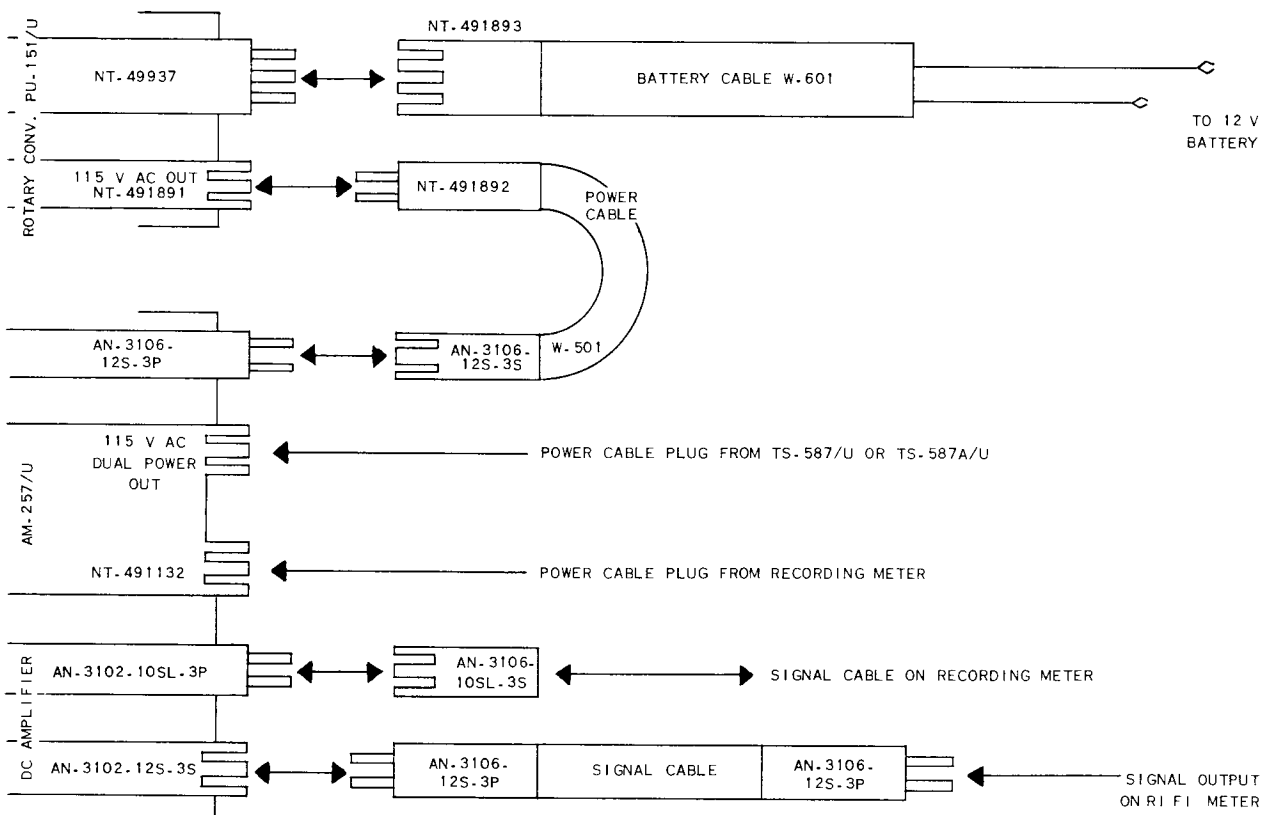
Contract NObsr-39372, dated 10 May 1948.

TUBE COMPLEMENT

- (1) 2C51
- (1) 6X4
- (1) OB2
- (1) OA2

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,990: Appendix 1, Instruction Book for Noise-Field Intensity Meter TS-587/U and TS-587A/U.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
2	Transit Case CY-673/U Containing All Units Except Rotary Converter PU-151/U	7.0	17-1/2	35-3/4	19-1/4	105
		0.7	12-1/2	11-1/2	8-1/2	27

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Modification Kit

MX-910/U

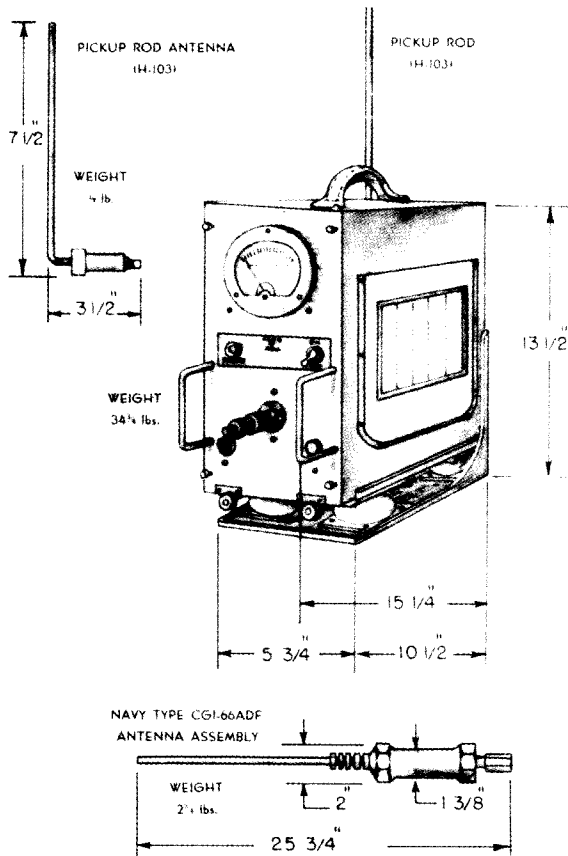
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Rotary Converter PU-151/U NT-212006	F17-M-70716-6192	10	9	6	22
1	Power Cable W-601	-	72 lg			
1	DC Amplifier AM-257/U	-	6	8-1/4	5-1/8	7
1	Power Cable NT-62458(6 ft)	N17-A-54001-1003	72 lg			
1	Signal Cable NT-62459 (6ft 2 in.)	-	74 lg			
1	Plug AN 3106-10SL-35	N17-C-48584-9046				
1	Azimuth Dial	-	3	2-3/4	2-3/4	0.31
2	Azimuth Dial Pointers	-	3/4	2	2	0.13
1	Observer Compass USN MKI MOD 0 and case	N18-C-1615	4-3/4	10-7/8	4-7/8	4.75
1	Transit Case, Plywood and Black Fiber, CY-673/U	N16-C-170001-314	17	35-1/4	18-3/4	45
2	Instruction Book Supplements Appendix I, NAVSHIPS 900,990	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Frequency Measuring Equipment
OAA, OAA-2

**FREQUENCY METER EQUIPMENT NAVY
MODEL OAA AND RADAR TEST
EQUIPMENT MODEL OAA-2**



Radar Test Equipment OAA-2.

FUNCTIONAL DESCRIPTION

These equipments incorporate a tunable quarter wave resonant cavity of high Q, combined to a detector and a vacuum tube voltmeter. They are used as frequency meters or echo boxes in the band from 150 to 240 mc. They may be used to indicate the relative power output of certain transmitters, or in connection with an oscilloscope, to detect the received pulses for video presentation.

RELATION TO OTHER EQUIPMENT

These equipments are intended for use with Navy Models SA, SC, Sk Series Radars and similar Radars in the 150 to 240 mc range. The Navy Model OAA and the OAA-2 Model have identical functions and characteristics, the only differences are their respective presentation and layout and minor circuit changes.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—

Navy Model OAA: 115 v ac, 60 cps, 22 w.

OAA-2 Model: 105 to 125 v ac, 60 cps, 15 w.

FREQUENCY RANGE.—150 to 240 mc, ±0.5 mc.

RINGING TIME.—50 μsec, approx equivalent to an apparent range of 5000 yards.

PRESENTATION AND CONTROLS.—The front panel controls include a micrometer drum type tuning dial the numerical readings of which are converted to frequency by reference to a chart. A relative indication of the signal input power is given by the meter (electronic voltmeter) at resonance. A ZERO SET control and a SENSITIVITY control are also included. A video output jack is provided for connection to an oscilloscope. In the case of Navy Model OAA, the antenna jack and the ac power receptacle are located on the side of the instrument case. In the case of OAA-2 Model, these connectors are located at the back of the instrument case. Field Change No. 1 (OAA-2) dated 15 August 1944 and Field Change No. 2 (OAA-2) dated 1 September 1948 have been prescribed in the intention of eliminating standing waves by correcting antenna input termination, and to correct the frequency sensitivity of the Echo Box with respect to ring time and relative transmitter power meter indications.

FITTINGS AND ACCESSORIES.—These equipments are intended for fixed or semi-fixed shipboard installation. An ac plug is supplied, for use with the convenient length of cable which is not supplied. Parts and cable lengths are supplied for the assembly of a pick-up, or stub antenna with plug, and for a deck antenna with coaxial cable and plug. The assembly of these parts is to be made at the time of installation of each equipment according to instructions. A phone type plug is also supplied, for use with the video jack, to facilitate connection to an oscilloscope.

CONSTRUCTION.—The Navy Model OAA is built into a metal cabinet with shock mounts and a mounting plate and is intended for table or shelf mounting at a convenient location. The OAA-2 Model is enclosed in an oblong metal cabinet with shock mounts and a shelf type mounting plate intended for wall installation. A carrying handle is provided on top of the cabinet and the instrument can easily be used as a portable frequency meter with the use of the pick-up rod antenna.

OAA

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-194800-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2
F.I.I.N.:	

OAA-2

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-194840-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2
F.I.I.N.:	

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Frequency Measuring Equipment

UNCLASSIFIED

OAA, OAA-2

MANUFACTURER'S OR CONTRACTOR'S DATA

RCA Manufacturing Co., Camden, N.J. (OAA).
 Contract NOS-96554, dated 25 May 1942.
 Gilfillan Bros. Inc., Los Angeles, Calif. (OAA-2).
 Contract NXsr-10810.
 Contract NXsr-45459.
 Contract NXsr-33633.
 Contract NXsr-60073.
 Contract NXrr-41013.

TUBE COMPLEMENT

(1) 6X5-GT (1) 6SQ7 (1) 955

REFERENCE DATA AND LITERATURE

RCA-1B-38186 (ENG 184): Preliminary Instruction Book for Navy Model OAA Frequency Meter Equipment.
 SHIPS 227: Instruction Book for OAA-2 Model Radar Test Equipment.
 Field Change No. 1, 15 August 1944 (OAA-2).
 Field Change No. 2, 1 September 1948 (OAA-2).

EQUIPMENT SUPPLIED

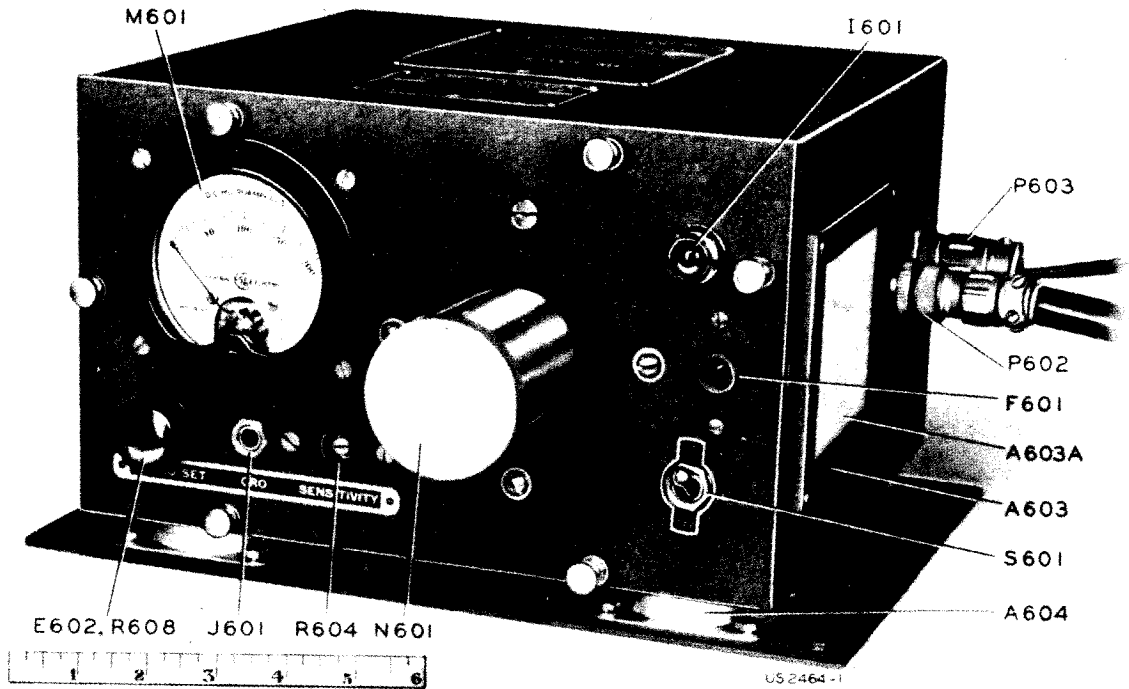
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	OAA					
1	Frequency Meter Unit NT-60AAP	-	6-5/8	10	9-1/8	27
1	Antenna Assembly Unit NT-66ABW (Deck), Including Cable and Parts	-				
11	Antenna Assembly Unit NT-66ACL (Stub)	-				
1	AC Plug	-				
1	Kit of Equipment Spares	-				
2	Instruction Books ENG 184	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			
	OAA-2					
1	Frequency Meter Unit NT-60ABC	-	13-1/2	5-3/4	15-1/4	34.75
1	Antenna Assembly Unit NT-66ADE, Including Cable and Parts	-	25-3/4	x 2 dia		2.75
1	Antenna Pick-up Rod H-103, With Plug	-	17-1/2	3-1/2		0.50
1	AC Plug	-				
1	Kit of Equipment Spares	-				
2	Instruction Books SHIPS 227	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			38.00

UNCLASSIFIED

Frequency Measuring Equipment

**RADAR TEST EQUIPMENT NAVY MODEL
OAO SERIES**

OAO SERIES



Radar Test Equipment Model OAO.

FUNCTIONAL DESCRIPTION

Radar Test Equipment Navy Models OAO, OAO-1 and OAO-2 incorporate a tunable quarter-wave resonant cavity of high Q combined with a detector and a vacuum tube voltmeter. They are used as frequency meters or echo boxes in the range from 105 to 125 mc. They may be used to indicate the relative power output of certain radar transmitters, or in connection with an oscilloscope, to detect the received pulses for video presentation.

RELATION TO OTHER EQUIPMENT

These equipments are similar to Navy Models OAA and OAF, the difference being found in the frequency coverage and in the type and quantities of accessories supplied. They are intended for use with radar equipments which operate on a 60 cycle repetition rate and a duty cycle of approximately 0.05%.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 60 cps, 11 w.

FREQUENCY RANGE.—105 to 125 mc.

Accuracy: ±0.25 mc.

RINGING TIME.—50 μsec (normal), or an apparent range of 8000 yds or more.

OAO-1

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-197770-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2.2
F.I.I.N.:	

OAO-2

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-197801-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2.2
F.I.I.N.:	

OAO

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-197761-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2.2
F.I.I.N.:	

UNCLASSIFIED

OAO SERIES

METER RANGE.—0 to 200 μ a.

PRESENTATION AND CONTROLS.—The front panel controls include a micrometer drum type tuning dial, the numerical readings of which are converted to frequency by reference to a chart. A relative indication of the signal input power is given by the meter (electronic voltmeter) at resonance. A ZERO SET control and a SENSITIVITY adjusting screw are also included. A CRO output jack is provided for connection to an oscilloscope. The antenna jack and the ac power receptacle are located on the side of the instrument case.

FITTINGS AND ACCESSORIES.—These equipments are intended for fixed shipboard installation. The CRO output receptacle is a Navy Type - 49872 phone jack. A phone plug NT-49006-B is supplied for use in this connection. The ac power receptacle is an AN Type connector (AN-3102-16S-4P). A mating AN Type cable connector (AN-3106-16S-4S) and cable clamp (AN-3057-8) are supplied together with a length of cable, in order to establish this connection. The antenna receptacle is an AN Type jack (AN-3102-12-5SY). Two RF plugs (AN-3106-12-5PY) and a sufficient length of RG-8/U coaxial cable are supplied, together with an RF pick-up device, to permit the installation of the equipment.

MODEL	FREQUENCY METER	ANTENNA ASSEMBLY	PICK-UP LOOP	IMPEDANCE ADAPTOR
OAO	60 ABA	--	47 AAH	-53146
OAO-1	60 ABA	--	47 AAK	--
OAO-2	60 ABA-1	66 ADC	47 AAH	-53146

The type of pick-up device supplied varies with each equipment. Pick-up Loop Assembly 47 AAH is for use

with transmission lines having a 3-1/4-inch diameter. An Impedance Adaptor NT-53146 is required for use between the Pick-up Loop Assembly and the antenna cable.

Pick-up Loop Assembly 47 AAK is for use with transmission lines having a 1-5/8 inch diameter, and includes its own impedance matching network. The Antenna Assembly 66 ADC is for installation in proximity to the radar antenna and is suitable for bracket mounting.

CONSTRUCTION.—Each equipment is enclosed in a metal cabinet with shock mounts and a flat mounting plate for installation next to the radar receiver indicator. The Antenna Assembly is of the quarter wave rod type and has an insulated base assembly suitable for bracket mounting.

MANUFACTURER'S OR CONTRACTOR'S DATA

Radio Corporation of America, Camden, N.J. (OAO and OAO-1).

Contract NXss-23218, dated 6 February 1943.

The Liebel-Flarsheim Company, Cincinnati 2, Ohio (OAO-2).

Contract NXsr-53325, dated 14 March 1944.

TUBE COMPLEMENT

(1) 955 (1) 6SQ7 (1) 6X5-GT

REFERENCE DATA AND LITERATURE

SHIPS 240: Instruction Book for Navy Model OAO Radar Test Equipment.

SHIPS 245: Instruction Book for Navy Model OAO-1 Radar Test Equipment.

SHIPS 269: Instruction Book for Radar Test Equipment Model OAO-2.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
	OAO					
1	Radar Test Equipment Model OAO with Accessories	1	9-3/4	15-1/4	14	33
1	Set of Equipment Spares		10	18-1/2	15-3/4	29
	OAO-1					
1	Radar Test Equipment Model OAO-1	1	9-3/4	15-1/4	14	33
1	Equipment Spares		10	18-1/2	15-3/4	11
	OAO-2					
1	Radar Test Equipment Model OAO-2, Including Spares	5.5	14-1/8	41-1/4	16-1/2	100
1	Equipment Spares	1.3	12-1/8	16-1/8	15	36

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Frequency Measuring Equipment

OAO SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	OAO					
1	Frequency Meter NT-60ABA	-	6-5/8	12	12	28
1	Pick-up Loop NT-47AAK	-	4-9/16	3-1/4	2-1/2	0.5
1	Impedance Adaptor NT-53146	-	1-5/32	1-1/8	3-3/8	0.3
2	Instruction Book SHIPS 240	-				
1	Maintenance Repair Parts	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			28.8
			TOTAL			
	OAO-1					
1	Frequency Meter NT-60ABA	-	6-5/8	12	12	28
1	Pick-up Loop NT-47AAK	-	3-1/8	1-5/8	3-15/32	0.75
2	Instruction Book SHIPS 245	-				
1	Equipment Spares	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			28.75
			TOTAL			
	OAO-2					
1	Frequency Meter NT-60ABA-1	-	6-5/8	12	12	28
1	Antenna Assembly NT-66ADC	-	36-1/8	1-1/2	1-1/2	2
1	Pick-up Loop NT-47AAH	-	4-9/16	3-1/4	2-1/2	0.5
1	Impedance Adaptor NT-53146	-	1-5/32	1-1/8	3-3/8	0.3
2	Instruction Book SHIPS 269	-				
1	Maintenance Repair Parts	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			30.8
			TOTAL			35.8

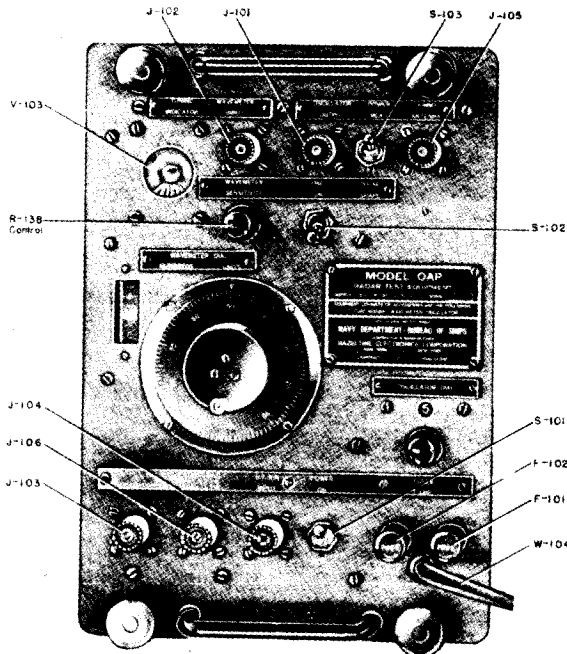
UNCLASSIFIED

UNCLASSIFIED

Combination and Group Test Set

**WAVEMETER- OSCILLATOR NAVY
MODEL OAP SERIES**

OAP SERIES



Wavemeter Oscillator OAP.

FUNCTIONAL DESCRIPTION

Navy Models OAP and OAP-1 Wavemeter-Oscillators are test and monitor equipments operating in the 150 to 230 mc frequency range. They may be used as follows:

1. Tune a transmitter to a given frequency.
2. Tune a receiver to a given frequency.
3. Adjust an antenna system for test performance.
4. Measure the power output of a transmitter.
5. Monitor a transmitter during operation.

Model OAP-1 is slightly more sensitive than Model OAP.

They consist of an oscillator, a frequency meter and a power meter.

RELATION TO OTHER EQUIPMENT

These equipments are designed for use with MK 3 IFF Equipment and other equipment in the 150 to 230 mc range. With an oscilloscope, they can be used to show the shape of the transmitter video signal or pulse.

Model OAP-1 can be operated from either a 60 cycle or 400 cycle power source.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—

Model OAP: 110 to 120 v ac, 50 to 70 cps, 30 w.

Model OAP-1: 110 to 120 v ac, 50 to 70 cps or 400 cps, 30 w.

WAVEMETER.—

Frequency Range: 150 to 230 mc.

Accuracy: $\pm 0.25\%$, from 0° to 50°C.

Input Impedance: 50 ohms.

Power Range: Maximum allowable signal input.

To Wavemeter: 0.5 w, average power.

To Dummy Antenna: 8 w, average power.

OSCILLATOR.—

Frequency Range: 150 to 230 mc.

Accuracy: $\pm 0.25\%$, as for wavemeter.

Modulation: Line frequency.

Output: 10 mv, approx.

Impedance: 50 ohms.

POWER METER.—

Frequency Range: VTVM input, untuned.

Input Impedance: 50 ohms.

Relative Level Indication: Tuning indicator.

Maximum Input Level: 0.5 w.

Calibrating Voltage: 18 v, peak-to-peak.

DUMMY ANTENNA.—

Impedance: 50 ohms, approx.

Rated Power: 8 w, continuous duty.

PRESENTATION AND CONTROLS.—A combination disc and drum dial indicates the frequency setting of the wavemeter. A tuning indicator detector indicates resonance of the wavemeter tuned circuit with an external signal, directly into the wavemeter input jack or through the VTVM input jack, or with the internal oscillator. The oscillator is tuned by means of a tuning dial and knob and is calibrated with the help of the wavemeter. A wavemeter sensitivity control is used when sharp indication of tuning is desired. Six coaxial panel jacks are provided for the following connections.

1. Oscillator output, 50 ohms.
2. Wavemeter input, 50 ohms.
3. Video amplifier output, for scope indication.
4. Vacuum tube voltmeter input.
5. Dummy antenna. This antenna is actually used for signal pickup. Signals picked up by the antenna, are rectified and amplified with a cathode follower to present to an oscilloscope for waveform presentation.
6. Calibrating voltage.

Two toggle switches are used to switch the oscillator on or off and to set the video amplifier for power measurements or for pulse shape observation. A power on-off switch and fuse holders are provided.

OAP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-197920-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.1.3
F. I. I. N.	

OAP-1

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-197925-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.1.3
F. I. I. N.	

UNCLASSIFIED

OAP SERIES

FITTINGS AND ACCESSORIES.—Models OAP and OAP-1 are supplied with 3 coaxial cable assemblies for connections to a receiver, a transmitter or to an oscilloscope. With Model OAP-1, a short interconnecting cable W-204, is supplied in addition, in order to facilitate simultaneous frequency measurements and wave shape observation when testing a transmitter. All front panel input and output receptacles are small UHF Type coaxial jacks. A SEPARATE RECEIVER GAIN CONTROL is supplied in the form of a plug-in potentiometer, and is used in connection with receiver gain measurements. Details of practical connections are shown on the chart, for Model OAP-1.

CONSTRUCTION.—The major unit is enclosed in a metal case provided with rubber feet and a carrying handle. A lower compartment is provided to house the power cord and the test cables. A metal latch type cover is supplied for the instrument case, and is designed to accommodate the other accessories and the calibration charts. Spare parts, when supplied, are contained in a separate meter box.

MANUFACTURER'S OR CONTRACTOR'S DATA

Hazeltine Electronics Corp., New York, N.Y.
 Contract NXss-22208, dated 17 June 1943 (OAP).
 Contract NXsr-46027, dated 12 June 1944 (OAP-1).
 Contract NXsr-38852, dated 13 October 1943 (OAP-1).
 Contract NOrd-4621, dated 22 October 1943 (OAP-1).

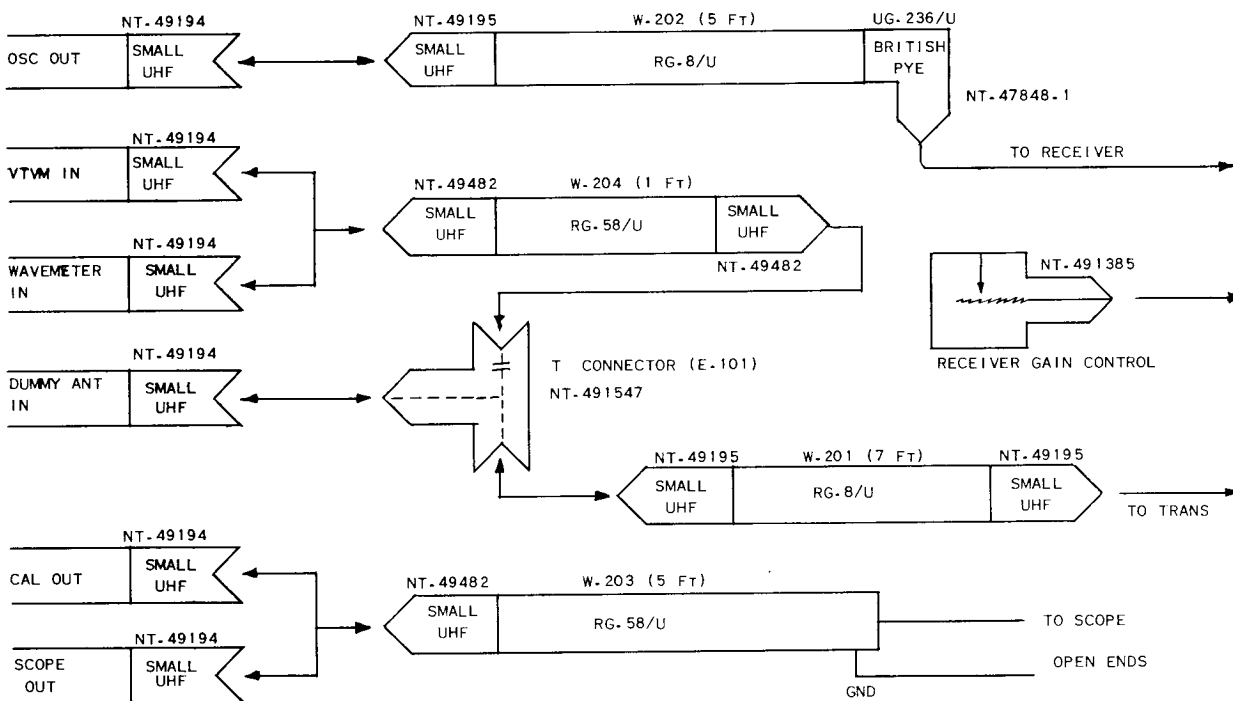
TUBE COMPLEMENT

OAP
 (1) 9006 (1) 6E5 (2) 6SN7-GT
 (1) WE-704-A (1) 6J6 (1) 6X5-GT

OAP-1
 (1) 9006 (1) 6E5 (2) 6SN7-GT
 (1) WE-704-A (1) 6C4 (1) 6X5-GT

REFERENCE DATA AND LITERATURE

NAVSHIPS 95163: Instruction Book for Model OAP Wavemeter-Oscillator.
 NAVSHIPS 900,001: Instruction Book for Model OAP-1 Wavemeter-Oscillator.



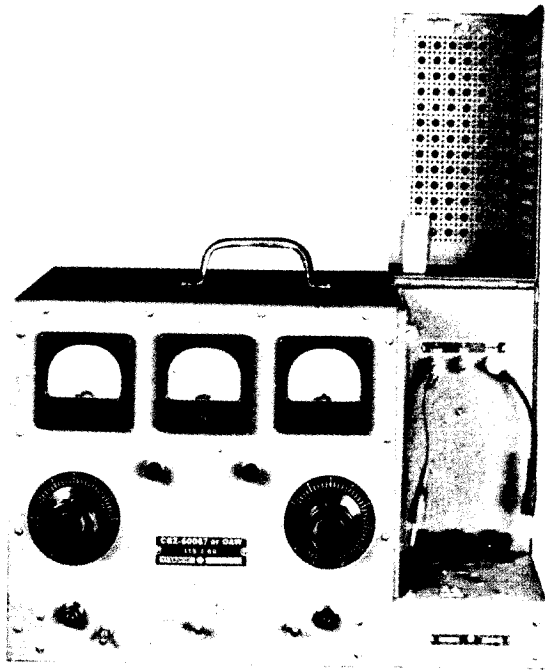
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	OAP Wavemeter-Oscillator NT-60-ABN	- 3F4320-2.1	10-1/2	8-1/2	15-1/8	
1	Receiver Cable, W-202	- 3E7350-2.60.1	60 lg			
1	Transmitter Cable, W-201	- 3F7350-2.84.1	84 lg			

UNCLASSIFIED

Voltage and/or Current Measuring Equipment

PORTABLE TUBE TESTING EQUIPMENT OAW, OAW-1
NAVY MODEL OAW SERIES



Tube Tester—Transmitting Type OAW.

FUNCTIONAL DESCRIPTION

Portable Tube Testing Equipment Navy Model OAW Series is designed to permit rapid determination of the peak emission and the cut-off point of various tubes such as Types 15E, 227, 327, and VT90(8011). As it is not practical to produce peak emission, this ability of the tube is predicted by a temperature limited continuous emission test. The cut-off point is determined by applying rated filament voltage and the grid bias is gradually decreased until the plate meter shows a deflection of 1/2 milliamper. The cut-off can then be read on the "Grid Voltage" meter.

RELATION TO OTHER EQUIPMENT

Navy Model OAW and Navy Model OAW-1 are electrically the same. Their sizes are also the same, but

slight differences exist in the layout and the components. They are used with radars such as Navy Model SA and SC Series.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 60 cycle, approx 100 w.
RANGES.—
 Plate Voltage: +250 and +1000.
 Bias Voltage: 0 to -150.
 Filament Voltage: 0 to 10 v ac (meter ranges 0-3 and 0-12).
 Plate Current: 0-1 and 0-10 ma.
PRESENTATION.—Calibrated meter readings and their interpretation on graphs for each tube type.
TERMINALS.—Alligator clips used to connect to plate and grid connections of tubes. Filament connection made in two-hole test socket or by flexible leads to binding posts.
CONSTRUCTION.—Metal case with electrically interlocked compartment for tube under test.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Communication Co., Boston, Mass.
 Contract NXsa-26587 (OAW).
 Contract NXsr-86365, dated 12 January 1945 (OAW-1).

TUBE COMPLEMENT

(1) 2X2 (1) 6X5GT

REFERENCE DATA AND LITERATURE

NAVAER 08-5S-103: Instruction Book for Navy Model OAW.
 NAVSHIPS 900,722: Instruction Book for Navy Model OAW-1 Portable Tube Testing Equipment.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-199310-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	1.2.1
F. I. I. N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Portable Tube Testing Equipment Navy Model OAW (complete with cord) or					
1	Portable Tube Testing Equipment Navy Model OAW-1 (complete with cord)					

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Voltage and/or Current Measuring Equipment

UNCLASSIFIED

OAW, OAW-1

EQUIPMENT SUPPLIED

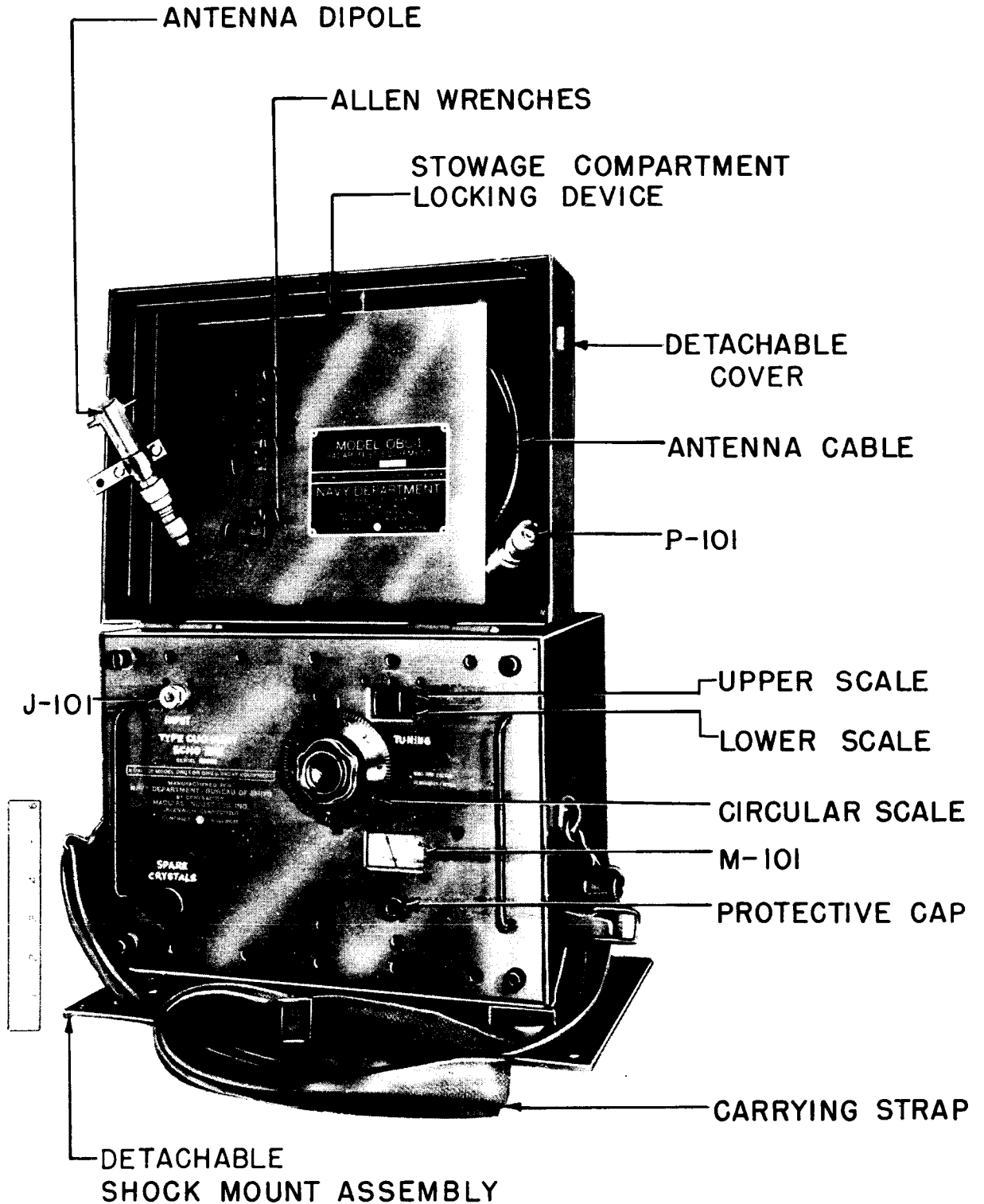
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Tube Tester Navy Model OAW Series	- F16-Q-199310-100 -	12-13/16	17-1/2	9-29/32	50.0 (approx)

UNCLASSIFIED

Frequency Measuring Equipment

**ECHO BOX RADAR TEST EQUIPMENT
MODELS OBU-1, OBU-2**

OBU-1, OBU-2



Echo Box Radar Test Equipment OBU-1.

UNCLASSIFIED

OBU-1, OBU-2

FUNCTIONAL DESCRIPTION

Models OBU-1 and OBU-2 are portable echo box test sets consisting mainly of a tunable ringing cavity of high Q. They are intended for the testing and adjustment of radars operating at frequencies from 2900 to 3100 mc. They are designed for frequency and relative power measurements as well as rough spectrum analysis. Coupling to the radar system can be made constant through the use of a directional coupler or of a pick-up dipole antenna.

The most often performed tests are:

- Relative indication (from day-to-day) of transmitter power output.
- Measurement of transmitter, and local oscillator frequencies.
- Analysis of transmitter frequency spectrum.
- Checking on erratic operation, double moding and frequency pulling.
- Measurement of pulse duration.
- Checking of receiver AFC action, measurement of TR box and receiver recovery time.
- Measurement of standing wave ratio, of transmission line losses, and other factors.

RELATION TO OTHER EQUIPMENT

Radar Test Equipments Models OBU-1 and OBU-2, and Radar Echo Box Test Sets Models OBU-3 and OBU-4 have similar functions and performance characteristics.

The different types of Directional Couplers which are supplied with each individual Model makes them adaptable to different types of Radar and waveguides, as shown by table:

MODEL	ECHO BOX NAVY TYPE	WAVEGUIDE COUPLER TYPE	WAVEGUIDE SIZE	ANTENNA TYPE	RADAR TYPE TO WHICH ADAPTED
OBU-1	14AAY	47AAL(20db)	2-3/4 x 3/8	66AHV	SG-1, SG-A, SL, SL-1, SL-A, SJ
OBU-2	14AAY	47AAM(27db)	1-1/2 x 3	66AHV	SG-1, SG-A, SL, SL-1, SL-A, SJ
OBU-3	14ABA-1	47AAN(27db)	1-1/2 x 3	66AJG	SF, SF-1, SO, SO-1, 2, 8, 9
OBU-4	14ABA-1	47AAP(18db)	3/8 x 2-3/4	66AJG	13, -a, -b, SG-a, SG-1, SL, SL-a, SL-1, SJ-1
		tapered	1-1/2 x 3		

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—2900 to 3100 mc (Ss band).

SENSITIVITY.—65 yards ring time per db.

TEMPERATURE RANGE.— -34°C (+410 yards correction); +49°C (-160 yards correction).

LOADED Q.—30,000 approx.

PRESENTATION AND CONTROLS.—The position of the piston in the resonant cavity is controlled by the tuning knob and its associated tuning dial located on the front panel. The tuning knob has a 100 division circular scale. The tuning dial has two scales. The lower scale contains 34 arbitrary divisions. The upper scale contains 32 divisions and the gear ratio is such that each of the 32 upper scale divisions corresponds exactly to one full 100 division rotation of the circular knob. A chart is provided to express various dial readings in terms of frequency. The output power meter, also located on the front panel, is used to tune the cavity to the exact frequency of the Radar under test by indicating the point of maximum absorbed power. A coaxial input receptacle for connection to

the coupling device, and a spare crystal holder are also provided.

FITTINGS AND ACCESSORIES.—The input receptacle on the front panel is an N-Type UG-19/U jack to which is connected either the 3-foot long dipole antenna cable or the 5-foot coaxial cable used with the directional coupler. Both cables are made of RG-8/U coaxial sections and have N-Type UG-21/U plugs on each end. The coaxial jacks provided on the dipole antenna and on the directional coupler are threaded for N-Type plug connection.

Directional Coupler Model 47AAL supplied with Model OBU-1 is made for 2-3/4 in. x 3/8 in. waveguides. It has a standard coupling flange on one end and a standard choke coupling on the other end. The nominal coupling attenuation is 20 db.

Directional Coupler Model 47AAM is made for 1-1/2 in. x 3 in. waveguides. One end is terminated by a Navy Type 49480 (UG-65/U) flange and the other end by a Navy Type 49481 (UG-66/U) flange.

The antenna pick-up dipole Model 66AHV is intended for installation near or on the Radar Antenna Reflector, with the help of special mounting brackets. The type of bracket to be used depends on the type of Radar to be tested. Brackets must be procured separately.

CONSTRUCTION.—The Test Set Assembly is housed in a splashproof sheet aluminum carrying case provided with a carrying strap. The carrying case cover is detachable and contains a stowage compartment for the Test Dipole Antenna Assembly. Three small Allen wrenches are secured by spring clips to the inner side of the cover. The sheet-steel spare parts case contains the 5-foot connecting Cable Assembly, in addition to a complement of spare parts. The directional coupler is separately supplied with the equipment.

MANUFACTURER'S OR CONTRACTOR'S DATA

Maguire Industries Inc., Electronics Division, Greenwich, Conn.

Contract NXsr-51561, dated 13 March 1944.

REFERENCE DATA AND LITERATURE

SHIPS 310-A: Instruction Book for Echo Box Radar Test Equipment Models OBU-1, OBU-2.

TYPE	(USAF):	OBU-1
CLASSIFICATION:	(NAVY): Sub. Standard	
	(ARMY): Not Classified	
STOCK NO.:	(USAF):	
	(NAVY):	
	(ARMY):	
DESIGN COGNIZANCE:	Navy, BUSHIPS	
PROCUREMENT INFO.:		
PROCUREMENT COG.:	Navy	
RDB IDENT. NO.:	2.2.2.1	
F. I. I. N.:		

TYPE	(USAF):	OBU-2
CLASSIFICATION:	(NAVY): Sub. Standard	
	(ARMY):	
STOCK NO.:	(USAF):	
	(NAVY):	
	(ARMY):	
DESIGN COGNIZANCE:	Navy, BUSHIPS	
PROCUREMENT INFO.:		
PROCUREMENT COG.:	Navy	
RDB IDENT. NO.:	2.2.2.1	
F. I. I. N.:		

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Frequency Measuring Equipment

OBU-1, OBU-2

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box Radar Test Equipment Model OBU-1 or	4.95				71.0
1	Echo Box Radar Test Equipment Model OBU-2	4.95	28	18	17	75.0

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Set Assembly (in case with cover and shock-mounted strap)	-	10-11/16	14-5/8	12-7/8	17.75
1	Test Dipole Antenna Assembly 66AHV, with Cable	-	2-1/2 x 43	1g		.80
1	Connecting Cable Assembly W-102	-	3/4 x 60	1g		.75
1	Directional Coupler, 47AAL*	-	9-1/8	5-1/2	5-1/2	4.80
1	Directional Coupler, 47AAM**	-	12	6-1/2	6	8.75
1	Maintenance Repair Parts Case	-	13-3/16	7-3/8	6-1/2	10.88
2	Instruction Books SHIPS 310-A	-				
			OBU-1: TOTAL LESS MAINTENANCE REPAIR PARTS			24.10
			TOTAL			34.98
			OBU-2: TOTAL LESS MAINTENANCE REPAIR PARTS			28.05
			TOTAL			38.93

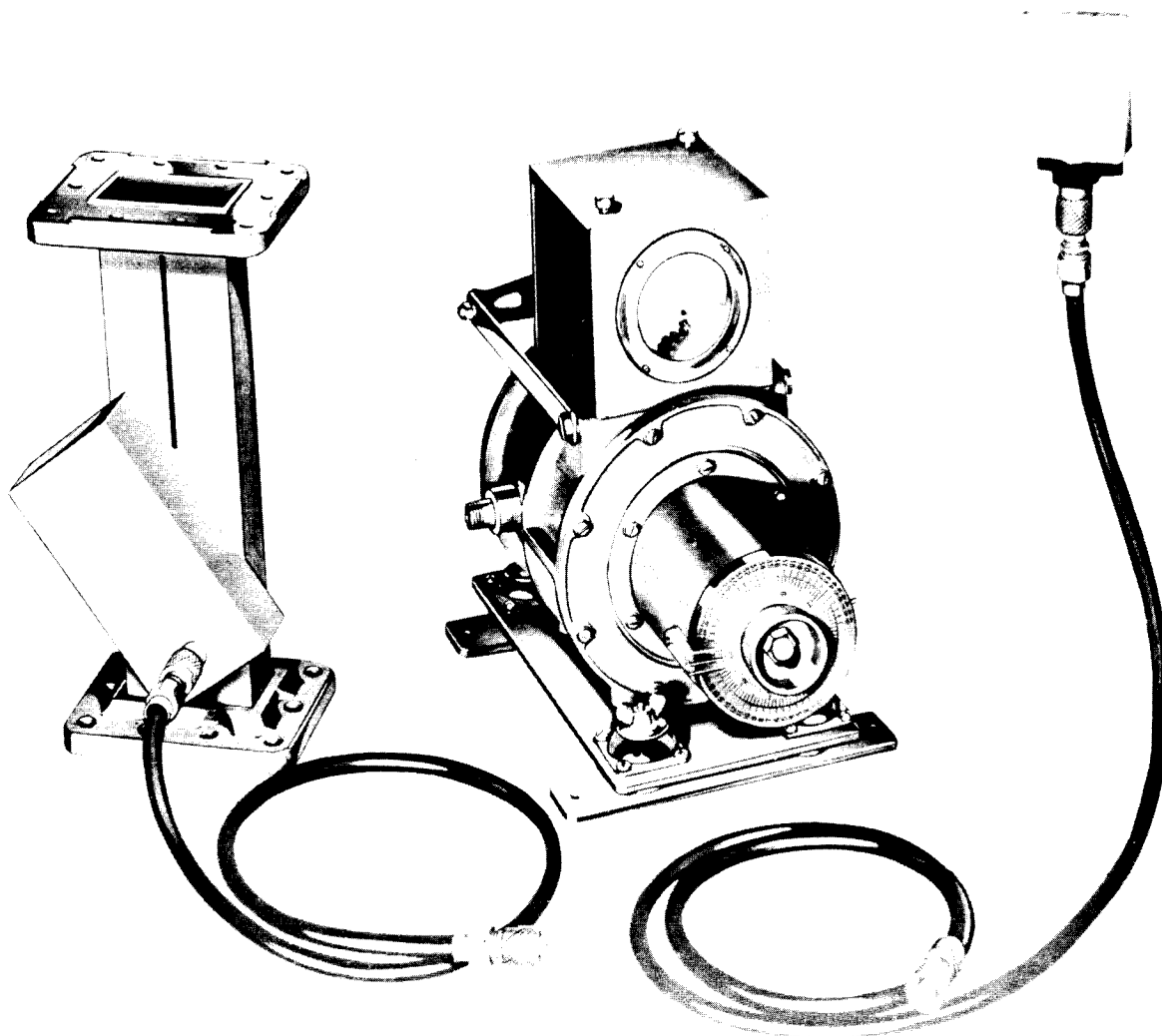
*OBU-1.
**OBU-2.

UNCLASSIFIED

Frequency Measuring Equipment

**RADAR ECHO BOX TEST SETS
NAVY MODELS OBU-3, OBU-4**

OBU-3, OBU-4



Radar Echo Box Test Set OBU-3.

FUNCTIONAL DESCRIPTION

Models OBU-3 and OBU-4 are portable echo box test sets consisting mainly of a tunable ringing cavity of high Q. They are intended for the testing and adjustment of radars operating at frequencies from 2900 to 3100 mc. They are designed for frequency and relative power measurements as well as rough spectrum analysis. Coupling to the radar system can be made constant through the use of a directional coupler or of a pick-up dipole antenna.

RELATION TO OTHER EQUIPMENT

Radar Echo Box Test Sets Models OBU-3 and OBU-4, and Radar Test Equipments Models OBU-1 and OBU-2 have similar functions and performance characteristics. The different types of Directional Couplers which are supplied with each individual Model, makes them adaptable to different types of Radar and wave guides, as shown in the table on the following page.

OBU-3	
TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-Q-207565-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.:	

OBU-4	
TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-Q-207585-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	2 2 2 2
F. I. I. N.:	

UNCLASSIFIED

OBU-3, OBU-4

MODEL	ECHO BOX NAVY TYPE	WAVEGUIDE COUPLER TYPE	WAVEGUIDE SIZE (inches)	ANTENNA TYPE	RADAR TYPE TO WHICH ADAPTED
OBU-1	14AAY	47AAL(20db)	2-3/4 x 3/8	66AHV	SG-1, SG-A, SL, SL-1
OBU-2	14AAY	47AAM(2/db)	1-1/2 x 3	66AHV	SL-A, SJ
OBU-3	14ABA-1	47AAN(27db)	1-1/2 x 3	66AJG	SF, SF-1, SO, SO-1, 3, 8, 9, 13, a, b, SG-a, SG-1, SL, SL-a, SL-1, SJ-1
OBU-4	14ABA-1	47AAP(18db) tapered	3/8 x 2-3/4 1-1/2 x 3	66AJG	

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—2900 to 3100 mc (Ss band).

SENSITIVITY.—90 yards per db.

TEMPERATURE RANGE.— -40°C (+13.7% change in ring time); +60C (-6.7% change in ring time).

LOADED Q.—47,000 approx.

PRESENTATION AND CONTROLS.—The cast metal tunable cavity is provided with a tuning mechanism actuated by a knob and associated with two geared disc dials. Gears are so arranged that the outer dial travels the amount of one of its divisions while the inner dial makes one revolution (10 major divisions or 100 minor divisions). A chart is provided for conversion of dial markings to megacycles. For power measurements, the echo box is provided with an adjustable coupled loop, a rectifier and a meter. The meter gives in microamperes the average rectified current from which relative power may be computed.

FITTINGS AND ACCESSORIES.—One N Type (49795) female coaxial receptacle is provided on the side of the echo box. It is matched by the N Type UG-21/U plug which terminates both the 3 foot long coaxial cable used for connection to the directional coupler,

and the 5 foot long coaxial cable used for connection to the pick-up dipole. Within the box which contains the meter, a combination plug-socket is provided to house the crystal rectifier in use. Three spare crystals are also housed in a special compartment inside the meter box. Directional Coupler Model 47AAN supplied with Model OBU-3 is a rectangular brass tubing (3 in. x 1-1/2 in. x 12 in.) which has a 27 db attenuation factor.

Directional Coupler Model 47AAP supplied with Model OBU-4 is a tapered guide section for use as replacement for tapered sections found on the front of certain transmitters. The attenuation factor is 20 db.

The Antenna pick-up dipole Model 66AJG is provided with an N Type female connector matching the end connection on the antenna cable. It is intended for installation near the Radar Antenna Reflector, with the help of special brackets depending on the type of Radar to be tested. These brackets are obtained separately.

CONSTRUCTION.—The Echo Box is made of cast metal, and is installed on a Shock Mounting with the help of a Wing nut assembly. One carrying handle is attached to the Echo Box and one carrying strap is also supplied among the accessories.

MANUFACTURER'S OR CONTRACTOR'S DATA

Johnson Service Company, Milwaukee, Wisconsin

OBU-3:

Contract NXsr-65336, dated 15 June 1944.

OBU-4:

Contract NXsr-83396, dated 26 November 1944.

REFERENCE DATA AND LITERATURE

SHIPS 308-B, Instruction Book for Model OBU-3 Echo Box Test Set.

SHIPS 345-(A), Instruction Book for Echo Box Test Set Navy Model OBU-4.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Model OBU-4 Radar Echo Box Test Set	2.53	24-3/4	16-1/4	14-1/2	77
1	Model OBU-3 Radar Echo Box Test Set	2.53	24-3/4	16-1/4	14-1/2	80

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Set Assembly CRVV-14ABA-1	-	10-3/4	7-5/8	11-1/4	18.5
1	Shock Mounting	-	10	8	2-1/8	6
1	Connecting Cable, W-101	-		60 lg		0.75
1	Connecting Cable, W-102	-		36 lg		0.75

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Frequency Measuring Equipment

OBU-3, OBU-4

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Directional Coupler (OBU-3) 47AAN	- N16-RC-22732 2Z4885-15	12	6-1/4	5-1/4	8.75
1	Directional Coupler (OBU-4) 47AAP	- -	8-1/16	6-1/4	4-3/4	5.75
1	Pickup Dipole, 66-AJG	- F16-A-45217-1051				
1	Accessory Box	- -	10-1/2	11-1/4	3-1/8	9.25
1	MR parts Case	- -	7-1/2	8-1/2	3	7.(full)
2	Instruction Books	- -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Combination and Group Test Set

SONAR PORTABLE TESTING EQUIPMENT NAVY MODEL OCP SERIES

OCP SERIES

FUNCTIONAL DESCRIPTION

Navy Model OCP Series is a portable underwater sound test equipment designed to generate and receive ultrasonic signal energy at frequencies between 7 and 70 kc.

Signals of known frequency can be generated which have a fairly constant strength throughout the band. Relative power measurement can be made of signals radiated by ships' sonar equipment. These signals can be converted into sound through a loudspeaker. By beat frequency operation, the air frequency can also be measured.

With its hydrophone, the equipment can be used for underwater test of various sonar equipments.

RELATION TO OTHER EQUIPMENT

Sonar Portable Test Equipments Navy Model X-OCP, Navy Model OCP-1, Navy Model OCP-2, and Navy Model OCP-3 are similar in design. These Models supersede Navy Model OAX Series. Navy Model OCP-2 supersedes Navy Model OCP-1, these being identical except for slightly different front panel markings. Navy Model OCP-3 is identical to Navy Model OCP-2 but is supplied without the spare parts box. Navy Model OAX Series covers the frequency range from 17 kc to 26 kc only.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—100 to 130 v ac, 60 cps, 60 w.

FREQUENCY RANGE.—7 to 70 kc, nominal, (5 to 88 kc in 4 steps).

FREQUENCY STABILITY.—+2% of dial markings, between 0°C and 50°C.

OUTPUT IMPEDANCE.—50 ohms.

OUTPUT POWER.—0.54 w max to speaker, 1 w max to transducer.

TRANSDUCER INPUT IMPEDANCE.—50 ohms at 30 kc.

POWER INPUT.—5 w max.

PRESENTATION AND CONTROLS.—All controls and terminals are located on the front panel. A frequency band switch (4 bands) and a frequency dial are used to tune the internal oscillator at the desired frequency.

A selector switch determines the following 4 functions of the oscillator amplifier: Receive (high sensitivity); Receive (normal); Beat (the oscillator beating against the received signal); Send.

The attenuator dial and slip ring give settings of receiver input or transmitter output attenuators. A ZERO SET knob is used to adjust transmitting level to zero db as read on the output meter.

The output meter is the signal reference level indicator. A loudspeaker permits aural monitoring and zero beat calibrating.

An ac power receptacle, "ON-OFF" switch, fuse holder, and pilot light are provided.

The panel hydrophone receptacle is the input-output, 3 contact connector, to which is linked the submerged transducer.

FITTINGS AND ACCESSORIES.—The equipment is self-contained, except for a weight (25 to 50 lb), and a secure line (50 feet or more) needed to hold the transducer assembly submerged at convenient depth.

The front panel hydrophone receptacle is an AN-3102-16S-5S type connector, to which is connected the end plug (AN-3106-16S-5P) of the 60-foot transducer cable permanently attached to the transducer. For greater depths, use can be made of the 75-foot extension cable terminated by plug AN-3106-16S-5P, and jack AN-3101-16S-5S.

One end of the ac power cable mates the male ac receptacle on the front panel. The other end is fitted with a Harvey Hubbell plug.

An 8-inch adaptor cable provides one alternative GE plug termination for the power cable.

CONSTRUCTION.—The oscillator amplifier is enclosed in a metal cabinet with carrying handle and panel guards. The carrying case is in the form of a deep box lid which fits on top of the instrument case by means of clasps, and accommodates the transducer as well as other accessories and cables.

MANUFACTURER'S OR CONTRACTOR'S DATA

OCP-1:

David Bogen Company, New York, N.Y.
Contract N5sr-760, dated 16 April 1945.

OCP-2:

Chatham Electronics Co., Newark, N.J.
Contract NObsr-49111, dated 15 May 1950.

OCP-3:

David Bogen Co., New York, N.Y.
Contract NObsr-52512.

OCP-1

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-Q-211943-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F.I.I.N.	

OCP-2

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-Q-211942-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F.I.I.N.	

OCP-3

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F.I.I.N.	

UNCLASSIFIED

4.10 OCP: 1

CATALOG OF NAVY MATERIAL

Combination and Group Test Set

UNCLASSIFIED

OCP SERIES

TUBE COMPLEMENT

OCP-1
 (1) 5Y3-GT (1) 6SN7-GT (1) 6H6
 (1) 6V6-GT/G (5) 6SJ7 (1) VR-150

OCP-2
 (1) 5Y3-GT (1) 6SN7-GT (1) 6H6
 (1) 6V6-GT/G (5) 6SJ7 (1) VR-150

OCP-3
 (1) 5Y3-GT (1) 6SN7-GT (1) 6H6
 (1) 6V6-GT/G (5) 6SJ7 (1) VR-150

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,811: Instruction Book, Sonar Portable Testing Equipment Navy Model OCP-1.
 MANUSCRIPT: Sonar Portable Testing Equipment Navy Model OCP-3.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
	OCP-1					
1	Sonar Portable Testing Equipment Navy Model OCP-1	5.23	15	21.5	28	105.0
1	Spare Parts Box	2.89	13	24	16	92.0
	OCP-2					
1	Sonar Portable Testing Equipment Navy Model OCP-2	5.23	15	21.5	28	105.0
1	Spare Parts Box	2.89	13	24	16	92.0
	OCP-3					
1	Sonar Portable Testing Equipment Navy Model OCP-3	5.23	15	21.5	28	105.0

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	OCP-1					
1	Transducer NT-51112 (with cable attached)	F16-H-99162-7769	11-9/16	1-5/8 dia		5.5
1	Oscillator Amplifier NT-50283	F16-R-32711-5801	9-3/4	15	12	37.5
1	Extension Cable W-201	-	75 ft lg			
1	Power Cable W-101	-	25 lg			
1	Power Cable Adaptor W-102	-	8-1/2 lg			
1	Carrying Case NT-10590	N16-C-170001-192	9-3/4	15	20-3/8	13.0
2	Instruction Book NAVSHIPS 900,811	-				
1	Maintenance Repair Parts	-	9-1/2	18-1/2	12-1/2	65.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			56.0
					TOTAL	121.0
	OCP-2					
1	Transducer NT-51112 (with cable attached)	F16-H-99162-7769	11-9/16 x	1-5/8 dia		5.5
1	Oscillator Amplifier NT-50283	F16-R-32711-5801	9-3/4	15	12	37.5

BUREAU OF SHIPS SECTION— Part III

UNCLASSIFIED

Combination and Group Test Set

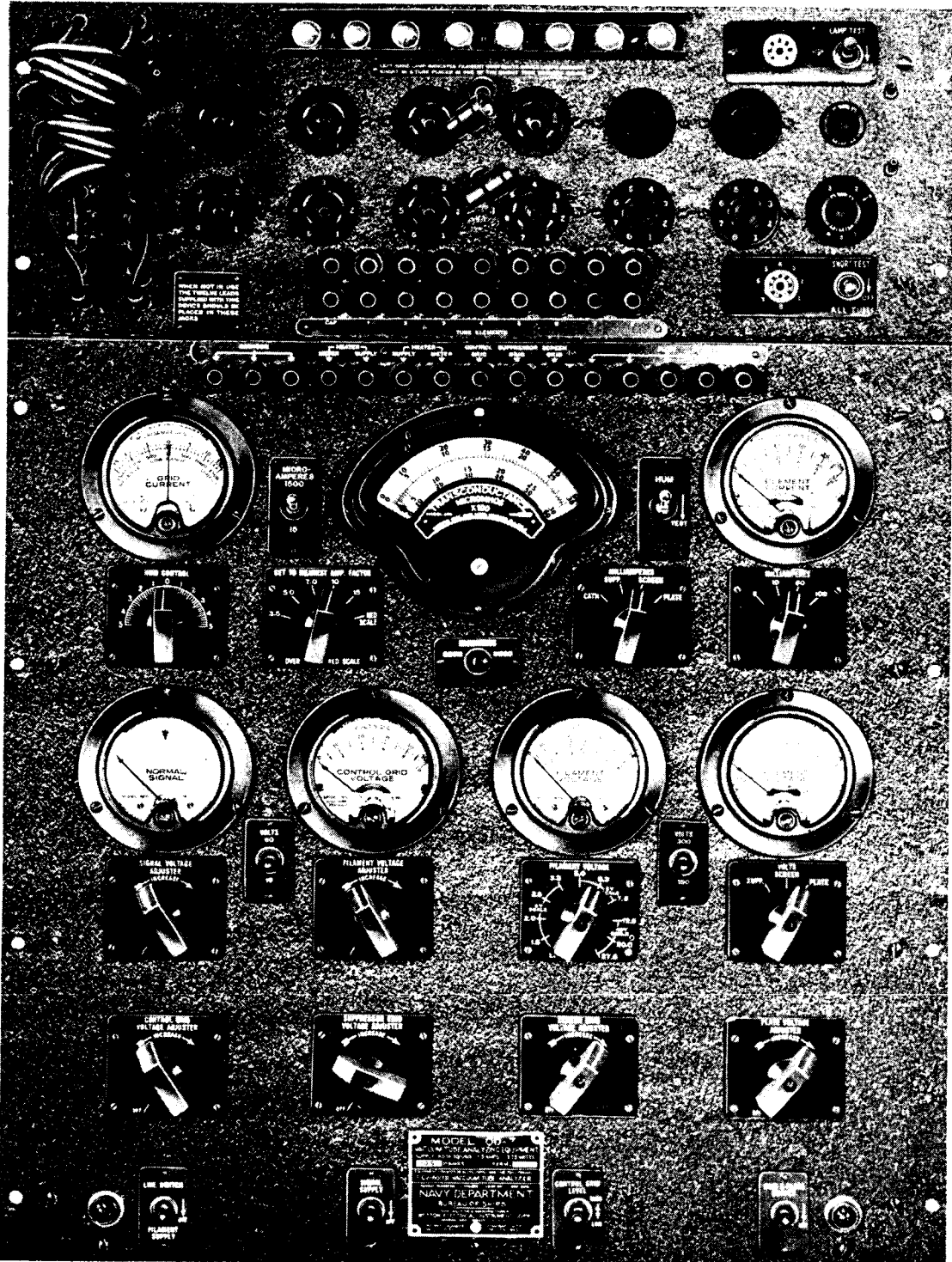
OCP SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (Inches)			WEIGHT (Lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Extension Cable W-201	-	75 ft lg			
1	Power Cable W-101	-	25 in. lg			
1	Power Cable Adaptor W-102	-	8-1/2 in. lg			
1	Carrying Case NT-10590	N16-C-170001-192	9-3/4	15	20-3/8	13.0
2	Instruction Book	-				
1	Maintenance Repair Parts	-	9-1/2	18-1/2	12-1/2	65.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			56.0
			TOTAL			121.0
	OCP-3					
1	Transducer NT-51112 (with cable attached)	F16-H-99162-7769	11-9/16 x	1-5/8 dia		5.5
1	Oscillator Amplifier NT-50283-B	-	9-3/4	15	12	37.5
1	Extension Cable W-201	-	75 ft lg			
1	Power Cable W-101	-	25 in. lg			
1	Power Cable Adaptor W-102	-	8-1/2 in. lg			
1	Carrying Case NT-10590	N16-C-170001-192	9-3/4	15	20-3/8	13.0
2	Instruction Book	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			56.0
			TOTAL			

UNCLASSIFIED

VACUUM TUBE ANALYZING EQUIPMENT

OD-7



Vacuum Tube Analyzing Equipment Model OD-7.

OD-7

FUNCTIONAL DESCRIPTION

This equipment is designed to measure the dynamic transconductance of electron tubes in micromhos. The measurement is accomplished by applying a 60 cycle signal of known voltage to the grid of the tube under test and measuring the alternating current component of the plate current on a meter calibrated in micromhos. Tests for opens and shorts in the tube elements may also be made. A set of patch cords is used to make connections between the socket pins and the element potential source to provide flexibility and maximum protection against obsolescence.

RELATION TO OTHER EQUIPMENT

All models of the OD Series are similar except the OD to OD-4 do not provide for testing miniature, loctal or acorn tubes. It is also similar to Weston model 686, type 9A which does not provide separate sockets for short tests, has a higher transconductance range, and a wider selection of filament voltages. This equipment is superseded by Electron Tube Test Set AN/USM-31.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—110 to 115 v, 50 to 60 cps, 1.5 amp.
TUBE SOCKETS PROVIDED.—4, 5, 6, 7S, 7L, Octal, Loctal, and Acorn.

ACCURACY.—

Indicating Instruments: ±2%.
 Possible Accumulative Error: ±6 to 8%.

RANGES.—

Transconductance: 0 to 6000 micromhos.
 Filament Volts: 1.1 to 27.5 v ac.
 Grid Current: 0 to 1500 ma.
 Element Current: 0 to 100 ma.
 Element Voltage: 0 to 300 v dc.
 Control Grid Voltage: 0 to 50 v dc.

PRESENTATION AND CONTROLS.—The dynamic transconductance is presented directly on the main meter, and plate, screen grid, control grid, and heater voltages are presented simultaneously on separate meters. Grid current and any one of plate, screen, suppressor, or cathode currents are also available on

two separate meters. The elements of the electron tube to be tested are connected to the power supply by means of a free point patch cord system. Banana jacks are provided so that there is a separate patch cord used for each tube connection—thus all possible tube pin arrangements are provided for.

FITTINGS AND ACCESSORIES.—There are 12 patch cords provided which are fitted with banana plugs on each end.

CONSTRUCTION.—The unit is housed in a heavy steel case. The tube testing panel consists of two sections, the upper section of which contains the tube sockets, and the lower section of which contains all the meters and controls.

MOUNTING DATA.—An angle iron leg at each side of the bottom of the case is arranged so that the unit may be bolted to a table.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corp, Newark, N.J.
 Contract NXsr-41025, dated 22 November 1943.

TUBE COMPLEMENT

(1) 5U4
 Total Tubes: (1).

REFERENCE DATA AND LITERATURE

NAVSHIPS 95174: Instructions for Model OD-7 Vacuum Tube Analyzing Equipment.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-189243-100
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	1.2.1
F. I. I. N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Vacuum Tube Analyzing Equipment					

EQUIPMENT SUPPLIED

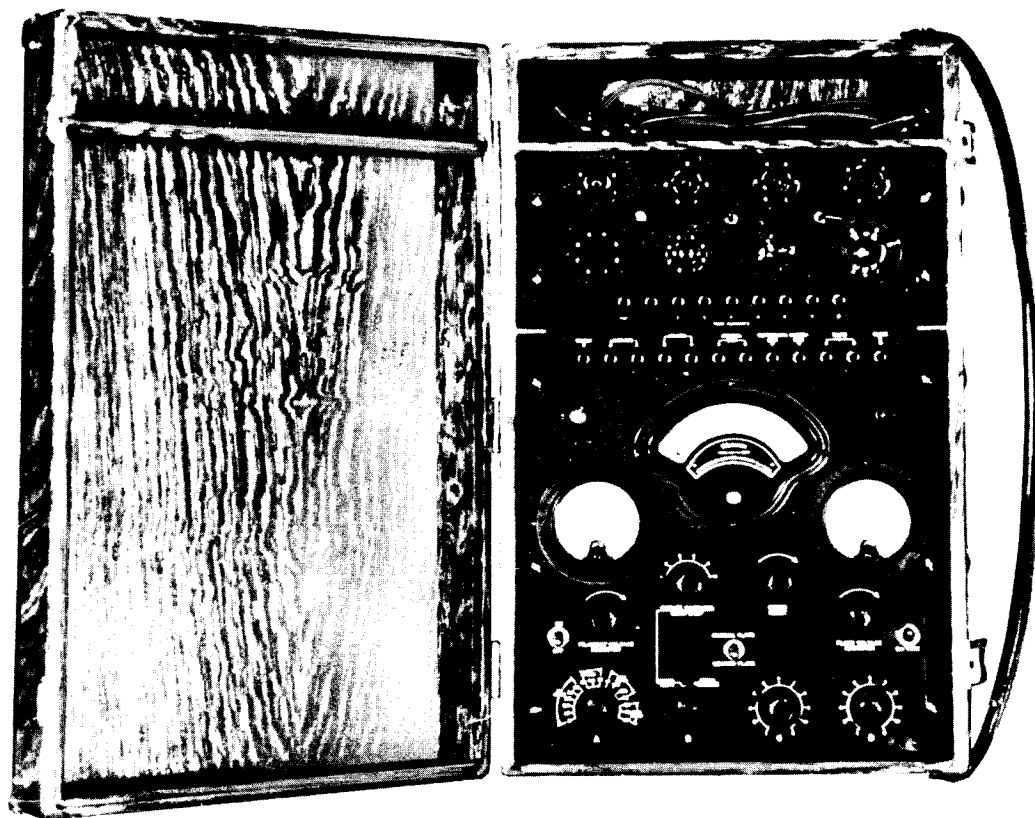
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Vacuum Tube Analyzing Equipment OD-7	F16-Q-189243-100	26-1/4	19-3/4	8-3/4	105
12	Patch Cords	-				
3	Spare Fuses	-				
4	Spare Neon Lamps	-				

UNCLASSIFIED

Voltage and Current Measuring Equipment

NAVY MODEL OQ SERIES VACUUM-TUBE TESTING EQUIPMENT

OQ SERIES



Navy Model OQ Series Vacuum-Tube Testing Equipment.

FUNCTIONAL DESCRIPTION

These equipments were designed to measure proportional transconductance above or below the normal listed value as specified by the various tube manufacturers. It will also test electron tubes for emission and interelectrode shorts.

RELATION TO OTHER EQUIPMENT

All models of the Navy Model OQ Series Vacuum Tube Testing Equipment are similar. The model OQ Vacuum Tube Testing Equipment does not have a 7-pin miniature socket.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 60 cps, 35 w.

HEATER VOLTAGE RANGE.—1 to 120 v.

ACCURACY.—

Indicating Instruments: $\pm 2\%$.

Overall: +6 to 8%.

PRESENTATION AND CONTROLS.—The percentage of rated transconductance, the element voltage and the

heater voltage are indicated on separate meter movements. Various knobs are used to adjust heater voltage and the voltage on other elements and to select ranges and functions, such as transconductance and short test.

The elements of the electron tube to be tested are connected to the power supply by means of a free point patch cord system there being a separate cord inserted for each tube connection. Banana jacks are provided for connection with patch cords. All possible tube pin arrangements can be accommodated for the sockets supplied.

FITTING AND ACCESSORIES.—There are 12 patch cords supplied for connecting the tube elements to the power and measuring sections of the unit. They are fitted with banana plugs on each end.

CONSTRUCTION.—The unit is housed in a heavy quartered oak case supplied with a full length carrying strap. The tube testing panel consists of two sections. The lower section contains all of the instruments and controls, and the upper section contains the tube sockets.

UNCLASSIFIED

4.1 OQ: 1

CATALOG OF NAVY MATERIAL

Voltage and Current Measuring Equipment

UNCLASSIFIED

OQ SERIES

The tube roller chart is mounted in a separate section at the bottom of the case.

For testing various types of tubes, the following sockets and leads are available on the instrument panel:

- 4 prong socket.
- 5 prong socket.
- 6 prong socket.
- 7 prong socket.
- 8 prong Octal socket.
- 8 prong Loctal socket.
- 215 A socket.
- Acorn socket.
- Ring for 215 A.
- Ring for acorn.
- Control grid lead.
- Plate lead for acorn.

The filament voltages available with the Heater Volts selector are:

- 4 Volts Scale: 0 Volt, 1.1, 1.5, 2.0, 2.5, 3.3, 4.0 volts.
- 8 Volts Scale: 5.0, 6.3, 7.5, volts.
- 40 Volts Scale: 10, 12.5, 27.5, 35 volts.
- 120 Volts Scale: 50, 70, 90, 120 volts.

The plate and screen voltages are adjustable between 35 and 130 v. The mutual conductance range extends from 0 to 130% of manufacturer's means rating.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corp., Newark, N.J.
 Contract NOs-87567, dated 23 June 1941 (OQ).
 Contract NOs-87567, dated 23 March 1942 (OQ-1).
 Contract NXss/a-13581, dated 30 September 1942 (OQ-2).
 Contract NXsr-33795 (OQ-3).

TUBE COMPLEMENT

(1) 71A

REFERENCE DATA AND LITERATURE

NAVSHIPS 95186: Vacuum Tube Testing Equipment (OQ).
 NAVSHIPS 95188: Vacuum Tube Testing Equipment (OQ-1).
 NAVSHIPS 95189: Vacuum Tube Testing Equipment (OQ-2).
 NAVSHIPS 95190: Vacuum Tube Testing Equipment (OQ-3).

OQ	
TYPE (USAF):	
CLASSIFICATION: (NAVY):	Obsolete
(ARMY):	
STOCK NO.: (USAF):	
(NAVY):	F16-Q-191701-200
(ARMY):	
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec RE 13A955, RE 9423
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	1.2.1
F.I.I.N.	

OQ-1, 2	
TYPE (USAF):	
CLASSIFICATION: (NAVY):	Sub. Standard
(ARMY):	
STOCK NO.: (USAF):	
(NAVY):	F16-Q-191721-200; F16-Q-191702-200
(ARMY):	
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec RE 13A955, RE 9423
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	1.2.1
F.I.I.N.	

