

D E P A R T M E N T O F T H E A R M Y T E C H N I C A L M A N U A L

---

ORGANIZATIONAL, FIELD  
AND DEPOT- MAINTENANCE MANUAL  
  
SIGNAL GENERATORS  
  
AN/USM-44 AND AN/USM-44A

---

This reprint includes all changes in effect at  
the time of publication; change 1.

---

H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y  
S E P T E M B E R 1 9 6 2

## TABLE OF CONTENTS

Section		Page
I	DESCRIPTION AND LEADING PARTICULARS.....	1
	1-1. Identification .....	1
	1-3. Leading Particulars .....	2
	1-8. Differences in Equipments .....	2
	1-10. Operating Controls, Dials, and Terminals .....	4
II	SPECIAL TEST EQUIPMENT AND SPECIAL TOOLS .....	9
	2-1. Test Equipment Required.....	9
	2-3. Special Tools .....	9
	2-5. Cable Fabrication.....	9
III	PREPARATION FOR USE AND RESHIPMENT .....	11
	3-1. Preparation for Use .....	11
	3-8. Preparation for Reshipment.....	12
IV	THEORY OF OPERATION	
	4-1. General System Operation .....	13
	4-3. R-F Generator Assembly Operation .....	13
	4-6. Radio Frequency Oscillator .....	13
	4-13. Radio Frequency Buffer Operation.....	15
	4-16. Radio Frequency Power Amplifier Operation.....	15
	4-21. Output Attenuator and R-F Power Monitor Operation .....	17
	4-26. Frequency Calibrator Operation .....	18
	4-30. Modulator Section Operation.....	20
	4-36. Modulation-Measuring Circuits Operation.....	21
	4-40. Power Supply .....	23
	4-44. Heater Supply Multivibrator.....	24
	4-46. Operation of Mechanical Components.....	24
V	ORGANIZATIONAL AND SQUADRON MAINTENANCE .....	25
	5-1. Introduction .....	25
	5-3. Cabinet Removal .....	25
	5-5. Troubleshooting the TS-510A/U .....	25
	5-11. Power Supply Troubleshooting and Adjustment.....	27
	5-14. Replacing Electron Tubes .....	28
	5-16. Minor Repair and Adjustment .....	28
	5-19. Lubrication .....	30
	5-21. Inspection Schedule and Preventive Maintenance .....	33
VI	FIELD AND FASRON MAINTENANCE .....	35
	6-1. Introduction .....	35
	6-3. Minimum Performance Standards .....	35
	6-5. System Analysis Check Chart .....	36
	6-7. Replacing Tubes in the R-F Generator .....	36
	6-11. Replacing Components in the R-F Power Monitor Circuits.....	39
	6-13. Replacing/Repairing the R-F Output Attenuator Probe .....	43
	6-15. Replacing and Repairing the Attenuator Drive Cable.....	43
	6-17. Repairing the Internal Frequency Calibrator .....	45
	6-19. Replacing Components in the Modulation Oscillator.....	45
	6-22. Replacing the R-F Oscillator and Amplifier Tuning Coils .....	45
	6-24. Replacing Power Transformer T1.....	47
	6-26. Calibrating the Frequency Dial .....	47
	6-28. Calibrating the Output Attenuator .....	48
	6-30. Calibrating the Output Volts Meter.....	49

## List of Illustrations

## TABLE OF CONTENTS (Cont.)

Section		Page
	6-32. Calibrating the Percent Modulation Meter .....	51
	6-35. Calibrating the Frequency-Calibrator Oscillator .....	52
	6-37. Measuring the Quality of the Pulse Modulated R-F Output Signal .....	53
	6-39. Measuring the Quality of the Sine Modulated R-F Output Signal.....	54
	6-41. Maintenance, Overhaul and Inspection Schedule .....	54
	6-43. Modernization .....	54
VII	DIAGRAMS. ....	55
	7-1. Introduction .....	55
	INDEX .....	73

## LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1.	Signal Generator AN/USM-44 (Hewlett-Packard), Equipment Supplied.....	iv
1-1A.	Signal Generator AN/USM-44A (Hewlett-Packard), Equipment Supplied .....	1
1-1B.	Signal Generator AN/USM-44A (Nuclear Electronics), Equipment Supplied.....	2
1-2.	Signal Generator TS-510/U.....	3
1-2A.	Signal Generator TS-510A/U(**) .....	4
1-2B.	Signal Generator TS-510A/U(*) .....	5
1-3.	Signal Generator TS-510/U Front Panel Controls.....	6
1-3A.	Signal Generator TS-510A/U/(*), Front Panel Controls.....	7
1-3B.	Signal Generator TS-510A/U(**), Front Panel Controls .....	8
1-4.	Diagram Showing Relationship of Front Panel Controls to Major Circuits.....	8A
2-1	Fabrication of Video Cord CG-409/U .....	8E
3-1.	Transit Case CY-1605/USM-44 .....	10
3-2.	Accessory Cover.....	11
4-1.	Signal Circuit Block Diagram of Signal Generator TS-510A/U.....	12
4-2.	R-F Generator Assembly .....	14
4-3.	Schematic Diagram of Radio Frequency Oscillator .....	15
4-4.	Schematic Diagram of Buffer Amplifier .....	16
4-5.	Schematic Diagram of Radio Frequency Power Amplifier .....	16
4-6.	R-F Pickup Probe for Output Attenuator .....	17
4-7.	Schematic Diagram of Crystal Controlled Frequency Calibrator .....	18
4-7A.	Schematic Diagram of Crystal Controlled Frequency Calibrator TS-510A/U.....	19
4-8.	Schematic Diagram of Modulation Oscillator .....	20
4-9.	Schematic Diagram of Modulation Limiter and Amplifier.....	20A
4-10.	Schematic Diagram of Modulation Cathode Follower and Output Level Control Tube.....	20A
4-11.	Schematic Diagram of Modulation Indicator Amplifier.....	22
4-12.	Schematic Diagram of Modulation Meter Bridge and Rectifier.....	22
4-13	Schematic Diagram of Regulated Power Supplies .....	23
4-14.	Schematic Diagram of Heater Supply Multivibrator .....	24
5-1.	Cabinet Removal .....	26
5-2.	Power Supply Block Diagram.....	30
5-3.	Power Supply Section Showing Points of Voltage Measurement and Adjustment.....	31
5-4.	Tube Location Diagram .. .	32
5-5.	Frequency Drive Mechanism Showing Points of Lubrication .....	32
5-6.	R-F Generator Assembly, Rear View, Showing Output Attenuator Drive System .....	33
6-1	Diagram Showing Access to R-F Oscillator, Buffer and Amplifier Tubes .....	39
6-2.	Exploded View for Replacement of R-F Oscillator and Amplifier Tubes .....	40
6-3.	Diagram Showing Breakdown of Components in R-F Power Monitor Assembly .....	41
6-4	R-F Output Attenuator Probe .....	42

**LIST OF ILLUSTRATIONS (Cont.)**

Figure	Title	Page
6-5.	Diagram Showing Adjustment of Cable Tension for Output Attenuator Drive System .....	44
6-6.	Diagram Showing Removal of Frequency Drive Assembly from R-F Generator Housing .....	46
6-7.	Test Set-Up for Calibrating the R-F Output Attenuator Dial .....	48
6-8.	Graph Showing Effects of Adjustments on R-F Power Monitor Circuits .....	50
6-9.	Special R-F Transformer Used for Measuring Percentage Modulation .....	50
6-10.	Test Set-Up for Measuring Percent Modulation of R-F Carrier .....	51
6-11.	Test Set-Up for Calibrating Frequency Calibrator Oscillator .....	52
6-12.	Test Set-Up for Measuring R-F Output Pulse .....	53
6-13.	Test Set-Up for Measuring the Quality of CW Output Signal .....	54
7-1.	Signal Generator TS-510A/U Left Side View, Cover Removed .....	55
7-2.	R-F Generator Assembly, Inside View of Tuner Compartments .....	56
7-3.	R-F Generator Assembly, Inside View of Tube Compartment .....	57
7-4.	Signal Generator TS-510A/U Right Side View, Cabinet Removed .....	58
7-5.	Complete Block Diagram for Signal Generator T-510AU .....	59
7-6.	Tube Socket Voltage-Resistance Diagram, Power Supply Section .....	60
7-7.	Tube Socket Voltage-Resistance Diagram, R-F Generator Section .....	61
7-8.	Tube Socket Voltage-Resistance Diagram, Modulator Section .....	62
7-9.	Schematic Diagram for Signal Generator TS-510/U .....	63-64
7-9A.	Schematic Diagram for Signal Generator TS-510A/U(*) .....	65-66
7-9B.	Schematic Diagram for Signal Generator TS-510A/U(**) .....	65A-66A
7-10.	Practical Wiring Diagram for Signal Generator TS-510/U .....	67-68
7-10A.	Practical Wiring Diagram for Signal Generator TS-510A/U(*) .....	69-70
7-10B.	Practical Wiring Diagram for Signal Generator TS-510A/U(**) .....	69A-70A
7-11.	Signal Generator TS-510A/U Cabinet Dimensions .....	71
7-12.	Transit Case CY-1605/USM-44 Dimensions .....	71
7-13.	Resistor and Capacitor Color Code .....	72

