ELECTRICAL & ELECTRONIC

TEST EQUIPMENT DATA HANDBOOK

VOLUME 3

WAVEFORM MEASURING AND/OR ANALYZING EQUIPMENT

FREDERICK RESEARCH CORPORATION
2601 UNIVERSITY BOULEVARD, WEST
WHEATON, MARYLAND

TO THE USERS OF THIS HANDBOOK:

In recognition of the many problems associated with the selection of electrical-electronic test equipment for specific applications, Frederick Research Corporation has compiled a series of volumes which contain test equipment descriptions. The items described in the volumes are primarily those used by government agencies and contractors. At the request of the government, and in the interest of providing users with the desired information without the necessity of costly search and compilation, this firm has made this unclassified data available to government agencies and contractors for many years.

The United States Senate has twice cited the Frederick Research Corporation in the Congressional Record (1955 and 1960) for its achievements in efforts to save the government millions of dollars by avoiding duplication in government purchases and promoting the development and utilization of the best test equipment at the lowest cost consistent with quality. We believe that the material in these volumes should provide a means for users to review their test equipment requirements with a minimum expenditure of funds and technical man-hours.

FREDERICK RESEARCH CORPORATION

AIDS TO USE OF THE VOLUMES

This series of volumes has been prepared for the purpose of aiding engineers and other personnel in the selection of electrical-electronic test equipment to satisfy numerous test requirements. Thus, the format of the descriptive sheets has been specifically designed to provide the concise equipment data necessary for the selection procedure - functional description, electromechanical characteristics, reference source data, and other pertinent information. All data is as complete and current as the information available at the time the equipment description was prepared.

To save the maximum amount of time and to facilitate easy location of a particular item, the complete series has been divided into volumes based upon the accepted functional classification of equipment types. Thus, all equipments performing a specific type of test, monitoring, or measurement function are contained in one volume. For example, all equipments performing Voltage and Current Measuring functions are contained in Volume 1. Where the number of equipment descriptions in a particular class is insufficient to warrant an entire book, more than one volume (class) of equipment descriptions may be included in one book. For example, Volumes 5, 6, 7, 8 and 9 are contained in one book. The volumes are separated by green divider sheets.

Conversely, where the number of equipment descriptions is so large that a single book would be cumbersome, the volume will consist of two or more parts. For instance, Volume 10 is sufficiently large to warrant its division into parts.

Within each functional class and its subclasses, the descriptive sheets are arranged in alpha-numerical order based upon the equipment designation, e.g., ME-6B/U, ME-6D/U, ME-30/U, TS-375/U, and similarly until all descriptions in one particular class are covered.

The definitions and index of the functional classification categories and subclassifications will be found on the following pages. The alpha-numerical arrangement is provided to aid the user in his search for items in the event that only item nomenclature is known.

As an example of use of the Handbook, assume specific test requirements arise which dictate the use of a vacuum tube voltmeter (VTVM). To determine if there is an equipment having the necessary characteristics, locate the List of Handbook Volumes on Page iii in any

of the Handbook volumes and note that voltage and current measuring equipments are located in Volume 1.

In Volume 1 turn to the Electronics Test Equipment Functional Classifications to find the functional class under which VTVM's appear. From the listing, it is seen that voltage measuring equipments are assigned the functional class of 1.1 and that VTVM's are most likely included in the subclass 1.1.1 Electronic Voltmeter. A check of the functional class definitions provided on Page vii will verify this.

Next, turn to the yellow divider, 1.1 Voltage Measuring Equipment, and proceed in that section to the equipment descriptions assigned the functional class 1.1.1. All VTVM descriptions will appear in alpha-numerical order within this section. Alpha-numerical listings of equipment descriptions within each subclass are provided in the Table of Contents.

Data on specific pieces of test equipment may also be quickly located. For instance, assume that one wanted to look up the characteristics of the ME-6D/U Electronic Multimeter. First, locate the correct volume as in the above example, which in this case is again Volume 1. In Volume 1 refer to the Alpha-Numerical Index, locate the item and note its functional class as being 1.1.1. Next, turn to the yellow divider 1.1 Voltage Measuring Equipment and proceed in that section to the descriptions assigned the functional class 1.1.1. The ME-6D/U is placed alpha-numerically in this class, physically located between the ME-6B/U and the ME-30/U.

A standard data format is used throughout the Handbook. Once the user has become familiar with this format, he will find it easy to locate specific data on a given instrument as well as convenient for the comparison of several instruments.

LIST OF HANDBOOK VOLUMES

ELECTRONICS TEST EQUIPMENT
FUNCTIONAL CLASSIFICATION

3. WAVEFORM MEASURING AND/OR ANALYZING EQUIPMENT

- 3.1 Cathode Ray Oscilloscope
- 3.2 Synchroscope
- 3.3 Oscillograph
  - 3.3.1 Cathode Ray Oscillograph
  - 3.3.2 Mirror Galvanometer Oscillograph
  - 3.3.3 Stylus Oscillograph
- 3.4 Waveform Analyzer
  - 3.4.1 Wave Analyzer
  - 3.4.2 Sound Analyzer
  - 3.4.3 Vibration Analyzer
  - 3.4.4 Spectrum Analyzer
  - 3.4.5 Distortion Meter
- 3.5 Waveform Detecting and Measuring Equipment
  - 3.5.1 AM Detecting and Measuring Equipment
  - 3.5.2 FM Detecting and Measuring Equipment
  - 3.5.3 Pulse Modulation Detecting and Measuring Equipment

ELECTRONICS TEST EQUIPMENT
FUNCTIONAL CLASSIFICATION - DEFINITIONS

3. WAVEFORM MEASURING AND/OR ANALYZING EQUIPMENT
Equipment used to indicate, observe, and record, and/or analyze complex waves.

3.1 CATHODE-RAY OSCILLOSCOPE
An instrument using a cathode-ray tube to make visible on a fluorescent screen the waveforms of varying currents or voltages.

3.2 SYNCHROSCOPE
An oscilloscope with trigger and marker circuits. Internally generated pulses trigger the equipment under test and start the sweep and marker circuits in such a manner that all actions are synchronized. In the externally synchronized type, the waveform under investigation triggers the sweep.

3.3 OSCILLOGRAPH
An apparatus for producing a graphic record representing the instantaneous values of a rapidly varying electric quantity as a function of time or some other electric quantity.

3.3.1 CATHODE-RAY OSCILLOGRAPH
An apparatus having means for producing, from a cathode-ray tube, a permanent record of the value of an electrical quantity as a function of time.

3.3.2 MIRROR GALVANOMETER OSCILLOGRAPH
An instrument for recording photographically the deflection of a light spot reflected from a mirror attached to a moving coil.

3.3.3 STYLUS OSCILLOGRAPH
An instrument for recording the value of an electrical quantity as a function of time using a pen or stylus to obtain a trace on paper, or other suitable medium.

3.4 WAVEFORM ANALYZER
An equipment used to measure the amplitude and frequency of the components of complex waveforms.

3.4.1 WAVE ANALYZER
A device used to analyze electrical waveforms.

3.4.2 SOUND ANALYZER
An electronic apparatus for measuring sound levels and analyzing the frequency components that make up a sound.

3.4.3 VIBRATION ANALYZER
A device used to analyze mechanical vibrations.

3.4.4 SPECTRUM ANALYZER
An instrument capable of resolving and displaying visually the frequency components of a complex signal or waveform, and showing the relative amplitudes or relative power of each of the components.

3.4.5 DISTORTION METER
An instrument which measures the deviation of a complex wave from a pure sine wave.

3.5 WAVEFORM DETECTING AND MEASURING EQUIPMENT
An equipment used to detect signals and provide quantitative measurements of the modulation characteristics.

3.5.1 AM DETECTING AND MEASURING EQUIPMENT
An equipment used to detect and measure the amplitude modulation characteristics of a signal.

3.5.2 FM DETECTING AND MEASURING EQUIPMENT
An equipment used to detect and measure the frequency modulation characteristics of a signal.

3.5.3 PULSE MODULATION DETECTING AND MEASURING EQUIPMENT
An equipment used to detect and measure the pulse modulation characteristics of signals.

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AN/UPM-33	Radar Test Set	3.4.4
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AN/USM-24A	Oscilloscope	3.2
AN/USM-24C	Oscilloscope	3.2
AN/USM-24D	Oscilloscope	3.2
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AN/USM-38	Oscilloscope	3.2
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Designation	Name	Functional Classification
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Tektronix 513D	Oscilloscope	3.2
Tektronix 514AD	Oscilloscope	3.2

Designation	Name	Functional Classification
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Tektronix 535	Oscilloscope	3.2
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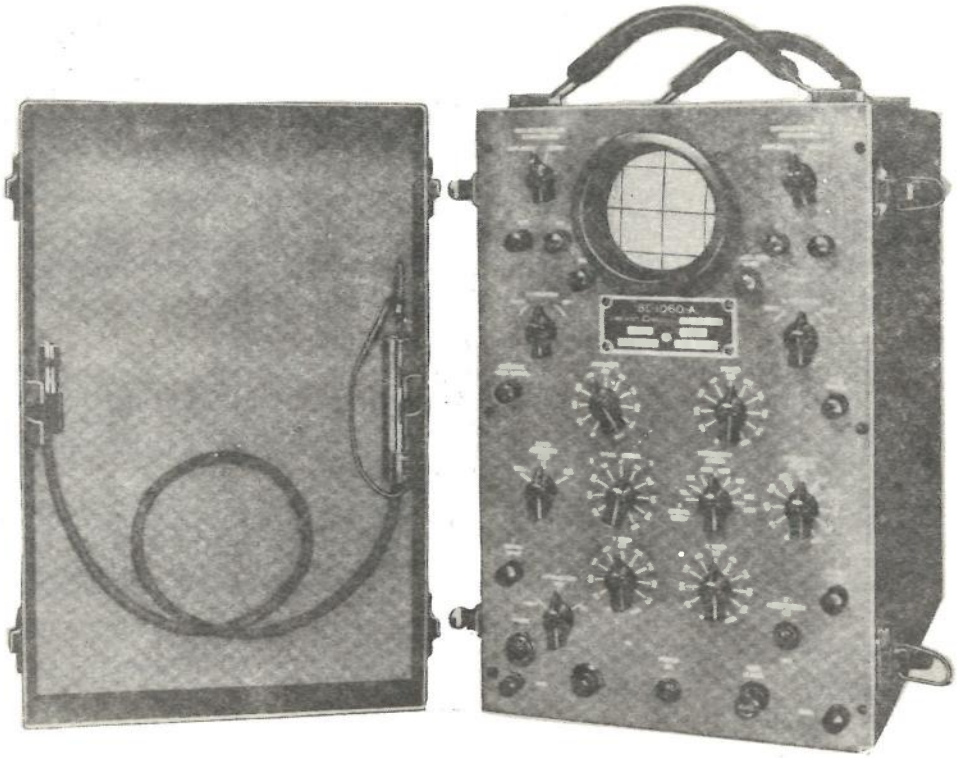
3.1 CATHODE-RAY OSCILLOSCOPES

OSCILLOSCOPE BC-1060-A

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument for bench testing radar and communication equipments. Displays a luminous spot of time-varying wave on a three-inch cathode ray tube. Intensity modulation terminal and deflection plate terminal are located on front panel.

RELATIONSHIP TO OTHER EQUIPMENT:

To be replaced by Oscilloscope OS-8A/U.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 volts, AC, 50 to 60 cycles per second, 150 watts.

Input Impedance:

Y-axis: At terminals, 2 megohms and 30 microcmirofardas; with probe, 1 megohm with 20 micromicrofarads; direct to plates unbalanced, 4.7 megohms and 25 micromicrofarads; direct to plates balanced, 9.4 megohms and 20 micromicrofarads.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	1600-326804800		3F3630-1060A
PROCUREM'T INFO.: SigC. Spec. No. 71-2357			
PROCUREM'T COG.: Army		DESIGN COG.: Army, ESL	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
- Electronics Test Equipment -			BC-1060-A

OSCILLOSCOPE BC-1060-A

ELECTROMECHANICAL DESCRIPTION: (Continued)

X-axis: At terminals and direct same as Y-axis.

Z-axis: (Internal Modulation 0.47 megohms and 30 micromicrofarads, (a-c impedance 0.28 megohms and 30 micromicrofarads).

Input Sensitivity:

Y-axis: 0.1 volt rms per inch deflection; with probe, 0.4 volts rms per inch.

X-axis: 0.9 volts rms per inch.

Z-axis: 15 volts peak brings beam from extinguished to brilliance.

Direct to Deflection Plates: 75 volts dc per inch ±20%.
78 volts dc per inch ±20%.

Frequency Range: Ranges given are uniform to 3 decibels. Y-axis, 20 cycles per second to 2 megacycles per second; X-axis, 10 cycles per second to 100 kilocycles per second; Z-axis, 30 cycles per second to 3 megacycles per second.

Maximum Input Potential: 400 volts.

Sweep: Internal power line frequency. External signal synchronizing sources of either polarity.

Modulation: Provision for modulating electron beam by external signals.

Test Probe: Consists of 4:1 attenuator in insulated probe with coaxial cable and connector with capacitance of 20 micromicrofarads and resistance of 1 megohm.

Controls: All controls on front panel.

MANUFACTURERS' OR CONTRACTORS' DATA:

Allen B. DuMont Laboratories, Passaic, New Jersey; Manufacturer's Spec. No. SCRL-9.

Espey Manufacturing Company, Inc., 528 East 72nd Street, New York, New York; Manufacturer's Spec. No. 71-Z357.

Westinghouse Electric Manufacturing Company, 3001 Walnut Street, Philadelphia, Pennsylvania; Order No. 650SCRL-42, 30 March 1943; Approximate Cost per Unit, $299.67.

TUBE COMPLEMENT:

4 JAN-6SJ7, 1 JAN-6AC7, 2 JAN-6AG7, 1 JAN-6SN7GT, 1 JAN-5U4G, 1 JAN-2X2, 1 JAN-6V6GT, 1 JAN-3GP1A, 1 JAN-884, 1 JAN-991.

REFERENCE DATA AND LITERATURE:

TO 16-40BC1060-5 (TM 11-2526) (Technical Manual).

SIG 8-BC-1060A (Spare Parts).

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

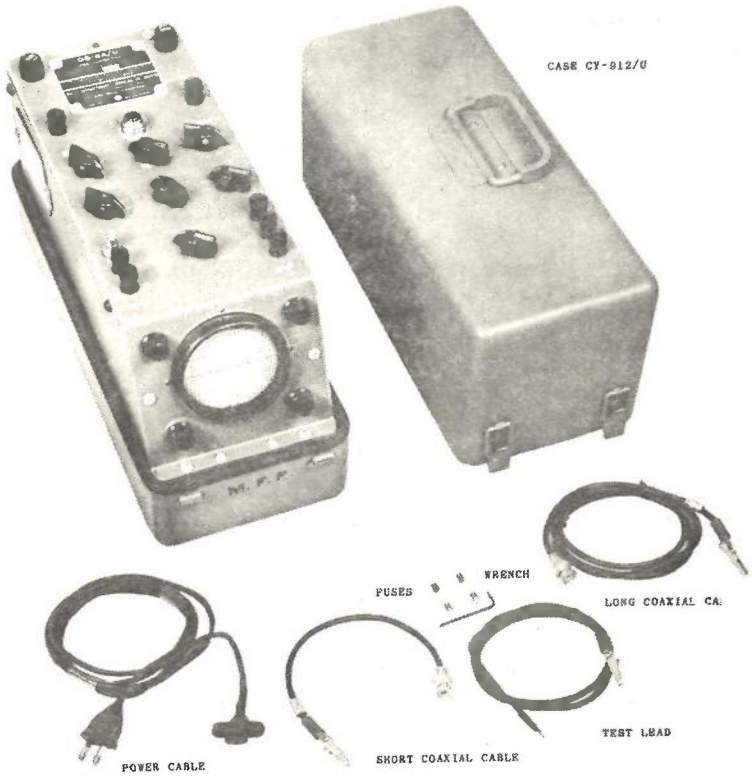
OSCILLOSCOPE BC-1060-A

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope BC-1060-A		1600-326804800 3F3630-1060A	15-1/2	10-3/8	17	60
1	Case Transit			17-3/4	13-3/4	27-1/4	46.5
1	Set of Spares						
2	Technical Manuals TM 11-2526						

OSCILLOSCOPE OS-8A/U

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose, test instrument designed to display, meter, and plot the characteristics of a waveform of a varying electrical potential. Indications are viewed on a three-inch cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Hycon Model 49 Oscilloscope.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 volts ±11 volts, AC, 50 to 1000 cycles per second, single phase, 65 watts.

Frequency Range:

Vertical Amplifier: DC Input: 0 to 1000 cycles per second. AC Input: 30 cycles per second to 2.0 megacycles per second.

Horizontal Amplifier: DC Input: 0 to 1000 cycles per second. AC Input: 25 to 100,000 cycles per second.

Sweep Circuit Oscillator: 3 to 50,000 cycles per second.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.	7CAC-611116		3F3575-8A
PROCUREM'T INFO.:	Navy Spec. O-108		
PROCUREM'T COG.:	Navy	DESIGN COG.:	Navy, BuShips
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.1

OSCILLOSCOPE OS-8A/U

ELECTROMECHANICAL DESCRIPTION: (Continued)

Horizontal Sweep Range: 3 to 50,000 cycles per second.

Over-all Bandwidth:

Vertical Amplifier: DC Input: +0, -3 decibels from 0 to 1000 cycles per second. AC Input: +0, -3 decibels from 30 cycles per second to 2 megacycles per second.

Horizontal Amplifier:

AC Input: +0, 2 decibels from 25 to 100,000 cycles per second with gain control in maximum position; +0, -12 decibels from 25 to 100,000 cycles per second with gain control in midposition.

Input Impedance:

Vertical Amplifier:

AC: 1.5 megohms shunted by 25 micromicrofarads.

DC: 2.0 megohms shunted by 25 microfarads.

Horizontal Amplifier: 1.0 megohms shunted by 25 microfarads.

Deflection Sensitivity:

Vertical: 0.1 volt rms for 1.0 inch, peak to peak.

Horizontal: 0.1 volt rms for 1.0 inch, peak to peak.

Vertical Direct Deflection: 48 volts per inch (approximately).

Horizontal Direct Deflection: 67 volts per inch (approximately).

Temperature Range: -20° C. to $+55^{\circ}$ C.

Relative Humidity: May approach 97% at a mean temperature of 40°C. before operation is affected.

MANUFACTURERS' OR CONTRACTORS' DATA:

Hycon Manufacturing Company, 2961 East Colorado Street, Pasadena 8, California; Contract No. NObsr-49286, 30 June 1950; Approximate Cost per Unit, $235.00.

TUBE COMPLEMENT:

2 JAN-12AT7, 1 JAN-6AG5, 1 JAN-6AH6, 1 JAN-3RP1, 3 JAN-6J6, 1 JAN-1Z2, 1 JAN-6X4.

REFERENCE DATA AND LITERATURE:

TO 16-35OS8-1 (Operation and Service Instructions).

NAVSHIPS 91364 (Instruction Book).

SHIPPING DATA:

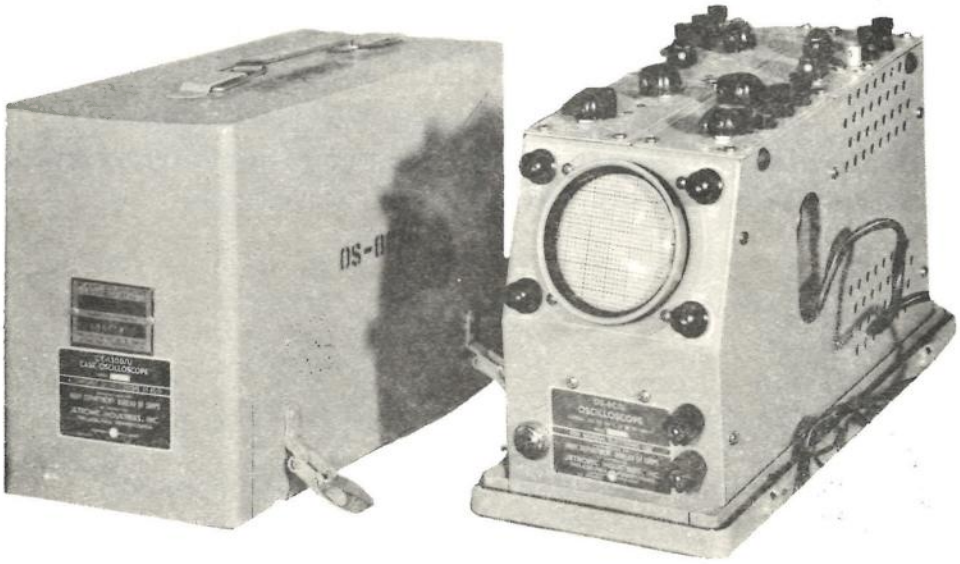
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

OSCILLOSCOPE OS-8A/U

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope OS-8A/U	Alum-inum	7CAC-611116 3F3575-8A	7-1/4	5-1/2	13-3/4	
1	Case CY-912/U	Alum-inum		9-1/4	6	15-3/8	
1	Power Cable W-104		3300-323001034 N17-C-A8226-1032 3E7350.1-72.12	72 long			
1	Coaxial Cable W-101			48 long			
1	Coaxial Cable W-102		N17-L-63201-9501	12 long			
1	Test Lead W-103 (ground)		N17-L-63205-7750	48 long			
1	Allen Wrench						
2	Spare Fuse						
2	Instruction Book						
						Total:	17.25

OSCILLOSCOPE OS-8C/U



FUNCTIONAL DESCRIPTION:

A portable, general purpose test instrument designed to display, meter, and plot the characteristics of a waveform of a varying electrical potential. Indications are viewed on a three-inch cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Hycon Model 49 Oscilloscope.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The oscilloscope is made up of seven major assemblies: vertical amplifier, horizontal amplifier, sweep circuit oscillator, sync circuit, power supply, cathode ray tube assembly, and potentiometer assembly (comprised of vertical positioning, horizontal positioning, intensity and focus controls).

Power Supply: 115 volts ±10 volts, AC, 50 to 1000 cycles per second, single-phase, 60 watts at 115 volts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			3F3575-8C
PROCUREM'T INFO.:	Spec. MIL-O-15525D		
PROCUREM'T COG.:	USN	DESIGN COG.: USN, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
	- Electronics Test Equipment -		OS-8C/U

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE OS-8C/U

ELECTROMECHANICAL DESCRIPTION: (Continued)

Frequency Range:
- Vertical Amplifier:
  - 0 to 2, 000, 000 cycles per second at full gain control setting.
  - 5 to 2, 000, 000 cycles per second independent of gain control setting.
- Horizontal Amplifier:
  - 0 to 500, 000 cycles per second at full gain control setting.
  - 1 to 500, 000 cycles per second independent of gain control setting.
- Sweep Circuit Oscillator: 3 to 50, 000 cycles per second.

Input Impedance:
- Vertical Amplifier:
  - AC: 1.5 megohms shunted by 25 micromicrofarads.
  - DC: 2.0 megohms.
- Horizontal Amplifier:
  - AC: 1.5 megohms shunted by 25 micromicrofarads.
  - DC: 2.0 megohms.
- Vertical Direct: 9 megohms shunted by 11 micromicrofarads.
- Horizontal Direct: 9 megohms shunted by 11 micromicrofarads.

Deflection Sensitivity:
- Vertical Amplifier: 0.075 rms volt per inch.
- Horizontal Amplifier: 0.075 rms volt per inch.
- Vertical Direct Deflection: 17 rms volts per inch (approximately).
- Horizontal Direct Deflection: 25 rms volts per inch (approximately).

Overall Accuracies:
- Vertical Amplifier:
  - ±3 decibels from 0 to 2,000,000 cycles per second at full gain control setting.
  - ±3 decibels from 5 to 2, 000, 000 cycles per second independent of gain control setting.
- Horizontal Amplifier:
  - ±3 decibels from 0 to 500, 000 cycles per second at full gain control setting.
  - ±3 decibels from 1 to 500, 000 cycles per second independent of gain control setting.

Temperature Range: -20° C. (-4° F.) to +55° C. (+131° F.).

Relative Humidity: May approach 97% at a mean temperature of 40° C. before operation is affected.

MANUFACTURERS' OR CONTRACTORS' DATA:

Jetronic Industries, Inc., Philadelphia, Pennsylvania; Type No. NAV-115; USN Contract No. NObsr-63378, dated 31 March 1953.

TUBE COMPLEMENT:

4 JAN-12AT7WA, 2 JAN-6AH6, 2 JAN-6J6, 1 JAN-3RP1, 1 JAN-6X4, (1-CR101, 1-CR102, 1-CR103, selenium rectifiers).

REFERENCE DATA AND LITERATURE: (Continued)

TO 33A1-13-19-11 (Instruction Book).

OSCILLOSCOPE OS-8C/U

REFERENCE DATA AND LITERATURE: (Continued)
NAVSHIPS 92251 (Instruction Book).

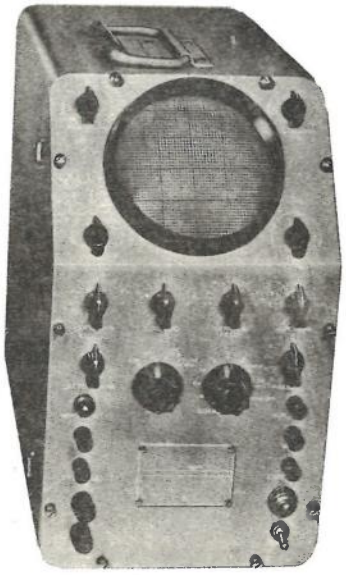
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope OS-8C/U	1.9	14-3/4	11-1/8	20-1/4	34

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope OS-8C/U	Alumi-num	3F3575-8C	9	6	13-1/2	
1	Case CY-1300/U	Alumi-num		9	6	13-1/2	
1	Test Lead CG-1207/U		N17-L-63284-1726 3E4017.27	36 long			
1	Test Lead CG-1207/U		N17-L-63284-7781 3E4017.28	6 long			
1	Ground Lead W-104		N17-L-63455-7490 3E4017.26	36 long			
						Total:	14.5

OSCILLOSCOPE OS-10A/U



FUNCTIONAL DESCRIPTION:

A portable, general purpose unit used for servicing electronics equipment. The oscilloscope is used during such functions as alighment and testing of radio receiving and transmitting equipment, hum measurements, frequency comparison, observance of complex waveforms, and percentage modulation measurements. Test results are observed on a cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Oscilloscope OS-10A/U is similar to OS-10/U except for changes in component parts. The deflection sensitivity has been changed from 0.03 in the OS-10/U to 0.02 rms volt per inch vertical deflection, and from 0.05 to 0.7 rms volt per inch horizontal deflection.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The oscilloscope employs standard oscilloscope circuitry. Power Supply: 105 to 125 volts, AC, 50 to 1200 cycles per second, single-phase, 50 watts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.:	USN
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
	- Electronics Test Equipment -		OS-10A/U

OSCILLOSCOPE OS-10A/U

ELECTROMECHANICAL DESCRIPTION: (Continued)

Deflection Sensitivity:

Vertical: 0.02 rms volts per inch.

Horizontal: 0.7 rms volts per inch.

Frequency Range:

Vertical Amplifier: 10 to 500,000 cycles per second ±3 decibels.

Horizontal Amplifier: 10 to 200,000 cycles per second ±3 decibels.

Sweep Circuit Oscillator: 3 to 60,000 cycles per second.

Input Impedance:

Vertical: 1 megohm.

Horizontal: 1 megohm.

MANUFACTURERS' OR CONTRACTORS' DATA:

Reiner Electronics Company, Inc., Easton, Pennsylvania; Contract No. NObsr-49204.

TUBE COMPLEMENT:

4 6J6, 1 6X4, 1 1B3/GT, 1 5UPI.

REFERENCE DATA AND LITERATURE:

OS-10A/U: SC Form 567.

EQUIPMENT SUPPLIED:

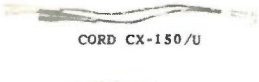
Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope OS-10A/U	metal		15-1/2	8-3/4	16-1/2	35
1	Power Cable						
1	Input Cable						
1	Calibrated Screen						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope OS-10A/U	8.6	20-1/2	12-1/4	18-1/8	96

OSCILLOSCOPE TS-34/AP

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A small, portable instrument intended for both field and laboratory use in testing and maintaining radar and associated electrical equipment.

It is used to display wave-forms of positive or negative pulses and sine waves. Measures peak values of voltage pulses, signal voltages and power by comparison of unknown to known reference images on the screen and pulse duration. The oscilloscope is suitable for use with circuits of both low and high impedance.

All controls and means for making external connections are in the two channels along the sides of the chassis.

RELATIONSHIP TO OTHER EQUIPMENT:

Replaced by TS-34A/AP.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The input signal passes through the Input Selector (sensitivity control), the Coupling Amplifier (image size control), the Delay Network (0.5

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Substitute Standard		
STOCK NOS.	7CAC-611115	F16-0-78232-5207	3F4325-34
PROCUREM'T INFO.: USAF Spec. 71-5043, Military Spec. 0-15630 (Ships)			
PROCUREM'T COG.: Navy		DESIGN COG.: Navy, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
- Electronics Test Equipment -			TS-34/AP

ELECTROMECHANICAL DESCRIPTION: (Continued)

microseconds), the Signal Attenuator (0 to 20 db), and the Signal Voltage Amplifier (60 db gain, 20 cycles per second to 4 megacycles per second) to the vertical deflecting plates.

The hotizontal sweep is synchronized either internally by the input signal or by external signal supplied with 0.5 microseconds delay to the "External Sync" jack. These synchronizing pulses pass through the Synchronizing Pulse Amplifier (sync voltage control) either through the Sawtooth Sweep Generator or the Start-Stop Sweep Generator (selected by the sweep selector knob) to the Sweep Amplifier and thence to the horizontal deflection plates.

Power Supply: 115 volts ±10%, AC, 50 to 1200 cycles per second, single phase, 90 watts at 60 cycles per second (less at higher frequencies).

Frequency Range: Used with Radar Equipment operating in "S" and "X" band.

Sine Waves Observable: 30 cycles per second to 1 megacycle per second.

Pulses and Square Waves Observable: Duration, 0.25 to 30,000 microseconds positive or negative polarity.

Input Impedance: Oscilloscope alone, 62 ohms (low); 430,000 ohms paralleled by 30 micromicrofarads (high). Oscilloscope with probe, 4 megohms paralleled by 12 micromicrofarads.

Input Voltage and Sensitivity: Oscilloscope alone, 0.1 to 1 volt low impedance input, 0.1 to 1 volt (0 db), 1 to 10 volts (20 db), 10 to 100 volts (40 db), high impedance inputs. Oscilloscope with probe, 1 to 450 volts. Oscilloscope with probe and Voltage Divider TS-89/AP, 200 to 20,000 volts.

Synchronizing Means and Voltage: Internal, synchronized by signal under observation. External, 0.5 to 75 volts.

Synchronizing Input Impedance: 1000 to 2000 ohms.

Sweep Circuits Available: Start-Stop, each impulse independent of preceding. Used for observing nonperiodic as well as periodic pulses. Sawtooth, synchronizes with periodic pulses. Not satisfactory for nonperiodic pulses unless departure from periodicity is small.

Sewep Speed Available: Start-Stop, 5, 50 and 250 microseconds. Sawtooth, 50,000 to 5000, 5000 to 250 and 250 to 10 cycles per second. Duration, 20 to 200, 200 to 4000, 4000 to 100,000 microseconds.

Measurement of Signal Duration: Under 5 microseconds measured, using internally developed microsecond pulses. Over 5 microseconds measured, using external pulses or sine waves of known frequency.

Ambient Temperature Limits: -40° F. to $+120^{\circ}$ F.

Relative Humidity: 95% maximum.

Effect of Microwaves: Small.

Accuracy: Flat response 20 cycles per second to 4 megacycles per second. 5% deday in pulse amplitudes in 2500 microseconds.

MANUFACTURERS' OR CONTRACTORS' DATA:

Western Electric Company, New York 7, New York; Mfg. Ident. No. X-61713B, Contract No. 342-44; Approximate Cost per Unit, $ 1179.00; Contract Nos. 569-

MANUFACTURERS' OR CONTRACTORS' DATA: (Continued)
44, 267-44, 709-44, 468-44; Approximate Cost per Unit, $516.00; Contract No. 85-44; Approximate Cost per Unit, $745.60.

TUBE COMPLEMENT:
1 JAN-2AP1, 4 JAN-6AK5, 2 JAN-6AG7, 2 JAN-6SL7, 1 JAN-6SN7GT, 1 JAN-5Y3GT, 1 JAN-6X5GT.

REFERENCE DATA AND LITERATURE:
TO 16-35TS34-3 (Maintenance Instructions).
TO 16-35TS-34-5 (TM 11-1067) (Instruction Book).
TO 16-55-31 (Spare Parts List).

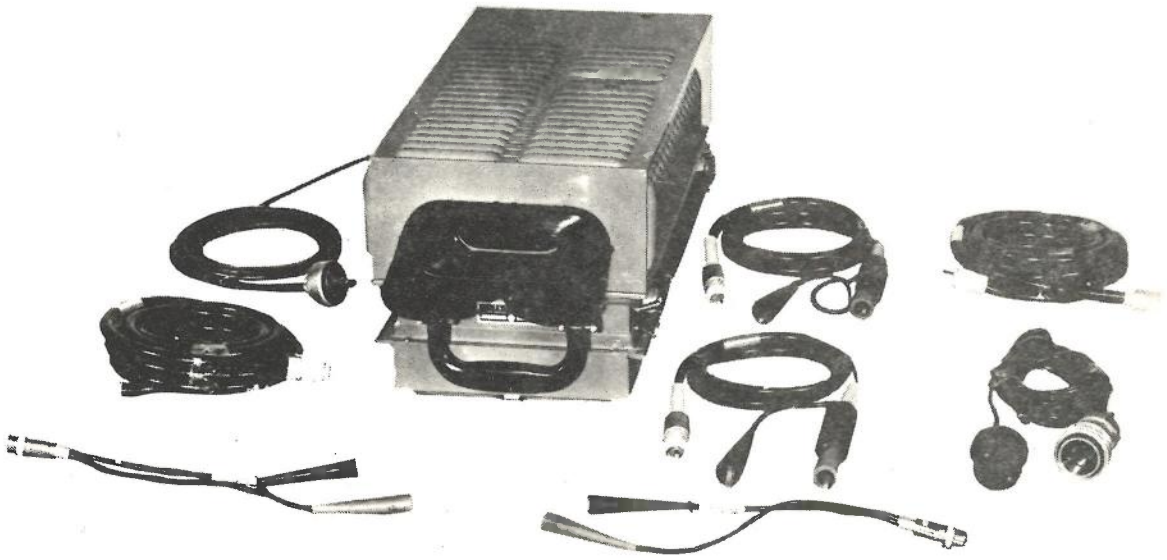
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope TS-34/AP	Steel	7CAC-611115 F16-O-78232-5207 3F4325-34	6	8	15	26.00
1	Probe Assembly MX-50/AP		7CAC-468919-2 1F475-50	50 long	1 dia.		0.75
2	Coaxial Cord CG-72/U		16-C-11586-2001	120 long			2.50
2	Cord CX-152/U		7CWX-B43482 17-C-48189-1021 3E6000-152	12 long			0.25
1	Cord CX-150/U		7CAC-170264-72 17-C-48262-1615 3E6000-150	180 long			0.75
1	Case CY-110/U		7CAC-176573-72 3F2529-110	29	9-3/4	10	15.75
						Total:	46.00

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope, TS-34/AP with accessories. (Shelf-package - water resistant carton).	3.17	33	14	17	56

OSCILLOSCOPE TS-34A/AP



FUNCTIONAL DESCRIPTION:

A portable, general purpose, instrument for observing electrical wave forms and for measuring their voltage, power, and duration. It is used in testing and maintaining radar and other electrical equipment. Images are viewed on a two-inch cathode ray tube. A lens within the viewing tube magnifies the images about twice.

RELATIONSHIP TO OTHER EQUIPMENT:

TS-34A/AP is an improved version of the TS-34/AP having continuously variable speed circuits and is more resistant to vibration.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 volts ±10%, AC, 50 to 1200 cycles per second, single phase, 90 watts at 60 cycles per second, less at higher frequencies.
Pulses and Square Waves Observable Duration: 1/4 to 30,000 microseconds.
Polarity: Positive or Negative.
Sine Wave Observable: 30 cycles per second to 1 megacycle per second.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.	7CAC-611112	F16-0-78232-5186	3F4325-34A
PROCUREM'T INFO.:	USAF Spec. 71-5043		
PROCUREM'T COG.:		DESIGN COG.: Navy, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
	- Electronics Test Equipment -		TS-34A/AP

OSCILLOSCOPE TS-34A/AP

ELECTROMECHANICAL DESCRIPTION: (Continued)

Input Impedance:
- Oscilloscope Alone:
  - Low: 62 ohms.
  - High: 430,000 ohms paralleled by 30 micromicrofarads.
- Oscilloscope with Probe: 4 megohms paralleled by 12 micromicrofarads.

Input Voltage and Sensitivity:
- Oscilloscope Alone:
  - Low Impedance Input: 0.1 to 1.0 volt.
  - High Impedance Input: 0 decibels: 0.1 to 1.0 volt.
    20 decibels: 1.0 to 10 volts.
    40 decibels: 10 to 100 volts.
- Oscilloscope with Probes: 1.0 to 450 volts.
- Oscilloscope with Probe and Voltage Divider TS-89/AP (not furnished): 200 to 20,000 volts.

Calibrating Voltage: Any known value between input voltage limits. Required only when measuring voltage. May be of any frequency or wave shape but preferably similar to unknown.

Synchronizing Means and Voltage: Internal: By signal under observation.
External without Probe: 2 to 100 volts.
External with Probe: 20 to 450 volts.

Synchronizing Input Impedance: 400,000 ohms paralleled by 30 micromicrofarads.

Sweep Circuits Available:
- Start-Stop: Each impulse independent of preceding; used for observing nonperiodic as well as periodic pulses.
- Sawtooth: Synchronizes with periodic pulses; not satisfactory for nonperiodic pulses unless departure from periodicity is small.

Sweep Speeds Available (approximate):
- Start-Stop Duration in Microseconds: Fast: 4.5 to 8; Medium: 20 to 50; Slow: 120 to 280.
- Sawtooth Duration in Microseconds: Fast: 20 to 200; Medium: 200 to 4000; Slow: 4000 to 100,000.
- Sawtooth Frequency in Cycles Per Second: Fast: 50,000 to 5000; Medium: 5000 to 250; Slow: 250 to 10.

Measurement of Signal Duration:
- Under 8 Microseconds: By internally developed microsecond pulses.
- Over 8 Microseconds: By external pulses or sine waves of known frequency.

Ambient Temperature Limits: -40° F. to $+120^{\circ}$ F.

Maximum Relative Humidity: 95%.

MANUFACTURERS' OR CONTRACTORS' DATA:

Western Electric Company, 195 Broadway, New York, New York; Contract No. NXsr-51503; Approximate Cost per Unit, $650.00, 3 January 1949.

OSCILLOSCOPE TS-34A/AP

TUBE COMPLEMENT:
4 JAN-6AK5, 2 JAN-6AG7, 2 JAN-6SL7GT, 1 JAN-6SN7GT, 1 JAN-5Y3GT/G, 1 JAN-6X5GT/G, 1 JAN-2AP1.

REFERENCE DATA AND LITERATURE:
AN 16-35TS34-4 (Maintenance Instructions).
TO 16-35TS36-6 (TM 11-1067A) (Maintenance Instructions).
NAVSHIPS 95343 (Maintenance Instructions).

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope TS-34A/AP	Steel	7CAC-611112 F16-0-78232-5186 3F4325-34A	20-3/4	9	8	29.00
2	Probe Assembly MX-50/AP		7CAC-468919-2 1F475-50	50 long	1 max. dia.		1.50
2	Coaxial Cord CG-72/U		16-C-11586-2001	120 long			2.50
2	Cord CX-152/U		7CWX-B43482 17-C-48189-1021 3E6000-152	12 long			0.25
1	Cord CX-150/U		7CAC-170264-72 17-C-48262-1615 3E5000-150	180 long			0.75
1	Case CY-213/AP	Alum-inum	16-C-17001-239 3F2623-213	23	11	12	6.00
						Total:	40.00

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope, TS-34A/AP with accessories (Shelf Package - Water Resistant Carton).	3.17	33	14	17	56

OSCILLOSCOPE TS-324/U

FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment used for applications which require the observation and examination of high-frequency signals above the range of the usual oscilloscope. Test results are indicated on a cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

The TS-324/U is the service designation for the Cathode-Ray Oscillograph DuMont 241.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The cathode-ray oscilloscope utilizes a cathode-ray tube, a linear time-base generator, power supplies, and X-, Y-, and Z-axis amplifiers. The Z-axis amplifier is intensity-modulated and is useful in tests where an increase in light intensity of the beam is needed for observation of a particular portion of the wave or, conversely, to blank out the undesired portion. The vertical and horizontal axes use balanced deflection amplifiers to mini-

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: USN	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
	- Electronics Test Equipment -		TS-324/U

ELECTROMECHANICAL DESCRIPTION: (Continued)

mize keystoning and to prevent defocusing at the edge of the screen. Cathode-loaded input stages are used in each axis. A mu metal shield protects the cathode-ray tube from external magnetic disturbances.