OQ-3	
TYPE (USAF):	
CLASSIFICATION: (NAVY):	Standard
(ARMY):	
STOCK NO.: (USAF):	
(NAVY):	F16-Q-191780-200
(ARMY):	3F4319
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec RE 13A955, RE 9423
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	1.2.1
F.I.I.N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Vacuum Tube Tester Model OQ, OQ-1, OQ-2 or OQ-3	5.2				52

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Voltage and Current Measuring Equipment

OQ SERIES

EQUIPMENT SUPPLIED

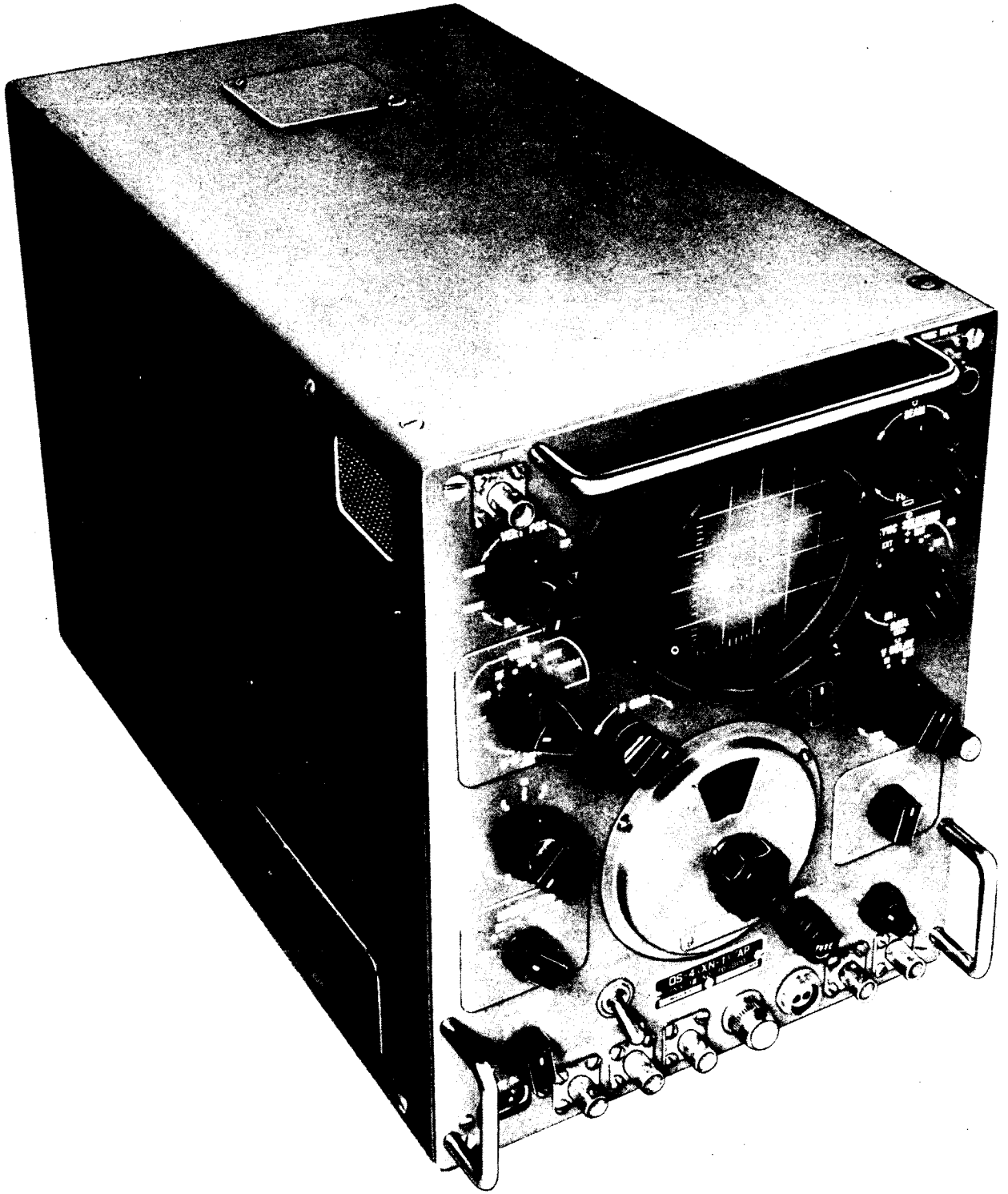
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Model OQ Vacuum Tube Tester	F16-T-21415-3036	8	13	23-3/4	35
12	Patch Cords	3E8000-10.2	12 1g			
2	Spare Fuses					
2	Instruction Books					
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Waveform Measuring Equipment

OSCILLOSCOPE OS-4(XN-1)/AP

OS-4(XN-1)/AP



Oscilloscope OS-4(XN-1)/AP.

UNCLASSIFIED

OS-4(XN-1)/AP

FUNCTIONAL DESCRIPTION

The Oscilloscope OS-4(XN-1)/AP is primarily intended for auxiliary radar ranging and testing of all types of electronic equipment in the radar and communication fields. It is sometimes known as an "A and R Scope" which was originally designed for AEW (aircraft early warning) applications. It may be used as a general purpose synchroscope or oscilloscope. It will show shapes of pulses, triggers and video signals. It may be used to measure accurately pulse length, rise time, decay time, and to display wave shapes having a wide variety of characteristics.

RELATION TO OTHER EQUIPMENT

This equipment is a miniaturized version of, and supersedes Oscilloscope OS-5/U. It has similar characteristics and is equivalent in performance except that it has a 3-inch cathode-ray tube in place of a 5-inch tube.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac $\pm 10\%$, 50 to 1000 cps, 150 w.
VIDEO AMPLIFIER.—

- Sensitivity Max: 0.5 v peak-to-peak per in.
- Attenuator Probe: 5 v peak-to-peak per in.
- Low C Probe: 0.75 v peak-to-peak per in.
- Direct: 50 v peak-to-peak per in.
- Response, Sine Wave: 1.5 cps to 11 mc, 0 to -6 db.
- Response, Thru Low C Probe: 10 cps to 7 mc, 0 to -6 db.
- Response, Thru Crystal Diode Probe: 10 cps to 15 kc, 0 to -6 db, 10 to 200 mc carrier.
- Pulse Rise and Fall Time: .07 μ sec.
- Droop of 1200 μ sec Square Wave: 1%.
- Impedance, Input: 1 meg shunted by 25 μ mf.
- Impedance, Attenuator Probe Input: 1 meg shunted by 9 μ mf.
- Impedance, Low C Probe Input: 1 meg shunted by 8 μ mf.
- Impedance, Crystal Probe Input: 24k shunted by 8 μ mf.
- Impedance, Direct Input: 2.2 meg shunted by 20 μ mf.
- Impedance, Z Axis to Cathode Input: 47k shunted by 33 μ mf.

SWEEP RANGES.—

- A, Sweep: 1.2 to 12,000 μ sec, 200 to 2,000,000 yd.
- R, Sweep: 2.4 to 24 μ sec, 400 to 4000 yd.
- R, Delay: 3 to 10,000 μ sec.
- R, Pedestal: 2.4 to 24 μ sec.
- Rep Rate, Internal: 40 to 3300 pps.
- Rep Rate, External: Up to 6000 pps.
- S, Sweep: Up to 820k pps.

RANGE MARKERS.—10 μ sec or 50 μ sec, 2000 or 10,000 yd.

Polarity: Positive or negative, amplitude presentation.
 Accuracy, Timing: $\pm .02\%$.

EXTERNAL TRIGGERING PULSE.— ± 15 v min.

Rise Time: 10 v per μ sec.
 At Video Input Jack: 0.15 v peak-to-peak square wave;
 0.3 v peak-to-peak sine wave.

S, SWEEP.—

Square Waves: 1.1 v peak-to-peak.
 Sine Waves: 2 v peak-to-peak.

SYNC INPUT IMPEDANCE.—

A and R, Sweep: 330k shunted by 15 μ mf.
 -A +R, Sweep: 330k shunted by 19 μ mf.
 +S, Sweep: 1 meg shunted by 17 μ mf.

TRIGGER MARKER OUTPUTS A AND R.— ± 55 v peak.

Rise Time: 0.2 μ sec.
 Impedance, Source: 70 ohms.

AMBIENT TEMPERATURE.— -40 to +55°C.

PRESENTATION AND CONTROLS.—The following terminals and controls are located on the front panel:

Controls	Function	Description
Vert Pos	Beam Positioning	Concentric Knobs
Hor Pos	Beam Positioning	Concentric Knobs
Coarse Yd	Selects Time Base Range	Concentric Knobs
Fine Sweep Time	Adj Sweep Time	Concentric Knobs
SAR	Sel. S, A, or R Swp	Concentric Knobs
R Sweep Time	Adj. "R" Swp	Concentric Knobs
Intensity	Adj. Beam Intensity	Concentric Knobs
Focus	Adj. Beam Focus	Concentric Knobs
Sync Selector	Selects Sync Means	Concentric Knobs
Int Trig Rate	Adj. Int Trig Rate	Concentric Knobs
V Delay	Selects Video Delay In or Out	Concentric Knobs
Sensitivity, S Sweep	Sets "A" Gate Bias for Max Sens.	Concentric Knobs
Marker Yd	Selects Marker Rate and Polarity	Single Knob
H Gain	Varies Horiz Length of Trace	Single Knob
Sync S Sweep	Sel. Amount and Polarity of S Sync	Single Knob
V Gain	Adj. Gain of Vert Amp	Single Knob
AR Trigger Polarity	Selects A & R Trig Polarity	Single Knob
Power	Power Line On-Off	Toggle Switch
Terminals	Purpose	Description
Intensity	For Intens Mod Z Axis	BNC Coax Recept
Sync Input	For Ext Sync Signals	BNC Coax Recept
Power	Input Line Power	Rect 2 Pin Recept Male
Marker A Trig	Connector "A" Trig for External Use	BNC Coax Recept
R Trig	Output for Triggering External Circuits	BNC Coax Recept
Heater	Indicates Power On	Pilot Light
Probe	Provides B+ and Heater to Probe	2 Pin Amphenol Recept

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Not Classified
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUAE
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	3.2
F.I.I.N.:	

UNCLASSIFIED

Waveform Measuring Equipment

OS-4(XN-1)/AP

<u>Terminals</u>	<u>Purpose</u>	<u>Description</u>
Cal Volt	Calibrating Voltage for External Use	BNC Coax Recept
V Input	Vertical Input Connection	BNC Coax Recept
Fuse, 3 Amp	Power Protection	Thumb Cap

FITTINGS AND ACCESSORIES.—The following cables are supplied with this equipment:

<u>Description</u>	<u>Equipment End</u>	<u>Ext. End</u>
Cable		
Low Capacitance Probe Cable	BNC (Male) Amphenol (2 pin)	Pin Probe and Gnd Clip
Attenuator Probe (10:1)	BNC (Female)	Pin Probe and Gnd Clip
Crystal Probe (10-200 mc)	BNC (Female)	Pin Probe and Gnd Clip
Adaptor Cable for Crystal or Atten Probe	BNC (Male)	BNC (Male)
(2) Video Cables (8 ft. long)	BNC (Male)	BNC (Male)

The following adaptors are supplied with this equipment:

- (2) UG-273/U UHF-Fem to BNC-Male
- (2) UG-146/U UHF-Male to N-Fem
- (2) UG-83/U UHF-Fem to N-Male
- (2) UG-201/U N-Fem to BNC-Male
- (2) UG-255/U UHF-Male to BNC-Fem.

MANUFACTURER'S OR CONTRACTOR'S DATA

Waterman Products Co. Inc., 2445-63 Emerald St., Philadelphia 25, Pa.

TUBE COMPLEMENT

(1) 6AS6	(10) 12AU7	(1) 6AH6
* (1) 3KP1	(2) 5704	(2) 6AN5
* (1) 3SP1	(1) 6AK5	(1) 1V2
(2) 12AT7	(1) 5744	(1) 6AB4
* Either as required.		(1) 6AL5

REFERENCE DATA AND LITERATURE

Preliminary Handbook of Operating and Maintenance Instructions for Oscilloscope OS-4(XN-1)/AP.

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope	-	9-1/8	17-1/4	11-1/4	33.5
1	Low Capacity Probe	-	4 1/2			7/16
1	Attenuator Probe	-	4-9/16	1 1/2 dia		3/16
1	Crystal Probe	-	4-9/16	1 1/2 dia		3/16
1	Cable for Attenuator or Crystal Probe	-	37	1 1/2 x 9/16 dia		3/16
2	Video Cables	-	97	1 1/2 x 9/16 dia		3/8
1	Power Cord	-	73	1 1/2 x 13/16 dia		3/16
2	Adaptor UG-273/U	N17-C-67988-5260 2Z308-273	1-3/8	1 1/2 x 3/4 dia		ea 1/16
2	Adaptor UG-146/U	N17-C-67991-3571 2Z308-146	1-3/8	1 1/2 x 13/16 dia		ea 1/8
2	Adaptor UG-83/U	N17-C-67991-3690 2Z308-83	1-3/4	1 1/2 x 11/16 dia		ea 1/8
2	Adaptor UG-201/U	N17-C-67990-2447 2Z308-201	1-9/16	1 1/2 x 3/4 dia		ea 1/16
2	Adaptor UG-255/U	N17-C-67989-1323 2Z308-255	1-5/16	1 1/2 x 5/8 dia		ea 1/16

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Waveform Measuring Equipment

UNCLASSIFIED

OS-4(XN-1)/AP

EQUIPMENT SUPPLIED

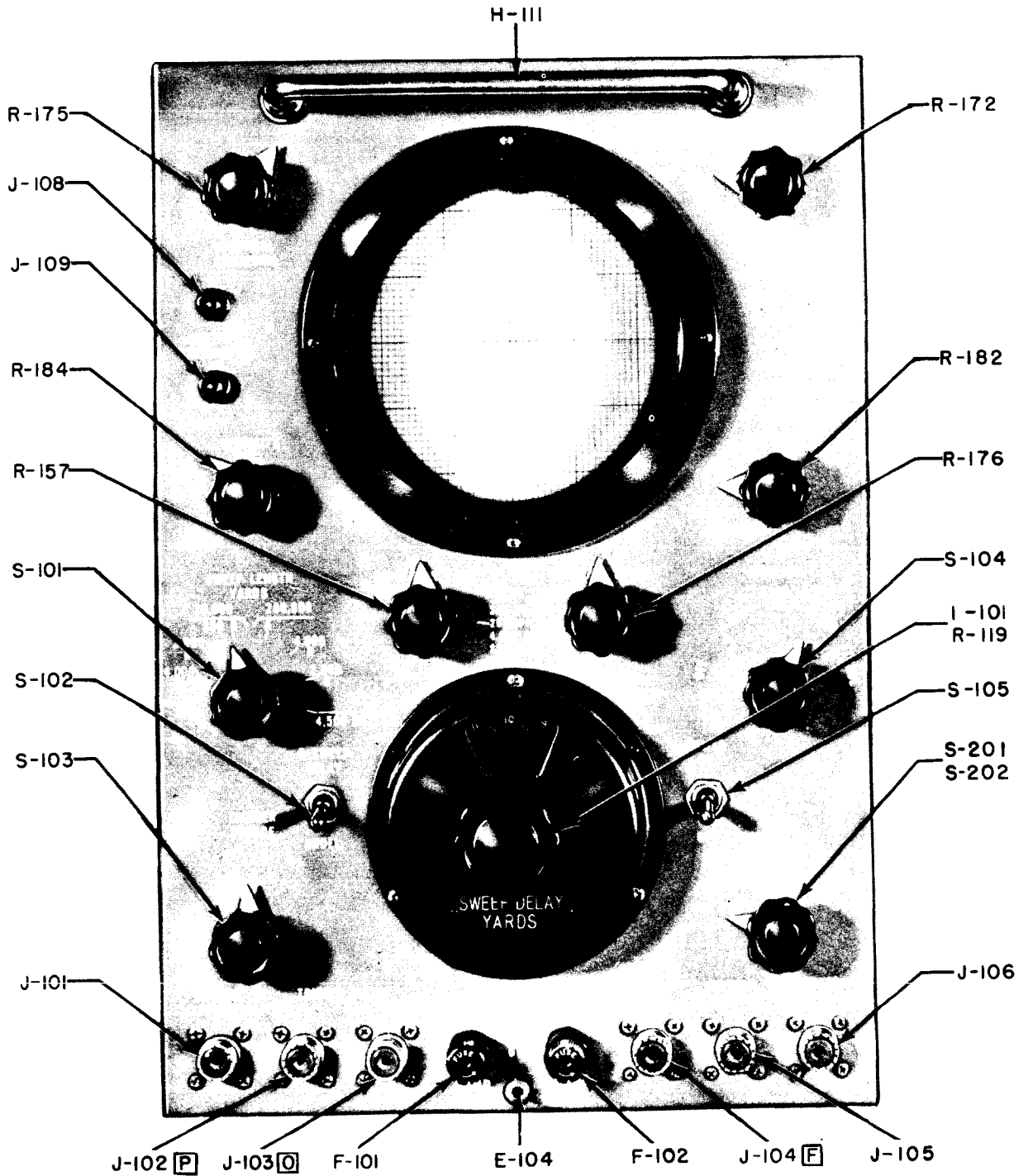
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Conversion Kit	-				
	Including:	-				
	1 Crystal	-	2-5/16	x 1-11/16 dia		3/32
	1 Dial	-	1/32	x 2-1/4 dia		1/64
	1 Dial	-	3-1/8	1/16		1/32
	1 Transit Case	-	12-1/8	22-7/8	14-1/8	
			TOTAL LESS MAINTENANCE REPAIR PARTS			37.5
			TOTAL			

UNCLASSIFIED

Waveform Measuring Equipment

OSCILLOSCOPE OS-5/U

OS-5/U



Oscilloscope OS-5/U.

UNCLASSIFIED

OS-5/U

FUNCTIONAL DESCRIPTION

Oscilloscope OS-5/U is a test synchroscope and auxiliary range unit which can be used as a precision test oscilloscope and range calibrator and can also be used with existing radar systems to increase ranging accuracy, extend range scale, provide accurate crystal controlled markers and provide expanded, delayed or undelayed sweeps. By means of this unit the accuracy in ranging of radar sets may be increased from 2 or 3% as seen on a PPI to 0.1% when using the "R" sweep.

RELATION TO OTHER EQUIPMENT

Oscilloscope OS-5/U was originally designed for use with AEW Systems. It is used on Naval Vessels primarily as a monitor and test oscilloscope for AEW Systems. It is similar to, and supersedes Dumont Model 256B, and is superseded by Oscilloscope OS-4/U, which is miniaturized and has added features.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ±10% ac, 50 to 1600 cps, 270 w.
"A" SWEEP RANGE.—200,000, 20,000, 4000, 2000 and 800 yds; 4500 μsec.
"R" SWEEP.—

Range: 4000, 2000 and 800 yds.
 Accuracy of Sweep Start: ±0.1% of full scale.
 Delay: Any 4000, 2000, or 800 yd portion of the 20,000 yd "A" sweep may be observed except the first 500 yds which may be observed without delay.
 Any 4000 or 2000 yd portion of the 200,000 yd sweep may be observed except the first 1000 yd sweep.

Accuracy: ±0.1% of full scale in the 500 to 20,000 yd and 1000 to 200,000 yd regions.

TRIGGER OUTPUT.—+100 v peak or -100 v peak.

Rise Time: 0.3 μsec.
 Duration: 1 μsec.
 Repetition Rate: 80 to 400 pps on 200,000 yd and 4500 μsec range; 80 to 2000 pps on 20,000 yd range.

EXTERNAL TRIGGER.—+15 v min.

Rise Time: 100 v per μsec.

MARKERS.—

With Internal Trigger Only: 2000 yd and 10,000 yd (first 10,000 yd marker at 8000 yd).

Rise Time: 0.25 μsec.

Duration: 1 μsec.

Accuracy: ±.02%.

Output: 10 to 12 v (low impedance source).

VIDEO AMPLIFIER.—

Attenuator: 1:1, 3:1, 10:1, 30:1, 100:1.

Input Impedance: 1 meg shunted by 20 μmf.

Voltage Gain: 100.

Sine Wave Response: -3 db at 7 mc; -6 db at 10 mc.

Pulse Response, 1 μsec Pulse: Sum of rise and fall time does not exceed .08 μsec.

Deflection Sensitivity: 0.2 v for 3/4 in. deflection.

Polarity: Positive signal deflects upward.

DIRECT DEFLECTION.—79 v per in. ±20%.

Max Signal: +600 v.

STROBE OUTPUT.—Positive "R" gate output, 36 v min.

PRESENTATION AND CONTROLS.—The delay is read directly from a calibrated dial. Markers and sweeps are presented as a cathode ray-tube display. The sweep length is adjusted by a selector switch. Marker spacing and strobe is selected by a panel selector switch. The video attenuator is a panel selector switch. The Repetition Rate knob controls the frequency of the internal trigger. The usual intensity, focus and centering controls are provided plus an Auxiliary Focus control which varies the voltage on the accelerating anode.

FITTINGS AND ACCESSORIES.—The Trigger Input jack, ± Trigger Output jacks, Strobe Output jack, Vertical Direct jack, Marker Output jack, and Video Input jack are Navy Type 49194 female coaxial connector, receptacles of the UHF Connector Series. The Vertical Calibration jacks are pin tip type jacks. No test cables are supplied with the equipment.

CONSTRUCTION.—A metal covered case is provided with dual carrying straps and an accessory front cover. The equipment is bench mounted.

MANUFACTURER'S OR CONTRACTOR'S DATA

Sylvania Elec. Products, Inc., 500 Fifth Ave., New York 18, N.Y.

Contract NObsr-39285, dated 18 June 1947.

Contract NObsr-43091, dated 16 November 1948.

TUBE COMPLEMENT

- (2) 2X2A (1) 6AC7 (1) 807
- (9) 6SN7-GT (1) 5U4-G (1) 6AG7
- (2) 6H6 (1) 5CP1A

REFERENCE DATA AND LITERATURE

NAVSHIPS 91188: Instruction Book for Oscilloscope OS-5/U.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-192555-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec CS-760 & NAVAER EP-295
PROCUREMENT COG.:	
RDB IDENT. NO.:	3.2
F.I.I.N.:	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope OS-5/U	6-9/10	21-1/4	33-1/4	17	167
2	Cathode-Ray Tube 5CP1A	1-4/25	20	10	10	4.5
3	Maintenance Repair Parts	1/3	13-5/16	7-7/8	5-9/16	17.25

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Waveform Measuring Equipment

OS-5/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope OS-5/U	-	16-3/32	11-3/16	26-1/16	110
	Including:	F16-0-76521-2095				
	1 Power Cord	-	72 lg			
	1 Cover	N17-C-48226-2026				
		-	16-1/4	11-3/8	2-15/16	
		N16-C-65001-244				
		-	TOTAL LESS MAINTENANCE REPAIR PARTS			110
			TOTAL			

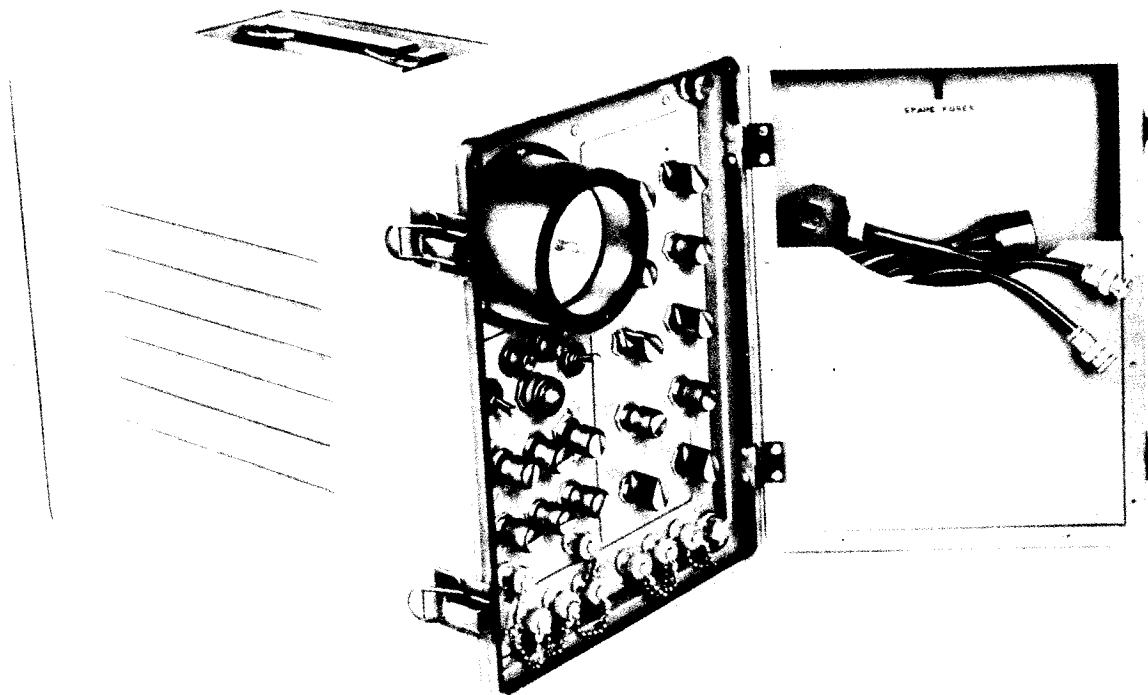
UNCLASSIFIED

UNCLASSIFIED

Waveform Measuring Equipment

OSCILLOSCOPE-RANGE CALIBRATOR OS-7/U

OS-7/U



Oscilloscope-Range Calibrator OS-7/U.

FUNCTIONAL DESCRIPTION

The Oscilloscope-Range Calibrator OS-7/U is a precision equipment designed primarily to provide means of calibrating the marker and ranging circuits in various types of radar equipment using a 2000-yard radar mile. The unit is so arranged that it can also be used as a conventional oscilloscope or as a synchroscope for general test purposes over a limited range of sweep frequencies.

The types of presentation obtainable are: A, linear undelayed; R, linear delayed; J, circular undelayed; and X, circular delayed.

Accurately spaced 1000 yard and 10,000 yard markers are generated within the unit.

RELATION TO OTHER EQUIPMENT

The Oscilloscope-Range Calibrator OS-7/U is similar to and supersedes A and J Oscilloscopes Navy Types 60ACZ and 60ACZ-1. It will be superseded in its range calibration functions by Range Calibrator TS-573/UP. Its oscilloscope functions are similar to those of Oscilloscopes TS-239/UP, OS-5/U and OS-4/U.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—110 v $\pm 10\%$ ac, 50 to 1600 cps, 150 w.
FREQUENCY, CRYSTAL OSCILLATOR.—163.934 kc, $\pm .01\%$ max.

SWEEPS.—

Circular, X and J Length: 1000 yd per rev, $\pm 01\%$
Lighting Gate Delay: 700 to 100,000 yd.

Lighting Gate Width: 700 to 1100 yd.
Linear A and R, Length: 1000, 60,000 and 400,000 yd, $\pm 5\%$.

Linear A, Delay: 700 to 100,000 yd (not used with 400,000 yd sweep).

DEFLECTION.—

Factor: 150 v per in.

Polarity, J and X, Sweep: Inward for positive signal.

Polarity, A and R, Sweep: Inward for positive signal.

Main Video Input: Upward for positive signal.

Aux Video Input: Downward for positive signal.

Input Impedance: 1 meg min.

VIDEO AMPLIFIER.—

Voltage Gain: 30.

Sine Wave Response: ± 3 db from 200 cps to 3 mc.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Not Classified
STOCK NO.:	(USAF):
	(NAVY): F16-Q-192558-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	BUSHIPS Spec No. CS-731
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	3.2
F.I.I.N.:	

UNCLASSIFIED

4.3 OS-7/U: 1

OS-7/U

Polarity: Opposite to direct deflection.
Input Impedance: 1 meg.

INTERNAL TRIGGER.—

Output Amplitude: +100 v or -70 v min.
Duration: 1 μ sec.
Rise Time: 400 v per μ sec.
Repetition Rate: 59 to 1600 pps.
Output Impedance: 1000 ohms.

RANGE MARKERS.—1000 yd and 10,000 yd.

Amplitude: +2 v.
Duration: 0.5 μ sec max at 70% peak amplitude.
Output Impedance: 10 ohms.

EXTERNALLY TRIGGERED OPERATION.—

Trigger Input Amplitude: 20 to 100 v.
Duration: 0.25 to 20 μ sec.
Rise Time: 5 v per μ sec.
Repetition Rate, 1000 yd Sweep: 2000 pps max.
60,000 yd Sweep: 1370 pps max.
400,000 yd Sweep: 205 pps max.
Input Impedance: 10,000 ohms.

FITTINGS AND ACCESSORIES.—The eight input and output jacks located on the front panel and the MAIN VIDEO INPUT jack located at the rear of the chassis, are all BNC Type UG-290/U female coaxial receptacles. These jacks are mated by the BNC Type UG-260/U coaxial plugs which are provided on the Oscilloscope end of each of the four Test Leads labeled W-2, W-3, W-4 Red and W-4 Black. For connection to external equipment, Test Lead W-2 (shielded cable) is terminated by one black sleeved alligator clip and one red sleeved phone tip; Test Lead W-3 (shielded cable) is terminated by one black sleeved and one red sleeved alligator clip. Test Leads W-4 Red and W-4 Black are both made of one red and one black stranded conductor terminated by one red sleeved and one black sleeved alligator clip. All the above Test Leads are 39-1/2 inches in length. Another Test Lead (W-1) is supplied, 84 in. long, and made of a two-conductor stranded cord with a connector plug moulded directly to the cord on each end.

One ac power cable is supplied. The ac input receptacle is an AN Type 49643 male connector located at the rear of the chassis.

CONSTRUCTION.—The Oscilloscope-Range Calibrator OS-7/U has an aluminum case with a removable cover. The unit is finished in Navy Gray enamel and has a carrying handle on top. Space is provided in the panel cover for storing the accessories.

MANUFACTURER'S OR CONTRACTOR'S DATA

Raytheon Manufacturing Co., Waltham, Mass.
Contract NObsr-39329, dated 26 June 1947.

TUBE COMPLEMENT

- (1) 12AU7 (1) 12AT7 (1) 6AN5
- (1) 6V6GT (1) 2X2A (1) 5Z4
- (1) 3DP1A

REFERENCE DATA AND LITERATURE

NAVSHIPS 91248: Instruction Book for Oscilloscope-Range Calibrator OS-7/U.

PRESENTATION AND CONTROLS

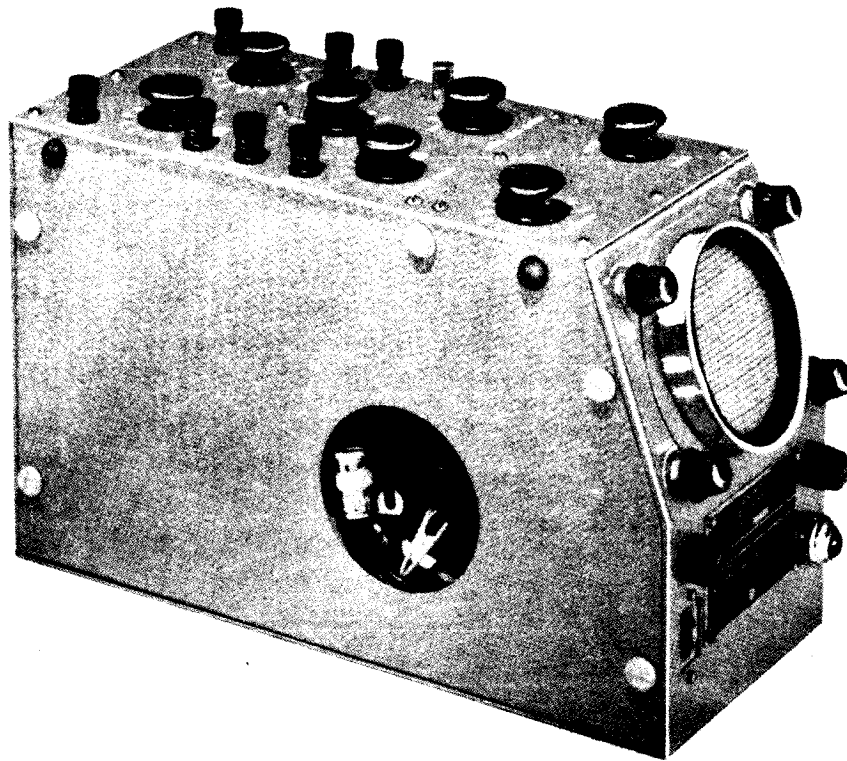
NAME	POSITIONS	FUNCTION	DESCRIPTION
F1		Line Fuse	Thumb cap
F2		Line Fuse	Thumb cap
Power	On-Off	Line power	Toggle switch
Pilot		Power indicator	Incandescent lamp
Trig	Int Ext	Selects internal or external trigger	Toggle switch
Circle Controls	Rotation (3)	Control shape and size of circle	Three small knobs
Sweep Delay	Rotation	Adjusts delay of unblanking and linear sweep	Small knob
Sync	Rotation	Adjusts trigger amplitude to obtain synchronism	Small knob
Output Trig Freq	60, 200, 1100, 1600	Controls repetition rate of internal trigger	Small knob
Aux Video		Receives video signal-linear only	Small coax receptacle BNC-type UG-290/U
Ext OSC		Receives external oscillator output	Small coax receptacle BNC-type UG-290/U
Trig Out		Delivers positive trigger	Small coax receptacle BNC-type UG-290/U
Trig Out		Delivers negative trigger	Small coax receptacle BNC-type UG-290/U
Trig In		Receives + or - trigger for unblanking and triggering linear sweep	Small coax receptacle BNC-type UG-290/U
Unblanking Gate		Receives or delivers unblanking gate	Small coax receptacle BNC-type UG-290/U
1000 yd Markers		Delivers 1000 yd markers	Small coax receptacle BNC-type UG-290/U
10,000 yd Markers		Delivers 10,000 yd markers	Small coax receptacle BNC-type UG-290/U
Sweep	Circular Linear	Selects circular or linear sweep	Pointer knob
Amplifier Video SW	Direct 1:35, 1:13, 1:1	Selects signal direct or through video amplifier with attenuators	Pointer knob
Intensity	Rotation	Controls brilliance of trace	Small knob
Focus	Rotation	Controls focus of trace	Small knob
Trig Select	‡ Undelayed ‡ Delayed	Connects circuits to receive positive or negative trigger for delayed or undelayed operation	
Gate in 1000 yd	1, 60, 400	Selects duration of scope unblanking and scale of linear sweep	Pointer knob
Vertical Position	Rotation	Controls vertical position of trace	Small knob
Horizontal Position	Rotation	Controls horizontal position of trace	Small knob
Gate	Int Ext	Selects internal or external gate	Pointer knob
Oscillator	Int Ext	Selects internal or external oscillator	Pointer knob

UNCLASSIFIED

Waveform Measuring Equipment

OSCILLOSCOPE OS-8/U

OS-8/U



Oscilloscope OS-8/U.

FUNCTIONAL DESCRIPTION

The Oscilloscope OS-8/U is a portable electronic device designed to display the waveform of varying electrical potential. The Oscilloscope uses a cathode ray tube with a three-inch screen and has a linear time base with a horizontal sweep range of 3 to 50,000 cps.

RELATION TO OTHER EQUIPMENT

The Oscilloscope OS-8/U supersedes older Navy Models OBL and OB T, which are either inferior in performance or much heavier in weight. It is superseded by Oscilloscope OS-8A/U which has superior square wave response features but is slightly larger and heavier.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 1600 cps, 50 w.
VERTICAL AMPLIFIERS.—

DC Input, Recommended Freq: 0 to 1000 cps, ± 3 db.

DC Input Impedance: 2 meg, shunted by 5000 μf .

AC Input, Recommended Freq: 5 cycles to 2 mc, ± 3 db.

AC Input Impedance: 1.5 meg, shunted by 25 μf .

Deflection Sensitivity: 0.1 v, rms per in.

Deflection Sensitivity, Direct: 22 v, rms per in.

Input Impedance, Direct: 12 meg, shunted by 15 μf .

HORIZONTAL AMPLIFIER.—

Recommended Frequencies: 25 to 100,000 cps, ± 2 db.

Input Impedance: 2 meg, shunted by 25 μf .

Deflection Sensitivity: 0.1 v, rms per in.

Deflection Sensitivity, Direct: 28 v, rms per in.

Input Impedance, Direct: 12 meg, shunted by 15 μf .

Sync Polarity: Positive or negative.

SWEEP OSCILLATOR.—3 to 50,000 cps.

INTENSITY MODULATION (Z AXIS).—Internal, or external by modification.

PRESENTATION AND CONTROLS.—Waveforms are displayed on a 3-inch cathode-ray-tube screen. The sweep is controlled by a 6 position coarse frequency selector switch and by a fine frequency vernier control. The sync selector switch permits the choice of external, internal or line sync action. The sync amplitude and sync polarity are controlled by the same locking control knob. The vertical amplifier gain is controlled by a four position attenuator switch having dc, 1, 10, and 100 positions; another vertical gain control is used for fine adjustment.

The horizontal amplifier gain is set by a continuously variable control knob. Horizontal position, vertical position, intensity-power-on and focus controls are also provided on the panel occupied by the screen, together with the ac receptacle, pilot lamp and fuse holders.

TYPE	(USAF):	
CLASSIFICATION:	(NAVY):	Substitute Standard
	(ARMY):	Not Classified
STOCK NO.:	(USAF):	
	(NAVY):	F16-0-192560-200
	(ARMY):	3F3665-8
DESIGN COGNIZANCE:	Navy, BUSHIPS	
PROCUREMENT INFO.:	Navy CS-835	
PROCUREMENT COG.:	Navy	
RDB IDENT. NO.:	3.1	
F. I. I. N.		

UNCLASSIFIED

OS-8/U

A coaxial jack is provided for the vertical ac input. Binding post terminals are provided for the vertical input dc, the horizontal input (external), the ground on both sides, external sweep synchronizing voltages, line frequency voltage supply, and Z axis input. At the back of the instrument case, a terminal board includes two "blanking" terminals, normally interconnected by a jumper, which can be used optionally to inject blanking voltages to the intensity modulation amplifier from an external source, for modulation of the beam, in place of the internal retrace blanking device.

FITTINGS AND ACCESSORIES.—The vertical amplifier input receptacle on the top panel is a UG-290/U female BNC fitting. A removable line cord, a ground lead with a black alligator clip on one end and an open tongue lug on the other, two test leads, one long, one short, both having a UG-88/U, BNC-type plug on one end and an alligator clip on the other end, are supplied.

CONSTRUCTION.—The Oscilloscope is built in an aluminum cabinet, itself mounted on a watertight aluminum outer case which has a latched separable cover.

The aluminum case cover has a carrying handle. All cables and leads can be stored in two small recesses arranged on each side of the cabinet. A visor is supplied for mounting on the cathode ray tube shield, to permit the screen to be viewed in a normally lighted room. A transparent screen, ruled with vertical and horizontal lines spaced 0.1 in., is mounted in front of the screen.

MANUFACTURER'S OR CONTRACTOR'S DATA

The Hickok Electrical Instrument Co, Cleveland 8, Ohio.

Contract NObsr-42167, dated 18 March 1948.

Contract NObsr-42368, dated 2 February 1949.

TUBE COMPLEMENT

- (1) 12AX7 (2) 6AK6 (1) 6AG5
- (1) 12AT7 (1) 3RP1 (1) 6J6
- (1) 6X4

REFERENCE DATA AND LITERATURE

NAVSHIPS 91272: Instruction Book for Oscilloscope OS-8/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope OS-8/U	3.335	20-1/4	11-1/8	14-3/4	34.0

EQUIPMENT SUPPLIED

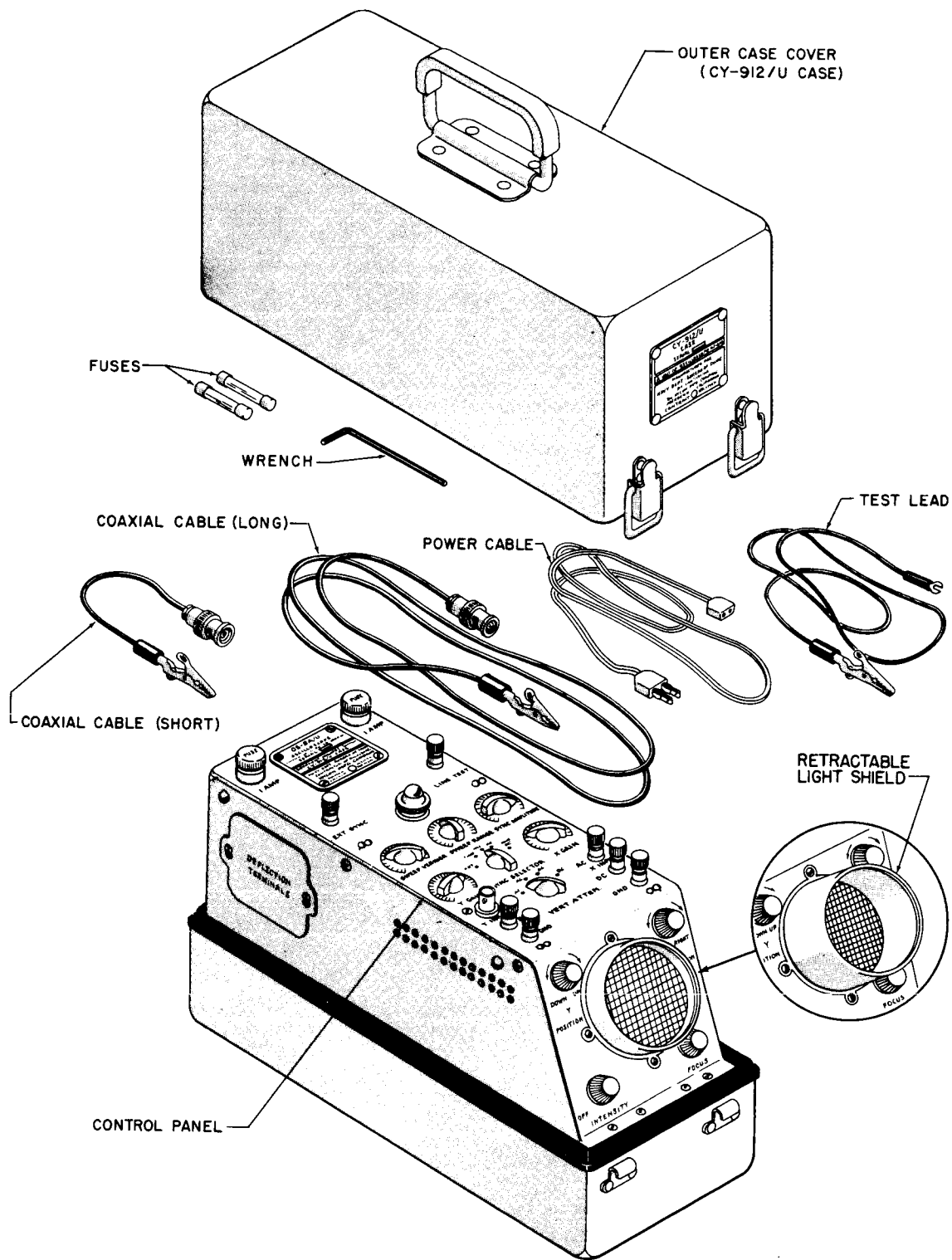
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope OS-8/U	- F16-0-78342-3925	7-3/8	5-1/4	11-15/16	
1	Case, CY-845/U	- N16-C-170001-336 2Z1800.108	9	6	13-1/2	
1	Test Lead CG-656/U	- N17-L-63389-1345 3E8000-48.7	48 lg			
1	Test Lead CG-656/U	- N17-L-63388-8732 3E8000-12.1	12 lg			
1	AC Line Cord W-103	- N17-C-48225-2611 3E7350.1-72.12	72 lg			
1	Ground Lead	- N17-L-63455-7490 3E8000-48.8	48 lg			
1	Visor	- N16-V-300201-756 2ZA951-45	2-7/8 dia			
1	Rectifier	- - -				
2	Instruction Book NAVSHIPS 91272	- - -				
TOTAL LESS MAINTENANCE REPAIR PARTS						14.0
TOTAL						

UNCLASSIFIED

Waveform Measuring Equipment

OSCILLOSCOPE OS-8A/U

OS-8A/U



Oscilloscope OS 8A/U.

UNCLASSIFIED

OS-8A/U

FUNCTIONAL DESCRIPTION

The Oscilloscope OS-8A/U is a portable electronic device designed to display the waveform of varying electrical potential. The oscilloscope uses a cathode-ray tube with a three-inch screen and has a linear time base with an horizontal sweep range of 3 to 50,000 cps.

RELATION TO OTHER EQUIPMENT

Oscilloscope OS-8A/U supersedes older Navy Models OBL and OBT, which are either inferior in performance or much heavier in weight. It supersedes Oscilloscope OS-8/U which has inferior square wave response features but is slightly smaller and lighter.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—104 to 126 v, ac, 60 cps, 65 w.

VERTICAL AMPLIFIER.—

DC Terminal, Recommended Frequencies: 0 to 1000 cps, 0 to -3 db.

DC Terminal, Input Impedance: 2 meg, shunted by 25 μ f.

AC Terminal, Recommended Frequencies: 30 cycles to 2 meg, 0 to -3 db.

AC Terminal, Input Impedance: 1.5 meg, shunted by 25 μ f.

Deflection Sensitivity: 0.1 v rms, for 1 in. peak-to-peak.

Direct Deflection: 48 v per in. approx.

HORIZONTAL AMPLIFIER.—

DC Terminal, Recommended Frequencies: 0 to 1000 cps, 0 to -12 db.

AC Terminal, Recommended Frequencies: 25 to 100,000 cps, 0 to -2 db.

Input Impedance: 1 meg, shunted by 25 μ f.

Deflection Sensitivity: 0.1 v rms for 1 in. peak-to-peak.

Direct Deflection: 67 v per in. approx.

Sync Polarity: Positive or Negative.

SWEEP OSCILLATOR.—3 to 50,000 cps.

PRESENTATION AND CONTROLS.—Waveforms are displayed on a 3-inch cathode-ray-tube screen. The sweep is controlled by a 6-position range selector and a fine frequency control. The sync amplitude and sync polarity are controlled by the same control knob. The sync selector permits the choice of external, line or internal sync. The horizontal amplifier gain is controlled by a continuously variable control knob. The vertical amplifier gain is controlled by a 3-position attenuator having 1:1, 10:1, and 100:1 positions; another control knob is used for fine adjustment. Horizontal position, vertical position, intensity and focus controls are also provided. The oscilloscope incorporates a Z axis amplifier which is wired so that

blanking of the trace is controlled throughout the sweep cycle. It is possible to put the blanking device out of action by disconnecting the proper Jumper connection at the internal deflection terminal input strip.

FITTINGS AND ACCESSORIES.—A removable line cord, a ground lead with a space lug on one end and an alligator clip on the other end, two coaxial cables, two spare fuses and an Allen wrench are supplied. Both coaxial cables have an alligator clip on one end and a BNC-type UG-88/U male coaxial plug on the other end which mates the Amphenol No. 31-102 female coaxial receptacle, Y ac input on the scope panel. The coaxial leads are made up of RG-58/U cable, one being 48 inches long, the other 12 inches long.

CONSTRUCTION.—The oscilloscope and supporting chassis are shock-mounted on a watertight aluminum outer case which has a latched separable cover. The aluminum cover has a carrying handle and accomodates the cables and accessories. A retractable visor permits the screen to be viewed in relatively brightly lighted surroundings. A flexible transparent screen, ruled with both vertical and horizontal lines spaced 0.1 inch apart is mounted in front of the cathode-ray tube.

MANUFACTURER'S OR CONTRACTOR'S DATA

Hycon Mfg. Co., Pasadena 8, Calif.
Contract NObsr-49286, 30 June 1950.

TUBE COMPLEMENT

- (2) 12AT7 (1) 6AG5 (1) 6AH6
- (1) 3RP1 (3) 6J6 (1) 1Z2
- (1) 6X4

REFERENCE DATA AND LITERATURE

NAVSHIPS 91364: Instruction Book for Oscilloscope OS-8A/U.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF):
	(NAVY): F16-Q-192561-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	3.1
F.I.I.N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope OS-8A/U					

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Waveform Measuring Equipment

OS-8A/U

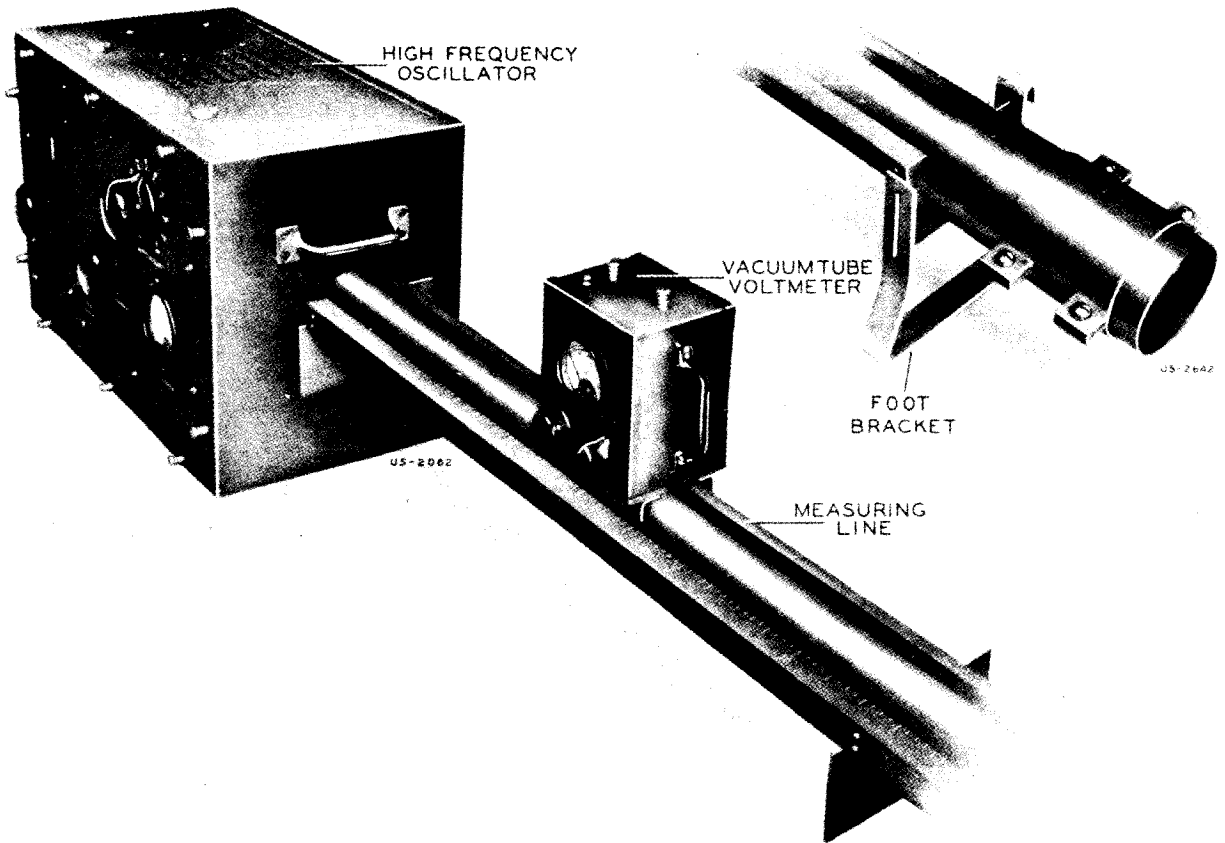
EQUIPMENT SUPPLIED							
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)	
			HEIGHT	WIDTH	DEPTH		
1	Oscilloscope OS-8A/U	-	7-1/4	5-1/2	13-3/4		
1	Case CY-912/U	-	9-1/4	6	15-3/8		
1	Power Cord W-104	3300-323001034 N17-C-A8226-1032 3E7350.1-72.12	72 lg				
1	Test Lead, W-101	-	48 lg				
1	Test Lead, W-102	- N17-L-63201-9501	12 lg				
1	Test Lead, W-103 (ground)	- N17-L-63205-7750	48 lg				
1	Allen Wrench	-					
2	Spare Fuses	-					
2	Instruction Book	-					
			TOTAL LESS MAINTENANCE REPAIR PARTS				17.25
			TOTAL				

UNCLASSIFIED

Impedance and Standing Wave Ratio Measuring Equipment

CONCENTRIC LINE STANDING WAVE MEASURING EQUIPMENT NAVY MODEL OT, OT-1

OT, OT-1



Concentric Line Standing Wave Measuring Equipment Navy Model OT.

FUNCTIONAL DESCRIPTION

The Concentric Line Standing Wave Measuring Equipment Navy Model OT and OT-1 are designed to measure the voltage standing wave ratio of concentric transmission lines with their components, in the frequency range of 100 to 225 mc. The complex impedance of antennas can be determined from measurements of the standing wave ratio and from the location of the voltage maximum or minimum points. The equipment consists of an oscillator and power supply, a voltage probe and a concentric slotted line. The concentric line kit includes inner connectors of various diameters to provide for different characteristic impedances.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—
 To Rectifier Power Unit: 117 v ac, 60 cps, 300 w.
 To Probe Voltmeter: 1.5 v dc, from dry cell.
FREQUENCY RANGE.—100 to 225 mc.
LINE IMPEDANCES.—40, 50, 63, 70 ohms.
PRESENTATION AND CONTROLS.—The standing wave ratio is determined from meter readings on the VACUUM TUBE PROBE VOLTMETER at maximum and minimum current or voltage points. This probe

voltmeter has a tuning control and a selector switch to set the tube filament voltage and select one of two available sensitivities. The OSCILLATOR unit has an output coupling, grid tuning and filament tuning controls, as well as a plate current meter. The MEASURING LINE is provided with one inch graduated rule along its length. This permits the measurement of voltage maximum displacements. Hence, knowing the standing wave ratio and the characteristic impedance of the measuring line, the complex impedance

OT

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-192590-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	6.2.1
F. I. I. N.:	

UNCLASSIFIED

OT, OT-1

of the unit under test can be determined. Adequate charts are provided for a rapid evaluation of such values.

FITTINGS AND ACCESSORIES.—The concentric MEASURING LINE is 6 ft-8 inches in length and 3-1/8 inches in diameter. With the four inner conductors supplied, it is possible to match a 3-1/8 inch nominal 70 ohm line, a 1-5/8 inch nominal 50 ohm line, a 7/8 inch nominal 63 ohm line, or a British Type 40 ohm line. A foot bracket is used to support the far end of the line. Two semi-circular polystyrene discs are used, one for the 60 ohm - 1-1/8 inch O.D. inner conductor, and one for the 70 ohm - 7/8 inch O.D. inner conductor, to provide support and eliminate sag. Three sizes of couplings are supplied to attach the far end of the measuring line to various sizes of concentric lines in common use. One cylindrical fitting is used for 3-1/8 inch lines, and two funnel shaped fittings for coupling to 1-5/8 inch and 1 inch lines. A split cylindrical shim is supplied with the smallest coupling to adapt it for use with a 7/8 inch line. A 1.5

v dry battery type BA-30 is included with the probe voltmeter to supply the filament voltage.

CONSTRUCTION.—The RECTIFIER POWER UNIT, OSCILLATOR UNIT and VACUUM TUBE PROBE VOLTMETER are housed in metal cabinets which are provided with metal carrying handles. The MEASURING LINE and its accessories are stored in a carrying case.

MANUFACTURER'S OR CONTRACTOR'S DATA

RCA Victor Division of Radio Corporation of America, Camden, N.J.

Contract NOS-98829, dated 11 February 1942.

Contract NOS-99649, dated 5 March 1942.

TUBE COMPLEMENT

(2) 826

(2) 816

(1) 957

REFERENCE DATA AND LITERATURE

NAVSHIPS 95193: Concentric Line Standing Wave Measuring Equipment Models OT / OT-1.

EQUIPMENT SUPPLIED

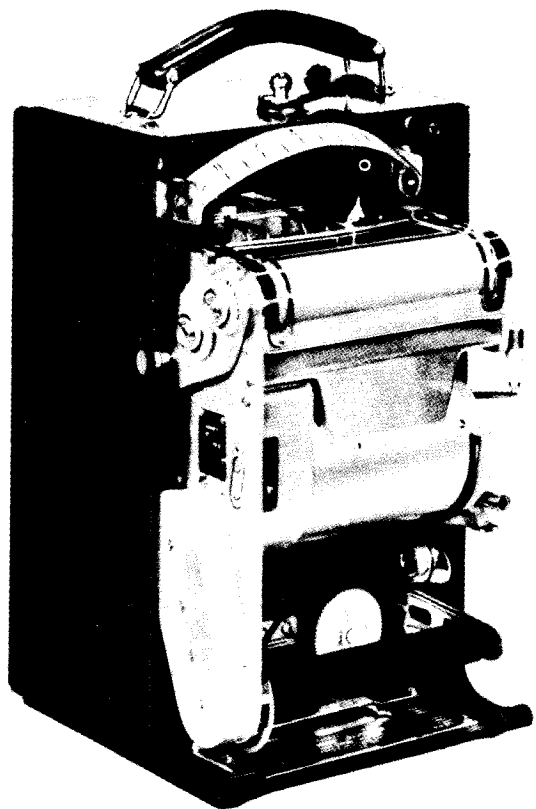
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Rectifier Power Unit NT-20133	- N16-P-67871-3768	11-3/8	20-3/4	9-1/16	70
1	Oscillator Unit NT-35006	- N16-0-55686-7909	11-15/16	19-3/4	11-1/8	30
1	Measuring Line (in kit form) NT-62035	- -				77
1	Vacuum Tube Voltmeter NT-60027	- F17-V-89051-5101	6	4	5	4
1	Inter-Unit Power Cable	- -	20 ft lg			
1	Power Cable	- -	15 ft lg			
1	Maintenance Repair Parts	- -				
TOTAL LESS MAINTENANCE REPAIR PARTS						181
TOTAL						

UNCLASSIFIED

Voltage and Current Measuring Equipment

MILLIAMMETER RECORDER RD-49/U

RD-49/U



Milliammeter Recorder RD-49/U.

FUNCTIONAL DESCRIPTION

Milliammeter Recorder RD-49/U is a portable, dc milliammeter recorder. Its purpose is to record permanently and continuously the fluctuations of a current as a function of time. A full scale reading for only one milliampere input makes it a highly sensitive measuring device. Various rates of chart speed make possible the recording of "fast" or "slow" phenomena, as compared to seconds or hours. It is useful for the recording of the variations of dc currents and as an auxiliary to field strength measuring and surveying equipments.

RELATION TO OTHER EQUIPMENT

This is an Esterline Angus Model AW Recorder. It is the same as milliammeter Recorder RF-59/U which is part of Radio Test Set AN/URM-6 except that milliammeter Recorder RD-59/U has AN-type receptacles.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY, CHART DRIVE.—115 v ac, 60 cps, 5 to 6 w.
 FULL SCALE CURRENT RANGE.—1 ma.
 Accuracy: $\pm 1\%$ of full scale.
 Current Ranges: 0 to 1, 2, 3, 5, 10, 25, 50 or 100 ma.
 EXTERNAL RESISTANCE FOR CRITICAL DAMPING.—35,000 ohms.
 AVERAGE COIL RESISTANCE.—1400 ohms.
 AVERAGE FULL SCALE VOLTS.—1.4 v.
 AVERAGE FULL SCALE POWER.—1.4 mw.
 INSULATION TEST.—5000 v between ground and current carrying parts.
 AVERAGE SWINGING TIME.—0.5 sec, critically damped.
 CHART DRIVE.—Synchronous.
 CHART FEEDS.—
 Inches Per Hour: 3/4, 1-1/2, 3, 6 or 12.
 Inches Per Minute: 3/4, 1-1/2, 3 or 6.
 CHRONOGRAPH PEN ATTACHMENT VOLTS.—6 v $\pm 15\%$.
 PRESENTATION AND CONTROLS.—Under a glass door is mounted a cylindrical meter scale sector below which is the recorder paper chart. A combination meter needle and pen recorder shows the instantaneous meter readings and records the motions on the chart. A connection panel is located at the back of the instrument for external connections.
 FITTINGS AND ACCESSORIES.—A set of leads is supplied, with taper plugs on the instrument end and open shade terminals on the other.
 CONSTRUCTION.—The recorder is enclosed in a die-cast aluminum alloy case with a hinged front door, an eccentric latch, and a carrying handle.

MANUFACTURER'S OR CONTRACTOR'S DATA

The Esterline Angus Company, Inc., Indianapolis, Ind.
 Contract NObsr-49133 (1734).

REFERENCE DATA AND LITERATURE

NAVSHIPS 91365: Instruction Book (Esterline Angus Catalog).

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-239709-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	1.1.2.4
F. I. I. N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Milliammeter Recorder RD-49/U					70

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Voltage and Current Measuring Equipment

UNCLASSIFIED

RD-49/U

EQUIPMENT SUPPLIED

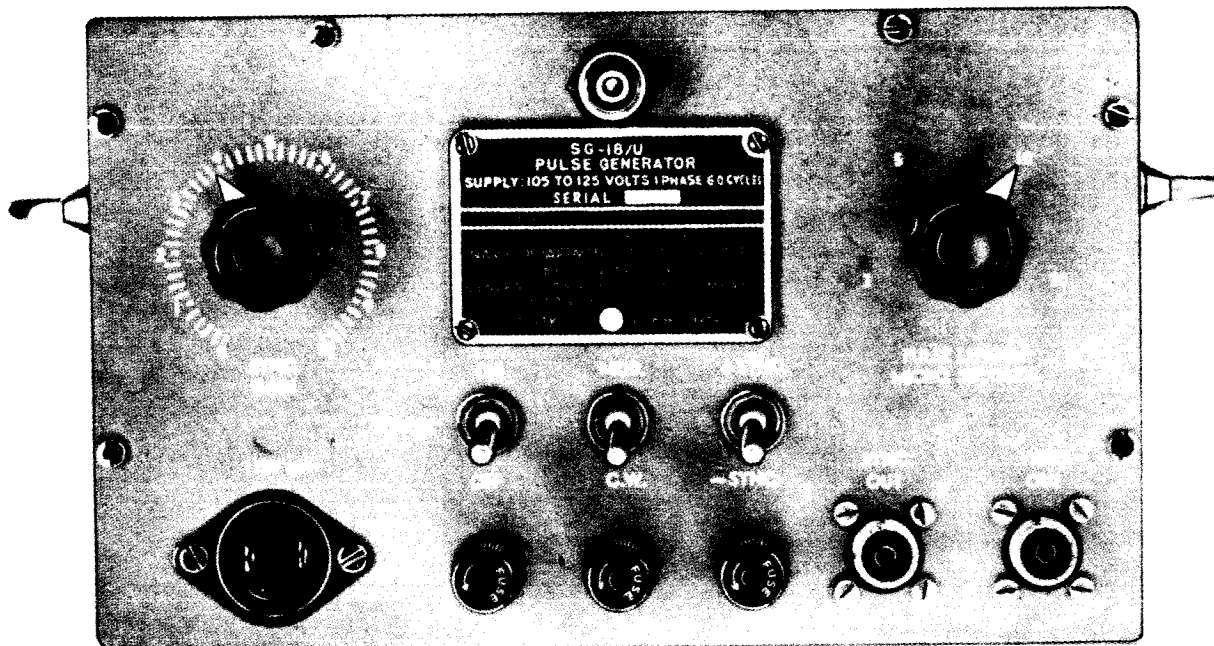
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Milliammeter Recorder RD-49/U	-	14-1/2	8-9/16	8-3/4	34
2	Instruction Book NAVSHIPS 91365	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			34
			TOTAL			

UNCLASSIFIED

Signal Generating Equipment

PULSE GENERATOR SG-18/U

SG-18/U



Pulse Generator SG-18/U.

FUNCTIONAL DESCRIPTION

Pulse Generator SG-18/U is a portable equipment which provides output pulses of substantially rectangular form suitable for pulse modulation of signal generators and synchronization of sweep circuits in oscilloscopes for the testing of radar equipment.

RELATION TO OTHER EQUIPMENT

It is commonly used to pulse UHF Signal Generators Navy Model LX Series. It supersedes Navy Model OCD. It is superseded by Pulse Generator AN/USM-27 which has a greater range of pulse rates and independent ranges of pulse width.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 120 v ac, 60 cps, 120 w.
PULSE RATE.—3000 to 6000 pps, approx, depending on pulse length.
PULSE LENGTH.—3 to 4 μ sec, affecting the pulse rate inversely.
PULSE VOLTAGE, VIDEO OUT.— ± 150 v peak.
PULSE VOLTAGE, SYNC OUT.—0 to ± 25 v peak.
OUTPUT IMPEDANCE, VIDEO AND SYNC.—4000 ohms.
PRESENTATION AND CONTROLS.—All controls and cable terminations are panel mounted and are shown in the picture. The Sync Output is variable from zero by means of a Sync gain control. The pulse length and pulse rate are controlled simultaneously by a single knob, the graduations of which show the pulse length in microseconds. Other controls and items are the ac receptacle, power switch, MOD-CW switch, +SYNC - SYNC switch, pilot lamp and fuse holder.

FITTINGS AND ACCESSORIES.—Two small UHF Navy Type 49194 (Army Type SO-239) connectors are provided for Sync and Video outputs. The Video and Sync output ends of each of the coaxial cables are terminated with small UHF Navy Type 49195 (Army Type PL259A) plugs. The far end of the video cable is fitted with an early UHF Navy Type 49121A plug to accommodate the early type receptacle on some equipment. The far end of the Sync cable has a UHF Type (PL259A) plug attached.

The diagram on the following page indicates external connections.

CONSTRUCTION.—The Pulse Generator is enclosed in a metal cabinet which is fitted with two handles on the sides. The front panel and chassis are fastened to the cabinet by screws. When the chassis is taken out of the cabinet, an interlock switch makes the whole unit inoperative.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Substitute Standard (ARMY): Not Classified
STOCK NO.:	(USAF): (NAVY): F16-Q-282245-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	BUSHIPS Spec MIL-G-15473
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	4.3
F. I. I. N.:	

UNCLASSIFIED

4.4 SG-18/U: 1

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

SG-18/U

MANUFACTURER'S OR CONTRACTOR'S DATA

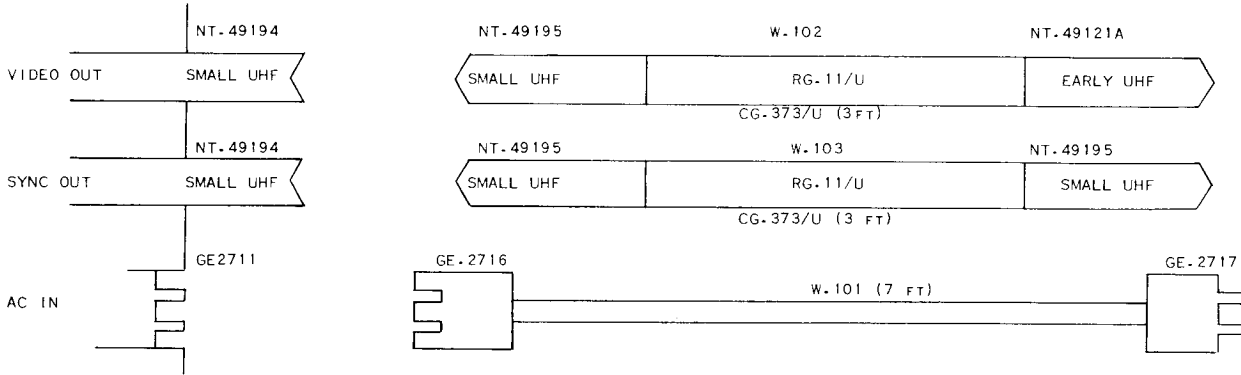
General Communication Co., Boston, Mass.
Contract NObsr-39379, dated 25 June 1947.

REFERENCE DATA AND LITERATURE

NAVSHIPS 91112: Instruction Book for Pulse Generator SG-18/U.

TUBE COMPLEMENT

- (1) 5Y3-GT (2) 6AG7 (1) 6L6-GA



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Pulse Generator SG-18/U	0.8	8-1/2	16	9-1/2	31
1	Equipment Spare Box	1.4	8-1/2	23	12	44

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Pulse Generator SG-18/U	-	6-1/8	12-1/4	7	
1	Power Cable W-101	-	72 lg			
1	Video Output Cable W-102	-	36 lg			
1	Sync Cable W-103	-	36 lg			
2	Instruction Book NAVSHIPS 91112	-				
1	Maintenance Repair Parts	-	6-1/2	19	10-1/4	27
			TOTAL LESS MAINTENANCE REPAIR PARTS			14
			TOTAL			41

UNCLASSIFIED

Signal Generating Equipment

AF SIGNAL GENERATOR SG-21/U

SG-21/U



AF Signal Generator SG-21/U.

FUNCTIONAL DESCRIPTION

The AF Signal Generator SG-21/U is a portable signal generator operating in the audio frequency band. It is capable of generating signals at any one of 26 set audio frequencies, and at a power output convenient for testing purposes.

RELATION TO OTHER EQUIPMENT

It has been designed specifically for the alignment and calibration of the frequency meter and recorder of Radiosonde Receptor AN/FMQ-2 (AN/FMQ-1, AN/FMQ-1A, and RAU Series) which is used to receive signals from Radiosonde AN/AMT-7. It replaces Signal Generator Navy Type 74039.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 60 cps, 80 w.
FREQUENCY RANGE.—10 to 500 cps, in 26 spot frequencies.

Spot Frequencies: 10, 20, 30, 50, 60, 70, 90, 100, 110, 130, 140, 150, 170, 180, 190, 210, 220, 230, 250, 260, 300, 340, 380, 420, 460, and 500 cps.
Accuracy: 0.1% from 0°C to +50°C.

OUTPUT CHARACTERISTICS.—25 v, rms min (at high impedance).

PRESENTATION AND CONTROLS.—The operating frequency is selected by means of a 13-position CYCLES-PER-SECOND selector. An X1-X2 scale switch is used as a frequency scale multiplier. A pilot lamp, fuse holder, and an ON-OFF switch are provided.

FITTINGS AND ACCESSORIES.—The output of the signal generator is drawn from two banana type jacks located on the front panel. Two output leads are provided which have banana plugs on one end and insulated alligator clips on the other end. The ac power cable is permanently attached.

CONSTRUCTION.—The signal generator is enclosed in a wooden carrying case which has a hinged cover and a leather handle. A separate box contains the maintenance repair parts. The power cable and test leads are housed in a small compartment provided within the instrument case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Seaboard Electric Co., New York 13, N.Y.
 Contract NObsr-42076, dated 2 May 1950.

TUBE COMPLEMENT

- (1) 6X5-GT (2) 6SL7-GT (1) 927
- (2) 6V6-GT (1) 6SJ7

REFERENCE DATA AND LITERATURE

NAVSHIPS 91303: Instruction Book for AF Signal Generator SG-21/U.

TYPE	(USAF):	
CLASSIFICATION:	(NAVY):	Standard
	(ARMY):	Not Classified
STOCK NO.:	(USAF):	
	(NAVY):	F16-Q-282255-200
	(ARMY):	
DESIGN COGNIZANCE:	Navy, BUSHIPS	
PROCUREMENT INFO.:		
PROCUREMENT COG.:	Navy, BUSHIPS	
RDB IDENT. NO.:	4.1.1	
F.I.I.N.		

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	AF Signal Generator SG-21/U and Maintenance repair parts					

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

SG-21/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator Unit	- N16-G-54385-4837	7-3/4	15	6	31
1	Test Lead 491955	- N17-L-63275-9501	8 ft 1g			
1	Test Lead 492012	- -	8 ft 1g			
2	Instruction Books Navships 91303	- -				31
1	Maintenance Repair Parts Box	- -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			31
			TOTAL			62

UNCLASSIFIED

Miscellaneous Test Equipment

ANTENNA SERVICING KIT FOR NAVY MODEL SU, SU-1 RADAR EQUIPMENT

SU, SU-1

FUNCTIONAL DESCRIPTION

This equipment consists of a kit of items needed to supply power to a model SU or SU-1 Radar antenna that has been removed from the Radar equipment. While these are the main items needed for antenna testing, additional material must be supplied, according to individual circumstances.

RELATION TO OTHER EQUIPMENT

This kit pertains only to test, adjustment, and repairs of Navy Type 66AGY, Submarine Signal Type 974, and Navy Type 66AGY-1, or Submarine Signal Type 974A Antenna assemblies supplied with Navy Models SU and SU-1 Radar Equipment.

ELECTROMECHANICAL DESCRIPTION

ANTENNA MOTOR-GENERATOR UNIT.—

Motor-Capacitance Induction: 115 v, 60 cps, 1 ϕ , 0.5 hp, 3500 rpm.

Induction Gen. (AC): 115 v, 240 cps, 3 ϕ , 0.4 amp.

Generator DC: 24 v 160 w.

PRESENTATION AND CONTROLS.—The major units, the antenna motor-generator unit and the control rectifier should be permanently mounted in a bench test area and wired to a test panel. A suggested test panel with wiring is shown in the instruction book for this antenna servicing kit. It is not supplied with the antenna servicing kit for Navy Model SU, SU-1 Radar Equipment.

CONSTRUCTION.—The antenna motor-generator is approximately 18 in. long by 8 in. dia, with a terminal box on one side approximately 4 in. deep. This terminal box houses fuses, filters and a terminal strip.

The control rectifier is 10 in. wide, in a metal cabinet with ventilation louvers and hinged door.

FITTINGS AND ACCESSORIES.—The fittings and accessories are wired into the test panel with additional suggested components of standard type, not supplied, using MHFA-10 wire cable. The test panel is then connected to the antenna assembly by means of a terminal board and lugs, using MHFA-30 cable.

MANUFACTURER'S OR CONTRACTOR'S DATA

Submarine Signal Co., Boston, Mass.
Contract NXsr-97677.

TUBE COMPLEMENT

For Control Rectifier NT-20272
(2) 6SN7GT (2) 6L-3C23

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,814: Instruction Book for Antenna Servicing Kit for Navy Model SU, SU-1 Radar Equipment.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	12.12.6
F. I. I. N.	

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Antenna Motor-Generator NT-211168	- - S.S.Part 2882				
1	Control Rectifier NT-20272	- - S.S.Part 926A				
1	Position Indicator M-501	- - S.S.Part 972-1				
1	Tuning Switch SPDT 5-509	- - S.S.Part 746-448				
1	Toggle Switch DPDT 5-515	- - S.S.Part 746-1A				
1	Transformer T-509	- - S.S.Part 947-119				
1	Resistor, 2MEG, Type BT-2 (R-724)	- - S.S.Part 738-886				
4	Fuse Clip	- - - -				
2	Fuse, 30 AMP 250v	- - S.S.Part 975-36				

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

SU, SU-1

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Neon Light (1-513)	- - S.S.Part 920-399				
	ERROR LIGHT ASSEMBLY CONSISTING OF:					
1	Socket	- - S.S.Part 920-398				
1	Jewell	- - S.S.Part 920-400				
1	Tube	- - S.S.Part 920-401				
1	Nut	- - S.S.Part 920-402				
1	Bracket	- - S.S.Part 972-400				
2	Screws	- - S.S.Part 972-401				
26	Nuts #4-40	- - S.S.Part 972-402				
26	Lockwashers #4	- - S.S.Part 972-371				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Miscellaneous Test Equipment

TOOL EQUIPMENT TE-50-A

TE-50-A

FUNCTIONAL DESCRIPTION

Tool Equipment Signal Corps Model TE-50-A is a kit of tools especially designed for the maintenance and repair of teletypewriter equipment. It consists of a portable case containing standard and special tools as listed under paragraph "Equipment Supplied."