**LIST OF TABLES**

Table	Title	Page
1-1.	Equipment Supplied .....	8B
1-2.	Electron Tube Complement .....	8C
1-3.	Controls and Terminals .....	8D
1-4.	Specifications for Signal Generator TS-510A/U .....	8F
2-1.	Test Equipment Required for Maintenance .....	9
5-1.	Minimum Performance Standards Check Chart .....	27
5-2.	Power Supply Troubleshooting Chart .....	28
5-3.	Tube Replacement Chart .....	29
6-1.	Minimum Performance Check Chart .....	35
6-2.	System Analysis Check Chart .....	37

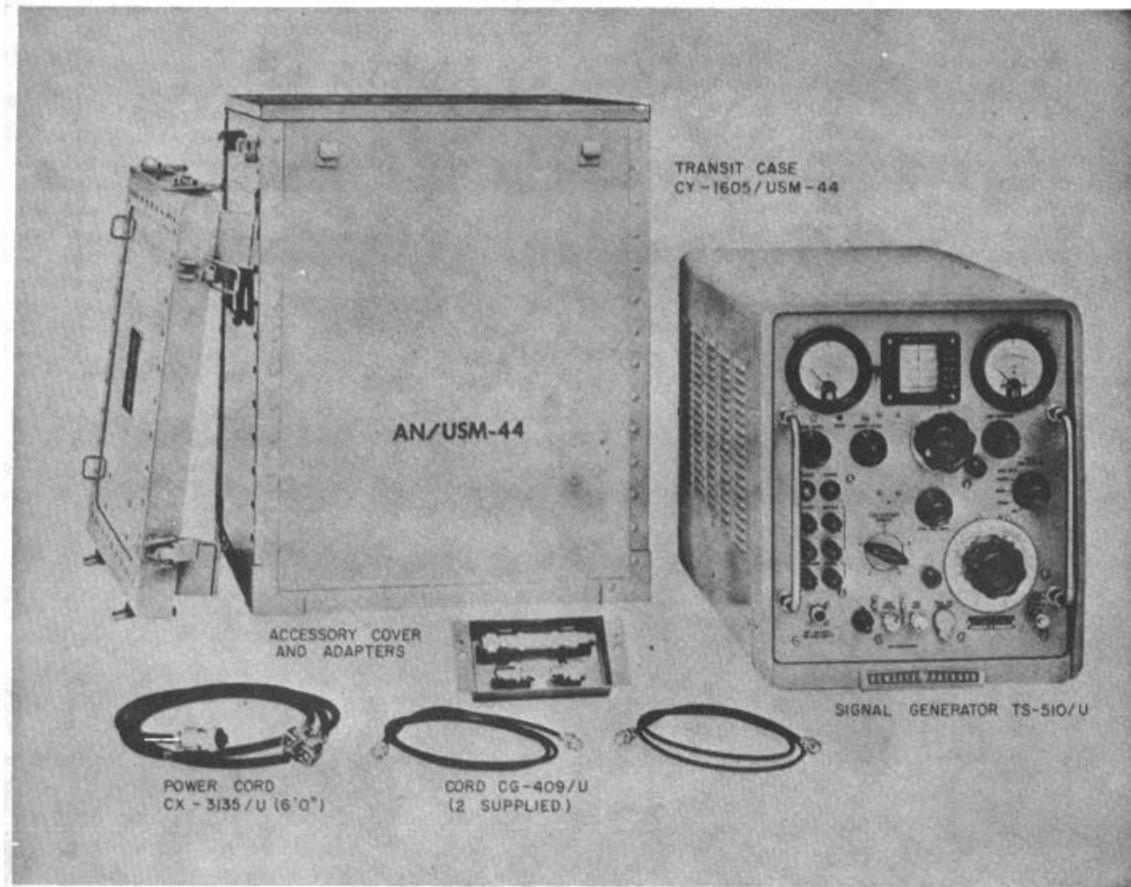


Figure 1-1. Signal Generator AN/USM-44 (Hewlett-Packard), Equipment Supplied

Revised 15 January 1960

## SECTION I

### DESCRIPTION AND LEADING PARTICULARS

#### 1-1. IDENTIFICATION.

1-2. This publication contains service and maintenance instructions for Signal Generator Test Set AN/USM-44 (figure 1-1), Signal Generator Test Set AN/USM-44A (figure 1-1A) manufactured by Hewlett-Packard Company, Palo Alto, California, and for Signal Generator Test Set AN/USM-44A (figure 1-1B) manufactured by the Nuclear Electronics Corporation, Philadelphia, Pennsylvania. The main component of Signal Generator Test Set AN/USM-44 is Signal Generator TS-510/U. The main component of Signal Generator Test Set AN/USM-44A manufactured by the Hewlett-Packard Company under Orders No. NO. asN383-33733A, N383-36708A, and N383-46471A, and manufactured by the Nuclear Electronics Corporation under Order No. N383-46472 is the Signal Generator