Power Supply: 115 volts, rms, 50 to 60 cycles per second, 160 watts, 3 amps.

Cathode-Ray Tube:

Accelerating Potential: 1500 volts.

Input Impedance (to either pair of deflection plates on the front panel):

Balanced: 5 megohms, 20 micromicrofarads.

Unbalanced: 5 megohms, 25 micromicrofarads.

Deflection Factor (Plates):

X-Axis: 21 volts rms per inch.

Y-Axis: 22 volts rms per inch.

Maximum Input Potential (Plates): 400 volts, rms, 600 volts DC maximum.

Y-Axis Amplifier:

Frequency Response: Within 3 decibels from 20 cycles per second to 2 megacycles per second at any attenuator setting, 6 decibels down at 4 megacycles per second.

Input Impedance:

Terminals: 2 megohms shunted by 40 micromicrofarads.

Probe: 1 megohm shunted by 10 micromicrofarads.

Deflection Factor:

Terminals: 0.07 volts rms per inch.

Probe: 0.7 volts rms per inch.

Maximum Input Potential: 400 volts rms signal, 600 volts DC maximum.

X-Axis Amplifier:

Frequency Response: Within 3 decibels from 5 cycles per second to 100 kilocycles per second at any attenuator setting, 6 decibels down at 300 kilocycles per second.

Input Impedance (Terminals): 2 megohms shunted by 40 micromicrofarads.

Deflection Factor (Terminals): 0.7 volts rms per inch.

Maximum Input Potential: 50 volts rms signal, 600 volts DC maximum.

Z-Axis Amplifier:

Frequency Response: Within 3 decibels from 30 cycles per second to 2 megacycles per second.

Input Impedance: 1 megohm shunted by 20 micromicrofarads.

Maximum Input Potential: 5 volts rms signal, 600 volts DC maximum.

Linear Time-Base Generator:

Frequency Range: 15 to 30,000 cycles per second.

Direction of Sweep: Left to right.

Synchronizing Signal Sources: Internal, Y-signal; external, powerline frequency.

Synchronizing Polarity: Either polarity of sync signal.

OSCILLOSCOPE TS-324/U

MANUFACTURERS' OR CONTRACTORS' DATA:
Allen B. DuMont Laboratories, Inc., Passaic, New Jersey.

TUBE COMPLEMENT:
1 6J5, 2 6AC7, 2 6AG7, 1 5JP1, 3 6SN7GT, 1 6Q5G, 2 6SG7, 1 5Z3, 1 80, 1 6V6GT/G, 1 6SJ7, 1 991.

REFERENCE DATA AND LITERATURE:
Manufacturer's Catalog.

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope TS-324/U	steel		17-1/2	10-3/4	21	65
1	Probe and Cable 242-B						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Oscilloscope TS-324/U					

OSCILLOSCOPE
TYPE 304-A
Allen B. DuMont Laboratories, Inc.

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.

FUNCTIONAL DESCRIPTION:

A portable, general purpose, test instrument used to study time variable quantities that can be converted into electrical energy. In addition, it can be used for both AC and DC voltage measurements by displaying the input signal visually on a 5-inch cathode ray tube calibrated directly in volts.

RELATIONSHIP TO OTHER EQUIPMENT:

This oscilloscope is an improvement over DuMont type 304-H Oscilloscope in that it offers a calibrated cathode-ray voltmeter.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 or 230 volts, AC, ±10%, 50 to 400 cycles per second, single phase, 110 watts.

Sweep Frequency Range:

Recurrent and Driven: 2 to 30,000 cycles per second.

Extra-low Frequency: Obtained by externally attached capacitor with 0.5 seconds of sweep added per microfarad capacitance added.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611138		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	

OSCILLOSCOPE
TYPE 304-A
Allen B. DuMont Laboratories, Inc.

ELECTROMECHANICAL DESCRIPTION: (Continued)

Maximum Sweep Speed (expanded): 1 inch per microsecond.

Sinusoidal Frequency Response: X and Y axis:

Direct Coupling: Down not more than 10% at 100,000 cycles per second, flat to DC (0 cycles per second).

AC Coupling: Down not more than 10% at 10 and 100,000 cycles per second.

AC and DC Coupling: Down not more than 50% at 300,000 cycles per second.

Range of Measurement:

Voltage Range: 0 to 1000 volts.

Volts Full Scale: 0 to 0.1, 1, 10, 100 volts.

Multiplier: x 1 to x 10.

Maximum Input Potential:

AC Coupling: 1000 volts, DC plus peak AC.

DC Coupling: 1000 volts, DC plus peak AC, except 0.1 position of VOLTS FULL SCALE switch where it is 100 volts, DC plus peak AC.

Input Impedance: X and Y axis, direct (balanced) 3 megohms paralleled by 20 micromicrofarads. X and Y axis, direct (unbalanced) 1.5 megohms paralleled by 20 micromicrofarads. X axis, amplifier, 2.2 megohms paralleled by 50 micromicrofarads. Y axis, amplifier, (single ended) 2 megohms paralleled by 50 micromicrofarads. Y axis, amplifier, (balanced) 2 megohms paralleled by 35 micromicrofarads. Z axis, (intensity modulation), 0.2 megohms paralleled by 80 micromicrofarads.

Deflection Factors:

X axis direct, 40 to 50 volts peak-to-peak (15-18 rms) per inch.

X axis amplifier (full gain), 0.3 volts peak-to-peak (0.1 rms) per inch.

Y axis direct, 32 to 39 volts peak-to-peak (12-14 rms) per inch.

Y axis amplifier (full gain), 0.1 volts peak-to-peak full scale, 0.025 volt peak-to-peak (0.009 rms) per inch.

Undistorted Deflection: More than 4 inches, plus expansion equivalent to 20 inches on the Y axis and 30 inches on the X axis.

Sweep Amplitude:

Minimum: 1/2 inch.

Maximum: 30 inches with full position control.

Sweep Direction: Left to right.

Return Trace: Automatically blanked by negative 15 volt blanking beam.

Synchronization: From signal of either polarity with sync limiting on both driven and recurrent sweeps.

Accelerating Potential (over-all): 3000 volts.

Maximum Photographic Writing Rates (with P11 phosphor):

Type 296 (f/2.8 lens): 0.8 inches per microsecond.

Type 321 and 295 (f/1.5 lens): 2.8 inches per microsecond.

Accuracy of Voltmeter: ±5%.

OSCILLOSCOPE
TYPE 304-A
Allen B. DuMont Laboratories, Inc.

MANUFACTURERS' OR CONTRACTORS' DATA:
Allen B. DuMont Laboratories, Inc., Instrument Division, Clifton, New Jersey; Approximate Cost per Unit, $333.00.

TUBE COMPLEMENT:
2 RTMA-1X2A, 2 RTMA-6AQ5, 6 RTMA-12AU7, 1 RTMA-5Y3GT, 2 RTMA-6J6, 2 RTMA-5963, 2 RTMA-6AL5, 1 DuMont-6Q5G, 1 RTMA-0B2, 1 DuMont-3-14, 1 DuMont-5ADP-.

REFERENCE DATA AND LITERATURE:
Manufacturer's Booklet.

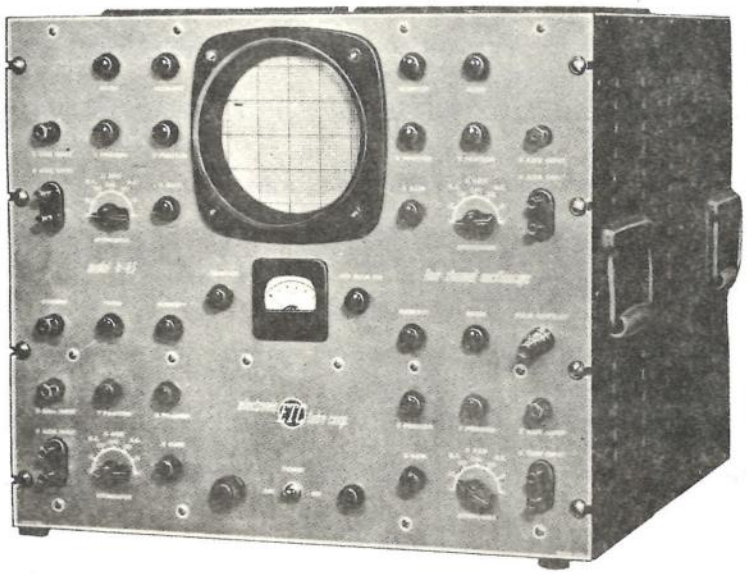
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	DuMont Type 304-A Oscilloscope	Metal	7CAC-611138	13-1/2	8-3/4	19-1/2	50

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	DuMont Type 304-A Oscilloscope	4.2	26	14	20	68

FOUR-CHANNEL OSCILLOSCOPE
MODEL H-43
(Electronic Tube Corporation)



FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment used to display as many as four independent variables on a single cathode-ray tube. A voltmeter permits horizontal deflection to be measured in terms of volts.

RELATIONSHIP TO OTHER EQUIPMENT:

The oscilloscope is designed for use with a continuous-film Recording Camera Electronic Tube SM-100.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 volts, AC, 50 to 60 cycles per second, 200 watts.
Cathode-Ray Tube Accelerating Potential: 4500 volts.
X-Amplifiers:

Input Coupling: Conductive or capacitive.

Input Impedance: 2 megohms shunted by 40 micromicrofarads.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.:	Commercial
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.1
	- Electronics Test Equipment -		Model H-43

FOUR-CHANNEL OSCILLOSCOPE MODEL H-43

ELECTROMECHANICAL DESCRIPTION: (Continued)

Attenuation: 1 to 1, 10 to 1, 100 to 1 with continuously variable control between steps.

Gain: Sufficient to give better than 1-inch deflection for 1 volt DC input.

Frequency: 0 to 100,000 cycles per second ±1 decibel or 0 to 200,000 cycles per second ±3 decibels with conductive input; 10 to 100,000 cycles per second ±1 decibel with capacitive input.

Linearity: Maximum undistorted deflection is 3 inches peak-to-peak.

Z-Axis:

Input: Capacitive to grid of cathode-ray tube.

Polarity: Positive signal increases intensity.

Impedance: 1 megohm shunted by 30 micromicrofarads.

Time Constant: 0.001 second.

Deflection Factor:

Y Plates: 80 volts DC per inch ±20%.

X Plates: 70 volts DC per inch ±20%.

Voltage Calibrator:

Voltmeter Range: Calibrated 0 to 10; can be read to 1000 volts by use of attenuators.

Waveform: Square wave at line frequency.

MANUFACTURERS' OR CONTRACTORS' DATA:

Electronic Tube Corporation, 1200 East Mermaid Lane, Philadelphia 18, Pennsylvania.

TUBE COMPLEMENT:

NI

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Four-Channel Oscilloscope Electronic Tube H-43					

FOUR-CHANNEL OSCILLOSCOPE MODEL H-43

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Four-Channel Oscilloscope Electronic Tube H-43	metal		21	16-1/2	22-1/2	75

OSCILLOSCOPE
(OSCILLOGRAPH)
MODEL 158
(Radio Corporation of America)

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.

FUNCTIONAL DESCRIPTION:

A portable, general purpose, test scope used for the observation of electrical circuit phenomena when testing television and radio equipment. Applications include: the study of wave shapes and transients, measurement of modulation, adjustment of radio receivers and transmitters, determination of peak voltages, and tracing of vacuum tube characteristics. Useful for viewing synchronizing and blanking impulses, horizontal and vertical sawtooth waves and grid and plate voltages on horizontal and vertical oscillators. Provision has been made for synchronization on positive or negative peaks. Images are viewed on a five-inch screen.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 volts ±10 volts, AC, 50 to 60 cycles per second, single phase, 55 watts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611400		3F3590.3
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.1	
	- Electronics Test Equipment -		Model No. 158

OSCILLOSCOPE
(OSCILLOGRAPH)
MODEL 158
(Radio Corporation of America)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Horizontal Sweep Frequency Range: 4 to 22,000 cycles per second.
Timing Frequency Range: 4 cycles per second to 18 kilocycles per second.
Frequency Characteristic, Vertical Amplifier: Maximum gain: 5 cycles per second to 500 kilocycles per second. Sine wave permitting square wave response 60 to 13,000 cycles per second.
Frequency Characteristic, Horizontal Amplifier: 5 cycles per second to 100 kilocycles per second.
Input Characteristics:
Vertical Amplifier with cable: 1.15 megohms, 16 micromicrofarads.
Vertical Amplifier without cable: 0.15 megohms, 38 micromicrofarads.
Frequency Response of Vertical Amplifier:
Flat Within: 1 decibel to 200 kilocycles per second.
Flat Within: -3 decibels to 500 kilocycles per second.
Useful Range: 5 cycles per second to 1 megacycle per second.
Frequency Response of Horizontal Amplifier:
Flat Within: 1 decibel to 45 kilocycles per second.
Flat Within: -3 decibels to 100 kilocycles per second.
Deflection Sensitivity at Vertical Amplifier Input:
With Cable: 0.3 volt rms per inch.
Without Cable: 0.04 volt rms per inch.
Deflection Sensitivity at Horizontal Amplifier: 0.56 volt rms per inch.

MANUFACTURERS' OR CONTRACTORS' DATA:

Radio Corporation of America, Princeton, New Jersey; Approximate Cost per Unit, $147.50.

TUBE COMPLEMENT:

1 RCA-6C6, 1 RCA-6SJ7, 1 RCA-1852, 1 RCA-884, 1 RCA-5BP1/1802-P1, 1 RCA-80, 1 RCA-879.

REFERENCE DATA AND LITERATURE:

TO 16-45-55 (Instruction Handbook).
Manufacturers' Catalog No. 104.

OSCILLOSCOPE
(OSCILLOGRAPH)
MODEL 158
(Radio Corporation of America)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope Model No. 158		7CAC-611400 3F3590.3	14-1/4	8	19-1/4	30
1	Cable			48 long			

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

3.2 SYNCHROSCOPES

OSCILLOSCOPE AN/USM-24

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.

FUNCTIONAL DESCRIPTION:

A portable, general purpose, field type synchroscope, used for bench testing radar and communication equipment. A luminous plot of time-varying voltage pulse or wave is displayed on a three-inch cathode ray tube. Internally generated calibration markers are synchronized with the sweep. Trigger voltages are also internally generated, or triggering can be accomplished externally. A calibrating voltage is available for directly measuring the amplitude of observed wave forms. A delayed sweep with a time expansion scale is also available to facilitate detailed examination of portions of the observed form. Improved visibility is achieved by the use of screen variable edge illumination, and an optical filter to reduce ambient light interference. A three-step panel switch compensates the equipment for variations in line voltage. Thermostatically controlled forced air ventilation insures minimum error due to ambient temperature changes. Terminals are provided at the rear of the equipment case for direct connection of the signal to the deflection plates when this is advantageous. Power interlock switches protect against high voltage shock when personnel are exposed by opening the case ventilation door.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.	7CAC-611119		3F3643-24
PROCUREM'T INFO.:	Spec. MIL-P-15458 (Ships)		
PROCUREM'T COG.:	Navy	DESIGN COG.:	Navy, BuShips
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.2
	- Electronics Test Equipment -		AN/USM-24

OSCILLOSCOPE AN/USM-24

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Waterman Model S-5-B.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105, 115, 125 volts, AC, 50 to 1000 cycles per second, single phase, 215 watts.
Frequency Range: 8 to 600,000 cycles per second for recurrent sweep.
Sweep Duration: 1.25 to 125,000 microseconds for triggered sweep.
Frequency Response: Horizontal, 0.5 to 700,000 cycles per second.
Vertical, 4 to 10,000,000 cycles per second.
Beam Modulation, 50 to 10,000,000 cycles per second.
Deflection Sensitivity: Horizontal, 4.0 volts, rms, per inch. Vertical, 0.035 volts, rms, per inch.
Input Resistance: Horizontal, 300,000 ohms. Vertical, 300,000 ohms. Beam modulation, 56,000 ohms.
Delayed Sweep Time Expansion Scale: 10:1.

MANUFACTURERS' OR CONTRACTORS' DATA:

Waterman Products Company, Philadelphia, Pennsylvania; Navy Contract No. NObsr-49230.

TUBE COMPLEMENT:

1 JAN-0A2, 2 JAN-1V2, 1 JAN-3JP1, 2 JAN-6AH6, 3 JAN-6AL5, 2 JAN-6AN5, 1 JAN-6C4, 1 JAN-6AG5, 1 JAN-6J6, 4 JAN-6X4W, 6 JAN-12AT7, 8 JAN-12AU7.

REFERENCE DATA AND LITERATURE:

TO 16-30USM24-3 (Instruction Book).

SHIPPING DATA:

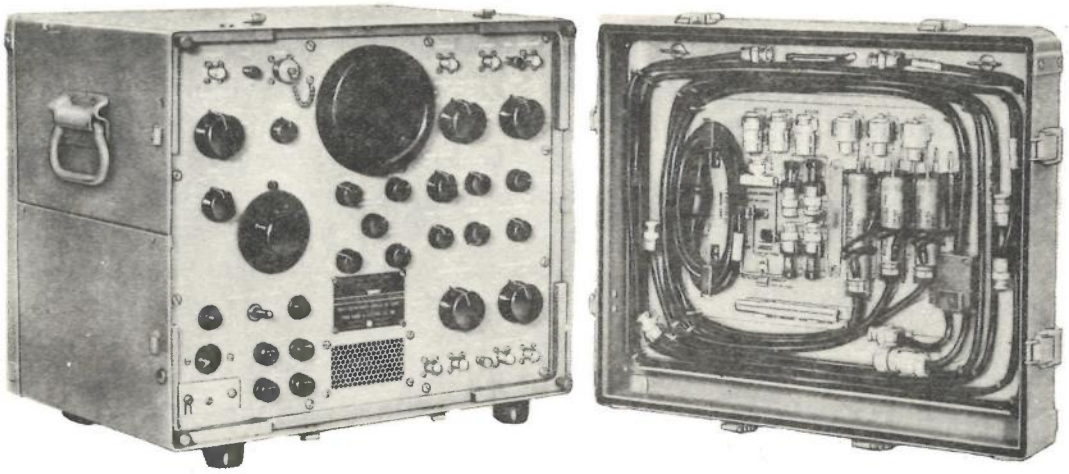
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope AN/USM-24 (Export Packed).	6.25	21	24-1/2	21	100

OSCILLOSCOPE AN/USM-24

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-24 Including:	Alum-inum	7CAC-611119 3F3643-24	14-9/16	17-1/8	14-11/16	60
2	RF Cable Assembly with Test Prod		3E8000-52.3				
2	Accessory RF Cable Assembly		3E7350-2.16	96 long			
3	Adapter Connector UG-255/U		8850-108880 R16-A-507 2Z308-255	1-3/8	5/8 O.D.		0.187
3	Adapter UG-273/U		8850-102000 R16-A-478 2Z308-273	1-3/8	3/4 O.D.		0.187
1	Adapter Connector UG-274/U		8850-102005 2Z308-274				
4	Adapter Connector		2Z308-924				
1	Power Cable		3E7350.1-20.11				
1	Spanner Wrench						
1	Hexagonal Wrench for No. 6 Socket Head		7900-859480 6R57400-6				
1	Hexagonal Wrench for No. 8 Socket Head		7900-859490 6R57400				
2	Instruction Book		6D13202-24				
1	Oscilloscope OS-26/USM-24		3F3629-26				

OSCILLOSCOPE AN/USM-24A



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument used to visually portray the time variation of a pulse or waveform, and to provide a means for determining the duration and instantaneous magnitude of the waveform. It is used for checking transmitters, receivers, and amplifiers primarily for the study of nonrecurrent, short duration transient pulses.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: This oscilloscope consists of ten basic circuits: (1) The Display Channel which consists of a cathode ray tube, the controls for static adjustment, and a means for trace calibration. (2) The Vertical Channel which transmits the signal from the input jack to the CRT without appreciable change in waveform, but controls the amplitude. It also provides a time delay to permit the time base, markers, and intensification circuits to start functioning before the vertical signal reaches the screen of the CRT. (3) The Horizontal Channel which consists of an amplifier with suitable pass band and gain to accommodate the signal produced by the internal time base generator. (4) The Intensity Channel which regulates the electron beam density within the CRT which is proportional to the brilliance of the trace on the screen. Since intensification is desired during "Go" time of the linear time base, a positive going gate is applied to the grid

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611120		3F3643-24A
PROCUREM'T INFO.: Spec. MIL-15458A (Ships)			
PROCUREM'T COG.: USN		DESIGN COG.: USN, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			AN/USM-24A

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

ELECTROMECHANICAL DESCRIPTION: (Continued)

and a negative marker signal applied to the cathode of the CRT. (5) The Time Base Channel which provides a linear time base so that the trace appears in a conventional notation, starting from left to right. The trace length can be varied in terms of time in order that signals of widely varying duration and rate of occurrence can be observed and measured. (6) The Synchronization Channel which provides a means of synchronizing the linear time base with a signal so that the signal appears to be stationary on the face of the CRT. The linear time base can be synchronized by the incoming signal, the internal trigger generator, or an external triggering pulse. (7) The Marker Channel which provides five fixed frequency intensity markers for calibrating the linear time base. By interpolation between the markings on the graph screen and the markers, actual pulse lengths can be determined. (8) The Trigger Channel which is basically a pulse generator used to trigger the oscilloscope internally and to provide positive or negative output pulses which can be used to initiate the operation of circuits whose output waveform is to be examined. (9) The Calibration Channel which consists of a 5-kilocycle square wave generator providing a signal of standard amplitude. The standard signal is used to calibrate the vertical amplifier and to permit the oscilloscope to be used as a voltmeter to measure the peak-to-peak amplitude of incoming signals. (10) The Power Supply Channel which provides all the necessary AC and DC voltages required for the operation of the oscilloscope from the power line voltages.

Power Supply: 115 volts ±10%, AC, 50 to 450 cycles per second, single-phase, 240 watts at 115 volts, 60 cycles per second.

Frequency Range: 8 to 600,000 cycles per second for recurrent sweep.

Vertical Amplifier:

Sine Wave Frequency Response: Down 3 decibels below 2 cycles and above 5 megacycles per second; down 6 decibels below 1.5 cycles and above 8 megacycles per second.

Transient Response: 0.075 microsecond rise time when input signal has 0.025 microsecond rise time.

Low Frequency Response: Less than 5% tilt for 200 cycle per second square wave.

Linear Time Base:

Sweep Time: Continuously adjustable from 1.25 to 125,000 microsecond duration.

Sweep Circuit: Trigger or periodic.

Sweep Delay and Expansion: Approximately 10 times for any portion of sweep over 10 microseconds.

Calibration Voltage: 5 kilocycle square wave continuously adjustable from 0.1 to 1 volt, peak-to-peak, accurate to ±5%. 65 volts peak-to-peak (±10%) of 5 kilocycle square wave is available at front panel jack for external use.

ELECTROMECHANICAL DESCRIPTION: (Continued)

Timing Markers: Intensity markers synchronized with sweep and available at intervals of 0.2, 1, 10, 100 or 500 microseconds; accurary ±5%.

Trigger Pulse Output: 55 volts peak, 1.5 microsecond pulse having rise time of 0.2 microsecond, occurring at 50, 300, 800, 2000, or 5000 pulses per second. Repetition rate accurate to ±5%.

Input Impedance:

Vertical: 300,000 ohms paralleled by 37 micromicrofarads.

Horizontal: 4.5 megohms paralleled by 25 micromicrofarads.

Beam Modulation: 56,000 ohms paralleled by 25 micromicrofarads.

Output Voltage and Minimum Load Impedance:

Horizontal: Variable 0 to 65 volts peak, 33,000 ohms.

Calibration: Fixed 65 volts peak-to-peak (±10%), 50,000 ohms.

Trigger: Fixed: 45 volts peak, 375 ohms.

Temperature Range: -54°C. (-65°F.) to +55°C. (+131°F.), operating.

Relative Humidity: 95%.

Altitude: Approximately 10,000 feet.

MANUFACTURERS' OR CONTRACTORS' DATA:

Fada Radio & Electric Company, Inc., Belleville 9, New Jersey; Navy Contract No. NObsr-52510.

TUBE COMPLEMENT:

1 JAN-OA2, 2 JAN-1AX2, 1 JAN-3JP1, 3 JAN-6AH6, 2 JAN-6AL5W, 2 JAN-6AN5, 1 JAN-6135, 1 JAN-5744WA, 1 JAN-6J6W, 4 JAN-6X4W, 5 JAN-12AT7WA, 9 JAN-5814.

REFERENCE DATA AND LITERATURE:

TO 33A1-13-10-1 (NAVSHIPS 92043) (Instruction Book).

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope AN/USM-24A (Export Packed)	4.96	19-1/2	23	18-7/8	105

OSCILLOSCOPE AN/USM-24A

EQUIPMENT SUPPLIED:

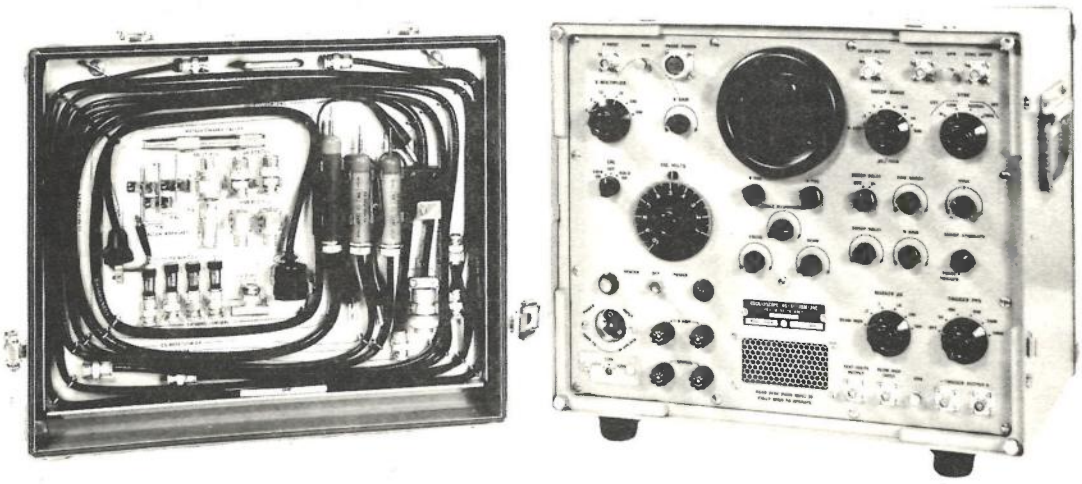
Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches) H	W	D	Weight (Lbs.)
1	Oscilloscope AN/USM-24A	Aluminum	7CAC-611120 3F3643-24A	14-5/8	17-1/8	14-1/2	56
	Including:						
2	Test Lead CG-883/USM-24			58-1/2 long	13-1/16 O.D.		1.25
1	Test Lead CG-1110/U			41-3/8 long	1-1/4		0.5
2	RF Cable Assembly CG-409/U		7CAC-170265-395 1F430-409.96	96 long	9/16 O.D.		1.122
3	Adapter Connector UG-255/U		8850-108880 R16-A-507 2Z308-255	1-3/8	5/8 O.D.		0.093
3	Adapter UG-273/U		8850-102000 R16-A-478 2Z308-273	1-3/8	3/4 O.D.		0.093
1	Adapter Connector UG-274/U		8850-102005 2Z308-274	1-5/16	1-1/8	9/16 O.D.	0.031
4	Adapter Connector UG-924/U		8850-151794 2Z308-924	1-3/16	9/16 O.D.		0.125
1	Electrical Power Cable Assy. CX-2570/U			74 long			0.187
1	Spanner Wrench, Flat			4 long	1/2		0.062
1	Spanner Wrench, Round			4 long	7/16 O.D.		0.062
1	Allen Wrench #4		G41 - W -2445				

(Continued)

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches) H	W	D	Weight (Lbs.)
1	Allen Wrench #6		7900-859480 G41-W-2445 6R57400-6				
1	Allen Wrench #8		7900-859490 G41-W-2446 6R57400				
2	Instruction Book		6D13202-24				
1	Oscilloscope OS-42/USM-24A		3F3629-26	14-1/2	17-1/8	12-1/2	48
1	Oscilloscope Cover CW-321/USM-24A			14-15/16	17-1/8	2-3/4	5.375

OSCILLOSCOPE AN/USM-24C



FUNCTIONAL DESCRIPTION:

This is a portable, general purpose instrument used to portray visually the time variation of a pulse or waveform, and to provide a means for determining the duration and instantaneous magnitude of the waveform. It is intended for use in checking and testing all types of electronic equipment such as transmitters, receivers, and amplifiers.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: This oscilloscope consists basically of the following eight circuits:

(1) The Display Channel consists of a cathode ray tube, the controls for static adjustment, and a means for trace calibration.

(2) The Vertical Channel transmits the signal from the input jack to the cathode ray tube and controls the amplitude of the signal without appreciably changing its waveform. It also provides a time delay to permit the time base, markers, and intensification circuits to start functioning before the vertical signal reaches the screen of the cathode ray tube.

(3) The Horizontal Channel consists of an amplifier with suitable pass band and gain to amplify sweep voltages produced by the linear time base.

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	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611118-52		
PROCUREM'T INFO.:			
PROCUREM'T COG.: USN		DESIGN COG.: USN, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			AN/USM-24C

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A

ELECTROMECHANICAL DESCRIPTION: (Continued)

(4) The Time Base Channel provides a linear time base so that the trace appears in a conventional notation, starting from left to right. Portions of the trace can be selected and expanded approximately 10 times for closer observation and measurement.

(5) The Synchronization Channel provides a means of synchronizing the linear time base with a signal so that the trace appears stationary on the face of the cathode ray tube. The linear time base can be synchronized by the incoming signal, the internal trigger generator, or an external triggering pulse.

(6) The Intensity Channel provides the modulation of the electron beam density which is proportional to the brilliance of the trace on the screen. Intensification is produced with a positive gate being applied to the grid and a negative marker signal being applied to the cathode of the cathode ray tube.

(7) The Trigger Channel consists of a pulse generator used to trigger the oscilloscope. Output jacks on the panel make available positive and negative polarity pulses for external use to control the equipment whose output is being studied.

(8) The Power Supply Channel provides all the necessary voltages required for the operation of the oscilloscope.

Power Supply: 115 volts ±10%, AC, 50 to 400 cycles per second, 220 watts at 115 volts, 60 cycles per second.

Frequency Range: 1.5 cycles per second to 8.5 megacycles per second.

Vertical Amplifier:

Sine Wave Response: Flat within -3 decibels from 2 cycles to 6 megacycles per second. Flat within -6 decibels from 1.5 cycles to 8.5 megacycles per second.

Transients Response: 0.07 microsecond risetime.

Sensitivity: 0.014 volt with a 0.25 inch deflection.

Low Frequency Response: Less than 5% tilt for 200 cycle per second square wave.

Linear Time Base:

Sweep Speed: Continuously adjustable from 0.5 to 50,000 microseconds per inch.

Sweep Circuit: Variable trigger or periodic and fixed pulse trigger.

Sweep Time: 0.125 second to 0.125 microsecond for 2.5-inch trace.

Sweep Expansion: Approximately 10 times for any portion of trace when the sweep time is over 6 microseconds per inch.

Calibration Voltage: 0.1 to 1 volt peak-to-peak from an internal 5 KC square wave generator for calibrating the incoming signal amplitude. A potential of 20 volts ±20% from this same generator is available at the front panel for external use.

Timing Markers: Synchronized with sweep and available at intervals of 0.2, 1, 10, 100, or 500 microseconds.

Trigger Pulse Output: 25 to 50 volts, approximately 1.6 microseconds wide pulse having risetime of 0.1 microsecond, occurring at 50, 300, 800, 2000, or 5000 times per second.

Trigger Pulse Input: 0.5 to 450 volts peak-to-peak.

Input Impedance:

Vertical: 300,000 ohms paralleled by 40 micromicrofarads.

Horizontal: 6.2 megohms paralleled by 47 micromicrofarads.

Beam Modulation: 56,000 ohms paralleled by 39 micromicrofarads.

(continued)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Output Voltage and Load Impedance:

Sweep Output: 20 volts peak-to-peak, 50,000 ohms.

Test Volts Output: 20 volts peak-to-peak, 250,000 ohms.

Trigger + or - : 25 to 50 volts peak-to-peak, 500 ohms.

Temperature Range: -54°C. (-65°F.) to +65°C. (+150°F.).

Relative Humidity: Over 95%.

Maximum Operational Altitude: Approximately 10,000 feet (barometric pressures down to 20.6 inches).

Radio Interference: Conducted and radiated interference between 14 KC and 1000 MC well below the limits of military specification MIL-I-16910 (SHIPS).

Effect of Microwave Fields: Virtually none.

Display Tube Diameter: 3 inches.

Tube Display: Horizontal, 2-1/2 inches. Vertical, 1-1/2 inches undistorted deflection (3/4 inch for unidirectional signals).

Measuring Scale: 25 x 15 divisions with controlled illumination.

MANUFACTURERS' OR CONTRACTORS' DATA:

Waterman Products Company, Incorporated, 2445-63 Emerald Street, Philadelphia 25, Pennsylvania; Contract No. NOBsr-59499.

TUBE COMPLEMENT:

1 JAN-OA2WA, 2 JAN-1V2, 1 JAN-3JP1, 3 JAN-6AH6, 2 JAN-6AN5WA, 5 JAN-12AT7WA, 7 JAN-12AU7, 1 JAN-5719, 2 JAN-5726, 2 JAN-6135, 4 JAN-6203.

REFERENCE DATA AND LITERATURE:

NAVSHIPS 92465 (Instruction Book).

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope AN/USM-24C	6.14	22-1/4	24-1/2	19-1/2	117

OSCILLOSCOPE AN/USM-24C

EQUIPMENT SUPPLIED:

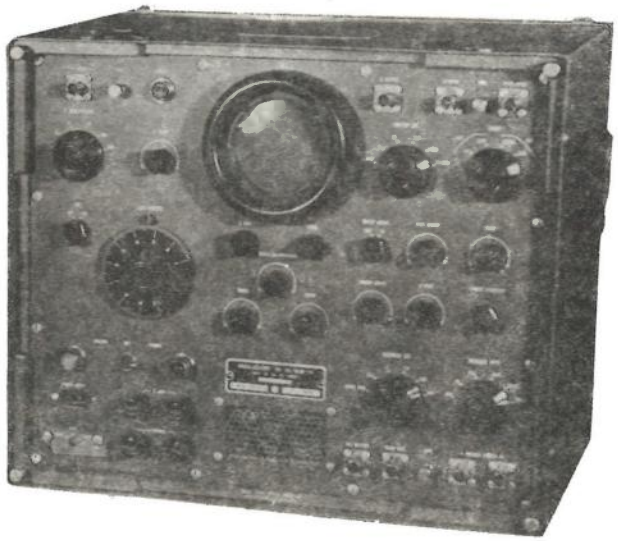
Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-24C		7CAC-611118-52	14-13/16	17-11/32	14-7/8	58
	Including:						
1	Oscilloscope OS-51/USM-24C			14-15/32	17-5/32	12-19/64	50-1/2
1	Cover Combination Case, CW-362/USM-24C			14-13/16	17-11/32	2-25/32	4-1/4
1	Cable, Power CX-3092/USM-24C			72 long		1-5/32 O. D.	3/8
2	Lead, Test CG-409/U			96 long		27/64 O. D.	9/16
2	Lead, Test CG-883A/USM-24			58 long		13/16 O. D.	5/8
1	Lead, Test CG-1277/USM-24C			42-3/4 long		1-1/4 O. D.	1/2
2	Adapter UG-255/U			1-3/8 long		5/8 O. D.	1/8
4	Adapter UG-924/U			1-13/16 long		9/16 O. D.	3/16
1	Adapter UG-274/U			1-9/32	1-1/16	9/16	1/16
2	Adapter UG-273/U			1-5/16 long		11/16 O. D.	1/8

(continued)

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Adapter UG-201A/U			1-5/16 long		13/16 O. D.	1/16
1	Adapter UG-349A/U			1-9/16 long		5/8 O. D.	1/16
1	Wrench, Allen No. 4			1-13/16	5/8	3/64	
1	Wrench, Allen No. 6			1-13/16	5/8	1/16	
1	Wrench, Allen No. 8			1-15/16	11/16	5/64	
1	Wrench, Spanner TWA003			4-1/8 long		7/16 O. D.	1/16
2	Instruction Book NavShips (92465)			11-1/2	8-3/4		3-1/2

OSCILLOSCOPE AN/USM-24D



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument used to display the time variation of a pulse or waveform, and to provide a means for determining the duration and instantaneous magnitude of the waveform. The instrument is intended for use in checking and testing all types of electronic equipment such as transmitters, receivers, and amplifiers.

RELATIONSHIP TO OTHER EQUIPMENT:

The AN/USM-24D is similar to the AN/USM-24C except for circuit design changes including an added direct-coupled push-pull amplifier which can be connected in place of the vertical channel.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The Oscilloscope AN/USM-24D consists basically of eight circuits. The Display Channel consists of a cathode-ray tube, the controls for

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: USN, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		AN/USM-24D

ELECTROMECHANICAL DESCRIPTION: (Continued)

static adjustment, and a means for trace calibration. The Vertical Channel transmits the signal from the input jack to the cathode-ray tube and controls the amplitude of the signal without appreciably changing its waveform. The channel also provides a time delay to permit the time base, markers, and intensification circuits to start functioning before the vertical signal reaches the screen of the cathode-ray tube. The Horizontal Channel consists of an amplifier with suitable pass band and gain to amplify sweep voltages produced by the linear time base. The Time Base Channel provides a linear time base so that the trace appears in a conventional notation, starting from left to right. Portions of the trace can be selected and expanded approximately 10 times for closer observation and measurement. The Synchronization Channel provides a means of synchronizing the linear time base with a signal so that the trace appears stationary on the face of the cathode-ray tube. The linear time base can be synchronized by the incoming signal, the internal trigger generator, or an external triggering pulse. The Intensity Channel provides the modulation of the electron beam density which is proportional to the brilliance of the trace on the screen. Intensification is produced with a positive gate being applied to the grid and a negative marker signal being applied to the cathode of the cathode-ray tube. The Trigger Channel consists of a pulse generator used to trigger the oscilloscope. Output jacks on the panel make available positive and negative polarity pulses for external use to control the equipment whose output is being studied. The Power Supply Channel provides all the necessary voltages required for the operation of the oscilloscope.

Power Supply: 115 volts, AC, 50 to 400 cycles per second, 220 watts.

Frequency Range: 8 cycles per second to 8.5 megacycles per second.

Vertical Amplifier:

- Sine Wave Response: Flat within -3 decibels from 2 cycles per second to 6 megacycles per second. Flat within -6 decibels from 1.5 cycles per second to 8.5 megacycles per second.
- Transients Response: 0.07 microsecond rise time.
- Sensitivity: 0.014 volt with a 0.25-inch deflection.
- Low Frequency Response: Less than 5% tilt for 200-cycles per second square wave.

Linear Time Base:

- Sweep Speed: Continuously adjustable from 0.5 to 50,000 microseconds per inch.
- Sweep Circuit: Variable trigger or periodic and fixed pulse trigger.
- Sweep Time: 0.125 second to 0.125 microsecond for 2.5-inch trace.

ELECTROMECHANICAL DESCRIPTION: (Continued)

Sweep Expansion: Approximately 10 times for any portion of trace when the sweep time is over 6 microseconds per inch.

Calibration Voltage: 0.1 to 1 volt peak-to-peak from an internal 5-kilocycle square wave generator for calibrating the incoming signal amplitude. A potential of 20 volts ±20% from this same generator is available at the front panel for external use.

Timing Markers: Synchronized with sweep and available at intervals of 0.2, 1, 10, 100, or 500 microseconds.

Trigger Pulse Output: 25 to 50 volts, approximately 1.6-microsecond wide pulse having risetime of 0.1 microsecond, occurring at 50, 300, 800, 2000, or 5000 times per second.

Trigger Pulse Input: 0.5 to 450 volts peak-to-peak.

Input Impedance:

Vertical: 300,000 ohms paralleled by 40 micromicrofarads.

Horizontal: 6.2 megohms paralleled by 47 micromicrofarads.

Beam Modulation: 56,000 ohms paralleled by 39 micromicrofarads.

Output Voltage and Load Impedance:

Sweep Output: 20 volts peak-to-peak, 50,000 ohms.

Test Volts Output: 20 volts peak-to-peak, 250,000 ohms.

Trigger + or -: 25 to 50 volts peak-to-peak, 500 ohms.

Temperature Range: -54°C (-65°F) to +65°C (+150°F).

Relative Humidity: Over 95%.

Maximum Operational Altitude: Approximately 10,000 feet (barometric pressures down to 20.6 inches).

Radio Interference: Conducted and radiated interference between 14 kilocycles per second and 1000 megacycles per second well below the limits of military specification MIL-I-16910 (SHIPS).