Field change No. 1 TE-50-A prescribes the addition to Tool Equipment TE-50-A of certain tools which can be used for the maintenance of TT-47 Teletypewriters.

RELATION TO OTHER EQUIPMENT

It is superseded by Tool Equipment TE-50-B.

ELECTROMECHANICAL DESCRIPTION

CONSTRUCTION.—The complete tool kit is enclosed in a fiber case fitted with hasp lock and a handle. Pockets and compartments are provided for the tools.

REFERENCE DATA AND LITERATURE

Department of the Army Supply Catalog Sig 6-TE-50-A.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-T-3672-75
	(ARMY): 6R38050A
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	12.6
F. I. I. N.:	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Tool Equipment TE-50-A, packed for export	2				44

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	A-TOOLS Case, for Tuning Fork	- 6Q17979/C2				
1	Case, Sig C Type CS-78, Fiber	- 6Q17979	19-1/2	13-1/2	6	
1	File, Flat, 6 in. Fed S.N., 41-F-870	- 6Q38033-6				
1	File, half-round, 6 in. Fed S.N., 41-F-950	- 6Q38124-6				
1	Flashlight Sig C, Type TL-122-D, 2 cell	- 6Z4002D				
2	Battery, BA-30	- 3A30				
2	Lamp, incandescent, 2.7 v	- 6Z6762				
1	Filter, Flashlight Blackout M-384	- 6Z4002A.1/4				
1	Hammer, Hand, Riveting, 4 oz Fed S.N., 41-H-620	- 6Q50004				
1	Knife, Sig C Type, TL-29, Electrician's, Folding Fed S.N. 41-K-370	- 6Q60229				
1	Lubricator, Pressure, Gun-Type	- 6G800				

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

TE-50-A

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Magnet Sig C Type M-129, Bar	- 6Z6970	6	3/4	1/4	
1	Mirror, Dental	- 6Z7072	6-3/4	1/4 o/a		
1	Multimeter TS-297/U	- 3F4325-297	6	3-1/2	3-1/8	
1	Battery BA-42	- 3A42				
2	Clip, Alligator	- 3Z1087				
1	Cord CX-468/U, 2 Leads	- 3E6000-468-48				
1	Lead Set CX-529/U, 2 Leads	- 3E6000-529				
1	Oiler, Hand, 6 oz, One Drop Force Feed Control	- 6Z7306				
1	Pliers, Sig C Type TL-13-A, Side Cutting, 6 in. Fed S.N., 41-P-1835	- 6R4513A				
1	Pliers, Sig C Type TL-103, Diagonal Cutting, 6 in. Fed S.N., 41-P-1712	- 6R4603				
1	Pliers, Sig C Type TL-126, Lg Chain Nose, w/o Cutters, 6 in. Fed S.N., 41-P-1904	- 6R4626				
1	Pliers, Sig C Type TL-368/U, Duck Bill w/o Cutters, 6 in. Fed S.N., 41-P-1773-120	- 6R4735-6				
1	Rule, Steel, Graduated in 32nds and 64ths, 6 in. Fed S.N., 41-R-2991	- 6R9906				
1	Rule, Wood, 2 feet-4 fold, 1 in. wd Fed S.N., 41-R-2800	- 6R9502B-1				
1	Screwdriver, Sig C Type TL-2, 1-1/2 in. Blade Fed S.N., 41-R-1224-50	- 6415110				
1	Screwdriver, 2 in. Blade w/ Screwholding Clip Fed S.N., 41-S-1118-940	- 6R17260				
1	Screwdriver, 10 in. Blade, w/ Screwholding Clip Fed S.N., 41-S-1119-85	- 6R19005-1				
1	Screwdriver, Sig C Type TL-44, 8 in. Blade Fed S.N., 41-S-1232	- 6R16510				
1	Screwdriver, Sig C Type TL-21, 2-1/2 in. Blade Fed S.N., 41-S-1056	- 6R15310				
1	Soldering Iron, Sig C Type TL-117, 70 to 100 w/ cord and Plug Fed S.N., 41-S-686-20	- 6R24617				
1	Tip, Soldering, Plug Type, 3/8 in. Dia	- 6R24617-1				

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Miscellaneous Test Equipment

TE-50-A

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Bag, Tool, 7-Pockets, 14-1/2 in. 1g x 11 in. wd w/Webb-Strap	- - 4C9914.5/51				
1	Tool Set	- - 4T81124				
1	Burnisher, Contact	- - 4A2805A/5	2-5/8	3/8	5/32	
1	Case, Tool, Steel	- - 4T77618	1/2	2-3/4	4	
1	File, Contact Point, Fed S.N., 41-F-2060	- - 4T138-30	3	5/16	0.045	
1	Gauge Set, Thickness, Wire Fed S.N., 41-G-417-470	- - 4T96368				
1	Gauge, Thickness, 0.006 in., Fed S.N., 41-G-417-506	- - 4T6369				
1	Gauge, Thickness, 0.008 in., Fed S.N., 41-G-417-508	- - 4T96371				
1	Gauge, Thickness, 0.010 in., Fed S.N., 41-G-417-510	- - 4T96373				
1	Gauge, Thickness, 0.012 in., Fed S.N., 41-G-417-512	- - 4T93828				
1	Gauge, Thickness, 0.015 in., Fed S.N., 41-G-417-515	- - 4T96375				
1	Gauge, Thickness, 0.018 in., Fed S.N., 41-G-417-518	- - 4T93824				
1	Gauge, Thickness, 0.020 in., Fed S.N., 41-G-417-520	- - 4T96377				
1	Gauge, Thickness, 0.025 in., Fed S.N., 41-G-417-525	- - 4T93825				
1	Holder, Thickness, Gauge, 3-31/32 in. 1g o/a	- - 4T93814				
1	Gauge Set, Thickness, Flat	- - 4T96355				
1	Gauge, Thickness 0.002 in.	- - 4T96356				
1	Gauge, Thickness 0.002 in., Brass Fed S.N., 41-G-417-502	- - 4T96358				
1	Gauge, Thickness 0.003 in., Fed S.N., 41-G-417-503	- - 4T93833				
1	Gauge, Thickness 0.004 in., Fed S.N., 41-G-417-504	- - 4T93822				
1	Gauge, Thickness 0.005 in., Fed S.N., 41-G-417-505	- - 4T93823				

UNCLASSIFIED

4.12 TE-50-A: 3

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

TE-50-A

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Gauge, Thickness 0.006 in.	- 4T96360				
1	Gauge, Thickness 0.007 in., Fed S.N., 41-G-417-507	- 4T96362				
1	Gauge, Thickness 0.010 in.	- 4T96364				
1	Holder, Thickness Gauge, 3-21/32 in. lg	- - -				
1	Gauge Set, Thickness, Wire	- - 4T106163				
1	Gauge, Thickness 0.030 in., Fed S.N., 41-G-417-530	- - 4T93811				
1	Gauge, Thickness 0.035 in., Fed S.N., 41-G-417-535	- - 4T96383				
1	Gauge, Thickness 0.040 in., Fed S.N., 41-G-417-540	- - 4T96385				
1	Gauge, Thickness 0.042 in.	- - 4T96387				
1	Gauge, Thickness 0.045 in., Fed S.N., 41-G-417-545	- - 4T96389				
1	Gauge, Thickness 0.050 in., Fed S.N., 41-G-417-550	- - 4T96391				
1	Gauge, Thickness 0.055 in., Fed S.N., 41-G-417-555	- - 4T93827				
1	Gauge, Thickness 0.060 in., Fed S.N., 41-G-417-560	- - 4T96393				
1	Holder, Thickness, Gauge, 3-31/32 in. lg Fed S.N., 41-H-2340-300	- - 4T96380				
1	Gauge Set, Thickness, Wire Fed S.N., 41-G-417-490	- - 4T96395				
1	Gauge, Thickness 0.065 in., Fed S.N., 41-G-417-565	- - 4T96399				
1	Gauge, Thickness 0.070 in., Fed S.N., 41-G-417-570	- - 4T96401				
1	Gauge, Thickness 0.075 in., Fed S.N., 41-G-417-575	- - 4T496403				
1	Gauge, Thickness 0.080 in., Fed S.N., 41-G-417-580	- - 4T96405				
1	Holder, Thickness Gauge, 3-31/32 in. lg	- - 4T96396				
1	Gauge, Thickness, 0.005 in., Hex Handle, Perforation Feed Wheel	- - 4T73517				

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Miscellaneous Test Equipment

TE-50-A

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Tool, Alignment	- - 4T73370	1-13/32	1.074	0.581	
1	Tool, Alignment, Spring Hook-pull, 6 in. lg	- - 4T75765				
1	Tool, Alignment, Spring Hook-push, 6 in, lg	- - 4T74403				
1	Pin, Straight, Steel, 2 in. lg x 0.153 in. OD, Squared Ends	- - 4T72581				
1	Scale, Weighing 0 to 8 oz in 1/2 oz Divisions	- - 4T138-55	13	1-3/8	1	
1	Scale, Weighing 0 to 2 lb in 1/2 oz Divisions	- - 4T138-58	13	1-3/8	3/16	
1	Scale, Weighing 0 to 12 lb in 1/4 lb Divisions	- - 4T4841	13-1/4	3/8	3/4	
1	Screwdriver, 2-1/2 in. Blade	- - 4T95368				
1	Screwdriver, 2-1/2 in Blade, Hex Metal Handle	- - 4T138-22				
1	Adjuster, Spring, 0.070 in., 90 Deg End Lug, 5 in. lg x 1 in. wd o/a	- - 4T72003				
1	Abrasive, Stone, Silicon Carbide, 4 in. lg x 1/2 in. sq.	- - 4T87698				
1	Abrasive, Stone, Silicon Carbide, Metal Frame, w/leather Case	- - 4T102876	4	17/32	3/32	
1	Gauge, Tape, Steel	- - 4T2215	6	1	1/32	
1	Wrench, Tommy, 1/16 in., & 3/32 in., 1 End Bent 45 Deg, 1/8 in. OD x 3-1/8 in. lg o/a	- - 4T6617				
1	Tool, Alignment, 90 Deg Angle, 6 in. lg x 1-13/16 in. o/a Fed S.N. 41-T-3068-300	- - 4T72575				
1	Tool, Locking Bail, 45 Deg Angle, 5-7/8 in. x 3/4 in. wd o/a, Fed S.N., 41-T-3215-950	- - 4T72574				
1	Wrench, Double Open End, 1/2 in. x 3/4 in. Opening, 7 in. lg	- - 4T87697				
1	Wrench, Double Open End, 1/4 in. & 5/16 in. Openings, 4-3/4 in. lg	- - 4T95367				
1	Wrench Sig C Type TL-477/U, Double Open End, 3/8 in. & 7/16 in. Openings, 4-3/4 in. lg, Fed S.N., 41-W-991	- - 6R66612-14.1				
1	Wrench, Double Open End, 3/8 in. & 9/16 in. Openings, 4-3/8 in. lg	- - 4T95366				
1	Wrench, Double Open End, 3/16 in. & 1/4 in. Openings, 2-7/16 in. lg	- - 4T138-36				

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

TE-50-A

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Wrench, Single Open End, 0.0385 in. Opening, 2 in. lg	- - 4T4871				
1	Socket, Wrench, Hex, 3/16 in. Opening, 4-3/4 in. lg	- - 4T138-23				
1	Socket, Wrench, Hex, 1/4 in. Opening, 4-3/4 in. lg	- - 4T89954				
1	Socket, Wrench, Hex, 5/16 in. Opening, 4-3/4 in. lg	- - 4T89955				
1	Fork, Tuning, 96.19 cps	- - 4T104984	11	1-1/4	11/32	
1	Fork, Tuning 87.6 cps	- - 6Q4001	10-3/4	7/8	5/16	
1	Wrench, Sig C Type TL-111, Adj, 3/4 in. Cap, 6 in. lg, Fed S.N., 41-W-485	- - 6R55006				
1	Wrench, Sig C Type TL-596/U, Double End Hook Spanner, Special 27/32 in. x 1-11/16 in.	- - 6R57708-3				
2	Wrench, Set Screw, L Shape, for Briste #5 Fed S.N., 41-W-2459-925	- - -				
B-EXPENDABLE SUPPLIES						
1	Abrasive, Sheet, Crocus Cloth, 9 in. x 11 in.	- - 6Z2000				
1	Abrasive, Sheet, Emery Cloth, #0, 9 in. x 11 in.	- - 6Z2000-0				
1	Abrasive, Sheet, Sandpaper, Flint, #000, 9 in. x 11 in.	- - 6Z7500-000				
1	Brush, Painting 1 in. wd x 5/8 in. thk	- - 6Z1567				
1	Brush, Cleaning, Typewriter, Toothbrush Style, Fed S.N., 53-B-26100	- - -				
1	Cloth, Textile, Bleached and Lintless, 36 wd	- - 6Z1989				
1	Handle, Sig C Type TS-14, File, Wood, 4 in. lg	- - 6Q51014				
1	Orange Stick, Wedge Shaped, 1/8 in. Dia x 5-3/4 in. lg	- - 6Z7360				
1	Paper, Cleaning, 1/2 in. x 2 in. 100 Strips in Envelope	- - 6M751				
1	Solder M-31, 38/62, Resin Core	- - 6N7531				
1	Tape, Relay Cleaning, 1/4 in. wd, 36 yd Roll	- - 6Z8626				

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Miscellaneous Test Equipment

TE-50-A

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Tape, Sig C Type TL-83, Friction, 3/4 in. wd	- 6N8583				
1	Tape, Sig C Type TL-192, Rubber, 3/4 in. wd	- 6N8692				
C - TOOLS SUPPLIED UNDER THE PROVISIONS OF FIELD CHANGE #1						
1	Spring Hook or Boyle #8 Crocket Hook Teletype No. 151351	- - -				
1	Screwdriver, Teletype No. 151382	- - -				
1	Gauge, Teletype No. 151377	- - -				
1	Wrench, 3/16 in., Teletype No. 151372	- - -				
1	Wrench, 1/4 in., Teletype No. 151373	- - -				
1	Wrench, 5/16 in., Teletype No. 151374	- - -				
1	Wrench, 3/8 in., Teletype No. 151375	- - -				
1	Key Lever Remover, Teletype No. 151383	- - -				
1	Screw Starter, Teletype No. 151384	- - -				
1	Hand Wheel, Teletype No. 150988	- - -				
1	Tommy, Teletype No. 73404	- - -				
1	Speed Indicator, 120 cps, Teletype No. 104986	- - -				

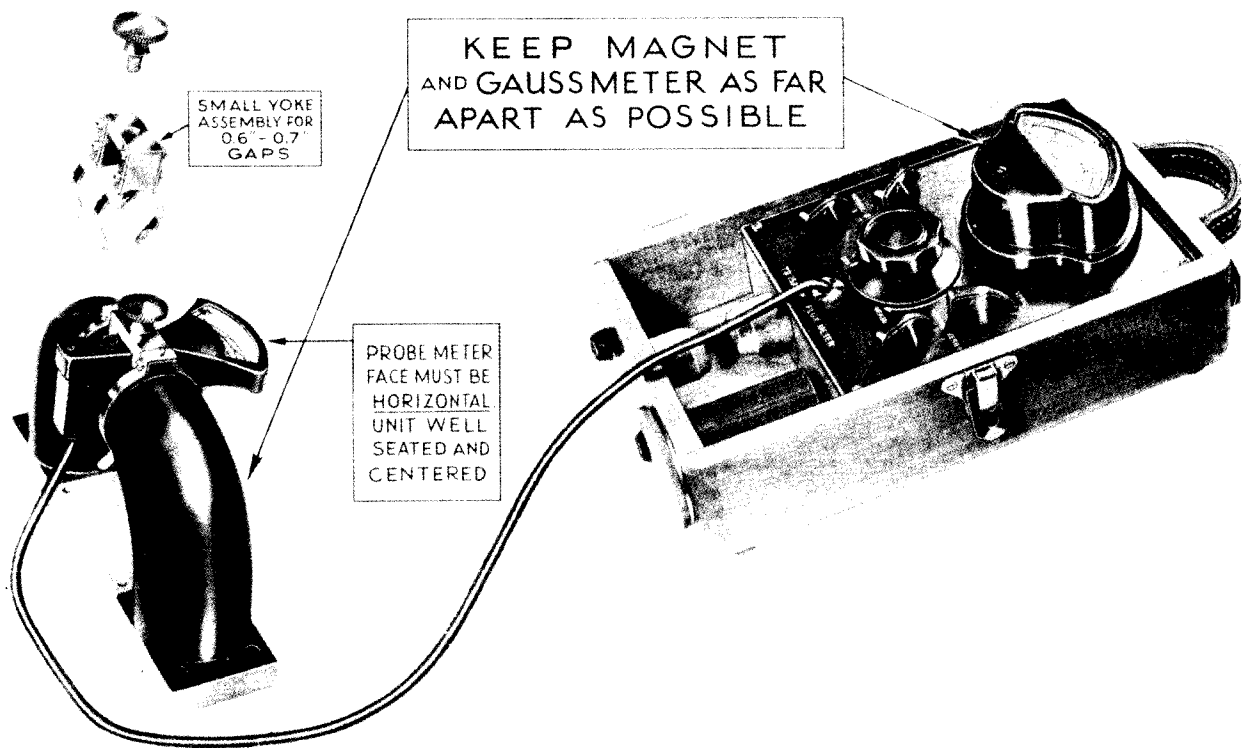
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Field Intensity Measuring Equipment

TEST SET TS-15/AP SERIES

TS-15/AP SERIES



Test Set TS-15/AP Series.

FUNCTIONAL DESCRIPTION

These Fluxmeters are designed to provide qualitative measurements of the flux densities in magnets used in magnetrons.

A gaussmeter and a probe meter are used in the operation of the equipment. The probe meter is inserted between the poles of the magnet under test, and the indications are read on the gaussmeter.

TS-15A/AP

TYPE	(USAF): Sub. Standard
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY):
STOCK NO.:	(USAF): 1690-327877010 (NAVY): F17-M-23912-4101 (ARMY): 3F4325-15A
DESIGN COGNIZANCE:	Army ESL
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	5.8
F. I. I. N.	

TS-15/AP

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Limited Standard (ARMY):
STOCK NO.:	(USAF): 7CAC-312150 (NAVY): F16-Q-303070-200, F16-Q-303072-200 (ARMY): 3F4325-15
DESIGN COGNIZANCE:	Army ESL
PROCUREMENT INFO.:	USAF Spec 7425
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	5.8
F. I. I. N.	

TS-15B/AP

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard (ARMY): Standard
STOCK NO.:	(USAF): 1690-327877030 (NAVY): (ARMY): 3F4325-15B
DESIGN COGNIZANCE:	Army ESL
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	5.8
F. I. I. N.	

UNCLASSIFIED

TS-15/AP SERIES

RELATION TO OTHER EQUIPMENT

The three fluxmeters have the same basic features. Modifications have been made in the models TS-15A/AP and TS-15B/AP to facilitate operation and insure greater accuracy of measurements.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—1.5 v, dc from dry cell.

FLUX RANGE.—

TS-15/AP: 1200 to 4500 gauss.

Accuracy: ±2% from 1200 to 1700 gauss on A Scale; 1700 to 2400 gauss on B Scale; 2400 to 3000 gauss on C Scale.

TS-15A/AP, TS-15B/AP: 1200 to 9600 gauss.

Accuracy: ±2%.

RANGE OF MEASURABLE GAPS AND POLE FACE DIAMETERS.—

TS-15/AP Gap: 1.3 to 1.5 in.

TS-15A/AP Gap: 0.6 to 0.7 in.; 1.3 to 1.5 in.

TS-15B/AP Gap: 0.6 to 0.7 in.; 1.3 to 1.5 in., 3.64 in. fxd.

TS-15/AP Pole Face Diameter: 1.5 to 2 in.

TS-15A/AP Pole Face Diameter: 7/8 to 1-1/8 in.; 1.5 to 2 in.

TS-15B/AP Pole Face Diameter: 7/8 to 1-1/8 in.; 1.5 to 2 in., 4 in. fxd.

PRESENTATION AND CONTROLS.—The GAUSSMETER and its controls are located on the front panel of the instrument box. The PROBE METER at the end of the probe cable is inserted in the gap of the magnetron. A red mark is shown on its scale and used for preliminary calibration of the GAUSSMETER. The GAUSSMETER has 3 scales (A, B, C) which are selected by means of the RANGE SELECTOR SWITCH. The NORMAL-ZERO SET switch is used in conjunction with the OFF-MEASURE control and VERNIER knob to make the preliminary adjustment of the gaussmeter. The NORMAL-REVERSE switch is used to obtain positive reading on the GAUSSMETER with the probe in any position with respect to the direction of the magnetic field.

FITTINGS AND ACCESSORIES.—The equipment is self-contained and ready for use after a 1.5 v dry cell JAN Type BA-30, not supplied with the equipment, has

been installed in its assigned compartment. In Fluxmeter TS-15/AP, the battery compartment is located under the front panel, which must be unscrewed and lifted.

In Fluxmeters TS-15A/AP and TS-15B/AP, the battery compartment is located within the accessories recess of the instrument case, and is kept closed by means of a knurled cap.

For adapting the probe meter to various sizes of magnets, each Model of the Series is supplied with one or more yoke assemblies.

Fluxmeter TS-15/AP is supplied with one small yoke assembly only.

Fluxmeter TS-15A/AP is supplied with one small and one large yoke assembly.

Fluxmeter TS-15B/AP is supplied with one small and one large yoke assembly. In addition to the two yokes, a Metal Handle and an Adaptor Nut are furnished for use with 2-inch pole face magnets, and a Test Set Adaptor for use with magnetrons whose pole gap is 3.64 in. and pole face diameter is 4 in. This Test Set Adaptor has a graduated scale on screw caps marked 1, 2, 3, 4 to cover the range of 90° to 360°.

CONSTRUCTION.—The equipment is enclosed in a wooden case with a carrying handle and two latches. The case cover is removable. The probe meter and accessories are housed inside the case.

In the case of Fluxmeter TS-15B/AP, the case has been waterproofed by means of a recessed rubber gasket around the case opening. Also, the leather handle has been replaced by a metal carrying handle.

MANUFACTURER'S OR CONTRACTOR'S DATA

Marion Electrical Instrument Co., 407 Canal St., Manchester, N.H.

Contract NXss-21899, dated 26 August 1944 (TS-15A/AP).

REFERENCE DATA AND LITERATURE

TM11-2559: Instruction Book.

AN16-35TS15-3: Maintenance Instructions for Fluxmeter TS-15/AP Series.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Fluxmeter, TS-15/AP	.47	13	9	7	9
1	Fluxmeter, TS-15A/AP	.47	13	9	7	9
1	Fluxmeter, TS-15B/AP	.47	13	9	7	9

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-15/AP Fluxmeter TS-15/AP Including: 1 Yoke Assembly	- N17-M-23912-2401 - - - 3F53400	10	6	4-1/2	6.5

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Field Intensity Measuring Equipment

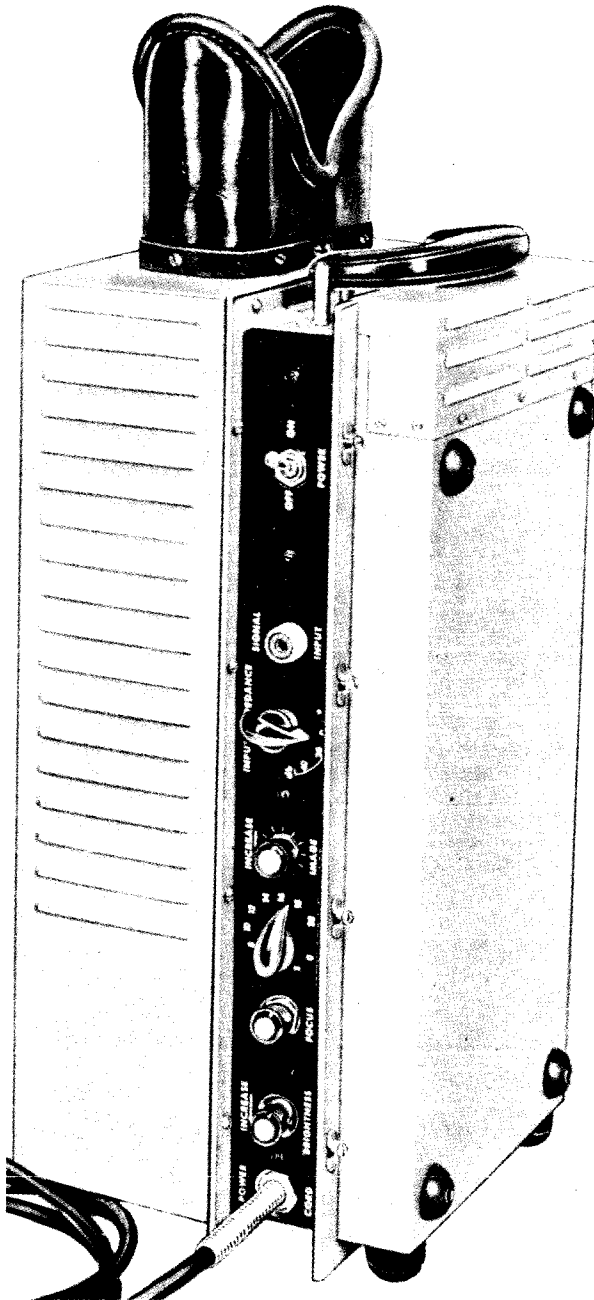
TS-15/AP SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	2 Instruction Books AN-16-35TS15-3	- - -				6.5
	TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL					
1	TS-15A/AP Fluxmeter TS-15A/AP	- F17-M-23912-4101	10	6	4-1/2	6.5
	Including:	-				
	1 Yoke Assembly	- 3F53400.1	1-11/16	1	1-1/16	
	1 Yoke Assembly	- 3F53400	2-3/16	1-1/2	1-13/16	
	2 Instruction Books AN-16-35TS15-3	- - -				
	TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL					
1	TS-15B/AP Fluxmeter TS-15B/AP	- F17-8-23912-4129	10	6	4-1/2	6.5
	Including:	-				
	1 Yoke Assembly	- 3F53400.1	1-1/16	1-11/16	1	
	1 Yoke Assembly	- 3F53400	2-3/16	1-1/2	1-13/16	
	1 Handle	- 3F4890-1	5-3/4	3/4		
	1 Adaptor Nut	- 22306-17	5/8	3/8		
	1 Test Set Adaptor MX-1028/U	-	3-1/4	x 1-1/8 dia		
	2 Instruction Books AN-16-35TS15-3	- - -				
	TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL					

UNCLASSIFIED

UNCLASSIFIED

Waveform Measuring Equipment

**OSCILLOSCOPE TS-34/AP and
TS-34A/AP****TS-34/AP,
TS-34A/AP****FUNCTIONAL DESCRIPTION**

Oscilloscope TS-34/AP Series is a small, lightweight portable equipment employing a two-inch cathode-ray tube and a magnifying glass for observing electrical waveforms. It has available either start-stop sweep or sawtooth sweep.

RELATION TO OTHER EQUIPMENT

Oscilloscope TS-34A/AP is mechanically the same as Oscilloscope TS-34/AP except for the carrying case. Oscilloscope TS-34/AP does not have a fine frequency control on the stop-start sweep generator; it has fixed durations of 5, 50 and 250 μ sec. The synchronizing input impedance of the Oscilloscope TS-34/AP is also different, being 1000 to 2000 ohms. This equipment can be used with Voltage Divider TS-89/AP at the video input to permit the display of higher voltages. These will be superseded by Oscilloscope AN/USM-32.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 1200 cps, 90 w.
PULSES AND SQUARE WAVES OBSERVABLE.—

Duration: 0.25 to 30,000 μ sec.

Polarity: Positive or negative.

SINE WAVES OBSERVABLE.—30 cps to 2.5 mc to within 3 db of their true sine wave form.

INPUT IMPEDANCE.—

Oscilloscope Alone, Low: 62 ohms.

Oscilloscope Alone, High: 0.43 meg shunted by 30 μ f.

Oscilloscope with Probe: 4 meg shunted by 12 μ f.

INPUT VOLTAGE.—

Oscilloscope Alone, Low: 0.1 to 1 v.

Oscilloscope Alone, High: 0.1 to 100 v.

Oscilloscope with Probe: 1 to 450 v.

SYNCHRONIZATION.—

External, Without Probe: 2 to 100 v.

External, With Probe: 20 to 450 v.

Input Impedance: 0.4 meg shunted by 30 μ f (TS-34A/AP only); 1000 to 2000 ohms (TS-34/AP only).

SWEEP SPEEDS, APPROX (TS-34A/AP).—

Start-Stop Duration:

Fast: 4.5 to 8 μ sec.

Medium: 20 to 50 μ sec.

Slow: 120 to 280 μ sec.

TS-34/AP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Standard
STOCK NO.:	(USAF): (NAVY): F16-Q-303180-200 (ARMY): 3F4325-34A
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	USAF Spec No. 71-5043, Military
PROCUREMENT COG.:	Navy, BUSHIPS Spec No. 0-15630(SHIPS)
RDB IDENT. NO.:	3.1
F. I. I. N.	

TS-34A/AP

TYPE	(USAF): Minor Limited Standard
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): 7CAC-611115 (NAVY): F16-Q-303185-200 (ARMY): 3F4325-34
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	USAF Spec No. 71-5043, Military
PROCUREMENT COG.:	Navy, BUSHIPS Spec No. 0-15630(SHIPS)
RDB IDENT. NO.:	3.1
F. I. I. N.	

UNCLASSIFIED

4.3 TS-34/AP: 1

TS-34/AP, TS-34A/AP

Sawtooth Duration:

- Fast: 20 to 200 μ sec.
- Medium: 200 to 4000 μ sec.
- Slow: 4000 to 100,000 μ sec.

Sawtooth Frequency:

- Fast: 50,000 to 5000 cps.
- Medium: 5000 to 250 cps.
- Slow: 250 to 10 cps.

SWEEP SPEEDS, APPROX (TS-34/AP).—

Start-Stop Duration (TS-34/AP only):

- Fast: 5 μ sec.
- Medium: 50 μ sec.
- Slow: 250 μ sec.

Sawtooth Frequency Ranges:

- Fast: 5000 to 50,000 cps.
- Medium: 250 to 5000 cps.
- Slow: 10 to 250 cps.

Sawtooth Duration:

- Fast: 20 to 200 μ sec.
- Medium: 200 to 4000 μ sec.
- Slow: 4000 to 100,000 μ sec.

AMBIENT TEMPERATURE RANGE.— -40° F to +120° F.

ATTENUATION "Y" AMPLIFIER.—

Input Impedance Switch: 0, 20 or 40 db on High impedance pos.

Input Attenuator: 0 to 20 db in 2 db steps.

PRESENTATION AND CONTROLS.—Electrical waveforms are displayed on the face of a two-inch cathode ray tube. A built-in lens magnifies the image about two times and enables the operator to observe the screen comfortably from a closer position than would otherwise be possible. The usual focus, brightness, and position controls are provided. A switch permits selection of sawtooth or start-stop sweep. A three position selector switch gives coarse adjustment of the sweep frequency and a continuous control gives fine frequency adjustment. A toggle switch is used to select sync polarity for start-stop sweep. A four position Input Impedance selector has a LOW position and three HIGH positions with 0, 20, and 40 db attenuation.

Additional attenuation is provided in 2 db steps from 0 to 20 db by the input attenuator.

FITTINGS AND ACCESSORIES.—Two probes with cords, two coaxial cords, one power cord and two plate connecting cords are supplied. These may be connected as shown below.

CONSTRUCTION.—The Oscilloscope, TS-34/AP Series has a central steel framework on which all the apparatus is mounted. Removable sheet steel covers attached to the top and bottom of this frame give access to all component parts. Perforated inner linings act as shields against microwave fields. The control knobs and jack are mounted on both sides of the unit. A carrying handle is provided on the viewing end.

The carrying case of the TS-34A/AP is made of aluminum and that of the TS-34/AP is made of plywood and fiber. Both have a compartment for the accessories.

MANUFACTURER'S OR CONTRACTOR'S DATA

Western Electric Co., 195 Broadway, New York, N. Y.

TS-34/AP:

- Contract NOas-1277.
- Contract 342-44.
- Contract 569-44.
- Contract 267-44.
- Contract 709-44.
- Contract 468-44.
- Contract 85-44.

TS-34A/AP:

- Contract NXsr-51503.

TUBE COMPLEMENT

TS-34/AP or TS-34A/AP

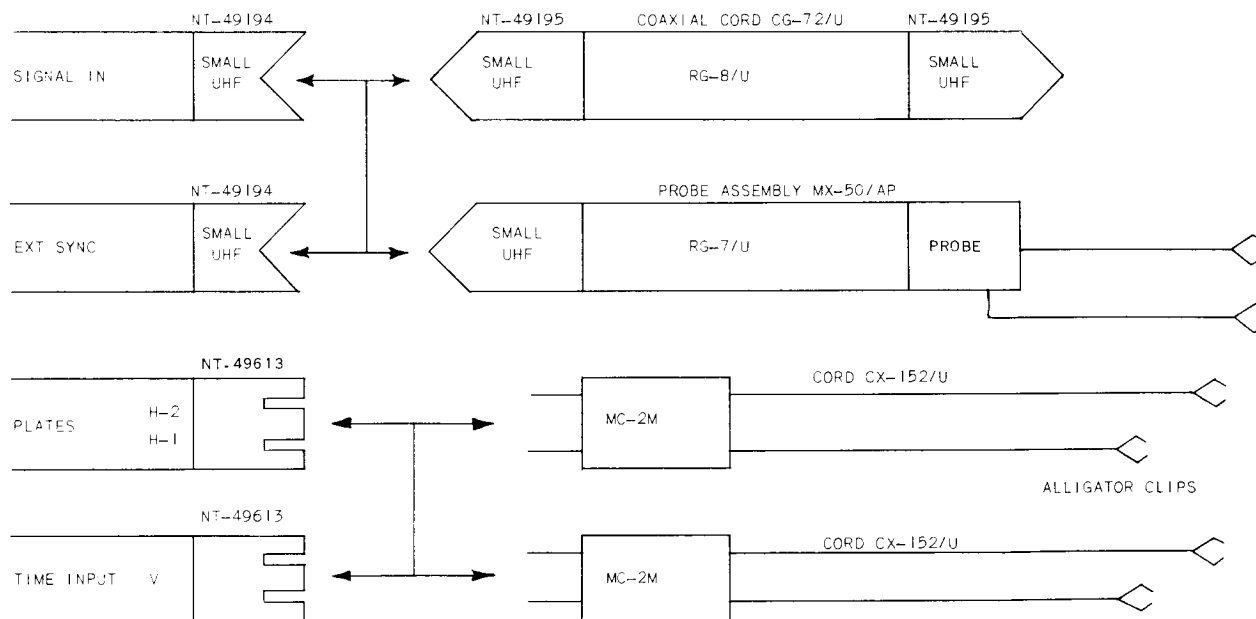
- (1) 6X5-GT/G (1) 6SN7-GT (2) 6AG7 (4) 6AK5
- (1) 5Y3-GT/G (2) 6SL7-GT (1) 2AP1

REFERENCE DATA AND LITERATURE

AN 08-35TS34-3, TM 11067: Maintenance Instructions (TS-34/AP).

NAVSHIPS 95343: Handbook of Maintenance Instructions for Oscilloscope TS-34A/AP.

TM 11-1067A: Oscilloscope TS-34A/AP.



BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Waveform Measuring Equipment

TS-34/AP, TS-34A/AP

EQUIPMENT SUPPLIED

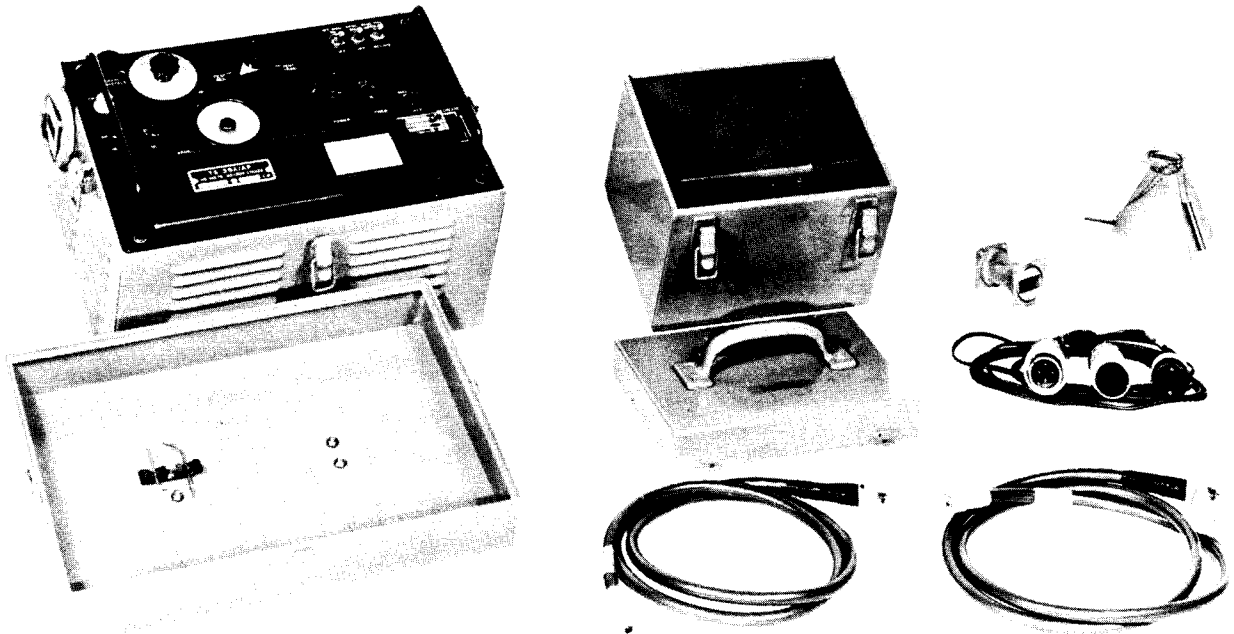
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope TS-34A/AP including:	- F16-0-78232-5186 3F4325-34A	20-3/4	9	8	29.0
2	Probe Assembly MX-50/AP	- N17-L-63364-8876 1F475-50	50 lg x 1 dia			1.0
2	Coaxial Cord CG-72/U	- N16-C-11586-2001 1F430-107.120	120 lg			2.5
2	Cord CX-152/U	- N17-C-48189-1021 3E6000-152	12 lg			.25
1	Cord CX-150/U	- N17-C-48262-1615 3E5000-150	15 lg			.75
1	Case CY-213/AP	- N16-C-17001-239 3F2623-213	23	11	12	6.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			39.5
			TOTAL			
1	Oscilloscope TS-34/AP including:	- F16-0-78232-5207 3F4325-34	6	8	15	26.0
1	Probe Assembly MX-50/AP	- N17-L-63364-8876 1F475-50	50 lg x 1 dia			1.0
2	Coaxial Cord CG-72/U	- N16-C-11586-2001 1F430-107.120	120 lg			2.5
2	Cord CX-152/U	- N17-C-48189-1021 3E6000-152	12 lg			2.5
1	Cord CX-150/U	- N17-C-48262-1615 3E6000-150	15 ft lg			0.75
1	Instruction Book	- 3F4325-34/Bi				
1	Case CY-110/U	- 3F2529-110	29	9-3/4	10	15.75
			TOTAL LESS MAINTENANCE REPAIR PARTS			48.5
			TOTAL			

UNCLASSIFIED

4.3 TS-34/AP: 3

UNCLASSIFIED

Combination and Group Test Set

SIGNAL GENERATOR TS-35A/AP**TS-35A/AP***Signal Generator TS-35A/AP.***FUNCTIONAL DESCRIPTION**

Signal Generator TS-35A/AP is a general purpose set designed for the testing and general maintenance of radar equipment operating in the range of 8500 to 9600 megacycles. Its main functions are:

To generate SHF signals of known frequency and power, either unmodulated, pulse-modulated or frequency modulated, with or without synchronization.

To detect and measure the frequency and average power of modulated or unmodulated SHF signals.

To detect radar signals and observe the video waveshapes of radar transmitters or receivers with the help of an oscilloscope, and to determine the receiver recovery characteristics.

RELATION TO OTHER EQUIPMENT

This equipment supersedes Signal Generator TS-35/AP and is similar to it. In turn, it is superseded by Test Set TS-147A/UP. Certain tests with these signal generators require the use of Oscilloscopes TS-34/AP Series or TS-239/UP Series.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 1600 cps, 1.7 amp.

FREQUENCY RANGE.—8500 to 9600 mc.

Accuracy: ± 5 mc, absolute, ± 0.5 mc on differences.

TEMPERATURE.—

Ranges (all functions): -4 to $+50^{\circ}\text{C}$.

Coefficient (frequency meter): .05 mc per $^{\circ}\text{F}$, at 80°F .

POWER RANGE.—

Power Meter: 0.1 mw to 2 w avg.

Signal Generator: 0 to 70 db below 1 mw peak, cw or pulsed.

MAXIMUM INPUT POWER.—

Frequency Meter and Power Meter: 200 w peak or 2 w avg.

Signal Generator (sync input): 2 v peak max, crystal in.

Waveshape Detector: 0.25 w peak, (0.1 v out across 72 ohms).

MINIMUM INPUT POWER.—

Frequency Meter: 0.1 mw avg.

Power Meter: 0.1 mw avg.

Signal Generator and Wave Shape Detector: 0.8 v peak at video jack for 1 μsec pulse, 15 to 20 v across 16,000 ohms, 80 μmf .

TYPE OF INDICATION.—

Frequency Meter: Min. on dc meter.

Power Meter, Signal Generator and Wave Shape Detector: Linear reading on dc meter up to 1 mw, db on attenuator dial above 1 mw.

ES0-N16-AT-75311

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Sub. standard
	(ARMY):
STOCK NO.:	(USAF): 1690-327022035
	(NAVY): F16-Q-303199-200
	(ARMY): 3F3901-35A
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec. RE 13A965
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.1.3
F. I. I. N.	

UNCLASSIFIED

4.10 TS-35A/AP: 1

TS-35A/AP

Internal Pulse Characteristics: 2 μ sec on, 6 μ sec off, UNSYNC; sync by rectified rf pulse or ext video pulse, 7 μ sec on, 10 μ sec off, followed by 2 μ sec pulses every 8 μ sec.

FREQUENCY MOD CHARACTERISTICS.—20 mc sweep every 8 μ sec centered on tuned frequency.

SIGNAL GAIN OR LOSS.—

Free Space, Dipole to Horn: -63 db at 80 ft to 51 db at 20 ft.

Horn Ant: +34 db.

Waveguide to Coaxial cable Plug: 3 db, typical.

Waveguide to Coaxial Cable Jack: 7 db, typical.

SWR SIGNAL ACCESSORIES.—

Waveguide choke coupling: 1.2 max.

Waveguide to Coax. Plug: 1.2 max.

Waveguide to Coax. Jack: 1.2 max.

CONSTRUCTION.—The signal generator is encased in a metal box provided with rubber feet, louvers and four spring latches which are used to fasten the box lid cover on the front panel. The cover is provided with a carrying handle.

All the accessories are housed in a smaller box with spring latch fixtures and carrying handle.

PRESENTATION AND CONTROLS.—

THE FOLLOWING ITEMS ARE ON THE RIGHT END PANEL OF THE UNIT:

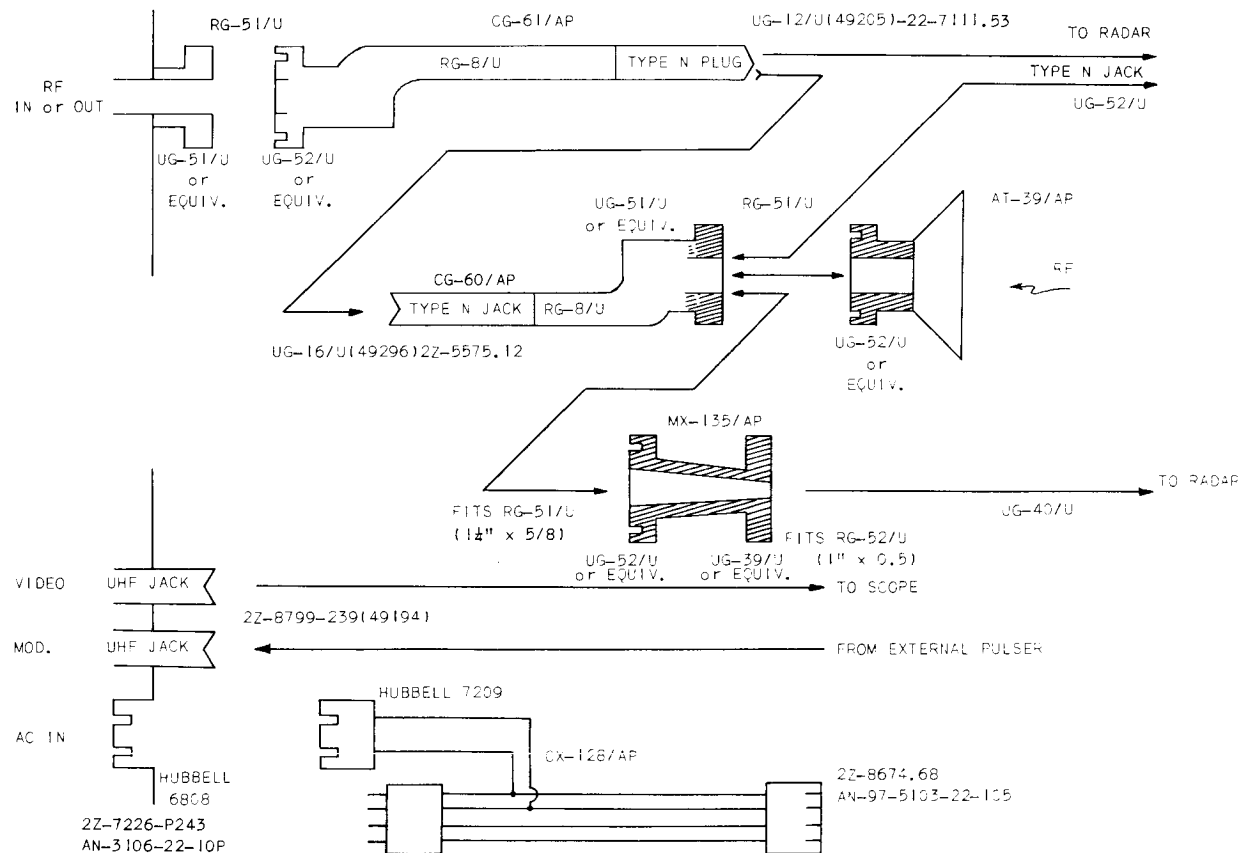
MARKINGS	ITEM	FUNCTION
ON-OFF	Toggle Switch	Controls ac power input
115v - 50 - 1600 (cps)	Jack	AC power connection

2 AMP SPARE	Fuses, 2 amp	Protection to input power
MOD	Fuses, 2 amp	Spare fuses
VIDEO	Coaxial jack	External pulse input
	Coaxial jack	Crystal detector output and external sync input
LT	Push button switch	Prebeats compensating thermistor

THE FOLLOWING ITEMS ARE ON THE TOP PANEL:

ZERO BAL	Small knob	Zero adjust on power meter
ATTENUATOR (DB)	Graduated dial	Control of rf power in waveguide
35 DB PAD	Pointer knob	35 db pad in waveguide
CRYSTAL	Crystal pocket cover	Access to crystal for replacement
SPARE CRYSTALS	Compartment cover	Convenient storage for spare crystals
ADJ CRYSTAL	Shaft with screw-driver slot	Matches crystal to waveguide
FREQ	Small knob	Controls oscillator frequency
REP	Small knob	Controls frequency by repeller voltage
SENS	Push button switch	Increase sensitivity of frequency measuring circuit
POWER	Large knob	Changes oscillator coupling to waveguide
MEAS FREQ	Knurled micrometer thumb screw	Controls resonant frequency of wavemeter cavity
INT MOD-CW	Toggle switch	Selects pulse-fm, or cw
SYNC	Toggle switch	Connects synchronizer to video jack
SYNC POL	Toggle switch	Selects positive or negative input synchronizing pulse

FITTINGS AND ACCESSORIES.—The probes used and connections for the accessories with this equipment are shown in the following chart.



BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Combination and Group Test Set

TS-35A/AP

MANUFACTURER'S OR CONTRACTOR'S DATA

Western Electric Co., New York, N.Y.
Order No. 870-DAY-45 RA-Contract No. NOrd 4748,
NOrd 3644, NOrd 5557.

TUBE COMPLEMENT

(3) 6X5-GT (1) VR-150 (2) 121A
(1) 6V6-GT (1) 2K25 (2) 6SL7-GT
(3) 6SN7-GT

REFERENCE DATA AND LITERATURE

SHIPS 339: Handbook of Maintenance Instructions, Sig.
Gen. TS-35A/AP.

EQUIPMENT SUPPLIED

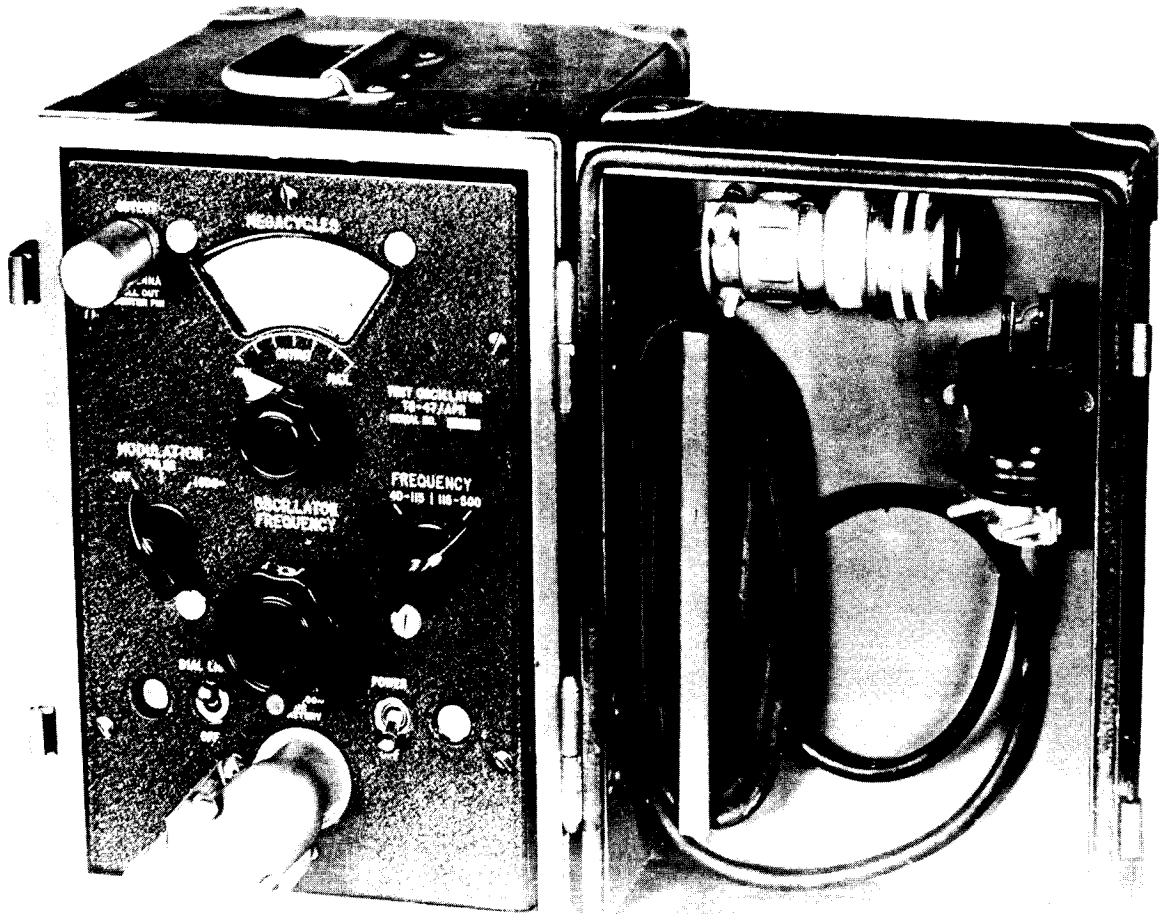
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	Signal Generator including:	- F17-T-20133-6101 -	11-1/4	15-5/8	10-5/8	26.3
	1 Accessory Set X-66167/B	1690-327002032 - -				6.2
	Consisting of:					
	1 Carrying Case CY-94/AP	1690-286765822 - 2Z1891-94	9-3/16	9-5/32	8- 1/4	(2.5)
	1 Horn Antenna AT-39/AP	1690-201202515 N16-A-5118 2A203-39				
	1 Cord CG-60/AP	1690-150430655 - 1F430-60.60				
	1 Cord CG-61/AP	1690-150430657 N16-C-11615-6969 1F430-61.60				
	1 Adaptor MX-135/AP	1690-286049845 - 2Z301-135				
	1 Cord CX-128/AP	1690-324759888 - 3E6000-128-10				
			TOTAL LESS MAINTENANCE REPAIR PARTS			32.5
					TOTAL	

UNCLASSIFIED

Signal Generating Equipment

TEST OSCILLATOR TS-47/APR

TS-47/APR



Test Oscillator TS-47/APR.

FUNCTIONAL DESCRIPTION

The Test Oscillator TS-47/APR is a small, light-weight oscillator primarily designed to provide a calibrated high frequency signal source for testing receivers in the field. It covers the range from 40 to 500 mc with useful harmonics to 3000 mc.

RELATION TO OTHER EQUIPMENT

Used primarily to determine whether wide band receivers such as countermeasure receivers are in operating condition.

ELECTROMECHANICAL DESCRIPTION**POWER SUPPLY.—**

80, 115 or 230 v ac, 50 to 2600 cps, 13.5 w; or 6.3 v dc at 0.55 amp (dial light off), 220 v, dc at 16 ma (1000 cps Mod). (Dial light draws 0.25 amp at 6.3 v.)

FREQUENCY RANGE.—40 to 500 mc (in two bands).

Accuracy: Within $\pm 1\%$.

OUTPUT POWER.—3 mw (up to 400 mc).

Impedance: 50 ohms.

MODULATION.—

Amplitude: 1000 cps, 50% approx.

Pulse repetition rate: 500 pps.

Pulse duration: 70 μ sec.

PRESENTATION AND CONTROLS.—The frequency control dial is calibrated directly in frequency. The position of the power line voltage selector switch is indicated through a small window in the panel.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF): 1690-327022140
	(NAVY): F16-Q-303250-200
	(ARMY): 3F3901-47
DESIGN COGNIZANCE:	Army, ESL
PROCUREMENT INFO.:	Signal Corps Spec No. 271-5077
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	Category 4.2.2
F.I.I.N.	

UNCLASSIFIED

4.4 TS-47/APR: 1

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

TS-47/APR

FITTINGS AND ACCESSORIES.—The output connector is a modified type N connector. The center conductor of this connector can be pulled out to form an antenna with a maximum length of 5 inches. One ac and one dc cable, terminating in standard AN connectors, are supplied. These plug directly into the power receptacle on the panel.

CONSTRUCTION.—The unit is mounted in an aluminum box on shock-absorbing mounts to isolate vibration. The box is then enclosed in an airplane type luggage carrying case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Fairchild Camera and Instrument Corp., Jamaica, New Jersey.
Order No.600-DAY-45-SL, dated 19 December 1944.
Approximate Cost: \$429.

Order No. 545-DAY-44, dated 31 December 1943.
Approximate Cost: \$450.
General Radio Co., 275 Mass. Ave., Cambridge 39, Mass.
Contract No. S&A 5818, dated August 1945.

TUBE COMPLEMENT

(2) 9002 (1) 6X5-GT

REFERENCE DATA AND LITERATURE

Preliminary Handbook of Operating Instructions for Test Oscillator TS-47/APR.
TO 16-35TS47-2: Maintenance Instructions.
8-TS-47/APR (ASF Cat. Sig) Higher Echelon Parts List.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Oscillator TS-47/APR	0.86	14	12	10	24

EQUIPMENT SUPPLIED

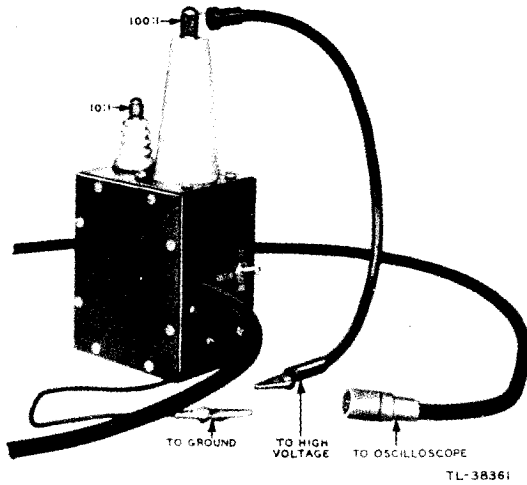
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Oscillator TS-47/APR	1690-327022300 N16-G-62656-5641 3F3901-47.1	11-3/8	6-3/4	9	15
1	Cord CX-153/U	1690-322849984 - 3E6000-153	72 lg			
1	Fuse 1/2 amp	3300-38798000 - 2Z2595.3				
1	Lamp	3300-292403000 - 2Z5927				
1	Instruction Book	- - 6D9810-47				
TOTAL LESS MAINTENANCE REPAIR PARTS						15
TOTAL						

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Associated Devices For Electronic Test Equipment

VOLTAGE DIVIDER TS-89/AP

TS-89/AP



Voltage Divider TS-89/AP.

FUNCTIONAL DESCRIPTION

Voltage Divider TS-89/AP provides a means by which various oscilloscopes may be used to view and measure video pulses between 200 and 20,000 volts in high impedance circuits.

RELATION TO OTHER EQUIPMENT

Measurements with this equipment necessitate the use of an oscilloscope or synchroscope.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RESPONSE.—150 cps to 5 mc, flat within ± 2 db.

OPERATING RANGES.—

Volts, 100:1 Ratio: 2000 to 20,000 v.

Volts, 10:1 Ratio: 200 to 2000 v.

Accuracy: Ratio, Within $\pm 15\%$ of designated values.

INPUT IMPEDANCE.—2000 ohms in series with 10 μmf capacitance.

OUTPUT IMPEDANCE.—4 meg shunted by 20 μmf .
PULSE DURATION.—100 μsec approx.
TEMPERATURE RANGE.— -40°F to $+120^\circ\text{F}$.
PRESENTATION AND CONTROLS.—The top side supports the two high-voltage porcelain insulated binding posts, one for each voltage range. The ratio selector switch, 10 or 100, is located on one side.

FITTINGS AND ACCESSORIES.—All cables for the input and output connections are permanently attached. Both the ground cable (13 in.) and the high voltage input cable (19 in.) terminate in an alligator clip.

The output cable is made of 5 feet of coaxial cable RG-8/U or similar, with a Signal Corps Type PL 259 (Small Coaxial UHF Navy Type 49190) at its scope end. An adaptor (UHF to Jones) is linked permanently by a bead chain to the end of the output cable, to be available for use with scopes having a Jones input jack.

CONSTRUCTION.—The voltage divider is contained in a sheet brass box. Hooks are attached to the top of the box so that the unit may be conveniently hung in a protective cage while in use.

MANUFACTURER'S OR CONTRACTOR'S DATA

United Cinephone Corp., Torrington, Conn.
 Western Electric Co., 120 Broadway, New York, N.Y.
 Contract NAVAER 00168, 00340.

REFERENCE DATA AND LITERATURE

AN-16-35TS89-3: Handbook of Maintenance Instructions for Voltage Divider TS-89/AP.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-303420-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	11.12
F. I. I. N.:	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Voltage Divider TS-89/AP (Shelf package, water-resistant carton)	.25	12	6	6	6

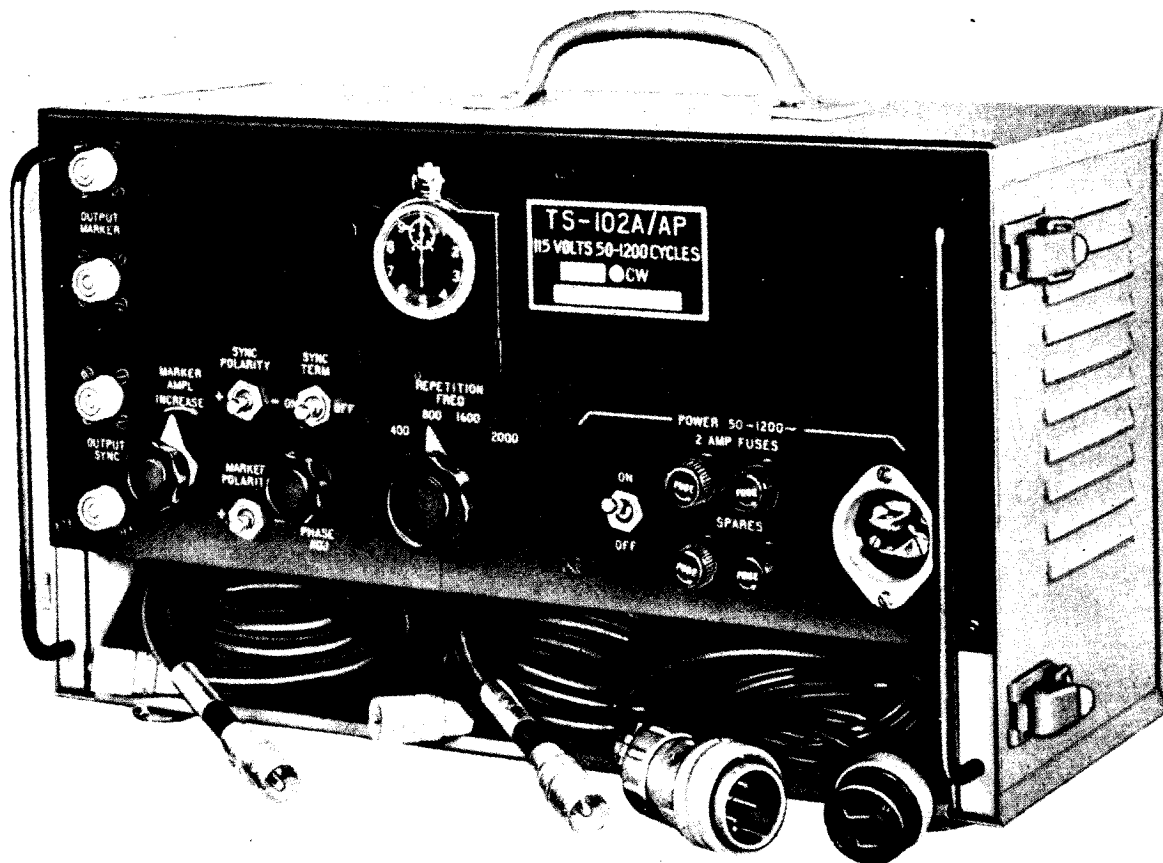
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Voltage Divider TS-89/AP	- F16-N-30826-1070	10-1/4	4-3/4	4-1/4	4.0
2	Handbook of Maintenance Instructions AN-16-35TS89-3	- 3F4325-89/B1	.			
TOTAL LESS MAINTENANCE REPAIR PARTS						4.0
TOTAL						

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Time Based Measuring and Counting Equipment

**PRECISION RANGE CALIBRATOR TS-102/
AP and TS-102A/AP****TS-102/AP,
TS-102A/AP**

Precision Range Calibrator TS-102A/AP.

FUNCTIONAL DESCRIPTION

This equipment is essentially a pulse generator producing a train of square synchronizing pulses and triangular pulses for range calibration. It produces precisely timed marker pulses corresponding to a 500 yard range variable in phase with respect to the synchronizing pulses continuously over 360 degrees.

RELATION TO OTHER EQUIPMENT

Used for calibration of the range units of radar receivers. Precision Range Calibrator TS-102A/AP has an aluminum case and two marker and synchronizing jacks while the TS-102/AP unit has a steel case and single marker and synchronizing jacks. This equipment will be superseded by Range Calibrator TS-573/UP.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—110 to 120 v, ac, 50 to 1200 cps, 65 w.
SYNC OUTPUT PULSE, SQUARE WAVE.—

Repetition Frequency: 400, 800, 1600 or 2000.

Duration: 0.8 μ sec.

Amplitude: ± 50 v.

MARKER OUTPUT PULSE, TRIANGULAR WAVE.—

Repetition Frequency: 327.800 pps ($1/327.800 = 3.05$
 μ sec = 500 yd echo time).

Amplitude: 0 to ± 30 v continuously variable.

PHASE STABILITY, SYNC AND MARKER PULSES.—
 ± 0.2 μ sec, corresponding echo of 10 ft.

PHASE ADJUSTMENT, MARKERS WITH RESPECT TO SYNC.—0 to 360° continuously variable.

PRESENTATION AND CONTROLS.—The synchronizing and marker output jacks are of the UHF type and are front panel mounted.

The marker amplitude, phase adjustment and repetition rate controls are on the front panel. Marker and Sync probe polarity switches and a main power switch are also on the front panel. A stop watch is provided in a special mount at the top center of the front panel.

TS-102A/AP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-303470-200
	(ARMY):
DESIGN COGNIZANCE:	BUSHIPS, USAF, ARL
PROCUREMENT INFO.:	Navy Spec RE-13A918
PROCUREMENT COG.:	
RDB IDENT. NO.:	8.1
F. I. I. N.	

UNCLASSIFIED

4.8 TS-102/AP: 1

TS-102/AP, TS-102A/AP

It may be removed easily if desired. Its purpose is to determine the rate of travel of marker pulses for radar equipments having range-rate-determining circuits.

FITTINGS AND ACCESSORIES.—A 15 foot power supply cord is furnished with a female plug on the equipment end to engage the equipment receptacle and an AN-3106-22-10P male plug on the other end to engage a special receptacle on equipment to be tested. Two coaxial cables are supplied each 5 feet long and fitted with Navy Type 49190 UHF coaxial plugs on each end, for output sync and output marker signals.

CONSTRUCTION.—This equipment has an aluminum case with a carrying handle. An accessory storage compartment is provided within the main unit case below the main panel. A main panel cover is secured by latch fasteners.

MANUFACTURER'S OR CONTRACTOR'S DATA

Western Elec. Co., Inc., New York, N.Y.
Contract NXsr-78776.

TUBE COMPLEMENT

(2) 6SN7-GT (5) 6AC7 (2) 6AG7
(1) 5Y3-GT

REFERENCE DATA AND LITERATURE

AN16-35TS102-2: Manuscript of Instructions for Operation and Maintenance of Precision Range Calibrator TS-102/AP Maintenance Instructions.
CO-AN08-35TS102-2: Instruction Book, Range Calibrator TS-102/AP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Range Calibrator TS-102/AP and Accessories (shelf package)	2.96	16	20	16	45

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-102/AP Precision Range Calibrator TS-102/AP	1690-328999860 - 3F4325-102.1	11-1/2	16-3/4	9-3/4	31
2	Cord CG-72/U (5 ft)	-				
1	Cord CX-154/AP	-	120 lg			
2	Cord CD-800	3E6000-154	120 lg			
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			38
1	TS-102A/AP Range Calibrator TS-102A/AP	-	11	17-7/8	9-7/8	31
1	Cord CX-234/AP	-	180 lg			
4	Cord CG-107/U	-	60 lg			
1	Adaptor CX-790/U	-	10 lg			
2	Cord CG-177/U	-	72 lg			
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			

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Combination and Group Test Set

**WAVE AND POWER METER SET
SET TS-107/TPM-1**
TS-107/TPM-1

Wave and Power Meter Set TS-107/TPM-1.

FUNCTIONAL DESCRIPTION

The Wave and Power Meter Set TS-107/TPM-1 is a portable self-contained unit used to check frequencies of transmitters, signal generators and receiver beating oscillators in the band from 500 to 1500 mc. In addition, it will measure the average power of CW, modulated or pulsed carriers and provide a video output for observation on an oscilloscope. This equipment may also be used to measure the converter crystal current of certain radar systems.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard (BUSHIPS)
	(ARMY):
STOCK NO.:	(USAF): 1690-327879431
	(NAVY): F16-Q-303485-200
	(ARMY): 3F4325-110
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	USAF Spec No. 371-5080
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.1.1
F.I.I.N.	

UNCLASSIFIED

4,10 TS-107/TPM-1: 1

Combination and Group Test Set

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TS-107/TPM-1

RELATION TO OTHER EQUIPMENT

The Wave and Power Meter Set TS-107/TPM-1 is a component of the depot testing equipments for AN/TPS-1, Mark 20 and other radars.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—4.5 v battery, BA-27, self-contained.
 FREQUENCY RANGE.—500 to 1500 mc.

Accuracy: ±1 db nominal.

IMPEDANCE, ALL RF CONNECTORS.—50 ohms.

INPUT POWER RANGE.—0.5 to 12 mw (-3 to +11 dbm).

With 10 db Pad: 0.5 to 120 mw (-3 to +21 dbm).

PAD ATTENUATOR.—10 db ±0.5 db.

DC METER RANGE.—0 to 1.5 ma, for external use; 0 to 15 ma, for power measurements.

TEMPERATURE RANGE.— -23.3°C to +50°C.

PRESENTATION AND CONTROLS.—The frequency meter consists of a tunable coaxial quarter wave cavity. A counter type dial indicates the relative length of inner conductor projecting into the cavity. This number is referred to a calibration chart for finding the frequency. Power is measured by means of a thermistor bridge and dc meter. Power is determined by reference to a conversion chart. A crystal detector is used for obtaining the video component and indicating resonance for CW signals. The resonator is used in such a way as to produce a null for this purpose.

The panel is fitted with 2 UHF Navy Type NT-49194 coaxial receptacles for direct meter and video

connections, and three UG-10/U, type N coaxial receptacles; "crystal in," "frequency meter in" and "frequency meter out" connections. A dc milliammeter is used for determining balance of the thermistor bridge. It has a sensitivity key for fine adjustment of balance.

FITTINGS AND ACCESSORIES.—Two interconnecting coaxial cables are supplied, one 11 inches long and one 2 feet long fitted with coaxial Type N plugs at each end.

A fixed 10 db pad is supplied with fittings so that it can be inserted in either cable.

A power computer of the circular slide rule type made of white Vinylite is supplied to calculate power from measured and known data.

CONSTRUCTION.—The measuring unit is mounted in a fiber covered plywood case with carrying handle. Accessories are fitted in the cover.

MANUFACTURER'S OR CONTRACTOR'S DATA

Western Elec. Co., Inc., New York, N.Y.
 Contracts NOrd 3456, NOrd 10095.

TUBE AND CRYSTAL COMPLEMENT

(1) 1N21B Rectifier Crystal.

REFERENCE DATA AND LITERATURE

Handbook of Maintenance Instructions for Wave and Power Meter Set TS-107/TPM-1, NAVSHIPS 900,454A.

SHIPPING DATA

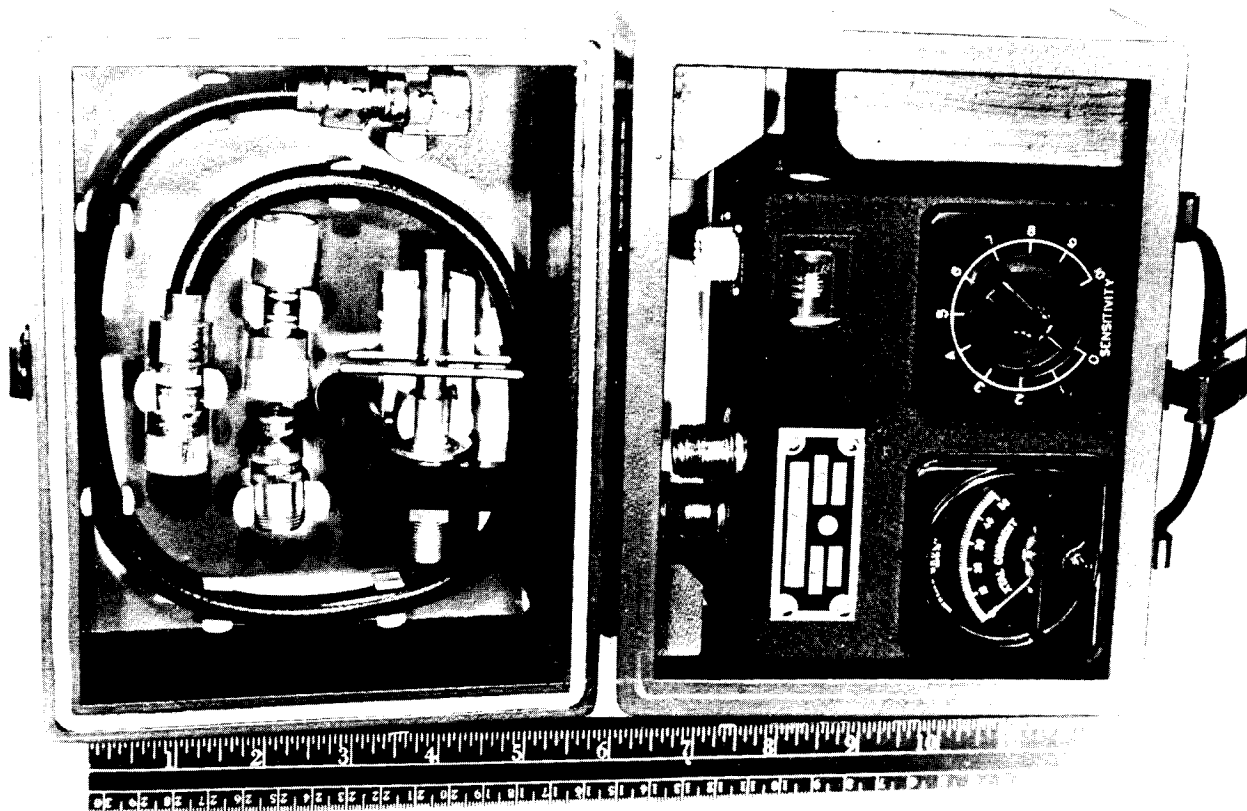
NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Wave & Power Meter TS-107/TPM-1 with Accessories	1.38	11	12	18	26

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Wave & Power Meter Set TS-107/TPM-1	1690-327860230 - 3F4258-107	7-3/16	14-3/4	9-9/16	18
1	Spare Thermistor CW-632568	-				
1	Spare Crystal 1N21B	-				
1	10 DB Pad X66445B	-				
1	Cable CG-311/U (11")	-	12 lg			
1	Cable CG-311/U (2'-1")	-	25 lg			
1	Allen Wrench 6R57400 #8	-				
1	Frequency Calibration Chart	-				
1	Power Computer	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Frequency Measuring Equipment

**WAVEMETER TEST SET
TS-117/GP****TS-117/GP**

Wavemeter Test Set TS-117/GP.

