



**HEWLETT
PACKARD**

MAINTENANCE MANUAL

MODEL 4195A

NETWORK/SPECTRUM

ANALYZER

(Including Option 001)

SERIAL NUMBERS

This manual applies directly to instruments whose serial number prefix is as follows.

2904A with ROM-based firmware revision 2.00
2904J with ROM-based firmware revision 2.00

With changes described in APPENDIX A, this manual also applies to instruments whose serial number prefix is 2830J and below, or whose ROM-based firmware is revision 1.02 and below.

For additional important information about serial numbers, read SERIAL NUMBER in Section 7 of the Operation Manual.

© COPYRIGHT: YOKOGAWA-HEWLETT-PACKARD, LTD., 1988
9-1, TAKAKURA-CHO, HACHIOJI-SHI, TOKYO, JAPAN

Manual Part Number: 04195-90100
Microfiche Part Number: 04195-90150

Printed: November 1989

TABLE OF CONTENTS

SECTION 1 GENERAL INFORMATION

1-1.	INTRODUCTION	1-1
1-2.	REQUIRED EQUIPMENT	1-1
1-3.	PREPARATION FOR PERFORMANCE TEST/ADJUSTMENT	1-5
1-3-1.	SET THE LINE VOLTAGE SELECTION SWITCH	1-5
1-3-2.	WARMING UP THE HP 4195A	1-5
1-3-3.	EXPRESSION FOR THE KEYS AND SOFTKEYS IN THIS MANUAL	1-5
1-3-4.	INITIALIZING THE 4195A	1-5
1-3-5.	HOW TO SET UP THE 4195A	1-6
1-3-6.	USER PROGRAM (AUTO SEQUENCE PROGRAM)	1-7
1-3-7.	HOW TO READ 4195A MEASUREMENT DATA	1-7
1-4.	INTERCONNECTION CABLES	1-8

SECTION 2 PERFORMANCE TESTS

2-1.	INTRODUCTION	2-1
2-2.	PERFORMANCE TEST RECORD	2-1
2-3.	CALCULATION SHEET	2-1
2-4.	CALIBRATION CYCLE	2-2
2-6.	INTERNAL SYNTHESIZER FREQUENCY ACCURACY TEST	2-3
2-7.	RESOLUTION BAND WIDTH ACCURACY TEST	2-5
2-8.	AMPLITUDE MEASUREMENT ACCURACY TEST	2-7
2-9.	AMPLITUDE MEASUREMENT LINEARITY TEST	2-10
2-10.	AMPLITUDE MEASUREMENT FREQUENCY RESPONSE TEST	2-12
2-11.	SECOND HARMONIC DISTORTION TEST	2-15
2-12.	THIRD ORDER INTERMODULATION DISTORTION TEST	2-17
2-13.	RESIDUAL RESPONSE TEST	2-20
2-14.	LEVEL ACCURACY/FLATNESS TEST	2-22

APPECDIX A MANUAL BACKDATING	A-1
APPENDIX B BOARD ASSEMBLY LIST	B-1
APPENDIX C BOARD ASSEMBLY LOCATIONS	C-1

3-10. CRT DISPLAY ADJUSTMENTS	3-17
3-10-1. CRT DISPLAY SECTION REMOVAL	3-17
3-10-2. LOCAL VOLTAGE REGULATOR ADJUSTMENT	3-18
3-10-3. VERTICAL HOLD ADJUSTMENT	3-20
3-10-4. DISPLAY ADJUSTMENT	3-21
3-10-5. HORIZONTAL POSITION COARSE ADJUSTMENT	3-23
3-10-6. CRT CUTOFF ADJUSTMENT	3-24
3-10-7. WHITE BALANCE ADJUSTMENT	3-27
3-10-8. MAXIMUM INTENSITY ADJUSTMENT	3-28
3-10-9. FOCUS, CONVERGENCE, AND INTENSITY ADJUSTMENT	3-29
3-11. FREQUENCY GENERATOR ADJUSTMENTS	3-32
3-11-1. 80MHz REFERENCE SOURCE LEVEL ADJUSTMENT	3-32
3-11-2. 80MHz REFERENCE SOURCE FREQUENCY ADJUSTMENT	3-33
3-12. VCO OUTPUT SPURIOUS REJECTION ADJUSTMENTS	3-36
3-12-1. 100kHz SPURIOUS REJECTION ADJUSTMENT	3-36
3-12-2. API ADJUSTMENTS	3-38
3-12-3. 160MHz SPURIOUS REJECTION ADJUSTMENT	3-44
3-13. REFERENCE FREQUENCY CONVERTER ADJUSTMENTS	3-46
3-13-1. 80 MHz REFERENCE SIGNAL LEVEL ADJUSTMENT	3-46
3-13-2. 160 MHz BAND PASS FILTER AND REFERENCE SIGNAL LEVEL ADJUSTMENTS	3-47
3-14. AC OVERLOAD DETECTOR ADJUSTMENTS	3-49
3-14-1. LF AC OVERLOAD DETECTOR ADJUSTMENTS	3-49
3-14-2. HF AC OVERLOAD DETECTOR ADJUSTMENTS	3-51
3-15. RECEIVER INPUT FILTER ADJUSTMENTS	3-53
3-15-1. 150 MHz - 225 MHz VOLTAGE TUNED BPF ADJUSTMENT	3-53
3-15-2. 225 MHz - 340 MHz VOLTAGE TUNED BPF ADJUSTMENT	3-56
3-15-3. 340 MHz - 500 MHz VOLTAGE TUNED BPF ADJUSTMENT	3-59
3-16. RECEIVER FIRST IF CONVERTER ADJUSTMENTS	3-62
3-16-1. FIRST IF CONVERTER 86.6 MHz BPF ADJUSTMENT	3-62
3-16-2. FIRST IF CONVERTER 246 MHz BPF ADJUSTMENT	3-65
3-16-3. FIRST IF CONVERTER 86.6 MHz LEVEL ADJUSTMENT	3-67
3-16-4. FIRST IF CONVERTER 246 MHz LEVEL ADJUSTMENT	3-69
3-16-5. FIRST IF CONVERTER LOCAL LEAK ADJUSTMENT	3-71