Effect of Microwave Fields: Virtually none.

MANUFACTURERS' OR CONTRACTORS' DATA:

Waterman Products Company, 2445-63 Emerald Street, Philadelphia, Pennsylvania; Contract No. NObsr-594-99.

TUBE COMPLEMENT:

1 OA2WA, 2 1V2, 1 3JP1, 3 6AH6, 2 6AN5WA, 5 12AT7WA, 7 12AU7, 1 5719, 2 5726, 2 6135, 4 6203.

REFERENCE DATA AND LITERATURE:

NAVSHIPS 92465.

USAF TO 16-300USM24-3.

OSCILLOSCOPE AN/USM-24D

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-24D Including:	metal	7CAC-611120-46(USAF)	15-1/4	17-3/8	15	
1	Oscilloscope OS-51/USM-24D			14-15/32	17-5/32	12-19/64	
1	Cover Combination Case CW-362/USM-24C			14-13/16	17-11/32	12-25/32	4-1/4
1	Cable, Power CS-3092/USM-24C			72 long 1-5/32 O. D.			3/8
2	Lead, Test CG-409/U			96 long 27/64 O. D.			9/16
2	Lead, Test CG-883A/USM-24			58 long 13/16 O. D.			5/8
1	Lead, Test CG-1277/USM-24C			42/34 long 1-1/4 O. D.			1/2
2	Adapter UG-255/U			1-3/8 long 5/8 O. D.			1/8
4	Adapter UG-924/U			1-13/16 long 9/16 O. D.			3/16
1	Adapter UG-274/U			1-9/32	1-1/16	9/16	1/16

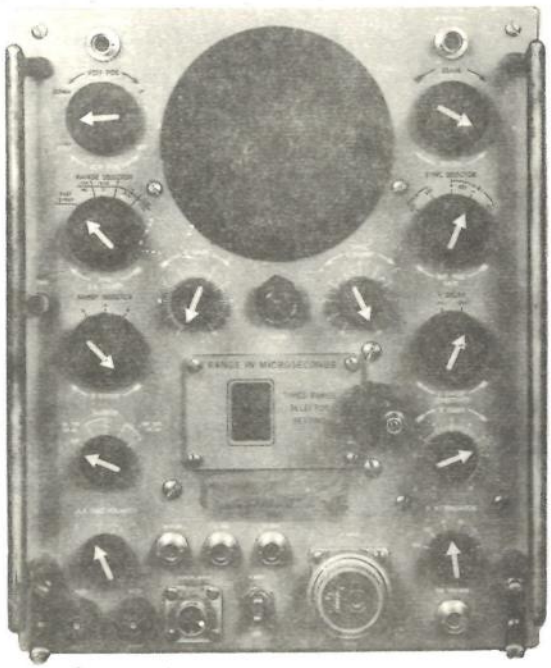
EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches) H	W	D	Weight (Lbs.)
2	Adapter UG-273/U	metal		1-5/16 long 11/16 O. D.			1/8
1	Adapter UG-201A/U			1-5/15 long 13/16 O. D.			1/16
1	Adapter UG-349A/U			1-9/16 long 5/8 O. D.			1/16
1	Wrench, Allen No. 4			1-13/16	5/8	3/64	
1	Wrench, Allen No. 6			1-13/16	5/8	1/16	
1	Wrench, Allen No. 8			1-15/16	11/16	5/64	
1	Wrench, Spanner TWA003			4-1/8 long 7/16 O. D.			1/16
2	Instruction Book			11-1/2	8-3/4		3-1/2

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches) H	W	D	Weight Packed (Lbs.)
1	Oscilloscope AN/USM-24D	6.14	22-1/4	24-1/2	19-1/2	117

OSCILLOSCOPE AN/USM-25A and/or AN/USM-25B



FUNCTIONAL DESCRIPTION:

A portable, general purpose oscilloscope designed to portray a luminous plot of instantaneous voltage against a time base. The equipment serves as an auxiliary ranging unit, a precision test oscilloscope, and a calibrator. It can be used with radar systems to increase the accuracy in ranging, extend the range scale, and provide accurate crystal controlled markers. It also provides expanded, delayed, or undelayed sweeps.

RELATIONSHIP TO OTHER EQUIPMENT:

The AN/USM-25A is intended for nonflight auxiliary radar ranging and bench testing of electronic devices, and includes Case CY-1094/AP. The AN/USM-25B is intended for flight use and includes Mounting MT-1292/USM-25B. The same oscilloscope, OS-4A/AP, is the major component of both models.

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.	7CAC-611135-55		
PROCUREM'T INFO.: Navy Spec. MIL-O-7738			
PROCUREM'T COG.: Navy		DESIGN COG.: Navy, BuAer	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3, 2	
- Electronics Test Equipment - AN/USM-25A and/or B			

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE AN/USM-25A and/or AN/USM-25B

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: This equipment contains a cathode ray tube with its associated circuits, a sweep channel, a signal channel, calibration marker and trigger circuits, and a power supply. Horizontal traces are of the start-stop type, produced only by triggering from a suitable synchronizing pulse.

Power Supply: 115 volts ±10%, AC, 50 to 1000 cycles per second, single phase, 180 watts.

Video Amplifier:

- Sensitivity:
  - Minimum: 0.5 volt peak-to-peak per inch.
  - With Crystal Probe: 5.0 volts peak-to-peak per inch.
  - With Test Lead: 1.0 volt peak-to-peak per inch.
  - Direct to Vertical Deflecting Plates: 43 to 52 volts, peak-to-peak per inch.
- Frequency Response:
  - Amplifier: ±1 decibel between 50 cycles per second and 5 megacycles per second; ±3 decibels between 10 cycles per second and 8 megacycles per second.
  - With Test Lead: ±1 decibel between 50 cycles per second and 5 megacycles per second; ±3 decibels between 10 cycles per second and 8 megacycles per second.
  - At Carrier Frequencies of 10 to 200 megacycles: 10 to 15,000 cycles per second between 6 decibel points.
- Pulse Response:
  - Rise Time: Less than 0.1 microsecond.
  - Delay Time: Less than 0.2 microsecond.
  - 200 Cycle Square Wave Droop: Less than 5%.
- Input Impedance:
  - Amplifier: 1 megohm shunted by 26 micromicrofarads.
  - Attenuator Prod: 1 megohm shunted by 10 micromicrofarads.
  - Test Lead: 10 megohms shunted by 8 micromicrofarads.
  - Crystal Detector: 47,000 ohms shunted by 8 micromicrofarads.
  - Vertical Direct: 560,000 ohms shunted by 20 micromicrofarads.
- Signal Delay:
  - Delay Time: 0.60 microsecond.
- Sweep Ranges:
  - A and S Modes: 1.2 to 12,000 microseconds.
  - R Mode: 2.4 to 24 microseconds. (Inoperative on the fast sweep ranges.)
  - Sweep Delay: 3 to 10,000 microseconds. (Inoperative on the fast sweep ranges.)

Synchronizing:

- Crystal Controlled Markers: 10 microseconds or 2000 yards (12.2 microseconds); 50 microseconds or 10,000 (61.0 microseconds).
  - Accuracy: ±0.03%.
- Marker Output: 12 volts peak in 100,000 ohm load shunted by 200 micromicrofarads.

(Continued)

OSCILLOSCOPE AN/USM-25A and/or AN/USM-25B

ELECTROMECHANICAL DESCRIPTION: (Continued)

Internal Impedance: 56 ohms.

Sync. Input: 5 volts peak minimum amplitude.

Rise Time: 0.1 to 1.0 microsecond.

Repetition Rate:

A and R Mode Internal: 40 to 3300 pulses per second.

A and R Mode External: 6000 pulses per second, maximum.

S Mode: 20 to 200,000 pulses per second with pulse input; 20 to 1,000,000 cycles per second with sine wave input.

Sync. Input Impedance:

A and R Modes External: 330,000 ohms, shunted by 15 micromicrofarads, positive; 330,000 ohms shunted by 19 micromicrofarads, negative.

S Mode: 1 megohm shunted by 17 micromicrofarads.

Trigger Output:

No Load: Amplitude, 75 volts peak; Rise Time, 0.16 microsecond.

With Load: Amplitude, 65 volts peak; Rise Time, 0.16 microsecond.

Ambient Temperature: -40°C. (-40°F.) to +55°C. (+131°F.).

Transportable Altitude: 40,000 feet.

Operable Altitude: 10,000 feet.

Operable Relative Humidity: 95% maximum.

MANUFACTURERS' OR CONTRACTORS' DATA:

Industrial Television Incorporated, Clifton, New Jersey; Type Number IT-120T, Navy Contract NOas-52-693-i.

TUBE COMPLEMENT:

2 JAN-OA2, 3 JAN-1N69, 1 JAN-1Z2, 5 JAN-12AT7, 1-3WP1 (KRT Display), 1 JAN-5718, 1 JAN-5725, 1 JAN-5726, 2 JAN-5763, 8 JAN-5814, 2 JAN-6AH6.

REFERENCE DATA AND LITERATURE:

AN 16-30USM25-2 (Service Instructions).

SHIPPING DATA:

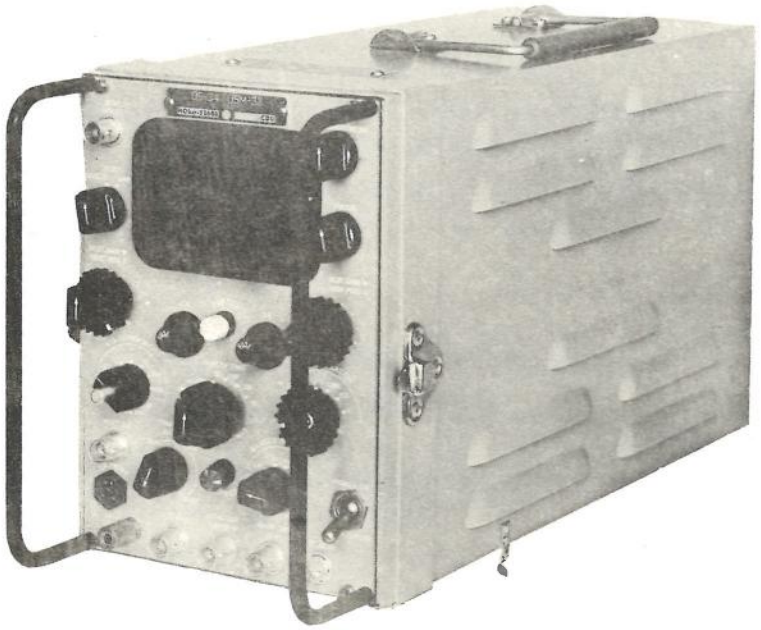
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

OSCILLOSCOPE AN/USM-25A and/or AN/USM-25B

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-25A, B		7CAC-611135-55				
	Including:						
1	Oscilloscope OS-4A/AP			11-1/8	17-1/2	9	35
1	CY-1094/AP (with AN/USM-25A only)						
1	Test Prod MX-1537/AP			2-1/2 long		3/4 dia.	
1	Test Prod MX-1539/AP			2-1/2 long		3/4 dia.	
1	Test Lead CG-1099/USM-25A			43 long			
1	RF Cable Assy. CG-530/U			96 long			
1	RF Cable Assy. CG-530/U			37 long			
1	Power Electrical Cable Assy. CX-2454/U			72 long			
1	Crystal Bliley Elec. Co. Type BH-8(81.94KC)			2-3/8 x 1-3/4 dia.			
1	Mounting MT-1292/USM-25B (with AN/USM-25B only)						
1	Accessories Case CY-1456/ USM-25A						

OSCILLOSCOPE AN/USM-32



FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment used primarily to observe electrical waveforms during the testing and maintenance of radar and related equipment. Means are provided to measure both the time duration and instantaneous amplitude of observed pulses. Results are presented on a cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to the DuMont 301A.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The AN/USM-32 utilizes conventional deflection and synchronization circuitry; it also embodies a sweep expansion circuit and a time calibration circuit. · Detector, attenuator, and cathode follower test prods are supplied with the oscilloscope to increase its versatility

Power Supply: 115 volts, AC, ±10%, 60 cycles per second ±5% or 400 cycles per second ±10%, single-phase, 110 watts.

	AIR FORCE	NAVY	ARMY
TYPE CLASS.		Standard	
STOCK NOS.		(ASO)R-16A-USM32DUM	
PROCUREM'T INFO.: Mil-0-15630			
PROCUREM'T COG.:		DESIGN COG.: USN	
F.I.I.N.: 6625-376-4943		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			AN/USM-32

ELECTROMECHANICAL DESCRIPTION: (Continued)

Vertical Deflection Circuit:

Deflection Factor: Amplifier (at full gain), 0.1 volt per inch; direct, 15 to 18 volts per inch.

Sinusoidal Frequency Response: 10 cycles per second to 4 megacycles per second (down not more than 2 decibels).

Transient Response: Rise time, 0.08 microsecond, overshoot less than 5%.

Maximum Input Voltage: 600 (DC plus peak AC).

Input Impedance: Amplifier, 1 megohm, 28 ±2 micromicrofarads for all positions of the VOLTS PER INCH switch; direct, 3 megohms, 30 micromicrofarads.

Input Attenuation: Factors of 0.3, 1, 3, 10, 30, and 100 volts per inch (VERT GAIN Control fully clockwise).

Positioning: 2-1/4 inches (±1-1/8 inches from center).

Signal Delay: 0.35 microsecond by built-in delay line.

Horizontal Deflection Circuit:

Circuit: Driven sweep employing vacuum tube time base generator.

Time Duration: Continuously variable from 10 to 200,000 microseconds.

Expansion: To twice full screen diameter (5 inches).

Positioning: Sufficient to permit examination of any full screen expanded portion.

Gating: Gate turns beam on during forward sweep only.

Synchronization: External, line, or vertical amplifier signals of either polarity; internal-selected by panel switch.

Vertical Signal (internal): Sweep triggers on 1/2 inch of vertical deflection (maximum sensitivity).

External (Signal Applied to SYNC Input):

Below 50 Cycles Per Second: Sweep triggers with 0.8 volt peak-to-peak, provided rise time of sync signal is equal to or less than that of a 5 cycle per second sine wave.

From 50 Cycles Per Second to 200 Kilocycles Per Second: Sweep triggers with 0.2 volt peak-to-peak.

From 200 Kilocycles Per Second to 2 Megacycles Per Second: Sweep triggers with 0.8 volt peak-to-peak.

Maximum Input Voltage: 600 volts (DC plus peak AC).

Input Attenuation: Factors of 1 or 15 as selected by synchronization selector switch.

Input Impedance: 1 megohm, 45 micromicrofarads (EX.): 1.5 megohms, 10 micromicrofarads (EX./15).

ELECTROMECHANICAL DESCRIPTION: (Continued)

Time Calibration Circuit (2 Axis):

Time Marker Generator:

Sensitivity: Sufficient to blank the beam with normal intensity settings.

Interval: 1, 10, 100, 1000, or 10 000 microseconds as selected.

Accuracy: ±5%.

Availability: MARKER OUT terminal, 120,000 ohms; also applied to cathode of CRT.

Polarity: Positive.

External Marker Input (Z-Input):

Sensitivity: 10 volts peak (positive) will blank beam with normal intensity settings.

Input Impedance: 1 megohm, 30 micromicrofarads.

Amplitude Calibration:

Availability: Calibration voltage may be applied to input of vertical amplifier by depressing front panel pushbutton; also available at CAL OUT terminal on front panel.

Waveshape: Clipped sine wave.

Frequency: Power line.

Amplitude: 0.6 volt peak-to-peak.

Trigger Generator:

Availability: +TRIG OUT Terminal; also available for sweep initiation at TRIG position of synchronization selector switch.

Duration: 1 to 2 microseconds (approximately).

Repetition Frequency: 45 cycles per second to 5.5 kilocycles per second (minimum range).

Amplitude: 100 volts ±30% into 5000 ohms shunted by 1500 micromicrofarads; 25 volts into 75 ohms (approximately).

Rise Time: 0.5 microsecond (maximum).

Cathode-Ray Tube:

Type: 3WP1.

Accelerating Potential: 1400 volts DC.

Screen Size: 2-1/4" x 2-1/2"

Test Prod (Cathode Follower) MX-1609/USM-32:

Input Impedance: 6 megohms, 10 micromicrofarads.

Gain: 0.7 (approximately).

Bandwidth: 10 cycles per second to 7 megacycles per second.

Input Voltage: 2 volts (maximum).

Test Prod (Attenuator) MS-1610/USM-32:

Input Impedance: 8 megohms, 8 micromicrofarads.

Passive Attenuation: 20:1, ±3% (VERT SIG terminal).

OSCILLOSCOPE AN/USM-32

ELECTROMECHANICAL DESCRIPTION: (Continued)

Input Voltage: 600 volts (DC plus peak AC) maximum.

Test Prod (Detector) MX-1604/USM-32:

Frequency Range: Carrier, 500 kilocycles per second to 400 megacycles per second; demodulation, 0 to 15 kilocycles per second.

Response: Audio frequency response ±6 decibels from 1 kilocycle per second value at any carrier frequency in the operating range.

Input Impedance: 20,000 ohms (minimum), 7 micromicrofarads at 1 megacycle per second.

Inverse Peak Voltage (on crystal): 125 volts.

MANUFACTURERS' OR CONTRACTORS' DATA:

Allen B. DuMont Laboratories, Inc., Clifton, New Jersey; Contract No. NObsr-52688 dated 27 June 1951.

TUBE COMPLEMENT:

1 1Z2, 1 3WP1, 3 6AN5WA, 3 6AU6WA, 2 6X4W, 6 12AT7WA, 1 5651 WA, 1 5702 WA, 1 5726/6AL5W, 3 5654/6AK5W, 3 5814A, 2 1N70.

REFERENCE DATA AND LITERATURE:

NAVSHIPS 92257.

SHIPPING DATA:

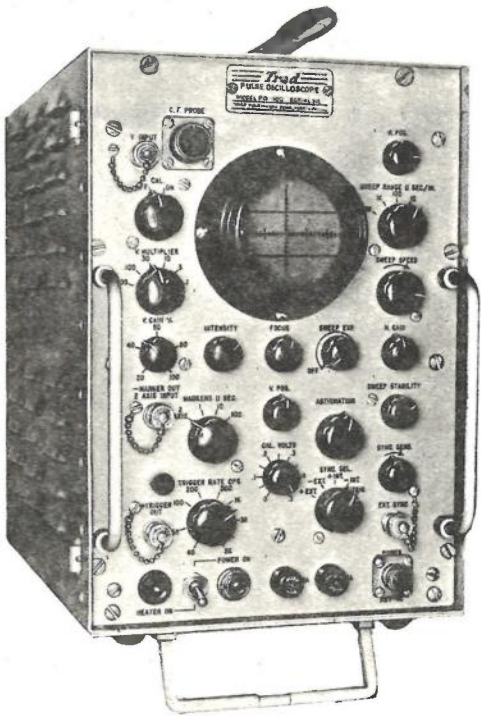
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope AN/USM-32	2.7	11	17	25	46

OSCILLOSCOPE AN/USM-32

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-32	metal					
1	Oscilloscope OS-34/USM-32			6-5/8	9-3/8	15-1/2	17
1	Oscilloscope Cover CW-337/USM-32			3-5/8	6	8-1/6	1
1	Test Prod (Cathode Follower) MX-1609/USM-32						
1	Test Prod (Attenuator) MX-1610/USM-32						
1	Test Prod (Detector) MX-1604/USM-32						
1	Resistor Assembly MX-1605/USM-32						
2	Adapter Connector UG-1090/U						
1	RF Cable Assembly CG-530/U			6 long			
1	RF Cable Assembly CG-530/U			4 long			
2	Fuse, 2 amp, type 3AG (spares)						
2	Indicator Lamp						
2	Instruction Book						

OSCILLOSCOPE AN/USM-38



FUNCTIONAL DESCRIPTION:

A portable, general purpose unit used to test and maintain radar equipment. The unit provides for visual observation of amplitude, duration, and shape of electrical waveforms. Test results are indicated on a cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

The equipment is equivalent to Oscilloscope Trad PO-400.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The oscilloscope consists of a cathode-ray tube, attenuators, amplifiers, specialized circuits, and external coupling devices. The chassis assembly basically includes the power supply, a wiring harness, printed wiring assemblies, and tubes.

Power Supply: 115 volts, AC, 50 to 400 cycles per second, single-phase.

Sine-Wave Response: Flat within 3 decibels from 10 cycles per second to 6 megacycles per second.

Transient Response: 0.06 microsecond rise.

Square Wave Response: Less than 10% tilt for 50-cycles per second square wave.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:	Spec Ships-0-1518		
PROCUREM'T COG.:	USN	DESIGN COG.:	NAVY
F.I.I.N.: 6625-643-3336		FUNCTIONAL CLASS. NO.:	3.2
	- Electronics Test Equipment -		AN/USM-38

ELECTROMECHANICAL DESCRIPTION: (Continued)

Polarity: Positive for upward deflection, negative for downward deflection.

Input Impedance:

V-INPUT: 1 megohm paralleled by 35 micromicrofarads.

With External Adapter: 75 ohms.

With 10 to 1 Attenuator Probe: 10 megohms paralleled by 15 micromicrofarads.

With Detector Probe: 20,000 ohms paralleled by 7 micromicrofarads.

CF PROBE with Cathode Follower Probe: 8 megohms paralleled by 10 micromicrofarads.

V-DIRECT: 3.9 megohms paralleled by 20 micromicrofarads.

H-DIRECT: 3.9 megohms paralleled by 20 micromicrofarads.

+ EXT SYNC: 1.5 megohms paralleled by 25 micromicrofarads.

- EXT SYNC: 1.5 megohms paralleled by 75 micromicrofarads.

AXIS INPUT (Two): 680 ohms paralleled by 20 micromicrofarads.

Output Voltages:

- MARKER OUT: 3 volts peak, 5.7 kilohms minimum load impedance.

+ TRIGGER OUT: 100 volts peak, 2000 ohms maximum internal impedance.

Sweep Time: 1 to 100,000 microseconds per inch continuously adjustable.

Sweep Circuit: Triggered or periodic.

Calibration: 0 to 1 volt peak-to-peak line frequency flat-topped wave for calibrating signal amplifier.

Timing Markers: Synchronized with sweep and available at intervals of 1, 10, and 100 microseconds.

Trigger Pulse Output: 100 volt peak, 1.5 microsecond pulse, with 0.5 microsecond rise time; repetition rate continuously variable from 40 to 5000 times per second.

Sweep Delay and Expansion: Any 10% of trace may be expanded by a factor of 9.

Input Sensitivity and Voltage Limits:

	Signal Volts		Total Peak Volts
	Minimum	Maximum	
V INPUT	0.1 rms	150 rms	600
V INPUT with Attenuator Probe	1 rms	500 peak	500
V INPUT with Detector Probe		125 peak	500
CF PROBE with Cathode-Follower Probe	0.5 rms	5 rms	500
V DIRECT	50 peak		500

ELECTROMECHANICAL DESCRIPTION: (Continued)

	Signal Volts		Total Peak Volts
	Minimum	Maximum	
H DIRECT	75 peak		500
EXT SYNC	0.05 peak	100 peak	500
EXT SYNC with Attenuator Probe	0.05 peak	500 peak	500
Z-AXIS INPUT	1.0 peak	50 peak	No DC

MANUFACTURERS' OR CONTRACTORS' DATA:

Trad Electronics Corporation, 1001 First Avenue, Asbury Park, New Jersey; Contract No. NObsr 59445; approximate cost per unit, $750.00.

TUBE COMPLEMENT:

7 6H6, 5 5814A, 2 12BY7, 1 3WPI, 6 12AT7WA, 2 5726, 2 OA2WA, 1 6X4W, 1 5R4WGB, 1 1Z2, 1 5718.

REFERENCE DATA AND LITERATURE:

NAVSHIPS 92671.

SHIPPING DATA:

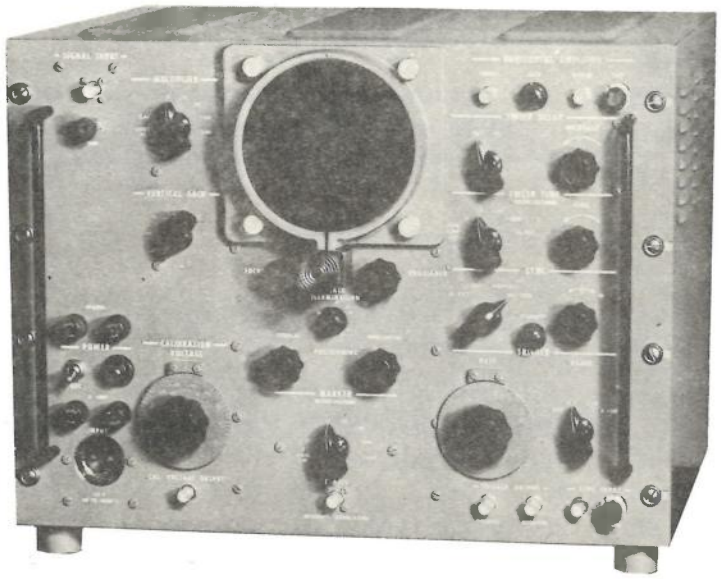
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Oscilloscope AN/USM-38					

OSCILLOSCOPE AN/USM-38

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches) H	W	D	Weight (Lbs.)
1	Oscilloscope AN/USM-38	alum-inum					
1	Oscilloscope OS-57/USM-38			9	13	15-1/8	36
1	Power Cable CX-3304/U			8'			10 oz.
1	R-F Cable W901			4'			4-1/2 oz
1	R-F Cable W801			5-1/2'			6-1/2 oz
1	Detector Probe MX-1815/ USM-38			6"			2-1/2 oz
1	C-F Probe MX-1816/USM-38			6"			10 oz.
1	Attenuator Probe MX-1817/ USM-38			6"			5-1/2 oz
1	Dummy load DA-113/U			1-11/16 x 1-1/8 dia.			1 oz.
1	Oscilloscope Cover CW-376/USM-38			9-5/16	13-13/32	3	1 oz.
2	Connector Adapter UG-282A/U			1-1/4"			1 oz.
1	Set, Spare Parts						

OSCILLOSCOPE AN/USM-50



FUNCTIONAL DESCRIPTION:

A portable general purpose test instrument used for circuit phenomena observation and testing radar and communications equipment. Positioning controls permit the trace to be located without distortion anywhere on the face of the three-inch cathode ray tube. A high impedance probe is included for measuring high impedance circuits. Sine waves which vary from 3 cycles per second to 20 megacycles per second may be observed. May be installed in a standard rack or as a portable bench test set when mounted in its dust cover.

RELATIONSHIP TO OTHER EQUIPMENT:

This equipment is similar to the Lavoie type No. LA-239C.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Conventional circuitry is used throughout. Highly regulated power supplies maintain accuracy and constant operation under varying line conditions or surges.

Power Supply: 110 to 130 volts, AC, 50 to 1000 cycles per second, single-phase,

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.: USA		DESIGN COG.: USA, ORD C	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			AN/USM-50

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE AN/USM-50

ELECTROMECHANICAL DESCRIPTION: (Continued)

295 watts. (Fused at 4 amperes.)

Input Impedance, Vertical and Horizontal:

Oscilloscope alone: 1 megohm paralleled by 40 micromicrofarads.

Oscilloscope with probe: 10 megohms paralleled by 12 micromicrofarads.

Frequency Characteristics:

Sine waves observable: 10 cycles per second to 20 megacycles per second.

Transients observable: minimum rise time of 0.022 microsecond, maximum square pulse duration of 30,000 microseconds, positive or negative polarity.

Input Voltage:

Oscilloscope alone: 0.03 to 90 volts peak.

With probe: 0.3 to 450 volts peak.

Input Sensitivity: 10 millivolts per centimeter rms.

Sweep Time: Continuously adjustable from 0.17 to 37,500 microseconds per inch. Start-stop or recurrent circuit, each sweep started by signal pulses independent of preceding pulse. Any portion of sweep nominally over 10 microseconds may be delayed and expanded about 10 times.

Timing Markers: Synchronized with sweep, 0.2, 1, 5, 20, 100, 500, and 2000 microseconds. Markers are also available through Z-axis jack as 15-volt pulses.

Calibration Voltage: Internally generated 1 kilocycle per second square wave, continuously adjustable from 20 to 200 millivolts. Constant 40 volts output available for external use.

External Sync: Without probe, ±0.05 volt to ±45 volts; with probe, ±0.5 volt to ±450 volts.

Trigger Pulse Output: ±25 volts, 1.5 microsecond pulses continuously variable from 10 to 10,000 cycles per second, rise time of 0.15 microsecond.

Sawtooth Voltage Output: ±150 volts, duration varied by adjusting sweep time.

Accelerating Potential: 4000 volts.

External Connections:

To Vertical Plate: Through 0.1 microfarad, approximately 45 volts per inch sensitivity.

To Horizontal Amplifier: Through potentiometer, 3 to 200 volts per inch. Bandwidth 10 to 750,000 cycles per second at maximum sensitivity.

To Cathode of Cathode Ray Tube: Through 0.01 microfarad (Z-axis, maximum peak 75 volts).

Trace Presentation: Automatic cutoff of amplitudes exceeding 4 centimeters, so that there is no visable lag or overshoot to vertical positioning. Standard scale pattern area is 3 by 6 centimeters, indexed in 2-millimeter and 1-centimeter increments.

MANUFACTURERS' OR CONTRACTORS' DATA:

Lavoie Laboratories, Matawan-Freehold Road, Morganville, New Jersey; Approximate Cost per Unit, $1250.00.

OSCILLOSCOPE AN/USM-50

TUBE COMPLEMENT:

3 JAN-6AL5, 1 JAN-6AS6, 4 JAN-6AU6, 11 JAN-6CB6, 7 JAN-12AT7, 3 JAN-12AU7, 5 JAN-12B4, 1 JAN-12BH7, 4 JAN-12BY7, 2 JAN-5642, 2 JAN-5651, 1 JAN-6080.

REFERENCE DATA AND LITERATURE:

Manufacturer's Operation and Service Manual.

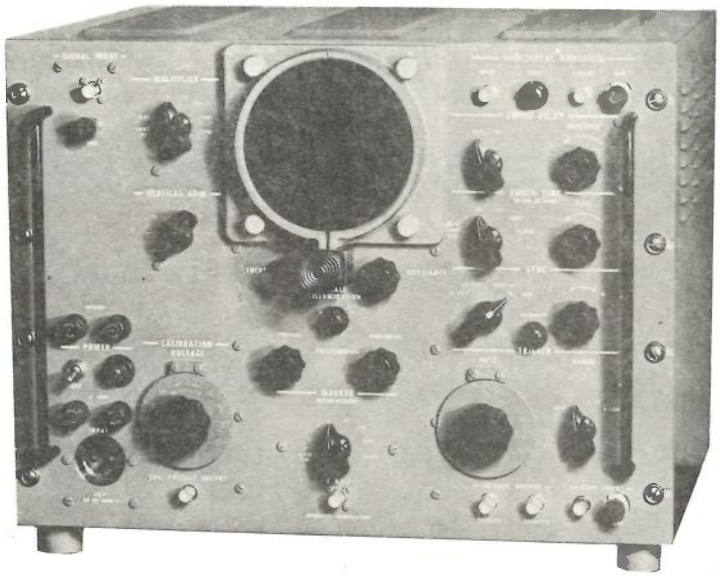
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-50			15-1/4	19-1/2	16-3/4	65
1	Power Cable			72 long			
1	Probe Assembly						

OSCILLOSCOPE AN/USM-50B



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument designed to present visual indications of instantaneous values and variations of electrical phenomena. Test results are indicated on the screen of a 3-inch cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

The AN/USM-50B is similar to the AN/USM-50A except for minor circuit changes and maintenance parts.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The sweep circuit is triggered and includes a polarity reversing switch. The instrument incorporates such special features as internal voltage calibration, a calibrated attenuator, and a reflecting nonparallax scale.
Power Supply: 110 to 120 volts, AC, 50 to 1000 cycles per second, single-phase.
Sweep Duration: 0.17 to 37,500 microseconds.
Sweep Amplitude: 25 volts.
Marker Intervals: 0.2, 1, 5, 20, 100, 500, 2000 microseconds.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: USA, ORDC	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		AN/USM-50B

OSCILLOSCOPE AN/USM-50B

ELECTROMECHANICAL DESCRIPTION: (Continued)

Vertical Sensitivity:
Through Amplifier: 0.013 volt rms per inch.
Direct to Plates: 4.2 volts rms per inch.

Horizontal Sensitivity:
Through Amplifier: 0.5 volt rms per inch.
Direct to Plates: 6.0 volts rms per inch.

Y-Axis:
Frequency Response: 10 cycles per second to 750 kilocycles per second.
Input Impedance: 1 megohm.

X-Axis:
Frequency Response: 5 cycles per second to 15 megacycles per second.
Input Impedance: 1 megohm.

Z-Axis:
Frequency Response: 10 cycles per second to 5 megacycles per second.
Input Impedance: 1 megohm.

MANUFACTURERS' OR CONTRACTORS' DATA:

Lavoie Laboratories, Inc., Matawan-Freehold Road, Morganville, New Jersey; Contract No. 36048-Phila-57-56(31); approximate unit cost, $1,250.00.

TUBE COMPLEMENT:

NI

REFERENCE DATA AND LITERATURE:

AN/USM-50B: SC Form 567.
AN/USM-50A: Manufacturer's Operation and Service Manual.
SC Form 567.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Oscilloscope AN/USM-50B					

OSCILLOSCOPE AN/USM-50B

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope AN/USM-50B	metal		19-1/2	16-3/4	15-1/4	65
1	Oscilloscope OS-62A/USM-50						
1	Accessory Cover						
1	Cable			40 long			
1	Probe						
4	Adapter Connector UG-255/U						
4	Adapter Connector UG-273/U						
2	Adapter Connector UG-274A/U						
2	Adapter Connector UG-914/U						
4	Adapter Connector UG-924/U						

OSCILLOSCOPE AN/USM-105(V)

FUNCTIONAL DESCRIPTION:

A general purpose equipment used to study electrical phenomena. The response of the instrument permits the examination of pulse type signals encountered in radar, television, nucleonics and guidance systems. Calibration square wave, sweep sawtooth and gate voltages are provided at binding posts located on the front panel of the instrument. Signals are observed on a 5-inch cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

The AN/USM-105(V) is similar to the Hewlett-Packard 150A with High Gain Amplifier Hewlett-Packard 151A.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 or 230 volts, AC, ±10%, 50 to 60 cycles per second, 650 watts.
Vertical Amplifier:

Frequency Response: DC to 10 megacycles per second.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		AN/USM-105(V)

OSCILLOSCOPE AN/USM-105(V)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Rise Time: 0.035 microsecond.

Signal Delay: 0.25 microsecond.

Horizontal Amplifier:

Frequency Response: DC to 500 kilocycles per second.

Sensitivity: 0.2 to 15 volts per centimeter in 5 calibrated ranges.

Sweep Magnification: 5, 10, 50 or 100 times; any 10 centimeter portion of magnified sweep may be viewed.

Sweep Generator:

Range: 0.02 microsecond to 15 seconds per centimeter.

Calibration: 24 calibrated sweeps in 1, 2, 5 and 10 sequence, 0.1 microsecond to 5 seconds per centimeter.

Accuracy of Calibrated Sweeps: ±3%.

Triggering: Internally or with line voltage, and externally with 0.5 volt or more.

Trigger Point: Any positive or negative level on positive or negative slope of signal triggering sweep, +30 to -30 volt range for external trigger.

Amplitude Calibrator:

Output: 1 kilocycle per second square wave.

Amplitude: 0.2 millivolt to 100 volts peak to peak in 18 steps. Calibrated in 2, 5, 10 sequence.

Rise Time: Less than 1 microsecond.

Decay Time: Less than 1 microsecond.

Accuracy: ±3%.

Sawtooth Output: -20 to +20 volts.

Gate Output: +20 volts signal for duration of sweep.

Intensity Modulation: 20 volts positive signal blanks cathode-ray tube at normal intensity.

Cathode-Ray Tube: 5 AMP mono-accelerator flat face.

Cathode-Ray Tube Accelerating Potential: 5000 volts.

Probe Impedance: 10 megohms.

Probe Capacity: 10 micromicrofarads.

151A High Gain Amplifier:

Sensitivity Range: 5 millivolts to 50 volts per centimeter.

Input Attenuator: 12 calibrated ranges in 0.5, 1, 2 and 5 sequence for 5 millivolts to 20 volts per centimeter. Vernier permits continuous adjustment between ranges and extension of the sensitivity range to 50 volts per centimeter.

Input Impedance: 1 megohm shunted by 50 micromicrofarads.

OSCILLOSCOPE AN/USM-105(V)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Pass Band: DC to 10 megacycles per second.
Rise Time: 0.035 microsecond.
Coupling: AC or DC.

MANUFACTURERS' OR CONTRACTORS' DATA:

Hewlett-Packard Company, 275 Page Mill Road, Palo Alto, California; approximate cost per unit, $1300.00.

TUBE COMPLEMENT:

NI

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog.

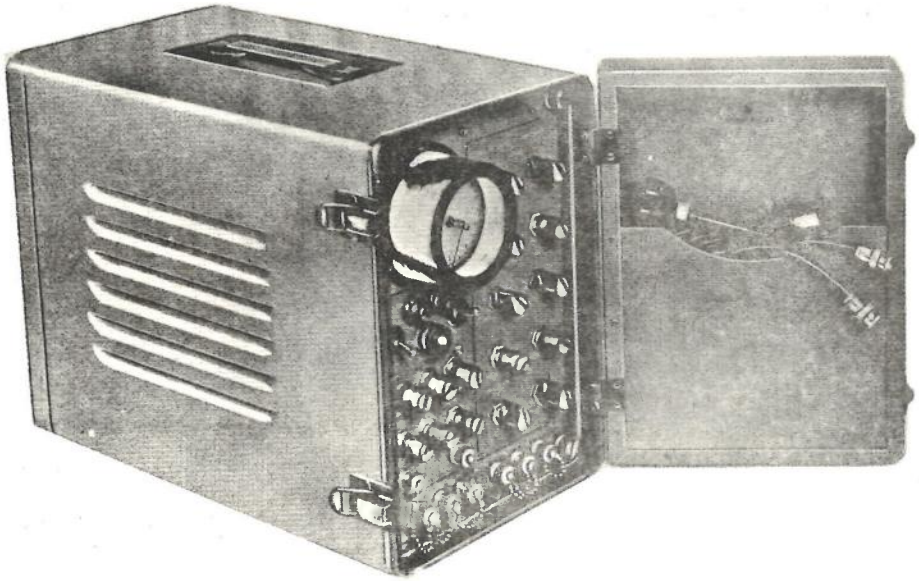
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope	metal		17-1/4	13-1/2	25	83
1	High Gain Amplifier Hewlett-Packard 151A						
2	Low Capacity Probes Hewlett-Packard AC-21A						
2	BNC Binding Post Adapters Hewlett-Packard AC-76A						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Oscilloscope					125
	High Gain Amplifier Hewlett-Packard 151A					9

OSCILLOSCOPE-RANGE CALIBRATOR OS-7/U



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument used to provide a means of calibrating the range and marker circuits of radar equipments which use a 2000-yard radar mile. The unit is also adaptable for use as a conventional oscilloscope or as a synchroscope. Test results are indicated on a cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

OS-7/U is similar in function to A and J Oscilloscope Navy 60ACZ and 60ACZ-1, and Oscilloscope TS-239/UP, OS-4/U, and OS-5/U. The OS-7/U supersedes Oscilloscope 60ACZ and 60ACZ-1. The OS-7/U is superseded in range calibration functions by Range Calibrator TS-573/UP.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 110 volts, AC, ±10%, 50 to 1600 cycles per second, 150 watts.
Frequency (Crystal Oscillator): 163.934 kilocycles per second ±0.01% maximum.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: USN	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			OS-7/U

OSCILLOSCOPE-RANGE CALIBRATOR OS-7/U

ELECTROMECHANICAL DESCRIPTION: (Continued)

Sweeps:
- Circular, J and X Length: 1000 yards per revolution, ±0.01%.
- Lighting-Gate Delay: 700 to 100,000 yards.
- Lighting-Gate Width: 700 to 1100 yards.
- Linear A and R (Length): 1000, 60,000, and 400,000 yards, ±5%
- Linear A (Delay): 700 to 100,000 yards (not used with 400,000-yard sweep)

Deflection:
- Factor: 150 volts per inch.
- Polarity:
  - J and X Sweep: Forward for positive signal.
  - A and R Sweep: Forward for positive signal.
- Main Video Input: Upward for positive signal.
- Auxiliary Video Input: Downward for positive signal.
- Input Impedance: 1 megohm, minimum.

Video Amplifier:
- Voltage Gain: 30.
- Sine Wave Response: ±3 decibels from 200 cycles per second to 3 megacycles per second.
- Polarity: Opposite to direct deflection.
- Input Impedance: 1 megohm.

Internal Trigger:
- Output Amplitude: +100 volts or -70 volts minimum.
- Duration: 1 microsecond.
- Rise Time: 400 volts per microsecond.
- Repetition Rate: 59 to 1600 pulses per second.
- Output Impedance: 1000 ohms.