FUNCTIONAL DESCRIPTION

Wavemeter Test Set TS-117/GP is designed for frequency measurements of radar systems operating in the band from 2400 mc to 3400 mc. The unit can be used to measure the frequency of a system by attaching the supplied antenna and placing the unit in the field of microwave energy radiating from the antenna. Frequencies of local oscillators can be measured if a suitable cable connection is made. The unit can be used for relative field strength measurements and to determine relative output of radar systems operating within the above stated frequency range.

RELATION TO OTHER EQUIPMENT

The TS-117/GP supersedes Thermistor Frequency Meter NAVY TYPE 60 ABM.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—2400 mc to 3400 mc.

Accuracy: $\pm 0.05\%$ overall.

Stability: -40°C to $+40^{\circ}\text{C}$ produces a max frequency change of one part in 4000.

Q.—1800 to 2000.

POWER INPUT, RF.—100 to 1000 mw.

SENSITIVITY.—500 mw full scale deflection.

PRESENTATION AND CONTROLS.—Correct tuning is indicated by a dip or a peak in the reading of the XTAL CURRENT meter, depending upon which receptacle is connected to the rf pick-up device. The tuned frequency can be determined from micrometer readings and with the calibration chart. The TUNE TO PEAK method is always used for pulsed power measurements to prevent damage to the crystal. An oscilloscope may be connected to the video receptacle for examination of the pulse.

FITTINGS AND ACCESSORIES.—Two coaxial adaptors, one pick-up antenna and one cable are supplied. Their

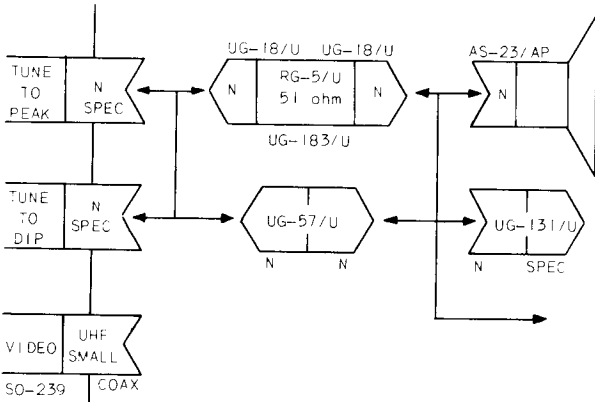
TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF): 1690-327879455
	(NAVY): F16-Q-303548-200
	(ARMY): 3F4325-117
DESIGN COGNIZANCE:	Signal Corps, ESL
PROCUREMENT INFO.:	Army Spec No. 171-2223
PROCUREMENT COG.:	Signal Corps
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.:	

UNCLASSIFIED

4.2 TS-117/GP: 1

TS-117/GP

constructional details and their use are shown on the following chart.



CONSTRUCTION.—The Test Set is enclosed in a metal case. The metal case is placed inside a wooden carrying case which has a handle in the side, and a cover with clips to accommodate the accessories. Two spare crystals are mounted inside the Test Set case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Sperry Gyroscope Co., Great Neck, New York.
Order Nos. 2338-MPD-45 & 2538-MPD-45 Mfr.
Type No. MKS22.

TUBE AND CRYSTAL COMPLEMENT

(1) 1N21B Crystal

REFERENCE DATA AND LITERATURE

TM 11-2538: War Dept. Technical Manual, Wavemeter Test Set TS-117/GP.
CO-AN16-35TS117-3: Maintenance Instructions for Wavemeter Test Set TS-117/GP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Wavemeter Test Set TS-117/GP	0.69	12	10	10	9.5

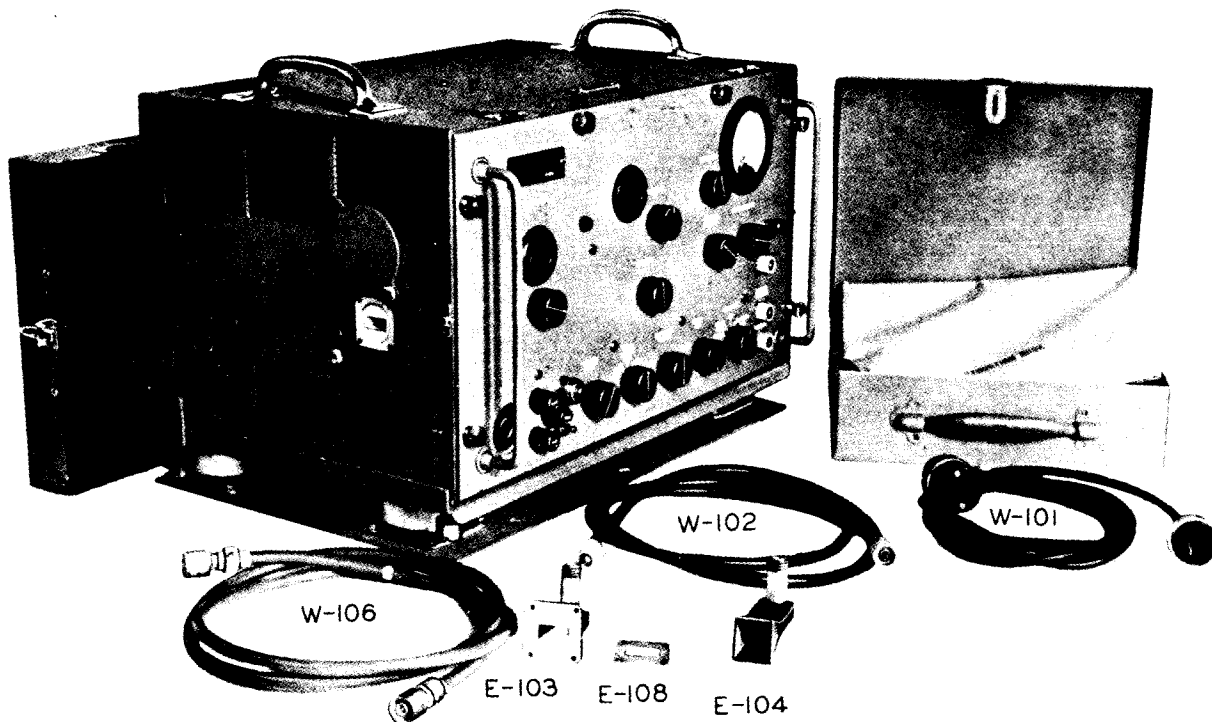
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Wavemeter TS-117/GP	7CAC-979578 - 3F4325-117Z	4-3/4	5-7/8	2-3/4	3.36
1	Carrying Case	- - -	6-1/4	8	5-3/4	3.51
1	Cable UG-183/U	1800-132057350 - 1F453-1.23		23 lg		
1	Adaptor UG-57/U	8850-108740 N17-C-68244-2887 227390-57		13/16 dia x 1-3/4 lg		
1	Adaptor UG-131/U	3300-28605-4505 - 22308-131		5/8 dia x 1-39/64 lg		
1	Directive Antenna AS-23/AP	7CAC-045140 N16-A-45216-3476 2A264-23	3-13/16	2-3/16	1-1/8	
3	1N21B Crystal Rectifier	3300-234137020 - 2J1N21B				
2	Instruction Book TM11-2538					
TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL						6.87

UNCLASSIFIED

Combination and Group Test Set

TEST SET TS-120/UP and TS-191/UP

TS-120/UP,
TS-191/UP

Test Set TS-120/UP.

FUNCTIONAL DESCRIPTION

These equipments are portable signal generators used for precise measurement and adjustment of radar and radar beacon equipment in the band 9285 to 9465 mc (TS-120/UP) and 8990 to 9170 mc (TS-191/UP). They function as signal generators, frequency meters and power meters. They are also used for:

- Measuring radar receiver bandwidth.
- Checking AFC operation.
- Checking TR recovery.
- Bench testing of RF components.

These signal generators can produce outputs of CW, square wave modulated RF, pulse modulated RF or frequency modulated RF, with external sawtooth. Their pulse generators may be externally triggered, synchronously, throughout a wide range of repetition rates.

RELATION TO OTHER EQUIPMENT

These devices can be used in conjunction with Standing Wave Indicator TS-12/AP to measure VSWR. These test sets have been superseded by Test Set TS-642/U.

ELECTROMECHANICAL DESCRIPTION

POWER INPUT.—115 v $\pm 10\%$ or 80 v $\pm 10\%$, 50 to 800 cps, 157.5 w max.

FREQUENCY RANGE.—
9285 to 9465 mc (TS-120/UP).
8990 to 9170 mc (TS-191/UP).

MODULATION.—
Square Wave: 1250 cps, 50% duty cycle.

Frequency: By external saw-tooth wave.

Pulses: 0.2 to 0.5 μ sec or 1 μ sec to 2 μ sec.

DELAY.—

Fixed: 0 approximately.

Variable: 10 to 200 μ sec.

RF OUTPUT, CW OR PEAK PULSE.—0 to 75 db below 1 mw.

SYNC.—

Internal: Square wave only.

External: 200 to 2500 cps, pulse only.

TRIGGER REQUIRED.—25 to 200 v positive or 30 to 200 v negative.

VIDEO OUTPUT, SYNC WITH RF PULSE.—10 to 15 v negative.

RF OUTPUT, POWER METER.—5 to 32 db above 1 mw.

TYPE	(USAF): Minor Standard
CLASSIFICATION:	(NAVY): Limited Standard
	(ARMY):

STOCK NO.:	(USAF): 1690-327879467
	(NAVY): F16-0-303558-200
	(ARMY): 3F4325-120

DESIGN COGNIZANCE: Navy, BUSHIPS

PROCUREMENT INFO.: BUSHIPS Spec RE-9514-B

PROCUREMENT COG.: Navy, BUSHIPS

RDB IDENT. NO.: 10.1.3

E. I. I. N.

UNCLASSIFIED

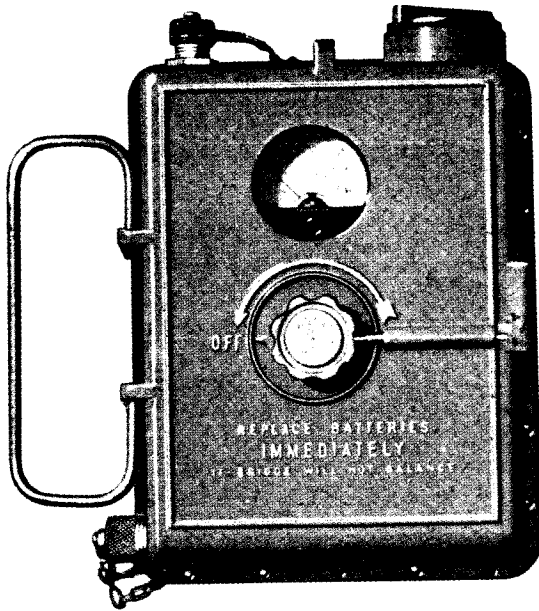
4.10 TS-120/UP: 1

UNCLASSIFIED

Power Measuring Equipment

POWER METER TS-125/AP

TS-125/AP



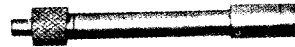
POWER METER



CORD CG-171 AP



**ATTENUATOR TPS-51PB 10 (Old No.)
CN-42 UP (New No.)**



**ATTENUATOR TPS-51PB/16 (Old No.)
CN-43 UP (New No.)**

Power Meter TS-125/AP.

FUNCTIONAL DESCRIPTION

Power Meter TS-125/AP is a compact, light-weight battery operated UHF wattmeter. It consists of a temperature compensated thermistor bridge energized by an RF matching transformer (coaxial line), a milliwattmeter, a horn type pick-up antenna, a lossy cable and two attenuators. It is used to check the relative power output of radar transmitters with the pick-up antenna placed in a standard position, or with the input cable connected directly to a directional coupler. It indicates average power. It can also be used for antenna radiation pattern and standing wave ratio measurements.

RELATION TO OTHER EQUIPMENT

It is part of Test Kit AN/UPM-7, Test Sets AN/UPM-2, 3,5,12, 18 and Radar Test Set AN/APM-33.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—4.5 v dc from 3 dry batteries JAN Type BA-30.
FREQUENCY RANGE.—2400 to 3335 mc.
POWER RANGE.—
 Bridge Input: 0 to 2 mw (-10 to +3 dbm).
 Signal Power (using attenuators): 0 to 4 w (-6 to +33 dbm).

ATTENUATION.—

Cord CG-171/AP: 7 db (+0.5 db nominal).
 Pad CN-42/UP: 10 db (throughout).
 Pad CN-43/UP: 16 db (+1 db correction towards 3700 mc).

ACCURACY OF METER.—±0.5 dbm, from day to day, on some radar and under identical conditions.

TEMPERATURE RANGE.— -20°C to +60°C.

INPUT IMPEDANCE.—50 ohms at end of cord.

ANTENNA GAIN.—8 db.

PRESENTATION AND CONTROLS.—The meter is calibrated in milliwatts and dbm. A combination on-off

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY): Standard
STOCK NO.:	(USAF): 1690-327879477 (NAVY): AS0: R16-AN-TS-125/AP (ARMY): 3F4325-125
DESIGN COGNIZANCE:	USAF, ARL
PROCUREMENT INFO.:	71-5067
PROCUREMENT COG.:	Signal Corps
RDB IDENT. NO.:	14.2
F. I. I. N.:	

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Power Measuring Equipment

UNCLASSIFIED

TS-125/AP

switch/potentiometer is used to zero-set the bridge at zero input. The RF input terminal is located on the side of the case nearest the meter.

FITTINGS AND ACCESSORIES.—Cord CG-171/AP is made of ten feet of RG-21/U cable terminated by N-Type UG-18/U plugs at each end. The bridge input terminal and antenna output connector are both N-Type jacks. The two attenuators are both fitted with one N Type plug and one N Type jack. Three dry batteries Type BA-30 are required but not supplied with the equipment.

CONSTRUCTION.—The instrument case is waterproof and made of cast aluminum. The input terminal, battery and attenuator compartments are provided

with screw-on caps. The batteries are housed inside the case in a plastic tube which contains the circuit connections. The cord and the antenna fit into a detachable hinged box lid which hooks on top of the front panel. The box lid cannot be closed unless the on-off switch is in the off position.

MANUFACTURER'S OR CONTRACTOR'S DATA

Electric Products Co., Chicago, Ill.

REFERENCE DATA AND LITERATURE

TM 11-1217: War Department Technical Manual for Power Meter TS-125/AP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Two in Each Box: Power Meter TS-125/AP, Complete, Less Batteries	3.75	15.5	12.0	29	55

EQUIPMENT SUPPLIED

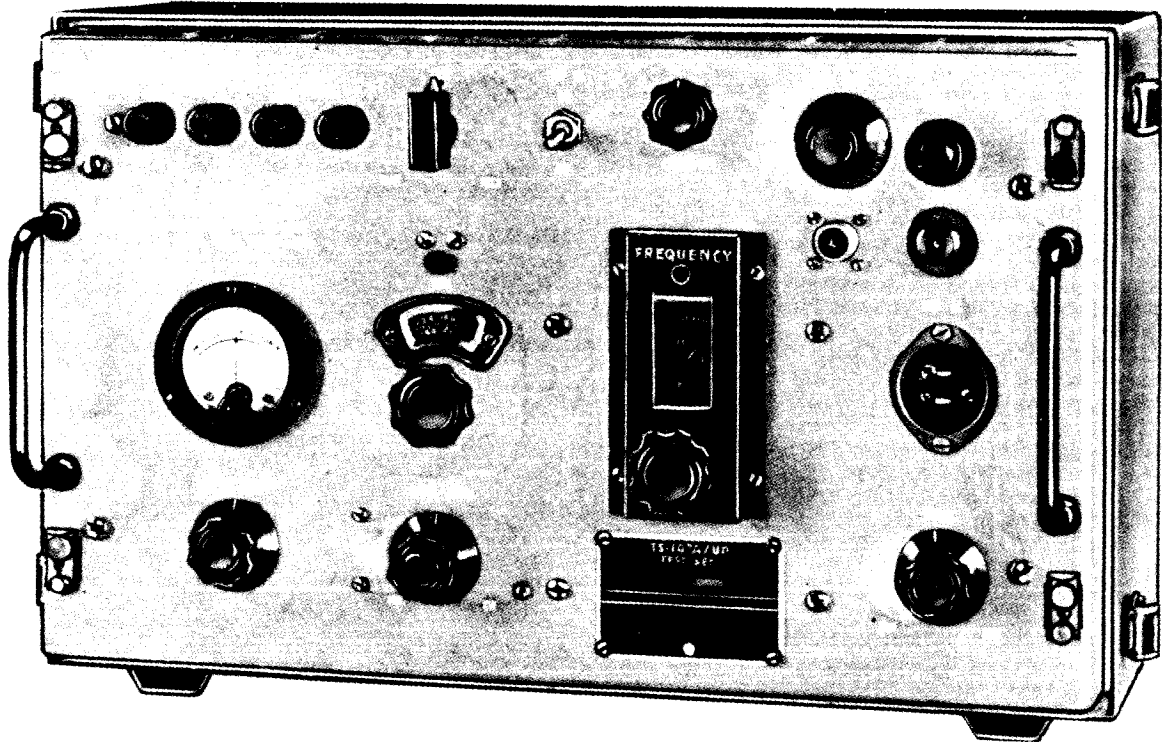
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Power Meter TS-125/AP	-	10	7-7/8	5-5/16	
1	Attenuator CN-42/UP (TPS-51PB/10)	1690-286075427 - 2Z394.14	5 lg			
1	Attenuator CN-43/UP (TPS-51PB/16)	1690-286075428 - 2Z394.13	5 lg			
1	Cord CG-171/AP	1690-322850522 R16-A-4934 3E6015-171	111 lg			
1	Antenna AT/67/AP	1690-327305616 - 3F3988-67	4-1/4	3-1/2 dia		
2	Instruction Book TM-11-1217	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			12.0
			TOTAL			

UNCLASSIFIED

Combination and Group Test Set

TEST SET TS-147/UP and TS-147A/UP

**TS-147/UP,
TS-147A/UP**



Test Set TS-147A/UP.

FUNCTIONAL DESCRIPTION

Test Set TS-147/UP is a portable microwave test set designed for testing and adjusting beacon radar systems which operate within the frequency band of 8500 to 9600 mc.

The test set supplies microwave test signals, either FM or CW, of known power level and frequency. These signals, together with the aid of an oscilloscope for observing the radar video output, can be used in visual alignment methods of adjusting radar systems. The sweep of the test signal frequency modulation and the horizontal sweep of the oscilloscope are triggered in synchronism with the radar system. The resulting pattern seen on the A-scope represents the frequency response curve of the receiver.

The test set contains a direct reading frequency meter and power level meter which measures power referenced to one milliwatt.

RELATION TO OTHER EQUIPMENT

The following equipment or equivalent should be used with the test set in most of the applications to testing radar systems: Oscilloscope TS-34/AP or TS-239/UP Series for receiver tests; a directional coupler for quantitative power measurements where the test antenna cannot be used. Similar to Signal Generator TS-35/AP

TS-147/UP

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY): Standard
STOCK NO.:	(USAF): 7CAC-801319-2365 (NAVY): F16-Q-303740-200 (ARMY): 3F4325-147
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec No. RE 9583A
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F. I. I. N.:	

TS-147A/UP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-Q-303741-200 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec No. RE 9583A
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F. I. I. N.:	

UNCLASSIFIED

Combination and Group Test Set

UNCLASSIFIED

TS-147/UP, TS-147A/UP

Series except that TS-35/AP is pulse modulated instead of frequency modulated. Test Set TS-147A/UP is identical to Test Set TS-147/UP with the exception of a newly designed oscillator housing and layout changes.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v $\pm 10\%$ ac, 50 to 1600 cps, 125 w.
FREQUENCY METER.—

Frequency Range: 8500 to 9600 mc.
 Accuracy: ± 2.5 mc at 25°C and 60% relative humidity;
 ± 1.0 mc for frequency increment of less than 60 mc.
 Calibration Point: 9310 ± 1.0 mc at 25°C and 60% relative humidity.

SIGNAL GENERATOR.—

Frequency Range: 8500 to 9600 mc.
 Output Impedance: 75 ohms.
 Sweep Rate, Frequency Modulation: 0 to 6 mc per μ sec (for tubes having at least 3 mc per v tuning range).

Phase Range or Delay: 3 to 50 μ sec after trigger.

Frequency Deviation: 0 to 60 mc.

RF Trigger Required: 5 to 500 w peak, 0.5 to 6 μ sec duration, rise time less than 0.5 μ sec.

Video Trigger Required: +10 to 50 v peak, 0.5 to 20 μ sec duration at 10% amplitude, rise time less than 0.5 μ sec between 10% and 90% of maximum points.

POWER METER.—

Input Signals: +7 to +30 dbm.
 Accuracy: ± 2.0 db.
 Output Test Signal: -24 to -83 dbm.
 Accuracy: ± 2 db.

PRESENTATION AND CONTROLS.—The frequency meter has a dial calibrated directly in frequency. The attenuation is read from a dial calibrated directly in db. Power input or output is indicated by an attenuator setting and reference level indicator. The trigger input is connected through a Navy Type 49194 UHF coaxial receptacle on the panel.

FITTINGS AND ACCESSORIES.—The Trigger Cable Assembly CG-91/U(6) consists of six feet of RG-11/U cable fitted with two Navy Type 49195 UHF coaxial connector plugs which mate the "Trigger-in" jack.

The RF jack is a UG-23/U, Type N, coaxial connector receptacle. RF Cable Assembly CG-92/U(8) consists of eight feet of RG-9/U cable fitted with two UG-21/U, Type N, coaxial connector plugs. These plugs mate the rf jack on the control panel and the female coaxial Type N connector receptacle on the antenna horn. A 90° adaptor with a male and female UHF coaxial connector is supplied.

CONSTRUCTION.—The unit is enclosed in a metal case with a removable cover. A carrying handle is provided and all accessories are stored in the cover. All operating spares are located in the cover or on the equipment chassis.

MANUFACTURER'S OR CONTRACTOR'S DATA

TS-147/UP:

Sperry Gyroscope Co., Great Neck, New York.
 Contract NXsa-51553.
 Contract NXsa-49714.

TS-147A/UP:

Sperry Gyroscope Co., Great Neck, New York.
 Contract NObsa-39114, dated 25 February 1947.
 Contract NObsr-39296, dated 25 June 1947.

TUBE AND CRYSTAL COMPLEMENT

- (2) OC3/VR-105 (1) 5R4GY (2) 6SL7-GT
- (1) 6SH7 (1) 6Y6G
- (1) 723A/B or 2K25
- (1) 1N23 Crystal Rectifier

REFERENCE DATA AND LITERATURE

TS-147/UP:

CO-AN-08-35TS147-2M: Handbook of Maintenance Instructions for Test Set TS-147/UP.

TM 11-1247: Test Set TS-147/UP.

TO 16-35TS-147-2: Maintenance Instructions.

Sig 7-TS-147/UP: Spare Parts List.

Sig 8-TS-147/UP: Higher Echelon Spare Parts List.

TS-147A/UP:

NAVSHIPS 91104: Test Set TS-147A/UP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Set TS-147/UP (Export Packed)	2.68	22	12-3/4	16	65

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Set TS-147/UP including:	-	11	18-3/4	12-1/4	35.0
1	Horn AT-68/UP	F16-T-20134-7001 -	2-1/4	6-3/4	4-1/2	0.14
1	Cable, RF CG-92/U	N16-A-52545-1626 2A1510-2 -	8 ft lg			1.25
		R16-C-3851 1F430-92				

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Combination and Group Test Set
TS-147/UP, TS-147A/UP

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	1 Cable, Trigger CG-91/U	- N16-C-11864-8216 1F430-91	6 ft lg			1.25
	1 Connector NT-49192	- N17-C-67444-1285 2Z299-359	1-3/16	1-7/32	5/8	
	1 Cord, Power CX-337/U(6)	- N17-C-48226-2021 3F6000-337-72	6 ft lg			0.13
	1 Set Operating Spares	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			37.77
					TOTAL	

UNCLASSIFIED

4.10 TS-147/UP: 3

TS-148/UP

the rf oscillator sweeps can be controlled by the Spectrum Width control. The Oscillator Frequency knob selects the desired frequency range of the analyzer. The selector switch has a Mixer position to make adjustments on the analyzer, a Spectrum position which attenuates the signal, and a Spectrum Amplified position which does not attenuate the signal. The Spectrum Center controls the dc potential on the reflector of the rf oscillator. The Sweep Frequency knob controls the rate of frequency sweep. The Sync switch locks the sweep rate to one-half the line frequency. The Mixer Amplifier jack provides an external connection to the dc mixer amplifier. When this jack is used, the crystal in the radar replaces the crystal mixer in the analyzer.

Two handles are provided on the control panel to facilitate its removal from the Carrying Case. The Carrying Case is made of sheet aluminum and is finished with grey paint. The analyzer may be operated without removing it from the Carrying Case. The Carriage is used to provide a shock-mounting for the analyzer in or out of the Carrying Case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Westinghouse Elec. Corp., Pittsburg, Pa.
 Contract NXsa-59108 and NXsa-51586.
 Hazeltine Electronic Corp., New York, N.Y.
 Contract N383s-1427.

TUBE COMPLEMENT

- (3) 6SJ7 (1) 6SA7 (1) 6AC7
- (3) 6SN7-GT (1) 5R4-GY (1) 884
- (1) 3BP1 (1) 2X2 (1) 6Y6-G
- (4) 991 (1) 2K25, or 723A/B

REFERENCE DATA AND LITERATURE

- TM11-1249: Instruction Manual.
- NAVSHIPS 900,754: Handbook of Operating and Maintenance Instructions for TS-148/UP Test Equipment - Spectrum Analyzer.

FITTINGS AND ACCESSORIES.—The rf input to the analyzer is a waveguide with a UG-40/U choke flange mating the flexible waveguide to coaxial adaptor supplied with the equipment. The Antenna Horn Cable has a UG-21/U, Type N male coaxial connector plug on each end mating the Waveguide to Coaxial Cable Adaptor and the Antenna Horn. The Mixer Cable has an NT-49109 single circuit, phone plug on each end mating the Mixer Amplifier jack on the analyzer. A Choke-to-Choke Adaptor is supplied to permit coupling two choke flanges together.

CONSTRUCTION.—The Spectrum Analyzer is a self-contained unit built into a sheet aluminum housing.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Spectrum Analyzer TS-148/UP	1.2	22-1/2	17	30-1/2	149

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Spectrum Analyzer	- F16-T-20139-5901	9	13	14	39.0
1	Waveguide to Coaxial Adaptor UG-183/UP	- N16-A-15630-8251	2-1/2	1	1-1/2	0.5
1	Antenna Horn AT-68/UP	1600-327805619 N16-A-52545-1626 3F3988-68	3-21/64	1-3/64	2-13/16	0.25
1	Antenna Horn Cable CG-92/U	- N16-C-11604-7021	72 1g			
1	Mixer Cable CX-464/UP	1600-322975227 N17-C-48211-5521 2E6000-337	48 1g			0.12
1	Power Cable CX-337/U	- N17-C-48226-2021	72 1g			0.5
1	Flexible Waveguide Assembly CG-182/APM-40-15	1600-299540032 R16-WX7415324-G1 2Z1000G-182	15 1g			0.25
1	Carriage, Shock Absorbing MT-325/U	- N16-M-71237-8700	16-11/32	13-3/4	11-11/16	49

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Waveform Measuring Equipment

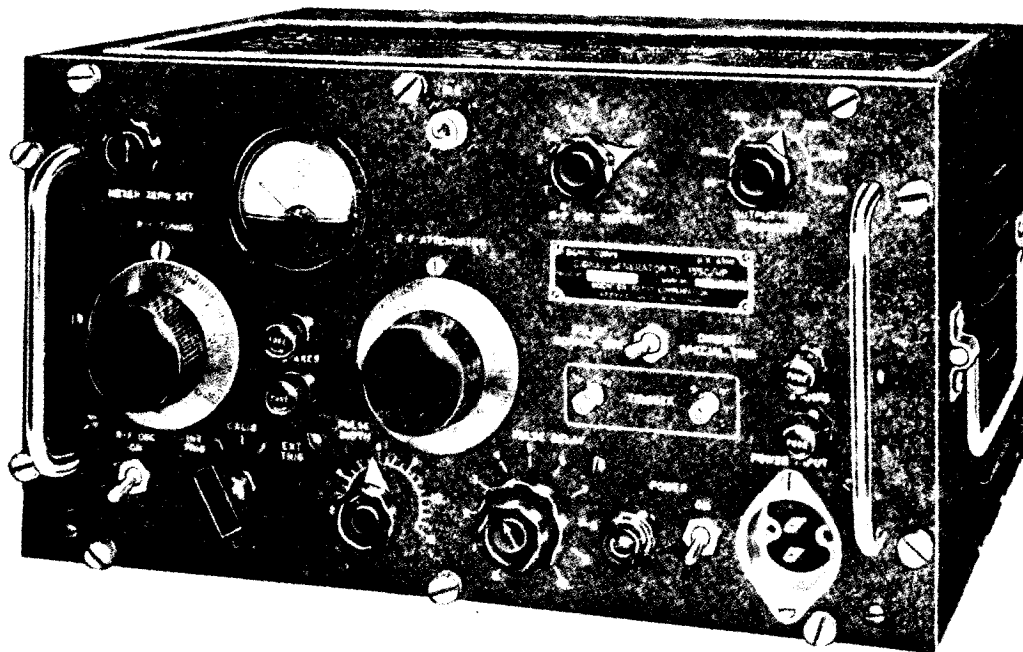
TS-148/UP

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIP	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Carrying Case CY-246/U	- N16-C-170001-241 -	25-9/16	19	13-1/2	0.25
1	Choke-to-Choke Adaptor UG-144/AP	3300-287675045 N16-F-650511-186 2Z3288-144	1-5/8	1-5/8	0.062	
1	Allen Wrench for #8 Set Screw	7900-859490 G41-W-2446 6R57400				
1	Allen Wrench for #6 Set Screw	7900-859480 N41-W-2445 6R57400-6				
1	Allen Wrench for #4 Set Screw	7900-859460 G41-W-2444 6R55499				
1	Tuning Wrench	3300-679481630 R16-WX-7416520-G1 6R38461	3-9/16	1/2	1/8 dia	
1	Maintenance Repair Parts Box CY-245/U	- - -	17-29/32	7-1/4	10-1/16	
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

UNCLASSIFIED

Combination and Group Test Set

SIGNAL GENERATOR TS-155C/UP**TS-155C/UP***Signal Generator TS-155C/UP.***FUNCTIONAL DESCRIPTION**

Signal Generator TS-155C/UP contains a generator of pulse modulated calibrated rf signals and a power meter.

By means of interchangeable cavity oscillator grid cylinders, the set may be used for testing the operation of radar sets operating at frequencies from 2700 to 3400 mc.

Pulse modulation is accomplished either by the use of the internal pulse generator, or by the use of an external positive-trigger source.

It can be used as a signal generator to check the sensitivity of radar receivers, or as a power monitor to check the power output of radar transmitters. It can also be used as an uncalibrated absorption type frequency meter.

RELATION TO OTHER EQUIPMENT

It is similar to Signal Generator TS-155/UP, 155A/UP and 155B/UP. These earlier equipments had:

No set of interchangeable grid cylinders, narrower frequency range, or no variable delay switch, and no positive and negative external triggering.

This equipment supersedes Navy Model LAD Signal Generator.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v, or 210 to 230 v, 50 to 1600 cps, 100 w.

FREQUENCY RANGE OUTPUT SIGNAL.—2700 to 3400 mc.

POWER RANGE.— -20 to -100 dbm.

As Signal Generator, Output: 2 mw max.

As a Power Meter, Input: 1000 kw peak.

RF PULSE CHARACTERISTICS.—

Width: 0.75 μ sec to 5.75 μ sec.

Rate: 80 to 2600 pps.

Delay Off: 0.75 μ sec.

Delay On: 5 to 1800 μ sec.

Rise Time: 0.25 μ sec max from 10 to 90% max.

Fall Time: 0.30 μ sec max from 90 to 10% max.

OUTPUT TRIGGER CHARACTERISTICS.—

Amplitude: +100 to +50 v.

Duration: 0.5 to 20 μ sec between 10% max amplitude points.

Rise Time: 0.5 μ sec max from 10 to 90% max.

Flatness: $\pm 10\%$ of max amplitude.

Decay Overshoot: Less than 10% of max amplitude.

PULSE AMPLITUDE VARIATION.—Not more than $\pm 5\%$ of max amplitude.

EXTERNAL TRIGGER CHARACTERISTICS DIRECT TRIGGER ACTION.—

Trigger Rate: 2500 pps.

Trigger Delay: Paired trigger pulses, 2 μ sec apart.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-303762-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Signal Corps Spec
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.1.4
F. I. I. N.:	

UNCLASSIFIED

4.10 TS-155C/UP: 1

TS-155C/UP

Trigger Width: 0.3 to 1 μ sec at 1/2 voltage points.
 RF Pulse Width: 0.4 to 1.4 μ sec at 1/2 voltage points.
 Amplitude: ± 30 to ± 50 v.
 Rise Time: Less than 0.3 μ sec from 10 to 90% max amplitude points.

DELAYED TRIGGER ACTION.—

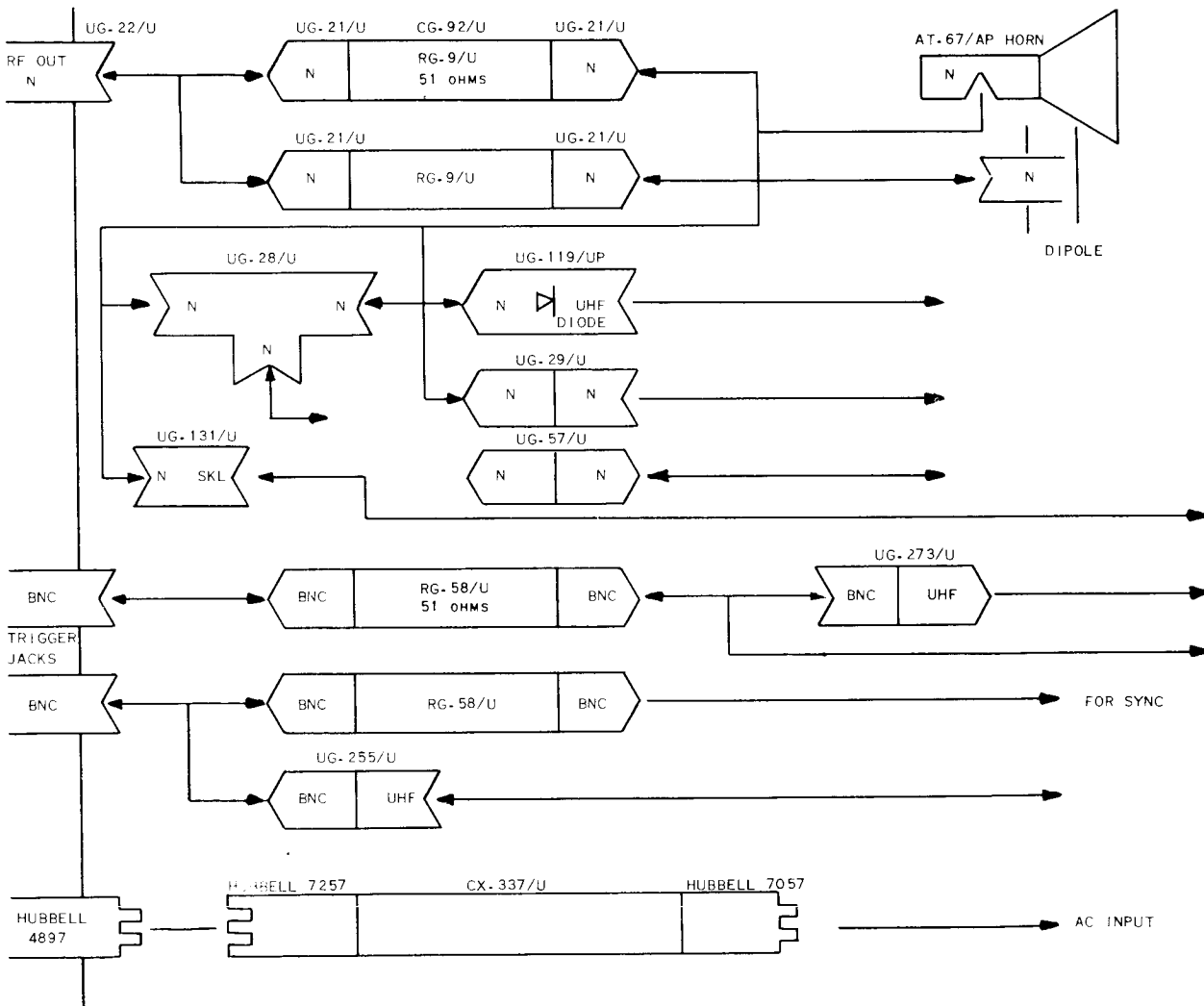
Trigger Rate: 80 to 2600 pps.
 Trigger Delay: 4 to 1900 μ sec.
 Trigger Width: 0.7 to 12 μ sec.

PRESENTATION AND CONTROLS.—The following controls and terminals are located on the front panel:

RF Tuning - Used to tune resonant cavity graduated 0 to 100 (may be calibrated within 6 mc with external wavemeter).
 RF Attenuator - Sets dbm attenuation (calibrated 20 to 100).
 Pulse Delay - Continuous course and five knob graduated to 0 to 10 (nominal calibration curve in μ sec).
 Output Trigger Frequency - Continuously adjusts Sync out trigger 80 to 2600 cps.
 Pulse Width - Continuously adjusts width, graduated 1 to 12 μ sec.

Power Switch - AC ON-OFF switch.
 Meter Zero Set - Sets power monitoring bridge circuit to zero.
 RF Osc. Output Control - Controls output power delivered by cavity oscillator.
 INT TRIG - Internal trigger made available at trigger jacks.
 CALIB Switch - Calibration of output power.
 EXT TRIG - External sync voltage is fed to either the internal delay multivibrator, or to the pulse multivibrator/modulator.
 RF OSC Switch - Turns ON or OFF the pulse modulating voltage to the cavity oscillator.
 DELAY DIRECT Switch - Used to insert or remove variable delay between trigger pulse (internal or external) and output rf pulse.
 Trigger Jacks - Both (jacks) in parallel, are provided for trigger input or output functions.
 RF Jack - Pulsed rf input or output receptacle.
 Power Input - AC input receptacle.

FITTINGS AND ACCESSORIES (See Chart).—A total of 5 cables and 7 adaptors are supplied.



UNCLASSIFIED

Combination and Group Test Set

TS-155C/UP

One Cord (CX-337/U) is for connections of ac power. Two rf cords (CG-92/U) are used for connection of the rf output jack to either the horn antenna (AT-67/AP) or to the directional coupler of the radar set. Both cords are terminated by an N type plug. Two video cords (CG-409/U) are for connection to the trigger jacks and externally to a source of trigger voltage or some external equipment in need of synchronization. Both cords are terminated by BNC type plugs.

The various adaptors may be used for connections to be made to external equipment having UHF or SKL connectors.

One N to UHF straight adaptor (UG-119/UP) is designed to include a crystal rectifier (1N21B) when it is desired to service the Signal Generator and observe the rf pulse shape.

CONSTRUCTION.—The Signal Generator is enclosed in a metal case with louvers, rubber feet and carrying handles. The front panel is provided with guard-handles. The complete equipment with accessories and running spares are housed in a metal carrying case with hinged cover and handles.

MANUFACTURER'S OR CONTRACTOR'S DATA

Boston Radio Corporation, Boston, Mass.
Sig. C. Order LR-ESL-45-4216.

TUBE COMPLEMENT

(1) VR105/30 (1) 5Y3-GT (1) 6AG7
(1) VR150/30 (8) 6SN7-GT (1) 2C40

REFERENCE DATA AND LITERATURE

TM 11-2657C: War Dept. Technical Manual, Sig. Gen. TS-155C/UP.

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-155C/UP	-	9	16-11/16	12-13/16	41
1	Grid Cylinder MX-678/UP	- 2Z3600C-678	7/8	7/8	1-5/8	1/16
1	Grid Cylinder MX-679/UP	- 2Z3600C-679	7/8	7/8	1-5/8	1/16
1	Grid Cylinder MX-680/UP	- 2Z3600C-680	7/8	7/8	1-5/8	1/16
2	Cord, RF CG-92/U	- 1F430-92.96	96 lg			
2	Cord, Trigger CG-409/U	- 1F430-409-74.12	96 lg			
1	Cord, Power CX-337/U	- 3E-6000-337	72 lg			
1	RF Adaptor UG-28/U	- N17-C-68713-2386 2Z-7390-28	5/8	1-3/4	3-1/32	3/16
1	RF Adaptor UG-57/U	- N17-C-68244-2887 2Z7390-57	3/4	3/4	2-3/64	1/8
1	RF Adaptor UG-29/U	- N17-C-67732-2907 2Z7390-29	5/8	5/8	2-3/16	1/8
1	Crystal Adaptor UG-119/UP	- 2Z308-119	3/4	3/4	2	1/8
2	Adaptor UG-255/U	- N17-C-67989-1323 2Z-308-255	1-5/32	1-5/32	1-3/64	1/16
2	Adaptor UG-273/U	- N17-C-67988-5260 2Z-308-273	1-5/32	1-5/32	1-2/64	1/16
1	Adaptor UG-131/U	- 2Z308-131	5/8	5/8	1-35/64	1/16

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Combination and Group Test Set

UNCLASSIFIED

TS-155C/UP

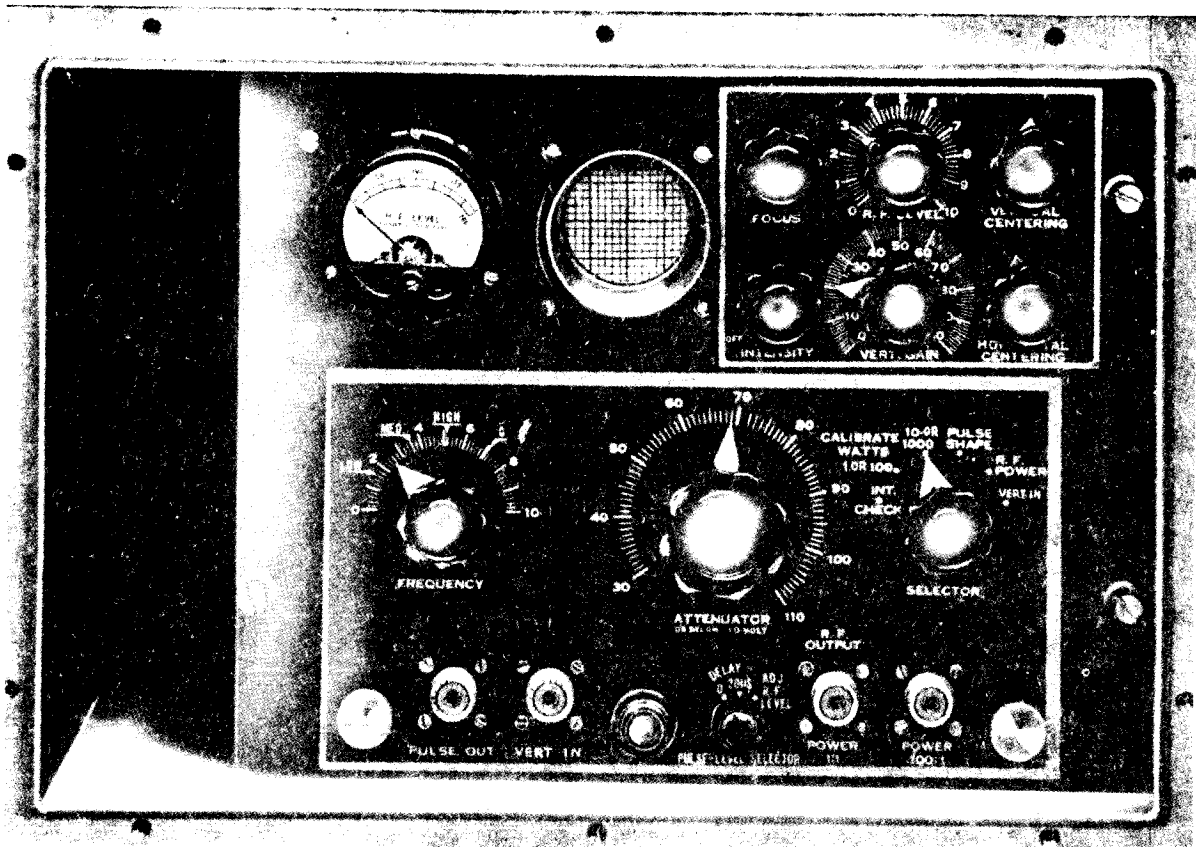
EQUIPMENT SUPPLIED

QUANTITY	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal IN21B (in adaptor)	-				
1	Horn Antenna AT-67/AP	-	4-1/4	3-3/4	2	7/16
		3F-3988-67				
1	Set of Allen Wrenches No. 4,6,8,10	-				
1	Transit Case	-	15-1/4	21	10-3/8	30
1	Maintenance Repair Parts	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

RESTRICTED
Security Information

Combination and Group Test Set

TEST SET TS-182/UP and TS-355/UP

TS-182/UP,
TS-355/UP

Test Set Model TS-182/UP.

FUNCTIONAL DESCRIPTION

The Test Sets TS-182/UP and TS-355/UP are designed for checking the sensitivity of receivers, or the power output of transmitters, which receive and transmit pulse modulated signals within the 150 to 240 mc range. It is further suitable for displaying with good fidelity the actual pulse shape of short rf and video pulses from 2 to 150 μ sec on the built-in cathode-ray oscilloscope. It consists of a signal generator, power meter, and synchroscope.

RELATION TO OTHER EQUIPMENT

These test sets are used primarily with Mark 3 IFF equipment.

Test Set TS-355/UP is similar to and supersedes Test Set TS-182/UP. The following modifications in design have been incorporated to change the TS-182/UP to TS-355/UP:

- (1) The repetition rate has been decreased.
- (2) Two sweep speeds have been provided.
- (3) The delay has been increased.
- (4) A larger sync output pulse has been provided.
- (5) A high power diode section has been added.
- (6) A circuit has been added to permit the rf level meter to be used as a 400 v voltmeter.

TS-182/UP

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-303865-200
	(ARMY): 3F4325-182
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. RE-9525
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.2.8
F. I. I. N.	

TS-355/UP

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF): ASO R16-AN-TS-355/UP
	(NAVY): F16-0-304386-200
	(ARMY): 3F4325-355
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. N0as 7871
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.2.8
F. I. I. N.	

RESTRICTED

4.10 TS-182/UP: 1

Combination and Group Test Set

RESTRICTED
Security Information

TS-182/UP, TS-355/UP

ELECTROMECHANICAL DESCRIPTION

POWER INPUT.—115 v $\pm 5\%$ ac, 50 to 1200 cps, 75 w.
SIGNAL SOURCE.—

Frequency Range: 150 to 240 mc.

OUTPUT.—30 to 110 db below 1 v.

Accuracy: $\pm 35\%$ of correct value (with line voltage within $\pm 5\%$ of 115 v).

Impedance: 50 ohms.

PULSE MODULATION.—

Delay (with respect to start of sweep): 20 μ sec (for TS-182/UP); 40 μ sec (for TS-355/UP).

OSCILLOSCOPE.—

Vertical Amplifier, Frequency Response: 50 to 500,000 cps.

Gain: 50 max.

TS-182/UP Sweep, Duration: 200 μ sec.

TS-182/UP Sweep Repetition Rate: 300 pps.

TS-355/UP Sweep Duration: 20 and 100 μ sec per in.

TS-355/UP Sweep Repetition Rate: 150 pps.

TS-182/UP Sync Pulse Delay (with respect to start of Sweep): 0 or 20 μ sec.

TS-355/UP Sync Pulse Delay (with respect to start of Sweep): 0 or 40 μ sec.

TS-182/UP Sync Pulse Amplitude: +7.5 v peak.

TS-182/UP Load Impedance: 75 ohms resistive.

TS-355/UP Sync Pulse Amplitude: +200 v peak.

TS-355/UP Load Impedance: 75 ohms resistive.

POWER MEASUREMENTS.—

Input Impedance: 50 ohms.

Max Pulsed Power Input: 3000 w.

Accuracy: $\pm 35\%$ (TS-182/UP); $\pm 25\%$ (TS-355/UP) (for line voltage within $\pm 5\%$ of 115 v); $\pm 5\%$ (using High Power Diode on TS-355/UP for pulsed power greater than 40 w).

SENSITIVITY MEASUREMENTS.—

Range: 30 to 110 db below 1 v.

Accuracy: ± 2 db.

Min Receiver Video Output: 1 v.

PRESENTATION AND CONTROLS.—Waveforms and pulse shapes are displayed on the screen of a two-inch

cathode-ray tube with this equipment. Receiver sensitivity in db and signal source output in db read directly from calibrated attenuator. Frequency dial of signal source calibrated in arbitrary units from 0 to 10. A Selector switch connects the circuits for various types of measurements and calibration for watt measurements. A Pulse-Level Selector has two delay positions and an Adj. RF Level position. The Adj. RF Level position of this switch is used along with the RF Level control and RF Level meter to set the carrier amplitude. The usual focus, intensity, centering and vertical gain controls are provided for the oscilloscope. In addition to the above controls the Test Set TS-355/UP has a two-position Sweep-Speed selector switch and a high power adjust knob for making power measurements above 40 watts of pulsed power.

Power in all cases is calculated from a known load resistance and a measured voltage.

FITTINGS AND ADAPTORS.—Two connecting cables, one test cable and six adaptors are supplied. These may be connected as shown below.

CONSTRUCTION.—The test set is housed together with all accessories in a completely watertight metal case which serves as a carrying case. When the cover has been properly secured in place, the entire equipment will float in water. The carrying case has a handle on each side.

MANUFACTURER'S OR CONTRACTOR'S DATA

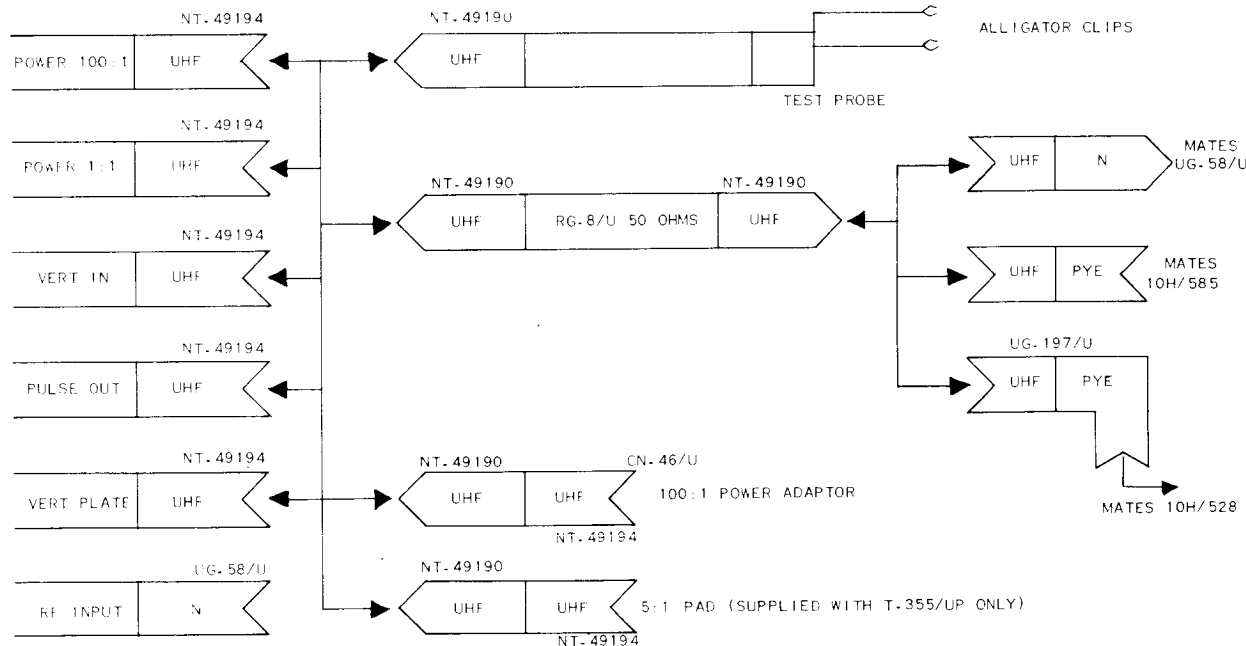
Harvey-Wells Electronics, Inc., South Bridge, Mass.
Contract NOAs-7871.

TUBE COMPLEMENT

(4) 6SN7-GT	(1) 2AP1	(1) 6AG7
(1) 5R4-GY	(2) 955	(1) 6AL5
(1) 6X5-GT	(1) 6SL7	

REFERENCE DATA AND LITERATURE

CO-NAVAER 16-55-507: Handbook of Maintenance Instructions for TS-355/UP Test Set.



BUREAU OF SHIPS SECTION—Part III

RESTRICTED
Security Information

Combination and Group Test Set
TS-182/UP, TS-355/UP

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS - inches			WEIGHT PACKED lbs.
			HEIGHT	WIDTH	DEPTH	
1	Test Set TS-182/UP		29	23-1/2	23-1/2	118

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS - inches			WEIGHT lbs.
			HEIGHT	WIDTH	DEPTH	
1	TS-355/UP Test Set	- F16-T-20137-6701	16	9-1/4	12	43
1	Tuning Unit TN-79/UP	- N16-T-98375-1001 3F5875-79	9-3/4	5-1/4	5	5.75
1	Test Cable	-	48 lg			
2	Adaptor UG-197/U	- N17-C-67727-5486 2Z308-197	13/16	1-1/8	5/8	
2	Adaptor	-				
2	Adaptor	-				
1	AC Line Cord CX-337A/U	-	180 lg			
1	100:1 Power Adaptor CN-46/U	- N16-A-96079-3256 2Z396-46	4	1-1/4	1-1/4	
1	High Power Diode Unit	-	6-1/4	4	3	
1	1:5 Pad CN-117/U	- N16-A-96891-1501	4-7/8	1-1/4	1-1/4	
1	Transit Case CY-278/UP	- N16-C-10623-2201 3F2529-278	16	17	11	15
2	Connecting Cable	-	48 lg			
			TOTAL LESS MAINTENANCE REPAIR PARTS			
						TOTAL

CATALOG OF NAVY MATERIAL

Combination and Group Test Set
TS-182/UP, TS-355/UP

RESTRICTED
 Security Information

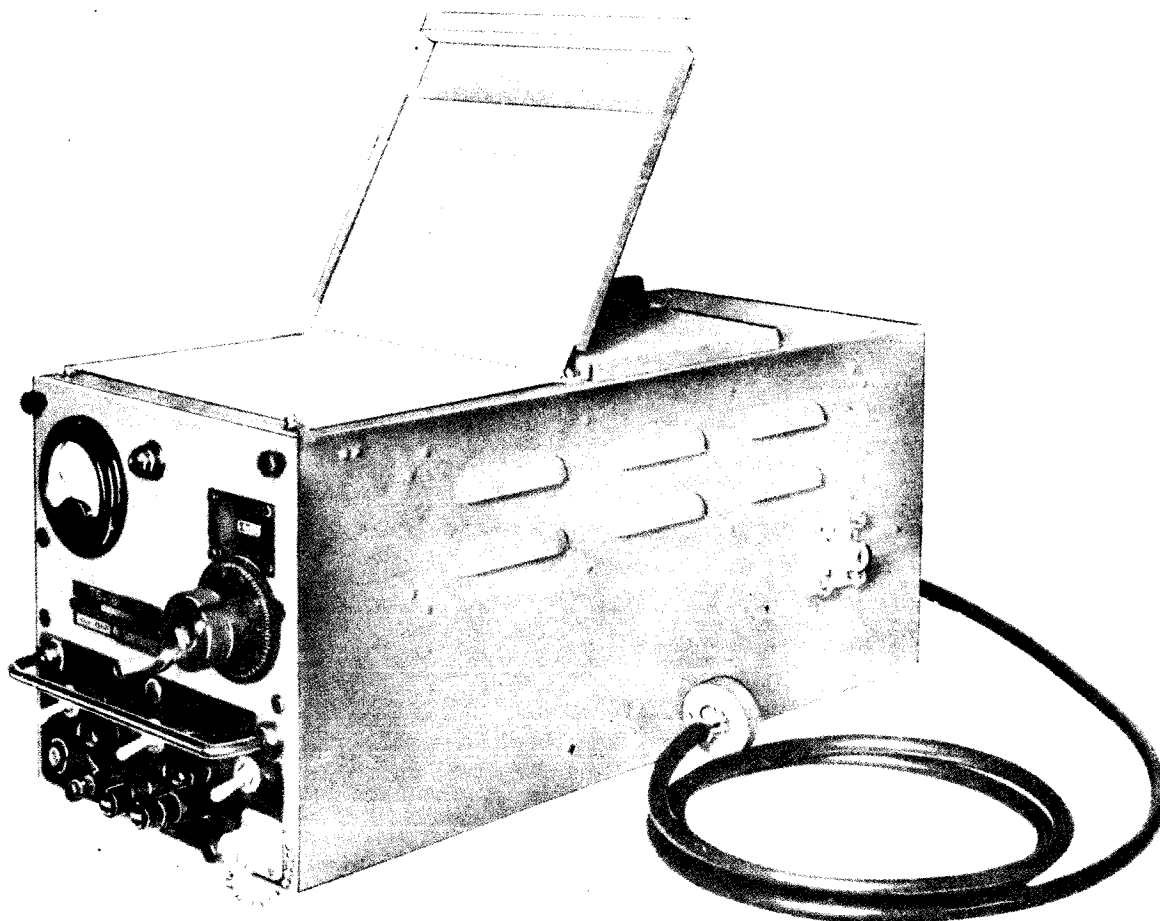
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBLRS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (Inches)			WEIGHT (Lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-182/UP Test Set	- F16-T-20134-7801	16	9-1/4	12	43
1	Tuning Unit TN-79/UP	- N16-T-98375-1001 3F5875-79	9-3/4	5-1/4	5	5.75
2	Connecting Cables	- -	48 lg			
1	Test Cable	- -	48 lg			
2	Adaptor VG-197/U	- N17-C-67727-5486 2Z308-197	13/16	1-1/8	5/8	
2	Adaptor	- -				
2	Adaptor	- -				
1	Power Cord	- -	180 lg			
1	100:1 Power Adaptor CN-46/U	- N16-A-96079-3256 2Z396-46	4	1-1/4	1-1/4	
1	Transit Case CY-278/UP	- N16-C-10623-2201 3F2529-278	16	17	11	15
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Frequency Measuring Equipment

FREQUENCY METER TS-186/UP SERIES TS-186/UP SERIES



Frequency Meter TS-186/UP Series.

FUNCTIONAL DESCRIPTION

Frequency Meter TS-186/UP Series is designed for making frequency measurements in the range of 100 to 10,000 mc. Harmonics of the unknown signal or of the heterodyne oscillator are used for measurements outside the 500 to 1250 mc fundamental range of the heterodyne oscillator.

The equipment consists of 6 elements: Heterodyne Oscillator, Oscillator, Crystal Calibrator, Detector Mixer, Audio Amplifier, Beat Indicator and Power Supply.

TS-186/UP

TYPE	(USAF): Lim. Std. Minor
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY): Not Classified
STOCK NO.:	(USAF): 7CAC-801313-2664 (NAVY): F16-Q-303882-200 (ARMY): 3F4325-186
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. RE 13A1032
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.1.2
F.I.I.N.	

TS-186A/UP

TYPE	(USAF): Std. Minor
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY): Not Classified
STOCK NO.:	(USAF): 7CAC-318208-745 (NAVY): F16-Q-303876-200 (ARMY): 3F4325-186A
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	BUSHIPS Spec No. RE-13-A-1032A
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.2.3
F.I.I.N.	

TS-186B/UP

TYPE	(USAF): Std. Minor
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY): Not Classified
STOCK NO.:	(USAF): 7CAC-318208-75 (NAVY): (ARMY): 3F4325-186B
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec No. RF13A1032A
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.1.1
F.I.I.N.	

UNCLASSIFIED

TS-186/UP SERIES

RELATION TO OTHER EQUIPMENT

The basic differences among TS-186/UP Series equipments are:

TS-186/UP

FUSES	ELECTRON TUBE DIFFERENCES	POWER TRANSFORMER	DC FILAMENTS
Single fuse located after line filter	Detector-mixer Type 955	Variable tap for 105, 115 and 125 v ac	Detector-mixer
TS-186A/UP			
Single fuse located after line filter	Detector-mixer Type 2C51	Variable tap for 105, 115 and 125 v ac	Detector-mixer
TS-186B/UP:			
Two line fuses located before line filter	Detector-mixer Type 2C51	Variable tap for 105, 115 and 125 v ac	1st Audio and Detector-mixer
TS-186C/UP:			
Two-line fuses located before line filter	Detector-mixer Type 2C51	Continuous operation 115 v ac \pm 10%	1st Audio and Detector-mixer

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—

TS-186/UP: 105, 115, 125 v ac, 50 to 1600 cps, 60 w.
 TS-186A/UP: 105, 115, 125 v ac, 50 to 1600 cps, 65 w.
 TS-186B/UP: 105, 115, 125 v ac, 50 to 1600 cps, 70 w.
 TS-186C/UP: 115 v ac \pm 10%, 50 to 1000 cps, 70 w.

FREQUENCY MEASUREMENT RANGE.—100 to 10,000 mc.

Accuracy, Overall: 0.01%.

Accuracy at Check Points: 0.002%.

HETERODYNE OSCILLATOR RANGE.—500 to 1250 mc.

CRYSTAL CALIBRATOR.—

Output Frequency: 20 mc.

Control: 5000 kc quartz crystal.

AUDIO AMPLIFIER RESPONSE.—100 to 100,000 cps.

BEAT INDICATOR RESPONSE.—100 to 100,000 cps.

TEMPERATURE RANGE.—-40° to +55°C.

HUMIDITY RANGE.—0 to 95% relative at temperature up to 50°C.

PRESSURE RANGE.—From atmospheric down to a pressure corresponding to an altitude of 10,000 ft.

SENSITIVITY, RF INPUT.—500 μ v to 1 v.

CALIBRATION CHART.—750 entries distributed over 16,500 dial divisions.

PRESENTATION AND CONTROLS.—Frequency is determined by interpreting tuning dial readings with a calibration chart. There are 16,500 dial divisions. A dc meter movement calibrated 0 to 1.0 ma measures the grid current of the crystal oscillator, the cathode current of the detector mixer, the cathode current of the heterodyne oscillator and the cathode current of the indicator electron tube. A switch selects the circuit to be metered. The meter dips as an indication that zero beat is being approached. However, since the indicator circuit does not respond to frequencies

less than 100 cps it is necessary to use a pair of headphones to determine zero beat. Toggle switches are provided to turn off or on the heterodyne oscillator and the crystal calibrator. A Video Output Jack permits visual observation using an external oscilloscope. **FITTINGS AND ACCESSORIES.—**The Video Output Jack is a Navy Type 49194, small UHF, coaxial connector receptacle. The RF Input waveguide is a standard 1 in. x 1/2 in. guide with a plain flange. A coaxial adaptor is supplied to mate the rf input waveguide to a coaxial cable. The adaptor has a UG-58/U, Type N coaxial receptacle that will mate UG-18/U or UG-21/U Series, Type N coaxial plugs, or equivalent. The Audio Output jack is a Navy Type 49839 telephone jack.

CONSTRUCTION.—The unit is housed in a metal case with a carrying handle on top. The calibration charts are mounted in a cover on top of the case. A carrying case with a handle on each side is provided for the equipment and accessories. The equipment has a removable line cord.

MANUFACTURER'S OR CONTRACTOR'S DATA

Washington Institute of Technology, Washington, D. C.
 Contract NXsr-83449 (TS-186/UP).

Washington Institute of Technology, Washington, D. C.
 Contract NObsr-42462, dated 30 June 1948 (TS-186A/UP).

Federal Manufacturing and Engineering Corp., Brooklyn 5, New York.
 Contract NObsr-43397, dated 16 June 1949 (TS-186B/UP).

Federal Manufacturing and Engineering Corp., Brooklyn 5, New York.
 Contract NObsr-49229, dated 16 June 1950 (TS-186C/UP).

TUBE COMPLEMENT

TS-186/UP
 (5) 6SJ7 (1) 2C40 (1) 955
 (2) OD3/VR-150 (1) 5Y3-GT/G

TS-186A/UP
 (1) 2C40 (1) 2C51 (4) 6SJ7
 (2) OD3/VR-150 (1) 5Y3-GT/G (1) 6SN7

TS-186B/UP
 (1) 2C40 (1) 2C51 (4) 6SJ7
 (2) OD3/VR-105 (1) 5Y3-GT/G (1) 6SN7

TS-186C/UP
 (1) 2C40 (1) 2C51 (4) 6SJ7
 (2) OD3/VR-150 (1) 5Y3-GT/G (1) 6SN7

REFERENCE DATA AND LITERATURE

TS-186/UP:
 AN 16-35TS186-3: Handbook of Maintenance Instructions for Frequency Meter TS-186/UP.

TS-186A/UP:
 NAVSHIPS 91205: Instruction Book for Frequency Meter TS-186A/UP.

TS-186B/UP:
 NAVSHIPS 91335: Instruction Book for Frequency Meter TS-186B/UP.

TS-186C/UP:
 NAVSHIPS 91376: Instruction Book for Frequency Meter TS-186C/UP.

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Frequency Measuring Equipment

TS-186/UP SERIES

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Frequency Meter TS-186/UP	4.5	17-3/4	15-3/4	27-1/2	100
1	Frequency Meter TS-186A/UP	6.8	18-1/2	18-1/2	34-1/2	133
1	Frequency Meter TS-186B/UP	6.8	18-1/2	18-1/2	34-1/4	133
1	Frequency Meter TS-186C/UP	6.8	18-1/2	18-1/2	34-1/4	97

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)				
			HEIGHT	WIDTH	DEPTH					
1	TS-186/UP Frequency Meter TS-186/UP Including:	7CAC-801319-2664	9-1/2	8-1/2	20					
	1 Spare 2C40 Electron Tube	- 3F4325-186								
	1 Spare Fuse	- - Installed in Unit								
	2 Spanner Wrenches	-								
	4 Allen Wrenches	-								
	1 Coaxial J-106 Adaptor	-								
	1 Calibration Book	-								
	1 Power Cable W-101	-								
	2 Instruction Book	-								
	1 Set, Maintenance Repair Parts	-								
	1 Transit Case CY-556/UP	- N16-C-170001-244								
							84 lg			0.8
										1.0
						0.9				
			13	11-1/2	23	22.0				
			TOTAL LESS MAINTENANCE REPAIR PARTS			64.7				
			TOTAL			65.6				

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Frequency Measuring Equipment

UNCLASSIFIED

TS-186/UP SERIES

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS - INCHES			WEIGHT - LBS.
			HEIGHT	WIDTH	DEPTH	
1	TS-186A/UP Frequency Meter TS-186A/UP	7CAC-318208-745 - 3F4325-186A	9-1/2	8-1/2	20	40.0
1	Coaxial Adaptor J-104	- N16-A-15630-7051 -	1-5/8	1-5/8	2-7/16	0.2
1	Power Cable NT-62412	- N17-C-48236-2051 -	84 lg			0.8
2	Instruction Book NAVSHIPS 91205	- - -				1.5
1	Transit Case CY-556/UP	- N16-C-170001-244 -	13	11-1/2	23	46
			TOTAL LESS MAINTENANCE REPAIR PARTS			88.5
						TOTAL
1	TS-186B/UP Frequency Meter TS-186B/UP	7CAC-318208-75 - 3F4325-186B	9-1/2	8-1/2	20	42.5
1	Coaxial J-104 Adaptor	- N16-A-15630-7051 3F2-1	1-5/8	1-5/8	2-7/16	0.2
1	Power Cable NT-62412(7)	- - 3E7350.1-86	84 lg			0.8
2	Instruction Book NAVSHIPS 91335	- - -				1.5
1	Transit Case CY-556A/UP	- N16-C-170001-335 -	13	11-1/2	23	46.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			91.0
						TOTAL
1	TS-186C/UP Frequency Meter TS-186C/UP	- - -	9-1/2	8-1/2	20	42.5
1	Coaxial J-104 Adaptor	- N16-A-15630-7051 3F2-1	1-5/8	1-5/8	2-7/16	0.2
1	Power Cable NT-62412	- - -	84 lg			0.8
2	Instruction Book NAVSHIPS 91376	- - -				1.5
1	Transit Case CY 556A/UP	- N16-C-170001-244 -	13	11-1/2	23	22.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			67.0
						TOTAL

UNCLASSIFIED

Combination and Group Test Set

TEST SET TS-191/UP

TS-191/UP

FOR TECHNICAL INFORMATION REGARDING

THIS EQUIPMENT REFER TO

TS-120/UP

PAGES 4.10 TS-120/UP: 1-2

UNCLASSIFIED

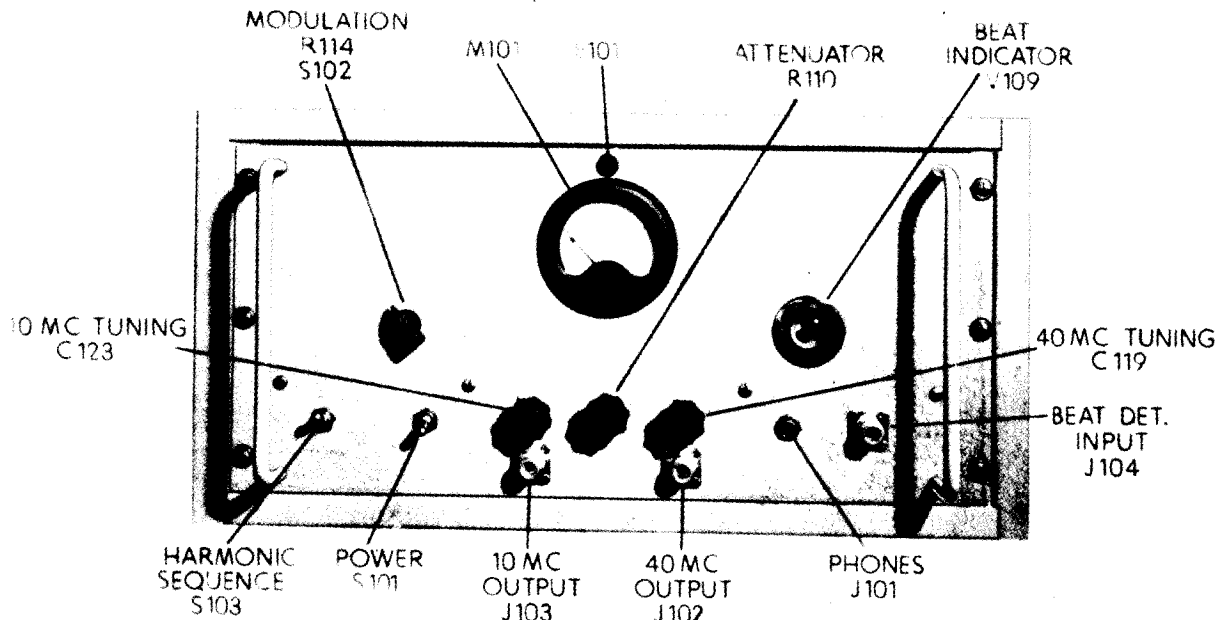
4.10 TS-191/UP: 1

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-202/U

TS-202/U



Signal Generator TS-202/U.

FUNCTIONAL DESCRIPTION

The Signal Generator TS-202/U is a high accuracy harmonic signal generator.

It is used at frequencies above 100 mc. Useful harmonic output is obtained at frequencies as high as 2000 mc. Crystal-controlled harmonic multiples of 10 mc and 40 mc are obtained with a high degree of accuracy.

It is used for the calibration of receivers, transmitters, wavemeters and signal generators.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, $\pm 10\%$, 50 to 800 cps at 1.5 amp.

FREQUENCY RANGE.—100 mc to 2000 mc, in 10 or 40 mc steps; 5 mc crystal fundamental.

Accuracy: $\pm 0.2\%$ on harmonic frequencies over the temperature range of -40°F to $+158^{\circ}\text{F}$.

MODULATION.—1000 cps sine wave, percentage of modulation is adjustable.

WAVEMETERS, RESONANT CAVITY TYPE.—

Frequency Range: Z-101, 198 to 216 mc; Z-102, 303 to 630 mc; Z-103, 950 to 1050 mc.

Bandwidth: 20 mc at 20 db down.

Max. Loss at Center Freq: 6 db.

PRESENTATION AND CONTROLS.—A "Harmonic Sequence" switch permits the selection of either 10 mc or 40 mc harmonics. Tuning controls for 10 mc and 40 mc harmonics provide adjustment for maximum harmonic amplifier current as indicated by tuning meter. The "Attenuator" controls the amplitude and, to a certain extent, the degree of harmonic content. The "Modulation" control determines the percentage of 1000 cps modulation. The beat indicator is made

operative when the modulation control is fully counterclockwise. Zero beat may be determined by the use of a headset or by use of the "eye" tube on the panel.

FITTINGS AND ACCESSORIES.—The beat detector input jack, 10 mc output jack, and 40 mc output jack are all UG-22/U Type N female coaxial connectors mating the UG-21/U plugs on both ends of the coaxial RG-8/U 3 foot long Test Cable. Each wavemeter unit (Identifier) has a UG-58/U Type N female coaxial connector which mates the Test Cable and a UG-21/U Type N male coaxial connector which mates the panel output jacks.

The Headset Jack is a Navy Type 49025 Telephone Jack.

CONSTRUCTION.—The equipment is housed in a metal case.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-303925-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	4.1.2
F. I. I. N.	

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4.4 TS-202/U: 1

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

TS-202/U

MANUFACTURER'S OR CONTRACTOR'S DATA

Lavoie Laboratories, Morganville, N.J.
 Contract NXsr-51595, dated 1946.
 Contract N5sr-7256.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,866(A):
 NAVAEER 16-5S-528: Instruction Book for Signal Generator TS-202/U.