TS-510A/U. This equipment is manufactured in accordance with Specification MIL-G7702 (AER), dated 15 November 1953

1-2A. Throughout this handbook references to Signal Generator TS-510A/U will be construed to mean all models; references to Signal Generator TS-510A/U(\*) refer specifically to the Signal Generator TS-510A/U manufactured by the Nuclear Electronics Corporation under Order No. N383-46472; and references to Signal Generator TS-510A/U(\*\*) refer specifically to the Signal Generator TS-510A/U manufactured by the Hewlett-Packard Company under Orders No. NOasN383-33733A, N383-36708A, and N383-47671A. The information contained in this handbook is applicable to Signal Generator TS-510/U and all models of Signal Generator TS-510A/U unless otherwise indicated.

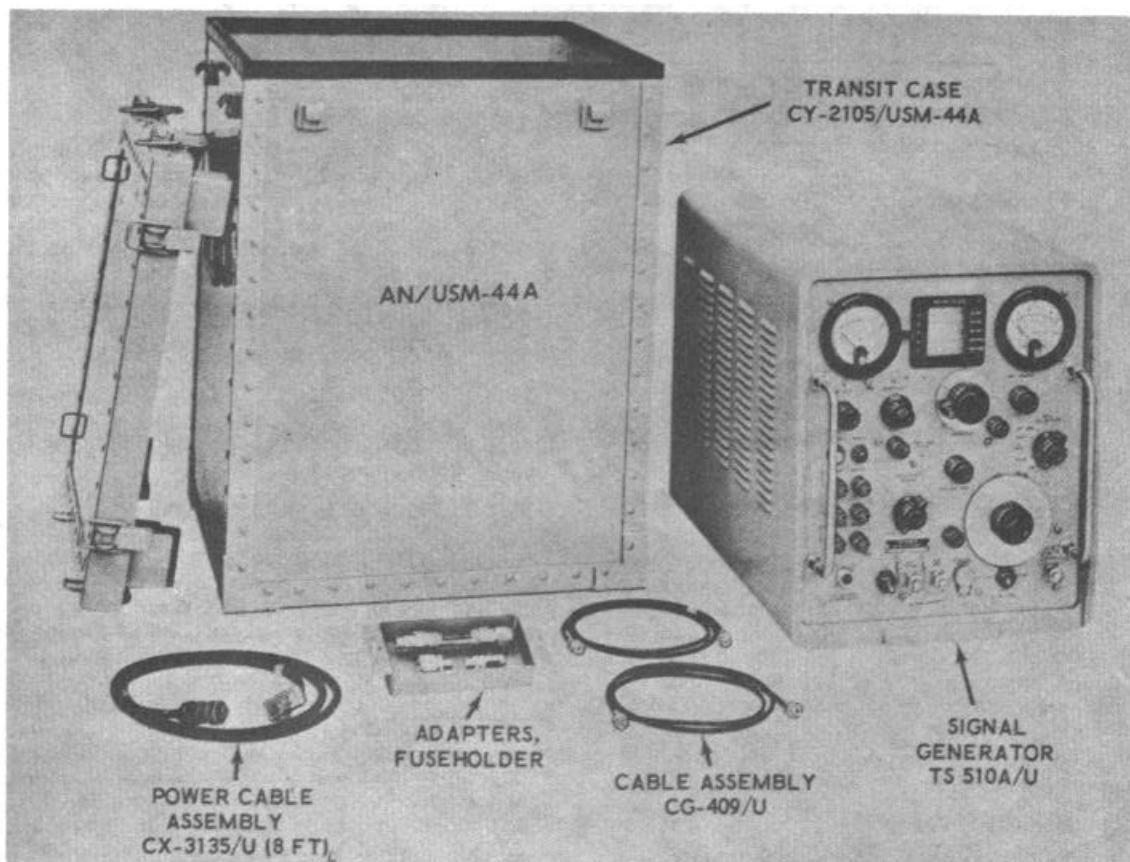


Figure 1-1A. Signal Generator AN/USM-44A (Hewlett-Packard), Equipment Supplied