Range Markers: 1000 and 10,000 yards.
- Amplitude: +2 volts.
- Duration: 0.5 microsecond maximum at 70% peak amplitude.
- Output Impedance: 10 ohms.

Externally Triggered Operation:
- Trigger Input Amplitude: 20 to 100 volts.
- Duration: 0.25 to 20 microseconds.
- Rise Time: 5 volts per microsecond.
- Repetition Rate: 1000 yard Sweep: 2000 pulses per second maximum in 1000-yard sweep; 1370 pulses per second maximum in 60,000-yard sweep; 205 pulses per second maximum in 400,000-yard sweep.
- Input Impedance: 10,000 ohms.

MANUFACTURERS' OR CONTRACTORS' DATA:

Raytheon Manufacturing Company, Waltham, Massachusetts, Contract No. NObsr-39329.

OSCILLOSCOPE-RANGE CALIBRATOR OS-7/U

TUBE COMPLEMENT:
1 12AU7, 1 12AT7, 1 6AN5, 1 6V6GT, 1 2X2A, 1 5Z4, 1 3DP1A.

REFERENCE DATA AND LITERATURE:
Instruction Book.

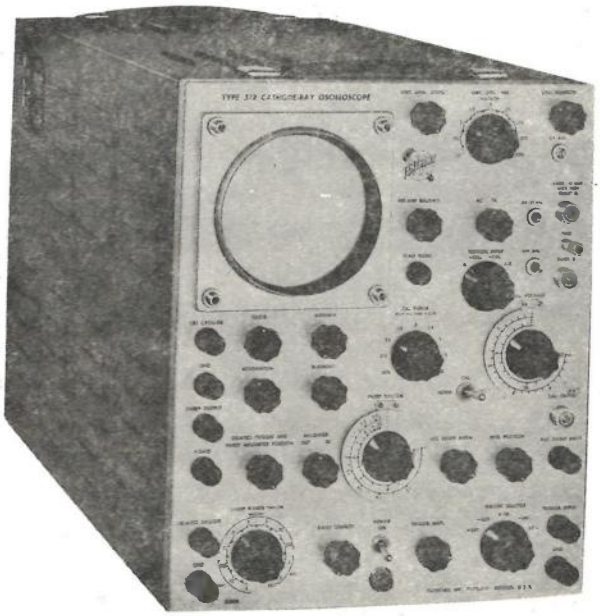
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope Range Calibrator OS-7/U	aluminum	F16-Q-192558-200(USN)	12	9-1/8	18-3/8	39-1/4
1	Test Lead W-1			84 long			
1	Test Lead W-2			39-1/2 long			
1	Test Lead W-3			39-1/2 long			
2	Test Lead W-4			39-1/2 long			
1	Cord CX-237/U						
1	Allen Wrench (for No. 6 set screw)						
1	Wrench (for No. 4 set screw)						
2	Instruction Book						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope-Range Calibrator OS-7/U	5.42	19	17	29	80

OSCILLOSCOPE OS-48/U



FUNCTIONAL DESCRIPTION:

A portable, general purpose, laboratory instrument for use in studies where comparatively slow recurring phenomena must be observed. A square wave calibrating voltage, a gate, delayed trigger, and a sweep saw tooth voltage are available through jacks on the front panel.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Tektronix type 512 Cathode Ray Oscilloscope.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: A high-gain, direct-coupled, wideband vertical amplifier provides for observation of an extremely wide range of waveforms. The amplifier is divided into two sections: a preamplifier and an output amplifier, each having two push-pull stages. For observation of only the AC components, a switch on the front panel permits optional insertion of coupling capacitors. A differential amplifier permits either single ended or push-pull input and provides a ready means of mixing two signals without interaction or frequency discrimination. A screen-coupled phanastron sweep circuit is followed by a direct-coupled push-pull linear amplifier. A trigger selector switch enables the sweep to be triggered from an external source or by the signal being observed. It thus permits the ob-

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611138-7		
PROCUREM'T INFO.:			
PROCUREM'T COG.: USA		DESIGN COG.: USA, Ord	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			OS-48/U

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE OS-48/U

ELECTROMECHANICAL DESCRIPTION: (Continued)

servation of a randomly occurring phenomenon or a single pulse.

Power Supply: 105 to 125 or 210 to 250 volts, AC, 50 to 60 cycles per second, single-phase, 280 watts.

Sweep Time: Continuously variable from 0.3 second per cm to 3 microseconds per cm in ten calibrated ranges. Calibration accuracy ±5%. Sweep may be synchronized with frequencies of 1 mc or higher or with the power line frequency.

Magnification: Any desired 20% of the sweep can be spread over the entire trace.

External Sweep Input: Furnished by a DC coupled amplifier and controlled by a 100,000 ohm potentiometer. 1.5 volts per cm maximum sensitivity.

Trigger Requirements: Triggers from signals being observed which produce deflection of 5 mm or greater. External triggers may be of either polarity, pulses or sine waves 0.5 volt or larger, and of 1 microsecond or longer duration.

Vertical Deflection Sensitivity (peak-to-peak):

Direct to plate: 5 volts per cm.

Via Amplifier: 5 millivolts per cm to 50 volts per cm.

Sensitivity reduced by a factor of 10 when probe is used.

Input Impedance: 1 megohm shunted by 45 micromicrofarads with probe, 10 megohms shunted by 14 micromicrofarads.

Vertical Amplifier Response:

For sensitivities of 0.15 volt per cm or lower:

Bandwidth: DC to 2 megacycles per second.

Rise Time: 0.2 microsecond.

For sensitivities between 5 millivolts per cm and 0.15 volt per cm:

Bandwidth: DC to 1 megacycle per second.

Rise Time: 0.4 microsecond.

Calibrating Voltage: 1 kilocycle square wave; nine ranges, 5 millivolts to 50 volts full scale; accuracy ±2% of full scale.

Waveforms Available Externally:

Sweep saw tooth, 100 volts peak.

Delay trigger, 75 volts peak.

Positive gate, 150 volts peak.

One kilocycle square wave calibrating signal, 0 to 50 volts peak.

Connection to CRT Cathode: Through a 0.1 microfarad capacitor. RC=0.01 second.

Accelerating Voltage on Cathode Ray Tube: 3000 volts.

Time Marker Input: Through an isolating state to the video amplifier. Minimum marker amplitude, 8 volts.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix, Inc., 712 S.E. Hawthorne Blvd., Portland 14, Oregon; Army Contract No. DA-04-495-ORD-355; Approximate Cost per Unit, $950.00.

TUBE COMPLEMENT:

9 JAN-6AU6, 2 JAN-6J6, 1 JAN-6BH6, 9 JAN-12AU7, 1 JAN-12AT7, 1 JAN-6AL5, 2 JAN-6AK6, 6 JAN-12AU6, 2 JAN-6AG7, 4 JAN-6W4GT, 2 JAN-1B3GT, 1 JAN-6AQ5, 1 JAN-5651, 1 JAN-6AS7G, 1 JAN-6X4, 1 JAN-5CPA.

OSCILLOSCOPE OS-48/U

REFERENCE DATA AND LITERATURE:

SHIPPING DATA:

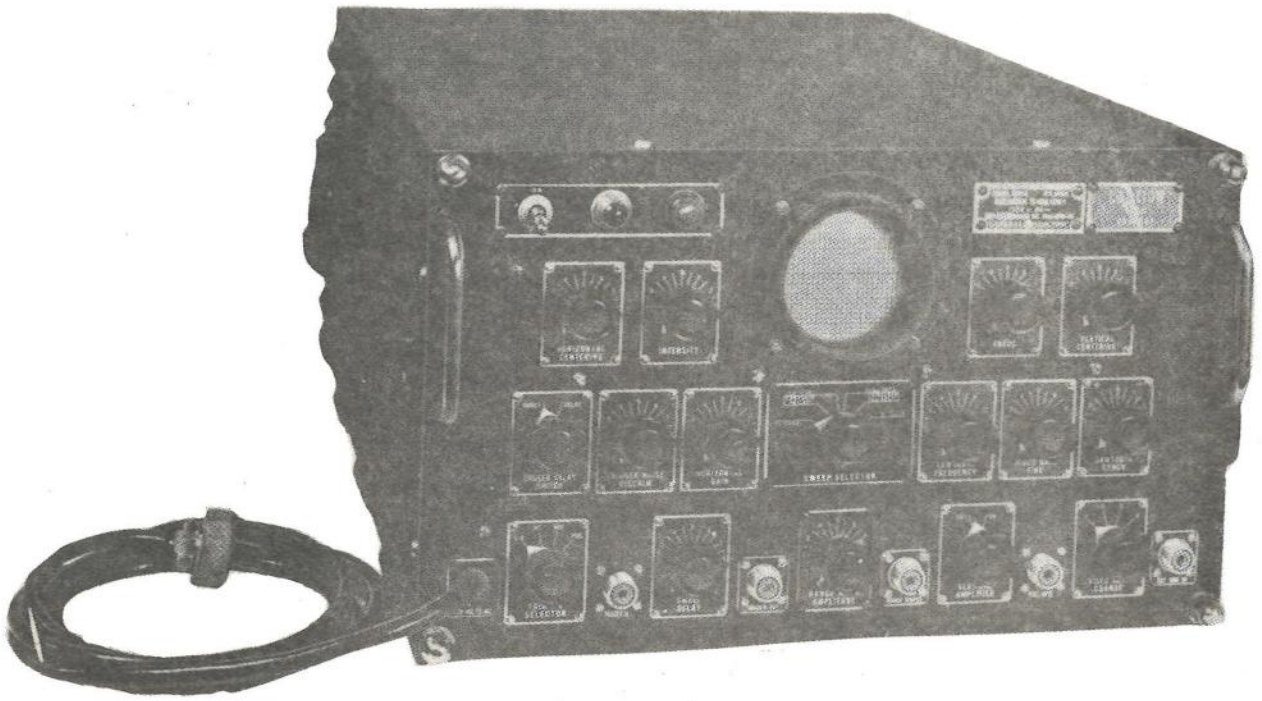
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope OS-48/U	3.6	19-5/16	15-1/8	25-3/4	73

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope OS-48/U	Aluminum	7CAC-611138-7	15-1/2	12-1/2	21-1/2	53

OSCILLOSCOPE TS-198A/CPM-4

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A general purpose, portable test instrument used to observe and measure audio or low radio frequency voltage wave shapes. Indications are given on a 3-inch cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Oscilloscope TS-198A/CPM-4 is a modified version of TS-198/CPM-4. The modification consists principally of the addition of an input circuit which permits the display of externally supplied range marks on the cathode ray tube. Also the sweep duration times are changed and the double binding-post "Trigger In", "Trigger Out", "Vert Input", and "Ex. Hor. In" jacks are removed.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The input signal either goes through the video amplifier or direct to the vertical deflecting plates of the cathode ray tube (switch controlled) depending on the amplitude of the incoming signal.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611135		3F4325-198A
PROCUREM'T INFO.:			
PROCUREM'T COG.: USAF		DESIGN COG.: USAF, Rome	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			TS-198A/CPM-4

OSCILLOSCOPE TS-198A/CPM-4

ELECTROMECHANICAL DESCRIPTION: (Continued)

The sweep selector switch selects either the Triggered Sweep Chain or the Sweep Generator. The triggered sweep chain with its delay circuit and resulting fast sweep permits very narrow pulses to be observed. The sweep generator is a conventional sawtooth generator which supplies a voltage that increases linearly with time and repeats this cycle periodically. This circuit operates independently and applies a sweep directly to the horizontal plates of the cathode ray tube.

Power Supply: 120 volts, AC, 60 cycles per second, single phase, 190 watts.

Sawtooth Sweep Frequency Range: Variable from 50 to 1250 cycles per second in two steps. 50 to 250 cycles per second, 250 to 1250 cycles per second.

Input Voltage and Sensitivity: With the vertical amplifier in and with full video gain, sensitivity is 0.4 volt per inch deflection. With vertical amplifier out, sensitivity is approximately 160 volts per inch.

Sine Waves Observable: 25 to 5000 cycles per second.

Pulse and Square Waves Observable: With a duration of 1 microsecond to 40,000 microseconds, positive or negative polarity.

Input and Output Impedances: The following impedances are measured directly across the receptacles as follows: Vert Input, infinite; Trigger In, infinite; Trigger Out, 470 ohms; Ex. Hor. In, infinite.

Synchronizing Voltage: The triggered sweep requires 15 to 100 volts input. The sawtooth sweep is internally synchronized.

Triggered Sweeps: 5 microseconds, 70 microseconds, 250 microseconds.

Trigger Sweep Delay: Minimum is 3/4 microsecond; maximum is 2600 microseconds.

Temperature Range: -40° F. to $+135^{\circ}$ F.

Humidity: Will operate to 95% humidity.

MANUFACTURERS' OR CONTRACTORS' DATA:

General Electric Company, Schenectady, New York; G. E. Dwg. No. XRS83733; Approximate Cost per Unit, $1774.30, 7 January 1952.

TUBE COMPLEMENT:

1 JAN-3B24, 1 JAN-3BP1, 1 JAN-5U4G, 2 JAN-6AC7, 2 JAN-6AG7, 6 JAN-6SN7GT, 2 JAN-6H6, 1 JAN-884, 1 JAN-0D3/VR-150, 2 JAN-0C3/VR-105.

REFERENCE DATA AND LITERATURE:

AN 16-35TS198-3 (Maintenance Instructions).

TO 16-55-200 (Spare Parts List).

OSCILLOSCOPE TS-198A/CPM-4

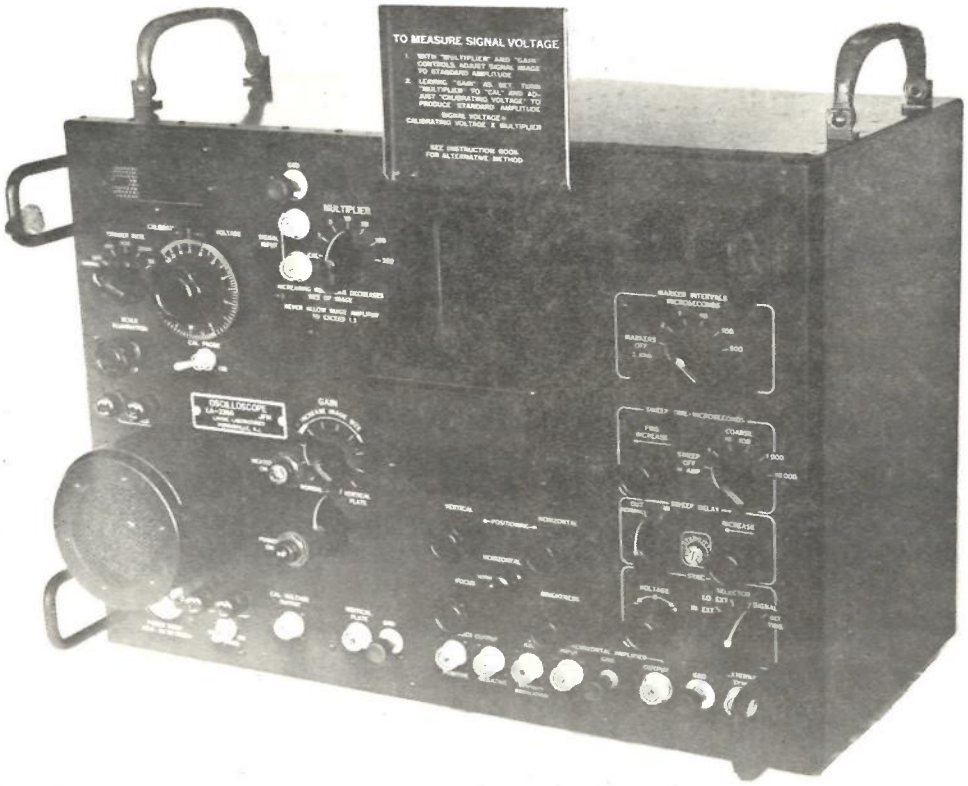
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope TS-198A/CPM-4	Steel	7CAC-611135 3F4325-198	10	16	25	130
1	Cable W4101			48 long			0.6
1	Cable W4102			72 long			0.7
1	Cable W4103			72 long			0.8
1	Cable W4104			48 long			0.5
1	Transport Case			11-3/4	19-1/4	26	39.5

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope TS-198A/CPM-4 (Domestic Packed without Case and Cables)		12	18	26	150

OSCILLOSCOPE TS-239/UP



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument for bench testing all types of radar and communication equipment. Displays a luminous plot of time-varying voltage pulse or wave on a three-inch cathode ray tube. Sine waves from 10 cycles to 5 mega-cycles per second are observable.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to TS-239A/UP except the "A" has a negative trigger output and a 5000 pulse per second trigger rate. Superseded by Oscilloscope AN/USM-24 series which is smaller and lighter and is contained in a combination case.

Voltage Divider TS-89/AP or similar device may be used to extend range above 450 volts.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 ±10 volts, AC, 50 to 1600 cycles per second, single phase, 210 watts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Limited Standard		
STOCK NOS.	7CAC-612120	16-O-78387-9251	3F4325-239
PROCUREM'T INFO.:	Navy Spec. No. 1602 (RE); Dwg. No. 16-O-5(Aer)		
PROCUREM'T COG.:	Navy	DESIGN COG.:	Navy, BuShips
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.2
	- Electronics Test Equipment -		TS-239/UP

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE TS-239/UP

ELECTROMECHANICAL DESCRIPTION: (Continued)

Input Impedance: 300,000 ohms paralleled by 30 micromicrofarads. With probe, 3 megohms paralled by 12 micromicrofarads.

Nominal Signal Input: (For image of standard amplitude of 0.6 inches), (a) Oscilloscope alone: 0.1 to 100 volts peak; (b) With Probe MX-607/AP: 1 to 450 volts peak; (c) With Voltage Divider TS-89/AP (not furnished): 200 to 20,000 volts.

Output: (a) Trigger pulse +25 volts, 4 microsecond duration, occurring 300,800, or 2,000 times per second, rising from 10 to 90 percent of full amplitude within 1/2 microsecond; (b) Sawtooth voltage +150, available through 100,000 ohms in series with 50,000 micromicrofarads.

Frequency Range: 1 cycle to 3 megacycles per second. Response drops 0.3 decibel at each end-point.

Pulses: Displays pulses from about 0.2 to 5,000 microseconds. Contains an internally generated square wave of 150 cycles per second, adjustable from 0.1 to 1 volt applied to input of signal amplifier. Also a 75 volt square wave to calibrate plate deflections, horizontal amplifier and probe; also for external use.

Sensitivity: A signal of 0.1 volt produces standard deflection with maximum amplification.

Controls: All controls and connections on front panel. A six step internal multiplier extends voltage range 300 times. A continuously adjustable gain control increases the range by six times. This 1800 to 1 change in sensitivity does not affect the input impedance of 300,000 ohms.

Sweep Time: Continuously adjustable from 0.5 to 50,000 microseconds per inch. Start-stop, each sweep started by signal pulses independent of preceding. Any portion of sweeps nominally over 10 microseconds may be delayed and expanded about ten times for detailed examination of signal.

Timing Markers: Synchronized with sweep and available at intervals of 0.2, 1, 10, 100 and 500 microseconds.

Accelerating Potential: Minimum, 3000 volts.

Rise Time: 0.08 microseconds.

Polarity: Postive or negative.

Probe: Input impedance may be increased by ten times at expense of a ten to one reduction in sensitivity by use of the probe. Use of probe also increases the voltage range to 450.

Auxiliary Features: (a) A calibrating voltage generator permits measurement of instantaneous signal voltages without recourse to any outside standard; (b) a timing marker generator furnishing a choice of five time scales; (c) a trigger generator producing pulses for triggering external circuits and also the oscilloscope at three different rates; (d) self-contained means for measuring duration and instantaneous magnitude of signal; (e) self-contained means for timing and voltage calibration.

Ambient Temperature: -40° to $+55^{\circ}$ C.

Humidity: About 95%.

Microwave Field: Practically no effect.

OSCILLOSCOPE TS-239/UP

MANUFACTURERS' OR CONTRACTORS' DATA:

Western Electric Company, New York, New York; Contract No. NXsa97713; Ident. X-66558A; April 1947.

Lavoie Laboratories, Morganville, New Jersey; Contract No. NOa(s)8804; Ident. LL-1350; Approximate Cost per Unit, $2,275.00 (1947).

TUBE COMPLEMENT:

3 JAN-6AK5, 2 JAN-6AG7, 2 JAN-6C4, 8 JAN-7F8, 1 JAN-6AL5, 2 JAN-6SN7W, 1 JAN-0C3/VR105, 1 JAN-3JP1, 2 JAN-6X5GT/G, 1 JAN-5R4GY.

REFERENCE DATA AND LITERATURE:

AN 16-35TS239-3 (Handbook of Operations and Maintenance Instructions).

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope, TS-239/UP, and accessories.	7.64	30	20	22	150

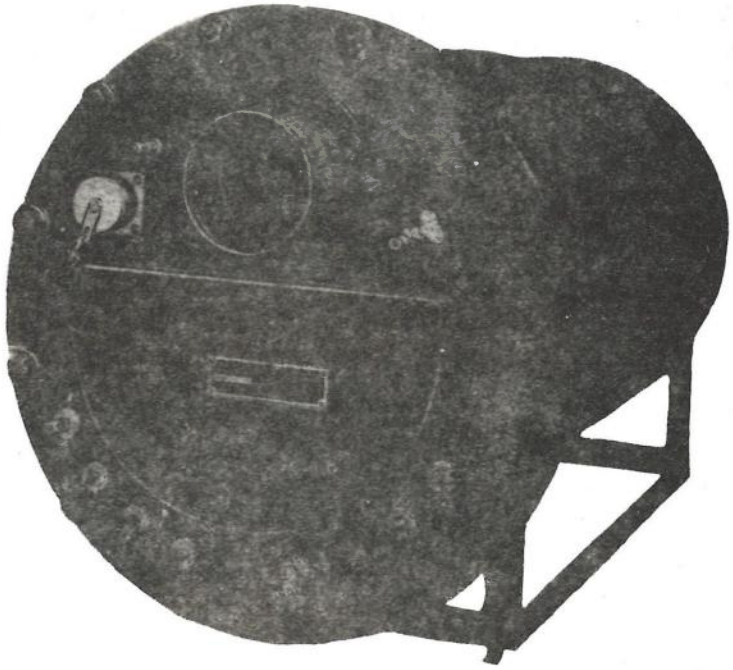
OSCILLOSCOPE TS-239/UP

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope TS-239/UP		7CAC-612120 16-O-78387-9251 3F4325-239	21-1/2	16-1/2	13-1/2	63
2	Probe Assembly MX-607/AP		N17-L-63352-9310 3F3155-1	52	1-1/4 (max. dia.)		1
2	Cable Assembly RF, CG-332/U		7CLL-LA441077 N16-C-11945-2866 1F430-332.96	96			11/16
1	Power Cord CX-337/U		7CAC-170264-86 N17-C-48226-2021 3E6000-337-72	72 long			8/16
1	Adapter M-358 (NT-49199)		8850-106900 N17-C-68722-3539 2Z299-358	1-15/16	1-1/4	3/4	1/8
4	Adapter NT-491429		3300-286051074 N17-C-71415-6447 2Z303-23	1-7/8	2-3/32 O.D.		5/16
3	Adapter UG-255/U		8850-108880 N17-C-67989-1323 2Z308-255	1-3/8	5/8 O.D.		3/16
3	Adapter UG-273/U		8850-102000 N17-C-67988-5260 2Z308-273	1-3/8	3/4 O.D.		3/16
1	Transit Case CY-573/UP	Wood and Alum.	7CAC-176572-53 N16-C-170001-248 2Z1891-573	25-1/2	19	16-3/4	24
						Total:	90

OSCILLOSCOPE TS-262A/TPS-10

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A special purpose, portable, test scope for viewing wave forms on Radar Set AN/TPS-10A. It serves as an IFF indicator, as a radar A-scope during tuning and as a test oscilloscope for trouble shooting. Indications are made on a three-inch electrostatic deflection type cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: A trigger switch selects either RHI (range, height, and azimuth) of IFF high voltage positive pulses. With "Delay" switch ON the pulses will go through the delay circuits; with switch OFF, the pulses will go directly to the horizontal sweep circuit. The horizontal sweep circuit consists of a trigger amplifier, gate multivibrator, sweep generator, and inverter amplifier. The sweep generator produces a linear sawtooth wave corresponding in time with the negative output gate from the gate multivibrator. The wave is applied to one

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-612165		3F4325-262A
PROCUREM'T INFO.:			
PROCUREM'T COG.: USAF		DESIGN COG.: USAF, Rome	
F.I.I.N.:		FUNCTIONAL CLASS, NO.: 3.2	
	- Electronics Test Equipment -		TS-262A/TPS-10

ELECTROMECHANICAL DESCRIPTION: (Continued)

horizontal deflecting plate of the cathode ray tube, to the inverter amplifier and to the Sawtooth Output Jack. The inverter amplifier produces an inverted sawtooth that is applied to the other horizontal deflecting plate of the cathode ray tube. Signals to be viewed are applied to the upper vertical deflecting plate through the video amplifier, or directly to the lower vertical deflecting plate. Range marks are applied to the lower plate. An intensifying gate, coincidental with the horizontal sweep, is applied to the grid of the cathode ray tube. DC restorers are used in the sweep circuit to maintain both sawtooth waves at a constant base level.

Power Supply: 115 volts, AC, 400 cycles per second, capable of furnishing 150 watts.

Frequency Range: 100 to 1100 kilocycles per second.

Sweep Times: 10 microseconds corresponding to 1 mile. 100 microseconds corresponding to 10 miles. 700 microseconds corresponding to 70 miles.

Signal Range, Input: 1 to 5 volts.

Input Impedance: As "A" scope, 470,000 ohms in shunt with 50 micromicrofarads; for IFF signal, 100,000 ohms.

Output Impedance: Sawtooth, 500 ohms; delay trigger, 500 ohms.

Sensitivity: 3/4" deflection for 1 volt input into the video amplifier; 1" deflection for 130 volt input directly to plates.

Temperature Range: -40° F. to $+120^{\circ}$ F.

MANUFACTURERS' OR CONTRACTORS' DATA:

Zenith Radio Corporation, 6001 Dickens Avenue, Chicago 39, Illinois; Order No. 5000-DAY-45.

TUBE COMPLEMENT:

7 JAN-6SN7GT, 2 JAN-6AC7Y, 1 JAN-5R4GY, 1 JAN-3B24W, 1 JAN-6L6GAY, 1 JAN-3BP1A, 1 JAN-0D3/BR-150.

REFERENCE DATA AND LITERATURE:

TO 16-55-341 (Spare Parts List).

TO 16-35TS262-3 (Maintenance Instructions).

SHIPPING DATA:

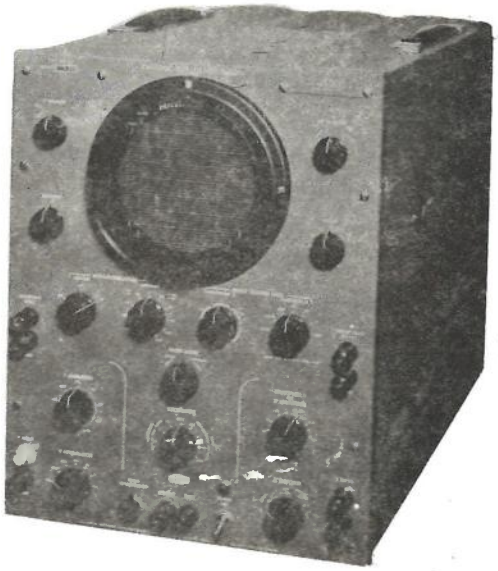
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

OSCILLOSCOPE TS-262A/TPS-10

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope TS-262A/TPS-10	Alum-inum	7CAC-612165 3F4325-262A	27-1/2	13-3/4 dia.		70

SYNCHROSCOPE
Part No. 303-AH
(Allen B. DuMont Laboratories)



FUNCTIONAL DESCRIPTION:

This is a portable, general purpose, test instrument designed to be used in the study of pulses and other high frequency phenomena. Provision is made for time and voltage measurements by means of substitution. Internally generated voltage standards and time interval wave trains may be applied to the screen by means of a front panel selector.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The circuit is of the conventional type incorporating a high-gain vertical amplifier system with a signal delay line. The delay is to assure the initiation of the sweep before the signal is applied to the vertical deflection plates. A BNC coaxial connector for Y-input is provided on the panel. A negative sweep-gate output connector on the panel permits the instrument to be operated in synchronism with external equipment. The display tube uses a metallized screen to obtain maximum light output. A calibrated scale with controlled variable intensity illumination is mounted in front of the tube screen.

Power Supply: 115 or 230 volts, AC, 50 to 60 cycles per second, single-phase.

Y-Axis:

Deflection Through Amplifier:

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		DuMont 303-AH

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

SYNCHROSCOPE
Part No. 303-AH
(Allen B. DuMont Laboratories)

ELECTROMECHANICAL DESCRIPTION: (Continued)

At 3000 volts, 0.1 pp (0.035 rms) volt/inch.
At 7000 volts, 0.14 pp (0.05 rms) volt/inch.
At 10,000 volts, 0.16 pp (0.057 rms) volt/inch.

Deflection Direct To Plates:

At 3000 volts, 28 pp (10 rms) volts/inch.
At 7000 volts, 40 pp (14 rms) volts/inch.
At 10,000 volts, 46 pp (16 rms) volts/inch.

Sinusoidal Frequency Response: Down not more than 30% from 10 cycles per second to 10 megacycles per second, with no positive slope above 10 kilocycles.

Pulse Response: Will not degrade a rise time of 0.01 microsecond, or less, to more than 0.033 microsecond.

Undistorted Deflection (unidirectional signals):

At 3000 volts, 1.5 inches.
At 7000 volts, 1.05 inches.
At 10,000 volts, 0.95 inch.

Input Impedance:

Through amplifier: 2 megohms, 40 micromicrofarads.
Direct (balanced): 7.8 megohms, 10 micromicrofarads.
Direct (unbalanced): 3.9 megohms, 10 micromicrofarads.

Maximum Input: 600 volts, DC plus peak AC.

X-Axis:

Deflection Through Amplifier:

At 3000 volts, 0.35 pp (0.12 rms) volt/inch.
At 7000 volts, 0.5 pp (0.18 rms) volt/inch.
At 10,000 volts, 0.6 pp (0.21 rms) volt/inch.

Undistorted Deflection:

At 3000 volts, 4.25 inches.
At 7000 volts, 3.6 inches.
At 10,000 volts, 3 inches.

Sinusoidal Frequency Response: Uniform within 30% to 700 kilocycles, flat to DC.

Input Impedance: 2.2 megohms, 40 micromicrofarads.

Linear Time Base: Driven and recurrent sweeps are continuously variable in duration from 0.1 second to 2 microseconds.

Sweep Expansion: To 6 times.

Sweep Writing Rate:

At 3000 volts, 10 inches/microsecond.
At 7000 volts, 7 inches/ microsecond.
At 10,000 volts, 6 inches/microsecond.

SYNCHROSCOPE
Part No. 303-AH
(Allen B. DuMont Laboratories)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Synchronization: From internal or external signal, or from internally supplied voltage of powerline frequency. Synchronization is possible from sine wave signals of frequencies as high as 20 megacycles per second.

Voltage Calibration: Square waves of 0.1, 1, 10 or 100 volts amplitude may be substituted for the signal under study.
Accuracy: ±5%.

Time Calibration: Damped oscillations indicating intervals of 0.1, 1, 10, or 100 microseconds may be substituted for the signal under study.
Accuracy: ±3%.

Intensity Modulation: Positive polarity decreases intensity. Fifteen volts blanks the beam at normal intensity settings.

Negative Gate Output: Negative gate of not less than 50 volts amplitude is provided at a front panel binding post.
Output Impedance: Less than 1000 ohms.

MANUFACTURERS' OR CONTRACTORS' DATA:

Allen B. DuMont Laboratories, Inc., 760 Bloomfield Avenue, Clifton, New Jersey.

TUBE COMPLEMENT:

1 JAN-1X2A, 1 JAN-5U4G, 2 JAN-5Y3GT, 1 JAN-5XP-AM, 9 JAN-6AH6V, 2 JAN-6AL5, 2 JAN-6AQ5, 1 JAN-6AU6, 1 JAN-6C4, 4 JAN-6J6, 2 JAN-6X4, 1 JAN 12AT7, 4 JAN-12AU7, 1 JAN-OB2, 2 JAN-5763, 2 JAN-5642, 1 JAN-6BQ6GT.

REFERENCE DATA AND LITERATURE:

Manufacturer's Data Sheet.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

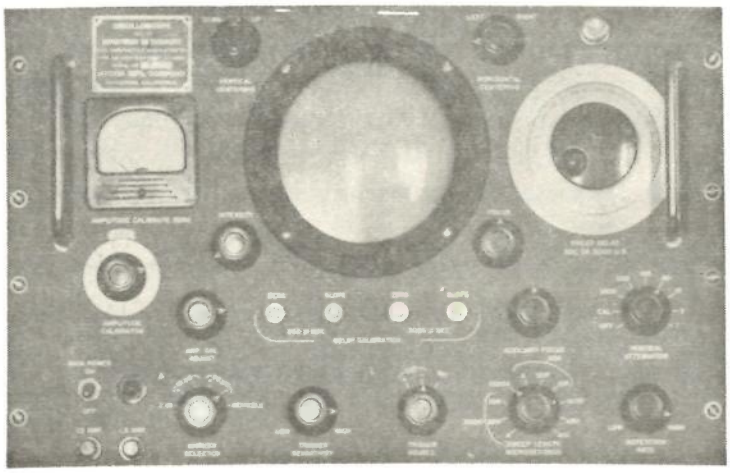
SYNCHROSCOPE
Part No. 303-AH
(Allen B. DuMont Laboratories)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Synchroscope (DuMont 303-AH)			16	12-1/8	19-3/4	84

CATHODE RAY OSCILLOSCOPE
CAA MODEL NO. CA-2521
(Hycon Mfg. Company)

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose, test instrument used to check the range accuracy of Distance Measuring Equipment and to provide accurate crystal controlled markers and expanded, delayed and undelayed sweeps. It also is used in making voltage and time measurements on waveforms having amplitudes between 50 millivolts and 1000 volts and durations between 0.1 and 3000 microseconds. Provision is made for either internal or external triggering. Indications are viewed on a five inch cathode ray tube. Designed to be rack mounted.

RELATIONSHIP TO OTHER EQUIPMENT:

Used to test Radar Set AN/APN-34.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Standard oscilloscope circuitry with provision for both an "A" and an "R" sweep. The "A" sweep being the trace which starts simultaneously with the initiating trigger pulse and the "R" sweep being an expanded and delayed

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		Model CA-2521

CATHODE RAY OSCILLOSCOPE
CAA MODEL NO. CA-2521
(Hycon Mfg. Company)

ELECTROMECHANICAL DESCRIPTION: (Continued)

portion of the "A" sweep. A marker generator circuit, consisting of a crystal oscillator, 10 microsecond marker generator and a 50 microsecond marker generator, furnishes marker pulses spaced 10 and 50 microseconds apart for intensity modulation of the cathode ray tube. A signal generator circuit provides a square wave with a frequency of approximate 1450 cycles per second, of known amplitude to make possible comparison measurements of the amplitude of an input signal. The amplitude of the square wave is dial controlled and variable from 0.1 volt to 1.0 volt in steps of 0.1; it may be read directly with an accuracy of ±2%.

Power Supply: 115 volts ±5%, 230 volts ±5%, AC, single phase, 60 cycles per second, 250 watts.

"A" Sweeps: 3000, 1000, 300, 100, 30 and 10 microseconds.

"R" Sweeps: 30 and 10 microseconds, which may be delayed to display any portion of the 3000 or 300 microsecond sweeps, except that portion from 0 to 10 microseconds. The delay is read on a dial with an accuracy of at least 0.25% of full scale on the 3000 and 300 microsecond range.

Sweep Speed for Each Sweep:

Sweep	Sweep Speed
10 μs	2.5 μs/in
30 μs	7.5 μs/in
100 μs	25.0 μs/in
300 μs	75.0 μs/in
1000 μs	250.0 μs/in
3000 μs	750.0 μs/in

Internal Trigger Operation:

Trigger Output: Positive: 100 volts peak.
Negative: 100 volts peak.

Trigger Rise Time: 0.25 microseconds.

Trigger Duration: 1 microsecond.

Trigger Repetition Rate: 10 to 200 on the 1000 and 3000 microsecond sweeps, 10 to 2000 on the 10, 30, 100, and 300 microsecond sweeps. Crystal controlled time markers of either polarity with spacings of 10 or 50 microseconds may be selected by the marker selector switch (first 50 microsecond marker appears at 40 microseconds and each successive one, 50 microseconds later).

Marker Time Rise: 0.25 microseconds.

Marker Duration Time: 1 microsecond.

Marker Timing Accuracy: ±0.02%.

External Trigger Operation:

Trigger Input: ±7.5 volts minimum and ±100 volts maximum at 100 volts per microsecond rise for accurate timing. A trigger amplifier makes operation independent of waveform so that an input trigger rise of 10 volts per micro-

(Continued)

CATHODE RAY OSCILLOSCOPE
CAA MODEL NO. CA-2521
(Hycon Mfg. Company)

ELECTROMECHANICAL DESCRIPTION: (Continued)

second will trigger the sweep, but the instrument must be recalibrated. Repetition rate of 200 maximum on the 3000 microsecond scale and 2000 on the 300 microsecond scale.

Intensity Modulation: Intensity modulation input available in Z-IN position of Marker Selector Switch.

Vertical Deflection:

Direct: Deflection factor: 65 DC volts per inch.

Polarity: Positive signal voltage deflects upward.

Maximum signal input: 1000 volts peak.

Vertical Amplifier:

Stepped Attenuator: 1000:1; 300:1; 100:1; 30:1; 10:1; 3:1; 1:1; Resistance Capacitor compensated.

Input Impedance: 1.5 megohms shunted by 20 micromicrofarads.

Gain: 300.

Frequency Response: 21 cycles per second to 4 megacylces per second, flat within 3 decibels.

Pulse Response: A 2.5 microsecond pulse will have less than 0.1 microsecond increased rise time. The top of a 60 cycle square wave will be flat within 5%.

Overload Input: Approximately 1 volt peak to peak.

Deflection: Minimum deflection 1 inch for 0.25 volts peak to peak signal.

Polarity: Positive signal voltage deflects upward.

Crystal: Secondary standard, 100 kilocycles ±0.005% at 20° C.

MANUFACTURERS' OR CONTRACTORS' DATA:

Hycon Manufacturing Company, 2961 East Colorado Street, Pasadena, California; Approximate Cost per Unit, $885.17, 1 November 1950; Order No. AF(33-038)51-4190. PR No. 103832.

TUBE COMPLEMENT:

12-12AU7, 1-12AX7, 3-6AL5, 1-12AT7, 1-5CP1 or 5CP1-A, 1-5R4GY, 2-2X2A, 1-6AC7, 1-6AG7, 1-1614.

REFERENCE DATA AND LITERATURE:

Instruction Book (Manufacturer) dated 30 June 1950.

SHIPPING DATA:

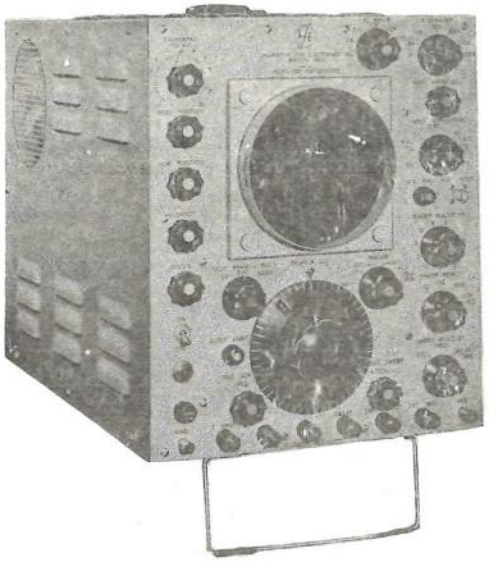
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

CATHODE RAY OSCILLOSCOPE
CAA MODEL NO. CA-2521
(Hycon Mfg. Company)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Cathode Ray Oscilloscope CAA Model CA-2521	Alum-inum alloy		12-1/4	19	16-3/4	130

SYNCHROSCOPE
Part No. 401
(Laboratory for Electronics, Inc.)



FUNCTIONAL DESCRIPTION:

This is a portable, high gain, wide band, general purpose instrument designed to be used for measuring high and low speed electrical phenomena when testing radar and communications equipment.

Applications include the examination of pulse waveforms, transients, and conventional signals. The display indicator is a five-inch cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The synchroscope contains standard oscilloscope circuitry with a wide range of driven and recurrent sweeps. Three triggers are available for external use: plus and minus triggers, and a plus delayed trigger whose delay range can be adjusted by the delay sweep dial on the panel to give an indication of time intervals. This delay sweep dial, which also controls the internal triggering, is a 10-turn control providing a continuously adjustable delay system which eliminates the need for time markers.