TUBE COMPLEMENT

(1) 6SN7	(1) 9002	(2) 6L6
(2) 6AG7	(1) 6AC7	(1) 6V6
(1) 5U4-G	(1) 6E5	(2) 6J6

EQUIPMENT SUPPLIED

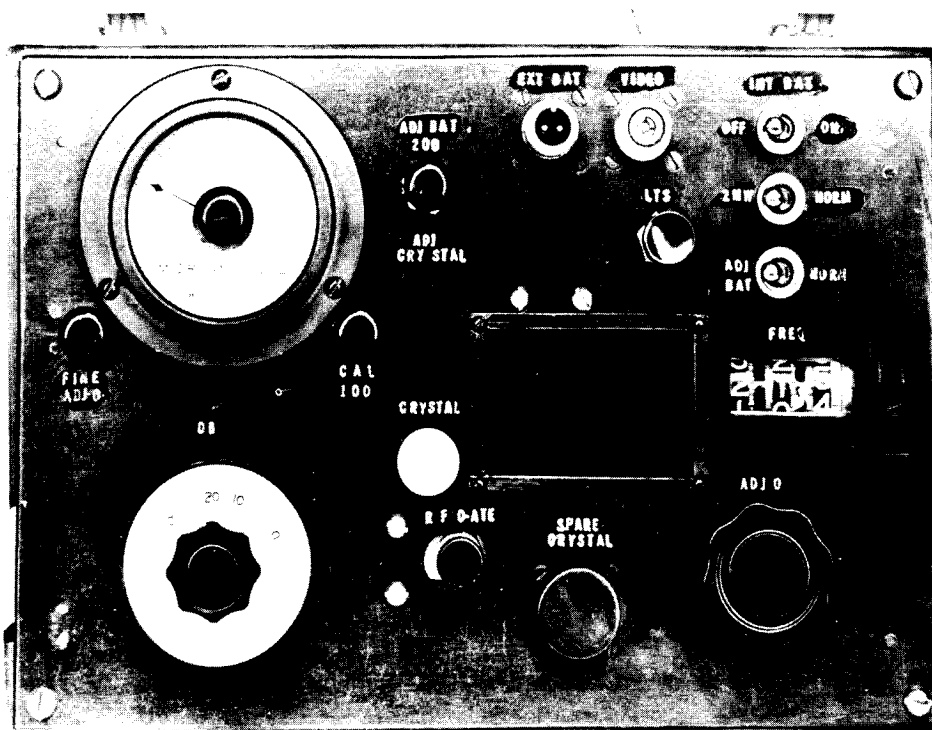
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Harmonic Signal Generator TS-202/U Complete, including:	-	10-1/2	21	14-5/8	60
	1 Frequency Identifier 200 mc Z-101	F16-G-62693-1857 -	4-1/2	4	6	2.5
	1 Frequency Identifier 500 mc Z-102	N16-C-67607-9101 -	4-1/2	4	6	2.5
	1 Frequency Identifier 1,000 mc Z-103	N16-C-67611-1901 -	2	3-1/4	5-1/4	1
	1 Test Cable RG-8/U-W105	N16-C-67630-5141 - - -	30 lg			
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Combination and Group Test Set

**FREQUENCY POWER METER MODELS
TS-230/AP, TS-230A/AP**

**TS-230/AP,
TS-230A/AP**



Frequency Power Meter Models TS-230/AP and TS-230A/AP.

FUNCTIONAL DESCRIPTION

Frequency-Power Meter Models TS-230/AP and TS-230A/AP are designed to measure the frequency and power of unmodulated or pulsed signals in the range from 8500 to 9600 mc. These equipments can be used as detectors for signals received from a radar system, the resulting video pulses being fed to an oscilloscope such as Oscilloscope TS-34/AP Series or equivalent.

RELATION TO OTHER EQUIPMENT

Frequency-Power Meters Models TS-230/AP and TS-230A/AP are practically identical except for slight mechanical differences such as the video output connector, and the rf cable supplied only with Model TS-230A/AP.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—6 v dc, 2 w, from four dry batteries Type BA-30.

Provision for External Battery: 24 to 30 v dc, 5 w.

FREQUENCY RANGE.—8500 to 9600 mc.

Absolute Accuracy: ± 3.0 mc.

Relative Accuracy: ± 0.5 mc.

TEMPERATURE RANGE.— -40° to $+55^{\circ}$ C.

TS-230/AP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-T-20135-6501 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec No. RE-13A787
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.1
F.I.I.N.	

TS-230A/AP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-T-20135-6521 (ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec CS-677
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.1
F.I.I.N.	

UNCLASSIFIED

4.10 TS-230/AP: 1

TS-230/AP, TS-230A/AP

TEMPERATURE COEFFICIENT OF CALIBRATION.—
0.05 mc per degree Centigrade.

POWER MEASURING RANGE.—0.1 to 1000 mw avg.

Absolute Accuracy: ±1.0 db (0.1 to 1.0 mw); ±1.5 db
(1.0 to 1000 mw).

Relative Accuracy: ±0.2 db.

RF POWER INPUT.—

Maximum: 200 w peak, or 2 w avg.

Minimum: 0.1 mw avg.

VIDEO OUTPUT.—0.1 v across 72 ohms for rf input of
0.25 w peak.

PRESENTATION AND CONTROLS.—The frequency of
signals is determined from the reading given by the
FREQUENCY micrometer and a calibration chart.
The micrometer is set for a minimum reading on the
dc microammeter. The power is determined from
linear readings on the dc meter up to 1 mw, and from
the db dial above 1 mw.

FITTINGS AND ACCESSORIES.—The rf input receptacle
is in the form of a rectangular wave guide RG-51/U
(1-1/4 x 5/8 inch) terminated by a standard AN Type
flat cover flange. With Model TS-230A/AP, an rf
cable is supplied, which has an AN Type UG-42/U
choke flange wave guide fitting on one end, and an
N-Type UG-21/U coaxial plug on the other.

On Model TS-230/AP, the VIDEO jack is a small
UHF Type 49194 coaxial receptacle. On Model TS-
230A/AP, the VIDEO jack is a BNC Type UG-290/U
coaxial receptacle. On both Models, the EXTERNAL
BATTERY receptacle is an AN connector (AN-3102-
10SL-4P).

CONSTRUCTION.—Model TS-230/AP and Model TS-
230A/AP are enclosed in metal cabinets, provided

with a lid cover and snap latches. A metal carrying
handle is provided at the top of the cabinet. To find
access to the built-in battery compartment and spare
crystal holder, the front panel can be removed. On
Model TS-230A/AP, panel guards are provided, and
the lid cover is provided with clamps to hold the rf
cable and the set of wrenches.

MANUFACTURER'S OR CONTRACTOR'S DATA

TS-230/AP:

Western Elec. Co., Inc., New York, N.Y.
Contract NXsr-51503, dated 5 May 1945.
Contract NXss-32196, dated 5 May 1945.
Contract NOrd-3644, dated 5 May 1945.

TS-230A/AP:

Midwest Engineering Development Co., Inc., 3543
Broadway, Kansas City 2, Missouri.
Contract NObsr-39303, dated 19 June 1947.

TUBE AND CRYSTAL COMPLEMENT

TS-230/AP

Requires any one of the following crystal rectifiers:

1N23 1N22 1N21
1N21A 1N21B

TS-230A/AP

(1) 1N23A Crystal Rectifier

REFERENCE DATA AND LITERATURE

NAVSHIPS 372: Instruction Book for Frequency-Power
Meter Model TS-230/AP.

NAVSHIPS 91105: Instruction Book for Frequency-Power
Meter TS-230A/AP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-230/AP Frequency Power Meter TS-230/AP	1.9	17	15	11	35
1	TS-230A/AP Frequency Power Meter TS-230A/AP Including Maintenance Repair Parts	2.24	11	22	16	28

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-230/AP Frequency Power Meter TS-230/AP	- - -	12	10	6	10-1/2
2	Instruction Book NAVSHIPS 372	- - -	TOTAL LESS MAINTENANCE REPAIR PARTS			TOTAL
			TOTAL			

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Combination and Group Test Set

TS-230/AP, TS-230A/AP

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-230A/AP Frequency-Power Meter TS-230A/AP	-	6	12	8	10.62
1	RF Cable Assembly CG-550/U	- 16-C-11604-5001	65 lg			1.0
1	Allen Wrench #8	- 3300-680668000 41-W-2446 6R-57400				
1	Allen Wrench #10	- 3300-68038400 41-W-2449 6R-55496				
4	Batteries BA-30 NT-19031 (Type C)	- G17-B-7210	1-1/8	9-1/2	1-1/8	.75
2	Instruction Book NAVSHIPS 91105	-	9	11-1/2	3/4	1.25
1	Set of Maintenance Repair Parts	-	5	12	6	5.06
			TOTAL LESS MAINTENANCE REPAIR PARTS			13.62
			TOTAL			18.68

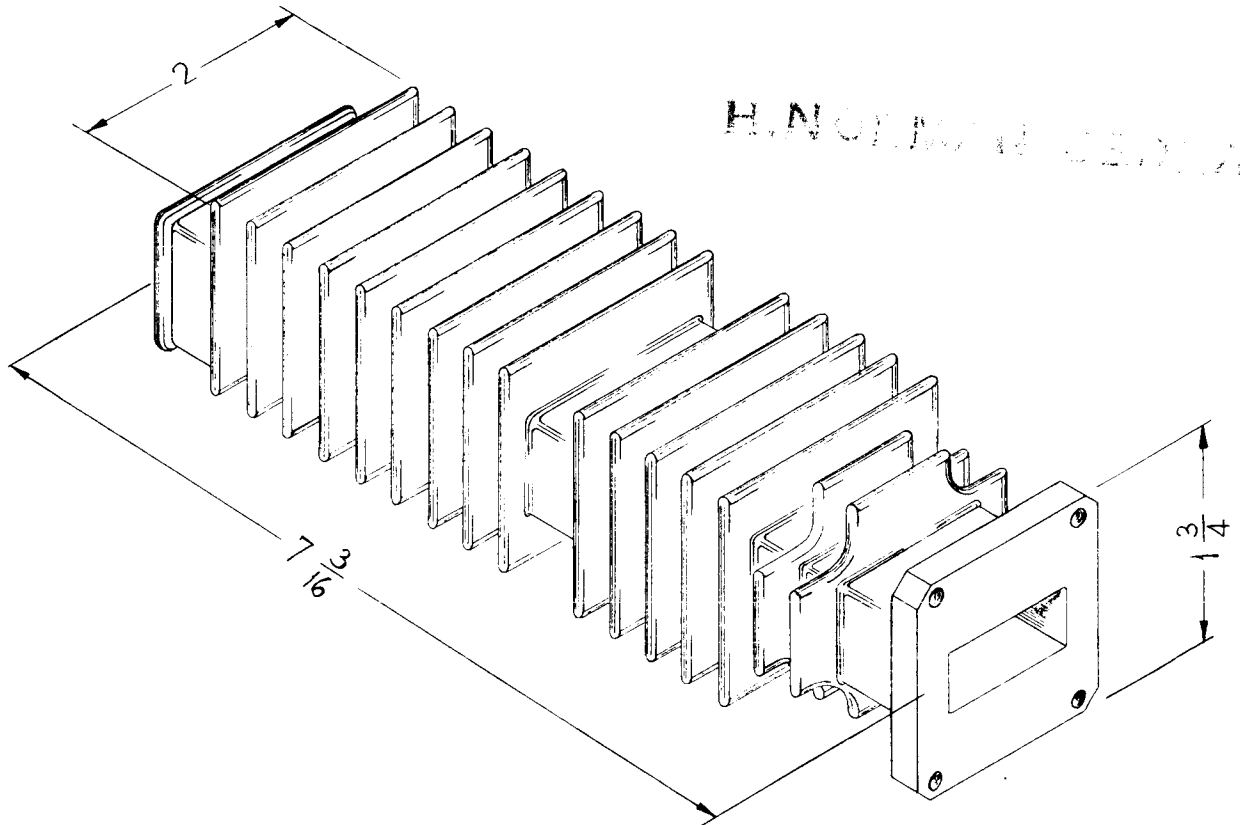
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Associated Devices for Electronics Test Equipment

**DUMMY ANTENNA TS-231/AP and
TS-231A/AP**

**TS-231/AP,
TS-231A/AP**



Dummy Antenna TS-231/AP.

FUNCTIONAL DESCRIPTION

Dummy Antenna TS-231/AP is employed as an rf load in the alignment and testing of radars operating over the frequency range of 8600 to 9600 mc. It provides a power-absorbing termination for the rf transmission line waveguide into which the radar transmitter can work without radiating energy into space. The rf energy is converted to heat which is dissipated by black cooling fins.

RELATION TO OTHER EQUIPMENT.

Dummy Antenna TS-231A/AP is similar to Dummy Antenna TS-231/AP but will dissipate more energy. It may be used as a replacement for TS-231/AP. The TS-231/AP is rated at 50 watts average dissipation. It is the same as Navy Type 66AHT and is similar to Dummy Antenna TS-108/AP which is designed for a 1 in. x 1-1/2 in. waveguide.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—8500 to 9600 mc.
RF POWER DISSIPATION.—
TS-231/AP: 50 w avg.
TS-231A/AP: 200 w avg.
IMPEDANCE, INPUT.—50 ohms.
SWR.—1.05 max to waveguide.
AMBIENT TEMPERATURE RANGE.—-40° to +40°C.

TS-231/AP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-L-86178-9251 (ARMY): 3F4325-231
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec RE-13A1027
PROCUREMENT COG.:	
RDB IDENT. NO.:	11.7
F.I.I.N.	

TS-231A/AP

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-L-86162-7801 (ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec CS-745
PROCUREMENT COG.:	
RDB IDENT. NO.:	11.7
F.I.I.N.	

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CATALOG OF NAVY MATERIAL

Associated Devices for Electronics Test Equipment

UNCLASSIFIED

TS-231/AP, TS-231A/AP

FITTINGS AND ACCESSORIES.—The input end is equipped with a flange cover plate for connection to a 5/8 in. x 1-1/2 in. choke coupling, such as UG-52/U with the rf transmission line of the radar.

CONSTRUCTION.—Dummy Antenna TS-231A/AP is constructed of a waveguide with a high loss tapered ceramic insert and cooling fins on the outside. The unit is made of brass with an ebonol finish. The Dummy Antenna TS-231/AP has an aluminum cast housing with radiating fins.

MANUFACTURER'S OR CONTRACTOR'S DATA

Western Electric Co., 120 Broadway, New York, N.Y. (TS-231/AP).
 Contract N5sr-11831, dated 25 February 1946.
 Contract NXsr-48371.
 Contract NXsr-51503.
 DeMornay-Budd Inc., 475 Grand Concourse, New York 51, N.Y. (TS-231A/AP).
 Contract 39380.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,869: Instruction Book for Dummy Antenna TS-231/AP.

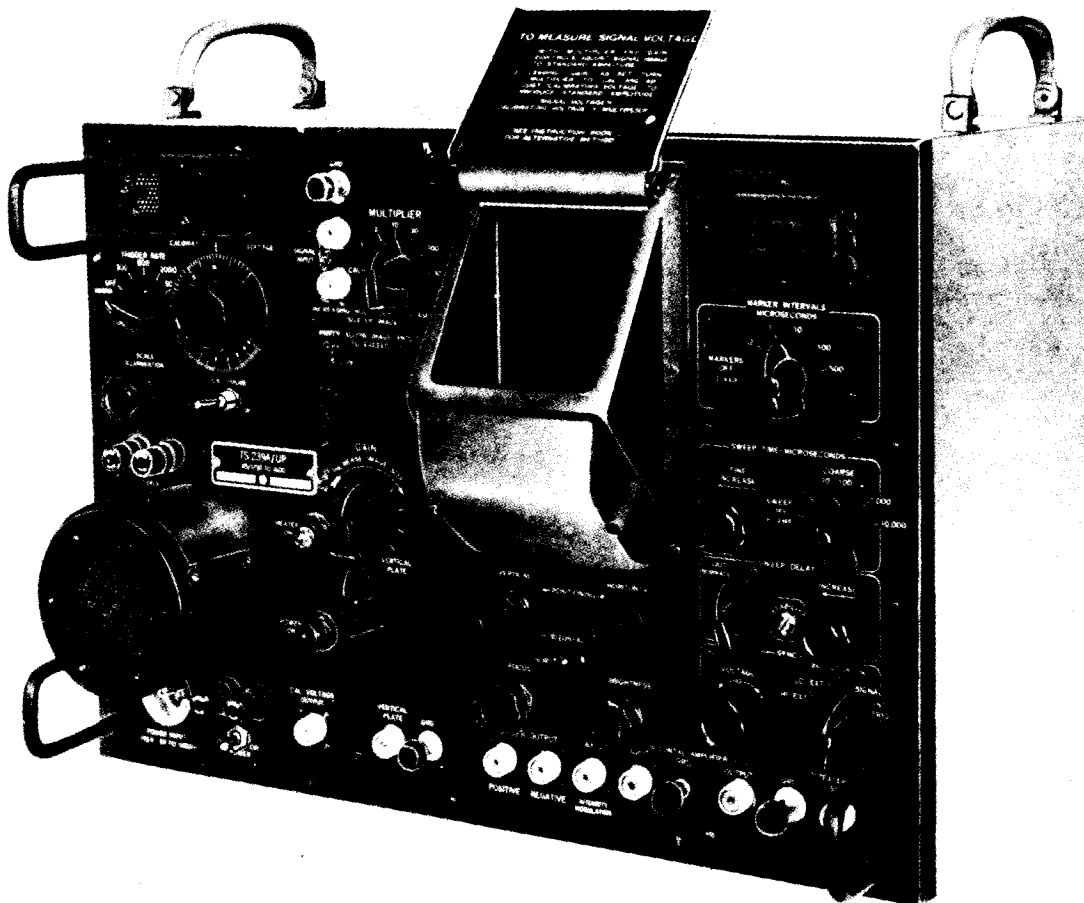
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Dummy Antenna TS-231/AP	- - 3F4325-231	1-3/4	7-1/4	2	1
1	Dummy Antenna TS-231A/AP	- N16-L-86162-7801 -	2-1/2	7-1/4	2	7.3
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

OSCILLOSCOPE TS-239/UP and TS-239A/UP

Waveform Measuring Equipment
**TS-239/UP,
TS-239A/UP**



Oscilloscope TS-239A/UP.

FUNCTIONAL DESCRIPTION

Oscilloscope TS-239A/UP is an equipment for displaying a luminous plot of the time-variation of a voltage pulse or wave, with self-contained means for measuring its duration and instantaneous magnitude. It is intended for use in testing all types of electronic equipment in the radar and communications fields.

The Oscilloscope contains a calibrating voltage generator which permits convenient measurement of instantaneous signal voltages without recourse to any outside standard, a timing marker generator furnishing five time scales, and a trigger generator producing pulses for triggering external circuits and also the oscilloscope at four different rates.

RELATION TO OTHER EQUIPMENT

Oscilloscope TS-239A/UP is the same as TS-239/UP except that the latter does not have a negative trigger output or a 5000 pps trigger rate. This equipment is superseded by Oscilloscope AN/USM-24 Series which is smaller and lighter and is contained in a combination case.

ELECTROMECHANICAL DESCRIPTION

POWER INPUT.—105 to 125 v ac, 50 to 1600 cps, 210 w.

TYPE	(USAF): Sub. Standard	TS-239/UP
CLASSIFICATION:	(NAVY): Sub. Standard	
	(ARMY): Standard	
STOCK NO.:	(USAF):	
	(NAVY): F16-0-304050-200	
	(ARMY): 3F4325-239	
DESIGN COGNIZANCE:	Navy, BUSHIPS	
PROCUREMENT INFO.:	Navy Spec Dwg No. 16-0-5(BUAER)	
PROCUREMENT COG.:	Navy, BUSHIPS	
RDB IDENT. NO.:	3.2	
F. I. I. N.		

TYPE	(USAF):	TS-239A/UP
CLASSIFICATION:	(NAVY): Standard	
	(ARMY):	
STOCK NO.:	(USAF):	
	(NAVY): F16-0-304052-200	
	(ARMY):	
DESIGN COGNIZANCE:	Navy, BUSHIPS	
PROCUREMENT INFO.:	Navy Spec No. CS-750	
PROCUREMENT COG.:		
RDB IDENT. NO.:	3.2	
F. I. I. N.		

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4.3 TS-239/UP: 1

TS-239/UP, TS-239A/UP

VERTICAL, Y AXIS, AMPLIFIER.—
 Sine Wave Response: 10 cps to 5 mc.
 Transients, Observable Rise Time: 0.08 μ sec max, 10% to 90% of full amplitude.
 Square Pulse Duration: 0.2 to 5000 μ sec.
 Polarity: Positive or negative.
 Sensitivity for Standard Deflection:
 Oscilloscope Alone: 0.1 to 100 v peak.
 Oscilloscope with Probe: 1 to 450 v peak.
 Input Impedance:
 Oscilloscope Alone: 0.3 meg shunted by 30 μ mf.
 Oscilloscope with Probe: 3 meg shunted by 12 μ mf.

DIRECT VERTICAL PLATE CONNECTION.—
 Sensitivity: 110 v per inch deflection.
 Max Input: 450 v peak.
 Input Impedance: 2.2 meg through 0.1 μ f.

HORIZONTAL, X AXIS, AMPLIFIER.—
 Response: 10 to 10,000 cps.
 Sensitivity: 8 to 200 v per inch deflection.
 Max Input: 450 v peak.
 Input Impedance: 0.5 meg.

INTENSITY, Z AXIS (Normally used for internal markers).—
 Input Impedance: 0.1 meg through .01 μ f.
 Max Input: \pm 75 v.

SWEEP (STOP-START) X AXIS.—
 Speed: 0.5 to 50,000 μ sec per inch.
 Delay: Any portion over 10 μ sec may be observed.
 Expansion: 10 times.
 Output Trigger Amp: +150 v.
 Output Impedance: 0.1 meg in series with .05 μ f.

SYNCHRONIZATION.—
 Input Impedance:
 Oscilloscope Alone: 0.3 meg shunted by 30 μ mf.
 Oscilloscope with Probe: 3 meg shunted by 12 μ mf.
 Means: Leading or lagging edge of pulse.
 Internal: Trigger generator.
 External, Without Probe: \pm 0.5 to \pm 150 v peak.
 External, With Probe: \pm 5 to \pm 450 v peak.

TRIGGER PULSE OUTPUT.—
 Amplitude: \pm 25 v.
 Duration: 4 μ sec.
 Repetition Rate: 300, 800, 2000 or 5000 pps.
 Rise Time: 1/2 μ sec (10 to 90% of full amplitude).

TIMING MARKERS (SYNCHRONIZED WITH SWEEP).—
 Intervals: 0.2, 1, 10, 100 or 500 μ sec.

CALIBRATING VOLTAGES, VERT, Y.—
 Square Wave (approx 150 cps) Amplitude: 0.1 to 1 v, peak-to-peak.

SQUARE WAVE.—
 Amplitude: 75 v peak-to-peak.
 Calibration Of: Vert deflection plates, Horiz amplifier, probe and external use.

MEASURING SCALE.—
 Divisions: 30 x 40.
 Illumination: Continuously variable to full pilot brightness.

AMBIENT TEMP LIMITS.— -40°C to +55°C.
PRESENTATION AND CONTROLS.— Waveforms are displayed on the face of a 3-inch cathode-ray tube. The screen of the cathode-ray tube is viewed through a green plexiglass window in the front panel. The image of an illuminated orange-colored scale reflected from the surface of this window appears to coincide with the tube screen, thus giving a reference scale free from parallax.

The following controls and other items are provided on the front panel for operating the equipment:

<u>Name</u>	<u>Function</u>
Power Input	Receptacle for power supply cord.
Power Off-On	Switch controlling power supply.
Power On	Red pilot light indicates power is on and heater is off.
Heater On	White pilot light indicates heater is on and power is turned off.
Stability	For adjustment of horizontal sweep.
Signal Input	Two jacks in parallel, for viewing two video inputs simultaneously.
Multiplier	Video input gain multiplier.
Gain	Video gain control.
Calibrating Voltage	Adjusts calibrating voltage.
Cal Probe	For external use of calibrating generator.
Cal Voltage Output	External connection to calibrating generator.
Scale Illumination	Controls on-off and brightness of cathode-ray face scale.
Brightness	Controls brightness of trace image.
Focus	Controls sharpness of image.
Positioning Vertical	Adjusts vertical position of image.
Horizontal	Adjusts horizontal position of image.
Sync Selector	Selects synchronizing means.
Sync Voltage	Controls polarity and voltage of sync pulse.
Sweep Time (Coarse)	Controls sweep-time decade steps.
Sweep Time (Fine)	Controls sweep-speed over each decade range.
Sweep Delay, out-in	Switches delay circuit, in or out.
Increase	Regulates delay.
External Sync	For connecting external sync source.
Marker Intervals	Selects marker intervals in steps.
Z-Axis	Connection for external intensity signals.
Trigger Rate	Sets repetition rate of internal trigger pulses.
Trigger Output	Supplies trigger output pulse.
Normal-Vertical Plate	Switches connection to cathode ray tube vertical plate from video output to ext jack.
Vertical Plate	Jack for connecting signal directly to lower vertical plate.
GROUND	Ground binding posts.
Horizontal Amplifier Input and Output	Permits external use of Horiz sweep amplifier.
Horizontal Gain	Adjusts gain of horizontal amplifier, for external signals.
FITTINGS AND ADAPTORS.— All jacks (except power) are Navy Type 49194 small UHF, female, coaxial connector receptacles. The probe cable and patching cords have Navy Type 49195 UHF, male, coaxial connector plugs which mate the panel receptacles. Three UG-255/U adaptors are supplied to mate the male UHF coaxial connector plugs to male BNC coaxial connector receptacles. Three UG-273/U adaptors are supplied to mate the female UHF coaxial connector	

UNCLASSIFIED

Waveform Measuring Equipment

TS-239/UP , TS-239A/UP

receptacles to female BNC coaxial connector receptacles. One adaptor Navy Type 49199 is supplied to permit two connections to be made simultaneously to one panel jack. It has one male and two female UHF coaxial connectors. Each of four adaptors Navy Type 49429 has a binding post mounted on a UHF male coaxial connector plug to convert any panel jack to binding posts.

The following chart shows the connections ordinarily used.

CONSTRUCTION.—The equipment is housed in metal case with two carrying handles on top. It has a motor driven blower with filter for ventilation. The transit case is made of balsa wood panels covered on both sides with aluminum sheet. The cover is held in position with trunk type fasteners. A carrying handle is provided at each end and the case is finished in gray enamel.

MANUFACTURER'S OR CONTRACTOR'S DATA

TS-239/UP:

Western Elec. Co., New York, N.Y.
 Contract NXsa-97713, dated April 1947.
 Lavoie Laboratories, Morganville, New Jersey.
 Contract NOa(s) 8804.

TS-239A/UP:

Lavoie Laboratories, Morganville, N.J.
 Contract NObsr-39422, dated 15 December 1948.

TUBE COMPLEMENT

TS-239/UP

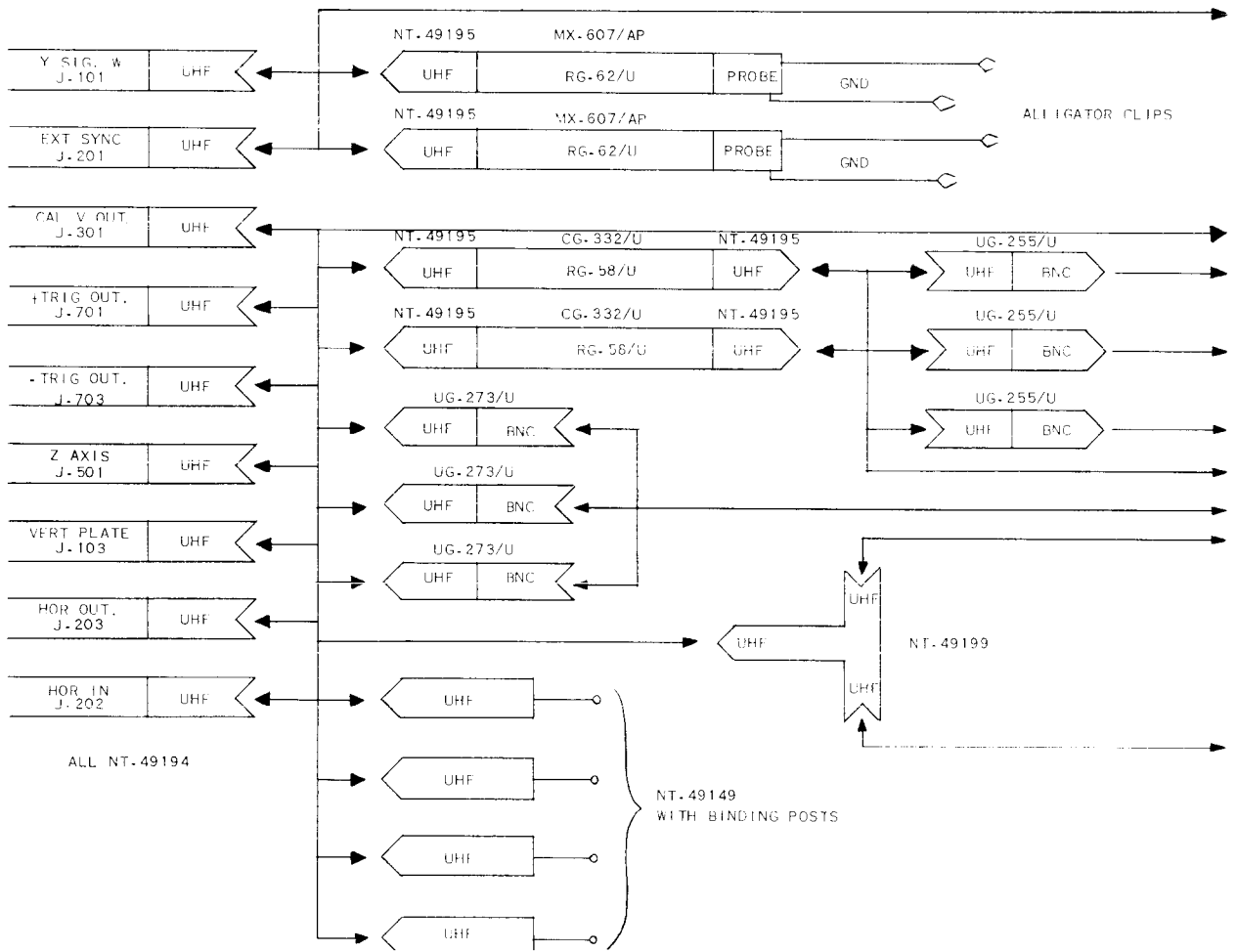
(2) 6X5-GT/G	(1) 6AL5	(1) 3JP1
(1) OC3/VR-105	(2) 6AG7	(8) 7F8
(2) 6SN7-W	(3) 6AK5	(2) 6C4
(1) 5R4-GY		

TS-239A/UP

(1) OC3/VR-105	(1) 5R4-GY	(2) 6AG7
(2) 6X5-GT/G	(1) 6AL5	(1) 3JP1
(2) 6SN7-W	(3) 6AK5	(8) 7F8
(2) 6C4		

REFERENCE DATA AND LITERATURE

AN 16-35TS239-3: Handbook of Operating and Maintenance Instructions for Oscilloscope TS-239/UP.
 NAVSHIPS 91148: Instruction Book for Oscilloscope TS-239A/UP.



UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Waveform Measuring Equipment

UNCLASSIFIED

TS-239/UP, TS-239A/UP

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope TS-239A/UP	7.64	30	20	22	150
1	Maintenance Repair Parts	7.8	16	44	19	160

EQUIPMENT SUPPLIED

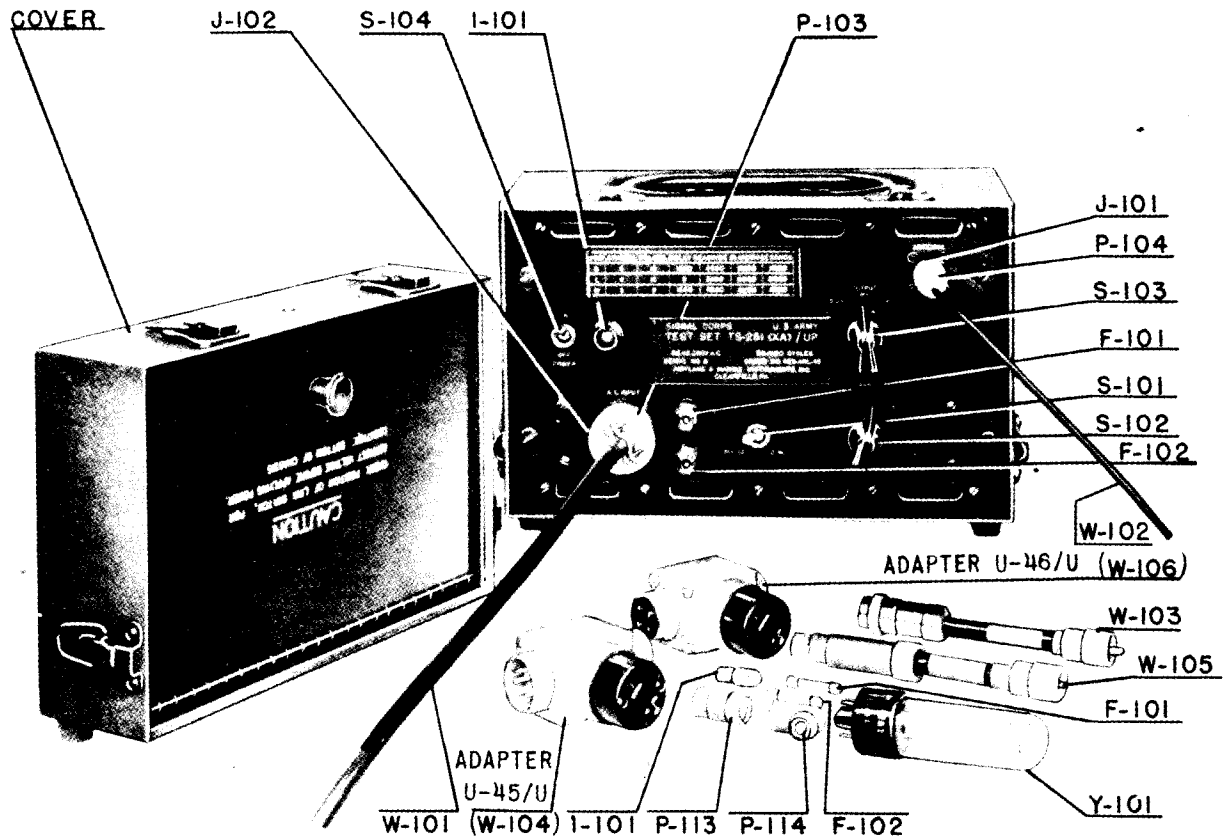
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Oscilloscope TS-239/UP or TS-239A/UP	-	16-1/2	21-1/2	13-1/2	66
2	Probe MX-607/AP	1600-326-433005 N17-L-63352-9310 3F3155-1	52 lg			1
2	Cord (Patching) CG-332/U	- N16-C-11945-2866 1F430-332.96	96 lg			11/16
1	Power Cord CX-337/U	- N17-C-48226-2021 3E6000-337-72	72 lg			1/2
1	Adaptor NT-49199	3300-286-044750 N17-C-68722-3539 2Z299-358	1	1-1/4	3/4	1/8
3	Adaptor UG-255/U	3300-298-296928 N17-C-67989-1323 2Z308-255	1-3/8 x 5/8 dia			3/16
3	Adaptor UG-273/U	3300-298-296948 N17-C-67988-5260 2Z308-273	1-3/8 x 3/4 dia			3/16
4	Adaptor NT-491429	3300-286-051074 N17-C-71415-6447 2Z303-23	1-7/8 x 23/32 dia			5/16
1	Transit Case CY-573/UP	- N16-C-170001-248	16-3/4	25-1/2	19	24
1	Maintenance Repair Parts	- - -	15	36	12	100
					TOTAL LESS MAINTENANCE REPAIR PARTS	93 (approx)
					TOTAL	193 (approx)

UNCLASSIFIED

Signal Generating Equipment

TEST SET TS-251/UP

TS-251/UP



Test Set TS-251/UP.

FUNCTIONAL DESCRIPTION

Test Set TS-251/UP is a small portable signal generator for use in preflight, Navy Yard and tender checking of LORAN receivers. CW or Pulsed rf signals are produced to permit the following checks:

- Receiver alignment and sensitivity.
- Timer performance and crystal oscillator frequency.
- Stability of sweep generating circuits and accuracy of time delay measurements.
- Possible receiver distortion due to insufficient handling capability.
- Possible video distortion.
- Performance of "gain" and "amplitude balance" controls.
- Performance of "Left-Right" control.
- Alignment of antenna loading coil.

RELATION TO OTHER EQUIPMENT

This equipment will be superseded by Signal Generator AN/GPM-15.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—80, 115 or 230 v ac, 50 to 1600 cps, 22 w.

FREQUENCY RANGE.—

Channel	kc	Factory Set
1	1890 to 2010	1950
2	1790 to 1910	1850
3	1840 to 1960	1900
4	1700 to 1850	1750

FREQUENCY DRIFT.—±5 kc from 0°C to +50°C; ±10 kc from -65°C to +85°C.

STANDARD OUTPUT LEVELS.—15 μv across 50 ohms load; 1 mv across 50 ohms load; 1 v across 150 ohms load.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF): 1690-329001265
	(NAVY): F16-Q-304075-200
	(ARMY): 3F4325-251
DESIGN COGNIZANCE:	USAF, C & N
PROCUREMENT INFO.:	Spec No. 371-5091
PROCUREMENT COG.:	USAF
RDB IDENT. NO.:	4.1.2
F.I.I.N.	

UNCLASSIFIED

TS-251/UP

PULSE RATE.—303.03 pps, 3300 μsec between pulses.
CRYSTAL OSCILLATOR FREQUENCY.—1818.18 cps, 1817.44 at 20°C.

PRESENTATION AND CONTROLS.—Operating controls on the front panel are as follows:

A “pulse-CW” switch, a channel selector switch and an output selector, act in relation to the output signal which is tapped from the output terminal labeled “Antenna.”

The ac input jack, on-off switch, fuse holders and pilot light are related to ac power. A link switch situated under the chassis of the set is used to tap three sections of the Transformer’s primary so as to adjust it to the line voltage. When making preflight tests of Loran receivers, two T adaptors, U-45/U and U-46/U are provided, to derive ac power directly from cables interconnecting the Loran receiver and the aircraft power unit.

FITTINGS AND ACCESSORIES.—All cables and accessories are provided to connect the signal generator

to the rf input terminal of various Loran receivers. (See chart.)

CONSTRUCTION.—The complete set and its accessories are enclosed in a metal cabinet with carrying handle, rubber feet, and locks. The lid cover is detachable and houses all the cables, accessories and equipment spares.

MANUFACTURER'S OR CONTRACTOR'S DATA

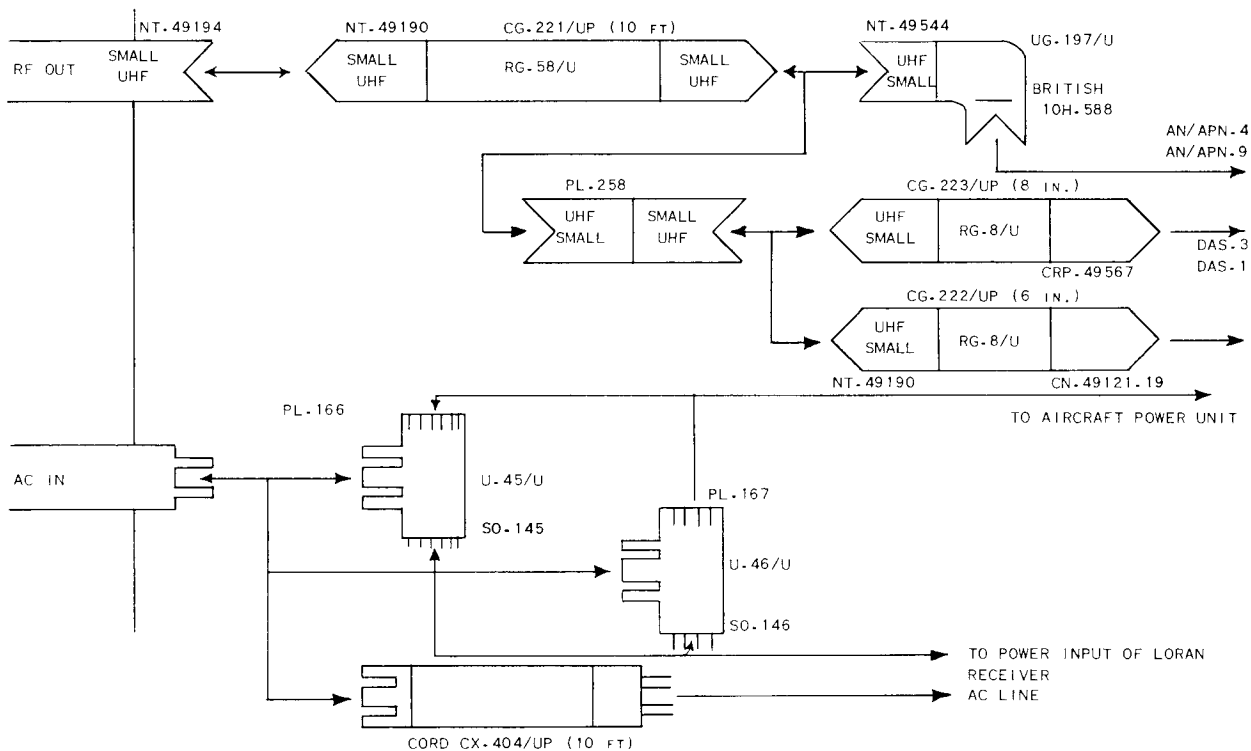
Airplane and Marine Instruments, Inc., Clearfield, Pa.
 Order No. 454-DAV-45, dated 1945.

TUBE COMPLEMENT

- (1) 6SN7-GT (1) 6SJ7 (1) 6SK7
- (1) 6SL7-GT (1) 6X5-GT/G (1) 6J5

REFERENCE DATA AND LITERATURE

AN 16-35TS251-2 (NAVSHIPS 900652): Handbook of Maintenance Instructions for Test Set TS-251/UP.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Set, TS-251/UP, with Accessories-(Shelf package-water resistant)	1.44	12	16	14	22

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Signal Generating Equipment

TS-251/UP

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Set TS-251/UP	- F16-G-63940-5861	7-3/4	11-3/4	10-1/2	18.1
	Including:	-				
1	Cord CG-221/UP	1690-154431620	120 lg			
		1F430-221.120				
1	Cord CG-222/UP	1690-132336232	6 lg			
		1F430-222				
1	Cord CG-223/UP	1690-132336233	8 lg			
		1F430-223				
1	Crystal Unit CR-11/U	1690-326167700 2X163-1.81818 3F2693-11	3-7/8	1-1/4		0.19
1	Adaptor U-45/U	3300-286050302	6 lg			
		2Z-302-45				
1	Adaptor U-46/U	3300-286050303	6 lg			
		2Z302-46				
1	Adaptor Navy Type 40544	3300-287350366				
		2Z3062-57				
1	Lamp, Mazda 47 LM-52	3300-292448000				
		2Z5952				
1	Plug PL-258	3300-294052500				
		2Z7226-258				
1	Cord, AC CX-404/UP	1690-322975394	120 lg			
		3E6000-404				
2	Fuse FU-26	3300-387698000				
		3Z1926				
1	Wrench, Hex 5/64 Inches	3300-680668000				
		6R57400				
1	Maintenance Instructions	- 6D9810-251				
TOTAL LESS MAINTENANCE REPAIR PARTS						18.1
TOTAL						

UNCLASSIFIED

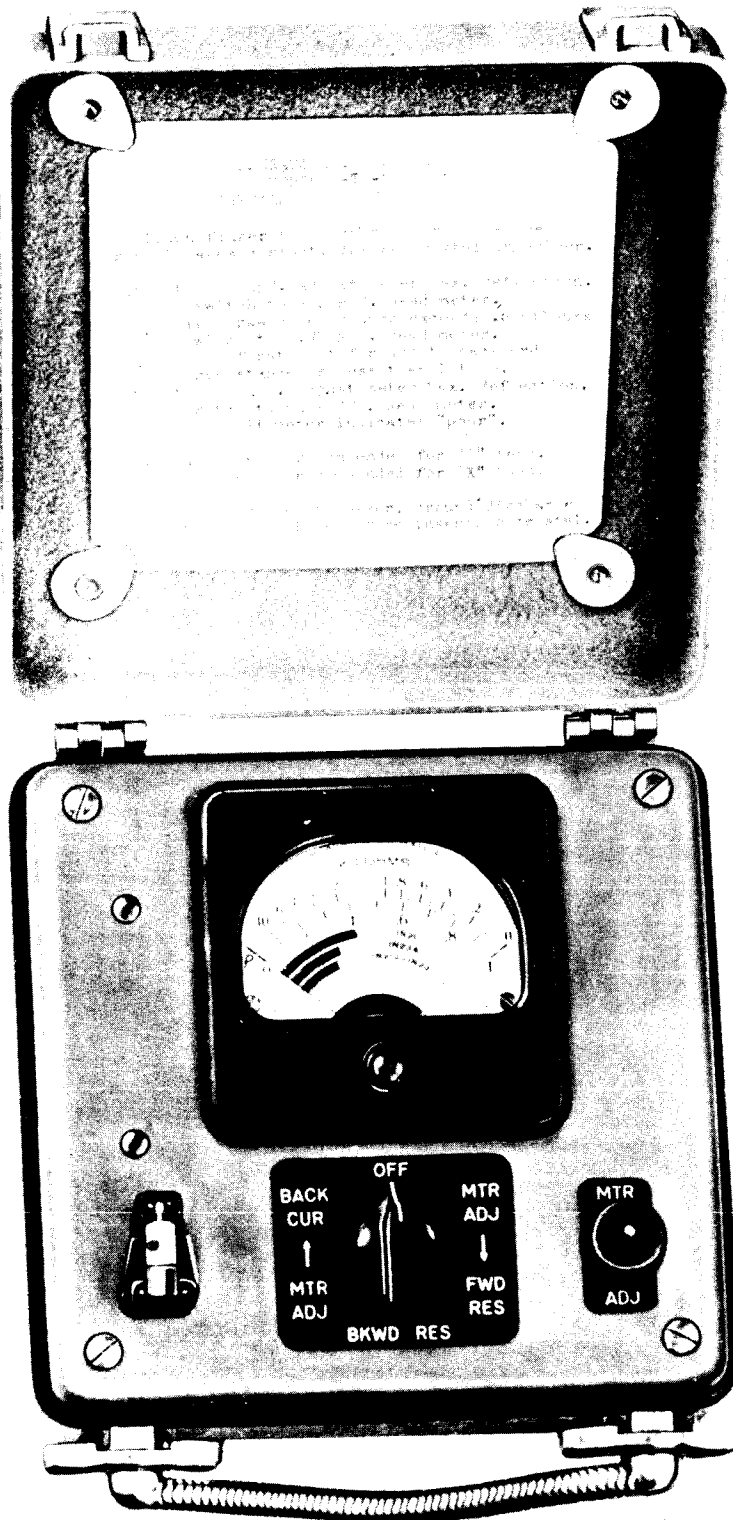
4.4 TS-251/UP: 3

UNCLASSIFIED

Voltage and Current Measuring Equipment

**CRYSTAL RECTIFIER TEST SET
MODEL TS-268/U SERIES**

TS-268/U SERIES



Crystal Rectifier Test Set Model TS-268/U.

UNCLASSIFIED

4.1 TS-268/U: 1

TS-268/U SERIES

FUNCTIONAL DESCRIPTION

Crystal rectifier test set TS-268(U)/U is a portable, self-contained test unit designed to make speedy qualitative tests on certain types of crystal rectifiers.

It measures the forward and the backward resistance of the crystal under test in order to obtain a ratio which indicates quality.

The condition of the crystal can further be determined by measurement of backward current flow.

Following is a partial list of crystal rectifiers which may be tested with this equipment.

BAND	LEAST SENSITIVE	MEDIUM SENSITIVE	MOST SENSITIVE	HIGH BURN OUT
L-BAND	IN21	—	—	IN25
S-BAND	IN21	IN21A	IN21B	—
X-BAND	IN25	IN21A	IN21B	—

RELATION TO OTHER EQUIPMENT

It is part of Test Kit AN/UPM-7, and of Radar Test Set AN/TPM-3.

TS-268/U is the interim model for TS-268A/U, and is similar to MIT type TMN-10RL.

TS-268A/U is the tropical version of TS-268/U.

TS-268B/U replaces TS-268/U.

TS-268C/U replaces TS-268B/U. Functions and characteristics being the same, except for the watertight case cover.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—1.5 v, dc from dry battery.

METER RANGE.—0 to 10,000 ohms; 0 to 1 ma, dc.

Accuracy: ±2%.

Temperature Range: -4°F to +120°F.

PRESENTATION AND CONTROLS.—All necessary controls are situated on the front panel. A special socket is used to insert the crystal under test in the meter circuit. The meter is calibrated in kilohms and milliamperes. The current scale is provided with colored sections which facilitate acceptance or rejection of crystals according to the type being tested.

A function switch is used to turn the set on and off, and to measure currents and resistances (forward and backward). Two meter adjustment positions are provided, one related to current measurements, the other to resistance measurements.

FITTINGS AND ACCESSORIES.—The Crystal Socket is located on the front panel. It is provided with a grounding spring which is used to check possible electrostatic charges of fingers before insertion of the crystal. A 1.5 volt dry battery type BA-30 is supplied with the Test Set and located under the front panel, in a spring-contact holder.

CONSTRUCTION.—The Test Set is enclosed in a metal box which has a hinged cover and a flexible metal handle with two clasps.

MANUFACTURER'S OR CONTRACTOR'S DATA

Radio Frequency Laboratories, Inc., Boonton, N. J. (TS-268/U).

Contract NXsr-84999, dated 12 December 1944.

Contract LL-NXsr-93897, dated 17 April 1945.

TYPE	(USAF):
CLASSIFICATION:	(NAVY):
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304135-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	12.12.8
F.I.I.N.	

TS-268/U:

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Sub.Standard(BUSHIPS)
	(ARMY): 3F4325-265
STOCK NO.:	(USAF): 1690-329001392
	(NAVY):
	(ARMY): 3F4325-265
DESIGN COGNIZANCE:	Navy, BUAER
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	1.2.3
F.I.I.N.	

TS-268A/U:

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY): Standard
STOCK NO.:	(USAF): 1690-329001395
	(NAVY):
	(ARMY): 3F4325-268A
DESIGN COGNIZANCE:	Army, ESL
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	1.2.3
F.I.I.N.	

TS-268B/U:

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF): 1690-329001395
	(NAVY):
	(ARMY): 3F4325-268B
DESIGN COGNIZANCE:	USAF, Watson
PROCUREMENT INFO.:	USAF Exhibit No. WLENG-121
PROCUREMENT COG.:	USAF
RDB IDENT. NO.:	1.2.3
F.I.I.N.	

TS-268C/U:

TYPE	(USAF): Sub. Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF): 1690-329001396
	(NAVY):
	(ARMY): 3F4325-268C
DESIGN COGNIZANCE:	USAF, Watson
PROCUREMENT INFO.:	USAF Exhibit No. WLENG-121A
PROCUREMENT COG.:	USAF
RDB IDENT. NO.:	1.2.3
F.I.I.N.	

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Voltage and Current Measuring Equipment

TS-268/U SERIES

Marion Electrical Instrument Co., Manchester, N.H.
(TS-268A/U, TS-268B/U).
Order No. 28-099-45-343.
Approximate Cost: \$25.

Munston Manufacturing & Service, Inc., New York,
N.Y. (TS-268C/U).
Contract No. W-33-038-ac-17893.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,647: Instruction Book (TS-268/U).
AN 16-35TS268-2: Handbook of Maintenance Instructions
(TS-268/U).
TM 11-1242: Technical Manual (TS-268/U).
TM 11-1200: Radar Test Equipment (TS-268/U).
TM 1-215: Technical Manual (TS-268B/U).
NAVAER 08-5S-78: Manual of Test Equipment (TS-
268B/U).

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Rectifier Test Set TS-268/U, domestic package	0.15	7-3/4	6-1/4	6-1/2	4.0
1	Crystal Rectifier Test Set TS-268A/U, shelf package	0.10	8	7	-	-
1	Crystal Rectifier Test Set TS-268B/U, shelf package	0.10	8	7	-	-
1	Crystal Rectifier Test Set TS-268C/U, in water-resistant carton	0.31	6	11	8	5.6

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Rectifier Test Set TS-268/U	1690-329001392 - 3F4325-265	3	6	7	3.0
1	Dry Battery BA-30	- - -				
2	Instruction Book NAVSHIPS 900.647	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			
1	Crystal Rectifier Test Set TS-268A/U	1690-329001395 - 3F4325-268A				
1	Dry Battery BA-30	- - -				
2	Instruction Book	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			
1	Crystal Rectifier Test Set TS-268B/U	1690-329001395 - 3F4326-268B	7-1/2	5-3/4	4-3/8	3.5
1	Dry Battery BA-30	- - -				
2	Instruction Book	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Voltage and Current Measuring Equipment

UNCLASSIFIED

TS-268/U SERIES

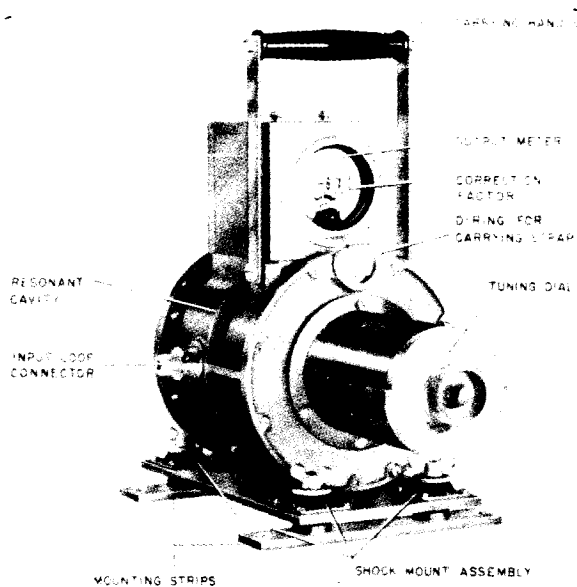
EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Rectifier Test Set TS-268C/U	1690-329001396 - 3F4325-268C	8	3-1/2	5-1/2	3.4
1	Dry Battery BA-30	- - -				
2	Instruction Book	- - -				
TOTAL LESS MAINTENANCE REPAIR PARTS						
TOTAL						

UNCLASSIFIED

Frequency Measuring Equipment

ECHO BOX MODEL TS-270/UP SERIES TS-270/UP SERIES



Echo Box Model TS-270/UP Series.

FUNCTIONAL DESCRIPTION

This equipment Series is a portable, hand tuned ring-ing cavity designed to make a quick, routine analysis of the overall performance of radar systems.

Some of its more important uses are:

- Measurement of ringing time.
- Analysis of transmitter frequency spectrum.
- Measurement of pulse duration.
- Relative indication of transmitter power output.
- Tuning of radar equipment.
- Measurement of transmitter frequency.
- Measurement of local-oscillator frequency.
- Checking erratic transmitter operation.
- Check transmitter frequency pulling.
- Check receiver AFC action.
- Measurement of TR-box recovery time.
- Measurement of receiver recovery time.
- Check transmission line losses.
- Trouble location.

A visual indication of system performance appears on the radar screen. Resonance and relative power are indicated by the deflections of the internal microammeter. Frequency is indicated by referring the dial settings to a calibrated chart.

RELATION TO OTHER EQUIPMENT

TS-270/UP Series is similar in design to Echo Boxes 14ABA(), OBU, and TS-275/UP Series.

It is a part of Radar Set AN/MPN-1A.

The use of Echo Box Model TS-270/UP Series pre-supposes the use of a pick-up device (antenna or direc-tional coupler) which is not included in this equipment.

Differences in models of the Series are shown in the following chart.

TS-270/UP	TS-270A/UP	TS-270B/UP
Cast bronze cavity	Cast bronze cavity	Cast aluminum cavity
Ring prediction factor	Ring prediction factor	Ring prediction factor
Stamped on housing	Stamped on housing	Shown on meter window
Percentage ring prediction	Percentage ring prediction	None
Scale on tuning dial rim	Scale on tuning dial rim approx freq scale on outer edge of tuning dial	Approx freq scale on outer edge of tuning dial
Accessory box only	Accessory box only	Carrying case only
One end of RG-8A/U RF Cable terminated by N plug	One end of RG-8A/U RF Cable terminated by N plug	Complete RF cable assy N plug on both ends

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—

As an Echo Box: 2700 to 2900 mc.

As a Wavemeter: 2630 to 2970 mc.

SENSITIVITY.—90 yards (of ringtime) per db.

TEMPERATURE RANGE.—-40° F to +140° F.

TS-270/UP

TYPE	(USAF): Limited Standard
CLASSIFICATION:	(NAVY): Substitute Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): 1690-329001405 (NAVY): F16-C-67647-4666 (ARMY): 3F4325-270
DESIGN COGNIZANCE:	Navy
PROCUREMENT INFO.:	Mil. Spec No. E3221, Navy Spec No.
PROCUREMENT COG.:	RE-13A-1047A, Army Spec No. 371-2398 Navy
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

TS-270A/UP

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard (ARMY): Limited Standard
STOCK NO.:	(USAF): 1690-329001408 (NAVY): (ARMY): 3F4325-270A
DESIGN COGNIZANCE:	USAF, Watson
PROCUREMENT INFO.:	
PROCUREMENT COG.:	USAF
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

TS-270B/UP

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): (ARMY):
STOCK NO.:	(USAF): 1690-329001409 (NAVY): F16-C-67646-6141 (ARMY): 3F325-270B
DESIGN COGNIZANCE:	USAF, Watson
PROCUREMENT INFO.:	Army Spec No. 71-2398
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

TS-270/UP SERIES

LOADED Q.—47,000 approx.

RESETTABILITY.—Within 2 minor divisions of inner dial (equivalent to 0.15 mc).

For each individual echo box, and for each type of radar to be tested, calibration charts related to frequency, temperature, and correction factors for cable loss, echo box, pick-up device, and standard method used are given.

PRESENTATION AND CONTROLS.—The main control is the tuning knob which actuates the plunger inside the resonant cavity, as well as the calibrated frequency dial. An individual calibration chart gives frequencies in relation to dial readings. A meter indicator with a 0 to 100 microamperes scale indicates the relative amount of power absorbed by the cavity over the tuning range and thereby indicates resonance. The echoed spectrum is analyzed on the A, J, or PPI scope of the radar system itself.

FITTINGS AND ACCESSORIES.—One rf cable, or cable assembly is supplied to connect the echo box to either a pick-up antenna (such as AS-23/AP pick-up dipole, or AT-67/AP coaxial horn) or a directional coupler installed along the radar transmission line. None of these accessories are supplied with the present equipment.

The echo box has a type N input jack (NT-49795) to which is connected one end of the rf cable ended by the corresponding type N plug (UG-21/U or UG-21B/U). The "radar" end of the cable is either unterminated (TS-270/UP, TS-270A/UP), or terminated

by another N plug (UG-21B/U) in the case of cord CG-55B/U for Echo Box Model TS-270B/UP.

CONSTRUCTION.—The echo box is screwed atop the plate of a shock mount assembly. The cylindrical cavity is made of cast bronze (TS-270/UP, TS-270A/UP) or cast aluminum (TS-270B/UP). A carrying handle is permanently attached to the box for convenience or alternately, the carrying strap may be used when it is desirable that both hands remain free.

MANUFACTURER'S OR CONTRACTOR'S DATA

TS-270/UP:

Johnson Service Co., Milwaukee, Wisconsin.
 Contract NXsr-LL-77902, dated 6 November 1944.
 Contract N5sr-8624, dated 26 April 1945.
 Contract W-28-099-ac-47, dated 19 July 1948.
 Order No. 2417-MPD45.

TS-270A/UP:

Johnson Service Co.
 Order No. 5040-DAY-45-CR.
 Order No. 2417-MPD-45.

TS-270B/UP:

Johnson Service Co.

REFERENCE DATA AND LITERATURE

TM 11-1086 (July 1951): Echo Box TS-270()/UP.
 SHIPS 343-A: Instruction Book for Model TS-270/UP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box Test Set TS-270/UP with spares and accessories	3.4	24-3/4	10-1/4	14-1/2	73.0
1	Echo Box Test Set TS-270A/UP with spares and accessories	3.4	24-3/4	16-1/4	14-1/2	73.0
1	Echo Box Test Set TS-270B/UP with spares and accessories	4.6	21-1/2	15-1/4	24-1/8	61.0

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
0/	Refers to TS-270/UP					
A/	Refers to TS-270A/UP					
B/	Refers to TS-270B/UP					
1	Echo Box TS-270/UP with shock mount	1690-329001405 R16-AN-TS-270/UP(ASO) 3F4325-270	12-1/4	8	14-5/8	25.75
1	Echo Box TS-270A/UP with shock mount	- - 3F4325-270A	12-1/4	8	14-5/8	25.75
1	TS-270B/UP with shock mount	- - 3F4325-270B	12-1/2	7-1/4	14-1/2	11.25
1	Accessory case	- - -	3-3/25	10-1/2	11-1/4	9.0 (full)
1	Carrying Case	- - 6F591	15-3/4	10	19	18.0 (full)

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Frequency Measuring Equipment

TS-270/UP SERIES

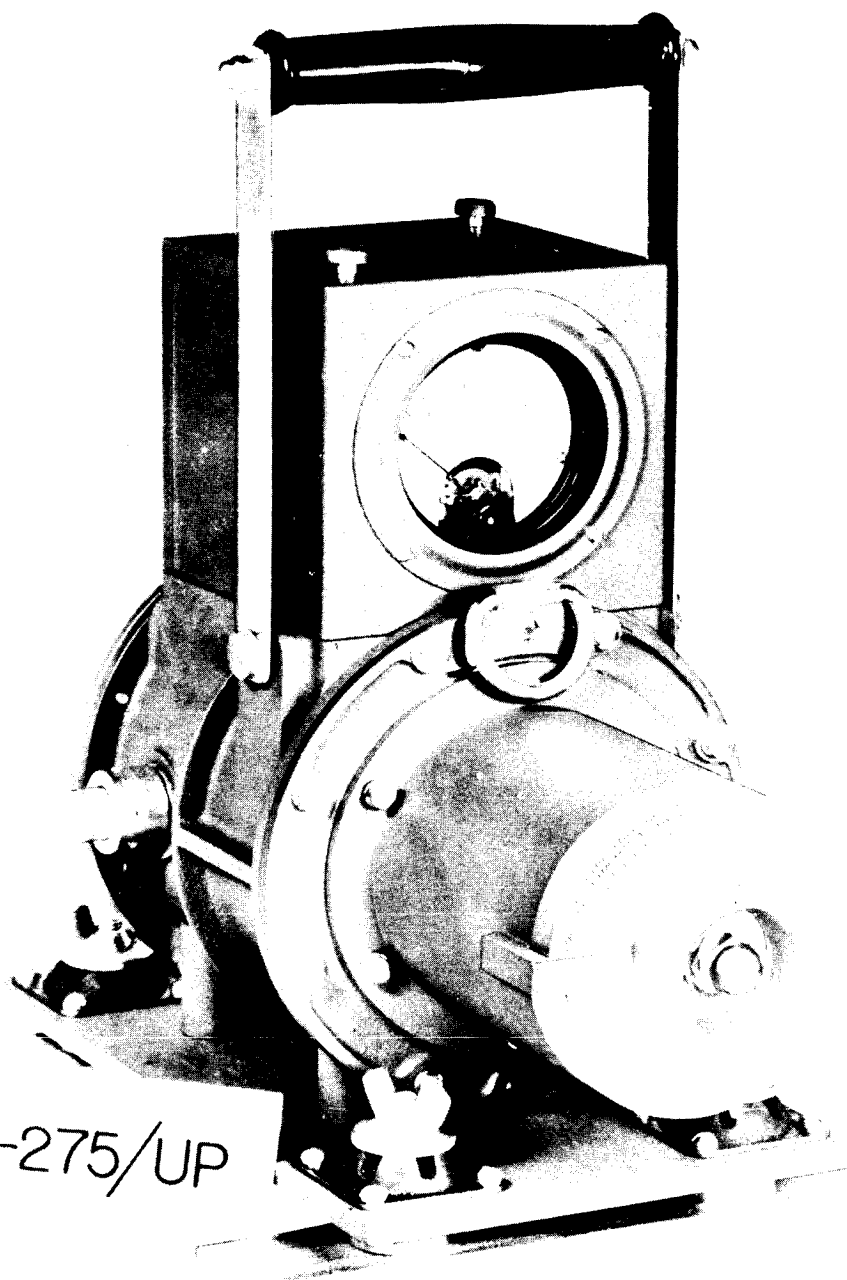
EQUIPMENT SUPPLIED							
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE		STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
				HEIGHT	WIDTH	DEPTH	
0/	A/	B/					
1	1	1	Socket Wrench 5/8" hex - 6R57420.2	2-1/2	7/8 dia		
1	1	1	Spanner Wrench - 5R57528	1	3/8 dia		
1	1	1	Plunger Positioning Gauge - 3F48800				
1	1	1	Carrying Strap - 2Z9052-70				
1	1		Connecting Cable RC-8A/U - - - 3E.6015-55C.2	120 lg			
1	1	1	Connecting Cable Assembly CG-55B/U - - 3E.6015-55C.2				
1	1	1	Technical Manuals and Charts - - -				
3	3	3	Spare Crystal IN21B 3300-234137020 - 251N21B				
				TOTAL LESS MAINTENANCE REPAIR PARTS			
							270: 52.75
							270A: 52.75
							270B: 38.25
							TOTAL

UNCLASSIFIED

Frequency Measuring Equipment

ECHO BOX MODEL TS-275/UP

TS-275/UP



Echo Box Model TS-275/UP.

UNCLASSIFIED

TS-275/UP

FUNCTIONAL DESCRIPTION

Model TS-275/UP is a sharp tuning, high Q resonant cavity designed to make a quick routine analysis of the overall performance of radar systems operating at frequencies between 3400 and 3700 mc. The most often performed tests are:

- Relative indication (from day-to-day) of transmitter power output.
- Measurement of transmitter, and local oscillator frequencies.
- Analysis of transmitter frequency spectrum.
- Checking on erratic operation, double moding and frequency pulling.
- Measurement of pulse duration.
- Checking of Receiver AFC action, measurement of TR Box and Receive recovery time.
- Measurement of standing wave ratio, of transmission line losses, and of other factors.
- A visual indication of system performance appears on the Radar screen. Resonance and relative power are indicated by the deflection of the built-in microammeter.

RELATION TO OTHER EQUIPMENT

The use of Echo Box TS-275/UP presupposes the availability of a pick-up device such as:
 Pick-up Dipole AS-23/AP or Coaxial Horn AT-67/AP, Directional Coupler CU-108/UP, Directional Coupler CU-132/TPL-1, Directional Coupler CU-214/UP, none of which is supplied with this equipment.

ELECTROMECHANICAL DESCRIPTION

- FREQUENCY RANGE.**—
 As Echo Box: 3400 to 3700 mc.
 As Wavemeter: 3330 to 3770 mc.
- SENSITIVITY.**—50 yards change in ring time per db change in power (subject to frequency and temperature).
- ACCURACY.**—
 Frequency: ±3 mc.
 Performance: ±3 db.
- LOADED Q.**—4700.
- PRESENTATION AND CONTROLS.**—The tuning knob actuates the plunger inside the resonant cavity, as well as the calibrated frequency dial. An individual calibration chart indicates frequencies in relation to dial settings.
 A meter indicator with a 0 to 100 microamperes scale indicates the relative amount of power absorbed by the cavity over the tuning range and thereby resonance. Three spare crystal rectifiers are located in

a special compartment inside the meter cover.
FITTINGS AND ACCESSORIES.—The input terminal on the side of the echo box is an N-type jack (NT-491992) to which is connected one end of the RF Cable.
 On contract NObsr-43119 and N5sr-5936, the furnished RF Cable is made of RG-8/U coaxial with a male UG-21/U plug on one end.
 On contract NObsr-49123, the furnished RF Cable is made of RG-9A/U coaxial with a male UG-21B/U plug on one end.
 In both cases, the "radar" end of the cable is un-terminated. The proper fittings must be procured.
CONSTRUCTION.—The Echo Box is provided with a shock mount assembly. The cavity is made of silver plated cast bronze. The meter box is mounted on the top of the casting. A carrying handle is permanently attached to the Echo Box. A carrying strap is used for carrying the Echo Box when the hands are occupied.

MANUFACTURER'S OR CONTRACTOR'S DATA

- Johnson Service Co., Milwaukee, Wisconsin.
- Contract N5sr-5934, dated 6 June 1945.
- Contract NObsr-43119, dated 18 November 1948.
- Contract NObsr-49123, dated 11 May 1950.
- Contract NXsr-65336.
- Contract NXsr-65336.
- Contract NObsr-57091, dated 21 November 1951.

TUBE AND CRYSTAL COMPLEMENT

(4) 1N21B Crystals.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,825: Instruction Book for Model TS-275/UP Echo Box.

TYPE	(USAF): Not Classified
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): 1690-329001424 (NAVY): F16-0-304216-200 (ARMY): 3F4235-275
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec No. RE 13A 1047, MIL-E-16076
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	2.2.2.2
F. I. L. N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-275/UP complete with equipment spares and accessories	3.12	24-1/2	16-1/4	14-1/2	75

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Frequency Measuring Equipment

TS-275/UP

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box Assembly TS-275/UP with shock mount	1690-329001424 F16-C-67658-2855 3F4325-275	12-5/8	7	10-1/2	23.5
1	RF Cable Assembly (RG-8/U; UG-21/U)	- N16-C-11586-1041 1F4J2-2.120		120 1g		
or						
1	RF Cable Assembly (CG-717/U)	- N16-C-11616-4121		120 1g		
1	Wrench, Spanner Size 1 in.	- N41-W-2647-60 6R57528				
1	Wrench, Socket 5/8 in. hex, T handle	- N41-W-2647-60 6R57420.2				
1	Carrying Strap	- N16-S-690501-110 2Z9052-70				
1	Plunger Positioning Gauge	- N41-G-148-2320				
1	Accessory box	- -	10-1/2	11-1/4	3-1/8	9.0 full
1	Maintenance Repair Parts in Case (Contract Nobsr 49123 only)	- -	7-1/2	8-1/2	3	7.0 full
				TOTAL, LESS SPARES		
			TOTAL LESS MAINTENANCE REPAIR PARTS			39.5
					TOTAL	

UNCLASSIFIED

UNCLASSIFIED

Combination and Group Test Set

RADAR TEST EQUIPMENT MODEL TS-295/UP AND FREQUENCY-POWER METER MODEL TS-295A/UP

**TS-295/UP,
TS-295A/UP**



Radar Test Equipment TS-295/UP.

FUNCTIONAL DESCRIPTION

This equipment is primarily a power and frequency measuring set operating in the 3400 to 3900 megacycle band. It consists of a calibrated resonant cavity related to a thermistor bridge circuit for measurement of CW or pulsed power and of frequency by the method of maximum absorption. A crystal detector is included, which permits the study of the video characteristics of radar signals with the use of an oscilloscope, or the measurement of frequency by the method of minimum reaction at resonance. Attenuators are included to extend the power measuring range.

RELATION TO OTHER EQUIPMENT

This equipment is similar to rf Wavemeter-Wattmeter Models TS-3/AP and TS-3A/AP. It is used with an oscilloscope for pulse viewing, or with a slotted line for SWR or characteristic impedance measurements.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—4.5 v dc from dry batteries (3 x BA-30, NT-19031 dry cells).

FREQUENCY RANGE.—3400 to 3900 mc.

Accuracy: ± 2 mc.

INPUT POWER.—

Direct to Input Jacks: 0.5 to 12.5 mw (-3 to $+11$ dbm).

Accuracy: ± 1 db.

Using 10 db cable: 5 to 125 mw.

Using 10 db and 3 db cables: 5 to 250 mw.

DC METER RANGE.—0 to 1.5 ma.

TEMPERATURE RANGE.— -7°C to $+50^{\circ}\text{C}$ (20 to 122°F).

PRESENTATION AND CONTROLS.—A drum counter type dial is used to tune the wavemeter, and its readings are referred to a calibration chart. A milliammeter calibrated in milliamperes (0 to 1.5) as well as milliwatts (0.5 to 22.5), A MEASURE and BALANCE test Key is used for power measurements. In the

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY): 3F4225-295A
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec CS-678
PROCUREMENT COG.:	
RDB IDENT. NO.:	10.1.1
F.I.I.N.	

UNCLASSIFIED

4.10 TS-295/UP: 1

TS-295/UP, TS-295A/UP

BALANCE position, the meter is used as a galvanometer while the bridge is being balanced. In the MEASURE position the meter is made to read the required amounts of dc power required to maintain balance with or without the unknown rf power being connected to the thermistor circuit. A GALV SENS button is depressed when it is desired to increase the sensitivity of the meter as a galvanometer. A MEAS PWR jack is used to inject rf power to the thermistor bridge circuit. The Wavemeter section is provided with an input jack and an output jack which must be connected to the MEAS PWR jack for indication of resonance. The crystal detector section is provided with a CRYSTAL IN jack and a VIDEO output jack. A battery ON-OFF switch is included.

FITTINGS AND ACCESSORIES.—The Wavemeter input and output jacks are both N-Type UG-10/U (NT-43427) coaxial connectors. The MEAS PWR input jack and the crystal input jack are also N-Type special coaxial connectors. The Video output terminal is a small UHF Type (NT-49194 coaxial jack).

The following cable assemblies are supplied:

A low loss rf connecting cable CG-257/U, five feet long, and terminated by an N Type (NT-49205) plug at each end.

A 10 db connecting cable CG-258/U, eleven feet long, and terminated by an N Type (NT-69206) plug at each end.

A 3-1/2 inch Patch Cable CG-256/U, terminated by an N Type, UG-9/U (NT-43426) plug at each end.

A 3 db rf Connecting Cable CG-358/U, forty inches long, and terminated by an N Type, UG-9/U (NT-49426) plug on one end and by an N Type, UG-11/U (NT-49428) on the other end.

CONSTRUCTION.—The complete equipment is enclosed in a metal case with a latch fastened box top. The box top contains the accessories and is provided with a carrying handle. The chassis is held in place by four thumb screws and a special compartment is provided within the instrument assembly to house the three dry cells.

MANUFACTURER'S OR CONTRACTOR'S DATA

TS-295/UP:

Western Electric Co., New York, N.Y.
Contract NXsr-66745, dated 16 June 1944.

TS-295A/UP:

Washington Institute of Technology, Washington 1, D.C.
Contract NObsr-39288, dated 17 June 1947.

REFERENCE DATA AND LITERATURE

SHIPS 311(A): Instruction Book for Radar Test Equipment Model TS-295/UP.

NAVSHIPS 91164: Instruction Book for Frequency Power Meter TS-295A/UP.

SHIPPING DATA

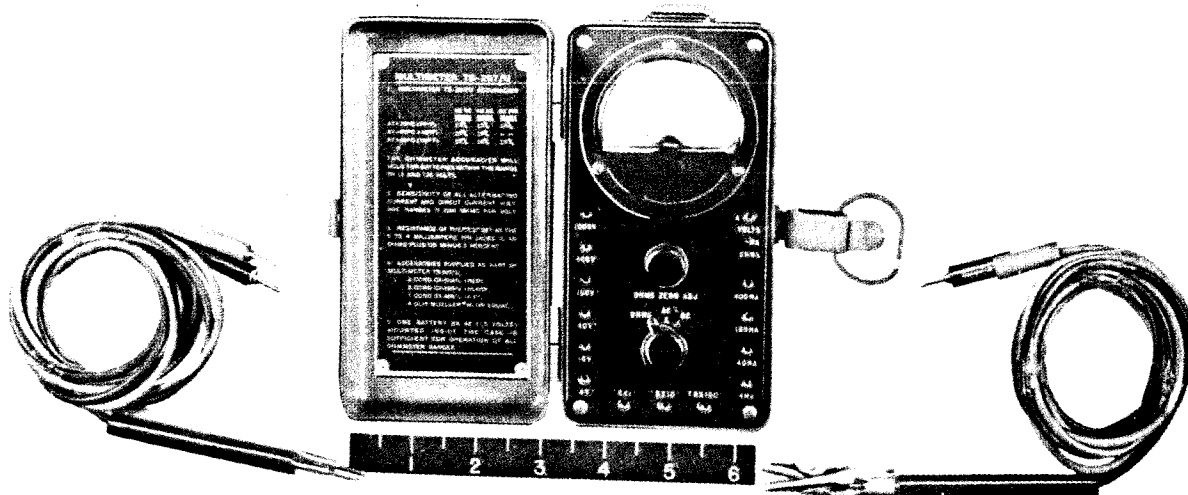
NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Radar Test Equipment TS-295/UP	2.1	16-7/8	14-5/8	14-3/8	16
1	Frequency Power Meter TS-295A/UP, with Equipment Spare Parts	3.0	16-7/8	21-3/8	14-5/8	95.0

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Radar Test Equipment TS-295/UP	-	9-1/4	11-3/8	9-3/8	12
	Including:					
	1 Patch Cable CG-256/U	-	6 lg			
	1 Low Loss Cable CG-257/U	-	60 lg			
	1 Connecting Cable, 10db, CG-258/U	-	132 lg			
	1 Connecting Cable, 3db, CG-358/U	-	40 lg			
	2 Instruction Book Ships, 311(A)	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			12
			TOTAL			

UNCLASSIFIED

Voltage and Current Measuring Equipment

MULTIMETER TS-297/U**TS-297/U**

Multimeter TS-297/U.

FUNCTIONAL DESCRIPTION

Multimeter TS-297/U is a small, multirange ac-dc volt-ohm-milliammeter for general purpose use. It can be used to measure resistance, ac voltage, dc voltage and dc milliamperes.

RELATION TO OTHER EQUIPMENT

This equipment supersedes Navy Model OCR Series, Test Set I-77, Test Unit I-236, Multimeter I-239() and Multimeter TS-380()/U, individually and in all assemblies of which they are a part.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—1.5 v dry cell, JAN Type BA-42.
VOLTAGE RANGES, AC.—0 to 4, 10, 40, 100, 400, 1000 v full scale.

Sensitivity: 1000 ohms per volt.

VOLTAGE RANGES, DC.—0 to 4, 10, 40, 100, 400, 1000 v full scale.

Sensitivity: 1000 ohms per volt.

CURRENT RANGES, DC.—0 to 4, 40, 100, 400 ma.

OHMMETER RANGES.—

RX 1 Mult: 0 to 1000 ohms, center scale 30 ohms.

RX 10 Mult: 0 to 10,000 ohms, center scale 300 ohms.

RX 100 Mult: 0 to 100,000 ohms, center scale 3000 ohms.

ACCURACY OF METER.—

Temp +25°C (+77°F): ±3% on ohms and dc ranges; ±5% on ac ranges.

Temp -40°C (-40°F): ±6% on dc ranges; +8% on ac ranges.

Temp +55°C (+131°F): ±5% on ohms and dc ranges; ±6% on ac ranges.

BASIC SENSITIVITY OF METER.—250 μ a, 62.5 mv.

PRESENTATION AND CONTROLS.—The various functions of the meter are selected by means of the "ohms - AC - DC" selector switch. Each range step in each function of the meter corresponds to one pin tip jack terminal for connection of the test leads. One

extra terminal is used as the common negative. The instrument incorporates the usual "OHMS ZERO ADJ" control knob. The meter is a 3-inch round type with multi-scale dial.

FITTINGS AND ACCESSORIES.—Two sets of standard red-black test leads are supplied. A third set of leads has a phone plug terminal (type PL-55). One dry battery (type BA-42, 1.5 volt), housed under panel, is required for resistance tests. For output measurements, a 0.1 μ f (not supplied) is required.

CONSTRUCTION.—The instrument is enclosed in a metal carrying case with a locking hinged detachable cover.

MANUFACTURER'S OR CONTRACTOR'S DATA

Simpson Electric Co., Chicago, Ill.

Contract dated 1945.

Chicago Industrial Instrument Co., 536 W. Elm St., Chicago 10, Ill.

Contract W36-039-AC-35613 (1938).

Order 11906-Phila. 47-77.

REFERENCE DATA AND LITERATURE

TM 11-5500, AFM 101-10: Technical Manual - TS-297/U.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Sub. Standard
STOCK NO.:	(USAF): 1690-329001500
	(NAVY): F16-n-304258-200
	(ARMY): 3F4325-297
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	USAF Spec No. 71-51176
PROCUREMENT COG.:	Army
RDB IDENT. NO.:	1.1.3.2.1
F. I. I. N.	

UNCLASSIFIED

4.1 TS-297/U: 1

CATALOG OF NAVY MATERIAL

Voltage and Current Measuring Equipment

UNCLASSIFIED

TS-297/U

SHIPPING DATA

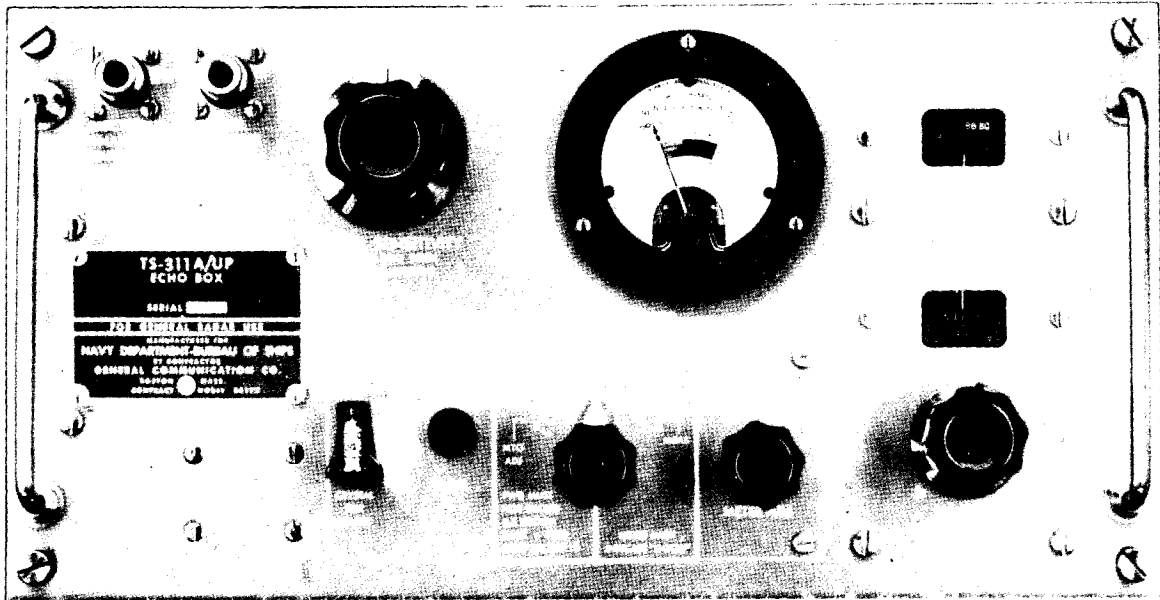
NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-297/U Multimeter	0.11	7-1/2	5-1/2	4-1/2	3.3

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter TS-297/U Complete, including:	1690-329001500 R16-AN-TS-297/U 3F4325-297	6-1/8	3-1/4	3-1/4	2.4
	2 Cords CX-529/U with Clips	1690-322975730 -	48 lg			
	1 Cord CX-468/U	3E6000-529 1690-324760500 -	48 lg			
	2 Instruction Book TM-11-5500	3E6000-468-48 - - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
						TOTAL

UNCLASSIFIED

Frequency Measuring Equipment

ECHO BOX TS-311A/UP**TS-311A/UP**

Echo Box TS-311A/UP.

FUNCTIONAL DESCRIPTION

Echo Box TS-311A/UP is a sharp tuning, high Q resonant cavity designed to make a quick routine analysis of the overall performance of radar systems operating at frequencies between 8730 mc and 8910 mc. The most often performed tests are:

- Relative indication (from day-to-day) of transmitter power output.
- Measurement of transmitter and local oscillator frequencies.
- Analysis of transmitter frequency spectrum.
- Checking on erratic operation, double moding and frequency pulling.
- Measurement of pulse duration.
- Checking of receiver AFC action, measurement of TR box and receiver recovery time.
- Measurement of standing wave ratio, of transmission line losses, and other factors.

A visual indication of system performance appears on the radar screen. An untuned input receptacle permits the signal picked up by the horn antenna to by-pass the cavity and be fed directly, through an attenuator, to the crystal diode, thereby helping to detect the presence of rf energy without having to tune the echo box.

A crystal checker unit is part of the main unit and is used for checking rectifier crystals in the field, by measuring the forward and backward resistances as well as the back current.

RELATION TO OTHER EQUIPMENT

It is similar to Echo Box TS-311/UP except that the latter does not incorporate a crystal checker.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY (Crystal checker).—1.5 v, dc from dry battery.

FREQUENCY RANGE.—8730 to 8910 mc.

Accuracy: ± 5 mc.

Stability: 0.14 mc per $^{\circ}\text{C}$, max.

LOADED Q.—50,000 approx.

INPUT IMPEDANCE.—51 ohms.

PRESENTATION AND CONTROLS.—The TUNING knob is used to tune the cavity and the frequency is read directly from two calibrated dials. The drum dial is calibrated every 10 mc and the vernier dial every 0.1 mc. The METER SENSITIVITY control is used to vary the attenuation between the cavity or the untuned input jack and the crystal diode and meter. One TUNED and one UNTUNED input jack are provided.

The selector switch on the crystal checker section is used to select either forward resistance, backward resistance, or current tests of crystals. A PUSH button and a METER ADJ knob are used to calibrate the meter before measurements are made.

FITTINGS AND ACCESSORIES.—The TUNED and UNTUNED input receptacles are both N Type, UG-22B/U

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304286-200
	(ARMY): 3F4325-311A
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

UNCLASSIFIED

4.2 TS-311A/UP: 1

TS-311A/UP

jacks. The 8 foot long antenna cable is made of RG-9A/U coaxial terminated on both ends by an N Type, UG-21B/U plug. The horn antenna is provided with an N Type jack to match the antenna cable connector. The dry battery used in connection with the crystal checker is a JAN-Type BA2030/U, 1.5 volt dry cell which is normally located in a special compartment behind the front panel.

CONSTRUCTION.—The Echo Box is enclosed in a splash-proof aluminum carrying case provided with a removable box-type cover. Rubber stands and spring latches are provided. The front panel has two guard handles and is fastened to the case by means of four slotted knurled screws. Provision has been made within the cover to house the accessories.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Communications Co., Boston, Mass.
 Contract No. 30172, dated 28 June 1946.
 Contract No. 39201, dated 19 May 1947.
 Contract No. 42101, dated 30 January 1948.
 Contract No. 42413, dated 21 June 1948.

TUBE AND CRYSTAL COMPLEMENT

(1) 1N23A Crystal Rectifier

REFERENCE DATA AND LITERATURE

NAVSHIPS 91111: Instruction Book for Echo Box TS-311A/UP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-311A/UP and Maintenance Repair Parts	3				

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-311A/UP Including Dry Battery	- F16-C-67673-2731 -	11	16	8-11/16	19.25
1	Pick-up Antenna AT-68/UP	- N16-A-52545-1626 -	2-1/4	1-1/8	3-3/8	.25
1	Antenna Cable RG-9A/U	- N15-C-12200-525 -	96 lg			1.25
3	Allen Wrench	- - -				
2	Instruction Book NAVSHIPS 91111	- - -				
1	Maintenance Repair Parts Set	- - -	4-1/2	12-1/4	10-1/2	12.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			19.25
					TOTAL	31.25

UNCLASSIFIED

Miscellaneous Test Equipment

CRYSTAL IMPEDANCE METER TS-330/TSM

TS-330/TSM



Crystal Impedance Meter TS-330/TSM.

TS-330/TSM

FUNCTIONAL DESCRIPTION

The Crystal Impedance Meter TS-330/TSM is used to measure the parameters of the equivalent circuit of crystal units in the frequency range of 500 kc to 12 mc. Series resonant frequency and anti-resonant frequency may be measured by use of an external frequency measuring device. Series resistance and effective resistance at anti-resonance are read directly from the equipment dials. Series capacitance, inductance and performance index may be determined by calculations.

RELATION TO OTHER EQUIPMENT

The Crystal Impedance Meter TS-330/TSM is part of Standard Crystal Test Set AN/TSM-3. It is suitable for testing CR-18/U crystals and those built on Specifications MIL-C-3098 whose fundamental frequencies can be between 500 and 15,000 kilocycles.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—110 to 115 v ac, 50 to 1720 cps, 35 w.

FREQUENCY RANGE.—500 kc to 12 mc in 7 ranges.

SERIES RESISTANCE AND EFFECTIVE RESISTANCE AT ANTI-RESONANCE RANGE.—0 to 99 ohms in 1 ohm steps; 0 to 990 ohms in 10 ohm steps; 0 to 9990 ohms in 100 ohm steps.

LOAD CAPACITANCE RANGE.—10 to 105 μ mf.

CRYSTAL PIN SPACING.—0.5 to 1.25 in.

SPECIAL HOLDERS.—FT-249.

PRESENTATION AND CONTROLS.—The load capacitance is determined from the dial reading and a calibration chart. Crystal current and grid current are indicated on calibrated meters. Series resistance and effective resistance at anti-resonance are read directly from equipment dials and multipliers.

Series capacitance is determined by calculation, noting the difference in frequency between the anti-resonant and series resonant frequency; the frequency

must be determined by an external frequency measuring device. The inductance in the series arm of the crystal can be calculated from the nominal frequency and the series capacitance.

FITTINGS AND ACCESSORIES.—The RF output jack, located on the rear of the chassis, is a small UHF Type (NT-49194) coaxial connector. By means of this jack, a small portion of the RF output of the oscillator may be fed to some frequency measuring equipment. Banana jacks are provided on the front panel so that the voltage across the crystal unit may be measured.

CONSTRUCTION.—The Crystal Impedance Meter is housed in a metal case with a black crackle finish. It is designed for standard rack installation. The unit is placed inside Carrying Case CY-23/TSM-1 for shipment.

TUBE COMPLEMENT

(1) 6V6-GT/G (1) 5Y3-GT/G (2) OC3/VR-105

REFERENCE DATA AND LITERATURE

Operating Instructions, Crystal Impedance Meter TS-330/TSM.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY): 3F4325-330
DESIGN COGNIZANCE:	Sig C
PROCUREMENT INFO.:	Sig C Spec No. 71-3376
PROCUREMENT COG.:	Sig C
RDB IDENT. NO.:	12.12.8
F. I. I. N.:	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Impedance Meter TS-330/TSM with Accessories, Export Packed	5.7	29	20	17	60

EQUIPMENT SUPPLIED

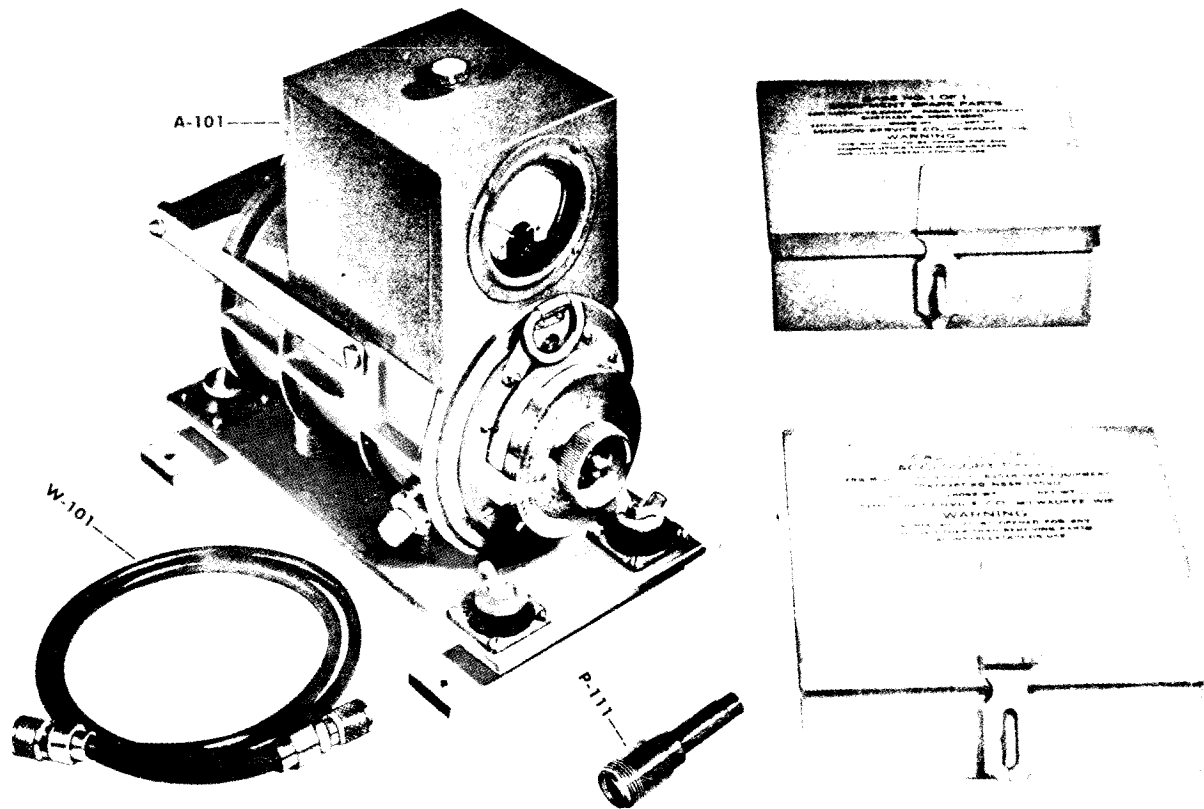
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Impedance Meter TS-330/TSM	-	7	19	10-1/8	25
1	RF Pick-up Cord	-				
1	Carrying Case CY-23/TSM-1	-				
2	Instruction Book	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

RESTRICTED
Security Information

Frequency Measuring Equipment

ECHO BOX TS-349/UP

TS-349/UP



Echo Box Test Set TS-349/UP.

FUNCTIONAL DESCRIPTION

Echo Box TS-349/UP is a portable, hand tuned ringing cavity designed to make a quick routine analysis of the overall performance of radar systems operating at frequencies between 910 and 980 Megacycles.

The most frequently made tests are:

Relative indication (from day-to-day) of transmitter power output.

Measurement of transmitter and local oscillator frequencies.

Analysis of transmitter frequency spectrum.

Checking on erratic operation, double moding and frequency pulling.

Measurement of pulse duration.

Checking of receiver AFC action, measurement of TR box and receiver recovery time.

Measurement of standing wave ratio, of transmission line losses, and other factors.

A visual indication of System performance appears on the Radar screen. Resonance and relative power are indicated by the deflections of the internal microammeter. Frequency is indicated by referring the dial settings to a calibration chart.

RELATION TO OTHER EQUIPMENT

This equipment was designed primarily for testing Navy radar set Mark 12.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—910 to 980 mc.

SENSITIVITY.—65 yards change in ring time per db change in power.

PRESENTATION AND CONTROLS.—The tuning knob actuates the plunger inside the resonant cavity and the calibrated frequency dial at the same time. An individual calibration chart indicates frequencies in relation to dial settings.

A meter indicator with a 0 to 100 microamperes scale indicates the relative amount of power absorbed by the cavity at the tuned frequency and thereby the resonance. Three spare crystal rectifiers are located in a special compartment within the meter cover.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-304381-200
	(ARMY): 3F4325-349
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. RE-16810
PROCUREMENT COG.:	
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

RESTRICTED

4.2 TS-349/UP: 1

CATALOG OF NAVY MATERIAL

Frequency Measuring Equipment

RESTRICTED
Security Information

TS-349/UP

FITTINGS AND ACCESSORIES.—The input terminal on the side of the echo box is an N type jack, NT-49795 to which is connected one end of the rf cable, terminated by an N plug, UG-18/U. The rf cable is made of RG-21/U coaxial, having a minimum length of four feet, and the other end is a similar plug, UG-18/U, for connection to either a pick-up antenna or a directional coupler. Neither of these accessories is supplied with the equipment.

An "N" to "Holmdel" adaptor, UG-8/AP, is supplied to match the equipment to radar systems having this latter type of coupling connector.

CONSTRUCTION.—The echo box is provided with a shock mount assembly. The cavity is made of silver-plated

cast bronze. A carrying handle is permanently attached to the echo box. A carrying strap is used when climbing the radar tower. No carrying case is supplied.

MANUFACTURER'S OR CONTRACTOR'S DATA

Johnson Service Company, Milwaukee, Wis.
Contract N5sr-13590, dated 17 September 1945.
Contract NObsr-39148, dated 21 March 1947.
Contract NObsr 39352, dated 24 June 1947.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,884: Instruction Book for Echo Box Model TS-349/UP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-349/UP Complete with Accessories and Equipment Spares	3.9	24-3/4	18-1/4	16	80.0

EQUIPMENT SUPPLIED

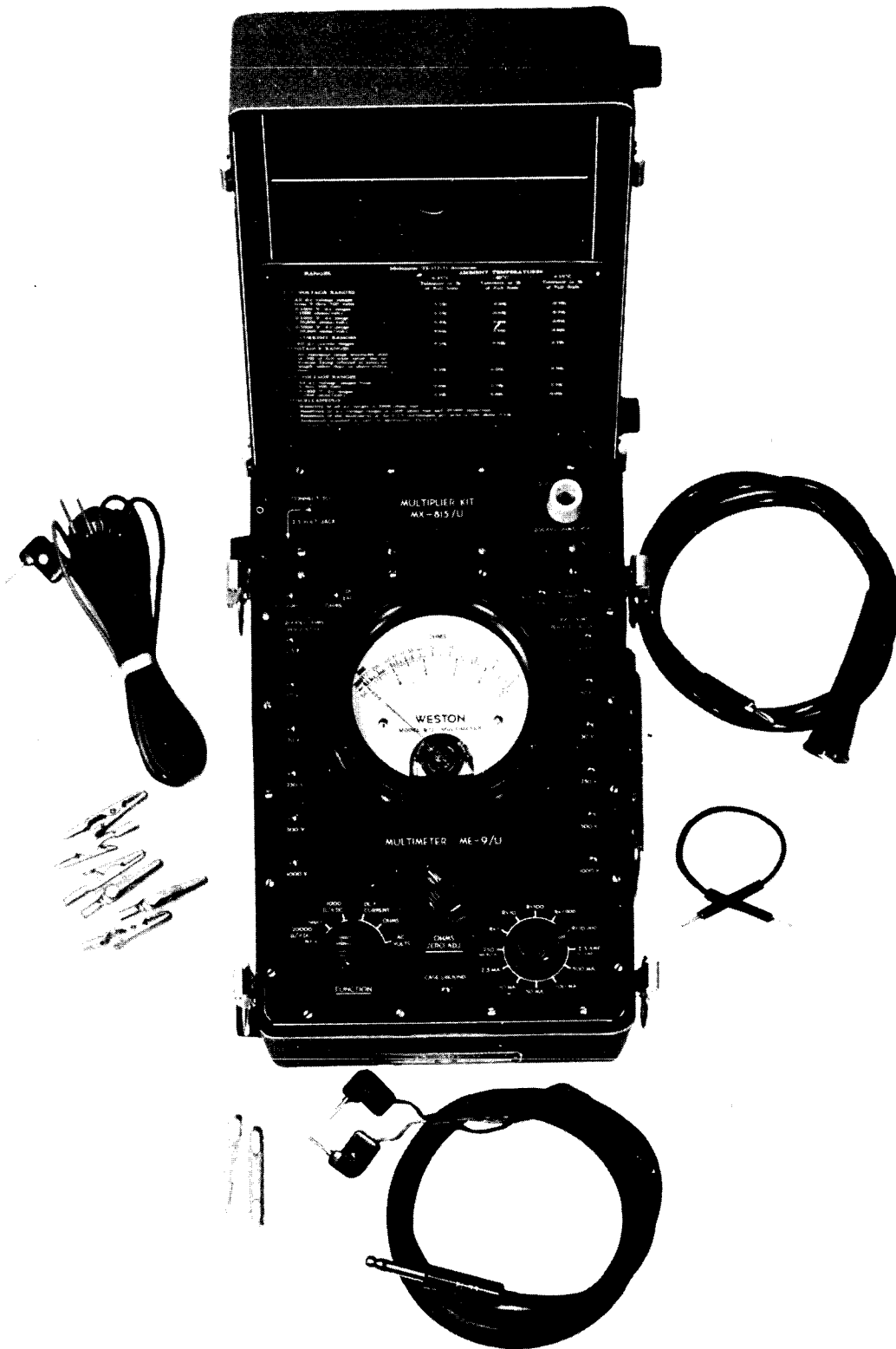
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box with Shock Mount	- F16-C-67630-3791	10-1/2	8	12-7/8	24.25
1	Accessory Box	-	7-1/2	8-1/2	3	7 (full)
1	RF Cable Assembly	-	48 lg			
1	Adaptor (N to Holmdel) UG-8AP	-				
1	Wrench, 5/8 hex.	-				
1	Wrench, Spanner, .1 in.	-				
1	Carrying Strap	-				
1	Plunger Positioning Gauge	-				
1	Maintenance Repair Spare Parts Case	-	7-1/2	8-1/2	3	7.5(full)
			TOTAL LESS MAINTENANCE REPAIR PARTS			31.25
					TOTAL	38.75

UNCLASSIFIED

Voltage and Current Measuring Equipment

MULTIMETER TS-352/U

TS-352/U



Multimeter TS-352/U.

UNCLASSIFIED

4.1 TS-352/U: 1

TS-352/U

FUNCTIONAL DESCRIPTION

The Multimeter TS-352/U is a portable, general purpose, multi-range equipment for use in circuit analysis and trouble-shooting. The Multimeter is constructed to give accurate and reliable readings on all ranges under extreme conditions of temperature and moisture.

RELATION TO OTHER EQUIPMENT

Multimeter TS-352/U supersedes Navy Model OE Series. It will be superseded by Multimeter AN/PSM-4 for Navy BuShips purposes.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY 15 v, dc, from dry batteries (not supplied)

DC VOLTAGE	RANGES	SENSITIVITY	ACCURACY
	0 to 2.5 v	1000 ohms per v	±3% of full scale
	0 to 10 v	and	
	0 to 50 v	20,000 ohms per v	
	0 to 250 v		
	0 to 500 v	1000 ohms per v	±3% of full scale
	0 to 1000 v		
	0 to 1000 v	20,000 ohms per v	
	0 to 5000 v (using MX-815/U)	20,000 ohms per v	
AC VOLTAGE	0 to 2.5 v	1000 ohms per v	±4% of full scale between 25 and 5000 cps
	0 to 10 v		
	0 to 50 v		
	0 to 250 v		
	0 to 500 v		±3% of full scale at 10,000 cps ±7% of full scale at 20,000 cps
	0 to 1000 v	1000 ohms per v	
DIRECT CURRENT	0 to 250 µa	On the 2.5 ma range, the re- sistance of the Meter is 100 ohms ±1%	±3% of full scale
	0 to 2.5 ma		
	0 to 10. ma		
	0 to 50 ma		
	0 to 100 ma		
	0 to 500 ma		
	0 to 2.5 amp		
	0 to 10 amp		
RESISTANCE	0 to 1000 ohms	25 ohms	±3% of full scale arc length
	0 to 10,000 ohms	250 ohms	
	0 to 1 meg	25,000 ohms	
	0 to 10 meg	250,000 ohms	

ACCURACY FUNCTION OF TEMPERATURE	-40°C		
	+25°C	+55°C	
0 to 500 v, dc	±6%	±3%	±5%
0 to 1000 v, dc, 1000 ohms per v	±6%	±3%	±5%
0 to 1000 v, dc, 20,000 ohms per v	±8%	±4%	±6%
0 to 5000 v, dc, 20,000 ohms per v	±9%	±6%	±8%
0 to 500 v, ac	±7%	±4%	±5%
0 to 1000 v, ac	±8%	±5%	±6%
All ranges, dc milliamperes	±6%	±3%	±5%
All ranges, ohms	±8% of full scale arc	±3% of full scale arc	±5% of full scale arc

PRESENTATION AND CONTROLS.—The meter is a 4-1/2 inch diameter sealed instrument, which has three scale arcs of different colors. The top scale is used for ohms, the lower scale is used for ac volts

and the center scale is used for both dc volts and dc amperes. Two selector switches are provided, one for ranges and the other for FUNCTION. An OHMS ZERO ADJ knob is used when measuring resistances. Different pin tipjacks are provided for various ranges and for either 1000 ohms per volt or 20,000 ohms per volt sensitivities. A high voltage jack is provided on the MULTIPLIER KIT panel for the 5000 v dc range. FITTINGS AND ACCESSORIES.—All range connectors on the Multimeter and Multiplier Kit panels are pin tip jacks, except for the 5000 v, dc connector which is a porcelain insulated banana jack. A total of five cords or leads are supplied. One patch cord is for use with the Multiplier Kit to transfer the divided voltage to the Multimeter. One high voltage cord is provided with a banana plug on one end and an insulated crocodile clip on the other. One test cord is terminated by a telephone plug (PL-55) on the "test" end, and two red and black test leads by the usual insulated pin tip probes. Six alligator clips are available for use as desired. For resistance measurements, a total of four dry cells are necessary (which are not supplied with the equipment) to obtain a 15 volt supply—(3) 4.5 v batteries Type BA-31; (1) 1.5 v battery Type BA-30. These batteries have their place in a special molded bakelite compartment located at the back of the Multimeter case, behind a panel. The + and - leads are built-in, and the two Connectors supplied are used for inter-cell connections.

CONSTRUCTION.—The Multimeter and the Multiplier Kit have their place in a grey wrinkle finished aluminum case. The case is provided with a box type cover which houses the accessories. Rubber stands and snap fasteners are provided on the case and its cover. The cover is detachable, and a rubber gasket around the edge of the box makes the equipment waterproof.

MANUFACTURER'S OR CONTRACTOR'S DATA

Weston Electrical Instrument Corp., Newark, N.J.
Contract W33-083-ac-18059.
Approximate Cost: \$75.
Electronic Measurements Co., Red Bank, N.J.
Contract W33-083-ac-219-21977.
Phasotron Co., S. Pasadena, Calif.
Contract AF33(038)9774, AF33(083)15118, AF33(083)15541, AF(083)50-3364.

REFERENCE DATA AND LITERATURE

AN 16-35TS352-3: Handbook of Maintenance Instructions for TS-352/U.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF): 1690-329001771
	(NAVY): F16-Q-304383-200
	(ARMY): 3F4325-352
DESIGN COGNIZANCE:	USAF, ARL
PROCUREMENT INFO.:	USAF Spec No. R-7000, Sig C Spec
PROCUREMENT COG.:	No. SCL-III
RDB IDENT. NO.:	1.1.3.2.)
F. I. I. N.	

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Voltage and Current Measuring Equipment

TS-352/U

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter TS-352/U complete with accessories	0.9	10	11	15	20.9

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Multimeter TS-352/U Consisting of:	-	6-1/4	8-3/4	11-1/2	14.5
1	Multimeter ME-9/U	-				5.4
1	Multiplier Kit MX-815/U	-				0.5
1	Patch Cord CX-939/U	1690-322979541	8-1/2 lg			—
1	Cord CX-927/U	1690-322979449	48 lg			0.2
1	Cord CX-468/U	1690-322975605	48 lg			0.3
2	Test lead CX-529/U	1690-322975730	48 lg			0.1
2	Connector PL0042	-	2 lg			—
6	Alligator Clips	-		1-1/2		—
1	Case	-	3-1/2	8-1/4	11-3/8	5.5
1	Cover	-	2-1/2	8-1/2	11-3/8	2.4
2	Instruction book AN16-35TS352-3	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			14.5
					TOTAL	

UNCLASSIFIED

4.1 TS-352/U: 3

RESTRICTED
Security Information

Combination and Group Test Set

TEST SET TS-355/UP

TS-355/UP

FOR TECHNICAL INFORMATION REGARDING

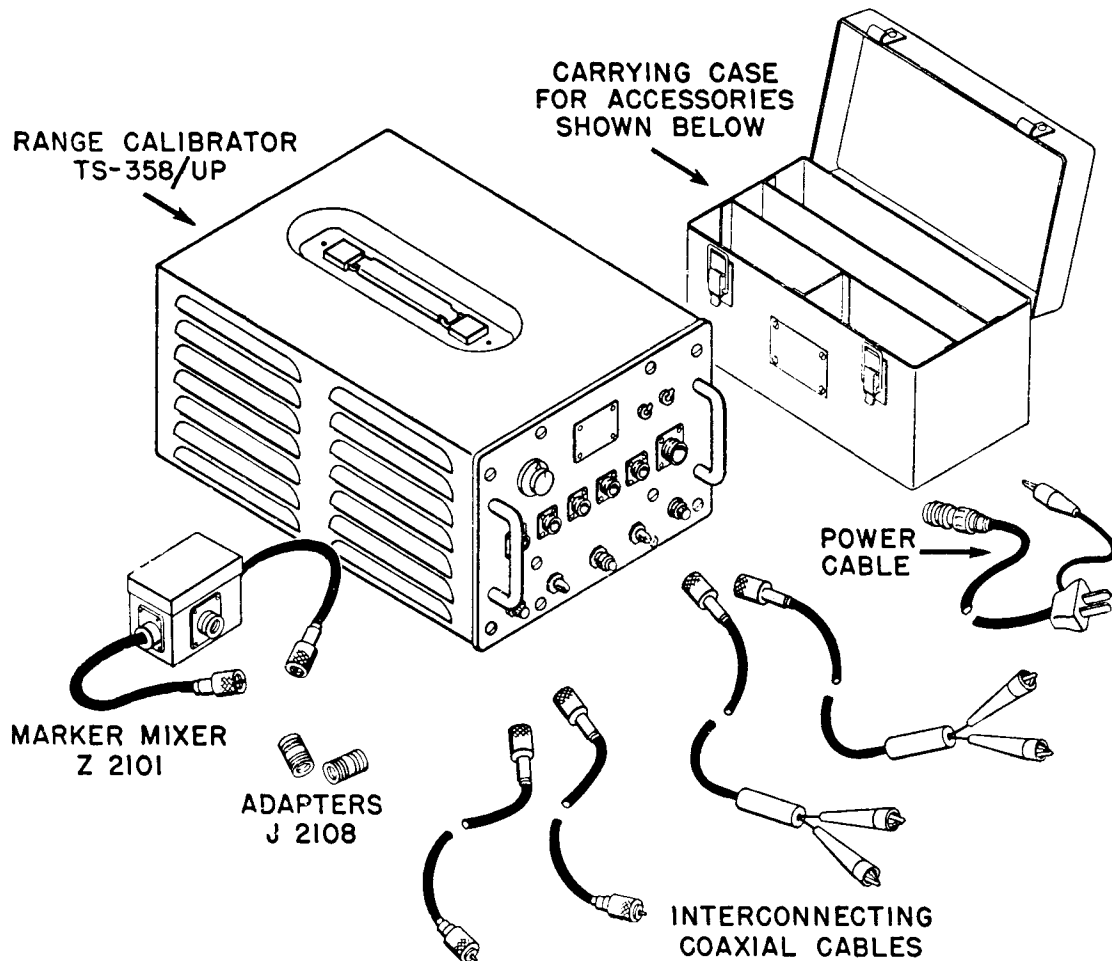
THIS EQUIPMENT REFER TO

TS-182/UP,

PAGES 4.10 TS-182/UP: 1-4

UNCLASSIFIED

Calibrating Equipment for Electronics Test Equipment

RANGE CALIBRATOR TS-358/UP**TS-358/UP***Range Calibrator TS-358/UP.***FUNCTIONAL DESCRIPTION**

The Range Calibrator TS-358/UP is a test unit designed to provide crystal-controlled calibration markers for checking and adjusting the calibration circuits of the unit under test, or to calibrate the ranges of equipments having no calibration circuits. A synchronizing pulse input to the external calibration circuit under test is also provided by the Range Calibrator. The timing of this triggering input may be varied in order to synchronize the occurrence of markers on the indicator of the unit under test with the markers of the Range Calibrator. Alignment of the external calibration circuit to the crystal-controlled range markers of the Range Calibrator is thereby made practical.

RELATION TO OTHER EQUIPMENT

This equipment will be superseded by Range Calibrator TS-573/UP Series.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 60 cps, 100 w.
CRYSTAL FREQUENCY.—81,964 kc.
Accuracy: $\pm 0.01\%$ (0°C to $+60^{\circ}\text{C}$).

MARKERS.—1, 5, 10 and 50 miles.

Accuracy: $\pm 0.05\%$ or ± 15 yd whichever is greater.
Output Impedance: 18 ohms.

TRIGGER.—

Rate: 180 or 540 pps.
Amplitude: 26 to 50 v peak.
Output Impedance: 330 ohms.
Delay, With Respect to Markers: 95 to 105 μsec approx (540 pps range).

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-0-304395-200 (ARMY): 3F4325-358
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. RE 16C20
PROCUREMENT COG.:	
RDB IDENT. NO.:	13.8
F. I. I. N.	

UNCLASSIFIED

4.13 TS-358/UP: 1

TS-358/UP

TEMPERATURE LIMITS.—0 to 50°C ambient.

PRESENTATION AND CONTROLS.—All operating controls and terminals are located on the front panel. The desired marker interval is selected by plugging the output cable into one of the four MARKERS output jacks. Any two markers may be combined by use of the MARKER MIXER box. The TRIGGER DELAY control permits variation of delay of the trigger continuously over the entire range, and respectively to the marker. A TRIGGER RATE switch is provided.

A power ON-OFF switch, fuse holders, fuse alarm indicator lamps, and power pilot lamp are also provided.

FITTINGS AND ACCESSORIES.—All coaxial output terminals on the front panel are small UHF-Type, 49194 jacks. The output jack of the marker mixer box is identical to the panel jacks. For instrument panel connections the four coaxial cables supplied and the marker mixer box all have small UHF-Type plugs. For connection to equipment under tests, the same cables provide either small UHF plug terminations or alligator clip terminations. The two adaptors supplied can be used for inter-cable coupling or for UHF-plug-to-UHF-plug interconnection. (See chart.)

CONSTRUCTION.—The Range Calibrator is a portable self-contained unit. The chassis is enclosed in a metal case and held in place by four thumbscrews placed at the rear of the case. Ventilation louvers are provided on the case, as well as a carrying handle. A carrying case is provided for the accessories.

MANUFACTURER'S OR CONTRACTOR'S DATA

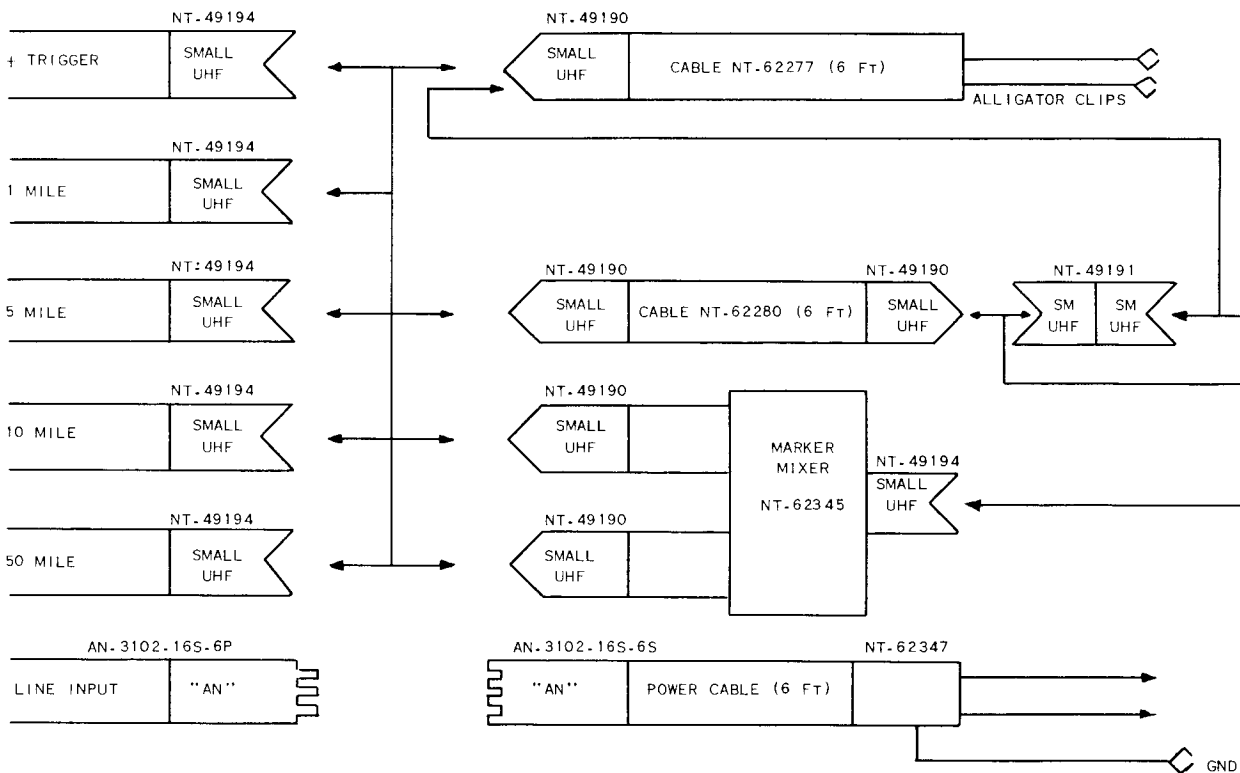
RCA Victor Div. of Radio Corporation of America, Camden, N.J.
Contract N5sr-5921, dated 6 June 1945.

TUBE COMPLEMENT

- (1) OD3/VR-150 (8) 6SN7-W (1) 6AG7
- (1) 6X5-GT/G (1) 6SA7

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,817: Instruction Book for Range Calibrator TS-358/UP.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Range Calibrator TS-358/UP with accessories and carrying case	9.0	18	22	40	143

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

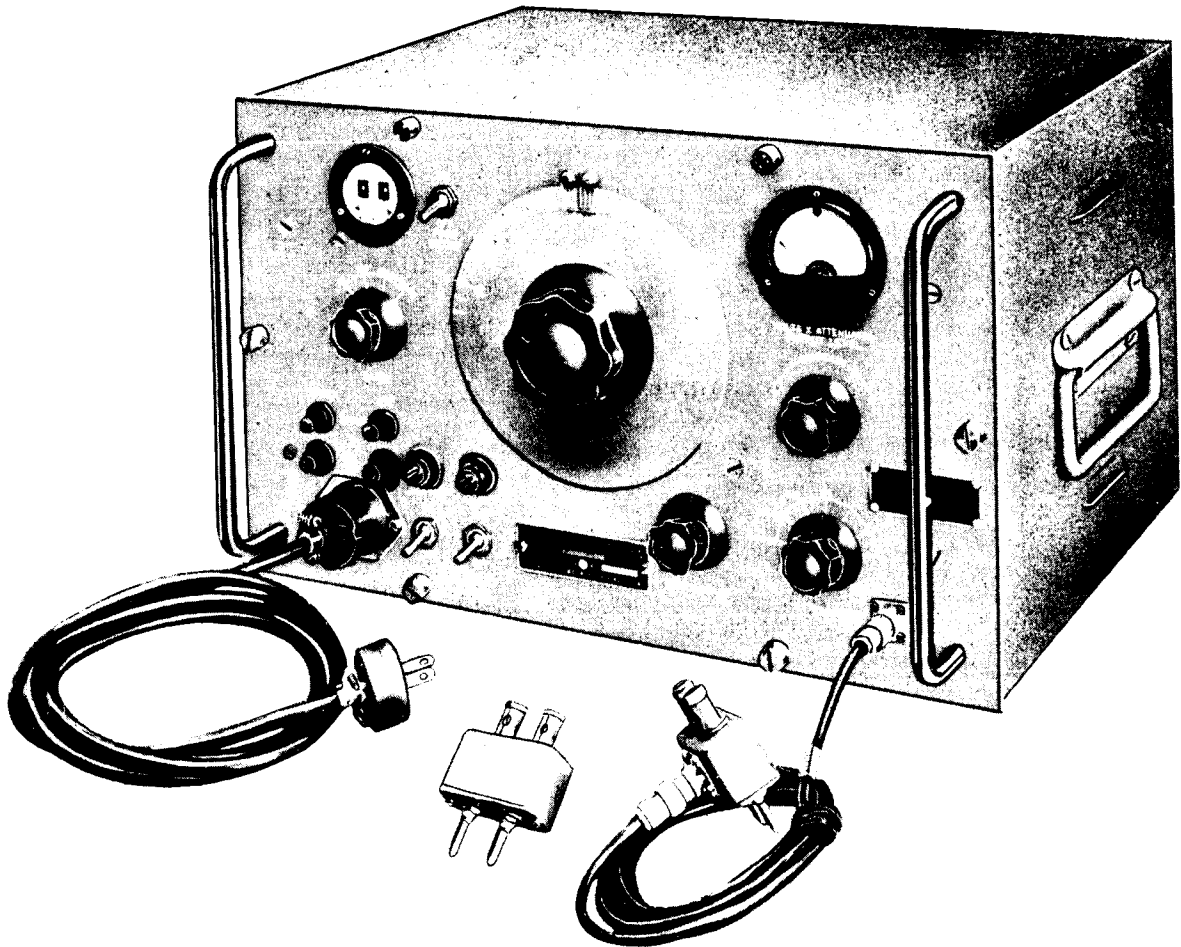
Calibrating Equipment for Electronics Test Equipment

TS-358/UP

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS <i>inches</i>			WEIGHT <i>lbs.</i>
			HEIGHT	WIDTH	DEPTH	
1	Range Calibrator TS-358/UP	- N16-C-14251-1005 3F4325-358	8-13/16	12-3/4	19-23/32	56
1	Carrying Case containing:	-	5-1/4	12-9/64	6-3/16	14
2	Cable NT-62277	- N16-C-11987-9661	72 lg			
2	Cable NT-62280	- N16-C-11987-8621	72 lg			
1	Power Cable NT-62346	- N17-C-48298-4711	72 lg			
1	Junction Box NT-62345	- N17-T-29308-3601	1-29/32	2-1/64	1-1/4	
2	Extension Adaptor NT-49191	- N17-C-67727-5787 2Z7226-258	1-1/8 lg x 5/8 dia			
2	Instruction Book NAVSHIPS 900.817	- -				
TOTAL LESS MAINTENANCE REPAIR PARTS						70.0
TOTAL						

UNCLASSIFIED

Signal Generating Equipment

AUDIO OSCILLATOR TS-382A/U**TS-382A/U**

Audio Oscillator TS-382A/U.

FUNCTIONAL DESCRIPTION

Audio Oscillator TS-382A/U is an audio signal generator of ac voltages at frequencies between 20 and 200,000 cps and at amplitudes between 0 and 10 volts. It is calibrated with respect to frequency and voltage and its harmonic distortion is very low. It is used in testing and repairing amplifiers, audio sections of receivers and filters, and in measuring the gain and distortion of such devices.

RELATION TO OTHER EQUIPMENT

Audio Oscillator TS-382A/U is a militarized equipment and supersedes all previous commercial versions.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 50 to 1600 cps.

FREQUENCY RANGE.—20 to 200,000 cps.

Accuracy: $\pm 2\%$ of dial calibration.

POWER OUTPUT.—100 mw maximum.

Voltage Output: 0 to 10 v.

Accuracy: $\pm 3\%$ of attenuator calibration.

RATED LOAD.—1000 ohms.

HARMONIC DISTORTION.—Less than 2%, below 120 cps;
Less than 1%, above 120 cps.

BUILT-IN FREQUENCY METER.—60 cps and 400 cps.
Accuracy: $\pm 0.75\%$.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY): Standard
STOCK NO.:	(USAF): 1690-329001981
	(NAVY):
	(ARMY): 3F4325-382A
DESIGN COGNIZANCE:	C & S
PROCUREMENT INFO.:	USAF Spec No. 7204, 16 Aug 1948
PROCUREMENT COG.:	USAF
ROB IDENT. NO.:	4.1.1
F.I.I.N.	

UNCLASSIFIED

4.4 TS-382A/U: 1

Signal Generating Equipment

UNCLASSIFIED

TS-382A/U

PRESENTATION AND CONTROLS.—All controls and connectors listed below are located on the front panel:

DESIGNATION	TYPE	FUNCTION
HEATER and OSC	Fuse Holders	Fuses and Spare fuses
115 v. 60/1600 cps	Male receptacle	AC power plug
Heater ON-OFF	Switch and pilot lamp	Used for warming up and when operating equipment
OSC. ON-OFF	Switch and pilot lamp	Used to operate the oscillator
THERMOSTAT	Knob	Used to adjust thermostat operation
RANGE	Switch	Multiplier Selector for frequency dial reading positions X1, X10, X100, X1000.
Main tuning dial	Dial knob	Variable tuning condenser (20 to 200)
OUTPUT LEVEL	Meter	Indicates voltage input to attenuator
OUTPUT INCREASE	Level control knob	Adjusts voltage reading on meter
ATTENUATOR	Selector switch	Reduces output level in steps (10, 1, .1, .01, .001, .0001, .00001)
FREQ METER	Vibrating reeds	Indicators for 60 and 400 cps
FREQUENCY METER ON-OFF	Switch	Switches calibration ON or OFF
OUTPUT	Coaxial jack	Signal output receptacle

FITTINGS AND ACCESSORIES.—In addition to the Transit Case and to the AC Cord, the list of accessories includes a 5 foot coaxial cable Cord CG-409/U, which has a BNC Type Plug UG-88/U on both ends. One end of the Cord mates the BNC Type output jack on the

front panel and the other end is either used directly for tests, or with the Adaptor UG-514/U. This Adaptor has a BNC Type Jack UG-185/U and for connection to external equipment, two banana plugs, or two binding posts, are available.

To match impedances equal to, or higher than 1000 ohms, the Cord may be used with the Dummy Load DA-35/U. Except for the internal shunt resistance, the Dummy Load has essentially the same disposition as the Adaptor.

CONSTRUCTION.—The oscillator is enclosed in a metal cabinet with a rack type front panel and guard handles. Two carrying handles and louvers are provided on each side.

The instrument can be quickly brought to, and kept at convenient operating temperature by the use of an internal heating device. This is particularly useful when operating in colder climates.

The carrying case used for transit is made of an aluminum-balsa sandwich and accommodates the oscillator and its accessories. It is provided with two casket type handles.

MANUFACTURER'S OR CONTRACTOR'S DATA

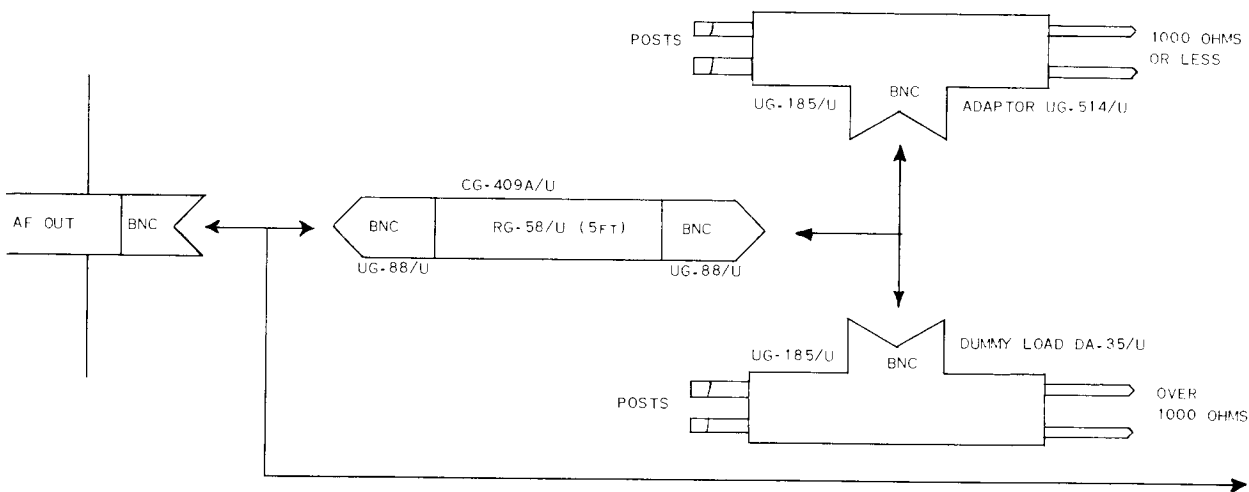
Hewlett Packard Co., Palo Alto, Calif.
 Contract N W (33-038) AC15148.
 Specialty Assembling and Packing Co., Brooklyn, N.Y.
 Contract AF33(038)7516.

TUBE COMPLEMENT

- (2) 6SJ7
- (1) 5Y3
- (1) 6J5
- (1) 6AG7
- (1) 6Y6
- (1) VR-75
- (1) 6V6
- (1) 6SQ7

REFERENCE DATA AND LITERATURE

T. O. No. 16-35TS382-2: Handbook Operation and Service Instructions, TS-382A/U.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Audio Oscillator TS-382A/U Complete, with Accessories					

UNCLASSIFIED

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Signal Generating Equipment

TS-382A/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Audio Oscillator TS-382A/U, Including:	-	12	19	11	
	1 Transit Case CY-688/U	1690-299554955	16	23	13	17
	1 Cord, AC CX-237A/U	1690-322974600	60 lg			
	1 Cord CG-409A/U	3E6000-237-240 1690-154435300	60 lg			
	1 Dummy Load DA-35/U	-	2	1-1/2	1-1/2	(4 oz)
	1 Adaptor UG-514/U	-	2	1-1/2	1-1/2	(4 oz)
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

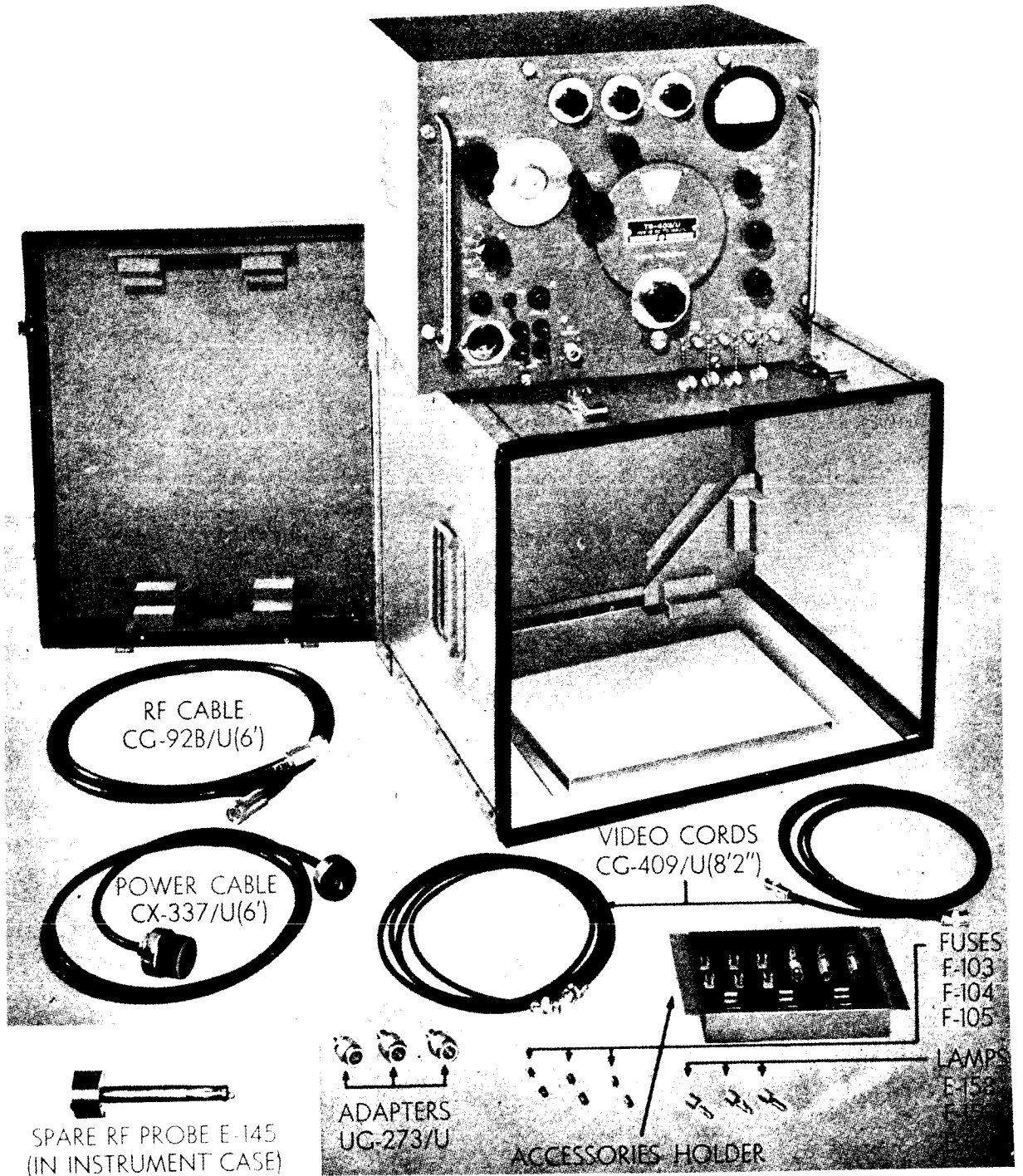
4.4 TS-382A/U: 3

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-403/U

TS-403/U



Signal Generator TS-403/U, Equipment Supplied.

UNCLASSIFIED

TS-403/U

FUNCTIONAL DESCRIPTION

Model TS-403/U Signal Generator is a portable, self-contained equipment, operating in the range 1800 to 4000 mc.

It generates rf signals within the UHF band and is very flexible in operation. The rf output signals are either unmodulated (cw) or modulated. Internal modulation is either of the "Frequency" or "Pulse" type. Provision has been made for modulation by an external source (pulse or square wave) for synchronization of the pulsed rf output by external positive or negative pulses or sine waves, and for the use of pulsed output signals to synchronize some external equipment, with or without an adjustable delay. All settings are made by accurately calibrated, direct reading dials.

The equipment is used in connection with radio and radar receivers and for other applications requiring small amounts of rf power, such as the measuring of standing wave ratios, antenna and transmission line characteristics, conversion gain, etc.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 50 to 1600 cps, 150 w.

FREQUENCY RANGE.—1800 to 4000 mc.

Accuracy: ±1%.

POWER OUTPUT.—1 mw max (0.1 μv to 0.224 v across 50 ohms).

ATTENUATION.—0 to -127 dbm.

Accuracy: ±2 db.

MODULATION.—	Internal	External
Pulse:	40 to 4000 pps ±15% in two ranges	40 to 4000 pps
Pulse Width:	0.5 to 10 μsec, ±20% or ±2 μsec, whichever is greater	0.5 to 20 μsec
Rise Time:	0.5 μsec	0.5 μsec
Amplitude:	+20 v peak across 50 ohms	±40 to ±70 v

Delay, With Respect to Fixed Sync Out: 3 to 300 μsec, ±20% or ±3 μsec, whichever is greater (up to 2500 pps, decreasing with increasing frequency; 3 to 175 μsec at 4000 cps).

FM (RATE).—Line frequency.

Deviation: ±5% max, of carrier, decreasing with increasing frequency.

Phase, Deviation With Respect to Modulation Component: 0 to 180°.

SYNC IN.—	Pulse (peak)	Sine Wave(rms)
Amplitude:	(±) 10 to 50 v	5 to 50 v
Pulse Rate:	40 to 4000 pps	40 to 4000 cps
Duration:	0.5 to 20 μsec between half voltage points	
Rise Time:	0.5 μsec between 10% and 90% of max amplitude	

OUTPUT PULSE.—	Internal	External
Timing:	Undelayed	Delayed
Amplitude (across rated load of 50 ohms to 0.1 meg shunted by no more than 1500 μμf):	+20 v	+20 v

	(Internal)	(External)
Width:	5 μsec max between half voltage points	5 μsec max between half voltage points
Rise Time:	1.5 μsec max	1.5 μsec max

FUNCTION AND CONTROLS.—All controls, input and output terminals are located on the front panel. When the ac power cable is plugged in and the ON-OFF switch is in the OFF position, an internal space heater, designed to prevent condensation, is made operative. With the power switch in the ON position, the space heater is switched OFF and the equipment is turned ON.

Five terminals, all located on the lower part of the front panel, are used for RF OUTPUT, EXT MOD, SYNC IN, SYNC OUT and DELAYED SYNC OUT.

Other operating controls and their functions are:

Designation	Function
Meter	Output level reference meter (-6 to -3 db).
Zero Set	Meter zero set control
Power Set	Adjusts reading of Power Level Meter
Output Atten. Atten. Dial	Output attenuator Control 1 μv to 200 mv, 0 to -127 dbm scales
Megacycles	Main tuning dial (10 mc per division)
Signal Frequency	Main tuning control (50 kc per division)
Modulation Selector	Selects FM, CW, OFF, INT, EXT NEG, EXT POS
FM Phase	Adjusts phase of frequency swing, on FM
Sync Selector	Adjusts Modulator to external Sync source
Pulse Rate	Adjusts rate of internal pulse
Pulse Delay	Adjusts delay between Ext Sync pulse and output pulse
Pulse Width	Adjusts width of output pulse

An ac power receptacle, fuse and spare fuse holders, HEATER and POWER pilot lamps are also provided.

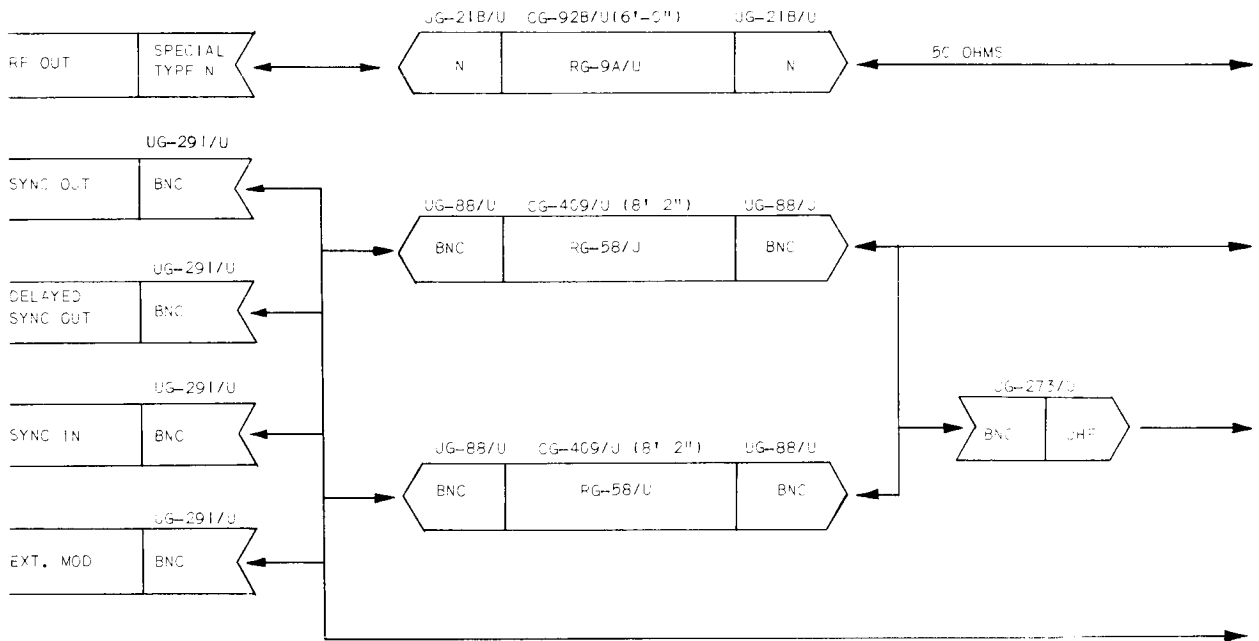
FITTINGS AND ACCESSORIES.—All coaxial receptacles on the front panel are BNC Type jacks, UG-291/U, except for the RF Output jack which is a special N-Type fitting. The rf output Cable is terminated by N-Type, UG-21B/U plugs on both ends. The two Video Cables are fitted with BNC-Type, UG-88/U plugs. Three UG-273/U, BNC to UHF adaptors are provided. The spare rf Probe E-145 supplied is located in a special clip holder within the instrument case. (See following chart.)

TYPE	(USAF): Minor Standard
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): 1690-329002175 (NAVY): F16-Q-304483-200 (ARMY): 3F4325-403
DESIGN COGNIZANCE:	Navy, BUAER
PROCUREMENT INFO.:	Navy, BUAER, Spec No. 1664
PROCUREMENT COG.:	Navy, BUAER
RDB IDENT. NO.:	4.1.2
F. I. I. N.	

UNCLASSIFIED

Signal Generating Equipment

TS-403/U



CONSTRUCTION.—The Signal Generator is enclosed in a metal cabinet with louvers and panel guard handles. The complete equipment, with accessories and equipment spares, fit into a transit case, waterproof, made of an aluminum balsa sandwich, with two carrying handles.

Federal Manufacturing and Engineering Co., Brooklyn, N.Y.
Prod. Contract NOa(s)-12297, dated June 1950.

MANUFACTURER'S OR CONTRACTOR'S DATA

Hewlett-Packard Co., Palo Alto, California.
Contract N5sa-9543, dated June 1947.
Prod. Contract NOa(s)-9213, dated June 1947.
Mfg. Ident. No. 616A.

TUBE COMPLEMENT

- (1) 6SL7-GT (2) 6X5-GT (3) OA2
- (1) 5R4-GY (2) 6Y6-G (3) 6J6
- (1) 2K28 (4) 6C4

REFERENCE DATA AND LITERATURE

AN 16-35TS403-3: Handbook of Maintenance Instructions for Signal Generator TS-403/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-403/U					

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-403/U	- F16-G-63741-4451	13-1/2	14	17-1/2	64.
1	Transit case CY-669/U	1600-328630940 - 3F2529-669	17-3/8	17	19-1/2	26.
1	Power cord CX-337/U	1690-322852132 R16-AN-CX337/U (ASO) 3E7350.2-72.5		72		0.62

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

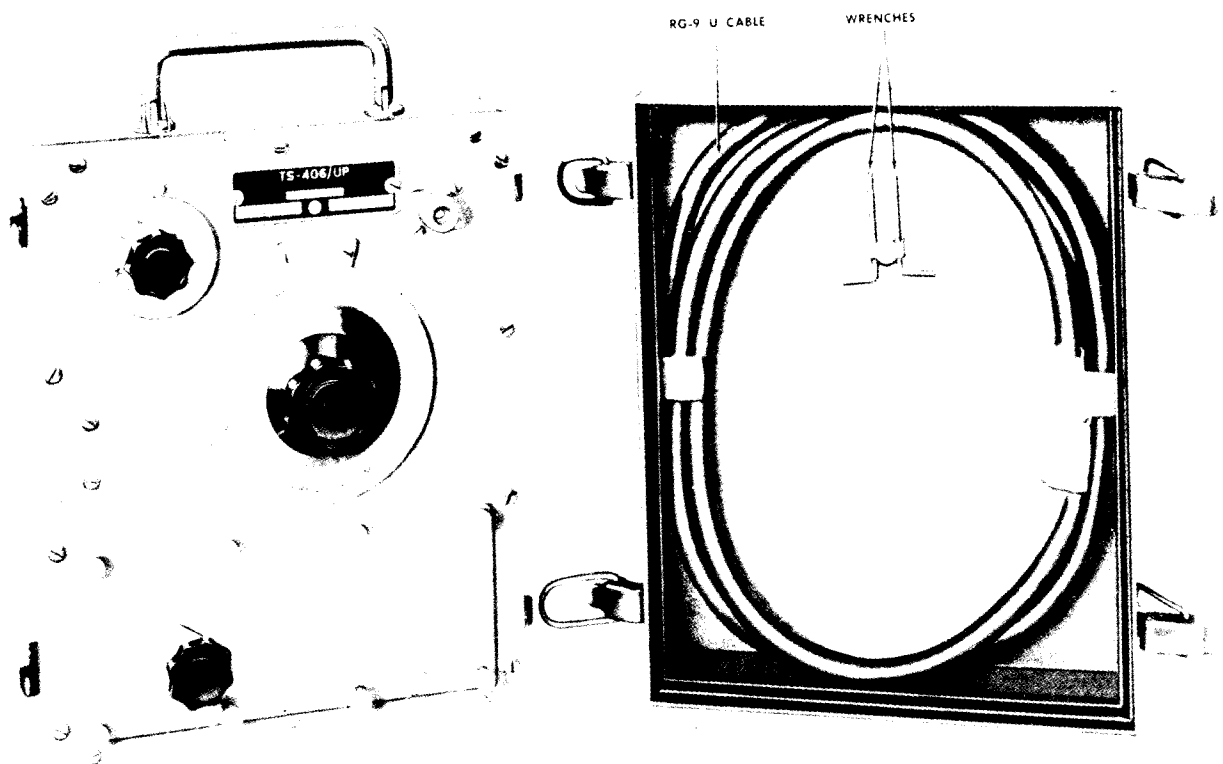
TS-403/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	RF Cable CG-92B/U	1690-154431048 R16-C-3738-600(ASO) IF 430-92 B.72		72		1.
2	Video Cord CG-409/U	1690-154435250 R16-C-3761-50(ASO) 1F430-409.96		98		0.25 0.25
3	Adaptor UG-273/U	3300-298296948 N17-C-67988-5260 2Z308-273	1-5/16	1/4 dia		0.06 0.06
1	RF Probe E-145 (spare)	3300-326826270 R16-P-6303-7(ASO) 3F3707	2-29/32	7/8 dia		0.25
1	Set of Equipment Spares	- - -				
TOTAL LESS MAINTENANCE REPAIR PARTS						92.55
TOTAL						

UNCLASSIFIED

Signal Generating Equipment

TEST OSCILLATOR TS-406/UP**TS-406/UP**

Test Oscillator TS-406/UP.

FUNCTIONAL DESCRIPTION

The Test Oscillator TS-406/UP is a compact light-weight portable instrument providing a low power test signal for receivers in the frequency range from 1000 to 3500 mc. This Test Set is designed for field testing either ground or airborne radio receiving equipment.

The radio frequency signal is produced by a buzzer and tuned by a cavity.

RELATION TO OTHER EQUIPMENT

It can be used for testing ECM receivers.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—3 v dc, from dry battery.

FREQUENCY RANGE.—1000 to 3500 mc.

Accuracy: +2%.

ATTENUATION, RELATIVE.—0 to 60 db.

TEMPERATURE RANGE.— -40°C to +55°C.

OPERATING LIFE.—

Battery: 40 hours.

Buzzer: 200 hours.

POWER OUTPUT.—10 μ v min, into a 50-ohm load.

OUTPUT IMPEDANCE.—50 ohms.

MODULATION.—Interrupted rf, at 1500 to 2000 pps.

PRESENTATION AND CONTROLS.—The frequency can be read directly from the calibrated FREQUENCY dial. The ATTENUATOR dial is calibrated in db, relative attenuation. An ON-OFF switch is provided as well as an rf output receptacle.

FITTINGS AND ACCESSORIES.—The rf output receptacle is a Type-N jack. The rf output cable is made of a 6 foot length of RG-9/U coax terminated by a Type-N UG-24/U plug at both ends.

The dry battery is a BA-205/U Type, 3.0 volt cell which is not supplied. It should be placed behind the removable plate section of the front panel. One spare buzzer is provided.

CONSTRUCTION.—The test oscillator is enclosed in a metal case with a carrying handle. A metal case cover with spring latches is provided which accommodates the output cable and the two Allen wrenches.

The cover of the battery compartment is fastened to the front panel by means of knurled screws. The spare buzzer is stored inside the case.

TYPE	(USAF):	
CLASSIFICATION:	(NAVY):	Standard
	(ARMY):	
STOCK NO.:	(USAF):	
	(NAVY):	F16-G-63939-1901
	(ARMY):	3F4325-406
DESIGN COGNIZANCE:		
PROCUREMENT INFO.:		
PROCUREMENT COG.:		
RDB IDENT. NO.:		4.2.2
F.I.I.N.		

UNCLASSIFIED

4.4 TS-406/UP: 1

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

TS-406/UP

MANUFACTURER'S OR CONTRACTOR'S DATA

Presto Recording Corp., New York, N.Y.
Contract NOa(s)-6676.