A delay line is included in the vertical deflection amplifier to delay the signal sufficiently to compensate for the inherent delay of the sweep circuits.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611160		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
		- Electronics Test Equipment -Lab. for Electronics 401	

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A

SYNCHROSCOPE
Part No. 401
(Laboratory for Electronics, Inc.)

ELECTROMECHANICAL DESCRIPTION: (Continued)

The control knobs are color coded and grouped according to circuit or channel. This permits the operator to locate, at a glance, the controls for the circuit or channel desired.

The colors and corresponding circuits are as follows:

Blue - Vertical Deflection Channel.
Green - Sweep Delay System.
Orange - Sweep and Trigger Channel.
Yellow - Vertical and Horizontal Positioning, Brightness, and Focus Adjustments.
White - Calibrating Voltage System.

Power Supply: 105 to 125 volts or 210 to 250 volts, AC, 50 to 60 cycles per second, single-phase, 400 watts.

Y-Axis Amplifier:

Deflection Sensitivity: 15 millivolts peak-to-peak per centimeter.
Frequency Response: DC to 10 megacycles per second (3 decibels point).
Transient Response: Rise time (10% to 90%) 0.035 microsecond.
Signal Delay: 0.25 microsecond.
Deflection: 3-inch visible deflection. (Vertical positioning control permits any part of a 5-inch deflection to be displayed without distortion.)
Input Impedance: Direct: 1 megohm, 30 micromicrofarads. Probe: 10 megohms, 10 micromicrofarads.
Attenuator: 1X, 10X, 100X, 1000 X.
Input Termination: Direct, 52, 72, or 93 ohms for AC or DC input.
Maximum Signal Input: 600 volts peak.

X-Axis:

Deflection Sensitivity: 3 volts peak-to-peak per centimeter.
Band Width: 10 cycles to 500 kilocycles per second.
Time Range: 0.01 sec/cm to 0.1 microsecond/cm; calibration accurate to within ±5 per cent.
Repetition Rate of Recurrent Sweep Triggers: 100 to 1000 cycles per second.
External Trigger Requirements: 0.5 volt to 100 volts peak-to-peak, either polarity.
Delayed Sweep:
Delayed Range: 5 to 5000 microseconds in three ranges.
Dial Scale: 500 divisions for ten turns. Lowest range calibration is 0.1 microsecond per division.
Calibrating Voltage: 60-cycle square wave, four ranges: 0.1, 1.0, 10, and 100 volts full scale.

Z-Axis Input: 15 peak volts will blank the beam at normal intensity settings.
Trigger Output: Positive or negative trigger or positive delayed trigger.
Cathode Ray Tube Diameter: Five inches.

SYNCHROSCOPE
Part No. 401
(Laboratory for Electronics, Inc.)

MANUFACTURERS' OR CONTRACTORS' DATA:

Laboratory for Electronics, Inc., 43 Leon Street, Boston, Massachusetts; Contract AF33(604)-9592; 29 November 1955; Approximate Cost per Unit, $695.00.

TUBE COMPLEMENT:

3 JAN-OD3, 2 JAN-1V2, 3 JAN-6AH6, 5 JAN-6AL5, 1 JAN-6AQ5, 1 JAN-6AS7-G, 3 JAN-6AX5, 4 JAN-6CB6, 1 JAN-6X4, 6 JAN-12AT7, 2 JAN-12AU7, 8 JAN-12AV7, 4 JAN-12AX7, 2 JAN-12BY7, 2 JAN-8-4 (ballast tube), 1 JAN-5YP.

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog "Model 401 Oscilloscope."

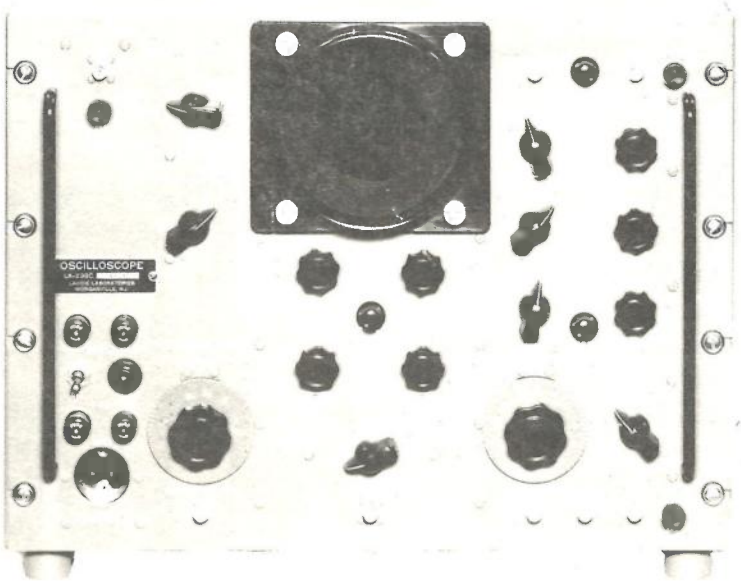
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Synchroscope (Lab. for Electronics 401)					80

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Synchroscope (Laboratory for Electronics 401)		7CAC-611160	15	12-1/2	19	55

OSCILLOSCOPE
Lavoie Type No. LA-239C



FUNCTIONAL DESCRIPTION:

A portable, general purpose test instrument used for circuit phenomena observation and testing radar and communications equipment. Positioning controls permit the trace to be located, without distortion, anywhere on the face of the three-inch cathode ray tube. A high impedance probe is included for measuring high impedance circuits. Sine waves which vary from 3 cycles to 20 megacycles may be observed. May be installed in a standard rack or as a portable bench test set when mounted in its dust cover.

RELATIONSHIP TO OTHER EQUIPMENT:

This equipment is similar to the AN/USM-50.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Conventional circuitry is used throughout. Highly regulated

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
- Electronics Test Equipment -			Lavoie LA-239C

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE
Lavoie Type No. LA-239C

ELECTROMECHANICAL DESCRIPTION: (Continued)

power supplied maintain accuracy and constant operation under varying line conditions or surges.

Power Supply: 110 to 130 volts, AC, 50 to 1000 cycles per second, single phase, 295 watts. (Fused at 4 amperes.)

Input Impedance, Vertical and Horizontal:

Oscilloscope alone: 1 megohm paralled by 40 micromicrofarads.

Oscilloscope with probe: 10 megohms paralleled by 12 micromicrofarads.

Frequency Characteristics:

Sine waves observable: 10 cycles to 20 megacycles per second.

Transients observable: minimum rise time of 0.022 microsecond, maximum square pulse duration of 30,000 microseconds, positive or negative polarity.

Input Voltage:

Oscilloscope alone: 0.03 to 90 volts peak.

With probe: 0.3 to 450 volts peak.

Input Sensitivity: 10 millivolts per centimeter rms.

Sweep Time: Continuously adjustable from 0.17 to 37,500 microseconds per inch. Start-stop or recurrent circuit, each sweep started by signal pulses independent of preceding pulse. Any portion of sweep nominally over 10 microseconds may be delayed and expanded about 10 times.

Timing Markers: Synchronized with sweep, 0.2, 1, 5, 20, 100, 500, and 2000 microseconds. Markers are also available through Z axis jack as 15-volt pulses.

Calibration Voltage: Internally generated 1 kilocycle square wave, continuously adjustable from 20 to 200 millivolts. Constant 40 volts output available for external use.

External Sync.: Without probe, ±0.05 to ±45 volts; with probe, ±0.5 to ±450 volts.

Trigger Pulse Output: ±25 volts, 1.5 microsecond pulses continuously variable from 10 to 10,000 cycles per second, rise time of 0.15 microsecond.

Sawtooth Voltage Output: ±150 volts, duration varied by adjusting sweep time.

Accelerating Potential: 4000 volts.

External Connections:

To Vertical Plate: Through 0.1 microfarad, approximately 45 volts per inch sensitivity.

To Horizontal Amplifier: Through potentiometer, 3 to 200 volts per inch. Bandwidth 10 to 750,000 cycles per second at maximum sensitivity.

To Cathode of CR Tube: Through 0.01 microfarad (Z axis, maximum peak 75 volts.)

Trace Presentation: Automatic cutoff of amplitudes exceeding 4 centimeters, so that there is no visible lag or overshoot to vertical positioning. Standard scale pattern area is 3 by 6 centimeters, indexed in 2 millimeter and 1 centimeter increments.

OSCILLOSCOPE
Lavoie Type No. LA-239C

MANUFACTURERS' OR CONTRACTORS' DATA:

Lavoie Laboratories, Morganville, New Jersey; Approximate Cost per Unit, $1250.00.

TUBE COMPLEMENT:

3 JAN-6AL5, 1 JAN-6AS6, 4 JAN-6AU6, 11 JAN-6CB6, 7 JAN-12AT7, 3 JAN-12AU7, 5 JAN-12B4, 1 JAN-12BH7, 4 JAN-12BY7, 2 JAN-5642, 2 JAN-5651, 1 JAN-6080.

REFERENCE DATA AND LITERATURE:

Manufacturers' Operation and Service Manual.

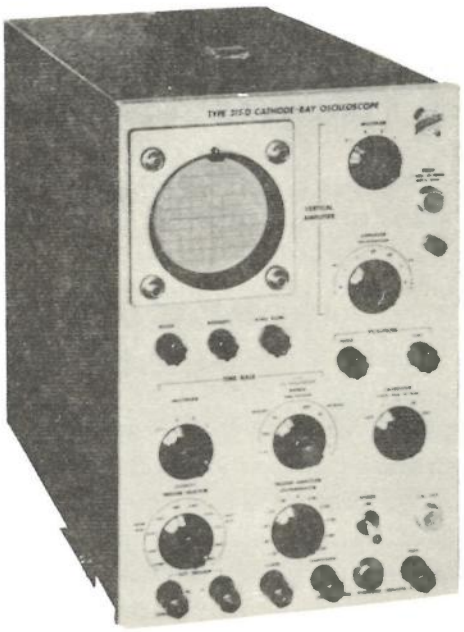
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope Lavoie LA-239C			15-1/4	19-1/2	16-3/4	65
1	Power Cable			72 long			
1	Probe Assembly						

OSCILLOSCOPE
Type 315D
(Tektronix, Incorporated)



FUNCTIONAL DESCRIPTION:

A compact, general purpose instrument designed for portability. It is used for circuit phenomena observation and testing of radar and communications equipment.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: This oscilloscope consists of nine basic circuits: (1) The Time Base Generator Channel which provides a linear time base by means of a Miller runup generator. (2) The Trigger Selector and Shaper Channel which triggers the oscilloscope internally and provides positive or negative pulses which can be used to initiate the operation of circuits whose output waveform is to be examined. The trigger generator is a bistable multivibrator for slow risetime trigger signals, and a cathode-coupled amplifier for fast risetime trigger signals. An internal triggering signal connection from the plate of the gain-control stage input tube to the trigger-selector circuits permits the sweep circuit to be triggered by the observed signal. (3) The Time Base Range and Multiplier Switch Detail which

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		Tektronix 315D

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U.S.A.

OSCILLOSCOPE
Type 315D
(Tektronix, Incorporated)

ELECTROMECHANICAL DESCRIPTION: (Continued)
controls the time per division and the gain of the amplifier. (4) The Time Base Amplifier Channel is a cathode-coupled phase inverter with a cathode-follower coupler to each deflection plate of the CRT. Use of the deflection plates increases the horizontal bandwidth by a factor of about three times. (5) The Vertical Preamplifier Channel is used only on the AC, 0.01 volt/division position. (6) The Vertical Amplifier which transmits the signal from the input jack to the CRT without appreciable change in waveform, but controls the amplitude. The output amplifier is a cathode coupled, grounded-grid, phase-inversion circuit. (7) The Calibration Channel which provides four square wave voltages available at a UHF coaxial fitting on the front panel, but not connected internally to the vertical amplifier. The source of the square wave voltage is a self-excited symmetrical AC coupled multivibrator operating at a PRF of about 1 kilocycle. (8) The Power Supply Channel which consists of four selenium full-wave bridge rectifiers and two unregulated voltage sources to provide all the necessary AC and DC voltages required for the operation of the oscilloscope from the power line voltages. (9) The High Voltage and CRT Channel which applies an accelerating voltage to the cathode of the CRT provides a means for trace calibration, and provides the controls for static adjustment. The accelerating voltage is obtained from an electronically regulated RF oscillator high-voltage supply.

Power Supply: 117 or 234 volts, ±10%, AC, 50 to 800 cycles per second, single-phase.

Frequency Range: DC to 5 megacycles per second.

Sweep Time: Continuously variable, 0.1 microsecond per division to 5 seconds per division; calibration accuracy ±5% or better. Sweep-time control, 10 to 1 continuously variable.

Vertical Amplifier Risetime: 0.07 microsecond.

Sensitivity:

AC: 0.01, 0.02, and 0.05 volt per division, 5 cycles per second to 5 megacycles per second.

DC and AC: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, and 50 volts per division.

Multiplier Control: 10 to 1 continuously variable.

Time Base Magnifier: 5 times at center.

Signal Delay: 0.25 microsecond.

Calibrating Voltage: 1 kilocycle square wave. Four fixed ranges, 0.1, 1, 10, and 100 volts peak-to-peak. Accuracy ±3%.

Trigger Amplitude Discriminator: -50, -40, -30, -20, -10, 0+10, +20, +30, +40, +50 volts.

Graticule: Quarter-inch divisions, 8 lines vertically, 10 lines horizontally.

Cathode Ray Tube: 3", flat-faced, high definition, 1.85 kilovolt accelerating potential.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix, Incorporated, 712 S. E. Hawthorne Boulevard, Portland 14, Oregon;

Approximate Cost per Unit. $770.00.

OSCILLOSCOPE
Type 315D
(Tektronix, Incorporated)

TUBE COMPLEMENT:
1 JAN-5651, 4 JAN-6AU6, 12 JAN-6BQ7, 2 JAN-6CL6, 4 JAN-12BY7, 2 JAN-12B4, 1 JAN-6AS5, 1 JAN-6080, 1 JAN-12AU7, 5 JAN-12AT7, 1 JAN-6AQ5, 2 JAN-5642, 2 JAN-6U8, 1 JAN-6AL5, 1 JAN-6AK6, 1 JAN-3WP2.

REFERENCE DATA AND LITERATURE:
Manufacturer's Catalog.

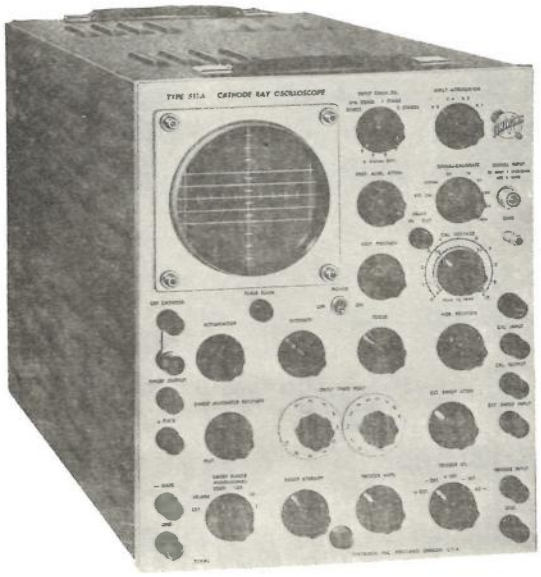
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope (Tektronix 315D) (Domestic Packed)					47

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope (Tektronix 315D)	Aluminum		12-3/8	8-5/8	18-1/4	36

CATHODE-RAY OSCILLOSCOPE
TYPE 511AD
(Tektronix, Incorporated)



FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment used for visual study of electrical phenomena. The oscilloscope is used at overhaul and repair activities. Results are indicated on a 5-inch cathode-ray tube. Time and amplitude calibrations, provided with the instrument, permit quantitative measurements to be made.

RELATIONSHIP TO OTHER EQUIPMENT:

The 511AD is similar to the 511A except for a 0.25 microsecond-delay network that is included in the 511AD. The 511A is no longer in production.

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 volts, AC, or 210 to 250 volts, 50 to 60 cycles per second, 240 watts.

Signals Observable: Sine waves, 10 cycles per second to 10 megacycles per second; pulses, 0.1 microsecond to 1/50 second.

Sweep Circuit: Either triggered or recurrent.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.:	Commercial
F.I.L.N.:		FUNCTIONAL CLASS. NO.:	3.2
	- Electronics Test Equipment -		Tektronix 511AD

CATHODE-RAY OSCILLOSCOPE TYPE 511AD

ELECTROMECHANICAL DESCRIPTION: (Continued)

Sweep Speeds: Continuously variable 0.1 second to 1 microsecond for a sweep length of 10 centimeters.

Trigger Requirements: 0.5 to 50 volts (peak) sine wave, or pulses as short as 0.05 microsecond.

Sweep Lag: 0.1 microsecond maximum.

Sweep Magnification: 5 times indicated sweep speed.

External Sweep Input: DC coupled via 100-kilohm potentiometer sweep amplifier; maximum deflection sensitivity 1.6 volts per centimeter.

Input Attenuator Ratios: 2, 4, and 8 multiplied 10 times by use of probe.

Vertical Deflection Sensitivity (Peak-to-Peak):

Without Amplifier: 25 volts per centimeter.

With 1 Stage: 2.5 volts per centimeter.

With 2 Stages: 0.25 volts per centimeter.

Input Impedance: 1 megohm shunted by 40 micromicrofarads; probe 10 megohms shunted by 14 micromicrofarads.

Vertical Amplifier Bandwidth:

1 Stage: 5 cycles per second to 10 megacycles per second.

2 Stages: 5 cycles per second to 8 megacycles per second.

Vertical Amplifier Transient Response:

1 Stage: 0.04 microsecond.

2 Stages: 0.05 microsecond.

Calibrating Voltage:

Line-Frequency Square-Wave Ranges: 0.3, 1, 3, 10, 30, and 100 volts peak-to-peak.

Accuracy: 3% of full scale.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix Incorporated, P. O. Box 831, Portland 7, Oregon; approximate unit cost, $845.00.

TUBE COMPLEMENT:

2 6AC7, 7 6AG7, 3 6AL5, 2 12AT7, 3 6C4, 1 6J6, 4 6AU6, 2 5V4G, 1 6AS7G, 1 5651, 2 6X4, 2 6AQ5, 2 1V2, 1 OD3, 1 5ABP.

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog.

SHIPPING DATA:

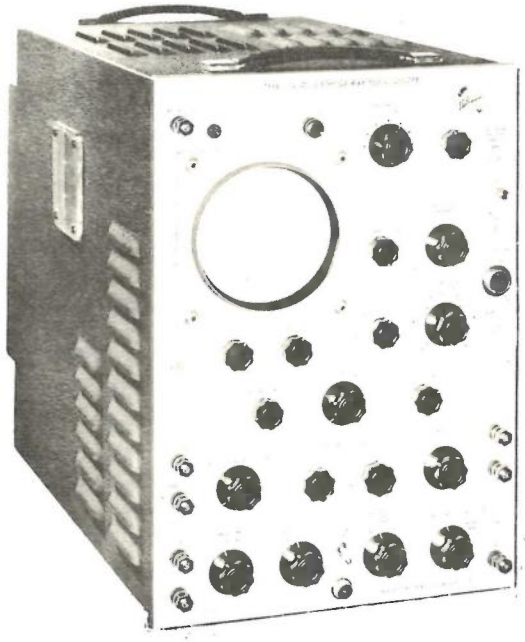
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Cathode-Ray Oscilloscope Tektronix 511AD					

CATHODE-RAY OSCILLOSCOPE TYPE 511AD

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Cathode-Ray Oscilloscope Tektronix 511AD	metal		15-15/16	12-7/8	21-7/8	55
1	Probe, R-C						

OSCILLOSCOPE
Type 513D
(Tektronix, Incorporated)



FUNCTIONAL DESCRIPTION:

A portable general purpose instrument used specifically for the study of short duration pulses. The cathode ray tube has a high writing rate, and it is useful when single high speed sweeps must be photographed. The following output waveforms are available: sweep saw tooth, gate, delayed gate, delayed trigger, 1 kilocycle calibrator square wave, trigger from internal rate generator.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Tektronix 513 except that the 0.25 microsecond delay has been omitted from the 513.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: A 4-stage type vertical amplifier is used which may be either directly or capacitively coupled. The vertical deflection sensitivity control inserts RC compensated attenuators, and also inserts the preamplifier stages in the two highest gain positions. A delay network provides a means of observing the front of a pulse which is being used to trigger the sweep. It delays the ap-

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611136-7		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
		- Electronics Test Equipment -	Tektronix 513D

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A

OSCILLOSCOPE
Type 513D
(Tektronix, Incorporated)

ELECTROMECHANICAL DESCRIPTION: (Continued)

pearance of the signal until the cathode ray tube is unblanked and the sweep is operating linearly. Amplitude calibration is accomplished by means of a comparison 1 kilocycle square wave whose amplitude is continuously variable. The calibrator voltage is also brought out to a binding post. A low capacity-low inductance connection can be made directly to the CRT deflection plates to permit observation of extremely high speed transients. The sweep circuit may be either triggered or recurrent. It may be triggered by a positive or negative external signal, by the positive or negative portion of the signal under observation, or it may be synchronized with the power line frequency. A built-in, free running, blocking oscillator is used as a trigger rate generator. The sweep may be synchronized with the sine waves of frequencies as high as 10 megacycles with pulses as short as 0.05 microsecond. An external sweep may be applied to the horizontal deflection plates via an attenuator and a two-stage direct coupled amplifier. Two signal input connections are provided so that two signals may easily be compared. All DC voltages are electronically regulated.

Power Supply: 105 to 125 or 210 to 250 volts, AC, 50 to 60 cycles per second, single-phase, 475 watts.

Internal Trigger Rate Generator: Five ranges from 200 to 5000 cycles per second.

Sweep Time: Continuously variable, 0.01 second per centimeter to 0.1 microsecond per centimeter of deflection; calibration accuracy ±5% or better.

Trigger Requirements: 0.5 to 50 volts (peak) sine wave, pulses as short as 0.05 microsecond, or signal under observation producing 0.5 centimeter deflection or more.

Sweep Lag: 0.1 microsecond, maximum.

Sweep Magnification: Any 20% of sweep, magnified 5 times.

External Sweep Input: Coupled via 100K potentiometer and 2-stage direct coupled sweep amplifier. Maximum deflection sensitivity, 1.6 volts per centimeter DC or peak-to-peak, AC.

AC Vertical Deflection Sensitivity: Continuously variable from 0.03 to 100 volts per centimeter, peak-to-peak.

DC Vertical Deflection Sensitivity: Continusouly variable from 0.3 to 100 volts per centimeter, peak-to-peak.

Probe: RC frequency compensated. The sensitivity is reduced by a factor of 10 when the probe is used.

Input Impedance: 1 megohm shunted by 35 micromicrofarads. With probe, 10 megohms shunted by 12 micromicrofarads.

Vertical Amplifier Transient Response: Rise time (10% to 90%) 0.025 microsecond.

Vertical Amplifier Response: DC to 20 megacycles, sensitivity of 0.3 volt per centimeter or lower; 2 cycles to 18 megacycles, sensitivity of 0.03 volt per centimeter or lower.

Signal Delay Network: Provides 0.25 microsecond signal delay. (Continued)

OSCILLOSCOPE
Type 513D
(Tektronix, Incorporated)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Calibrating Voltage: 1 kilocycle square wave. Seven ranges, 0.05 to 50 volts full scale. Accuracy ±2% of full scale.

Cathode Ray Tube: Type 5XP, 5-inch, with accelerating potential of 12 kilovolts.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix, Incorporated, 712 S. E. Hawthorne Boulevard, Portland 14, Oregon; Approximate Cost per Unit, $1650.00.

Contractor: Douglas Aircraft Company, Incorporated, Long Beach 1, California; Contract No. AF 33(600)16314.

TUBE COMPLEMENT:

2 JAN-12AW6, 6 JAN-12AT7, 21 JAN-6CB6, 2 JAN-19J6, 4 JAN-6AH6, 2 JAN-6AS5, 3 JAN-6J6, 5 JAN-12AU7, 3 JAN-6AG7, 2 JAN-6AL5, 1 JAN-6C4, 2 JAN-6AQ5, 3 JAN-6X4, 1 JAN-OA2, 1 JAN-6AS7, 1 JAN-5651, 1 JAN-12AX7, 3 JAN-6AU6, 2 JAN-6AU5, 3 JAN-1X2A, 1 JAN-5XP, 2 Dry Selenium Rectifiers.

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog and Instruction Manual.

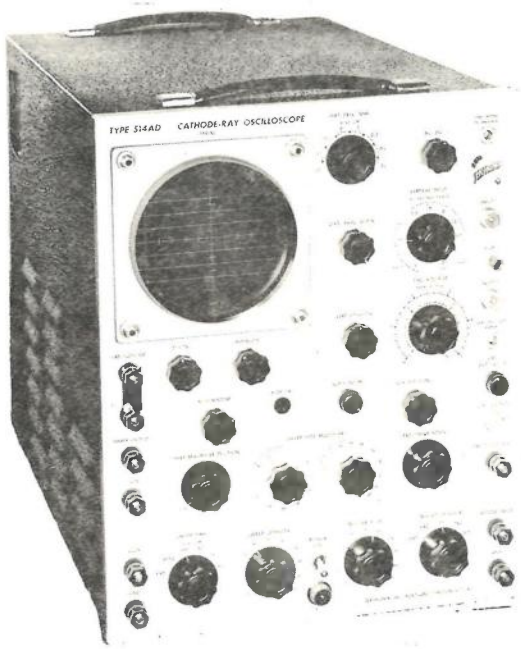
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope (Tektronix 513D)	6.42	22-1/8	16-1/8	30-1/2	100

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope (Tektronix 513D)	Aluminum Alloy	7CAC-611136-7	18-1/2	12-1/2	21-1/2	75
1	Probe, P510A						
3	Binding Post Adapter, A510						
1	Green Filter, F510-5						
1	Instruction Manual						

OSCILLOSCOPE
Type 514AD
(Tektronix, Inc.)



FUNCTIONAL DESCRIPTION:

A portable general purpose instrument used for circuit phenomena observation and testing of radar and communications equipment. It incorporates direct coupling, good transient response, and high gain. The following output waveforms are available: sweep saw tooth, positive gate, negative gate, 1 kilocycle square wave calibration signal.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: A 4-stage type vertical amplifier is used which may be either directly or capacitively coupled. The vertical deflection sensitivity controls use a high gain amplifier and precision, frequency compensated attenuator networks. A low capacity connection can be made directly to the CRT deflection plates. The sweep generating circuit is such that a slight adjustment of the sweep stability control is sufficient to obtain either triggered or recurrent sweeps. It may be triggered by a positive or negative external signal, by the positive or negative portion of the signal under observation, or it may be synchronized with the power line frequency. The sweep amplifier is a direct coupled, wide band amplifier.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
		- Electronics Test Equipment -	Tektronix 514AD

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE
Type 514AD
(Tektronix, Inc.)

ELECTROMECHANICAL DESCRIPTION: (Continued)

The sweep can be synchronized with frequencies as high as 10 megacycles or triggered by pulses as short as 0.05 microseconds. Two signal input connections are provided so that two signals may easily be compared. All DC power supplies have been regulated against variations in load and line voltage changes over the range of 105 to 125 volts.

Power Supply: 105 to 125 or 210 to 250 volts, AC, 50 to 60 cycles per second, single-phase, 375 watts.

Sweep Time: Continuously variable, 0.01 second per centimeter to 0.1 microsecond per centimeter of deflection; calibration accuracy ±5%.

Trigger Requirements: 0.5 to 50 volts (peak), pulses as short at 0.05 microsecond or signal under observation producing 0.5 centimeter deflection or more. Sweep may be triggered by pulses spaced a minimum of 5 microseconds apart.

Sweep Lag: 0.1 microsecond, maximum.

Sweep Magnification: Any 20% of sweep, magnified 5 times.

External Sweep Input: Coupled via 100 K potentiometer and 2 stage direct coupled sweep amplifier. Maximum deflection sensitivity 1.5 volts per centimeter DC or AC peak-to-peak.

AC Vertical Deflection Sensitivity: Continuously variable from 0.03 to 100 volts per centimeter, peak-to-peak.

DC Vertical Deflection Sensitivity: Continuously variable from 0.3 to 100 volts per centimeter, peak-to-peak.

Input Impedance: 1 megohm shunted by 30 micromicrofarads. With probe, 10 megohms shunted by 12 micromicrofarads.

Vertical Amplifier Response: DC to 10 megacycles, sensitivity of 0.3 volt per centimeter or lower; 2 cycles to 10 megacycles, sensitivity of 0.03 volt per centimeter or lower.

Vertical Amplifier Transient Response: Rise time (10% to 90%) 0.04 microsecond.

Signal Delay Network: Provides 0.25 microsecond signal delay.

Calibrating Voltage: 1 kilocycle square wave. Seven ranges, 0.05 to 50 volts full scale. Accuracy ±3%.

Duty Cycle: Variable from 2% to 98%.

Cathode Ray Tube: Type 5CPA, 5 inch, with an accelerating potential of 3 kilovolts.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix, Inc., 712 S.E. Hawthorne Blvd., Portland 14, Oregon; Approximate Cost per Unit, $950.00.

TUBE COMPLEMENT

2 JAN-6AC7, 9 JAN-6AG7, 2 JAN-6AL5, 6 JAN-12AU7, 1 JAN-6C4, 1 JAN-6J6, 4 JAN-6AU6, 3 JAN-6CB6, 2 JAN-6X4, 2 JAN-6AQ5, 3 JAN-5V4, 1 JAN-5651, 1 JAN-12AX7, 1 JAN-6AS7, 1 JAN-OD3, 2 JAN-6AS5, 2 JAN-1V2, 2 JAN-12AW6, 2 JAN-19J6, 4 JAN-6AH6, 1 JAN-5CPA.

OSCILLOSCOPE
Type 514AD
(Tektronix, Inc.)

REFERENCE DATA AND LITERATURE:
Manufacturer's Catalog.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope (Tektronix 514AD)	4.94	19-5/8	15-3/4	27-3/4	79

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope (Tektronix 514AD)	Aluminum		15-1/2	12-1/2	21-1/2	62

OSCILLOSCOPE
MODEL 515A
(Tektronix, Incorporated)

FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment used for visual observation of electrical phenomena. A square wave calibrating voltage, a gate and a sweep sawtooth voltage are provided at binding posts located on the front panel of the instrument. Results are indicated on a 5-inch cathode-ray tube. Circuits for time and amplitude calibration of the observed signal permit quantitative measurements to be performed.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 or 210 to 250 volts, AC, 50 to 60 cycles per second, 275 watts.
Vertical Amplifier Response: DC to 15 megacycles per second.
Vertical Amplifier Rise Time: 0.023 microseconds.
Vertical Attenuator:
Uncalibrated: 0.05 to 50 volts per centimeter.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	

OSCILLOSCOPE MODEL 515A
(Tektronix, Incorporated)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Calibrated: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20 volts per centimeter.
Calibrated Accuracy: ±3%.

Input Impedance: 1 megohm shunted by approximately 36 micromicrofarads.

Input Impedance With Probe: 10 megohms shunted by approximately 10.5 micromicrofarads.

Signal Delay: 0.25 microseconds.

Horizontal Amplifier Response: DC to 500 kilocycles per second.

Horizontal Deflection Factor: 1.4 volts per centimeter.

Horizontal Amplifier Sweep Range (Calibrated): 0.2, 0.5, 1, 2, 5, 10, 20, 50 microseconds per centimeter; 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 milliseconds per centimeter; 0.1, 0.2, 0.5, 1, 2 seconds per centimeter.

Horizontal Amplifier Sweep Range (Uncalibrated): 0.04 microseconds to 6 seconds per centimeter.

Horizontal Sweep Range Accuracy: ±3% for calibrated sweep rates.

Time Base Magnifier: 5 times.

Accuracy When Using Time Base Magnifier: ±5% of displayed portion.

Trigger Source: Internal, external or line frequency, AC or DC coupled.

Triggering Point: positive or negative slope of triggering waveform.

Automatic Triggering Range: Between 60 cycles per second and 2 megacycles per second approximately; 50 cycles per second in absence of input signal for reference trace.

Sync Requirements:

Internal: A signal amplitude to cause a 2 centimeter deflection.
External: 2 volts.

Trigger Requirements:

Internal: A signal amplitude to cause a 2 millimeter deflection.
External: 2 to 100 volts.

Square Wave Calibrating Voltage:

Frequency: 1 kilocycle per second.
Output: 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 volts peak to peak.
Accuracy: ±3%.

Cathode-Ray Tube Accelerating Potential: 4 kilovolts.

Gating Waveforms: 30 volts positive; gate of same time duration as sweep, 150 volts positive sweep sawtooth.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix Incorporated, Portland 7, Oregon; approximate unit cost, $800.00.

OSCILLOSCOPE MODEL 515A
(Tektronix Incorporated)

TUBE COMPLEMENT:

5 6AU6, 2 12BY7, 8 6BQ7A, 2 6CL6, 3 6U8, 2 12AT7, 2 6AN8, 1 6AL5, 1 5651, 1 6080, 1 6AU5, 1 6AQ5, 3 5642, 1 T55P2

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog.

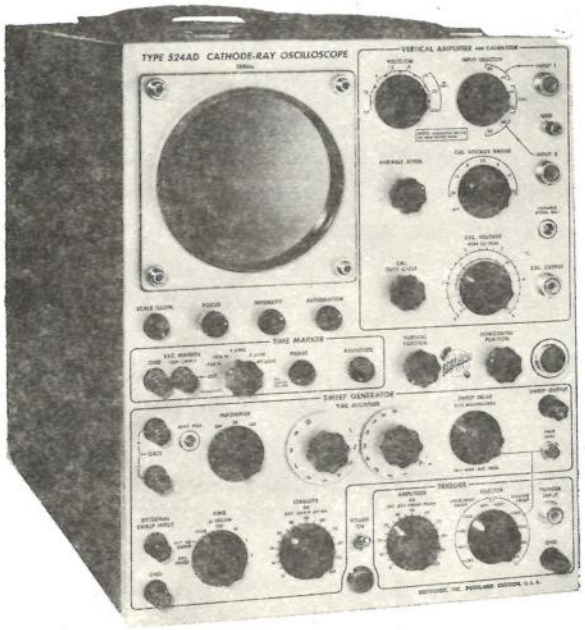
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope Tektronix 515A	alum-inum		9-3/4	13-1/2	21-1/2	40
1	Attenuator Probe P410						
2	Adapter, Bind-ing Post A510						
1	Green Filter 378-514						
1	Instruction Manual						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope Tektronix 515A and Accessories	5				58

SYNCHROSCOPE
Model No. 524AD
(Tektronix, Inc.)



FUNCTIONAL DESCRIPTION:

A portable general purpose self-contained cathode ray oscilloscope providing accurate measurements of pulse time widths within 0.05 microsecond. This is a precision laboratory instrument used for the maintenance and testing of video transmitters and related equipment. Internally-generated time markers facilitate sync-pulse timing and a network in the wideband vertical amplifier limits the high frequency response to that recommended for standardized pulse-level measurements. The sweep system provides calibrated sweeps as fast as 0.1 microsecond per centimeter, including a 3x and 10x magnifier, a composite-video-signal sync separator, and a 25 millisecond variable delayed sweep. Waveforms are shown on a five-inch cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		Tektronix 524AD

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

SYNCHROSCOPE
Model No. 524AD
(Tektronix, Inc.)

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Conventional oscilloscope circuitry with additional marker and trigger circuits providing the following characteristics:

Sweep circuit: Sweep time is continuously variable from 0.1 microsecond per centimeter to 0.01 second per centimeter. Sweeps can be triggered with a composite video signal between 0.5 volt and 15 volts peak, or pulses of 0.15 to 15 volts peak-to-peak. The delayed sweep is capable of selecting one horizontal line of a composite television signal at a 30 cycles per second repetition rate.

Sweep magnification: Magnifier expands the trace to right and left of center, either 3x or 10x. Magnified sweep speed limited to 0.1 microsecond per centimeter.

External sweep input: External sweep voltage can be coupled in via 100 k potentiometer through DC-coupled sweep amplifier. A square wave signal, which is continuously variable from 0.05 to 50 volts in seven ranges, is provided.

Accuracy of Calibrator: ±3% of full scale.

Duty Scale: Variable between 1% and 99%.

Time markers: Five time intervals of 1 microsecond, 0.1 microsecond, 0.05 microsecond, 0.318 microsecond, and 1.59 microseconds.

Vertical amplifier: Four DC-coupled stages provide sensitivities from 0.15 volt per centimeter. Output stage is a three section push-pull distributed amplifier. An AC-coupled 10x preamplifier can be switched in for highest sensitivity, giving a sensitivity of 0.015 volt per centimeter.

AC vertical-deflection sensitivity: Continuously variable from 0.015 volt per centimeter to 50 volts per centimeter, peak-to-peak.

DC vertical-deflection sensitivity: Continuously variable from 0.15 volt per centimeter to 50 volts per centimeter, peak-to-peak.

Frequency response of vertical amplifier: DC to 10 megacycles at a maximum sensitivity of 0.15 volt per centimeter. Two cycles to 10 megacycles with the AC-coupled preamplifier for sensitivity increased to 0.015 volt per centimeter. A switch on the access panel permits a choice of three types of vertical amplitude response: normal, flat to 5 megacycles, and IRE recommended response.

Transient response: Rise time, 0.04 microsecond between response points 10 percent and 90 percent of the final value.

Input Impedance: One megohm shunted by 40 micromicrofarads capacitance.

Probe input impedance: Ten megohms shunted by 14 micromicrofarads. (CF probe available).

Cathode ray tube: Type 5ABP1.

Power Supply: 105 to 125 volts or 210 to 250 volts, AC, single phase, 50 to 60 cycles per second, 500 watts.

SYNCHROSCOPE
Model No. 524AD
(Tektronix, Inc.)

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix, Inc., Sunset Highway and Barnes Road, P. O. Box 831, Portland 7, Oregon; Approximate Cost per Unit, $1180.00.

TUBE COMPLEMENT:

8 JAN-6AG7, 2 JAN-6AH6, 1 JAN-6AK5, 2 JAN-6AL5, 1 JAN-6AQ5, 2 JAN-6AS5, 1 JAN-6AS7, 4 JAN-6AU6, 1 JAN-6BH6, 8 JAN-6BQ7, 4 JAN-6CL6, 4 JAN-6U8, 3 JAN-6X4, 6 JAN-12AT7, 2 JAN-12AU7, 1 JAN-12AX7, 2 JAN-12B4, 2 JAN-12BY7, 3 JAN-12BZ7, 3 JAN-5642, 1 JAN-5651, 1 JAN-5ABP1.

REFERENCE DATA AND LITERATURE:

Manufacturer's Instruction Manual.

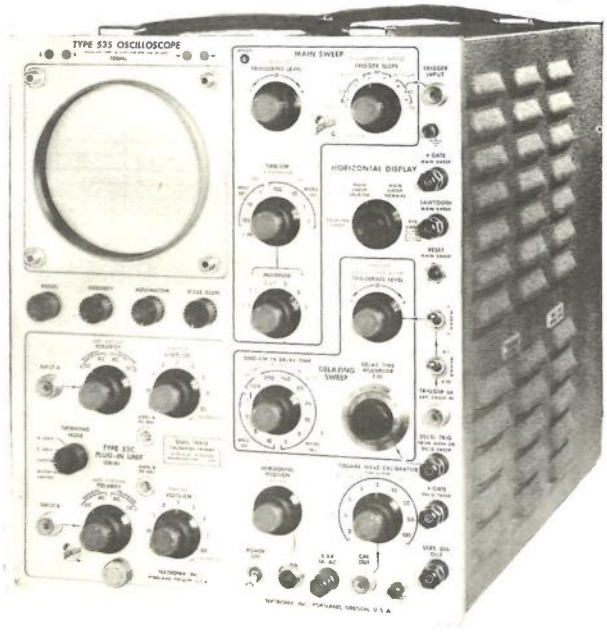
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Synchroscope Tektronix Model No. 524AD	5	19-1/2	16	28	83
1	Viewing Hood	1	8-1/2	9-3/4	13-1/4	5

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Synchroscope Tektronix Model No. 524AD	Welded Aluminum Alloy		16	12-7/8	22-3/8	61

OSCILLOSCOPE
Type 535
(Tektronix, Inc.)



FUNCTIONAL DESCRIPTION:

A general purpose, laboratory type oscilloscope designed to permit observation of a wide variety of signals. The instrument may be operated with single shot, recurrent, or triggered sweeps, making it useful for either very slow or very fast signal observations. The oscilloscope incorporates facilities for employing plug-in vertical preamplifiers for varying the bandpass, sensitivity, rise time, input impedance, and type of signals observable. A five-inch, flat faced, metallized cathode ray tube displays the signals.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The outstanding characteristics of this oscilloscope are the delayed sweep network and the plug-in vertical preamplifiers. A saw tooth generator provides a delay signal. The amount of delay is controlled by a multi-turn potentiometer. By superimposing the input signal on the delay saw tooth, the amount of delay may be observed by noting the area of increased intensity on the

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-611136-5		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.2	
	- Electronics Test Equipment -		Tektronix 535

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

OSCILLOSCOPE
Type 535
(Tektronix, Inc.)

ELECTROMECHANICAL DESCRIPTION: (Continued)

saw tooth. When the delay has been selected the main sweep is returned by means of a switch. When the delaying saw tooth is triggered by the first of a chain of pulses, the main sweep may be set to trigger on any selected pulse or at a point between pulses. The main sweep may also be triggered externally. If the external trigger signal has harmonic relation to the delay saw tooth trigger, jitter-free delay may be achieved.

Six different plug-in preamplifiers may be used with the vertical output amplifier in the oscilloscope. The type 53C dual-trace unit contains two identical amplifiers. In triggered operation the two amplifiers are switched at the end of each sweep. This makes it possible to view two separate signals alternately. In free-running operation the amplifiers may be switched at a rate that makes it possible to view two simultaneous transients. The amplifiers in this unit may also be used separately.

The type 53A is a wide-band direct coupled amplifier capable of accepting both AC and DC input signals. The type 53B is a modification of the 53A. It provides three additional calibrated sensitivities at a slightly reduced frequency response and rise time.

The type 53D unit is a differential-input, high-gain, DC amplifier. This unit provides maximum sensitivities for low frequency signals.

The type 53E unit provides the oscilloscope with calibrated vertical sensitivity. Separate high and low frequency response controls permit restriction of the band width to increase the signal-to-noise ratio.

Type 53G is a differential wide-band, DC amplifier. This unit adapts the oscilloscope for wide-band, differential-input applications. Independent step attenuators permit the mixing of signals of wide amplitude differences.

Power Supply: 117 or 234 volts, AC, 50 to 60 cycles per second.

Frequency Range: DC to 10 megacycles per second, dependent upon plug-in unit employed.

Main Sweep Generator:

Calibrated Sweep Rate: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500 microseconds per centimeter; 1, 2, 5, 10, 20, 50. 100, 200, 500 milliseconds per centimeter.

Uncalibrated Sweep Rate: 0.1 microsecond per centimeter to 10 seconds per centimeter, continuously variable.

Delaying Sweep Generator:

Delay Time: 10 to 20,000 microseconds in 9 calibrated ranges, continuously variable.

Interval Between Sweep: Calibrated from 20 to 20,000 microseconds.

Trigger Selection: The main sweep may be triggered internally by any signal causing a deflection larger than 0.2 centimeter, and externally by a signal having from 0.2 volt to 100 volts amplitude.

Delay Network: A balanced delay network provides a 0.25 microsecond signal delay.

Amplitude Calibrator: A square wave signal with amplitude range of 0.2 millivolt to 100 volts, in 18 fixed steps. (Continued)

OSCILLOSCOPE
Type 535
(Tektronix, Inc.)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Waveforms Available: positive gate, delayed gate, main saw tooth, internal trigger, calibrating square wave.

Horizontal Input Amplifier:

Sensitivity: 0.2 volt per centimeter to 20 volts per centimeter, continuously variable.

Vertical Amplifiers:

Type 53A: Sensitivity: 0.05 volt/centimeter to 50 volts/centimeter, AC or DC in nine steps.
Rise Time: 0.035 microsecond.
Bandpass: DC to 10 megacycles per second.
Input Impedance: 47 micromicrofarads paralleled by 1 megohm.

Type 53B: Sensitivity: AC Coupled Only - 0.005 volt/centimeter to 0.05 volt/centimeter.
AC or DC Coupled - 0.05 volt/centimeter to 50 volts/centimeter.
Calibrated - 0.005 to 20 volts/centimeter.
Continuously Variable - 0.005 to 50 volts/centimeter.
Rise Time: 0.04 microsecond.
Bandpass: 5 cycles per second to 9 megacycles per second.
Input Impedance: 44 micromicrofarads paralleled by 1 megohm.

Type 53C: Sensitivity: 0.05 volt/centimeter to 50 volts/centimeter, AC or DC in nine steps.
Rise Time: 0.04 microsecond.
Bandpass: DC to 8.5 megacycles per second.
Input Impedance: 45 micromicrofarads paralleled by 1 megohm.

Type 53D: Sensitivity: 1 millivolt/centimeter to 50 volts/centimeter in 24 steps.
Bandpass: 350 kcs at 1 millivolt/centimeter, 450 kcs at 2 millivolts/centimeter, 550 kcs at 5 millivolts/centimeter, 850 kcs at 10 millivolts/centimeter, 1,300 kcs at 20 millivolts/centimeter, 2,000 kcs at 50 millivolts/centimeter to 50 volts/centimeter.
Input Impedance: 45 micromicrofarads paralleled by 1 megohm.

Type 53E: Sensitivity: 47 microvolts/centimeter to 10 millivolts/centimeter.
Bandpass: 0.06 cycle per second to 60 kilocycles per second.
Input Impedance: 50 micromicrofarads paralleled by 10 megohms.

Type 53G: Sensitivity: 0.05 to 20 volts/centimeter.
Bandpass: DC to 10 megacycles per second.
Rise Time: 0.035 microsecond.
Input Impedance: 47 micromicrofarads paralleled by 1 megohm.

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix, Incorporated, Sunset Highway and Barnes Road, P.O. Box 831, Portland 7, Oregon; Approximate Cost per Unit (Basic Unit including Type 53A plug-in unit) $1385, (Type 53B plug-in unit) $125, (Type 53C plug-in unit) $275, (Type 53D plug-in unit) $145, (Type 53E plug-in unit) $165, (Type 53G plug-in unit) $175.

OSCILLOSCOPE
Type 535
(Tektronix, Inc.)

TUBE COMPLEMENT:

19 JAN-6BQ7A, 4 JAN-12BY7, 10 JAN-6U8, 6 JAN-6AU6, 1 JAN-6AL5, 1 JAN-6CL6, 1 JAN-12AU6, 1 JAN-12AL5, 2 JAN-12AU7, 1 JAN-6AU5, 5 JAN-5642, 1 JAN-5651, 2 JAN-6080, 4 JAN-12B4, 2 JAN-12AX7.

REFERENCE DATA AND LITERATURE:

Manufacturer's Data Sheet.

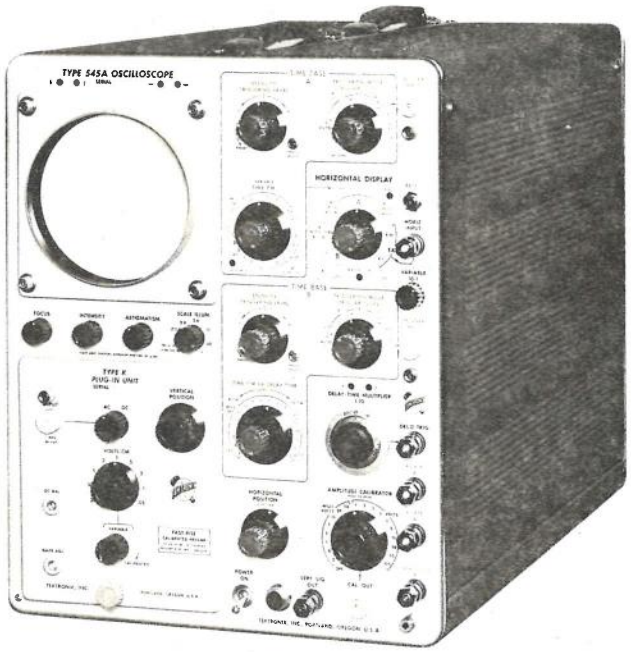
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Equipment Listed Below plus a plug-in preamplifier		19-3/8	15-7/8	27-7/8	90

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope (Tektronix 535)	Alumi-num	7CAC-611136-5	16	13	24	65
2	Probe P510A						
2	Binding Post Adapter A510						
1	Green Filter F510-5						
1	Instruction Manual						
1	Test Lead W530B						

OSCILLOSCOPE
TYPE 545A
(Tektronix, Incorporated)



FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment used to study electrical phenomena. The instrument is used for AC component voltage measurements, instantaneous voltage measurements, time measurements, and frequency measurements. The equipment can be used with any Tektronix letter-series plug-in unit. Test results are observed on a 5-inch cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Oscilloscope Tektronix 545A is similar to Oscilloscope Tektronix 535A except for the circuits of the vertical deflection system.

ELECTROMECHANICAL DESCRIPTION:

The following specifications assume the use of a Type K Plug-In Unit.
Power Supply: 105 to 125 volts or 210 to 250 volts, AC, 50 to 60 cycles per second.
Bandpass: DC to 30 megacycles per second (3 decibels down at 15 megacycles per second).

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.:	Commercial
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.2

OSCILLOSCOPE TYPE 545A
(Tektronix, Incorporated)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Risetime: 0.012 microseconds.

Internal Triggering: A signal causing 2 millimeters of vertical deflection.

External Trigger Requirements: 0.2 to 100 volts.

Sweep Speed:

Time Base A (Calibrated): 0.1 microseconds to 5 seconds per centimeter in 24 steps.

Time Base A (Uncalibrated): Variable 0.1 microsecond to 12 seconds per centimeter.

Accuracy: Typically within ±1% and in all cases within ±3%.

Time Base B (Calibrated) 2 microseconds to 1 second per centimeter in 18 steps.

Accuracy: Typically within ±1% and in all cases within ±3%.

Magnifier: Provides a 5 times magnification of the center 2-centimeter portion of the oscilloscope display. Extends Time Base A sweep speed to 0.02 microseconds per centimeter and Time Base B sweep speed to 0.4 microseconds per centimeter.

Horizontal Deflection Factor: 0.2 to 15 volts per centimeter continuously variable.

Horizontal Frequency Response: DC to 240 kilocycles per second, down 3 decibels at 240 kilocycles per second.

Horizontal Input Impedance: 1 megohm shunted by approximately 55 micromicrofarads.

Delayed Sweep: Variable 1 microsecond to 10 seconds. Actual delay within 1% of indicated delay; incremental delay accuracy within 0.2%.

Jitter: 1 part in 20,000.

Amplitude Calibrator Frequency: Square wave at 1000 cycles per second.

Amplitude Calibrator Output Voltage: 0.2 millivolt to 100 volts peak-to-peak in 18 steps.

Amplitude Calibrator Accuracy: ±3% of indicated peak-to-peak voltage.

Output Waveforms:

Delayed Trigger Pulse: 5 volts amplitude occurring at the end of delay period.

Positive Gate B: 30 volts peak-to-peak with same duration as sweep B.

Positive Gate A: 30 volts peak-to-peak with same duration as sweep A.

Sawtooth A: Sawtooth of 150 volts peak.

Vertical Deflection Signal Output: Approximately 1.5 volts peak-to-peak per centimeter of vertical deflection.

Cathode-Ray Tube Accelerating Potential: 10,000 volts.

Probe Impedance: 10 megohms shunted by 10 micromicrofarads.

Probe Attenuation Ratio: 10 to 1.

Probe Maximum Voltage Rating: 1200 volts peak AC or DC.

OSCILLOSCOPE TYPE 545A
(Tektronix, Incorporated)

MANUFACTURERS' OR CONTRACTORS' DATA:

Tektronix Incorporated, Portland 7, Oregon; approximate unit cost, $1450.00, without plug-in unit.

TUBE COMPLEMENT:

23 6DJ8, 12 6AU6, 2 T12G or HD 2607, 3 12BY7, 1 6AL5, 2 6CL6, 1 12AL5, 3 6080, 1 5651, 2 12AX7, 3 12B4, 1 6AU5, 3 12AU7, 5 5642, 1 T543/P2, 14 6DK 6, 1 5BHP2.

REFERENCE DATA AND LITERATURE:

Manufacturer's Instruction Manual.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Oscilloscope Tektronix 545A					85

OSCILLOSCOPE TYPE 545A
(Tektronix,Incorporated)

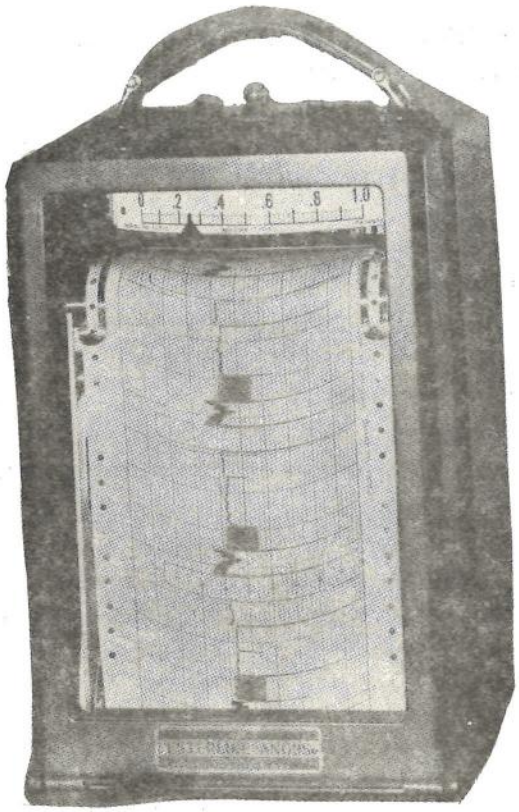
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Oscilloscope Tektronix 545A	alum-inum		16-3/4	13	24	65
2	Probes Tektronix P410A						
2	Building Post Adapters Tektronix A510						
1	Test Lead Tektronix 012-031.						
1	Green Filter Tektronix F510-5.						
1	Operator's Manual						
1	Operator's Handbook						
1	Parts Lists and Schematic Diagrams Manual						

3. 3 OSCILLOGRAPHS

RECORDER-MILLIAMMETER RD-49/U

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose, DC milliammeter recorder whose function is recording permanently and continuously the fluctuations of a current as a function of time. It is useful for the recording of the variations of RF amplitude and as an auxiliary to field strength measuring and surveying equipments. A combination meter needle and pen recorder shows the instantaneous meter readings on a scale calibrated in milliamperes and records its motions on a variable speed chart.

RELATIONSHIP TO OTHER EQUIPMENT:

Same as the Esterline-Angus Model AW Direct Current Milliammeter Recorder.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The permanent-magnet-moving-coil measuring element employs two "Alnico V" magnets to produce the magnetic field in which the armature coil moves. It is mounted as a complete unit on an insulating base. Damping of the moving element is produced chiefly by the eddy currents which flow in the metallic frame of the moving coil as it rotates in the magnetic field. (Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.: Navy		DESIGN COG.: Navy, BuShips	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.3.3	

ELECTROMECHANICAL DESCRIPTION: (Continued)

Power Supply, Chart Drive: 115 volts, AC, single phase, 60 cycles per second, 5 to 6 watts.
Current Ranges: 0 to 1, 2, 3, 5, 10, 25, 50, and 100 milliamperes.
External Resistance for Critical Damping: 35,000 to 50,000 ohms.
Average Coil Resistance: 1400 ohms.
Average Voltage Drop at Full Scale: 1.4 volts.
Average Power Drop at Full Scale: 1.4 milliwatts.
Average Swinging Time for Pen (one way): 0.5 second.
Chart Drive: Synchronous.
Chart Feeds: Inches per hour: 3/4, 1-1/2, 3, 6, and 12.
Inches per minute: 3/4, 1-1/2, 3, and 6.
Insulation Test: 2500 volts, AC, between current carrying parts and ground.
Accuracy: ±1% of full scale.

MANUFACTURERS' OR CONTRACTORS' DATA:

The Esterline-Angus Company, Inc., Indianapolis 6, Indiana; Contract No. NObsr-49133-(1734).

TUBE COMPLEMENT:

None.

REFERENCE DATA AND LITERATURE:

NAVSHIPS 91365 (Instruction Book).

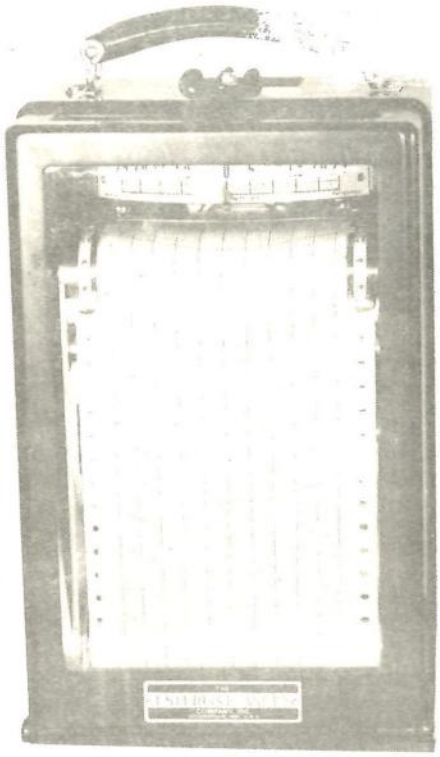
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Recorder-Milliammeter RD-49/U	Aluminum		14-1/2	8-9/16	8-3/4	34

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Recorder-Milliammeter RD-49/U					70

MILLIAMMETER RECORDER TS-584B/U



FUNCTIONAL DESCRIPTION:

A portable, general purpose, test instrument whose function is to record permanently and continuously the fluctuations of a current as a function of time. It is useful for the recording of the variations of RF amplitude and as an auxiliary to field strength measuring and surveying equipments. A combination meter needle and pen recorder shows the instantaneous meter readings on a scale calibrated in milliamperes and records its motions on a variable speed chart.

RELATIONSHIP TO OTHER EQUIPMENT:

Same as the Esterline-Angus Model AW Direct Current Milliammeter Recorder.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The permanent-magnet-moving-coil measuring element employs two "Alnico V" magnets to produce the magnetic field in which the armature coil moves. It is mounted as a complete unit on an insulating base. Damping of the

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.: Army		DESIGN COG.: Army, CSL	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.3.3	
- Electronics Test Equipment -			TS-584B/U

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

ELECTROMECHANICAL DESCRIPTION: (Continued)

moving element is produced chiefly by the eddy currents which flow in the metallic frame of the moving coil as it rotates in the magnetic field.

Power Supply: Chart Drive: 115 volts, AC, single phase, 60 cycles per second, 5 to 6 watts.

Current Range: 0 to 5 milliamperes.

External Resistance for Critical Damping: 3000 to 5000 ohms.

Average Coil Resistance: 70 ohms.

Average Voltage Drop at Full Scale: 0.35 volts.

Average Swinging Time for Pen (one way): 0.5 seconds.

Chart Drive: Synchronous.

Chart Feeds:

Inches per hour: 3/4, 1-1/2, 3, 6, and 12.

Inches per minute: 3/4, 1-1/2, 3, 6, and 12.

Insulation Test: 5000 volts, AC, between current carrying parts and ground.

Accuracy: ±1% of full scale.

MANUFACTURERS' OR CONTRACTORS' DATA:

The Esterline-Angus Company, Inc., Indianapolis 6, Indiana. Contract No. 24757-Phila-49.

TUBE COMPLEMENT:

None.

REFERENCE DATA AND LITERATURE:

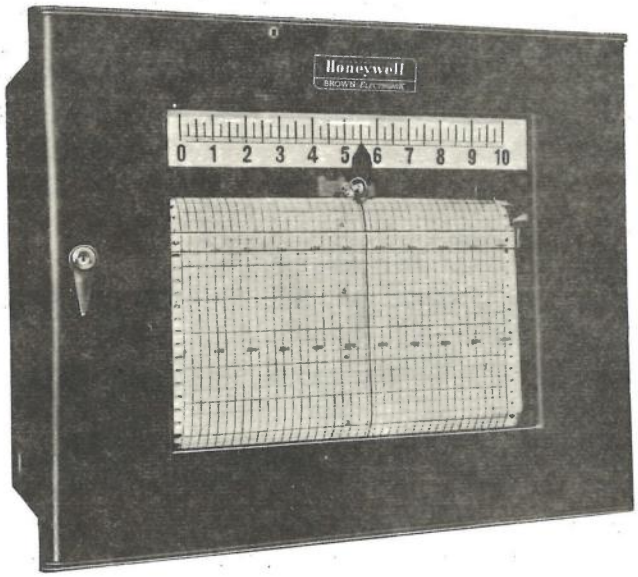
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Milliammeter Recorder TS-584B/U					70

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Milliammeter Recorder TS-584B/U	Aluminum		14-9/16	8-9/16	9-9/16	34

RECORDER, STRIP CHART
Model No. 153 X 12V
(Brown Instruments, Division of Minneapolis-Honeywell)



FUNCTIONAL DESCRIPTION:

This instrument is used to provide a single continuous record of measurements made by a wide variety of measuring elements. A platinum tip, reservoir type pen records a continuous pattern on a twelve-inch chart. The pen holds a month's supply of ink for normal chart speeds. A hinged door with a glass window provides easy access to all parts of the recorder.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The recorder employs the null-balance principle of measurement. The continuous balance unit consists of a converter, an input transformer, a voltage amplifier and a power amplifier. The small DC voltage from a thermocouple or other sensing device is introduced into the circuit across the converter and center top of the input transformer. As the vibrating reed of the converter

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CMH-153X12V-X30		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.3.3	
- Electronics Test Equipment - Brown (M. H.) 153X 12V			

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

RECORDER, STRIP CHART
Model No. 153 X 12V
(Brown Instruments, Division of Minneapolis-Honeywell)

ELECTROMECHANICAL DESCRIPTION: (Continued)
moves from one contact to another, current flows first in one direction through half of the primary of the input transformer and then in the opposite direction in the other half. The AC current emerging from the secondary of this transformer is amplified and so timed with the AC supply voltage that an increase or decrease of the sensing device voltage operates the balancing motor in the proper direction to balance the circuit. Whenever an unbalance occurs, the system acts to counterbalance it as well as to record the change.

Power Supply: 110 to 125 volts, AC, 25, 50, or 60 cycles per second, single-phase.
Scale Calibration: 0 to 10; 40 divisions.
Pen Speed: 4-1/2 seconds, full scale travel at 60 cycle operation.
5-1/2 seconds, full scale travel at 50 cycle operation.
Calibrated Accuracy: ±1/4% of scale span,
±0.03 millivolt for spans less than 12 millivolts.
Sensitivity: 1/14% of scale span,
0.007 millivolt for spans less than 10 millivolts.
Chart Speeds: 6, 30, or 120 inches per hour.
(120-inch per hour speed not available for 50-cycle operation).

MANUFACTURERS' OR CONTRACTORS' DATA:
Minneapolis-Honeywell Regulator Company, Brown Instruments Division, Philadelphia, Pennsylvania.

TUBE COMPLEMENT:
None.

REFERENCE DATA AND LITERATURE:
Minneapolis-Honeywell Catalog No. 1521.

SHIPPING DATA:

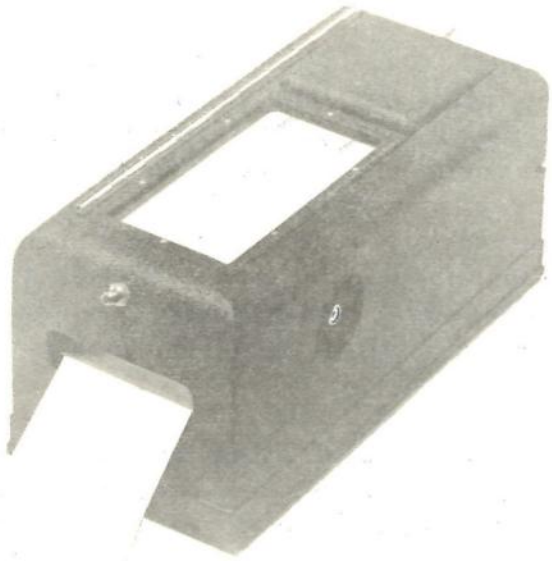
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
Brown (M. H.) 153X 12V - Electronics Test Equipment -						

RECORDER, STRIP CHART
Model No. 153X 12V
(Brown Instruments, Division of Minneapolis-Honeywell)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Recorder, Strip Chart (Brown 153X 12V)	Black enamel	7CMH-153X12V-X30	15-3/8	19-3/4	13-1/4	
1	Chart Roll				12	wide	
1	Ink						
	Spare fuses						
	Mounting Accessories						

MAGNETIC OSCILLOGRAPH
(OSCILLOGRAPH DOUBLE CHANNEL)
Model No. BL-202
(Brush Electronics Company)



FUNCTIONAL DESCRIPTION:

A portable test instrument used to make instantaneous and permanent chart records of a wide variety of electrical phenomena. The instrument has a large hinged cover plate with windows permitting direct reading and monitoring of the particular phenomena. The cover plate also permits penciled notations to be made on the chart paper and facilitates the servicing of the inkwells and minor adjustments to the chart paper. This instrument has double channels for dual ink recording.

RELATIONSHIP TO OTHER EQUIPMENT:

The Direct Writing Oscillograph Model BL-202 is very similar in appearance to Models BL-201, BL-221, and BL-222. Model BL-201 is a single channel instrument equipped for ink writing only. The combination oscillographs for ink and electric writing include an external Brush Power Supply Model BL-944, electric styluses, and electric writing chart paper. When so-equipped, the single channel instrument is Model BL-221, and the double channel instrument is Model BL-222.

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-610725		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.3.3	
	- Electronics Test Equipment -		Brush BL-202

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

MAGNETIC OSCILLOGRAPH
(OSCILLOGRAPH DOUBLE CHANNEL)
Model No. BL-202
(Brush Electronics Company)

ELECTROMECHANICAL OR MECHANICAL DESCRIPTION:

Circuit Information: The circuit consists essentially of a variable speed motor which drives the chart paper at a predetermined speed, and two electrically actuated ink-fed styluses which are energized by the input voltage. The styluses swing transversely in direct proportion to the voltage and polarity.

Power Supply: Power required to operate the drive motor is 105 to 125 volts, AC, 60 cycles per second, single-phase, 40 watts. Power to operate the styluses is furnished by the detecting equipment (thermocouple, anemometer, etc.), which is used in conjunction with the oscillograph. The maximum voltage for the stylus motors is 16 volts, rms.

Sensitivity: 1.1 millimeter per volt.

Frequency Response: 0 (DC) to 100 cycles per second when properly matched with a Brush amplifier. 0 (DC) to 30 cycles per second-pen motor only.

Amplitude: 40 millimeter maximum (peak-to-peak) from 0 (DC) to 70 cycles per second.

20 millimeter maximum (peak-to-peak) from 70 to 100 cycles per second.

DC Resistance: 1450 nominal.

Chart Paper Speeds: 5, 25, and 125 millimeters per second.

MANUFACTURERS' OR CONTRACTORS' DATA:

Brush Electronics Company, 3405 Perkins Avenue, Cleveland 14, Ohio.

TUBE COMPLEMENT:

None.

REFERENCE DATA AND LITERATURE:

Directing Writing Oscillographs for Brush Electronics Company, Operation and Service Instructions.

SHIPPING DATA:

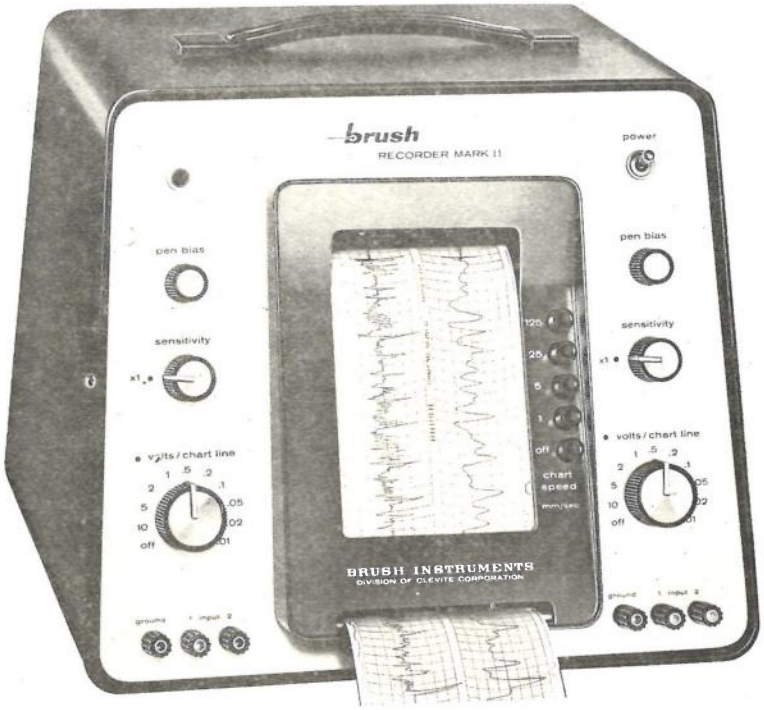
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Magnetic Oscillograph (Brush BL-202)	0.99	9	9	21	28

MAGNETIC OSCILLOGRAPH
(OSCILLOGRAPH DOUBLE CHANNEL)
Model No. BL-202
(Brush Electronics Company)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Magnetic Oscillograph Brush BL-202		7CAC-610725	6-7/8	6-1/2	14-7/8	25

RECORDER
MODEL RD 2521-00
(Brush Instruments, Division of Clevite Corporation)



FUNCTIONAL DESCRIPTION:

A portable, general purpose equipment which permanently and continuously records the fluctuations of current as a function of time. The instrument is also used as an auxiliary to field strength measuring and surveying equipments. Test results are recorded by a pen on a variable speed chart. The instrument incorporates two separate channels for dual ink recordings.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The instrument consists essentially of a variable speed motor which drives the chart paper at a predetermined speed, signal amplifiers to independently actuate the ink fed stylus of each channel and a regulated power supply. Signal limiting is employed on each channel to protect the pen motor from overload.

Power Supply: 105 to 125 volts, AC, 60 cycles per second, 135 watts; 12 volts, DC, internal.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.:	Commercial
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.3.3	

RECORDER MODEL RD 2521-00
(Brush Instruments, Division of Clevite Corporation)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Measurement Range: 0.010 to 400 volts.
Sensitivity: 10 milliwatts per millimeter (one chart line); ±200 milliwatts for full scale deflection from chart center.
Attenuated Sensitivities: 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5 and 10 volts per millimeter.
Input Impedance: 5 megohms single ended; 10 megohms balanced.
Pen Bias Positioning: ±20 millimeters, single or balanced input.
Frequency Response: DC to 100 cycles per second.
Trace Linearity:
Direct Voltage: ±1% of full chart width.
Alternating Voltage: ±2% of full chart width.
Stability: Better than 0.5 millimeter per hour, 1 millimeter per 8 hours.
Amplitude Response (Maximum):
0 to 40 Cycles Per Second: 40 millimeters peak-to-peak.
40 to 70 Cycles Per Second: 20 millimeters peak-to-peak.
70 to 100 Cycles Per Second: 10 millimeters peak-to-peak.
Trace Width: 0.015 inch with Model RA2821 30 pen.
Event Channels: Two actuated by external contacts.
Channel Width: 40 millimeters.
Chart Speeds: 1, 5, 25, 125 millimeters per second.

MANUFACTURERS' OR CONTRACTORS' DATA:

Brush Instruments, Division of Clevite Corporation, Cleveland 14, Ohio; approximate unit cost, $1377.00.

TUBE COMPLEMENT:

NI

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Recorder Brush RD 2521-00					40

RECORDER MODEL RD 2521-00
(Brush Instruments, Division of Clevite Corporation)

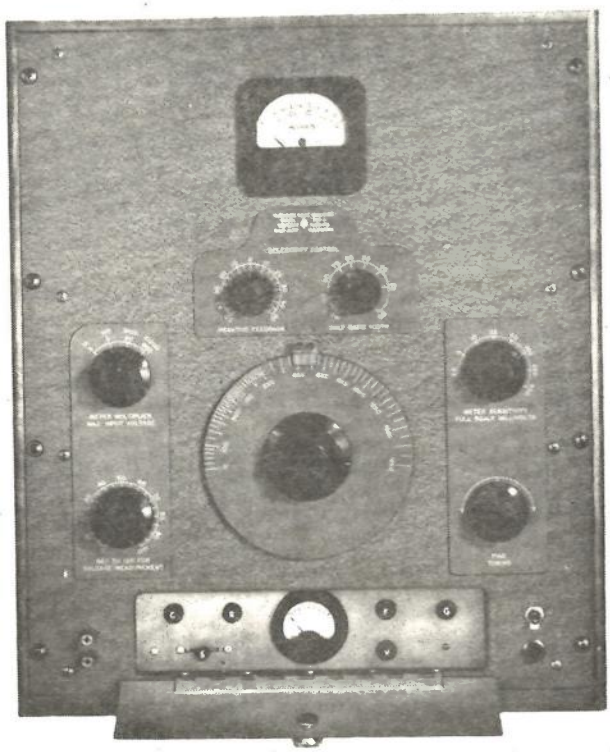
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Recorder RD 2521-00	metal		12	12-5/8	13-1/2	
4	Pens RA 2821-31						
1	Roll Chart Paper RA 2921-32						
1	Inkwell, 2 oz.						
1	Gram Gage						
1	Syringe						
1	Pen Mounting Tool						
1	Power Cable Adapter						

3.4 WAVEFORM ANALYZERS

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.

WAVE ANALYZER
MODEL NO. 300A
(Hewlett-Packard Company)



FUNCTIONAL DESCRIPTION:

A portable, general purpose, frequency selective, heterodyne type voltmeter designed to measure the individual components of complex waves. It can be used to analyze noise characteristics, broadcast amplifier characteristics, modulating amplifier distortion, network characteristics, etc. The dial is calibrated in millivolts.

RELATIONSHIP TO OTHER EQUIPMENT:

Used to test Interceptor-Guidance Group AN/GPA-6.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Consists of a variable local oscillator, a balanced modulator, a selective amplifier, and an indicating meter. The resistance-tuned type local oscillator modulates the unknown frequency to produce a constant difference frequency. This is applied to the selective amplifier, whose output is indicated by the meter which is proportional to the magnitude of the unknown voltage.

Power Supply: 115/230 volts, AC, 50 to 60 cycles per second, single phase, 105 watts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.1	
	- Electronics Test Equipment -		Model No. 300A

WAVE ANALYZER
MODEL NO. 300A
(Hewlett-Packard Company)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Frequency Range: 30 to 16,000 cycles per second.
Voltage Range: 0.001 to 500 volts full scale.
Input Impedance: Approximately 200,000 ohms minimum.
Selectivity: Varied by a panel control. At 40 decibel points (1% residual) half-band width is 30 cycles per second for maximum selectivity and 145 cycles per second for minimum selectivity.
Residual Modulation Products: Suppressed by at least 65 decibels (0.056% residual).
Hum: More than 75 decibels (0.018% residual) below maximum input voltage.
Voltage Accuracy: Within 5% provided that fundamental or adjacent harmonics are attenuated by selectivity of instrument to 1/3 of voltage being measured.

MANUFACTURERS' OR CONTRACTORS' DATA:

Hewlett-Packard Company, 395 Page Mill Road, Palo Alto, California; Approximate Cost per Unit, $625.00, 1950.

TUBE COMPLEMENT:

12 RTMA-6SJ7, 1 RTMA-6J7, 1 RTMA-6F6, 1 RTMA-0A2, 1 RTMA-6SQ7, 1 RTMA-6Y6GA, 1 RTMA-5U4GT/G, 2 RTMA-6N6.

REFERENCE DATA AND LITERATURE:

Manufacturer's Instruction and Operating Manual.
Manufacturer's Catalog No. 21A, 1952.
Hewlett-Packard Journal, Volume 2, No. 12, August 1951.

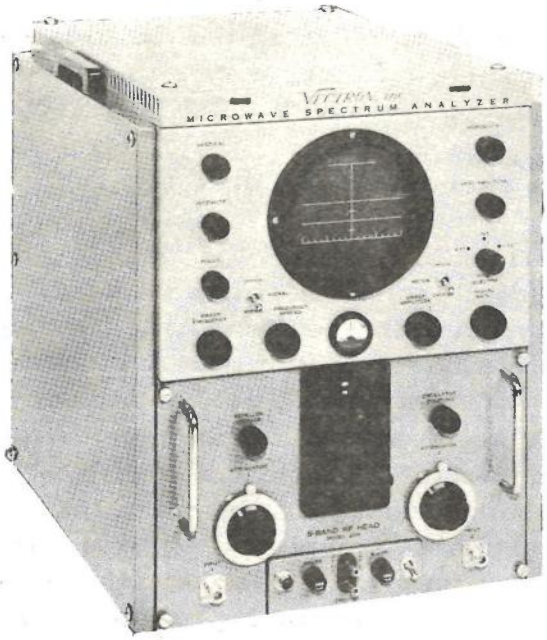
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Wave Analyzer Model No. 300A	Wood and Metal		24	21-5/8	14-1/8	78

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

SPECTRUM ANALYZER
Model No. SA-20
(Vectron Incorporated)



FUNCTIONAL DESCRIPTION:

A portable general purpose superheterodyne receiver with a cathode ray oscilloscope output indication and interchangeable RF input heads which efficiently cover portions of the microwave spectrum. It visually presents the frequency distribution spectrum of the power output of pulsed or CW microwave oscillators. It may also be used as a sensitive RF detector for checks and measurements in the design, production, and maintenance of microwave radar, communication equipment, and components.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The signal to be analyzed is applied to the input of an adjustable attenuator of the waveguide-below-cutoff type. The signal is then fed to a crystal mixer which is coupled to the local oscillator, a reflex klystron. The IF signals

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.1	
	- Electronics Test Equipment -		Vectron SA-20

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

SPECTRUM ANALYZER
Model No. SA-20
(Vectron Incorporated)

ELECTROMECHANICAL DESCRIPTION: (Continued)

produced in the output of the crystal mixer are introduced directly to the input transformer of the IF amplifier. The initial IF amplifier stage is centered at 22.5 megacycles and the second IF stage acts as a converter to 3 megacycles. The third and fourth IF stages are centered at 3 megacycles while the following stage is an infinite impedance detector.

The indicator section contains an oscilloscope for visual presentation of the incoming signal. The sawtooth oscillator of the indicator section generates a sweep voltage for the horizontal plates of the cathode ray tube and a modulating signal for sweeping the local oscillator of the RF head. Individual and adjustable amplifiers permit independent control of the two functions of the sawtooth oscillator. A blanking circuit, actuated by the sawtooth oscillator, acts to blank out the cathode ray tube trace during the return period.

With the IF amplifier acting as the resolving means, the local oscillator is swept through a frequency range in synchronism with the horizontal beam deflection of the cathode ray tube. The output transient of the IF amplifier is fed through amplifiers to the vertical deflection plates. During the sweep, the transients appear as vertical pips of varying height on the cathode ray tube screen. The incoming spectrum is presented in a graphic manner, power versus frequency, across the face of the oscilloscope.

Power Supply: 105 to 125 volts, AC, single-phase, 60 cycles per second.

Frequency Range: 2400 to 3650 megacycles per second.

Cathode Ray Tube: Electrostatic deflection type 5CP1A, 3000 volts accelerating potential.

Supply Voltages: DC voltages of -5, -300, -450, +150, and +250 regulated, +420 unregulated, and -1200 and +1800 indirectly regulated.

RF Head:

Dual signal inputs: Type N connectors with separate 80 decibels "waveguide-below-cutoff" attenuators.

Auxiliary input: Additional capacitive probe input provided for optional use.

Auxiliary output: Dual oscillator cavity output permits direct use of klystron output signal.

Mixer: Silicon crystal type 1N21B.

Local oscillator: Type 707B Klystron, precision dual-plunger tuning cavity.

Frequency dispersion: 0.75 to 5 megacycles per inch nominal range.

MANUFACTURERS' OR CONTRACTORS' DATA:

Vectron, Inc., 400 Main Street, Waltham, Massachusetts; Approximate Cost per Unit, $2635.00.

TUBE COMPLEMENT:

2 JAN-OA2, 2 JAN-1B3GT, 1 JAN-5CP1A, 2 JAN-5U4G, 4 JAN-6AQ5, 5 JAN-6AU6, 1 JAN-6BE6, 1 JAN-6D4, 1 JAN-12AU7, 4 JAN-12AX7, 1 JAN-707B.

SPECTRUM ANALYZER
Model No. SA-20
(Vectron Incorporated)

REFERENCE DATA AND LITERATURE:
Manufacturer's Instructions and Operating Manual.

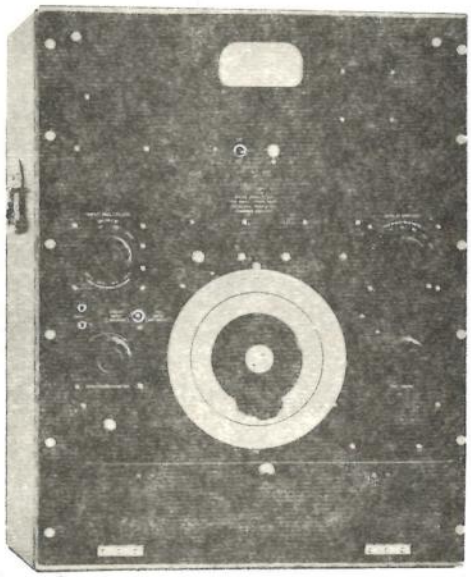
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer Vectron Model No. SA-20			22	17	22-1/4	130

SOUND ANALYZER TS-615/U
(ANALYZER, SPECTRUM, TS-615/U)



FUNCTIONAL DESCRIPTION:

A portable, general purpose test set used to measure the amplitude and frequency of the components of a steady-state complex electrical waveform when testing audio frequency communication equipment. This would include the components of harmonic distortion, intermodulation distortion, noise and hum. As a sharply tuned voltmeter, it can be used in the measurement of the transmission characteristics of electric wave filters and as a null detector for impedance bridges. The meter is calibrated in volts and decibels.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to General Radio Company Type 736-A Wave Analyzer.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The wave analyzer is essentially a heterodyne type of vacuum tube voltmeter. The incoming signal is mixed in a balanced detector with a carrier signal whose frequency is controlled by the large dial on the front panel.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			3F1772-4
PROCUREM'T INFO.:			
PROCUREM'T COG.: Army		DESIGN COG.: Army, CSL	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.2	
- Electronics Test Equipment -			TS-615/U

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S.