REFERENCE DATA AND LITERATURE

AN16-35 TS406-3: Handbook of Maintenance Instructions
for Test Oscillator TS-406/UP.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Oscillator TS-406/UP					

EQUIPMENT SUPPLIED

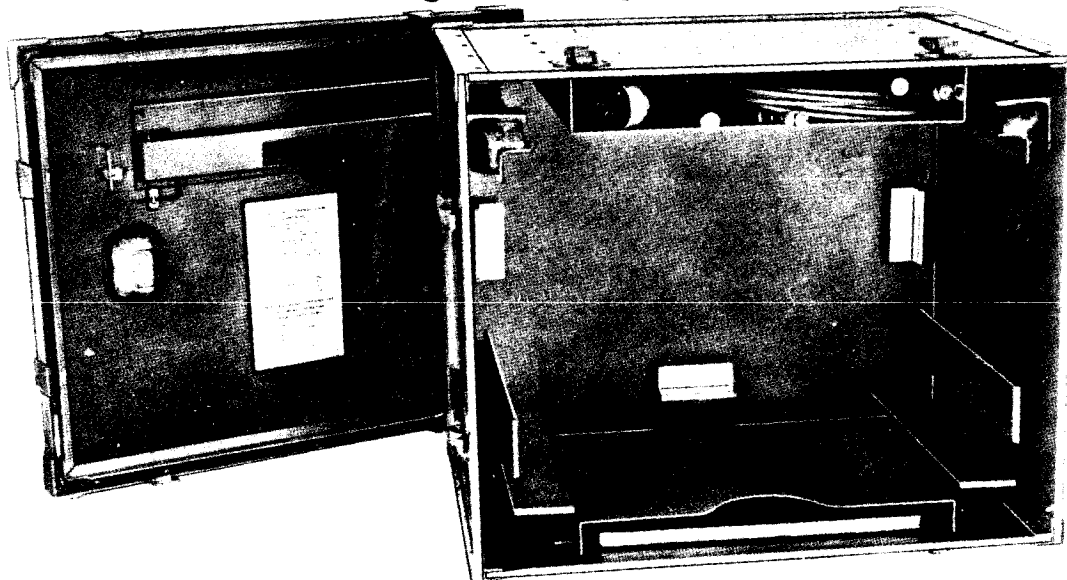
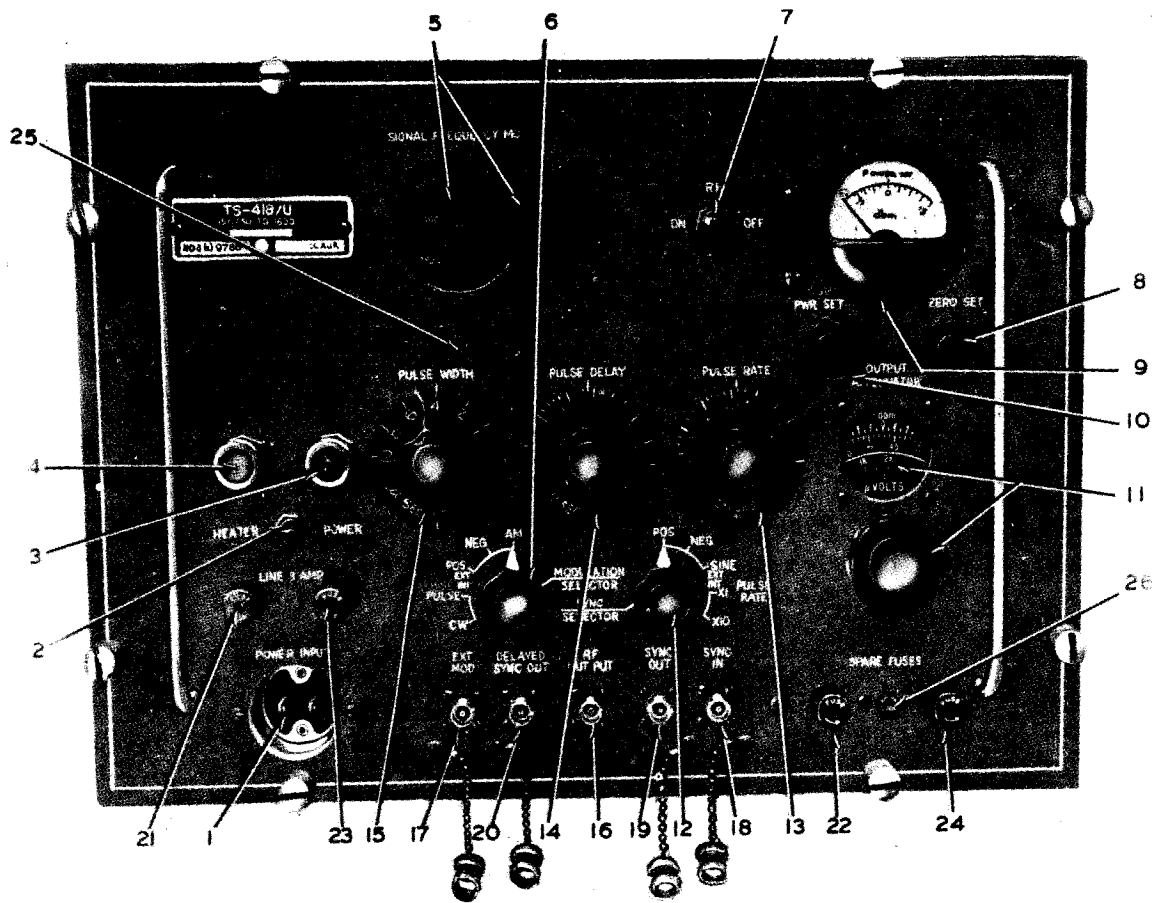
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Oscillator TS-406/UP including:	-	10-1/2	8-5/8	4-9/16	
1	Output Cable	-	72 lg			
2	Setscrew Wrench	R16-C-1532-11				
1	Spare Buzzer R-60 Modified	-				
2	Instruction Book	R16-B-15988				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			14.0

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-418/U

TS-418/U



Signal Generator TS-418/U.

UNCLASSIFIED

4.4 TS-418/U: 1

TS-418/U

FUNCTIONAL DESCRIPTION

Signal Generator TS-418/U is a portable, self-contained Signal Generator covering the band 400 to 1000 mc.

It provides either cw or pulse modulated rf signals derived from an internal modulator-oscillator system. Alternatively, positive or negative pulses, or sine waves of external origin can be used to modulate the rf carrier in place of the internal modulator. The internal modulator can either operate free running or be triggered by an external source of positive or negative polarity pulses or sine wave voltages.

The timing of the pulsed rf signal can be varied over a convenient range of time delay. Simultaneously, two separate output synchronizing video pulses are provided for external use, one of them coinciding with the outgoing rf pulse and likewise delayable.

The instrument is accurate and is designed for use with radio and radar receivers and for other applications requiring small amounts of rf power, such as the measurement of standing wave ratios, antenna or transmission line characteristics, conversion gain, etc.

RELATION TO OTHER EQUIPMENT

Part of Test Set AN/MPM-15. The latest version of this equipment bears the nomenclature Signal Generator AN/URM-49.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v $\pm 10\%$ ac, 50 to 1600 cps, 130 w (standby heaters for moisture elimination are included).

FREQUENCY RANGE.—400 to 1000 mc.

Accuracy: $\pm 1\%$ of dial reading.

OUTPUT IMPEDANCE.—50 ohms for max VSWR of 3 db.

OUTPUT POWER, RF.—1 milliwatt cw (max).

Accuracy: $\pm 2\%$.

OUTPUT VOLTS AND ATTENUATION, RF.—0.2 μ v (-120 db) to 0.2 v (0 db).

Accuracy: $\pm 2\%$.

MODULATION. —	Internal	External
Prf:	40 to 4000 pps.	40 to 6000 pps.
Pulse Width:	0.5 to 10 μ sec.	0.5 to 20 μ sec.
Pulse delay with respect to fixed sync out:	3 to 300 μ sec.	-----
Input Impedance:		10,000 ohms.
Input Volts:		± 40 to 70 v.
Frequency, Sine Wave:		100 cps to 100 kc (3 v for 30% mod).

SYNC OUT VOLTS.—+65 v peak, no load; +42 v peak, 500 ohms load shunted by 1500 μ f, 5 μ sec max duration.

PRESENTATION AND CONTROLS.—All operating controls and cable connectors are located on the front panel as shown in the picture and are as follows:

Reference	Designation	Function
1	Power Input	Power connector.
2	Power	Power switch. In the ON position the instrument is on; in the opposite position the space heater is on and the instrument is off.

Reference	Designation	Function
3	On	Pilot lamp (red) that indicates space heater is off and circuits are energized.
4	Off	Pilot lamp (white) that indicates space heater is on and circuits are not energized.
5	Signal Frequency mc	Main tuning dial and control knob.
6	Modulation Selector-cw; Pulse: Internal, External Position; External Negative; AM.	Oscillator modulation selector switch.
7	RF	Turns RF oscillator ON or OFF.
8	Zero Set	Meter zero set control.
9	Power Set	Output level reference meter.
10	Power Set	Control which adjusts reading of power level meter.
11	Output Attenuator	Output attenuator control and output level indicating dial.
12	Sync Selector	Adjusts Modulator so that it will synchronize with various types of external voltages; also allows Modulator to generate pulses internally.
13	Pulse Rate	Selects pulse repetition rate when Modulator generates internal pulse.
14	Pulse Delay	Determines delay in microseconds between external synchronizing pulse and start of output RF pulse.
15	Pulse Width	Determines width in microseconds of output RF pulse.

TYPE	(USAF): Minor Standard
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): 7CAC-363965 (NAVY): F16-Q-304512-200 (ARMY): 3F4325-418
DESIGN COGNIZANCE:	Navy, BUAER
PROCUREMENT INFO.:	Navy 16 (AER) Production, BUSHIPS CS-295 Development
PROCUREMENT COG.:	Navy, BUAER
RDB IDENT. NO.:	4.1.2
F.I.I.N.:	

UNCLASSIFIED

Signal Generating Equipment

TS-418/U

Reference	Designation	Function
16	RF Output	Terminal at which RF output is obtained.
17	Ext Mod	Terminal to which external modulating voltage is applied.
18	Sync In	Terminal to which external synchronizing voltage is applied.
19	Sync Out	Terminal at which undelayed positive synchronizing pulse is obtained.
20	Delayed Sync Out	Terminal at which delayed positive synchronizing is obtained; this pulse is approximately simultaneous with start of RF pulse.
21	Line	Holder for 3 ampere line fuse.
22	Spare	Holder for spare 3 ampere line fuse.
23	Line	Holder for 3 ampere line fuse.
24	Spare	Holder for spare 3 ampere line fuse.
25	Lock	Clamp to lock frequency drive mechanism at any setting.
26	Lock	Clamp to lock attenuator drive mechanism at any setting.

FITTINGS AND ACCESSORIES.—There are five coaxial connections to the front panel for Sync in, Sync out, Ext Mod., Delayed Sync Out and RF out. See cable adaptor chart following. Three coaxial cables are supplied, each with a BNC (UG-88/U) connector on each end. Three adaptors UG-273/U permit connecting each of the three coaxial cables to UHF type fittings and three more, UG-201/U, permit connecting to type N fittings. Three additional adaptors, UG-255/U, permit UHF connections directly at the equipment panel.

CONSTRUCTION.—Watertight Transit case CY-741/U provides slides for the Signal Generator, accessory cables and a Handbook (AN-16-35TS418-3). Other accessories are mounted in the Transit case cover. The hinged lid is provided with slide snap fasteners. The Signal Generator's case is of aluminum alloy with stainless steel rail handles. It has side louvers for ventilation and is gray wrinkle finished.

MANUFACTURER'S OR CONTRACTOR'S DATA

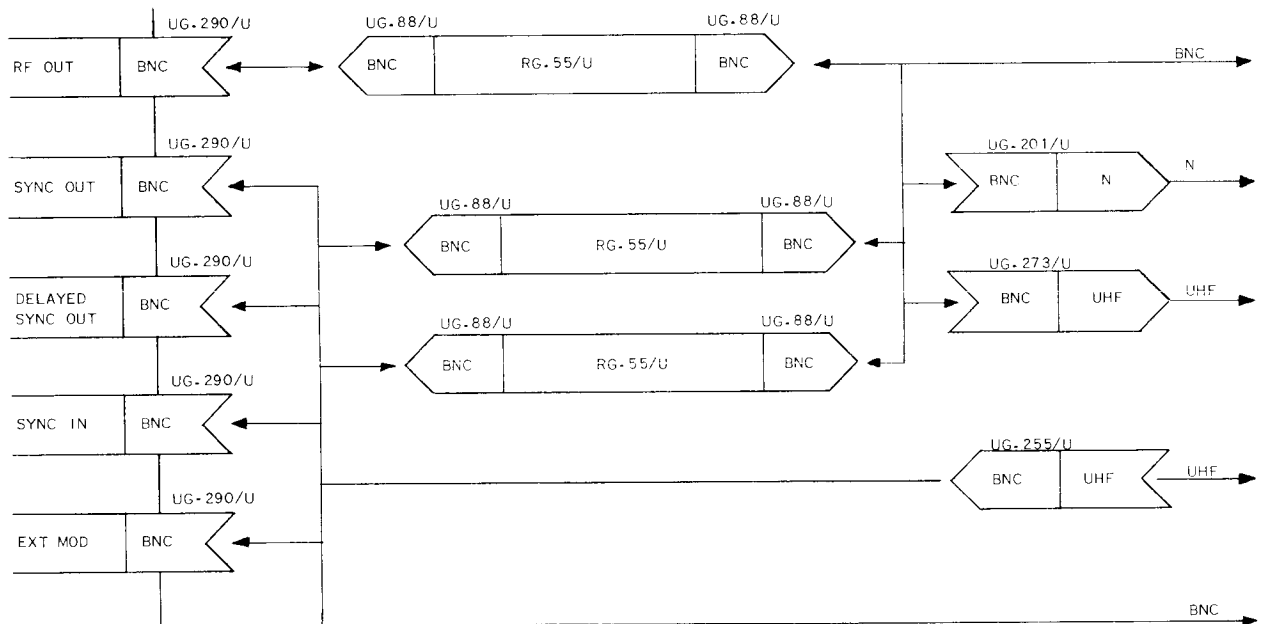
Lavoie Laboratories, Inc., Morganville, N.J.
 Contract NOa(s)-9766.
 Boonton Radio Corporation, Boonton, N.J.
 Contract N5sa-8669.

TUBE COMPLEMENT

(2) 6AG7	(1) 2C36	(2) OB2
(1) 5R4-GY	(1) 12AT7	(1) 6AK5
(1) 5Y3-GT	(1) 12AX7	(5) 6J6

REFERENCE DATA AND LITERATURE

AN 16-35TS418-3: Handbook of Maintenance Instructions for Signal Generators TS-418/U and TS-418A/U.



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CATALOG OF NAVY MATERIAL

Signal Generating Equipment

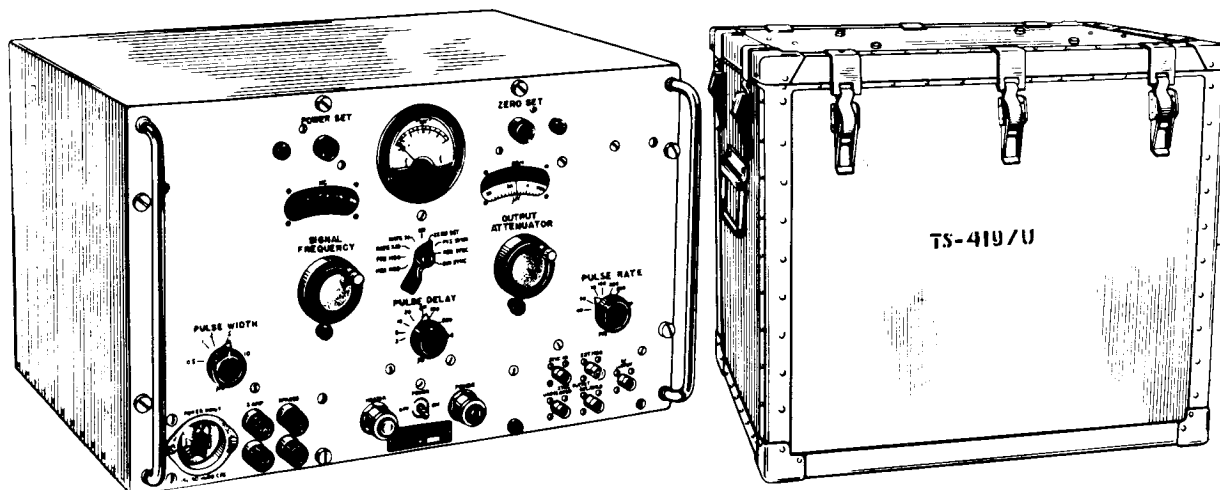
UNCLASSIFIED

TS-418/U

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-418/U	7CAC-363965 ASO-R16-AN-TS-418/U 3F4325-418	12-3/8	13-1/2	17-5/8	54.5
1	Transit Case CY-741/U	- F16-T-20139-5901 -	16	18-5/8	21-7/8	24.0
1	Power Cord CX-337/U	7CAC-170264-86 3E6000-337-72 N17-C-48226-2021 7CAC-170265-217	72 1g			0.6
1	RF Cable CG-546/U	3E6015-546.3 N16-C-11923-8221 7CAC-170265-54	72 1g			0.3
2	Video Cord CG-546/U	- 3E6015-546.4 -	96 1g			0.4
3	Adaptor UG-201/U	8850-108745 2Z308-201 N17-C-67990-2447		3/4 OD	1-9/16	0.1
3	Adaptor UG-255/U	8850-108880 2Z308-255 N17-C-67989-1323		5/8	1-3/8	0.1
3	Adaptor UG-273/U	8850-10200 2Z308-273 N17-C-67988-5260				0.1
	Spare fuses, pilot lamps, and thermistors are supplied with the equipment. All above packed in transit case.		TOTAL LESS MAINTENANCE REPAIR PARTS			81.1
			TOTAL			

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-419/U**TS-419/U**

Signal Generator TS-419/U.

FUNCTIONAL DESCRIPTION

Signal Generator TS-419/U is a portable, self-contained Signal Generator, covering the band from 900 to 2100 mc.

It provides either CW or pulse modulated RF signals deriving from an internal modulator-oscillator system. The timing of the pulsed RF signal can be varied over a convenient range of time delay. An external source of positive or negative pulses can be used to modulate the RF signal in place of the internal modulator. The internal modulation can be triggered by an external pulse source of positive or negative polarity, or by sine wave voltages. Two separate output-synchronizing video pulses are provided for external use, one of them coinciding with the outgoing RF pulse and likewise delayable.

The equipment provides an accurate signal source designed for use with radio and radar receivers and for other applications requiring only small amounts of RF power, such as the measuring of standing wave ratios, antenna or transmission line characteristics, conversion gain, etc.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—110 to 125 v, ac, 50 to 1600 cps, 300 w.

FREQUENCY RANGE.—900 to 2100 mc.

Accuracy: $\pm 1\%$ of dial reading.

OUTPUT IMPEDANCE, RF.—50 ohms (for max VSWR of 6 db).

OUTPUT POWER, RF.—1 mw max, CW.

OUTPUT ATTENUATION, RF.—0.22 μv (-121 dbm) to 0.16 v (-3 dbm).

Accuracy: ± 2 db by dial reading.

PULSE MODULATION.—Internal or External.

Rep Rate: 40 to 4000 pps max.

Width: 0.5 to 10 μsec max.

Delay (relative to fixed sync out): 3 to 300 μsec (max of 75% of interval between pulses, 187 μsec max at 4000 pps).

Peak Amplitude, Ext Mod. 40 to 70 v, \pm polarity.

SYNC IN.—

	<u>Pulse (Peak)</u>	<u>Sine Wave (rms)</u>
Amplitude:	10 to 50 v, \pm polarity	10 to 50 v
Rate:	40 to 4000 pps	40 to 4000 cps
Width:	0.5 to 50 μsec	

SYNC OUT.—

	Undelayed	Delayed
Peak amplitude, No Load:	40 v	40 v
500 ohms across		
1500 μmf :	25 v	25 v
Width:	1.3 to 4 μsec	1 to 3 μsec

PRESENTATION AND CONTROLS.—All operating controls and terminals are located on the front panel. When the ac power cable is plugged in and the ON-OFF switch is in the OFF position, an internal space heater, designed to prevent condensation, is made operative. With the power switch in the ON position, the space heater is switched OFF and the equipment is turned ON.

TYPE	(USAF): Standard Receiver
CLASSIFICATION:	(NAVY): Standard (ARMY): Not Classified
STOCK NO.:	(USAF): 1690-329002305 (NAVY): F16-Q-304514-200 (ARMY): 3F4325-419
DESIGN COGNIZANCE:	Navy, BUAER
PROCUREMENT INFO.:	Navy, 16G5(AER); DWG No. 1060
PROCUREMENT COG.:	Navy, BUAER
RDB IDENT. NO.:	4.1.2
F.I.I.N.	

UNCLASSIFIED

4.4 TS-419/U: 1

TS-419/U

Five coaxial terminals are used for RF OUTPUT, EXT MOD, SYNC IN, SYNC OUT and DELAYED SYNC OUT. The operating controls are:

Designation	Function
Meter	Output level indicator
Zero Set	Meter Zero set control
Power Set	Adjust reading of power level meter
Output Attenuator	Output attenuator Control
Attenuator Dial	dbm and μ v scales
Megacycles Dial	900 to 2100 mc, in 50 mc divisions
Function Selector	Selects NEG MOD, POS MOD, RATE X 10, RATE X1, CW, ZERO SET, POS SYNC, NEG SYNC, SIN SYNC
Pulse Width	0.5 to 10 μ sec scale
Pulse Delay	3 to 300 μ sec scale
Pulse Rate	40 to 400 pps scale

The ac power receptacle, fuse and spare fuse holders, HEATER and POWER pilot lamps are also provided.

FITTINGS AND ACCESSORIES.—All coaxial receptacles on the front panel are BNC jacks.

The RF cable and the two video cables are all terminated by BNC Type, UG-88/U plugs on both ends. For connections to equipments having Type connectors other than BNC, three sets of 3 adaptors (BNC to N, BNC to UHF male or female) are supplied. Ordinary uses of the accessory cables and adaptors are shown in the chart below.

CONSTRUCTION.—The Signal Generator is enclosed in a metal cabinet provided with panel guard handles. The complete equipment with accessories and equipment spares fits into a waterproof transit case, made of aluminum-balsa sandwich, that has spring latches and two carrying handles.

MANUFACTURER'S OR CONTRACTOR'S DATA

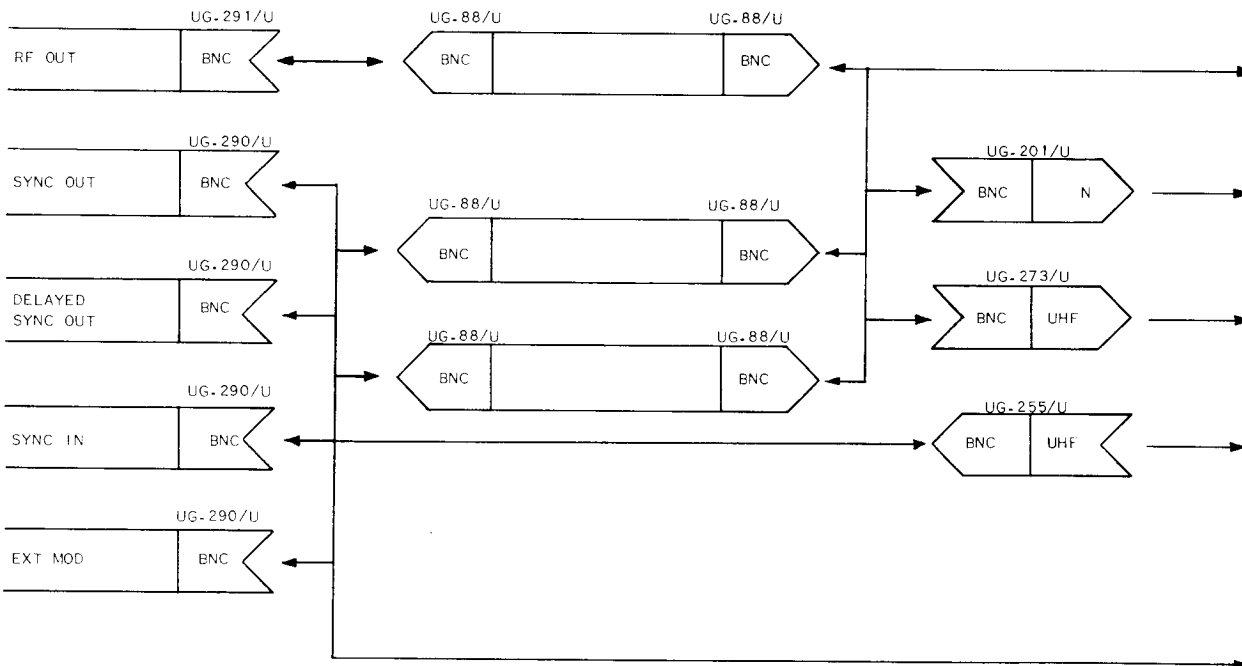
Aircraft Radio Corporation, Boonton, N.J.
 Development Contract N5SA13617, Model H-12.
 Production Contract NO: (s)9748, dated 4 April 1948.
 Technicraft Corporation, Kansas City, Missouri.
 Production Contract NOa(s)12279, Model H-12, dated June 1950.

TUBE COMPLEMENT

- (5) OA2
- (1) 6BM6
- (6) 7F8
- (2) 5R4-GY
- (8) 6V6-GT

REFERENCE DATA AND LITERATURE

AN16-35TS419-3: Handbook of Maintenance Instructions for Signal Generator TS-419/U.



SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator, TS-419/U, with Accessories	8	24	24	24	80.0

CATALOG OF NAVY MATERIAL

Combination and Group Test Set

UNCLASSIFIED

TS-433A/U

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Electronic Switch TS-433A/U	3.5				49

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Electronic Switch TS-433A/U	- F16-G-54385-4801 -	11-3/4	7-3/8	13	17
			TOTAL LESS MAINTENANCE REPAIR PARTS			
					TOTAL	

UNCLASSIFIED

Combination and Group Test Set

ELECTRONIC SWITCH TS-433B/U

TS-433B/U

FUNCTIONAL DESCRIPTION

Electronic Switch TS-433B/U is a portable equipment which makes possible simultaneous observation of two recurrent patterns on the screen of a single oscilloscope. The relative positions of the patterns on the oscilloscope may be varied so that they are superimposed on each other or placed one above the other. Direct comparison may be made of amplitudes, waveforms, frequencies and phase relationships.

RELATION TO OTHER EQUIPMENT

This equipment may be used with any oscilloscope. It is similar to DuMont Model 185-A Electronic Switch and to Electronic Switch TS-433A/U (for 115 v ac only).

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v $\pm 10\%$, or 230 v $\pm 10\%$ ac, 50 to 60 cps, 30 w.
SWITCHING RATE.—10 to 2000 times per sec, continuously variable.
FREQUENCY RESPONSE.—0 to 5000 cps, ± 1 db, 25 kc response not more than 25% below 1 kc response.
GAIN.—10 times.
ATTENUATION.—Continuously variable.
PHASE SHIFT.— $180^\circ - 2^\circ$ at 1 kc, $180^\circ - 35^\circ$ at 25 kc relative to input.
INPUT IMPEDANCE.—100,000 ohms $\pm 10\%$.
INPUT SIGNAL VOLTS.—2.5 to 150 v rms balance.
OUTPUT IMPEDANCE.—50,000 ohms at full gain.
OUTPUT SIGNAL VOLTS.—75 v peak-to-peak at balance.
SQUARE WAVE.—
 Range: 10 to 500 cps.
 Amplitude: 0 to 30 v peak-to-peak.
 Rise Time: 25 μ sec max at 500 cps.

PRESENTATION AND CONTROLS.—The various panel controls, as shown in the picture, perform the functions of setting the gain, frequency, and balance; and provide power control, fusing, and signal connections.
FITTINGS AND ACCESSORIES.—The input and output signals are attached to binding posts. No line cord or other accessories are supplied with the unit.
CONSTRUCTION.—The equipment is housed in a metal cabinet which is provided with a carrying handle.

MANUFACTURER'S OR CONTRACTOR'S DATA

Dunbrow Development Co., Burlington, N.J.

TUBE COMPLEMENT

(2) 6SN7-GT (2) 6SJ7-GT (1) 5Y3-GT

REFERENCE DATA AND LITERATURE

Technical Manual TM-11-5049; TO 16-35TS-433-5, dated May 1951.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	Army, Sig C
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Army, Sig C
RDB IDENT. NO.:	10.1.7
F. I. I. N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Electronic Switch TS-433B/U	2.18	15-1/2	13-1/2	18	55

EQUIPMENT SUPPLIED

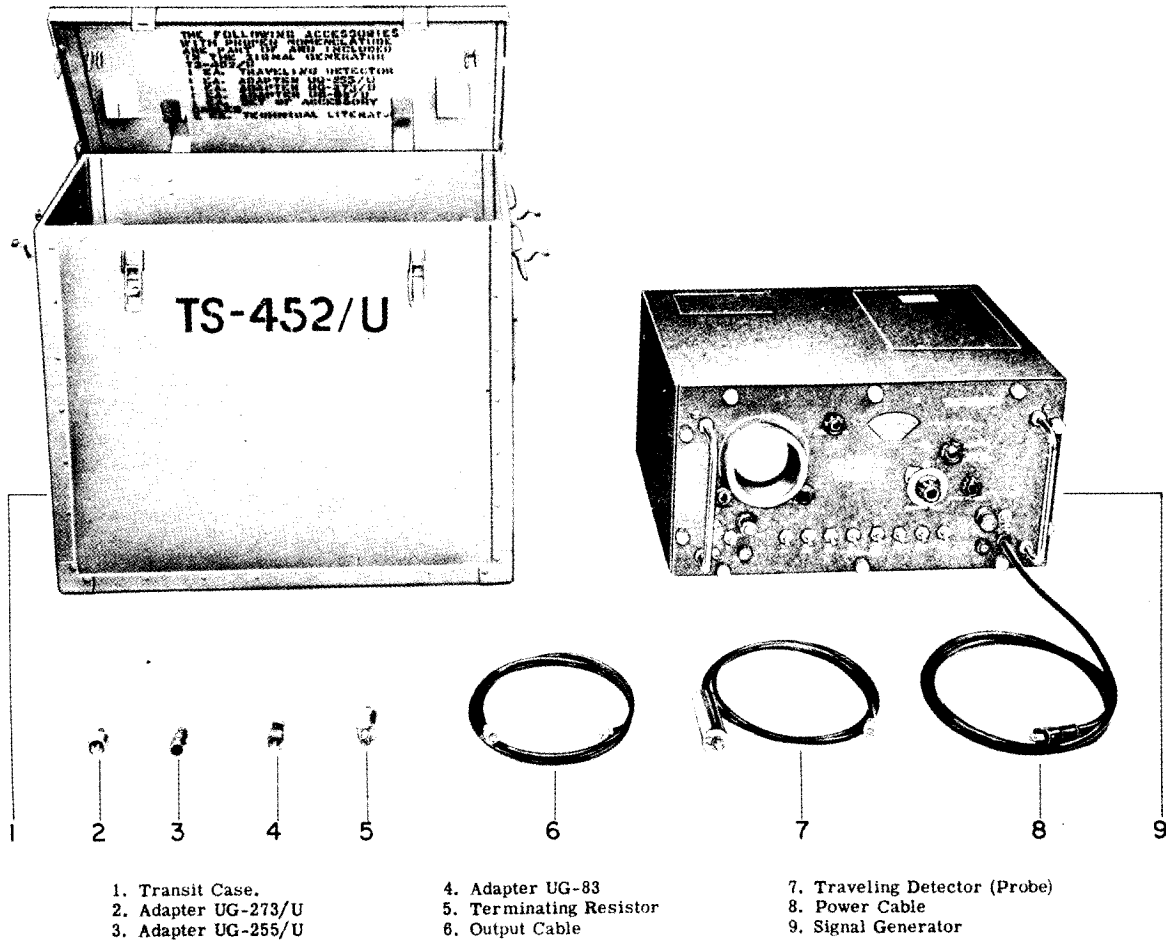
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Electronic Switch TS-433B/U	-	10	13	8-3/4	24
		-	TOTAL LESS MAINTENANCE REPAIR PARTS			24
			TOTAL			

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-452/U SERIES

TS-452/U



Signal Generator TS-452/U Series.

FUNCTIONAL DESCRIPTION

The TS-452/U Signal Generator is used to test the alignment of intermediate frequency and radio frequency circuits in the 5 to 100 mc range. It is fitted with a motor-driven capacitor for frequency sweep of the oscillator. A wavemeter provides a sweep blanking pulse to locate frequencies on the oscilloscope pattern. A traveling detector is provided to pick up the signal from any point in the circuit under test. This signal is rectified in the probe, amplified and displayed as vertical

TYPE	(USAF): Sub. Standard	TS-452A/U
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY):	
STOCK NO.:	(USAF): 1690-327002800 (NAVY): (ARMY): 3F3901-452	
DESIGN COGNIZANCE:	USAF Watson	
PROCUREMENT INFO.:	WLENG 133A	
PROCUREMENT COG.:	USAF	
RDB IDENT. NO.:	4.1.2	
F.I.I.N.		

TYPE	(USAF): Limited Standard	TS-452/U
CLASSIFICATION:	(NAVY): Sub. Standard (ARMY):	
STOCK NO.:	(USAF): 1690-327022800 (NAVY): (ARMY): 3F3901-452	
DESIGN COGNIZANCE:	USAF Watson	
PROCUREMENT INFO.:	Exhibit No. WLENG-133A, 21 June 1948	
PROCUREMENT COG.:	USAF	
RDB IDENT. NO.:	4.1.2	
F.I.I.N.		

TYPE	(USAF): Standard	TS-452B/U
CLASSIFICATION:	(NAVY): Standard (ARMY):	
STOCK NO.:	(USAF): 1690-329002465 (NAVY): (ARMY): 3F4325-452B	
DESIGN COGNIZANCE:	USAF Watson	
PROCUREMENT INFO.:	Eng-2115; USAF Spec No. 7519(Proposed)	
PROCUREMENT COG.:	USAF	
RDB IDENT. NO.:	4.1.2	
F.I.I.N.		

UNCLASSIFIED

Signal Generating Equipment

UNCLASSIFIED

TS-452/U

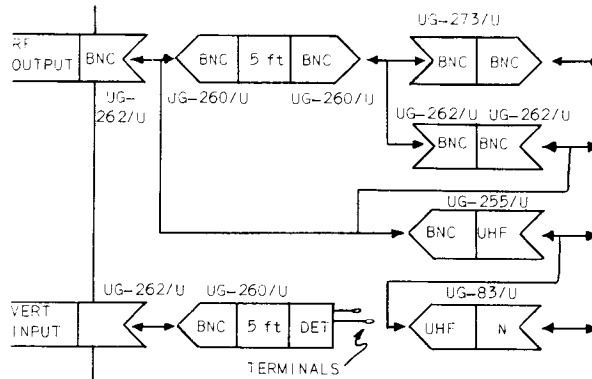
deflection on the cathode ray-tube screen. The time interval of the horizontal sweep of the oscilloscope is synchronized with the variation of frequency of the oscillator. The spot on the screen travels from left to right once during the time the frequency of the oscillator changes from minimum to maximum.

RELATION TO OTHER EQUIPMENT

Functionally, the TS-452/U, TS-452A/U and TS-452B/U are similar. Location and labeling of controls and indicators differ; however, the same number and means of control are employed. Range of frequency modulation differs by a small amount for each version. This equipment supersedes Signal Generator TS-309/U.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 50 to 1600 cps, 120 w.
FREQUENCY SWEEP.—5 to 11 mc; 8 to 18 mc; 13 to 27 mc; 20 to 42 mc; 33 to 70 mc; 45 to 100 mc.
WAVE METER.—5 to 100 mc in 4 bands.
 Accuracy: $\pm 0.33\%$.
ATTENUATION.—0 to -101 db in 1 db steps.
RATE OF FREQUENCY SWEEP.—60 to 100 times per sec approx.
INPUT IMPEDANCE.—
 Traveling Detector: 470 ohms shunted by $2.5 \mu f$.
 Vertical Input: 20,000 ohms.
OUTPUT.—
 Impedance: 75 ohms.
 Voltage: 0.25 v, min.
VERTICAL AMPLIFIER FREQUENCY RESPONSE.—20 to 30,000 cps.
PRESENTATION AND CONTROLS.—The band-pass characteristics of the circuit under test are plotted directly on the face of a 3-inch cathode-ray tube. Frequency identification is by means of a blanked spot in the trace corresponding to the frequency indicated on the calibrated dial of the wavemeter. The wavemeter range is selected by a band switch. The range of sweep of the oscillator is selected by plug-in coils. Marker amplitude, vertical gain, horizontal gain, and horizontal sync controls are also provided on the front panel. Eight toggle switches are used for the output attenuator. Intensity, focus, horizontal center, and vertical center controls are accessible through door in top of case.
FITTINGS AND ACCESSORIES.—Two cables, three adaptors and a terminating resistor are supplied and may be connected as shown in the chart.
CONSTRUCTION.—This Signal Generator has a black wrinkle finish, aluminum case, with metal carrying handles at each end of the front panel. Two doors in the top of the case provide access to the controls and plug-in coils.



MANUFACTURER'S OR CONTRACTOR'S DATA

TS-452/U:
 Thermionic Engineering Corp., Rt. 23 & Blvd., Pompton Plains, N.J.
 Contract AF33-038-48-1179, dated June 1928.
 Reiner Electronics Co., 152 W. 25th St., New York, N.Y.
 Contract W28-099-ac-29.
TS-452A/U:
 Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica, N.Y.
 Contract W33(038)ac21185, dated 18 May 1948.
TS-452B/U:
 Lewyt Corporation, 60 Broadway, New York, N.Y.
 Contract 33(038)6165, dated 21 December 1949.

TUBE COMPLEMENT

- TS-452/U**
 (2) OD3/VR-150 (2) 6X5GT (1) 6J6
 (2) 6SL7-GT (3) 6SN7-GT (1) 6AQ6
 (1) 3BP1-A
- TS-452A/U**
 (2) OD3/VR-150 (3) 6SN7-GT (1) 6AQ6
 (2) 6SL7-GT (2) 6X5-GT (1) 6J6
 (1) 3BP1-A
- TS-452B/U**
 (2) OD3/VR-150 (3) 6SN7-GT (1) 6AQ6
 (2) 6SL7-GT (1) 3BP1-A (1) 6J6
 (2) 6X5-GT (1) 1B3-GT

REFERENCE DATA AND LITERATURE

AN-16-35TS452-3: Handbook of Maintenance Instructions for Signal Generator TS-452/U.
 16-35TS452-10: Handbook of Operating and Service Instructions for Signal Generator TS-452A/U.

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-452/U Signal Generator TS-452/U	-	16	19	9-3/4	55.0

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Signal Generating Equipment

TS-452/U

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Traveling Detector and Cable	-	1-1/4 dia	60 lg		0.45
1	Adaptor UG-83/U	3300-28605-4448 N17-C-67991-3690 2Z308-83	3/4 dia	1-5/8 lg		0.10
1	Adaptor UG-255/U	3300-298296927 N17-C-67989-1323 2Z308-255	5/8 dia	1-3/8 lg		0.10
1	Adaptor UG-273/U	3300-298296948 N17-C-67988-5260 2Z308-273	3/4 dia	1-3/8 lg		0.10
1	Output Cable	-	9/16 dia	60 lg		0.25
1	Terminating Resistor	-	1 dia	2-1/2 lg		0.20
1	Transit Case	-	19	23	13-7/8	18.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			74.20
			TOTAL			
1	TS-452A/U Signal Generator TS-452A/U	-	17	12	9	59.30
1	Transit Case	-	19	23	13-7/8	31.50
1	Adaptor UG-88/U	3300-28605-4448 N17-C-67991-3690 2Z308-83	3/4 dia	1-5/8 lg		0.10
1	Adaptor UG-255/U	3300-298296927 N17-C-67988-5260 2Z308-273	5/8 dia	1-3/8 lg		0.10
1	Adaptor UG-273/U	3300-298296948 N17-C-67988-5260 2Z308-273	3/4 dia	1-3/8 lg		0.10
1	Output Cable	-	9/16 dia	60 lg		0.25
1	Terminating Resistor	-	1 dia	2-1/2 lg		0.20
1	Traveling Detector	-	1-1/4 dia	60 lg		0.45
			TOTAL LESS MAINTENANCE REPAIR PARTS			92.00
			TOTAL			
1	TS-452B/U Signal Generator TS-452B/U	-	17	12	9	59.50
1	Transit Case	-	19	23	13-7/8	31.50
1	Adaptor UG-83/U	3300-28605-4448 N17-C-67991-3690 2Z308-83	3/4 dia	1-5/8 lg		0.10

UNCLASSIFIED

4.4 TS-452/U: 3

CATALOG OF NAVY MATERIAL

Signal Generating Equipment

UNCLASSIFIED

TS-452/U

EQUIPMENT SUPPLIED

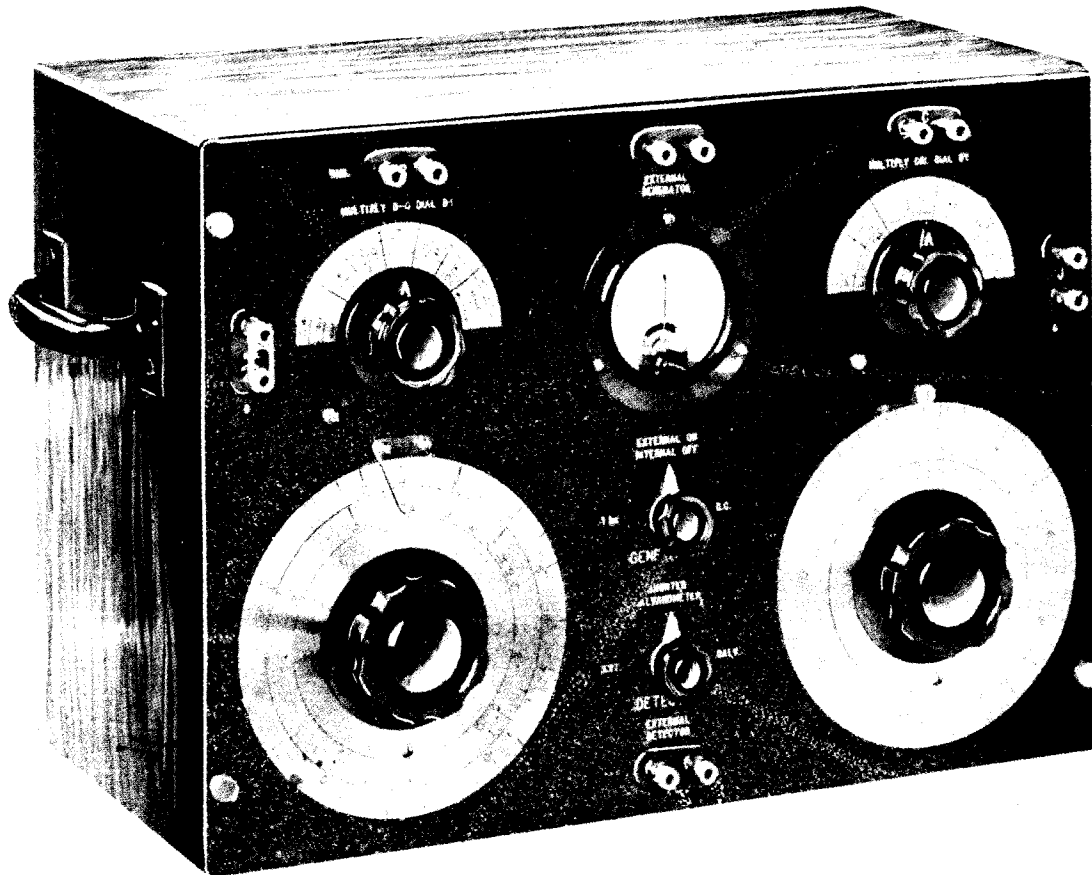
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Adaptor UG-255/U	3300-29829-6927 N17-C-67989-1323 2Z308-255	5/8 dia	1-3/8 lg		0.10
1	Adaptor UG-273	3300-29829-6948 N17-C-67988-5260 2Z308-273	3/4 dia	1-3/8 lg		0.10
1	Output Cable	-	9/16 dia	60 lg		0.25
1	Traveling Detector	-	1-1/4 dia	60 lg		0.45
			TOTAL LESS	MAINTENANCE	REPAIR PARTS	92.00
					TOTAL	

UNCLASSIFIED

Impedance and Standing Wave Measuring Equipment

**IMPEDANCE BRIDGE TS-460A/U and
TS-460B/U**

**TS-460A/U,
TS-460B/U**



Impedance Bridges TS-460A/U and TS-460B/U.

FUNCTIONAL DESCRIPTION

Impedance Bridges TS-460A/U and TS-460B/U are four-arm bridges used to make direct measurements of resistance, capacitance, inductance, dissipation factor of capacitors and storage factor of inductors. The bridge has a built-in 1 kc signal source and a dc supply.

RELATION TO OTHER EQUIPMENT

Models TS-460A/U and TS-460B/U are electrically identical. They are upright layout versions of Model TS-460/U (General Radio Model 650-A). Model TS-460A/U is enclosed in a hardwood cabinet. Model TS-460B/U is enclosed in a metal cabinet and its chassis and panel assembly are designed for optional relay-rack installation. They are superseded by Model TS-460C/U, which is similar in function, but has improved ranges and accuracies and is enclosed in a portable, dripproof metal case.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—6 v dc, from four 1.5 v dry batteries Type BA-23.

RANGES.—

Resistance: 1 milliohm to 1 megohm.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Sub. Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY): 3F2008
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Sig C 7029-Phila. 48 Sig. C.
PROCUREMENT COG.:	11048-Phila 47
RDB IDENT. NO.:	6.1.4.
F. I. I. N.:	

UNCLASSIFIED

TS-460A/U, TS-460B/U

Capacitance: 1 μf to 100 μf .
 Inductance: 1 μh to 100 L.
 Dissipation Factor: 0.002 to 1.0.
 Storage Factor: 0.02 to 1000.

ACCURACY.—

Resistance:

1.2 ohms to 100 kilohms: $\pm 1\%$.
 At 1 megohm: $\pm 2\%$.
 0.2 to 1.2 ohms: $\pm 1\%$ (when corrected for bridge distributed and lead resistance).

Capacitance:

1000 μf to 10 μf : $\pm 1\%$.
 At 100 μf : $\pm 2\%$.
 200 μf to 1000 μf : $\pm 1\%$ (when corrected for bridge and lead capacitance).
 Less than 200 μf : $\pm 2 \mu\text{f}$.

Inductance:

100 μh to 1h: $\pm 2\%$.
 At 10h: $\pm 5\%$.
 At 100h: $\pm 10\%$.
 Less than 100 μh : $\pm 2 \mu\text{h}$ (when corrected for bridge and lead inductance).

Dissipation Factor:

Capacitors greater than 500 μf : $\pm 20\%$ or 0.005 whichever is greater.

Storage Factor:

To a value of 10: $\pm 20\%$.
 Large values: ± 0.005 for its reciprocal.

FREQUENCY RANGE.—60 cps to 10 kc, from external generator.

INTERNAL SIGNAL SOURCE.—1 kc, $\pm 10\%$.

PRESENTATION AND CONTROLS.—The CRL dial is calibrated from 0 to 11 and gives the measured value directly when multiplied by the factor indicated by the CRL MULTIPLIER switch. The Q, D, DQ dial has 3 scales and gives the measured value directly when multiplied by the factor indicated by the MULTIPLY D-Q DIAL switch. The DETECTOR switch selects external detector, shunted galvanometer or the galvanometer and GENERATOR switch selects DC, 1 kc or

external signal source. A 100-0-100 microammeter is used for indicating bridge balance when using a dc signal source. Headphones are required for indicating balance with an ac signal source. Terminals are provided for external generator, unknown R, unknown C or L, external detector, external capacitance for measuring ac resistance with reactance, and external series resistance for determining dissipation factor or storage factor at frequencies other than 1 kc.

The calibration of the LRC dial is correct for any frequency from 60 cps to 10 kc. The Q, D and DQ dial readings must be corrected for frequencies other than 1 kc.

FITTINGS AND ACCESSORIES.—Two twin banana plug connectors (Sig. C Stock No. 2Z3022-26, GR No. 274) are supplied to facilitate connections of an oscillator, or the phone tip ends of a headset assembly, to the instrument. All terminals on the front panel are combination banana jack/binding posts. Both Models require four 1.5 v Type BA-23 dry batteries to supply power to the bridge or to the 1 kc signal generator. One headphone set is supplied with Model TS-460B/U.

CONSTRUCTION.—Model TS-460A/U is enclosed in a hardwood cabinet with carrying handles on each side. Model TS-460B/U is enclosed in an aluminum cabinet. A compartment is provided within the cabinets for the batteries, and access to it is from the underside.

MANUFACTURER'S OR CONTRACTOR'S DATA

Brown Engineering Co., 4635-37 SE Hawthorne Blvd.,
 Portland, Oregon.
 Sig. C Order No. 11048-Phila 47.

REFERENCE DATA AND LITERATURE

TM11-2634: Impedance Bridges TS-460/U, TS-460A/U and TS-460B/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Impedance Bridge TS-460B/U					41

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-460A/U Impedance Bridge TS-460A/U	-	12	17	10-3/4	23
2	Connector Plug	-				0.03
3	Battery Leads	2Z3022-26				
2	Instruction Book TM11-2636	-				23.03
TOTAL LESS MAINTENANCE REPAIR PARTS						
TOTAL						

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Impedance and Standing Wave Measuring Equipment

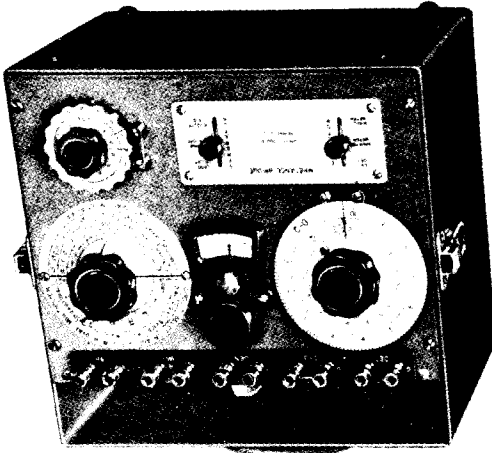
TS-460A/U, TS-460B/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	(USAF) STOCK NUMBERS (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	TS-460B/U Impedance Bridge TS-460B/U	- -	9-1/2	13	22	23
2	Connector, Plug	- -				
3	Battery Leads	223022-26 -				0.03
1	Headset NT-49003	- -				
		N17-R-43441-1681 28954-2				1.0
2	Instruction Book TM11-2634	- -				
TOTAL LESS MAINTENANCE REPAIR PARTS						
TOTAL						24.03

UNCLASSIFIED

Impedance and Standing Wave Measuring Equipment

IMPEDANCE BRIDGE TS-460C/U**TS-460C/U**

Impedance Bridge TS-460C/U.

FUNCTIONAL DESCRIPTION

Impedance Bridge TS-460C/U is a four-arm bridge used to make direct measurements of resistance, capacitance, inductance, dissipation factor of capacitors, and storage factor of inductors. The bridge has a built-in 1 kc signal source and a dc bridge source.

RELATION TO OTHER EQUIPMENT

Model TS-460C/U supersedes Models TS-460A/U and TS-460B/U which have lesser ranges and accuracies. These impedance bridges are similar in design and function to Model TS-460/U (General Radio Model 650-A). Model TS-460A/U is enclosed in a hardwood cabinet. Model TS-460B/U is built in a metal cabinet, and its chassis and panel assembly is designed for optional relay rack installation. Model TS-460C/U is enclosed in a portable, drip-proof metal case.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—6 v dc, from four 1.5 v dry batteries Type BA-30.

RANGES.—

Resistance: 1 milliohm to 11 meg.
 Capacitance: 1 μf to 1100 μf .
 Inductance: 1 μh to 1100 h.
 Dissipation Factor: 0.001 to 1.05.
 Storage Factor: 0.02 to 1000.

ACCURACY.—

Resistance:
 0.1 Range: $\pm(0.35\% + 1$ division on inner LRC dial).
 1 meg and 11 meg Range: $\pm(0.2\% + 1$ division on inner LRC dial).
 All other Ranges: $\pm(0.15\% + 1$ division on inner LRC dial).
 Capacitance:
 100 μf to 100 μf : $\pm(0.5\% + 1$ division on inner LRC dial).
 Over 100 μf : $\pm 2\%$.
 Less than 100 μf : $\pm 2 \mu\text{f}$ (when corrected for bridge and lead capacitance).
 Inductance:
 100 μh to 10 h: $\pm(1.0\% + 1$ division on inner LRC dial).

Over 10 h: $\pm 10\%$.Less than 100 μh : $\pm 2 \mu\text{h}$ (when corrected for bridge and lead inductance).**Dissipation Factor:**Capacitors greater than 0.1 μf : $\pm(7\% + .0025)$.**Storage Factor:**Up to 10 h: $\pm(7\% + .0025)$.At 100 h: $\pm(7\% + .015)$. In terms of its reciprocal.At 1000 h: $\pm(7\% + .055)$.

FREQUENCY RANGE.—A few cycles to 10 kc, from external generator.

INTERNAL SIGNAL SOURCE.—1 kc, $\pm 5\%$.

PRESENTATION AND CONTROLS.—The LRC dial is calibrated from 0 to 11, and gives the measured value directly when reading is multiplied by the factor indicated by the LRC DIAL MULTIPLIER. The Q-DQ dial has two scales, and gives measured values directly when reading is multiplied by the factor indicated by the CIRCUIT SELECTOR AND Q, DQ AND R DIAL MULTIPLIER switch. The DETECTOR switch selects either EXTERNAL DETECTOR, SHUNTED METER, or DIRECT METER functions; the GENERATOR switch selects either 1000 CYCLES, INTERNAL POWER OFF, or 6 VOLTS DC functions. A 7.5 microampere zero-center galvanometer is used for indicating bridge balance with the use of the dc source. Headphones are used for indication of balance with an ac signal source. Terminals are provided for an external generator. Unknown R or L, unknown C, EXTERNAL DQ, and an external detector (galvanometer or headset). The calibration of the LRC dial is correct for any signal frequency up to 10 kc. The Q and DQ dial readings must be corrected for frequencies other than 1 kc.

FITTINGS AND ACCESSORIES.—The equipment includes two 20-inch long test leads terminated by a crocodile clip on one end and a spade lug on the other. The ten terminal connectors on the front panel are combination banana jacks/binding posts. Dry batteries and a headset are not supplied as part of the equipment. A special battery compartment and cartridge holder are provided to accommodate four batteries of the BA-30 type.

CONSTRUCTION.—The equipment is housed in an aluminum case which has a detachable lid and a removable front panel. A carrying handle is located on the top of the case.

MANUFACTURER'S OR CONTRACTOR'S DATA

Brown Engineering Co, 4635-37 S.E., Hawthorne Blvd., Portland 15, Oregon.

REFERENCE DATA AND LITERATURE

TM 11-2646: Impedance Bridge TS-460C/U.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): RI6-T-1875-20(ASO)
	(ARMY):
DESIGN COGNIZANCE:	Army Sig C
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Army Sig C
RDB IDENT. NO.:	6.1.4
F.I.I.N.	

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4.6 TS-460C/U: 1

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CATALOG OF NAVY MATERIAL

Impedance and Standing Wave Measuring Equipment

UNCLASSIFIED

TS-460C/U

SHIPPING DATA

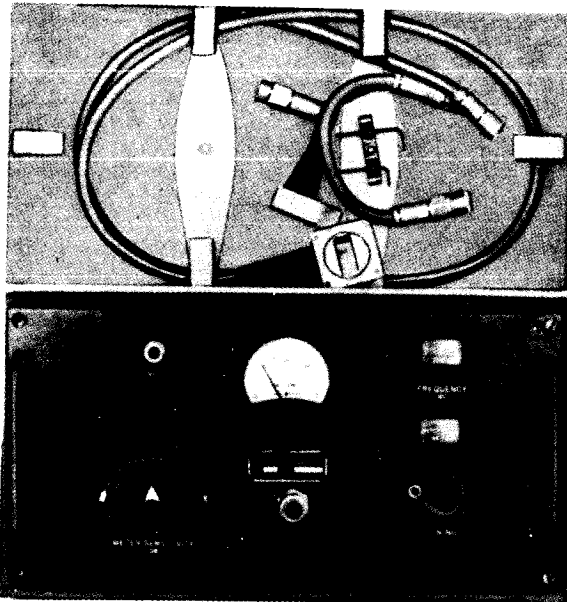
NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Impedance Bridge TS-460C/U and Accessories	1.13	11-1/2	12-1/2	13-1/2	20

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Impedance Bridge TS-460C/U	-	8-3/4	10-1/2	10-1/2	15
2	Test Leads	-	9-1/2 lg			
2	Instruction Book TM11-2646	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			15

RESTRICTED
Security Information

Frequency Measuring Equipment

ECHO BOX TS-488/UP**TS-488/UP**

Echo Box TS-488/UP.

FUNCTIONAL DESCRIPTION

Model TS-488/UP is a sharp tuning, high Q resonant cavity designed to make a quick routine analysis of the overall performance of Radar systems operating at frequencies between 8990 and 9610 mc.

The most often performed tests are:

Relative indication (from day-to-day) of transmitter power output.

Measurement of transmitter and local oscillator frequencies.

Analysis of transmitter frequency spectrum.

Checking on erratic operation, double moding and frequency pulling.

Measurement of pulse duration.

Checking of receiver AFC action; measurement of TR box and receiver recovery time.

Measurement of standing wave ratio, of transmission line losses, and other factors.

A visual indication of system performance appears on the radar screen. Resonance and relative power are indicated by the deflections of the internal microammeter.

RELATION TO OTHER EQUIPMENT

Echo Box Model TS-488/UP supersedes Echo Box Models TS-62/AP, TS-218/UP, TS-218A/UP.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—8990 to 9610 mc.

Accuracy: ± 8 mc from measured spot frequency. Frequencies 60 mc apart are read within ± 1.5 mc.
LOADED Q.—60,000 approx.

METER ATTENUATOR.—0 to 25 db.

PRESENTATION AND CONTROLS.—The TUNING knob is used to tune the Echo Box cavity. The tuned frequency is indicated on two separate dials, one having 10 mc divisions, the other having 0.1 mc divisions. A meter indicator with a 0 to 20 microampere scale indicates the relative amount of power absorbed by the cavity at the tuned frequency. A built-in vane type attenuator is used merely to keep the power input to the meter within its power handling range. A special socket for the crystal diode is accessible on the front panel. Spare crystals are housed in a special compartment protected by a screw-on cap. The input receptacle is located in the top left hand corner of the front panel.

FITTINGS AND ACCESSORIES.—Coupling of the echo box to the radar system can be made by means of either a directional coupler (usually installed on the radar transmission line) or the pick-up antenna, AT-68/UP.

In both cases the RF cable CG-92A/U is used. It is made of 8 feet of RG-9A/U coaxial with an N type plug, UG-21B/U, at both ends. One end mates the N type input jack on the front panel and the other is connected either to the pick-up antenna or to a similar type jack on the directional coupler.

CONSTRUCTION.—The main unit is fully enclosed in a metal cabinet standing on rubber feet. The front panel has two handles and is protected during transit by a lid cover with snap-down latches. This cover houses the RF cable and all other accessories and calibration charts.

MANUFACTURER'S OR CONTRACTOR'S DATA

Bell Telephone Laboratories, New York 14, N.Y.

Contract dated April 1948.

Fairchild Camera and Instrument Corp., Jamaica 1, N.Y.

Contract W33-038ac-21315, dated May 1948.

TUBE AND CRYSTAL COMPLEMENT

Uses 1N23B crystal diode.

REFERENCE DATA AND LITERATURE

AN 16-35TS488-3: Handbook Maintenance Instructions for Echo Box TS-488/UP.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF): 1690-329002585
	(NAVY): F16-C-67674-1021
	(ARMY): 3F4325-488
DESIGN COGNIZANCE:	USAF, Watson
PROCUREMENT INFO.:	Army Spec No. XS-7476, USAF Exhibit
PROCUREMENT COG.:	WLENG-115 DWG No. 1596
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

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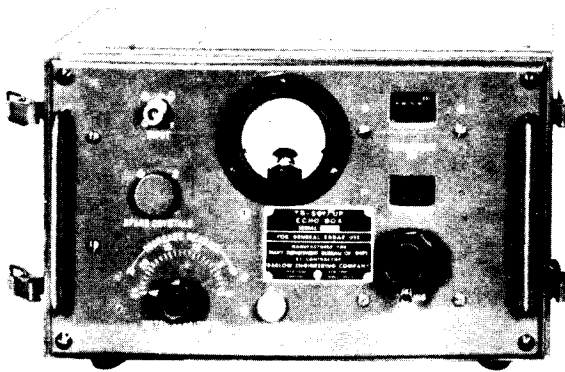
4.2 TS-488/UP: 1

RESTRICTED
Security Information

Frequency Measuring Equipment

ECHO BOX TS-501/UP

TS-501/UP



Echo Box TS-501/UP.

FUNCTIONAL DESCRIPTION

Echo Box TS-501/UP is a sharp-tuning, high Q resonant cavity designed to make a quick routine analysis of the overall performance of radar systems.

Typical tests performed are relative indication (from day-to-day) of transmitter power output; measurement of transmitter and local oscillator frequencies; analysis of transmitter frequency spectrum; checking on erratic operation, double moding, and frequency pulling; measurement of pulse duration; checking of receiver AFC action, measurement of TR box and receiver recovery time; measurement of standing wave ratio, transmission line losses, and other factors.

A visual indication of system performance appears on the radar scope. Resonance and relative power are indicated by the deflections of the internal microammeter.

RELATION TO OTHER EQUIPMENT

The use of Echo Box TS-501/UP necessitates the use of a test antenna, or the installation of a directional coupler with 20 to 35 db attenuation is required in the antenna feed of the radar system under test.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—6250 to 6900 mc.

SENSITIVITY.—50 yd of ringtime per db change in power.

METER ATTENUATOR.—0 to 25 db.

MEASUREMENT ACCURACY.—

Frequency: +5 mc.

Ringtime: +4%, across the band.

Ringtime Uniformity: +1/2 μ sec of agreed standard.

AMBIENT TEMPERATURE RANGE.— -40° F to +150° F.

PRESENTATION AND CONTROLS.—The cavity can be varied in length by means of the tuning knob. A common mechanism rotates two circular dials. One

dial has one division per 10 mc along the scale from 6250 to 6900 mc. The other dial has 100 divisions for each 10 mc sector, or 1 division per 0.1 mc.

A meter indicator with a 0 to 20 microampere scale indicates the relative amount of power absorbed by the cavity, over the tuning range, and thereby resonance for one particular frequency setting.

A built-in attenuator of the vane type is used merely to keep the meter circuit power intake within its handling range.

A special socket for the crystal rectifier is accessible from the front panel. Spare crystals are housed in a special compartment protected by a screw-on cap. The input jack is located in the top left-hand corner of the front panel.

FITTINGS AND ACCESSORIES.—To connect the echo box to the radar system under test, use is made of the RF Cable CG-92A/U, which consists of 10 feet of RG-9/U coax and an N-Type plug UG-21B/U at each end. One end may be connected to the input jack of the echo box, which is an N-Type UG-228/U female connector, and the other to a directional coupler provided with a similar N-Type female output connector.

CONSTRUCTION.—The instrument is fully enclosed in a metal cabinet standing on rubber feet. The front panel has two handles and is protected by a lid cover during transit. This cover houses the rf cable and three Allen wrenches, and is fastened on the cabinet by means of snap-down catches.

MANUFACTURER'S OR CONTRACTOR'S DATA

Barlow Engineering Co., New York, N.Y.

Contract by Hazeltine Electronics Co., New York, N.Y.

Contract NObsr-39218, dated 18 June 1947.

Contract NObsr-42428, dated 30 June 1948.

TUBE AND CRYSTAL COMPLEMENT

Contains 1 crystal rectifier 1N23.

REFERENCE DATA AND LITERATURE

NAVSHIPS 91191: Instruction Book for Echo Box TS-501/UP.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304610-200
	(ARMY):
DESIGN COGNIZANCE:	BUSHIPS Code 930
PROCUREMENT INFO.:	Navy Spec No. CS-675
PROCUREMENT COG.:	Navy
RDB IDENT. NO.:	2.2.2.2
F. I. I. N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-501/UP	1.8	16-1/4	15-1/4	14	36
1	Equipment Spare Parts	.44	14	13 1/2	4	17

RESTRICTED

CATALOG OF NAVY MATERIAL

Frequency Measuring Equipment

RESTRICTED
Security Information

TS-501/UP

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-501/UP	- F16-C-67667-5515	10-1/4	15-1/16	8-7/8	16.75
1	RF Cable CG-92A/U	-	120 lg			1.5
1	Socket Wrench #6 Allen	-				
1	Socket Wrench #8 Allen	-				
2	Instruction Book NAVSHIPS 91191	-				
1	Maintenance Repair Parts Case (full)	-	3-1/8	12-1/2	12-1/2	11
			TOTAL LESS MAINTENANCE REPAIR PARTS			18.25
			TOTAL			29.25

UNCLASSIFIED

Signal Generating Equipment

TEST OSCILLATOR TS-508/UP

TS-508/UP

FUNCTIONAL DESCRIPTION

Test Oscillator TS-508/UP is a pulsed rf signal generator covering the range of frequencies from 3000 to 11,000 megacycles. It is used to check the frequency calibration and the relative sensitivity of radio-countermeasures receivers, and other receivers operating in the same range of frequencies.

RELATION TO OTHER EQUIPMENT

It is similar to Test Oscillator TS-406/UP except for the frequency range.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—3 v dc, from dry batteries.
FREQUENCY RANGE.—3000 to 11,000 mc, ±2%.
MODULATION.—1000 to 2000 pps.
RELATIVE ATTENUATION.—0 to 100 db, ±2 db.
BATTERY LIFE.—200 hrs.
PRESENTATION AND CONTROLS.—The frequency dial is calibrated directly in frequency, with division intervals of 100 mc. The attenuator dial is calibrated directly in db, with 10 db intervals between divisions.
FITTINGS AND ACCESSORIES.—The output receptacle on the front panel is a Type N jack. One four foot long coaxial cord CG-55B/U, made of RG-8/U cable and with Type N UG-21B/U plugs at each end, is provided.

Four dry batteries Type BA-205/U (3 volts) connected in parallel are used. They are placed in a special compartment within the instrument case.

CONSTRUCTION.—The Test Oscillator is enclosed in a metal case provided with a carrying handle. A metal case cover with spring latches accommodates the output cable.

MANUFACTURER'S OR CONTRACTOR'S DATA

Davies Laboratories, College Park, Md.
 Contract NOa(s)-8807.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304625-200
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	Navy Spec No. CS-623
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F.I.I.N.	

SHIPPING DATA

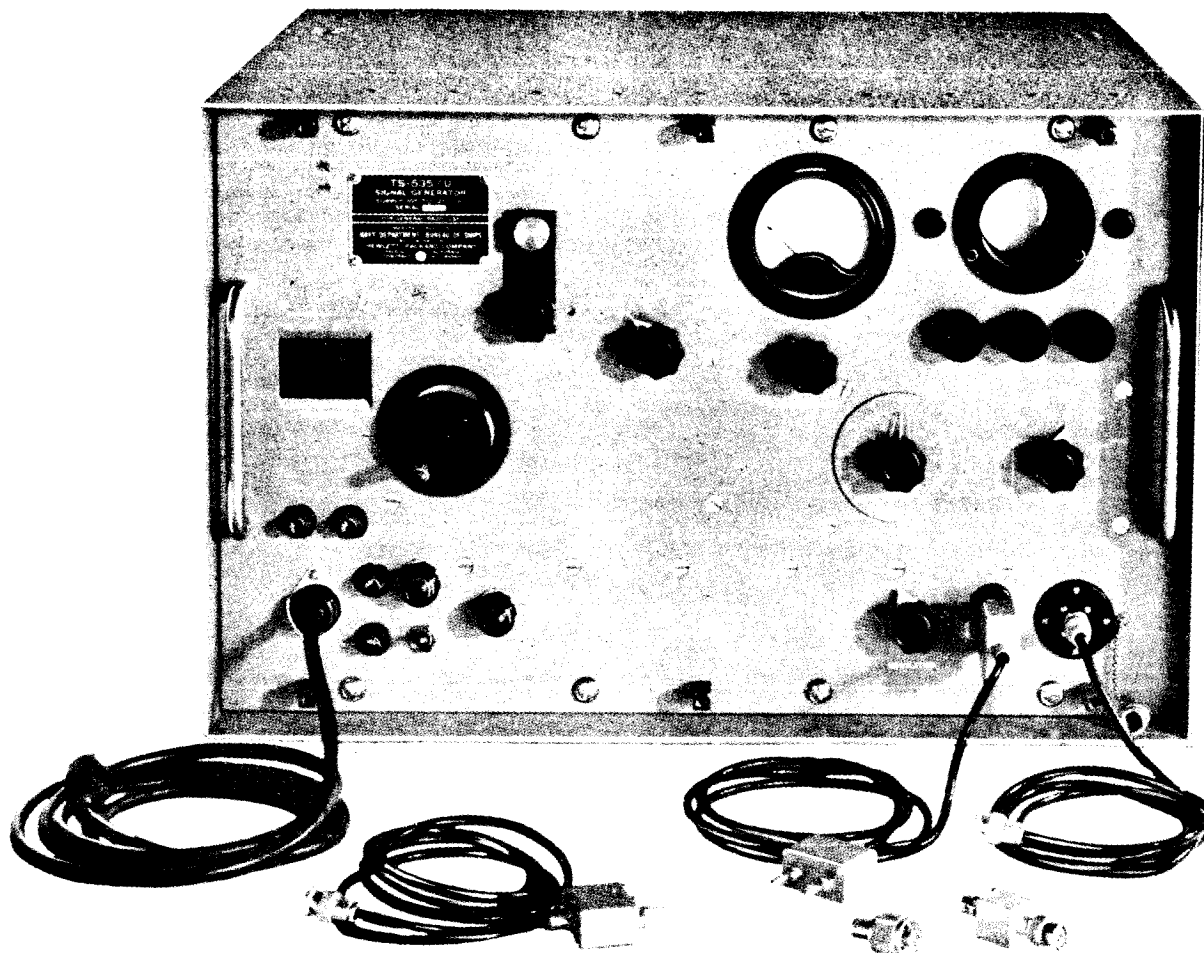
NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Oscillator TS-508/UP					

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Test Oscillator TS-508/UP	F16-G-43943-4321	6-1/2	6-1/2	6-1/2	15
1	Cord CG-55B/U	N16-C-11583-7486	51 lg			
TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL						15.0

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-535/U**TS-535/U***Signal Generator TS-535/U.***FUNCTIONAL DESCRIPTION**

Signal Generator TS-535/U is a precise, general purpose test equipment designed to generate sine waves of known frequency, at known amplitudes, between 7 and 160 kc.

The output signal is either CW or MCW. The modulation is obtained from either the internal 400 cycles oscillator or an external source.

One of its main uses is the testing of Sonar receivers. As a side line, the internal calibrator-indicator may be used as a frequency meter for measurement of an external signal. The output from the internal 5 kc calibrator may also be used to test other equipment.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 50 to 63 cps, 185 w.
FREQUENCY RANGE.—7 kc to 160 kc.

Accuracy: $\pm 0.1\%$ below 70 kc (specification); $\pm 0.5\%$ above 70 kc (specification); $\pm 0.03\%$ (measured).

MODULATION, AMPLITUDE.—

Internal: 400 cps at 30%.

External: 20 to 2000 cps, 30% for 1 v applied.

RF OUTPUT.— $0.5 \mu\text{v}$ to 1 v (-6 db to +120 db, for reference level at $1 \mu\text{v}$).

Accuracy: $\pm 10\%$, or $1 \mu\text{v}$ below 70 kc; $\pm 10\%$, or $0.5 \mu\text{v}$ above 70 kc.

OUTPUT IMPEDANCE.—5 ohms.

5 KC OUTPUT.— $\pm 0.01\%$ accuracy, after warm up.

PRESENTATION AND CONTROLS.—All controls, indicators and terminals are located on the front panel.

A frequency range selector switch (4 steps) and the

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304660-200
	(ARMY):
DESIGN COGNIZANCE:	Navy
PROCUREMENT INFO.:	Navy Spec No. RE-13A-935A
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
T.I.I.N.:	

UNCLASSIFIED

4.4 TS-535/U: 1

TS-535/U

main frequency dial and control knob are used to tune the carrier oscillator.

A calibration book is used to find the exact dial reading corresponding to the chosen carrier frequency (and vice versa). The carrier can be calibrated against the internal 5 kc calibrator oscillator at special check points of the band by means of the "calibrate" control, use being made by the internal CRT oscilloscope on which LISSAJOUS figures are obtained.

The scope section incorporates the intensity, focus, and horizontal gain controls. The "External Horizontal Input" jack can be used to inject signals of unknown frequency. These can then be compared on the scope against the internal carrier frequency, the LISSAJOUS figure display giving the ratio of the unknown frequency to the carrier frequency indicated by the dial reading.

The "5 kc output" jack makes such signal available for external use.

Standard output level (1 volt) is calibrated and measured by means of the "carrier adjust" knob and the carrier meter indicator. From there on, it is attenuated by either or both of:

A "microvolt-db" control knob (T pad) over a 26 db range (reference level being defined as 1 μ v).

A five section ladder "Multiplier" over a range of 100 db.

The output terminal constant impedance is 5 ohms. Modulation of the RF carrier is controlled by the "Modulation" Knob (OFF-400-Ext), and the "Ext Mod" input terminal (banana jack-binding post combination).

Related to ac power are the ac input receptacle, two fuses and spare fuses, the ON-OFF switch and pilot lamp, and the control lamp of the "Thermostat" stabilizing the tuning fork (5 kc calibrating oscillator).

FITTINGS AND ACCESSORIES (See chart).—All necessary cables and adaptors are provided to connect the signal generator to equipment under test having BNC or N type connectors, or by using standard insulated leads.

A separate plug-in attenuator, CN-77/U, is supplied for use when voltage outputs as low as 0.1 μ v are required, or when it is desired to lower the apparent internal impedance of the generator to 0.5 ohm.

External sources of modulating voltages can be connected with a special cable terminated by a twin banana plug.