SOUND ANALYZER TS-615/U
(ANALYZER, SPECTRUM, TS-615/U)

ELECTROMECHANICAL DESCRIPTION: (Continued)

When the carrier is so adjusted that the sum of its frequency and that of one of the components of the signal equals 50,000 cycles per second, the resultant signal is passed through a highly selective three section quartz-crystal filter and its amplitude measured on a meter.

Power Supply: 115 volts ±10 volts or 230 volts ±20 volts, AC, single phase, 40 to 60 cycles per second, 65 watts.

Frequency Range: 20 to 16,000 cycles per second.

Voltage Range: 300 microvolts to 300 volts full scale. The lowest division on the meter corresponds to 10 microvolts. The overall range is divided into four major ranges: 300 microvolts to 300 millivolts, 3 millivolts to 3 volts, 30 millivolts to 30 volts, 0.3 volts to 300 volts. Each of these ranges is divided into seven scale ranges; for example: the 0.3 to 300 volt range has the following full scale ranges: 0.3, 1.0, 3.0, 10, 30, 100, and 300 volts. A direct reading decibel scale is also provided.

Input Impedance: 1 megohm when used for direct voltage measurements. When used with the input potentiometer it is approximately 100,000 ohms.

Selectivity: The response is down 15 decibels at 5 cycles per second, 30 decibels at 10 cycles per second, 60 decibels at 30 cycles per second from the peak. The selectivity is constant over the frequency range.

Accuracy:

Frequency Calibration: ±(2%+1 cycle per second).

Voltage: Within ±5% on all ranges. Spurious voltages from higher order modulation products introduced by the detector are suppressed by at least 70 decibels. Hum is suppressed by at least 75 decibels.

MANUFACTURERS' OR CONTRACTORS' DATA:

General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Massachusetts; Approximate Cost per Unit, $1,075.00, October 1951.

TUBE COMPLEMENT:

3 JAN-6C6, 2 JAN-6K6GT, 3 JAN-6J7, 1 JAN-6B8, 1 JAN-6C5, 1 JAN-6X5GT, 1 JAN-6F5GT.

REFERENCE DATA AND LITERATURE:

SHIPPING DATA:

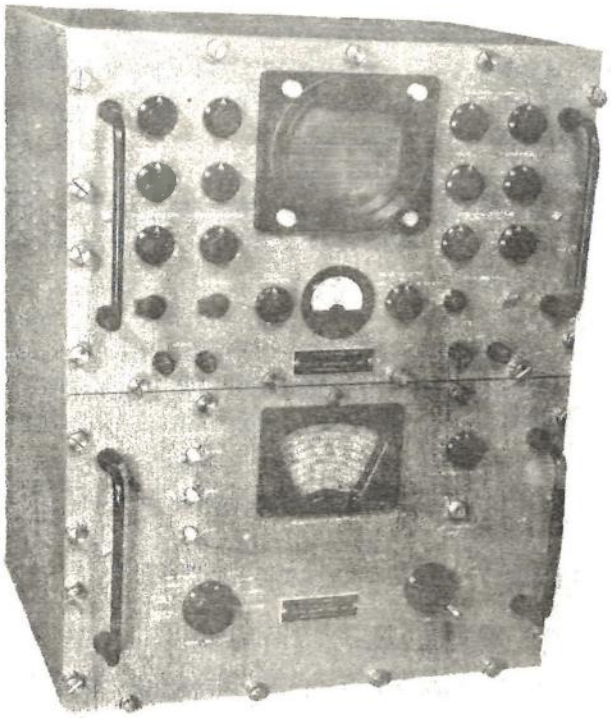
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

SOUND ANALYZER TS-615/U
(ANALYZER, SPECTRUM, TS-615/U)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Sound Analyzer TS-615/U	Oak	3F1772-4	25-1/8	19-1/2	10-7/8	86.25
1	Shielded Connector GR Type 274-NE						
1	Line Connector Cord						
	Spare Neon Lamps and Fuses						

SPECTRUM ANALYZER SET AN/UPM-17



FUNCTIONAL DESCRIPTION:

A transportable, general purpose, broadband spectrum analyzer used to aid in amplifier alignment of electronic counter measures equipment. It accurately measures frequency, determines bandwidth necessary for reproducing a radio frequency pulse observed on the indicator, compares two radio frequency signals differing by a small frequency separation, acts as a sensitive detector in radio frequency power measurements, observes and measures the sidebands associated with amplitude-modulated and frequency-modulated signals, checks operation of a magnetron, and may be used to illustrate the method of Fourier analysis of transient phenomena. Information is displayed in panoramic view on a five-inch green, medium persistence, cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Developed as TS-680(XA)/U. Similar to Lavoie Type 1469.

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.	7CAC-040850		
PROCUREM'T INFO.:	Spec. MIL-S-4469A (USAF)		
PROCUREM'T COG.:	USAF	DESIGN COG.:	USAF, ARL
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.4.4
	- Electronics Test Equipment -		AN/UPM-17

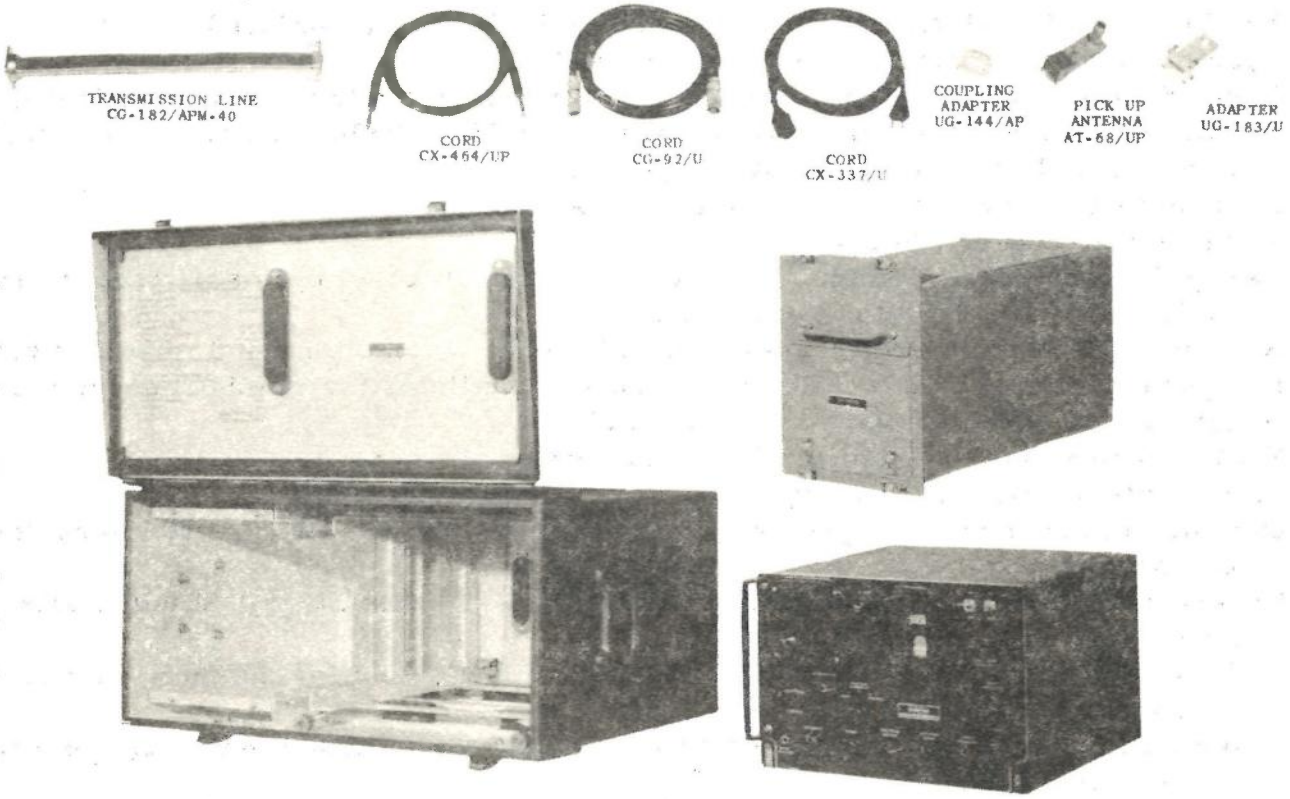
This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Variable RF Attenuator CN-319/UPM-17			72 long			1.7
1	Transit Case CY-903/UPM-17			30	24	22	35
1	Power Cord CX-1059/U			120 long	7/16 OD		
1	RF Cable CG-92E/U			72 long			
1	RF Cable CG-409E/U			72 long			
1	Special Purpose Cable Assembly CX-3163/U			56 long			1
1	Variable Attenuator CN-211/U			72 long			3

RADAR TEST SET AN/UPM-33

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose test set designed for depot testing of the over-all system performance of a radar system. It will check the frequency of signal genratorse, local oscillators, magnetrons, T/R and R/T boxes. In addition, it will measure pulse width, radio frequency spectrum width and the Q of resonant cavities.

All signals and spectrum measurements are displayed on a built-in three-inch cathode-ray oscilloscope screen. The frequency of the frequency meter and the signal generator are read directly from a calibrated dial. Input and output signals are introduced through Type N coaxial cable connector, waveguide or horn.

RELATIONSHIP TO OTHER EQUIPMENT:

Formerly nomenclatured TS-148/UP, Spectrum Analyzer

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 volts, AC, single phase, 50 to 1200 cycles per second, 125 watts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.			
PROCUREM'T INFO.:	Navy Spec. No. 16A46 (Aer)		
PROCUREM'T COG.:	Navy	DESIGN COG.:	Navy, BuAer
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.4.4
	- Electronics Test Equipment -		AN/UPM-33

RADAR TEST SET AN/UPM-33

ELECTROMECHANICAL DESCRIPTION: (Continued)

Type of Reception: Continuous Wave, Pulsed.

Type of Transmission: Continuous Wave, Frequency Modulated Carrier Wave.

Frequency Range: Calibrated directly from 8470 to 9630 megacycles per second (limited by local oscillator tube Type 2K25).

Frequency Check Point: 9310 megacycles per second.

Power Input: +12 to +70 dbm.

Sweep Frequencies: Continuously variable from 10 to 30 cycles per second (may be "locked" to main line frequency).

Attenuation (Spectrum Amplitude): Uncalibrated. Variable from 3 to 70 decibels.

Frequency Swing of Analyzer Radio-Frequency Oscillator (sawtooth frequency modulation): 40 to 50 megacycles per second.

First Intermediate Frequency: 22.5 megacycles per second.

Second Intermediate Frequency: 3.0 megacycles per second.

Over-all Intermediate Frequency Bandwidth at Half Power Points: 50 kilocycles per second.

Receiver Gain (2 Intermediate Frequency Stages, 1 Video Stage): 100 decibels.

Sensitivity to Continuous Wave:

Spectrum Amplified Position - 80 decibels below 1 watt for one inch of deflection on oscilloscope screen.

Spectrum Position - 55 decibels below 1 watt for one inch of deflection on oscilloscope screen.

Indicator: Cathode ray tube.

Maximum Dispersion of Spectra: 1.5 megacycles per second per inch.

Signal Output: As a signal generator, approximately 1 to 2 milliwatts.

Input and Output: Type N coaxial cable connector, waveguide, or horn.

Pulse Length: 0.5 to 5 microsecond duration.

Accuracy: Frequency, ±5 megacycles per second; frequency check point, ±2 megacycles per second.

Operating Temperature Range: -40° C. to $+55^{\circ}$ C.

MANUFACTURERS' OR CONTRACTORS' DATA:

Northeastern Engineering Company, Inc., Manchester, New Hampshire; Contract No. N383a-58410.

TUBE COMPLEMENT:

3 JAN-6SJ7, 1 JAN-6SA7, 3 JAN-6SN7GT, 1 JAN-6AC7, 1 JAN-3BP1, 1 JAN-884, 1 JAN-2X2A, 1 JAN-5R4GY, 1 JAN-6Y6G, 4 JAN-991, 1 JAN-2K25, 1 JAN-1N23B (Crystal Rectifier).

REFERENCE DATA AND LITERATURE:

TM 11-1249 (Instruction Manual).

Navships 900, 754 (Operating and Maintenance Instructions).

TO 16-30UPM33-3 (Operation and Maintenance Instructions).

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Radar Test Set AN/UPM-33 Including:						
1	Spectrum Analyzer TS-148/UP		7CAC-041085 F16-T-20139-5901 3F4325-148	15-11/16	13-13/32	9-1/8	39.00
1	Waveguide-to-Coaxial Adapter UG-183/U		7CWE-7415323 R16-WX-7415323-G1 2Z308-183	2-1/2	1	1-1/2	0.40
1	Antenna Horn AT-68/UP		7CAC-045705 R16-AN-AT-68/UP 3F3988-68	1-3/64	3-21/64	2-13/64	0.25
1	Antenna Horn Cable CG-92/U or		7CAC-170265-465 R16-AN-CG-92/U 1F430-92.72	72 long			1.00
1	Antenna Horn Cable CG-92A/U		R16-WX-7415328-G1	72 long			1.00
1	Mixer Cable CX-464/UP Type SJPL-55 Telephone Plugs Attached		7CAC-170264-47 R16-WX-7415326-G1 3E6000-464	48 long			0.25
1	Power Cable CX-337/U (6') or		7CAC-170264-86 R16-AN-CX-337/U 3E6000-337-72	72 long			0.40
1	Power Cable CX-337/U (10')		7CAC-170264-465 R16-WX-7415327-G1	120 long			0.50
1	Flexible Wave-Guide Assembly CG-182/APM-40 or		7CAC-472690 R16-WX-7415324-G1 2Z10006-182.1	1-1/8	21/32	15	0.25

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Flexible Wave-Guide Assembly CG-182/APM-40		7CAC-472697 R16-AN-CG-182/APM-40 2Z10006-182	1-1/8	21/32	18	0.32
1	Directional Coupler (Waveguide selector) CG-176/AP		7CAC-472696 R16-AN-CG-176/AP 3F3950-176	5	2-1/4	2-7/16	0.75
1	Auxiliary and Spare Parts Box CY-245/U		7CAC-176572-47 3F2529-245	17-29/32	7-1/4	10-1/16	6.00
1	Carriage, Shock Absorbing MT-325/U		7CAC-586275 R16-AN-MT-325/U 2Z6763-325	13-3/4	16-11/32	11-11/16	49.00
1	Carrying Case CY-246/U		7CAC-176555-285 R16-AN-CY-246/U 3F2529-246	19	25-9/16	13-1/2	
1	Choke-to-Choke Adapter UG-144/AP		7CWX-7818615P1 R16-AN-UG-144/AP 2Z3288-144	1-5/8	1-5/8	31/500	0.06
1	Allen Wrench No. 10						
1	Allen Wrench No. 8		7900-859490 41-W-2446 6R57400				
1	Allen Wrench No. 6		7900-859480 41-W-2445 6R57400-6				
1	Allen Wrench No. 4		7900-859460 41-W-2444 6R55499				
1	Tuning Wrench		3300-679481630 R16-WX-7416520-G1 6R38461	3-9/16	1/2	1/8 dia.	
	(Continued)						

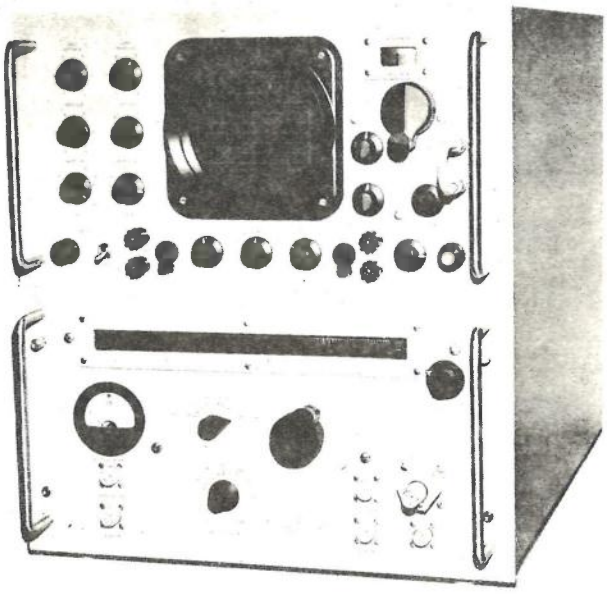
EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Set Spare Tubes						
4	Spare Incandescent Lamp, 2M-27, 6 to 8 volts.						
6	Spare Fuse FU-27						
2	Technical Manual TM 11-1249						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Radar Test Set AN/UPM-33 (Domestic Packed)	1.2	22-1/2	30-1/2	17	149

SPECTRUM ANALYZER AN/UPM-84



FUNCTIONAL DESCRIPTION:

A general purpose multiconversion superheterodyne receiver designed to provide a visual display of the spectral distribution of RF energy. Typical application includes side band measurements associated with modulated signals, determining the presence and frequency of RF signals, determining the type of modulation of RF signals, determining RF signal characteristics, and checking the operation of magnetrons. RF signals are displayed on a cathode-ray tube screen with power amplitude plotted as a function of frequency.

RELATIONSHIP TO OTHER EQUIPMENT:

The electrical specification of the AN/UPM-84 applies to the Lavoie LA-84 and the Polarad SA-84. The AN/UPM-84 is a modification of the AN/UPM-17.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The spectrum analyzer consists basically of an RF tuner, a wide band amplifier, a narrow band generator, a spectrum calibrator, video and sweep circuits, and power supplies. (Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.:	USN
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.4.4
	- Electronics Test Equipment -		AN/UPM-84

SPECTRUM ANALYZER AN/UPM-84

ELECTROMECHANICAL DESCRIPTION: (Continued)

Power Supply: 103.5 to 126.5 volts, AC, 50 to 1000 cycles per second, 380 watts.
Frequency Range: 10 to 40,880 megacycles per second in 8-bands.
Resolution Bandwidth: 20 kilocycles per second at all frequencies.
Frequency Dispersion:
- Tuning Range 10 to 55 Megacycles Per Second: Adjustable 500 kilocycles per second to 5 megacycles per second.
- Tuning Range 55 to 40,880 Megacycles Per Second: Adjustable 500 kilocycles per second to 25 megacycles per second.

Sensitivity (Minimum Discernible Signal):
- 10 to 400 Megacycles Per Second: -65 to -90 decibels below a milliwatt (dbm).
- 400 to 980 Megacycles Per Second: -57 to -80 dbm.
- 1000 to 2000 Megacycles Per Second: -50 to -75 dbm.
- 2000 to 12,000 Megacycles Per Second: -65 to -90 dbm.
- 12,000 to 40,880 Megacycles Per Second: -40 dbm nominal.

Sweep Repitition Rate: Adjustable 1 to 30 cycles per second.
Sweep Frequency: 224 megacycles per second center frequency, capable of ±12.5 megacycles per second deviation.
Synchronization: Internal line frequency.
Intermediate Frequencies:
- First Intermediate Frequency: 160 megacycles per second center, 25 megacycles per second bandwidth.
- Second Intermediate Frequency: 64 megacycles per second.
- Third Intermediate Frequency: 6 megacycles per second.
- Fourth Intermediate Frequency: 500 kilocycles per second.

Spectrum Calibrator Frequency: 160 megacycles per second center, frequency tuning range ±12.5 megacycles per second.
Spectrum Calibrator Accuracy: ±5% of the available display or ±1 megacycle per second for the maximum display.
Frequency Accuracy: ±1% of the fundamental local oscillator frequency.
Intermediate Frequency Attenuation: Variable 0 to 60 decibels in 6 decibel increments.

MANUFACTURERS' OR CONTRACTORS' DATA:

Lavoie Laboratories Incorporated, Matawan-Freehold Road, Morganville, New Jersey; approximate cost per unit, $6,811.00.

TUBE COMPLEMENT:

NI

REFERENCE DATA AND LITERATURE

Manufacturer's Catalog.

SPECTRUM ANALYZER AN/UPM-84

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-1011/UPM-84	metal	7CAC-040925 (USAF)	19-1/4	17-1/4	24-1/8	145
1	Electronic Equipment Case CY-2074/UPM-84						
1	Variable Attenuator CN-409/UPM-84 (12.4 to 18.0 kilomegacycles per second)						
1	Variable Attenuator CN-411/UPM-84 (18.0 to 26.5 kilomegacycles per second)						
1	Variable Attenuator CN-410/UPM-84 (26.5 to 40 kilomegacycles per second)						
1	Bandpass Filter F-338/UPM-84 (750 to 1350 megacycles per second)						
1	Bandpass Filter F-341/UPM-84 (1175 to 2250 megacycles per second)						

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Bandpass Filter F-337/UPM-84 (2000 to 3900 megacycles per second)						
1	Bandpass Filter F-336/UPM-84 (3375 to 7375 megacycles per second)						
1	Bandpass Filter F-335/UPM-84 (6100 to 12,100 megacycles per second)						
1	Cable Assembly, R-F CG-1526/U			18 long			
1	Cable Assembly, R-F CG-1526/U			72 long			
1	Cable Assembly, R-F CG-1525/U			3 long			
1	Cable Assembly, Power CX-3974/U			120 long			
1	Coax-To-Wave-guide Adapter UG-1241/UPM-84 (12.4 to 18 kilomegacycles per second)						
1	Coax-To-Wave-guide Adapter UG-1240/UPM-84 (18 to 26.5 kilomegacycles per second)						

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Coax-To-Waveguide Adapter UG-1239/UPM-84 (26.5 to 40 kilomegacycles per second)						
1	Adapter, R-F Cable UG-1242/UPM-84						
1	Rack Mounting Bracket, Right Side D108775						
1	Rack Mounting Bracket, Left Side D108774						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Spectrum Analyzer AN/UPM-84					

SPECTRUM ANALYZER TS-148/UP

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 volts, AC, 50 ot 1200 cycles per second, single phase, 125 watts.
Type of Reception: Continuous Wave, Pulsed.
Type of Transmission: Continuous Wave, Frequency Modulated Carrier Wave.
Frequency Range, Input: Calibrated directly from 8470 to 9630 megacycles per second (limited by local oscillator tube type 2K25 or 723A/B). Tolerance, ±5 megacycles per second.
Accuracy: Frequency, ±3 megacycles per second (absolute); at beacon frequency, ±0.5 megacycles per second (absolute).
Power Input: +12 to +70 dbm.
Frequency Range, Output: 8430 to 9580 megacycles per second (limited by tube type 2K25 or 723A/B).
Sweep Frequencies: Continuously variable from 10 to 30 cycles per second (may be "locked" to main line frequency).
Attenuation (Spectrum Amplitude): Uncalibrated.. Variable from 3 to 70 decibels.
Operating Temperature Range: -40° C. to $+55^{\circ}$ C.
Frequency Swing of Analyzer Radio-Frequency Oscillator (sawtooth frequency modulation): 40 to 50 megacycles per second.
First Intermediate Frequency: 22.5 megacycles per second.
Second Intermediate Frequency: 3.0 megacycles per second.
Overall Intermediate Frequency Bandwidth at Half Power Points: 50 kilocycles per second.
Receiver Gain (2 Intermediate Frequency Stages, 1 Video Stage): 100 decibels.
Sensitivity to Continuous Wave:
- Spectrum Amplified Position - 80 decibels below 1 watt for one inch of deflection on oscilloscope screen.
- Spectrum Position - 55 decibels below 1 watt for one inch of deflection on oscilloscope screen.

Indicator: Cathode ray tube.
Maximum Dispersion of Spectra: 1.5 megacycles per second per inch.
Maximum Power Output: Approximately 2 milliwatts (average).
Signal Output: As a signal generator, 2 milliwatts.
Input and Output: Type N coaxial cable connector, waveguide or horn.
Pulse Length: 0.5 to 5 microsecond duration.

MANUFACTURERS' OR CONTRACTORS' DATA:

Westinghouse Electric Corporation, Pittsburgh, Pennsylvania; Contract Nos. NXsa-59108 and NXsa-51586; Order No. 108-DAY-45RA; Mfg. Ident. XC1 and DL-7502890G-1; Approximate Cost per Unit, $750.00, 13 September 1946. Developed by Westinghouse Electric Corporation and Radiation Laboratory.

Hazeltine Electronic Corporation, 58-25 Little Neck Parkway, Little Neck, New York; Contract No. N383s-1427, Mfg. Ident. A-4014; Approximate Cost per Unit,

(Continued)

SPECTRUM ANALYZER TS-148/UP

MANUFACTURERS' OR CONTRACTORS' DATA: (Continued)
$2100.00, 10 June 1948; Order No. 47-2877, 1947; Approximate Cost per Unit, $2100.00; Order No. N383-s-37357, 1950; Approximate Cost per Unit, $2374.00.

TUBE COMPLEMENT:
3 JAN-6SJ7, 1 JAN-6SA7, 3 JAN-6SN7GT, 1 JAN-6AC7, 1 JAN-3BP1, 1 JAN-884, 1 JAN-2X2A, 1 JAN-5R4GY, 1 JAN-6Y6G, 4 JAN-991, 1 2K25 (or 723A/B), 1 JAN-1N23B (Crystal Rectifier).

REFERENCE DATA AND LITERATURE:
TM 11-1249 (Instruction Manual).
AN 16-35TS148-5 (Maintenance Instructions).
TO 16-55-369 (Spare Parts List).

EQUIPMENT SUPPLIED:

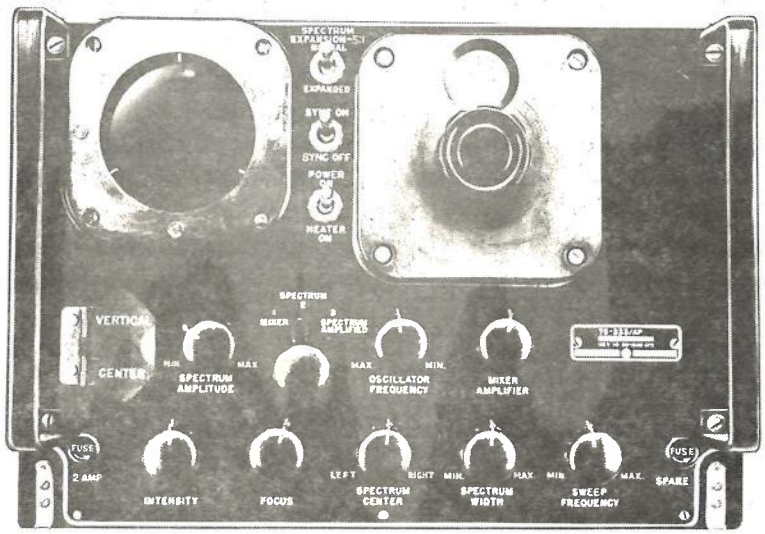
Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-148/UP		7CAC-041085 F16-T-20139-5901 3F4325-148Z	19	13-1/4	25	39
1	Directional Coupler (Waveguide selector) CG-176/AP		7CAC-472696 R16-AN-CG-176/AP 3F3950-176	5	2-1/4	2-7/16	0.75

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Spectrum Analyzer TS-148/UP (Packed Method 2).	1.2	22.5	17	30.5	149

SPECTRUM ANALYZER TS-333/AP
(ANALYZER, SPECTRUM, TS-333/AP)

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose test set designed to check the operation of signal generators, local oscillators and magnetrons. It will also measure frequency and supply a low-power radio frequency signal for use in standing wave ratio measurements, for determining the characteristics of T/R and R/T boxes, and for "Q" measurements. A three-inch cathode-ray-tube screen is used to indicate the RF energy spectrum.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The RF oscillator frequency is swept in synchronism with the sawtooth sweep voltage applied to the horizontal plates of the cathode ray tube. The incoming signal "beats" against the oscillator output. The resulting signal is amplified and put through the detector and video amplifier. The output of the video amplifier is applied to the vertical plates of the cathode ray tube. The

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Standard		
STOCK NOS.		R16-AN-TS-333/AP	
PROCUREM'T INFO.:	Navy Spec. 16T27(RE)		
PROCUREM'T COG.:	Navy	DESIGN COG.:	Navy, BuAer
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.4.4
- Electronics Test Equipment -			TS-333/AP

SPECTRUM ANALYZER TS-333/AP
(ANALYZER, SPECTRUM, TS-333/AP)

ELECTROMECHANICAL DESCRIPTION: (Continued)
frequency meter pip enables reading the frequency to which the frequency meter is set at any point along the resulting curve upon the screen of the cathode ray tube.
Power Supply: 115 volts, ±10 volts, AC, single phase, 50 to 1600 cycles per second, 150 volt-amperes.
Frequency Range: 23,500 to 24,500 megacycles per second.
Sweep Frequency: 4.5 to 70 megacycles per second.
Accuracy: ±25 megacycles per second of indicated frequency.
Atmospheric Limits: -40° C. to +55° C. at 10,000 feet.

MANUFACTURERS' OR CONTRACTORS' DATA:
Westinghouse Electric Corporation, Horseheads, New York; Navy Contract No. NXsa-91918.

TUBE COMPLEMENT:
1 JAN-3AP1, 1 JAN-5V4G, 1 JAN-6H6GT, 1 JAN-6J5GT, 2 JAN-6SJ7GT, 1 JAN-6SL7GT, 1 JAN-6SN7GT, 1 JAN-6Y6G, 1 JAN-6SK7GT, 5 JAN-7V7, 1 JAN-7A6, 1 JAN-812A, 1 JAN-884, 2 JAN-3B24, 1 JAN-0C3/VR-105, 4 JAN-0D3/VR-150, 2 Type A5022A.

REFERENCE DATA AND LITERATURE:

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

SPECTRUM ANALYZER TS-333/AP
(ANALYZER, SPECTRUM, TS-333/AP)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-333/AP		R16-AN-TS-333/AP	15	13-1/2	10	45
1	Transit Case CY-246/U		7CAC-176555-285	13-1/2	25-1/2	19-1/2	
1	Accessory Case CY-245/U		7CAC-176572-47				
1	Cord CX-464/UP		7CAC-170264-47	48 long			
1	Cord CX-337/U		7CAC-170264-86	72 long			
1	Horn						
1	Choke Adapter						
2	Waveguide Section						
						Total:	70

SPECTRUM ANALYZER TS-678(XW-3)/U
(ANALYZER, SPECTRUM, TS-678(XW-3)/U)

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.

FUNCTIONAL DESCRIPTION:

A portable, general purpose test set which is used for analysis of spectra of pulsed oscillators and particularly for examining and measuring the signal output of Loran equipment. A visual presentation is obtained of pulse characteristics and the distribution in frequency of the RF power of the pulse. The sweep may be expanded over the face of the viewing screen to allow measurement of the amplitude of the components. The frequencies of the components and their bandwidths can be measured by means of a built-in frequency meter. By varying the shape of the pulse applied to the transmitter and then viewing the spectrum received by the analyzer, the Loran equipment can be adjusted for optimum operation. The cathode ray viewing tube is three inches in diameter and of the long persistence type.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 115 volts ±10 volts, AC, single phase, 50 to 1600 cycles per second, 150 watts.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Development		
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.: USAF		DESIGN COG.: USAF, Rome	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.4	
	- Electronics Test Equipment -		TS-678(XW-3)/U

SPECTRUM ANALYZER TS-678(XW-3)/U
(ANALYZER, SPECTRUM, TS-678(XW-3)/U)

ELECTROMECHANICAL DESCRIPTION: (Continued)

Frequency Range: 60 to 240 kilocycles per second.
Type of Reception: Pulse Modulated and Continuous Wave.
Attenuator Range: 0 to 100 decibels.
Horizontal Sweep: 0.2 to 1.0 cycle per second.
Oscillator Sweep: Adjustable from center frequency to ±30 kilocycles per second.
Bandwidth of IF Strip: 100 cycles per second.
Gain: At least 100 decibels.
Accuracy of Frequency Meter: ±0.1%.

MANUFACTURERS' OR CONTRACTORS' DATA:

Radio Sonic Corporation, 186 Union Avenue, New Rochelle, New York; USAF Contract No. W28-099-ac-431.

TUBE COMPLEMENT:

4 JAN-6AU6, 2 JAN-6AK5, 2 JAN-0A2, 4 JAN-6BE6, 1 JAN-12AU7, 2 JAN-1B3GT, 4 JAN-6AK6, 2 JAN-6AC7, 5 JAN-12AX7, 2 JAN-0B2, 1 JAN-884, 2 JAN-6C4, 1 JAN-6SL7, 1 JAN-3JP7, 1 JAN-5651, 1 JAN-5R4GY, 1 JAN-6X4, 1 JAN-6AS7G.

REFERENCE DATA AND LITERATURE: Handbook of Operating Instructions.

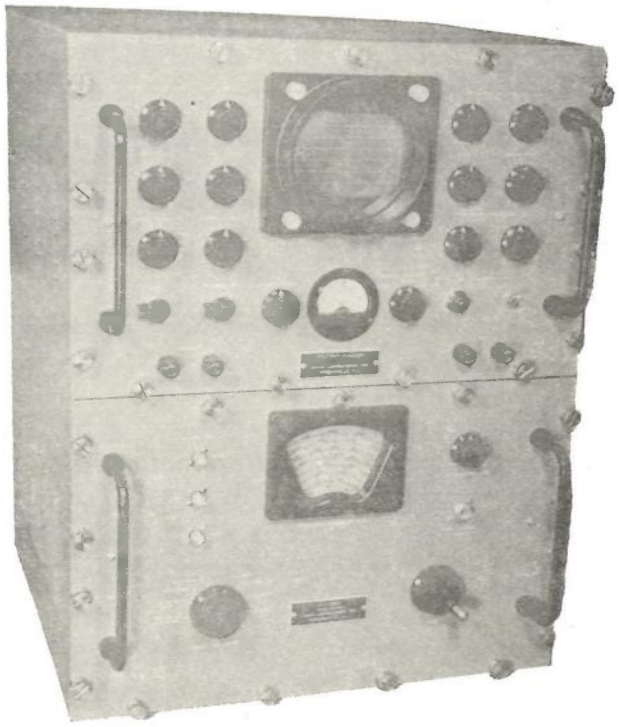
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-678(XW-3)/U			17	17-1/2	14-1/2	65.0
1	Transit Case			19-3/4	20-5/8	18-1/2	15.0
1	Cable RG-58/U		1800-020693055				
1	Instruction Book						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

SPECTRUM ANALYZER TS-680(XA)/U
(ANALYZER, SPECTRUM, TS-680(XA)/U)



FUNCTIONAL DESCRIPTION:

A transportable equipment for use in the laboratory or maintenance depots to provide visual indication of the frequency distribution of energy in radio and/or radar signals. It also accurately measures the frequency, determines the bandwidth necessary for reproducing a radio frequency pulse being observed on the Display Unit, compares two radio frequency signals differing by a small frequency separation, acts as a sensitive detector in radio frequency power measurements, observes and measures the sidebands associated with amplitude--and frequency--modulated signals, checks operation of a magnetron, and may be used to illustrate the method of Fourier analysis of transient phenomena. Information is displayed in panoramic view on a five-inch green, medium persistence, cathode ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

Now AN/UPM-17.

	AIR FORCE	NAVY	ARMY
TYPE CLASS.	Obsolete		
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.: USAF		DESIGN COG.:	USAF, ARL
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.4.4
	- Electronics Test Equipment -		TS-680(XA)/U

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

SPECTRUM ANALYZER TS-680(XA)/U
(ANALYZER, SPECTRUM, TS-680(XA)/U)

ELECTROMECHANICAL DESCRIPTION:

Power Supply: 105 to 125 volts, AC, single phase, 50 to 1600 cycles per second, 600 watts.

Frequency Range: Overall tuning range, 10 to 16,520 megacycles per second, obtained by utilizing seven discrete radio frequency bands included in three tuning units: First Tuning Unit, 10 to 1260 megacycles; Second Tuning Unit, 940 to 4500 megacycles; Third Tuning Unit, 4460 to 16,520 megacycles. Intermediate Frequencies, 160, 64, and 1 megacycle. One megacycle IF bandwidth at half-power points, 5 kilocycles. Sweep frequency range, 8 to 30 cycles per second. Maximum dispersion of spectra, approximately 100 kilocycles per inch on a four-inch calibrated scale. Frequency swing of sweeper oscillator, 211.5 to 236.5 megacycles.

Receiver: The spectrum analyzer incorporates a broad-band, triple conversion superheterodyne receiver. Receiver is electronically tuned in frequency by applying a linear modulating voltage to the second converter. Same sawtooth driving voltage is applied to horizontal plates of cathode ray tube. Receiver signal is applied to the vertical plates, thus indicating power vs. frequency.

Beat Frequency Oscillator: 160 megacycles beat frequency oscillator incorporated in intermediate frequency unit. Can be switched on or off on front panel. Beat frequency oscillator signal can be injected into second mixer circuit. Function is to provide a marker pip at center of spectrum on cathode ray tube display.

Detector: 1N34 germanium crystal used in intermediate frequency unit. Detected signal applied to video amplifier, thence to vertical deflection plates of display tube.

Calibration: Intermediate frequency attenuation variable between 0 and 60 dbm down in 6 decibel steps. Radio frequency attenuation variable between 0 and 120 decibels.

Temperature Range: -40° C. to $+55^{\circ}$ C.

Controls: All operating controls, pilot lamps, indicating meters, and certain important adjustment controls are located on front panel of units.

Mounting: All eight major units designed for standard 19" relay rack mounting. Each unit 12.25 inches high, 20.5 inches deep. Transit cases provided.

Fuses: Both operating and spare fuses accessible on front panel.

MANUFACTURERS' OR CONTRACTORS' DATA:

Polarad Electronics Corporation, 100 Metropolitan Avenue, Brooklyn 11, New York; Contract No. W-33-038-AC-20720, 29 April 1948; Approximate Cost per Unit, $13,000.00, complete; Model A-SA-SLX.

TUBE COMPLEMENT:

Radio Frequency Tuner (10-1,260 megacycles in three ranges): 1 JAN-6J6, 1 JAN-6AS6, 9 JAN-6AK5, 1 JAN-5675, 1 JAN-1N21. Total: 13

Radio Frequency Tuner (940-4,500 megacycles in two ranges): 1 QK-201, 1 QK-202, 7 JAN-6AK5, 2 JAN-1N23B. Total: 11

(Continued)

SPECTRUM ANALYZER TS-680(XA)/U
(ANALYZER, SPECTRUM, TS-680(XA)/U)

TUBE COMPLEMENT: (Continued)

Radio Frequency Tuner (4460-16,520 megacycles in two ranges): 1 JAN-5721, 1 JAN-1N26, 7 JAN-6AK5. Total: 9

Intermediate Frequency Unit: 2 JAN-6AG5, 13 JAN-6AK5, 2 JAN-6AS6, 1 JAN-6J6, 2 JAN-12AT7, 1 JAN-1N34. Total: 21

Klystron Power Unit: 7 JAN-OA2, 1 JAN-OB2, 1 JAN-5R4GY, 2 JAN-6SL7GT, 2 JAN-6Y6G, 2 JAN-1616. Total: 15

Power Unit: 2 JAN-OA2, 1 JAN-OB2, 3 JAN-5R4GY, 3 JAN-6AS7G, 3 JAN-6AK5, 1 JAN-991, 1 JAN-5Y3GT. Total: 14

Display Unit: 1 JAN-OA2, 1 JAN-5CP1A, 1 JAN-6AL5, 9 JAN-6SN7GT. Total: 12

REFERENCE DATA AND LITERATURE:

Operating and Maintenance Instructions, 31 August 1949. (Polarad Electronics Corporation Handbook).

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Radio Frequency Tuner TN-168(XA)/U	Aluminum		12-1/4	19	20-1/2	
1	Radio Frequency Tuner TN-169(XA)/UPM	Aluminum		12-1/4	19	20-1/2	
1	Radio Frequency Tuner TN-170(XA)/UPM	Aluminum		12-1/4	19	20-1/2	

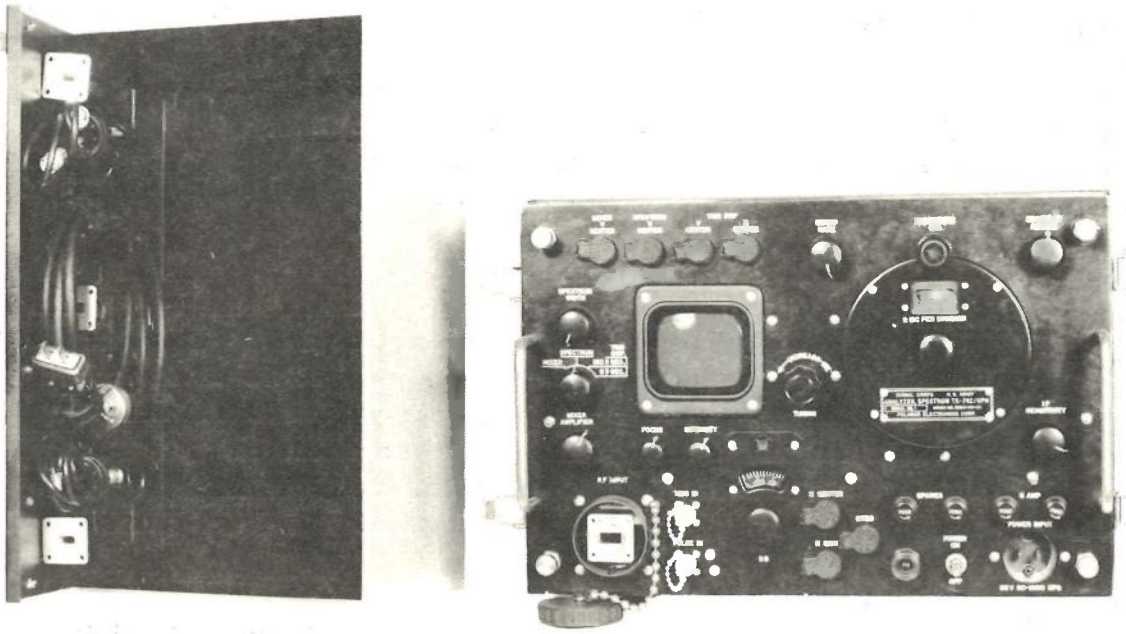
(Continued)

SPECTRUM ANALYZER TS-680(XA)/U
(ANALYZER, SPECTRUM, TS-680(XA)/U)

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Intermediate Frequency Unit AM(XA-57)/U	Alum-inum		12-1/4	19	20-1/2	
1	Klystron Power Unit PP(XA-83)/U	Alum-inum		12-1/4	19	20-1/2	
1	Power Unit PP(XA-84)/U	Alum-inum		12-1/4	19	20-1/2	
1	Display Unit I(XA-21)/U	Alum-inum		12-1/4	19	20-1/2	
2	Single Size Cabinet	Alum-inum		12-1/4	21	18-3/4	
3	Double Size Cabinet	Alum-inum		24-1/2	21	18	
2	Single Size Transit Case CY(XA-32)/U			23-1/2	22-1/4	15-1/2	
3	Double Size Transit Case CY(XA-33)/U			23-1/2	27-1/2	22	
1	RF Attenuator CN (XA-138)/U						
1	Cable Assembly CX-(XA-79)/U			96 long			
1	Cable Assembly CX-(XA-80)/U			96 long			
1	Cable Assembly CX-(XA-81)/U			96 long			
1	Power Cord CX-1059/U			120 long			
1	RF Cable CG-92B/U			96 long			
1	RF Cable CG-409A/U			96 long			

SPECTRUM ANALYZER TS-742/UPM



FUNCTIONAL DESCRIPTION:

A portable general purpose equipment designed to measure the frequency distribution of the power output of pulsed radar systems. It measures the width and continuous wave spectrum of a pulsed signal within its range. It is also used for measuring the frequency and operation of local oscillators, magnetrons, TR and RT Boxes, and signal generators. The spectrum of the pulse under test is displayed on a cathode ray tube screen for analysis. Each frequency component is displayed as power versus frequency. The equipment may also be used as a conventional synchroscope for large amplitude pulsed signals.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Polarad Model SA 1516.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The equipment is a sensitive, narrow band, double superheterodyne receiver with a swept local oscillator which presents its output visually

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			Experimental
STOCK NOS.			
PROCUREM'T INFO.: Spec. SCL-2229			
PROCUREM'T COG.: USA		DESIGN COG.: USA, SCEL, ESL	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.4	
- Electronics Test Equipment -			TS-742/UPM

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

SPECTRUM ANALYZER TS-742/UPM

ELECTROMECHANICAL DESCRIPTION: (Continued)

on a CRT screen. An absorption type frequency meter calibrates the displayed output.

Power Supply: 105 to 125 volts, AC, 50 to 1000 cycles per second, single-phase, 165 watts.

Frequency Range: 15,800 to 16,200 megacycles per second, in one band.

Modulating Pulse Width: 0.1 to 2 microseconds.

Modulating Pulse Repetition Rate: 100 to 10,000 pulses per second.

RF Power Input: Up to +30 dbm or one watt, average, or one kilowatt, peak, with a duty period of 0.1% or less.

Input Power Attenuation: 0 to 45 decibels, calibrated; 45 to 65 decibels, uncalibrated.

Spectrum Width: Expands to 1 inch, maximum.

Resolution: At least 50 discrete transients displayed between third minima points on either side and vertical line through the center of the main lobe.

IF Characteristics: 1st IF: 45 megacycles per second, bandwidth 700 kilocycles.
2nd IF: 5 megacycles per second, bandwidth 50 kilocycles.
Gain Control: 0 to 40 decibels.

Sensitivity to Continuous Wave: For 1 inch CRT deflection, -60 dbm. For minimum discernable signal, -70 dbm.

Maximum Dispersion: 1 inch per megacycle.

Sweep Frequency Range: 5 to 40 cycles per second, continuously variable.

Synchroscope Characteristics: Triggered sweep speeds 5 and 150 microseconds. Vertical deflection sensitivity 115 to 160 volts per inch.

Accuracy: of Frequency Calibration: ±2 megacycles per second relative over a 100 megacycles per second range; ±5 megacycles per second, absolute.

Temperature Range: -40° C. (-40° F.) to $+55^{\circ}$ C. ($+132^{\circ}$ F.), fully operable.
-53° C. (-65° F.) to $+65^{\circ}$ C. ($+150^{\circ}$ F.), operable.

Altitude Range: Up to 10,000 feet, operable. Up to 50,000 feet, transportable.

Humidity Range: Up to 100%, relative humidity, operable.

MANUFACTURERS' OR CONTRACTORS' DATA:

Polarad Electronics Corporation, 100 Metropolitan Avenue, Brooklyn 11, New York; USN Contract No. DA-36-039-sc-102. Order No. 13897-PH-50-5(1306-A).

TUBE COMPLEMENT:

1 RETMA-QK297, 1 JAN-5Y3WGT, 6 JAN-12AT7, 1 JAN-6X4W, 1 JAN-6AS7G, 3 JAN-6AH6, 1 JAN-6005, 1 JAN-2X2, 1 JAN-6BA7, 7 JAN-6AU6, 3 JAN-5651. 1 JAN-3RP1.

REFERENCE DATA AND LITERATURE:

Manufacturer's Instruction Book.

SPECTRUM ANALYZER TS-742/UPM

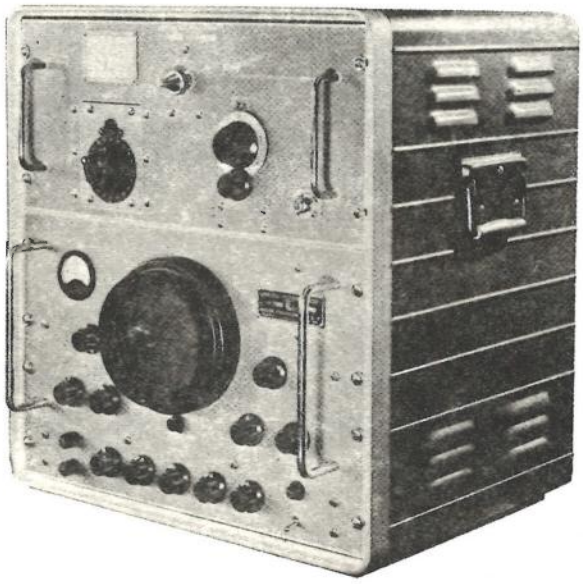
SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Spectrum Analyzer TS-742/UPM					

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-742/UPM	Aluminum		12-1/32	18-7/32	19-1/16	62
1	Combination Case						
1	Power Cable CX-337/U			72 long			
2	Video Cable RG-58/U terminated at each end in Connector UG-88/U			96 long			
1	Flexible Waveguide CG-539/U			24 long			
1	Directional Horn						

SPECTRUM ANALYZER TS-858/UP



FUNCTIONAL DESCRIPTION:

A portable, general purpose instrument used to locate and evaluate RF, radar, and radio relay signals. The analyzer is used to study the RF pulse characteristics of magnetron oscillators and similar microwave signal sources and may also be used as a receiver for applications such as high vswr measurements, leakage tests, and loss measurements. The spectrum under surveillance is displayed on the screen of a 5-inch cathode-ray tube.

RELATIONSHIP TO OTHER EQUIPMENT:

The TS-858/UP is similar to Spectrum Analyzer PRD 858.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The analyzer consists of an indicator unit and one or more RF heads. The indicator unit contains a narrowband IF amplifier, a video amplifier, sweep circuits, a cathode-ray tube, and metering circuits. The indicator unit supplies all voltages required to operate its own circuits and one

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: USN	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.4	

SPECTRUM ANALYZER TS-858/UP

ELECTROMECHANICAL DESCRIPTION: (Continued)

RF head. RF frequency range is determined by the choice of the RF head. Each RF head consists of a calibrated variable input attenuator with a 100-decibel range, a swept microwave oscillator, a precision-calibrated frequency meter, and a crystal mixer. The local oscillator is swept in synchronism with the horizontal trace of the cathode-ray tube, so that spectrum amplitude, as a function of frequency is displayed. The local oscillator modes, as well as spectra, may be displayed on the screen. The analyzer employs automatic focus-corrected intensification of the spectral lines.

Power Supply: 115 volts, AC, 50 to 60 cycles per second, single-phase.
Frequency Range: 5.1 to 5.9 kilomegacycles per second.
IF Center Frequency: 20 megacycles per second.
IF Bandwidth: 50 kolocycles per second.
Gain: Crystal noise visible for maximum gain control.
Sweep Range: 5 to 20 cycles per second, variable.
Dispersion: From less than one megacycle per second per inch to greater than 10 megacycles per second per inch (with total dispersion up to 50 megacycles per second per inch).
Frequency Meter Accuracy: ± 2 megacycles per second.

MANUFACTURERS' OR CONTRACTORS' DATA:

Polytechnic Research & Development Company, Inc., 202 Tillary Street, Brooklyn 1, New York.

TUBE COMPLEMENT:

NI

REFERENCE DATA AND LITERATURE:

Manufacturer's Manual.

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Spectrum Analyzer TS-858/UP					

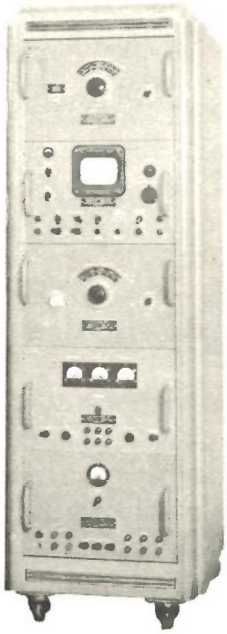
SPECTRUM ANALYZER TS-858/UP

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-858/UP	metal		23	22	15	58

SPECTRUM ANALYZER
MODEL LSA
(Polarad Electronics Corporation)

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A general purpose, rack-mounted, laboratory instrument consisting of three RF tuning units, a spectrum display unit, a power unit, a klystron power unit and a mounting rack. It is used to provide a visual indication of the frequency distribution of energy in an RF signal. Other uses would include: observe and measure side bands associated with amplitude and frequency modulated signals; determine the presence and accurately measure the frequency of radio and/or radar signals; check the spectrum of magnetron oscillators; measure noise spectra; check and observe tracking of RF components of a radar system; check two RF signals differing by a small frequency separation. Frequency dials are calibrated in megacycles per second. Signals detected are presented visually on a five-inch cathode ray tube as a plot of voltage on the vertical axis, versus frequency on the horizontal axis.

RELATIONSHIP TO OTHER EQUIPMENT:

Used to test Radar Set AN/APT-16, AN/APR-9, etc.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-040950		
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.4	
	- Electronics Test Equipment -		Model LSA

SPECTRUM ANALYZER
MODEL LSA
(Polarad Electronics Corporation)

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The spectrum analyzer consists essentially of a quintuple superheterodyne receiver working into a cathode ray tube display. The tuning unit is set to the frequency of the signal whose spectrum is desired. Spectrum analysis is obtained by frequency modulating the second local oscillator. Frequency stability is obtained by a mixer strip which heterodynes the signal down to the low frequency of the final IF amplifier. Sharp resolution of 5 kilocycles constant for all signal frequencies is achieved by passing the resulting spectrum through the narrow band-width final IF amplifier.

General:

Power Supply: 105-125 volts, AC, single phase, 50-60 cycles per second, 600 watts.

Frequency Range: 10 megacycles per second to 21,000 megacycles per second.

Types of Reception: Continuous Wave and Pulsed.

Spectrum Resolution: 5 kilocycles at all frequencies.

Frequency Dispersion: Electronically controlled, continuously adjustable from 50 kilocycles per inch to 7 megacycles per inch.

Input Impedance: 50 ohms coaxial.

Overall Gain: 120 decibels.

Attenuation RF: 110 decibels - external, continuously variable.
IF: 60 decibels in 6 decibel steps.

Frequency Accuracy: 1%.

RF Tuning Unit LTU-1:

Power Input: DC: +150 volts, +105 volts; AC: +115 volts.

Frequency Range: 9.5 megacycles per second to 1200 megacycles per second.

Oscillator:

Low Range: 10 megacycles per second to 120 megacycles per second.

Middle Range: 100 megacycles per second to 560 megacycles per second.

High Range: 225 megacycles per second to 1200 megacycles per second.

Bandwidth: 5 megacycles per second on low range. 25 megacycles per second on high ranges.

Sensitivity: (Low) - 97 decibels below 1 watt. (High) - 90 decibels below 1 watt.

RF Tuning Unit LTU-2:

Power Input: DC: +105 volts, -400 volts, -1000 volts; AC: 6.3 volts, 115 volts.

Frequency Range: 940 megacycles per second to 4500 megacycles per second.

Oscillator:

Low Range: 940 to 2020 megacycles per second.

High Range: 1980 to 4500 megacycles per second.

Bandwidth: 25 megacycles per second.

Sensitivity: Low Range: -115 decibels below 1 watt.
High Range: -105 decibels below 1 watt.

SPECTRUM ANALYZER
MODEL LSA
(Polarad Electronics Corporation)

ELECTROMECHANICAL DESCRIPTION: (Continued)

RF Tuning Unit LTU-3:
Power Input: DC: +105 volts, -1000 volts, -1600 volts; AC: 6.3 volts, 115 volts.
Frequency Range: 4460 to 16,520 megacycles per second.
Oscillator:
Low Range: 4460 to 8500 megacycles per second.
High Range: 8460 to 16,520 megacycles per second.
Bandwidth: 25 megacycles per second.
Sensitivity: -95 decibels below 1 watt.

RF Tuning Unit LTU-4:
Power Input: DC: +105 volts, -1250 volts, -1850 volts; AC: 6.3 volts, 115 volts.
Frequency Range: 15,000 to 21,000 megacycles per second.
Bandwidth: 25 megacycles per second.
Sensitivity: -80 decibels below 1 watt.

Spectrum Display Unit:
Power Input: DC: +150 volts, -150 volts, +300 volts; AC: 6.3 volts, 115 volts,
Scanning Rate: 5 to 20 cycles per second.
Synchronization: With submultiples of power line frequency.
Frequency Marker: Continuously variable, ±14 megacycles per second.

Power Unit:
Power Input: 105 to 125 volts, 50 to 60 cycles per second, 300 watts.
Output Power: +105 volts at 200 milliamperes.
+150 volts at 200 milliamperes.
+300 volts at 150 milliamperes.
-150 volts at 20 milliamperes.
Impedance: 1.5 ohms.
Regulation: 0.2%.
Ripple: 10 millivolts, root mean square.

Klystron Power Unit:
Power Input: 105 to 125 volts, 50 to 60 cycles per second, 300 watts.
Output Power: -300 volts at 40 milliamperes.
-400 volts at 40 milliamperes.
-1000 volts at 20 milliamperes.
-1250 volts at 20 milliamperes.
600 volts at 40 milliamperes.
Ripple: Less than 0.003%.

MANUFACTURERS' OR CONTRACTORS' DATA:

Polarad Electronics Corporation, 100 Metropolitan Avenue, Brooklyn 11, New York; Approximate Cost per Unit, $12,695.00, October 1950.

SPECTRUM ANALYZER
MODEL LSA
(Polarad Electronics Corporation)

TUBE COMPLEMENT:

RF Tuner (low range): 1 RTMA-5675, 1 RTMA-6J6, 1 RTMA-6AS6, 9 RTMA-6AK5, 1 RTMA-1N21.

RF Tuner (middle range): 1 RTMA-QK201, 7 RTMA-6AK5.

RF Tuner (high range): 1 RTMA-RK5721, 7 RTMA-6AK5.

RF Tuner (highest range): 1 RTMA-RK5721, 7 RTMA-6AK5.

Spectrum Display Unit: 2 RTMA-2X2A, 8 RTMA-6AK5, 4 RTMA-6AU6, 3 RTMA-6BA7, 2 RTMA-6J4, 4 RTMA-6J6, 1 RTMA-12AT7, 4 RTMA-12AU7, 1 RTMA-5CP1A.

Power Unit: 4 RTMA-0A2, 4 RTMA-5R4GY, 2 RTMA-6AS7G, 2 RTMA-6AU6, 1 RTMA-6L6G, 1 RTMA-6SL7.

Klystron Power Unit: 2 RTMA-1616, 1 RTMA-5R4GY, 1 RTMA-6Y6G, 7 RTMA-0A2, 1 RTMA-0B2, 2 RTMA-6SL7GT.

REFERENCE DATA AND LITERATURE:

Manufacturer's Instruction Manual (Five Parts).

Manufacturer's Pamphlet "Spectrum Analyser".

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer Model LSA Consists of:	Metal	7CAC-040950	85-3/8	24	24	525
1	RF Tuning Unit Model LTU-1	Metal		12-1/2	19	21-3/4	30
1	RF Tuning Unit Model LTU-2	Metal		12-1/2	19	21-3/4	45
						(Continued)	

SPECTRUM ANALYZER
MODEL LSA
(Polarad Electronics Corporation)

EQUIPMENT SUPPLIED: (Continued)

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	RF Tuning Unit Model LTU-3	Metal		12-1/2	19	21-3/4	45
1	RF Tuning Unit Model LTU-4	Metal		12-1/2	19	21-3/4	45
1	Spectrum Display Unit	Metal		12-1/4	19	21-3/4	50
1	Power Unit Model LPU-1	Metal		12-1/4	19	21-3/4	75
1	Klystron Power Unit Model LKU-1	Metal		12-1/4	19	21-3/4	85
1	Mounting Rack	Steel		85-3/8	24	24	175

SPECTRUM ANALYZER
MODEL TSA
(Polarad Electronics Corporation)

FUNCTIONAL DESCRIPTION:

A general purpose superheterodyne receiver designed to provide a visual display of the spectral distribution of RF energy. Typical application of the equipment includes determining the presence and measuring the frequency of RF signals, determining the types of RF signal modulation, observing and measuring sidebands associated with modulated signals, determining RF pulse characteristics by spectrum analysis, checking the operation of pulsed magnetron oscillators, measuring noise spectra and checking the frequency difference between adjacent RF signals. RF signals are displayed on a cathode-ray tube screen with amplitude plotted as a function of frequency.

RELATIONSHIP TO OTHER EQUIPMENT:

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The equipment consists of a display and power supply unit with five interchangeable RF plug-in units. The display and power supply unit

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.4	
	- Electronics Test Equipment -		Polarad TSA

SPECTRUM ANALYZER MODEL TSA
(Polarad Electronics Corporation)

ELECTROMECHANICAL DESCRIPTION: (Continued)

contains a wide and narrow band IF amplifier, sweeping circuits, a video amplifier and display tube, a variable frequency marker oscillator and four regulated power supplies. Each of the tuning units contains a local oscillator, a crystal mixer and a drive mechanism for simultaneous tracking of the local oscillator with tuning dial rotation.

Power Supply: 115 or 230 volts, AC, 50 to 60 cycles per second, 400 watts.

RF Tuning Unit STU-1:

Frequency Range: 10 to 400 and 350 to 1000 megacycles per second.

Sensitivity: -83 to -95 decibels below a milliwatt (dbm) from 10 to 400 megacycles per second, -76 to -90 dbm from 350 to 1000 megacycles per second.

RF Attenuation Range: 0 to 100 decibels.

RF Tuning Unit STU-2:

Frequency Range: 910 to 4560 megacycles per second.

Sensitivity: -85 to -95 dbm from 910 to 2200 megacycles per second, -75 to -87 dbm from 1980 to 4560 megacycles per second.

RF Attenuation Range: 0 to 100 decibels.

RF Tuning Unit STU-3:

Frequency Range: 4370 to 22,000 megacycles per second.

Sensitivity: -77 to -90 dbm from 4370 to 11000 megacycles per second, -65 to -85 dbm from 8900 to 22000 megacycles per second.

RF Attenuation Range: 0 to 100 decibels.

RF Tuning Unit STU-4:

Frequency Range: 21,000 to 33,000 megacycles per second.

Sensitivity: -57 to -75 dbm.

Attenuation: External attenuator required.

RF Tuning Unit STU-5:

Frequency Range: 33,000 to 44,000 megacycles per second.

Sensitivity: -50 to -65 dbm.

Attenuation: External attenuator required.

Resolution: 25 kilocycles per second.

Sweep Frequency: Variable 1 to 30 cycles per second.

Overall System Gain: 120 decibels.

Frequency Dispersion: Variable 400 kilocycles per second to 5 megacycles per second below 55 megacycles per second tuning range, variable 400 kilocycles per second to 25 megacycles per second above 55 megacycles per second tuning range.

IF Attenuation Range: 0 to 50 decibels.

Synchronization: External, line, or free running.

SPECTRUM ANALYZER MODEL TSA
(Polarad Electronics Corporation)

MANUFACTURERS' OR CONTRACTORS' DATA:

Polarad Electronics Corporation, 43-20 - 34th Street, Long Island City 1, New York; approximate cost per unit, $13,260.00

TUBE COMPLEMENT:

4 5R4WA, 2 807, 4 6AU6, 6 0A2, 5 6X4, 2 6AS7, 1 6AR6, 2 1X2A, 1 5ADP7, 2 6BA7, 2 6AG5, 3 6AM4, 2 6J6, 2 6CB6, 1 6AS6, 3 12AT7, 1 6J4, 2 12AU7, 9 6AK5, 1 6AF4, 3 6AM4, 4 klystron.

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog.

SHIPPING DATA:

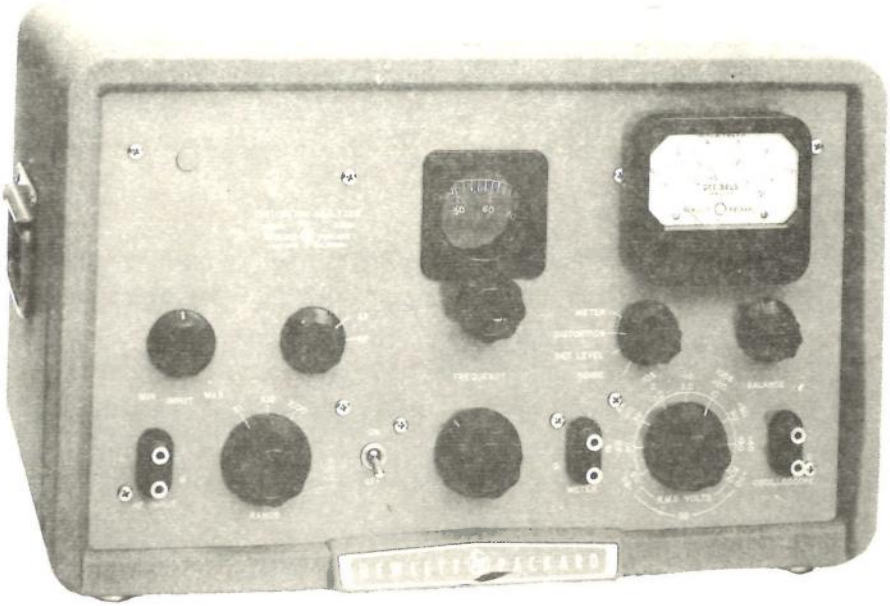
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
	Spectrum Analyzer Polarad TSA					225

SPECTRUM ANALYZER MODEL TSA
(Polarad Electronics Corporation)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TSA	metal		19-1/2	17-1/8	23-1/8	170
1	Display and Power Supply Unit DU						
1	RF Tuning Unit STU-1						
1	RF Tuning Unit STU-2						
1	RF Tuning Unit STU-3						
1	RF Tuning Unit STU-4						
1	RF Tuning Unit STU-5						
1	Wrench Kit						
1	Alignment Tool						
1	Set, Color Filters						
1	Cable Assembly, Power						
1	Type N Adapter						
4	Waveguide Adapters						

SPECTRUM ANALYZER TS-723/U



FUNCTIONAL DESCRIPTION:

A portable, general purpose test instrument that measures total audio distortion. With a detector the equipment will measure the total distortion of an amplitude modulated radio frequency carrier signal. Contained within the spectrum analyzer is a wide range vacuum tube voltmeter that can be used independently for voltage, amplifier gain, power output, direct noise and hum level measurements. With this instrument, accurate audio signal frequency measurements can be made. The meter is calibrated in root mean square volts and in decibels. Frequencies are selected on a directly calibrated dial in cycles per second. Terminals are provided for connection to an oscilloscope to observe the wave shapes of the original signal and the residual distortion components.

RELATIONSHIP TO OTHER EQUIPMENT:

Similar to Hewlett-Packard Distortion Analyzer Model 330B.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: The circuit consists of a frequency-selective amplifier, a regulated power supply and a vacuum tube voltmeter. The 20-decibel amplifier operates in conjunction with the resistance tuned circuit to provide infinite at-

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			3F1722-5.4
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.: USA		DESIGN COG.: USA, SigC	
F.I.I.N.:		FUNCTIONAL CLASS. NO.:	3.4.5
- Electronics Test Equipment -			TS-723/U

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

ELECTROMECHANICAL DESCRIPTION: (Continued)

tenuation at one frequency while allowing all other frequencies to be passed at the normal gain of the amplifier. The vacuum tube voltmeter circuit consists of a two-stage, high-gain amplifier, a rectifier, and an indicating meter.

Power Supply: 115/230 volts, ±10%, AC, 50 to 60 cycles per second, single-phase, 90 watts.

Frequency Range: 20 to 20,000 cycles per second.

Voltmeter Range: Full scale sensitivities of nine ranges: 0.03, 0.1, 0.3, 1.0, 3.0, 10, 30, 100, 300 volts. Calibration of +2 to -12 decibels is also provided. Ranges are related to each other in 10 decibel steps. Range switch indicates decibel level as well as voltage range. Zero level = one milliwatt in 600 ohms.

Sensitivity: Distortion levels of 0.3% are measured full scale. Levels of 0.1% can be read with good accuracy at approximately 25% scale reading.

Voltmeter Frequency Response: Flat within 3% over range of 10 to 100,000 cycles per second.

Noise Measurement: Full scale deflection on a signal of 300 microvolts. Satisfactory readings may be made to 75 decibels below 1 milliwatt in 600 ohms.

Audio Frequency Input Impedance: Approximately 200,000 ohms shunted by 40 micromicrofarads at the audio frequency input terminals.

One megohm shunted by 37 micromicrofarads at the vacuum tube voltmeter terminals.

Accuracy: Circuit will eliminate fundamental by more than 60 decibels and will attenuate second and higher harmonics by less than 10%. Distortion measurements are accurate within ±3% of full scale reading for levels as low as 0.5%. Meter indicates in proportion to the average value of the residual components. Residual distortion introduced by the instrument is less than 0.1%.

Voltmeter Accuracy: ±3% of full scale.

Frequency Calibration Accuracy: ±2% of entire range.

MANUFACTURERS' OR CONTRACTORS' DATA:

Hewlett-Parkard Company, 275 Page Mill Road, Palo Alto, California; Order No. 4695-PHILA-52-04; Approximate Cost per Unit, $410.00.

TUBE COMPLEMENT:

4 JAN-6SJ7, 2 JAN-6J5, 3 JAN-6AC7, 1 JAN-5Y3, 1 JAN-6Y6G, 1 JAN-OD3/VR-150, 1 JAN-6H6.

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog 22-A, 1955.

SPECTRUM ANALYZER TS-723/U

SHIPPING DATA:

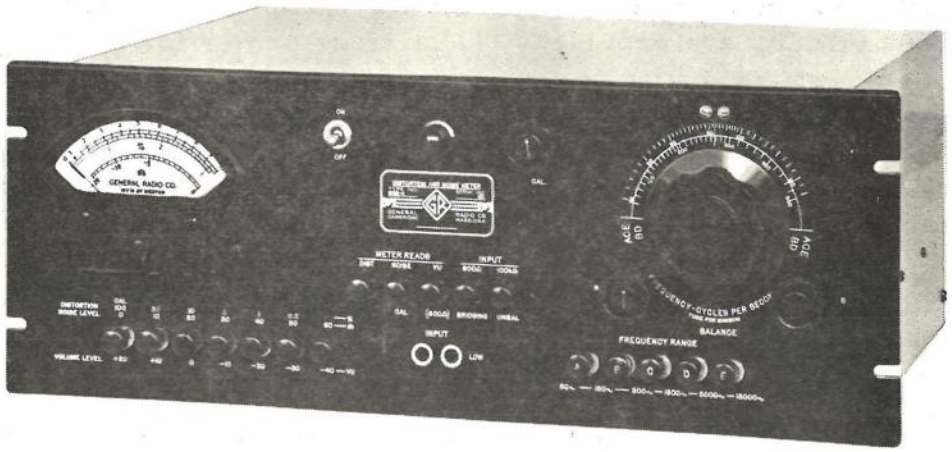
No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Overall Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Spectrum Analyzer TS-723/U	7.2	20	31	20	78

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock (USAF) Numbers (Navy) (Army)	Overall Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Spectrum Analyzer TS-723/U	Oak	3F1722-5.4	10-1/2	19	13	32

DISTORTION AND NOISE METER
MODEL NO. 1932A
(General Radio Company)

This research was supported by the USAF under Contract AF 33(038)12897 and monitored by the Wright Air Development Center, ARDC - Carl L. Frederick and Associates, Bethesda, Maryland - Multilithed in U.S.A.



FUNCTIONAL DESCRIPTION:

A portable, general purpose, test equipment used to measure distortion, noise, and hum level in audio frequency circuits. When used in conjunction with a linear detector, the distortion and noise characteristics of broadcast and other radio-telephone transmitters can be measured directly. The meter is calibrated in percentage and decibels; the dial is calibrated in frequency, cycles per second.

RELATIONSHIP TO OTHER EQUIPMENT:

Used to test Radio Set AN/ARC-27.

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Consists of a null network, a calibrated attenuator, and a vacuum tube voltmeter. The null network eliminates the fundamental of the audio frequency signal leaving only the distortion products which are indicated on the panel meter. It contains a high-gain amplifier with a resistance capacitor interstage coupling unit that balances to a null. The null frequency is continuously

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.	7CAC-041075		3F4312-2
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.5	
	- Electronics Test Equipment -		Model No. 1932A

DISTORTION AND NOISE METER
MODEL NO. 1932A
(General Radio Company)

ELECTROMECHANICAL DESCRIPTION: (Continued)
variable and dial controlled. The null network is switched out of the circuit for noise and hum measurements and the instrument then operates as a voltmeter. Two input circuits are provided: (1) a transformer for bridging a 600 ohm line and (2) a direct connection to the 100,000 ohm gain control.

Power Supply: 115 or 230 volts ±10%, AC, 50 to 60 cycles per second, single phase, 65 watts.

Frequency Range: 50 to 15,000 cycles per second (fundamental), for distortion measurement; 30 to 45,000 cycles per second for noise and hum measurements.

Distortion Range: Full scale deflections for 0.3%, 1%, 3%, 10%, and 30% distortion.

Noise Measurement Range: Extends to 80 decibels below 100% modulation when used in conjunction with a linear rectifier, or 80 decibels below an audio-frequency signal of zero dbm level, at maximum sensitivity.

DBM Range: +20 to -60 dbm. Full scale values of +20, +10, 0, -10, -20, -30, and -40 dbm are provided. The scale is calibrated in terms of a reference level of one milliwatt in 600 ohms.

Input Voltage Range: 100 kilohm input: 1.2 to 30 volts.
600 ohm input: 0.8 to 30 volts.

Input Impedance: 100,000 ohms unbalanced, and 600 ohm bridging input (10,000 ohms), balanced or unbalanced.

Residual Distortion Level:

100 Kilohm Input:	0.05% maximum below 7500 cycles per second.
	0.10% maximum above 7500 cycles per second.
Bridging Input:	0.10% maximum between 50 and 70 cycles per second.
	0.05% maximum between 70 and 7500 cycles per second.
	0.10% maximum above 7500 cycles per second.

Residual Noise Level: Less than -80 decibels.

Accuracy: ±5% of full scale, distortion; ±5% of full scale, noise and dbm.

MANUFACTURERS' OR CONTRACTORS' DATA:
General Radio Company, Cambridge, Massachusetts; Approximate Cost per Unit; $595.00, January 1953.

TUBE COMPLEMENT:
4 RTMA-6J5, 1 RTMA-6SN7GT, 1 RTMA-6K6GT/G, 1 RTMA-6H6, 1 RTMA-6X5, 2 RTMA-0D3.

DISTORTION AND NOISE METER
MODEL NO. 1932A
(General Radio Company)

REFERENCE DATA AND LITERATURE:

Air Force Technical Data: Operating Instructions AN 16-45-217.
Service Instructions AN 16-45-218.
Overhaul Instructions AN 16-45-219.
Parts Catalog AN 16-45-220.

Manufacturer's Operating and Maintenance Instructions.
Manufacturer's Catalog M, 1951.

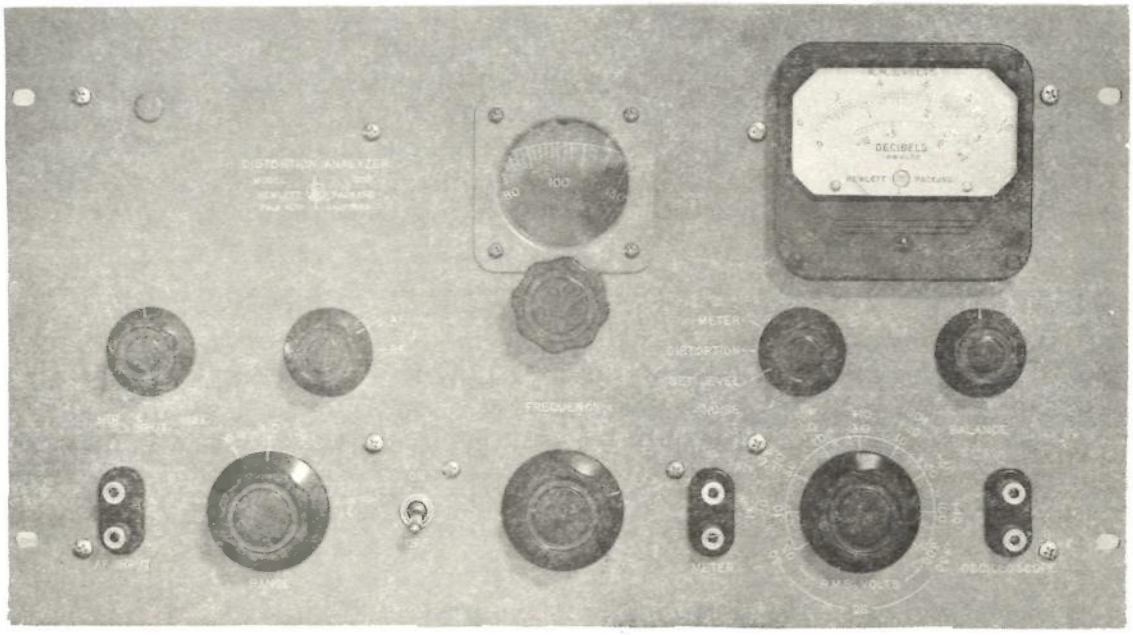
EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Distortion and Noise Meter Model No. 1932A		7CAC-041075 3F4312-2	7	19	12	37.75
1	Line Connector Cord						
1	Cable for connecting to GR Type 1931A for Transmitter Measurements						

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Distortion and Noise Meter Model No. 1932A	5.3	19	32	15	65

DISTORTION METER
MODEL NO. 330C
(Hewlett-Packard Company)



FUNCTIONAL DESCRIPTION:

A portable, general purpose test instrument used to measure the total distortion of a frequency modulated radio frequency carrier as well as the total audio distortion. It can also be used for measurements of voltage level, power output, and amplifier gain; measurements of noise and hum level directly, and determining audio signal frequency. The meter is calibrated in volts root mean square and in decibels. Frequencies are selected on a directly calibrated dial in cycles per second. Terminals are provided for connection to an oscilloscope to observe the wave shapes of the original signal and the residual distortion components.

RELATIONSHIP TO OTHER EQUIPMENT:

Used to test Telemeter Transmitting Set AN/AKT-6. Similar to Distortion Meter 330B except the C model is modified for frequency modulation measurements. Similar to Distortion Meter 330D except the C model is not equipped for amplitude modulating measurements.

(Continued)

	AIR FORCE	NAVY	ARMY
TYPE CLASS.			
STOCK NOS.			
PROCUREM'T INFO.:			
PROCUREM'T COG.:		DESIGN COG.: Commercial	
F.I.I.N.:		FUNCTIONAL CLASS. NO.: 3.4.5	
	- Electronics Test Equipment -		Model No. 330C

This project was supported by the USAF on Contract AF 33(600)28276 and monitored by WADC, ARDC - Carl L. Frederick, Bethesda, Md. - Multilithed in U. S. A.

DISTORTION METER
MODEL NO. 330C
(Hewlett-Packard Company)

ELECTROMECHANICAL DESCRIPTION:

Circuit Information: Consists of a frequency-selective amplifier, a regulated power supply and a vacuum tube voltmeter. The 20 decibel amplifier operates in conjunction with the resistance tuned circuit to provide infinite attenuation at one frequency while allowing all other frequencies to be passed at the normal gain of the amplifier. The Vacuum Tube Voltmeter circuit consists of a two stage high-gain amplifier, a rectifier and an indicating meter. The indicating meter movement is provided with VU ballistic characteristics to meet Federal Communication Commission requirements for frequency modulation broadcasting.

Power Supply: 115/230 volts, ±10%, AC, 50 to 60 cycles per second, single phase, 90 watts.

Frequency Range: 20 to 20,000 cycles per second.

Voltmeter Range: Full scale sensitivities of nine ranges: 0.03, 0.1, 0.3, 1.0, 3.0, 10, 30, 100, 300 volts. Calibration of +2 to -12 decibels is also provided. Ranges are related to each other in 10 decibel steps. Range switch indicates decibel level as well as voltage range Zero Level one milliwatt in 600 ohms.

Sensitivity: Distortion levels of 0.3% are measured full scale. Levels of 0.1% can be read with good accuracy at approximately 25% scale reading.

Voltmeter Frequency Response: 10 to 20,000 cycles per second: Flat within 3%. 20,000 to 60,000 cycles per second: Flat within ±5%.

Noise Measurement: Full scale deflection on a signal of 300 microvolts. Satisfactory readings may be made to 75 decibels below 1 milliwatt in 600 ohms.

Audio Frequency Input Impedance: Approximately 200,000 ohms shunted by 40 micro-microfarads at the audio frequency input terminals.

1 megohm shunted by 37 micromicrofarads at the vacuum tube voltmeter terminals.

Accuracy: Circuit will eliminate fundamental by more than 60 decibels and will attenuate second and higher harmonics by less than 10%. Distortion measurements are accurate within ±3% of full scale reading for levels as low as 0.5%. Meter indicates in proportion to the average value of the residual components. Residual distortion introduced by the instrument is less than 0.1%.

Voltmeter Accuracy: ±3% of full scale.

MANUFACTURERS' OR CONTRACTORS' DATA:

Hewlett-Packard Company, 395 Page Mill Road, Palo Alto, California; Approximate Cost per Unit, $425.00, September 1952.

TUBE COMPLEMENT:

4 RTMA-6SJ7, 2 RTMA-6J5, 3 RTMA-6AC7, 1 RTMA-5Y3, 1 RTMA-6Y6G, 1 RTMA-0D3/VR-150, 1 RTMA-6H6.

REFERENCE DATA AND LITERATURE:

Manufacturer's Catalog 21-A, 1952.

Hewlett-Packard Journal, Volume 2, No. 12, August 1951.

DISTORTION METER
MODEL NO. 330C
(Hewlett-Packard Company)

EQUIPMENT SUPPLIED:

Quant. Per Eq'pt	Name and Nomenclature	Case Mat'l	Stock Numbers (USAF) (Navy) (Army)	Over-all Dimensions (inches)			Weight (Lbs.)
				H	W	D	
1	Distortion Meter Model No. 330C	Oak		10-1/2	19	13	32

SHIPPING DATA:

No. of Boxes	Contents & Identification	Volume (Cu. Ft.)	Over-all Dimensions (inches)			Weight Packed (Lbs.)
			H	W	D	
1	Distortion Meter Model No. 330C					78