When used as a wavemeter or as a 5 kc generator, the necessary telephone plugs and conductors (not supplied) must be procured.

An ac power cable is supplied.

CONSTRUCTION.—The equipment is self-contained. It is enclosed in a metal cabinet with two carrying handles and ventilating louvers. The panel cover accommodates all cables and accessories and can be screwed into position when in transit.

MANUFACTURER'S OR CONTRACTOR'S DATA

Hewlett-Packard Co., Palo Alto, Calif.
Contract NXsr-84980, dated 8 December 1944.
Contract NObsr-39384.

TUBE COMPLEMENT

- | | | |
|------------|-------------|------------|
| (2) 6SJ7 | (2) 6V6GT/G | (1) 6AG7 |
| (1) 6SA7 | (3) 6SN7-W | (1) 5U4-G |
| (1) VR-105 | (1) 6SQ7 | (2) 6L6-GA |
| (1) 6J5 | (1) 6H6 | (1) 2AP1 |

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,839: Instruction Book for Signal Generator TS-535/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-535/U	9.1	21	30	25	180
1	Set of Equipment Spare Parts	2	10.5	22	14.5	61

EQUIPMENT SUPPLIED

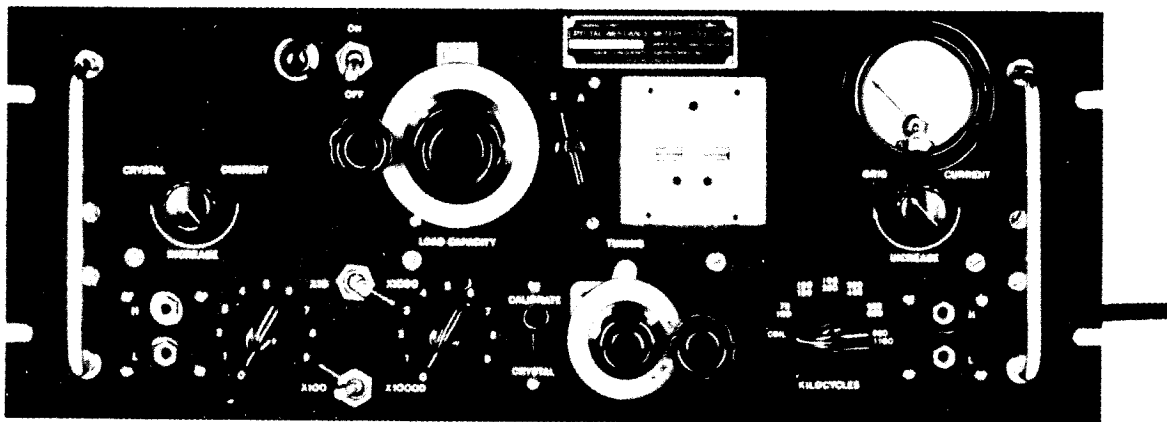
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator	F16-G-62502-2193	14	21-11/16	17-7/8	88.0
1	External Attenuator CN-77/U	-	3/4	3/4	2-1/4	0.12
1	Output Cable CG-409/U	-	50 lg			0.25
1	Output Cable CG-465/U	-	51 lg			0.50
1	Output Cable CG-466/U	-	53 lg			0.50
1	Adaptor UG-201/U	N17-C-67990-2447	3/4	3/4	1-13/32	1.06
TOTAL LESS MAINTENANCE REPAIR PARTS						88.43
TOTAL						

UNCLASSIFIED

Miscellaneous Test Equipment

CRYSTAL IMPEDANCE METER TS-537/TSM

TS-537/TSM



Crystal Impedance Meter TS-537/TSM.

FUNCTIONAL DESCRIPTION

Crystal Impedance Meter TS-537/TSM is designed specifically to test quartz crystal units in the frequency range of 75 to 1,100 kilocycles.

Testing is accomplished by measuring directly the effective series-resonant and antiresonant resistances of crystal units.

With the use of an external frequency measuring device, and a low frequency capacity measuring unit, the equivalent electrical parameters of crystal units can be measured.

Once the series-resonant and antiresonant frequencies, and the static capacitance are known, the equivalent series capacitance and inductance as well as the performance index can be computed.

RELATION TO OTHER EQUIPMENT

Crystal Impedance Meter TS-537/TSM is usually supplied jointly with Crystal Impedance Meter TS-330/TSM (500 kc to 12 mc) to form the overall Crystal Test Set AN/TSM-3 of which they are parts. Two cases CY-23/TSM are also supplied with Crystal Test Set AN/TSM-3, one of which is intended to carry Crystal Impedance Meter TS-537/TSM.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v, 50 to 1720 cps, 35 w ac.
 FREQUENCY RANGE.—75 to 1100 kc in six ranges.
 RESISTANCE CALIBRATION RANGES.—0 to 990 ohms in 10 ohm steps; 0 to 9900 ohms in 100 ohm steps; 0 to 99,900 ohms in 1000 ohm steps.

LOAD CAPACITANCE RANGE.—12 to 110 μf .

PRESENTATION AND CONTROLS.—The front panel controls and their respective functions are as follows:

Load Capacity control: Sets load capacitance in antiresonant operation. Scale from 0 to 100 converted with individual calibration chart.

Crystal current control: Amount of current through crystal.

Grid current meter and control: A per cent of the grid current is indicated by meter, shunted by controlled resistor.

Decade resistance selectors and range toggle switches: Select resistance equivalent to that of crystal.

Tuning control and KC switch: Tuning of oscillator to desired frequency. A "core" position is provided on switch to permit eventual down-band extension of frequency.

"Calibrate - crystal" switch: Switching of crystal into oscillator circuit. Switching in of substitution decade resistor for reading of equivalent resistance.

"S-A" switch: Selects either Series-resonant (load capacity by-passed) or antiresonant (load capacity switched in) operations.

Crystal socket: Receptacle for various crystals.

"H-L" jacks (2 pairs): Connections to VTVM for measurement of voltages across crystal units.

On-off switch, pilot light: AC power.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-304663-200
	(ARMY): 3F4325-537
DESIGN COGNIZANCE:	Army Sig C
PROCUREMENT INFO.:	U.S. Army Spec 71-3382
PROCUREMENT COG.:	Army Sig C
RDB IDENT. NO.:	12.12.8
F.I.I.N.	

UNCLASSIFIED

4.12 TS-537/TSM: 1

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

TS-537/TSM

At the rear of the chassis are found:

RF output receptacle: Means of feeding percentage of RF oscillator output to external frequency measuring equipment.

AC cord and plug: Power input.

FITTINGS AND ACCESSORIES.—The crystal socket on the front panel will accommodate crystals with a center-to-center pin spacing from 0.5 inch to 1.25 inch. Use may be made of Crystal Holder FT-249.

The banana jacks on the front panel used to connect an electronic voltmeter are single round ferrule contacts.

The rf output jack (rear of chassis) is a "UHF small" coaxial type NT-49194. The connector rf cable is made of 4 feet of RG-8A/U coaxial terminated by a "small UHF" plug type NT-49190.

CONSTRUCTION.—The crystal impedance meter is enclosed in a metal case with a thick panel plate and guard handles, designed for rack mounting.

MANUFACTURER'S OR CONTRACTOR'S DATA

Squier Signal Laboratory, Frequency Control Branch of Signal Corps Engineering Laboratories, Fort Monmouth, N.J.

TUBE COMPLEMENT

(2) OC3/VR-105 (1) 6V6-GT (1) 5Y3-GT

REFERENCE DATA AND LITERATURE

TM-11-5052: Operating Instructions, Crystal Impedance Meter TS-537/TSM.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Impedance Meter TS-537/TSM, with Accessories and Spares	5.7	29	17	20	60

EQUIPMENT SUPPLIED

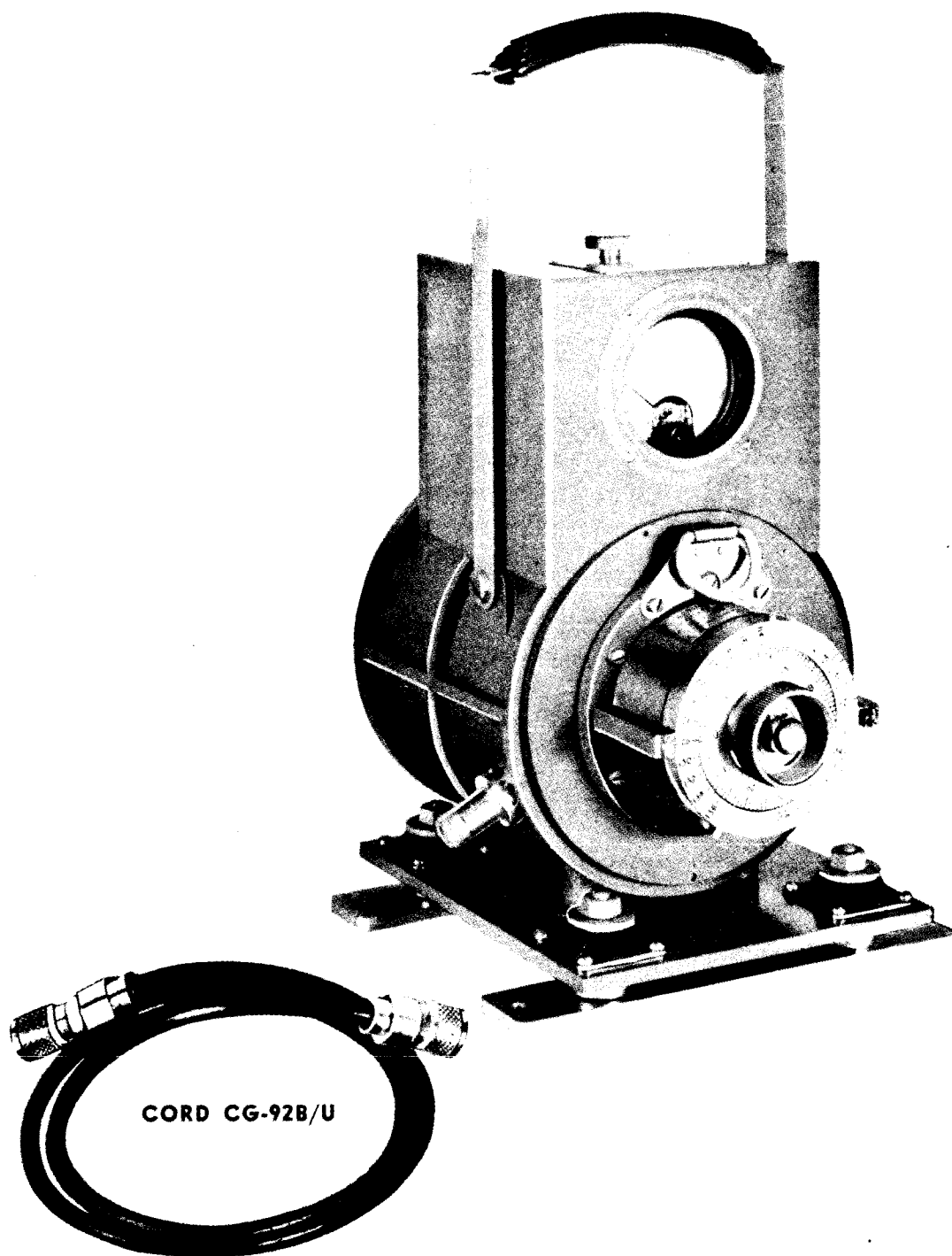
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Impedance Meter TS-537/TSM	-	7	19	10-1/2	25
	Including:	-				
	1 RF Cable Pick-up	3F4325-537				
		-				
	1 Calibration Chart	3E7350-2.58.2				
		-				
	2 Technical Manuals	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

RESTRICTED
Security Information

Frequency Measuring Equipment

ECHO BOX TS-545/UP

TS-545/UP



Echo Box TS-545/UP.

TS-545/UP

FUNCTIONAL DESCRIPTION

This equipment is an echo box operating in the frequency range 1150 to 1350 mc. It will indicate relative power output of the radar transmitter, the frequency and the general effectiveness of the radar system.

The most often performed tests are:

- Relative indication (from day to day) of transmitter power output.
- Measurement of transmitter and local oscillator frequencies.
- Analysis of transmitter frequency spectrum.
- Checking on erratic operation, double moding and frequency pulling.
- Measurement of pulse duration.
- Checking of receiver AFC action, measurement of TR box and receiver recovery time.
- Measurement of standing wave ratio, of transmission line losses, and other factors.

A visual indication of System performance appears on the Radar screen.

RELATION TO OTHER EQUIPMENT

It can be connected to the radar equipment by means of a directional coupler or a pick-up antenna.

ELECTROMECHANICAL DESCRIPTION

FREQUENCY RANGE.—1150 to 1350 mc.

Accuracy: ±5 mc.

TEMPERATURE COEFFICIENT.— -0.105% ring time per °F at 68°F.

SENSITIVITY.—1 db power loss for 50 yard ring time.

PRESENTATION AND CONTROLS.—This equipment is adjustable by means of a calibrated micrometer type screw adjustment. The dial is calibrated directly in mc with a correction scale.

A rectifier-detector is used to drive a microammeter so that resonance and relative input power may be determined.

FITTINGS AND ACCESSORIES.—The rf cable uses 10 feet of coaxial cable, type RG-9A/U, and is fitted with a UG-21B/U type N plug on each end. The Echo Box input receptacle is of special design but will fit a type N plug.

CONSTRUCTION.—The main cavity is of cast bronze. The detector and meter are metal-enclosed. The unit has a carrying handle and is provided with a base shock-mount.

MANUFACTURER'S OR CONTRACTOR'S DATA

- Johnson Service Co., Milwaukee, Wis.
- Contract NObsr-39392, dated 30 June 1947.
- Contract NObsr-42382, dated 24 June 1948.
- Contract NObsr-49089, dated 6 April 1950.

REFERENCE DATA AND LITERATURE

NAVSHIPS 91213: Instruction Book for Echo Box TS-545/UP.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-304675-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Navy Spec CS-746 and CS-914
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	2.2.2.2
F.I.I.N.:	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-545/UP with Accessory Box and Equipment Repair Parts	4.7	17-1/2	18-1/2	25	80

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Echo Box TS-545/UP	-	11-9/16	8-1/16	9-5/8	25.25
	Including:	F16-W-47074-5535				
	1 Separable Shock Mounted Case	-	2-1/4	8-3/4	8-1/4	4.0
	1 Cord CG-92A/U	-	120 lg			1.5
	1 Wrench, Dial Socket	-				0.25
	1 Wrench, Spanner (1 in.)	-				0.01

BUREAU OF SHIPS SECTION — Part III

RESTRICTED
Security Information

Frequency Measuring Equipment

TS-545/UP

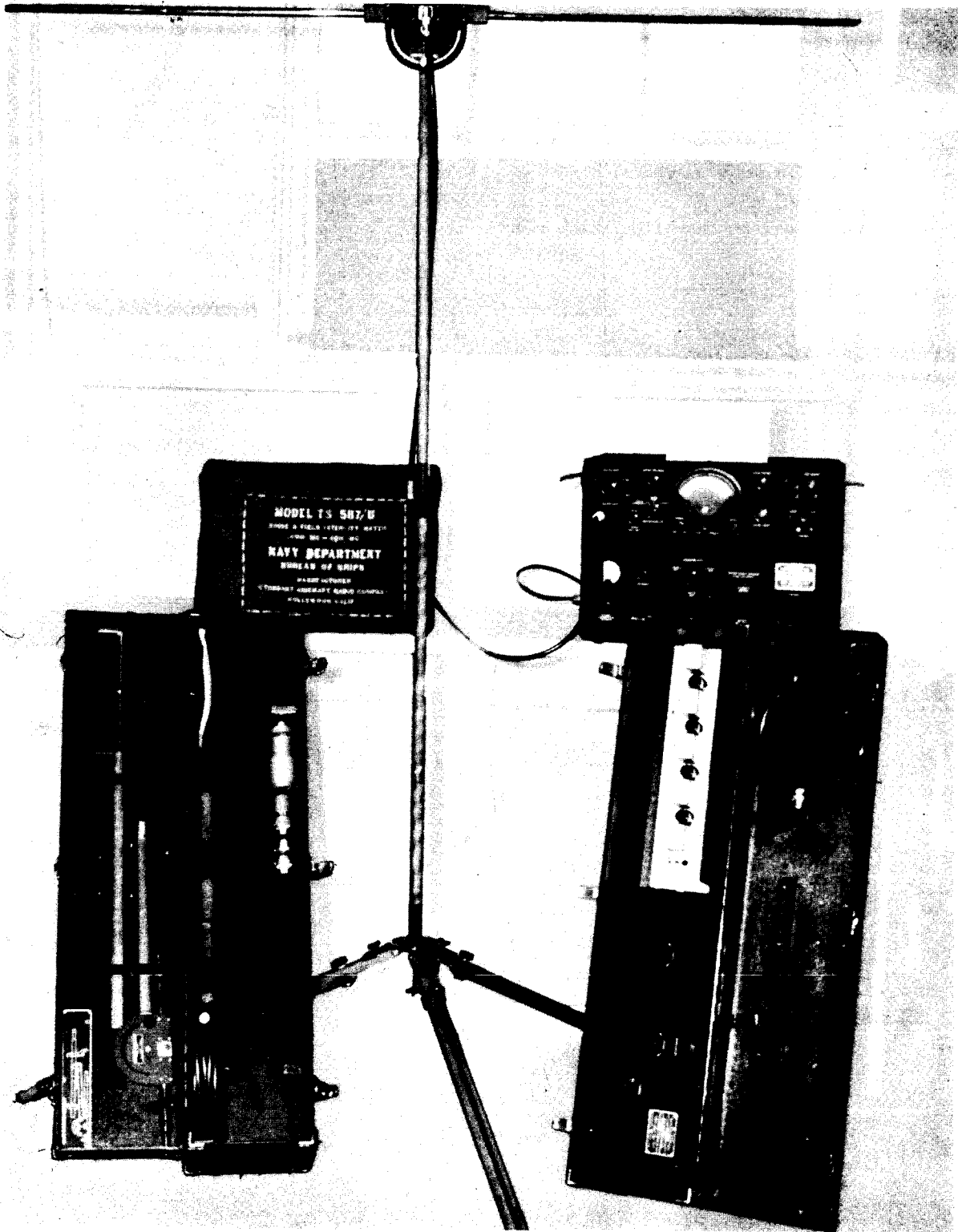
EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Strop, Carrying	-				0.20
3	Rectifier Crystal JAN-1N21B (not supplied on Contract N0bsr-49089)	-				
1	Accessory Box	-	3-7/8	8-1/2	9-1/8	8.0
2	Instruction Book NAVSHIPS 91213	-				
1	Equipment Repair Parts Box	-	3-3/8	10-1/2	11-1/2	8.0
			TOTAL LESS MAINTENANCE REPAIR PARTS			39.21
			TOTAL			42.21

UNCLASSIFIED

Field Intensity Measuring Equipment

**NOISE-FIELD INTENSITY METERS
TS-587/U AND TS-587A/U**

**TS-587/U,
TS-587A/U**



Noise-Field Intensity Meter TS-587/U.

UNCLASSIFIED

TS-587/U, TS-587A/U

FUNCTIONAL DESCRIPTION

The Noise-Field Intensity Meter TS-587/U or TS-587A/U is a high sensitivity HF and VHF superheterodyne radio receiver covering the frequency range of 15 to 400 mc. With a probe it is used as a selective radio frequency voltmeter. It also contains internal means for calibrating its vacuum tube voltmeter section, thus permitting direct readings in indicated microvolts that are readily converted to true microvolts or microvolts-per-meter. Microvolt-per-meter readings can be obtained when the dipole antennas furnished with the equipment are used. The various probes can be used for readings of the RF level of the signal or interference at the probe location.

RELATION TO OTHER EQUIPMENT

The Noise-Field Intensity Meter TS-587A/U is a modified commercial Model NMA-3A to make it equivalent to Noise-Field Intensity Meter TS-587/U. Noise-Field Intensity Meter TS-587A/U is similar to and interchangeable with Noise-Field Intensity Meter TS-587/U. Modification Kit MX-910/U enables Noise-Field Intensity Meter TS-587/U Series to operate from batteries and also supplies an amplifier to drive an external recording meter. It supplies other accessories as well. The Navy Model OCV becomes a Noise-Field Intensity Meter TS-587/U when Navy Field Change No. 2-OCV is applied to it.

ELECTROMECHANICAL DESCRIPTION

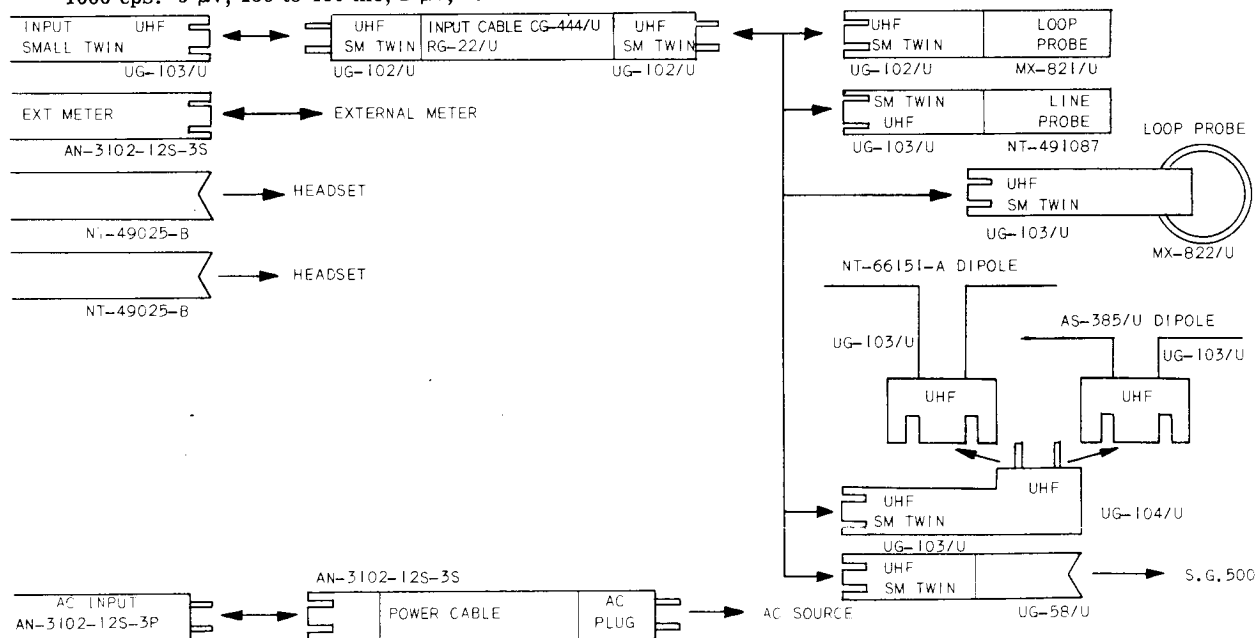
POWER SUPPLY.—105 to 125 v ac, 60 to 400 cps, 99 w, or 12 v dc at 17 amp (with Modification Kit MX-910).

FREQUENCY RANGE.—15 to 31 mc, 12 mc if; 29 to 64 mc, 12 mc if; 60 to 125 mc, 12 mc if; 100 to 400 mc, 30 mc if.

SENSITIVITY.—

As Selective RF Voltmeter: 5 μ v, 100 to 400 mc; 2 μ v, 15 to 100 mc.

With 6 mw Audio into Rated Load, RF Mod 30% at 1000 cps: 5 μ v, 100 to 400 mc; 2 μ v, 15 to 100 mc.



As Field Intensity Meter: 20 μ v per meter, 100 to 400 mc; 5 μ v per meter, 15 to 100 mc.

SELECTIVITY.—

Bandwidth, 0 to -6 db: 210 kc, 100 to 400 mc rf; 150 kc, 15 to 100 mc rf.

IMAGE FREQUENCY RESPONSE.— -60 db.

RECEIVER OUTPUT.—200 mw into rated load.

RECEIVER FIDELITY.— \pm 3 db, 300 to 3000 cps.

IMPEDANCES.—

Input RF: 95 ohms, balanced.

Output AF: 300 to 4000 ohms, for headset.

PRESENTATION AND CONTROLS.—Measurements can be made with the RI-FI meter in terms of the peak value of the signal or interference; the PEAK function of the meter, in terms of the "nuisance" value; the QUASI-PEAK function, or in terms of the average value; the FIELD STRENGTH function. The meter is calibrated in its QUASI-PEAK position.

The RI-FI indicating meter scale is directly calibrated as follows:

- 0 to 100 μ v;
- 6 to +40 db;
- 0 to 8 arbitrary units of "shot noise."

The db scale refers to the reference level of one microvolt across 95 ohms, the rf impedance at which the RI-FI meter operates.

The tuning dials are calibrated directly in mc on both rf heads. The rf Head RF-36/U also has a band switch; an rf gain control calibrator output control and a calibrator output meter.

The Control Panel C-417/U has an attenuator knob to control the input signal, a meter selector to control the meter function, a meter balance control, an adjust zero control, an aural null adjustment, a meter selector switch, a tune-operate switch, a power switch, an output impedance selector switch and an indicating meter.

FITTINGS AND ACCESSORIES.—Cables, a tripod mast, 2 dipoles and a loop antenna and other accessories are supplied as shown in the equipment list. These are connected as shown below.

BUREAU OF SHIPS SECTION—Part III

UNCLASSIFIED

Field Intensity Measuring Equipment

TS-587/U, TS-587A/U

CONSTRUCTION.—The main receiver unit of this equipment is enclosed in a metal case with top perforations and side ventilating louvers. It has a metal carrying handle on each side. The power supply connection and fuses are end-mounted. The control panel is in two sections, one consisting of replaceable rf heads, one for the highest frequency group and one for all other frequencies. A different replaceable if-strip is used with the highest frequency group rf head. A padded cover is provided to protect the meter cabinet and controls during transport.

Contract NObsr-30140, dated 21 June 1940.
Contract NObsr-30200, dated 26 June 1946.
Contract NObsr-39272, dated 27 June 1947.

TUBE COMPLEMENT

(1) OD3/VR-150	(1) 6L6-GA	(1) 6J6
(1) 5Y3-GT/G	(2) 6C4	(4) 6BA6
(1) 6J5-GT/G	(1) 6H6	(4) 6SG7
(2) 6V6-GT/G	(2) 6J4	(1) 9002
(1) 6SJ7	(2) 6AK5	(2) 6AL5
(2) 6AQ6		

MANUFACTURER'S OR CONTRACTOR'S DATA

Stoddard Aircraft Radio Co., Hollywood 38, Calif.
Contract NObsr-30088, dated 15 June 1946.

REFERENCE DATA AND LITERATURE

NAVSHIPS 900,990: Instruction Book for Noise-Field Intensity Meter TS-587/U and TS-587A/U.

TS-587/U

TYPE (USAF):	
CLASSIFICATION: (NAVY):	Standard
(ARMY):	
STOCK NO.: (USAF):	
(NAVY):	F16-Q-304755-200
(ARMY):	
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	5.6
F.I.I.N.	

TS-587A/U

TYPE (USAF):	
CLASSIFICATION: (NAVY):	Sub. Standard
(ARMY):	
STOCK NO.: (USAF):	
(NAVY):	F16-T-20141-9606
(ARMY):	
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	5.6
F.I.I.N.	

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Noise-Field Intensity Meter TS-587/U	35.3	36	47	36	330

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Noise-Field Intensity Meter TS-587/U	F17-M-23352-5031	15-3/16	21-1/2	14-9/16	64
1	Canvas cover for above	-				2
1	Equipment Case CY-606/U containing:	N16-C-170001-254	15	40	9	With content, 53; Empty, 23
1	Radio Frequency Head RF-36/U	-	6-1/2	17-1/2	14	
1	Intermediate Frequency Amplifier AM-194/U	N16-A-32246-2934	4-1/2	13-1/2	5	
1	Dipole Antenna AS-385/U	N16-A-45177-9701	60 1g			
2	Dipole Mast Sections for AS-385/U	-	33 1a			

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Field Intensity Measuring Equipment

UNCLASSIFIED

TS-587/U, TS-587A/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	1 Loop Probe MX-822/U	- N16-A-45883-2134	8-3/8 dia			
	1 Measuring Tape NT-10671	- N16-T-19041-1001	2	1-3/4	3/4	
	2 Instruction Books NAVSHIPS 900,990	- -				
1	Accessory Case CY-607/U containing:	N16-C-170001-255	15	40	9	With contents, 40; Empty, 25
	1 Dipole Antenna NT-66151-A	- N16-A-45186-1201	44 lg			
	2 Dipole Mast Sections for NT-66151-A	- -				
	1 Loop Probe MX-821/U	- N16-A-45902-1134	5-1/2 lg	1-17/32 dia		
	1 Line Probe NT-491087	- N16-P-87007-1041	5-3/8 lg	2-1/4 dia		
	1 Antenna Tripod NT-10545	- N16-T-802001-107	37-1/2 lg	3-13/16 dia		
	1 Matching Impedance NT-471228	- N16-A-22081-1007	2-5/8 lg	1-23/32 dia		
	1 Input Cable CG-444/U	- N16-C-12401-4616	20 ft lg			
	1 Input Cable CG-444/U	- N16-C-12400-4616	72 lg			
	1 Power Cable	- -				
			TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL			159.0

UNCLASSIFIED

Signal Generating Equipment

SIGNAL GENERATOR TS-621/U, TS-622/U

**TS-621/U,
TS-622/U**

FUNCTIONAL DESCRIPTION

Signal Generators TS-621/U and TS-622/U are designed to provide either cw or modulated rf signals accurately calibrated in frequency and power output level, in the frequency range from 3650 to 7300 mc and 6800 to 10,900 mc respectively. Modulation is obtained either by an internal modulator or by an external source of pulses or square waves. Synchronization of the leading pulse can be accomplished with an external source of sine waves or pulses of either polarity.

Two video output pulses are available, one of which is delayed by a variable amount in the same manner as the rf pulse. Frequency modulation of the rf carrier, internal or external, is also available.

RELATION TO OTHER EQUIPMENT

The latest version of Signal Generator TS-622/U bears the nomenclature Signal Generator AN/URM-44.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 50 to 1600 cps, 300 w.

FREQUENCY RANGE.—

TS-621/U: 3650 to 7300 mc.

TS-622/U: 6800 to 10,900 mc.

Accuracy of Dial: Within ±1%.

MAXIMUM POWER OUTPUT.—0.2 mw.

ATTENUATOR.—

Range: -127 to -7 dbm.

Accuracy: Within ±2 db over the range, (100,000 μv to 0.1 μv, calibration given by conversion chart).

Rated Load: 50 ohms, resistive.

MODULATION, INTERNAL.—

Pulse Rate: 40 to 4000 pps.

Pulse Width: 0.5 to 10 μsec.

Rise and Delay Times: 0.5 μsec max, between 10% and 90% max.

Pulse Delay: 3 to 300 μsec, from trigger pulse.

FM Deviation: ±3 mc, adjustable.

Rate: 40 to 4000 cps.

MODULATION, EXTERNAL.—

Positive Square Wave: 200 to 5000 cps.

Negative Square Wave: 100 to 5000 cps.

Pulse, Rate: 40 to 5000 pps.

Pulse, Width: 0.5 μsec approx.

Required Amplitude: 40 to 70 v peak.

SYNCHRONIZATION, EXT PULSES.—

Required Peak Amplitude: Between 10 and 50 v.

Polarity: Positive or negative.

Required Duration: 0.5 to 20 μsec, between 50% max points.

Required Rise Time: 0.5 μsec, between 10% and 90% max points.

Required Flatness: Flat above 90% max amplitude points.

DC Level: -10 to +10 v.

Rate: 40 to 4000 pps.

EXTERNAL SINE WAVES.—

Amplitude: 5 to 50 v peak.

Frequency: 40 to 4000 cps.

VIDEO OUTPUT.—

Undelayed: Occurring not more than 0.1 μsec after start of internal trigger, and less than 1 μsec after start of external trigger.

Delayed: Occurring less than 2 μsec previous to start of output rf pulse, itself delayable 3 to 500 μsec from trigger pulse.

Amplitude: 10 v min.

Polarity: Positive.

DC Level: Zero v.

OUTPUT IMPEDANCE.—500 to 100,000 ohms, with no more than 1500 μmf in parallel.

The following operating controls, dials and terminals are all located on the front panel:

NAME	TYPE OF ITEM	FUNCTION
Megacycles	Dial	RF carrier frequency
Signal Frequency	Knob	RF oscillator tuning
Power Set	Meter	Output level reference meter
Power Set	Knob	Adjusts RF power reference level
Meter Balance	Knob	With RF off, adjusts power monitor circuit
-DBM	Dial	RF output level dial in-DBM
Output Attenuator	Knob	Adjusts RF output level
Sync Selector (POS-NEG-SIN-INT)	Switch	Adjusts modulator for triggering by positive or negative pulses, or sine waves, or determines internal trigger operation
Rate Mult (X1,X10)	Switch	Select frequency range of free running modulator
Pulse Rate	Knob	Adjusts rate of free running modulator
Pulse Delay	Knob	Adjusts time delay between trigger pulse and output RF pulse (as delayed video pulse)
Pulse Width	Knob	Adjusts width of RF pulse
FM Amplitude	Knob	Adjusts amount of frequency swing of RF carrier
Mod Selector	Switch	Selects "EXT. NEG" or "EXT. POS" types of modulation by external pulses or square waves. The "INT" position actuates the internal trigger which can be synchronized by external source. The "FM" position actuates an internal sawtooth generator. The "CW" position cuts off all modulation. The "RF OFF" position cuts all RF power.

TS-621/U

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	BUAER
PROCUREMENT INFO.:	Specs: MIL-G-7141(AER) and MIL-G-7142(AER) 15 Feb 1951
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F. I. I. N.	

TS-622/U

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304796-200
	(ARMY):
DESIGN COGNIZANCE:	Specs: MIL-G-7141(AER) and MIL-G-7142(AER) 15 Feb 1951
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	4.1.2
F. I. I. N.	

UNCLASSIFIED

Signal Generating Equipment

UNCLASSIFIED

TS-621/U, TS-622/U

NAME	TYPE OF ITEM	FUNCTION
Power Input	Terminal	AC input receptacle
3 Amp Fuse	Holder	Operating fuses
Spares	Holder	Spare fuses
Power ON-OFF	Switch	AC ON (Power on - Space heater off) AC OFF (Power off - Space heater on)
Power	Indicator	Red pilot lamp - instrument "ON" when lit
Heater	Indicator	White pilot lamp - Heater "ON" when lit
Sync In	Terminal	Used to apply external sync voltage
Sync Out (Undelayed)	Terminal	Used to derive positive Video pulse, undelayed with respect to internal or external Sync pulse
Ext Mod	Terminal	Used to apply external modulating pulse
Sync Out (delayed)	Terminal	Used to derive positive Video pulse. Delayed with respect to sync pulse (internal or external) and approximately coincident with start of rf pulse

FITTINGS AND ACCESSORIES.—All terminals on the front panel are BNC type jacks, except the rf output jack (N type) and the ac receptacle.

Two video cables are supplied, CG-409/U which are terminated by BNC plugs. One adapter UG-273/U is provided, which is a combination BNC jack/UHF plug, to fit with external equipment using UHF jacks.

The RF Cord CG-92A/U is terminated by an N plug. The following chart shows the usual uses of the cables and adapters.

CONSTRUCTION.—The signal generators are enclosed in a metal cabinet. The front panel is provided with guard handles. For transit purposes, the instruments and all their accessories are housed in the transit case which is provided with flush type spring latches and carrying handles.

MANUFACTURER'S OR CONTRACTOR'S DATA

Polytechnic Research and Development Co., Brooklyn, N.Y.

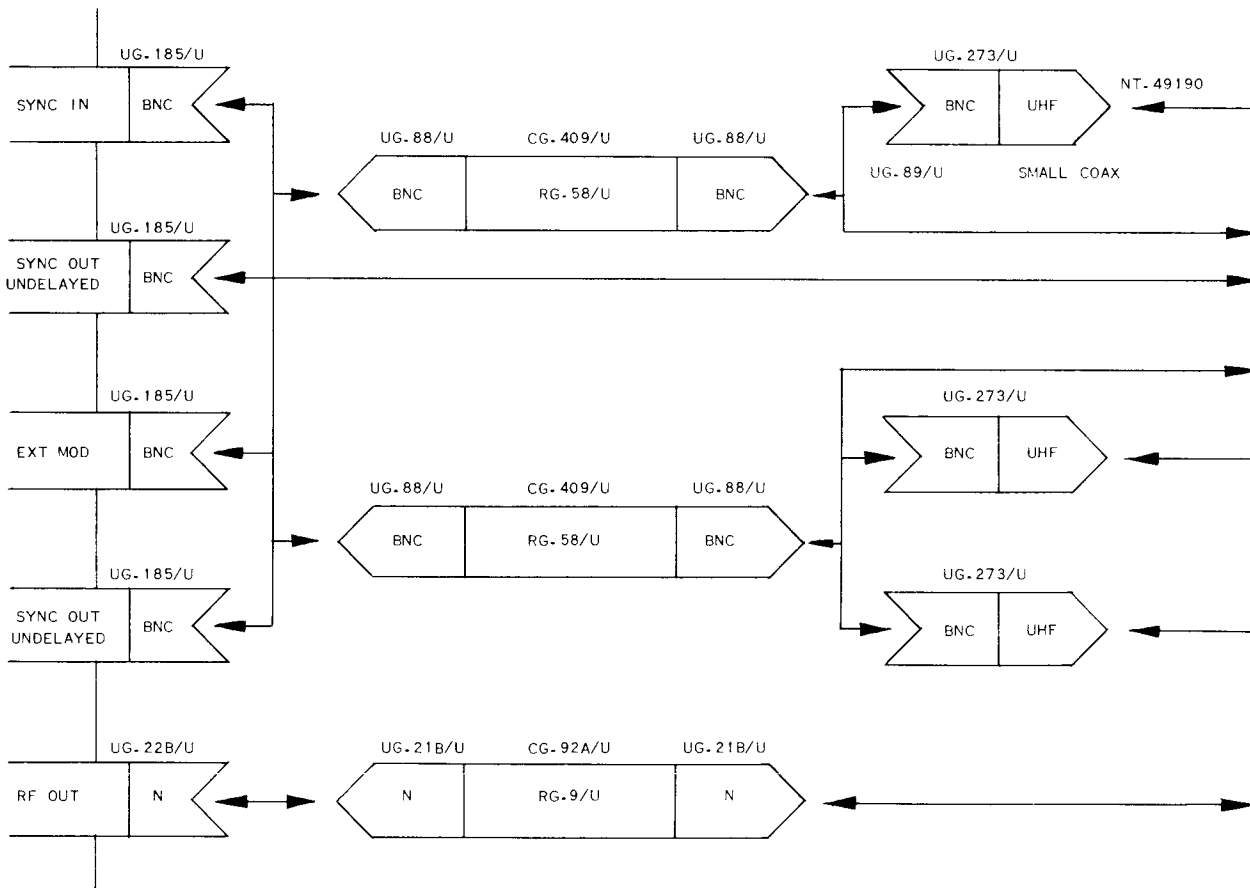
Contract NOa(s)-9156, (Serial No. 2 to 5 only in both equipment series).

TUBE COMPLEMENT

- | | | |
|------------|----------|------------|
| (1) 5U4G | (1) 6X4 | (2) 5R4-GY |
| (7) 6J6 | (1) 6X4 | (2) 6L6-GA |
| (1) OB2 | (1) 6AR6 | (1) 2D21 |
| (1) 6SH7 | (1) 6AG5 | (1) 2C53 |
| (1) RK5721 | (6) OA2 | (1) 6AK6 |
| (2) 5651 | | |

REFERENCE DATA AND LITERATURE

Prelim. Handbooks of Maintenance Instructions for Sig. Gen. TS-621/U and TS-622/U.



BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Signal Generating Equipment

TS-621/U, TS-622/U

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-621/U or TS-622/U	- F16-G-63069-1811 -	14-1/16	17	19	85
1	Transit Case	- -	21-5/8	17-1/8	24-3/8	45
1	Power Cord CX-337/U	- -				
1	RF Cable CG-92A/U	3E6000-337-72 - 1F430-92A.72 -	72 lg			
2	Video Cables CG-409/U	- 1F430-409-98 -	98 lg			
3	Adaptors UG-273/U	- 2Z308-273				
			1-5/16 x 1/4			
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

RESTRICTED
Security Information

Combination and Group Test Set

TEST SET TS-642/U

TS-642/U

FUNCTIONAL DESCRIPTION

Test Set TS-642/U is designed to provide unmodulated, pulse modulated, or frequency modulated signals for use in testing radar sets operating at frequencies between 8470 and 9630 megacycles. It is intended for making performance and maintenance tests on radar and beacon equipment on shipboard and at shore stations. It generates a signal, and is used to measure the frequency and power of an external signal.

RELATION TO OTHER EQUIPMENT

It is intended for use in place of Signal Generators TS-120/AP and TS-191/UP. This equipment can also perform the functions of Signal Generator TS-35/AP Series and Radar Test Set TS-147/UP Series.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v $\pm 10\%$ ac, 50 to 1000 cps, 250 w max.

SIGNAL GENERATED, CW.—8470 to 9630 mc.

Accuracy: ± 1 mc, from 8500 to 9600 mc.

Power Output: 10 μw to 2 mw (-100 to $+3$ dbm).

Stability: ± 1 mc per sec per hour, ± 1 mc max for any prf, delay, duration, or cw.

FM Max: 0.3 mc deviation.

AM Max: 0.5 db.

GENERATED SQUARE WAVE.—1250 cps, $\pm 20\%$.

Duty Cycle: 30 and 70%.

FM Max: 5 mc.

RF PULSE.—

Power Output: 10 μw to 2 mw (-100 to $+3$ dbm) avg.

Rep Rate: 100 to 10,000 pps.

Rise and Decay Time: 0.1 μsec between the 10% and 90% amplitude points.

Fxd Rate: 50,000 pps.

Pulse Shape: Flat, $\pm 10\%$ of a 90% amplitude line.

Fxd Duration: 1 ± 0.1 μsec , 2 ± 0.1 μsec .

Variable Duration: 0.12 to 10 μsec .

FREQUENCY MODULATION.—

Type of Sweep: Linear.

Sweep Rate: .02 to 25 mc per μsec .

Bandwidth: 25 mc at half power points.

Sweep Means: Internal or external.

Phase of Sweep: Positive for each sync pulse.

Timing of Sweep: Variable with respect to incident mod pulse.

EXTERNAL SYNC SIGNAL.—

RF or Video: Positive or negative video.

Delay: 2 to 300 μsec , with respect to initiating pulse.

Amplitude: 10 to 200 v.

Rise Time: 2 μsec , min.

Duration: 1 μsec , min.

Min Delay: 1 μsec between int and ext pulses.

INPUT IMPEDANCE.—10,000 ohms min.

VIDEO OUTPUT.—

Polarity: Negative.

Amplitude: 10 to 15 v.

Load: 10,000 ohms.

SIGNAL POWER INPUT RANGE.—1 to 1000 mw, ± 1.5 db.

PULSE OUTPUT.—

Polarity: Positive or negative.

Amplitude: 50 to 200 v.

Length: 1 to 5 μsec .

Rise Time: 0.1 μsec per 20 v.

Impedance: 72 ohms.

PRESENTATION AND CONTROLS.—The video connectors are BNC type. The controls are clearly shown on the picture.

FITTINGS AND ACCESSORIES.—(1) RF RG-9A/U 6 ft lg with type N connectors having captive protective covers; (2) Video, 6 ft lg type BNC connectors with captive protective covers; (1) Waveguide to choke adaptor; (2) BNC to NT-49195 (UHF) adapt; (1) Waveguide choke-to-choke adaptor; (1) RF horn antenna; (1) Power cord.

CONSTRUCTION.—The major unit has a vertical panel with carrying handles on top of the case, rubber feet on the bottom and back of the case, and a metal chassis and panel combination.

MANUFACTURER'S OR CONTRACTOR'S DATA

General Communications Co., Boston, Mass.

Contract NObsr-43172.

Contract NObsr-52261.

TYPE	(USAF): Standard
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-304833-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	Specs. MLL-T-15477(SHIPS) 1 Aug 1950
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	10.1.3
F. I. I. N.	

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Signal Generator TS-642/U	N16-T-20142-8501	14 13	17 15	25 max. 21	70 max
1	Transit Case	-				
1	RF Cable	-				
2	Video Cable	-				

RESTRICTED

CATALOG OF NAVY MATERIAL

Combination and Group Test Set

RESTRICTED
Security Information

TS-642/U

EQUIPMENT SUPPLIED

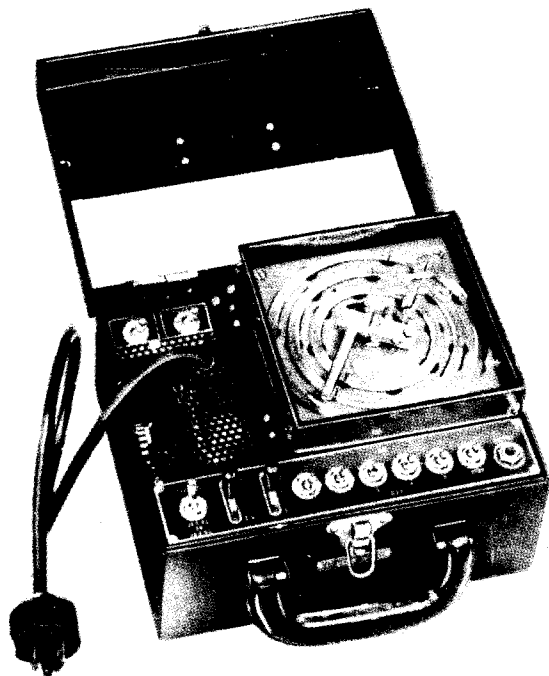
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
2	Adaptor Waveguide	-				
2	Adaptor Coax	-				
1	RF Horn	-				
1	Power Cord	-				
2	Instruction Book	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
						TOTAL

UNCLASSIFIED

Miscellaneous Test Equipment

DISTORTION TEST SET TS-659/UG

TS-659/UG



Distortion Test Set TS-659/UG

FUNCTIONAL DESCRIPTION

The Distortion Test Set TS-659/UG is a motor-driven unit arranged to transmit signals for testing teletype circuits and checking the efficiency of start-stop selectors on teletype apparatus. These signals may be a repetition of teletype signal combinations or telegraph reversals. The transmitted signals may be normal (undistorted), or they may be controlled to have 20% bias or end distortion, either marking or spacing.

RELATION TO OTHER EQUIPMENT

This equipment is the same as commercial Teletype Signal Distortion Test Set ED-58-HE. It is the same as Distortion Test Set TS-658/UG except that the latter uses a synchronous motor.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v ac, 25 to 65 cps, 1/2 amp fuse.
DISTORTION, MARKING OR SPACING.—

End: 20%.
 Bias: 20%.

SIGNALS.—

Telegraph Reversals: 23 cps.
 Teletype: 368 operations per minute.
 Teletype Signals: Undistorted. Marking bias distortion; spacing bias distortion; marking end distortion; spacing end distortion.

MOTOR.—Series governed type.

PRESENTATION AND CONTROLS.—A toggle switch selects teletype signals on the TTY SIGS position or telegraph reversals on the 24.5 RS or 30.6 RS position. A lever switch gives a closed loop condition in its mid-position and selects either end or bias distortion in the E.D. or BIAS positions. Another lever switch gives zero signal distortion in the mid position and spacing or marking distortion in the S or M positions. Five toggle switches permit any teletype character to be set-up and a sixth toggle switch connects and disconnects the stop impulse.

FITTINGS AND ACCESSORIES.—The equipment includes a power cord permanently attached to the set with lugs and fitted with a 3-prong plug on the other end.

CONSTRUCTION.—The test set is enclosed in a metal case equipped with a carrying handle. The case is finished with black wrinkle finish. A space is provided in the case for storing the line cord. All controls and the two-circuit telephone-type output jack are located on the panel.

MANUFACTURER'S OR CONTRACTOR'S DATA

Teletype Corp., Chicago, Ill.
 Contract NObsr-42388.

REFERENCE DATA AND LITERATURE

NAVSHIPS 91162: Teletype Instruction Manual No. 52.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY):
	(ARMY):
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	12.6
F. I. I. N.	

EQUIPMENT SUPPLIED						
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Distortion Test Set TS-659/UG	17-T-34291-1005	5	7	8-3/4	12
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Miscellaneous Test Equipment

CRYSTAL IMPEDANCE METER TS-683/TSM

TS-683/TSM

FUNCTIONAL DESCRIPTION

This equipment is designed to measure the equivalent electrical parameters of quartz crystals of the type used for communication purposes. Provision is made to measure directly the effective series resonant and anti-resonant resistances of quartz crystals at frequencies between 10 and 140 mc.

RELATION TO OTHER EQUIPMENT

A radio receiver or frequency meter must be used with this equipment.

ELECTROMECHANICAL DESCRIPTION

- POWER SUPPLY.**—115 or 230 v ac, 50 to 1000 cps, 30 w.
- FREQUENCY RANGE, (4 BAND).**—10 to 20, 18 to 60, 55 to 75, and 65 to 140 mc.
- EQUIVALENT SERIES RESISTANCE RANGE.**—10 to 150 ohms.
- PRESENTATION AND CONTROLS.**—The following controls and items are available at the front panel:
 - Tuning Knob, 10-60 mc: Operates grid and plate tuning coils.
 - Tuning Knob, 55-140 mc: Operates grid and plate tuning coils.
 - Screen Voltage: Knob to set screen voltage.
 - Meter Shunt: Knob to set meter shunt value.
 - Tuning Dial, 10-60 mc: Index dial for reading approx frequency 10-60 mc.
 - Tuning Dial, 55-140 mc: Index dial for reading approx frequency, 55-140 mc.
 - Band Switch, 10-20, 18-60 mc: Selects band of the lower two groups.
 - Band Switch, 55-75, 65-140 mc: Selects band of the higher two groups.
 - Range Switch: Selects low or high frequency oscillator.
 - Grid Current Meter: Measures grid current and screen voltage.
 - Crystal Socket: For lower frequency group.
 - Crystal Socket: For higher frequency group.
 - Screen Voltage Measure-Operate Switch: Switch to use in measuring screen voltage.
 - Power Switch: Power On-Off switch.
 - Pilot Light: Indicates whether the equipment is turned on or off.
 - Ground Jacks (2): For the crystal adaptor for each frequency group.

On the rear of the chassis there are mounted the following items:

- Power Transfer Switch:** Safety-lock switch to transfer from 115 to 230 v ac.
- Power Line Receptacle:** Connection to actual power supply.
- RF Receptacle:** Connection of rf component from this equipment to external equipment for frequency measurement.
- Fuse Holder:** Main power line fuse.

FITTINGS AND ACCESSORIES.—Included with the equipment are the following items: 1 rf output cable, (5 ft); 12 calibrating resistors; 10, 22, 30, 40, 51, 60, 68, 82, 91, 100, 120, and 150 ohms; 1 AR-1 Adaptor anti-resonant; 1 VR-2 Adaptor variable calibrating resistor; 1 box for accessories.

CONSTRUCTION.—The crystal impedance meter TS-683/TSM is enclosed in a gray smooth finish metal case designed for rack mounting. It is 19 in. wide, 10-1/2 in. deep, 7 in. high, and weighs 19 lbs.

MANUFACTURER'S OR CONTRACTOR'S DATA

Radio Frequency Laboratories, Inc.
Order 14211-PHILA-51, dated 10 December 1951.

TUBE COMPLEMENT

- (2) 5654
- (1) 5Y3
- (1) OA2

REFERENCE DATA AND LITERATURE

Instruction Book for Crystal Impedance Meter TS-683/TSM.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard (ARMY):
STOCK NO.:	(USAF): (NAVY): F16-G-304897-200 (ARMY): 3F4314-3.2 (Sig C)
DESIGN COGNIZANCE:	Army, Sig C
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Army, Sig C
RDB IDENT. NO.:	12.12.8
F. I. I. N.	

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Crystal Impedance Meter TS-683/TSM	- - 3F4314-3.2	7	19	10-1/2	19
	Including:					
1	RF Output Cable W-2	- - 1F425-8A	60 lg			.62
12	Calibrating Resistors	- - - - -	1	3/4	5/16	.19
1	Adaptor AR-1	- - -	2	1-1/2	1-5/8	.19

UNCLASSIFIED

CATALOG OF NAVY MATERIAL

Miscellaneous Test Equipment

UNCLASSIFIED

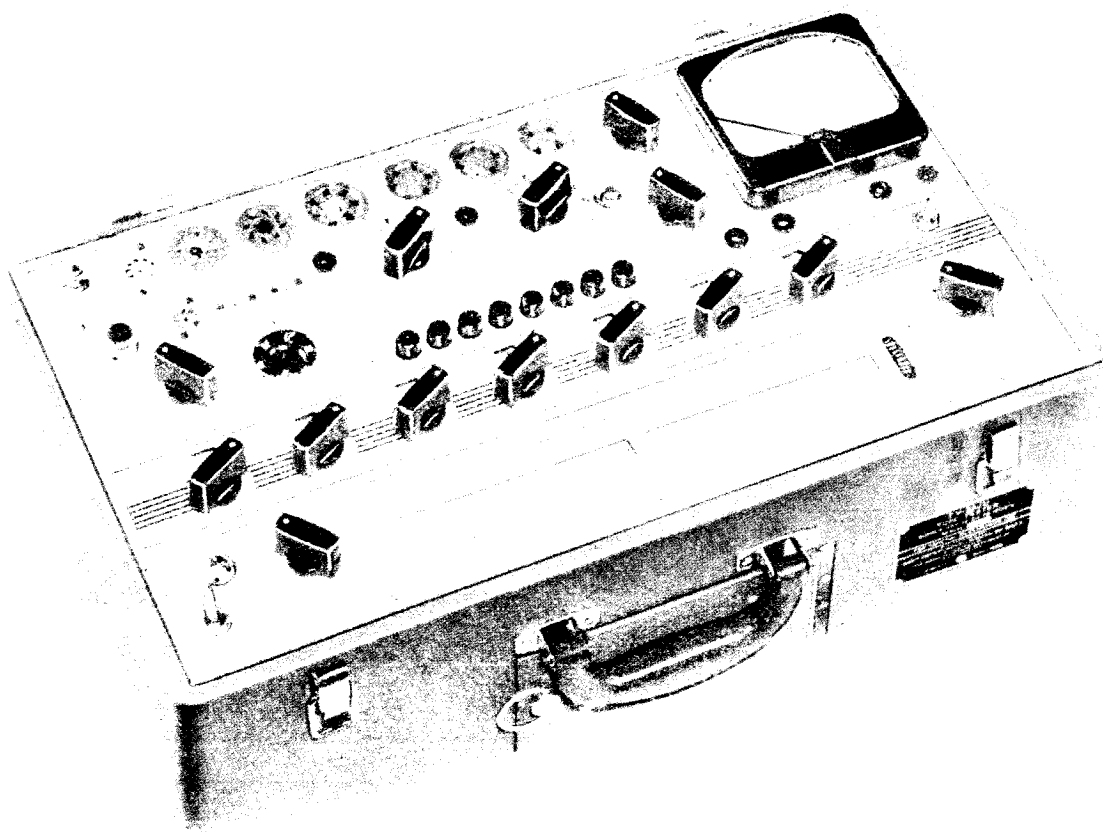
TS-683/TSM

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	1 Adaptor VR-2	-	1-3/4	1-1/2	2-1/4	.2
	1 Box for Resistors and Adaptors	-				
			TOTAL LESS MAINTENANCE REPAIR PARTS			20.2
			TOTAL			

UNCLASSIFIED

Voltage and Current Measuring Equipment

TUBE TESTER TV-3A/U**TV-3A/U***Tube Tester TV-3A/U.***FUNCTIONAL DESCRIPTION**

Tube Tester TV-3A/U is a portable, dynamic mutual conductance type tube tester designed to test and measure the mutual conductance values of receiving type electron tubes. A multimeter section, using the same indicator, is also incorporated in the equipment permitting measurement of ac and dc volts, dc mils, resistance and capacitance.

RELATION TO OTHER EQUIPMENT

This equipment supersedes and performs the same functions and is equipped with the same accessories as Tube Tester TV-3/U. The case and meter size of Tube Tester TV-3A/U is larger than that of Tube Tester TV-3/U. It contains a 30,000 micromhos range. The method of selection of the Micromhos Range and the Signal Voltage is different on the two equipments.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—115 v $\pm 10\%$ ac, 50 to 1600 cps, 45 w.
RANGES.—

Micromhos: 0 to 3000, 6000, 15,000 or 30,000 μ mhos.
AC and DC Volts: 0 to 20, 200, 500 or 1000 v.
Sensitivity, All Ranges: 1000 ohms per v.

DC Current: 0 to 20 or 200 ma.
Resistance: 0 to 1 or 100 meg.
Capacitance: 0 to 5 or 50 μ f.

ACCURACY.—

Micromhos: $\pm 10\%$.
DC Ranges: $\pm 3\%$ (10 to 25°C), $\pm 5\%$ (0 to 50°C).
AC Ranges: $\pm 5\%$ (10 to 25°C), $\pm 6\%$ (0 to 50°C).
Resistance: $\pm 5\%$ mid scale, at approx 20°C.

PRESENTATION AND CONTROLS.—The horizontal panel is fitted with a main multiscale meter, sockets

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-Q-305401-200
	(ARMY):
DESIGN COGNIZANCE:	Navy, BUSHIPS
PROCUREMENT INFO.:	
PROCUREMENT COG.:	Navy, BUSHIPS
RDB IDENT. NO.:	1.2.1
F.I.I.N.:	

UNCLASSIFIED

4.1 TV-3A/U: 1

TV-3A/U

for nearly all types of receiving electron tubes, and a series of controls for setting up the tester for each tube type. Included is a roll-type chart giving tube types and settings of controls for each type.

The following tube sockets are provided:

- 4 contact
- 5 contact
- 6 contact
- 7 contact (combination large and small)
- 8 contact (octal)
- 8 contact (loctal)
- 7 contact miniature
- 9 contact miniature
- 7 contact acorn
- 8 contact subminiature
- 7 contact in-line subminiature

This tube tester equipment is designed for testing the following general classes of tubes. While most are of the receiving type many are also used in other services such as transmitting, radar, sonar, etc.

- 1. diodes, high vacuum and gas.
- 2. triodes, high vacuum and gas (thyatron), electron ray, (tuning eye).
- 3. tetrodes, high vacuum and gas thyatron.
- 4. pentodes, beam power output.
- 5. heptodes, pentagrid converters.
- 6. hexodes.
- 7. dual and multiple element tubes.
- 8. lighthouse, acorn, subminiature.

Types of tests which this equipment can make are as follows:

- 1. Line voltage test.
- 2. Short test.
- 3. Noise test.
- 4. Rectifier emission test.
- 5. Mutual conductance.
- 6. Gas test.

FITTINGS AND ACCESSORIES.—Test leads are supplied for external use of the meter as indicated in the Electromechanical description above. Grid and plate detachable leads for use with lighthouse type tubes, a capacitor test cable, top cap plate and grid leads, and a power cord.

CONSTRUCTION.—This equipment has an aluminum carrying case with a built-in compartment for accessories and a removable cover with slip hinges. It has a plastic carrying handle on one side.

MANUFACTURER'S OR CONTRACTOR'S DATA

Hickok Electric Instrument Co., 10514 DuPont Ave., Cleveland 2, Ohio.
Contract NObsr-43282, dated 18 May 1949.
Contract NObsr-49238, dated 30 June 1950.

TUBE COMPLEMENT

- (1) 5Y3-GT
- (1) 83

REFERENCE DATA AND LITERATURE

NAVSHIPS 91435: Instruction Book for Tube Tester TV-3A/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Tube Tester TV-3A/U and Maintenance Repair Parts	5.3	13-1/2	29-1/2	23	90

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Tube Tester TV-3AU	-	6-7/8	18-3/4	10-7/8	32
1	Lead, Grid Plate	-				
1	Lead, Capacity Test	N17-L-64608-5801 3E8000-5				
1	Lead, Plate Connector	N17-L-64604-3492 3E8000-44				
1	Lead, Red Test Prod.	N17-L-63201-4677 3E8000-7				
1	Lead, Black Test Prod.	N17-L-63205-4185 3E8000-48.1				
1	Lead, Grid Connector	N17-L-63205-4190 3E8000-48				
1	Lead, Grid Connector	N17-L-63201-7851 3E8000-10.5				

BUREAU OF SHIPS SECTION — Part III

UNCLASSIFIED

Voltage and Current Measuring Equipment

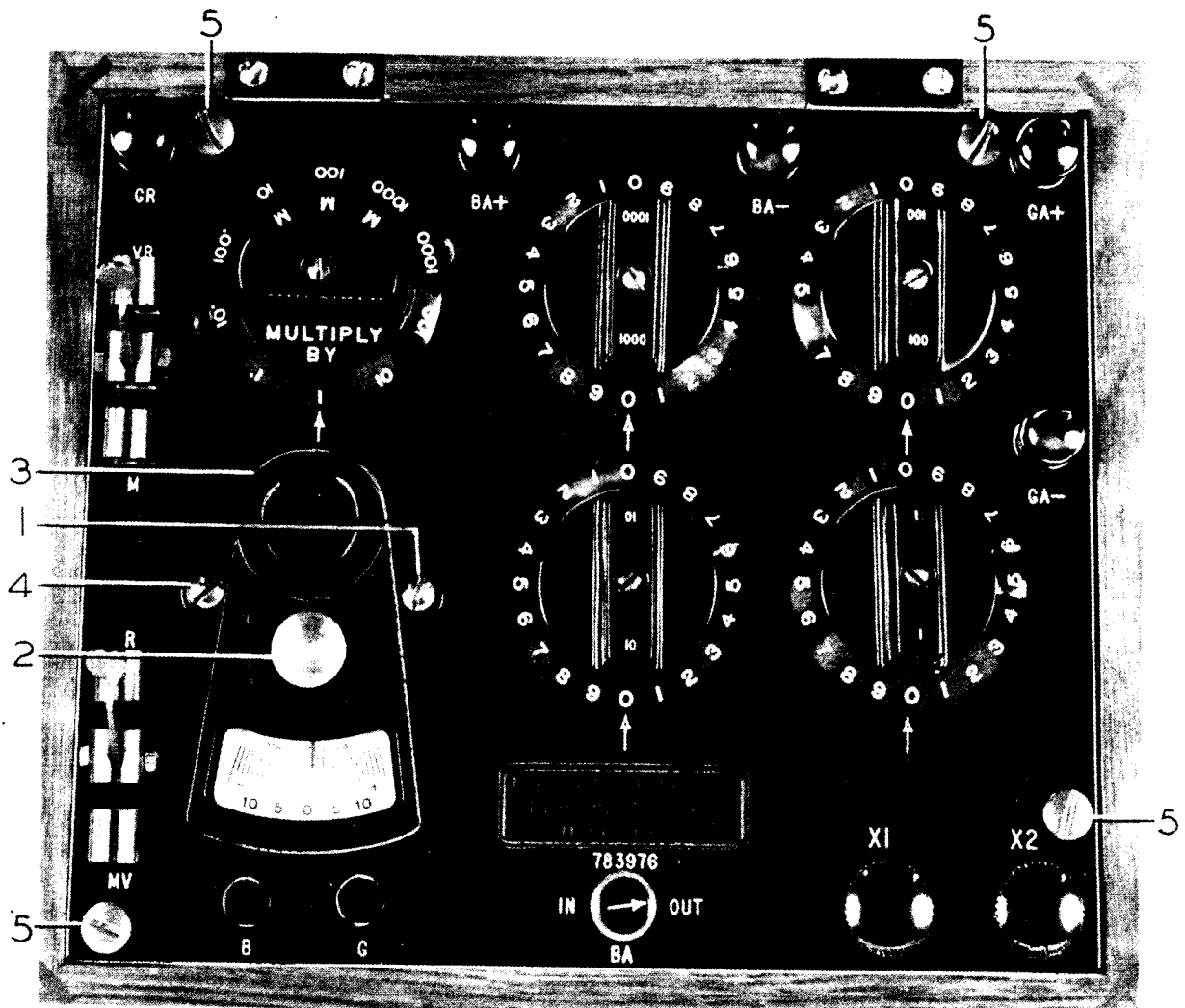
TV-3A/U

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Pilot Lamp	- G17-L-6297 2Z5952				
2	Fuse Lamps	- G17-L-6686 6Z6806.14				
1	Neon Lamp	- N17-L-6807 3F4056A/L2				
1	Instruction Book	- - -				
			TOTAL LESS MAINTENANCE REPAIR PARTS			
			TOTAL			

UNCLASSIFIED

Impedance and Standing Wave Ratio Measuring Equipment

RESISTANCE BRIDGE ZM-4U**ZM-4U**

Resistance Bridge ZM-4U.

FUNCTIONAL DESCRIPTION

Resistance Bridge ZM-4/U is a portable equipment designed to measure resistances in locating faults which occur in conductors used for communication systems and those used for power transmission. It can also be used to measure any fixed resistors having values between approximately 0.1 ohm and 10 megohms.

RELATION TO OTHER EQUIPMENT

This equipment is the same as the Leads Northrup Type S Test Set.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—(3) BA-30, 1.5 v self-contained batteries. (External batteries up to 200 v may be used with a series resistor for increased sensitivity).

RANGE. 1 ohm to 10 meg.

Accuracy: $\pm 0.15\%$.

PRESENTATION AND CONTROLS.—Calibrated dials are used to select individual resistors and decade multiplier resistors. A null is indicated on a self-contained galvanometer. Binding posts are provided for an external null indicator and for external batteries, if desired.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-0-358004-200
	(ARMY): 3F4020.2
DESIGN COGNIZANCE:	
PROCUREMENT INFO.:	
PROCUREMENT COG.:	
RDB IDENT. NO.:	6.1.1
F. I. I. N.:	

UNCLASSIFIED

4.6 ZM-4/U: 1

CATALOG OF NAVY MATERIAL

Impedance and Standing Wave Ratio Measuring Equipment

UNCLASSIFIED

ZM-4U

CONSTRUCTION.—The equipment is housed in an oak case with leather carrying handle, and cover.

Contract NObsr-49097, dated 31 May 1950.
Contract NObsr-39216, dated 31 May 1950.

MANUFACTURER'S OR CONTRACTOR'S DATA

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.

REFERENCE DATA AND LITERATURE

NAVSHIPS 91073 (A): Instruction Book for Resistance Bridge ZM-4/U.

SHIPPING DATA

NUMBER OF BOXES	CONTENTS AND IDENTIFICATION	VOLUME (Cu. Ft.)	OVERALL DIMENSIONS (inches)			WEIGHT PACKED (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Resistance Bridge ZM-4/U and Accessories	1.7	10	18	16	45

EQUIPMENT SUPPLIED

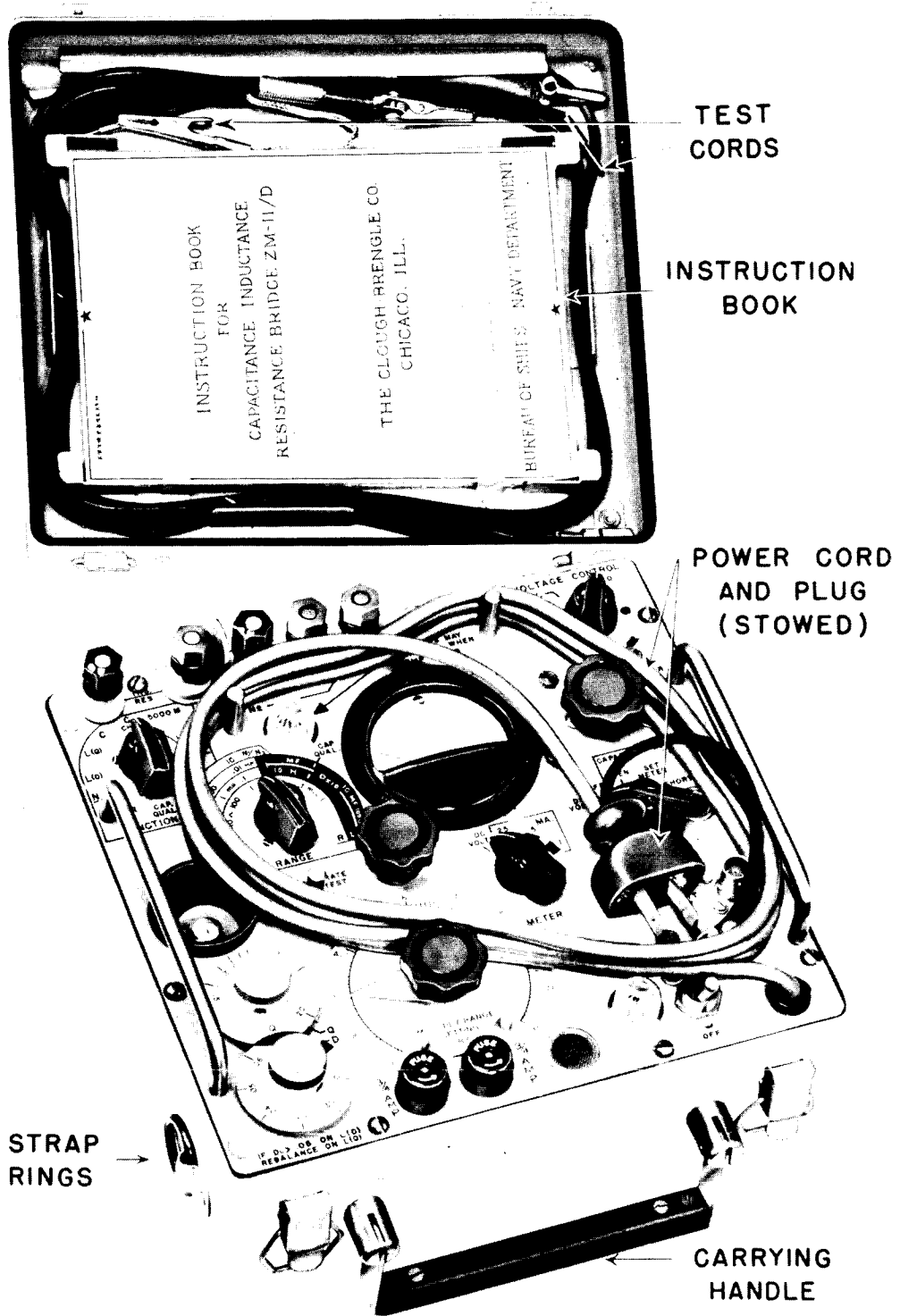
QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (NAVY) (USAF) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
1	Resistance Bridge ZM-4/U (Oak)	- F16-B-87145-3926	5-5/8	9	7-1/2	8
2	Instruction Books NavShips 91073(A)	-				
3	Flashlight Cells BA-30	-	2-5/16	x 1-5/16 dia		1
		G17-B-7210				
		-	TOTAL LESS MAINTENANCE REPAIR PARTS			9
						TOTAL

UNCLASSIFIED

Impedance and Standing Wave Ratio Measuring Equipment

**CAPACITANCE, INDUCTANCE,
RESISTANCE BRIDGE ZM-11/U**

ZM-11/U



Capacitance, Inductance, Resistance Bridge ZM 11/U.

UNCLASSIFIED

ZM-11/U

FUNCTIONAL DESCRIPTION

This equipment is for measuring and checking capacitors, resistors, inductors, and transformers to determine their value and condition. It is useful in the servicing and maintenance of practically all component part values used in practical electronic equipment in the field.

RELATION TO OTHER EQUIPMENT

This equipment supersedes Navy Type 60007 capacitance and resistance bridge. It has greater range and includes inductance measurement. It is also smaller and more compact in design.

ELECTROMECHANICAL DESCRIPTION

POWER SUPPLY.—105 to 125 v ac, 60 cps, 35 w.

RESISTANCE RANGE.—1 ohm to 11 meg.

Accuracy: $\pm(1.5\% + .03 \text{ ohms})$ 1 ohm to 1 meg; $\pm 5\%$, 1 to 10 meg.

CAPACITANCE RANGE.—10 μf to 110 μf .

Accuracy: 1.5%, 10 μf to 0.5 μf ; up to 2.5% at 22 μf paper condensers; up to 25% at 2 μf , 12% at 22 μf electrolytic condensers; 15% overall incl electrolytic above 22 μf .

INDUCTANCE.—100 μh to 110 h.

Accuracy: 2.5%, 0.5 mh to 5 h; $\pm 5\%$, 5 to 100 h.

CAPACITANCE DISSIPATION FACTOR (1/Q or COT X/R).—0 to .06, 10 μf to 0.1 μf ; 0 to 0.6, 0.1 μf to 100 μf .

TURNS RATIO RANGE.—.01 to .11; 0.1 to 1.1; 1 to 11.1; 10.0 to 110.

Q RANGE.—0.5 to 20.

PRESENTATION AND CONTROLS.—The panel of the instrument is provided with control knobs for function, range, and multiplier, D and Q dials for dissipation factor and Q respectively, a leakage current

range switch, a meter for reading applied polarizing voltage for electrolytic condensers, and their leakage current and a polarizing voltage control knob. There are 6 binding posts for connecting to components to be tested and for grounding. A bridge null is detected by means of an electron ray tube. The line cord enters through the panel and a line fuse is mounted on the panel.

FITTINGS AND ACCESSORIES.—Two test cables with alligator clips and a spare fuse are provided.

CONSTRUCTION.—The unit is in a compact metal case with a recessed panel for protection. A metal cover is provided with two spring latches. A compartment below the panel is used for storage of the line cord, test leads and spare fuse.

MANUFACTURER'S OR CONTRACTOR'S DATA

Clough Brengle Co., Chicago, Ill.
Contract NObsr-43157.

TYPE	(USAF):
CLASSIFICATION:	(NAVY): Standard
	(ARMY):
STOCK NO.:	(USAF):
	(NAVY): F16-B-86608-5951
	(ARMY):
DESIGN COGNIZANCE:	Navy
PROCUREMENT INFO.:	Navy Spec No. 16B20(RE)
PROCUREMENT COG.:	
RDB IDENT. NO.:	6.1.4.5
F. I. I. N.	

EQUIPMENT SUPPLIED

QUANTITY PER EQUIPT	NAME AND NOMENCLATURE	STOCK NUMBERS (USAF) (NAVY) (ARMY)	OVERALL DIMENSIONS (inches)			WEIGHT (lbs.)
			HEIGHT	WIDTH	DEPTH	
	ZM-11/7 Unit, (OVERALL)	- - -	7-7/8	8-3/8	6-7/8	
TOTAL LESS MAINTENANCE REPAIR PARTS TOTAL						11.5