Table of Contents

3-17. RECEIVER SECOND IF CONVERTER ADJUSTMENTS	3-73
3-17-1. SECOND IF CONVERTER 246 MHz BPF ADJUSTMENT	3-73
3-17-2. SECOND IF CONVERTER 86.6 MHz BPF ADJUSTMENT	3-75
3-17-3. SECOND IF CONVERTER LEVEL ADJUSTMENT	3-78
3-18. RECEIVER THIRD IF CONVERTER ADJUSTMENTS	3-81
3-18-1. THIRD IF CONVERTER 86.6 MHz BPF ADJUSTMENT	3-81
3-18-2. THIRD IF CONVERTER 6.3/6.9 MHz BPF ADJUSTMENTS	3-83
3-18-3. 20 dB AMPLIFIER GAIN/PHASE ADJUSTMENT	3-86
3-18-4. THIRD IF CONVERTER 6.6 MHz LEVEL ADJUSTMENT	3-88
3-18-5. 10 dB AMPLIFIER GAIN ADJUSTMENT	3-90
3-19. SOURCE SECOND/THIRD IF CONVERTER ADJUSTMENTS	3-93
3-19-1. SECOND IF CONVERTER FIRST 86.6 MHz BPF ADJUSTMENT	3-93
3-19-2. SECOND IF CONVERTER SECOND 86.6 MHz BPF ADJUSTMENT	3-95
3-19-3. THIRD IF CONVERTER 346 MHz BPF ADJUSTMENT	3-97
3-19-4. THIRD IF CONVERTER 86.6 MHz BPF ADJUSTMENT	3-99
3-19-5. SECOND/THIRD IF CONVERTER GAIN ADJUSTMENT	3-101
3-20. SOURCE FIRST IF CONVERTER ADJUSTMENTS	3-105
3-20-1. FIRST IF CONVERTER BAND PASS FILTER ADJUSTMENT	3-105
3-20-2. FIRST IF CONVERTER GAIN ADJUSTMENT	3-107
3-21. SOURCE OUTPUT FILTER ADJUSTMENTS	3-110
3-21-1. 150 MHz - 225 MHz VOLTAGE TUNED BPF ADJUSTMENT	3-110
3-21-2. 225 MHz - 340 MHz VOLTAGE TUNED BPF ADJUSTMENT	3-114
2-21-3. 340 MHz - 500 MHz VOLTAGE TUNED BPF ADJUSTMENT	3-116
3-22. SOURCE POWER AMPLIFIER ADJUSTMENTS	3-120
3-22-1. POWER AMPLIFIER DC OFFSET ADJUSTMENTS	3-120
3-22-2. POWER AMPLIFIER GAIN ADJUSTMENTS	3-122
3-23. SOURCE DC BIAS VOLTAGE ADJUSTMENTS	3-124
3-24. PHASE DETECTOR TRACKING ADJUSTMENTS	3-126
3-25. CALIBRATION DATA UPDATING	3-128
3-25-1. HP-IB CONTROLLER PREPARATION	3-128
3-25-2. RECEIVER BPF TUNING VOLTAGE CALIBRATION DATA UPDATING	3-131
3-25-3. FIRST IF CONVERTER OUTPUT LEVEL FINE ADJUSTMENT	3-132
3-25-4. RECEIVER FREQUENCY RESPONSE CALIBRATION DATA UPDATING	3-134
3-25-5. SOURCE BPF TUNING VOLTAGE CALIBRATION DATA UPDATING	3-136
3-25-6. SIGNAL SOURCE GAIN ADJUSTMENT	3-137
3-25-7. SIGNAL SOURCE AMPLITUDE CALIBRATION DATA UPDATING	3-139
3-25-8. SIGNAL SOURCE LINEARITY CALIBRATION DATA UPDATING	3-140
3-25-9. SIGNAL SOURCE FLATNESS CALIBRATION DATA UPDATING	3-141
3-25-10. EXITING THE ADJUSTMENT PROGRAM	3-141

Table of Contents

2-15. NON-SWEEP LINEARITY TEST	2-24
2-16. POWER SWEEP LINEARITY TEST	2-26
2-17. SECOND HARMONICS TEST	2-28
2-18. NON-HARMONIC SPURIOUS TEST	2-30
2-19. PHASE NOISE TEST	2-32
2-20. CROSSTALK TEST	2-34
2-21. MAGNITUDE RATIO/PHASE DYNAMIC ACCURACY TEST	2-36
2-22. MAGNITUDE RATIO/PHASE FREQUENCY RESPONSE TEST	2-39
2-23. DC SOURCE VOLTAGE ACCURACY TEST	2-43

CALCULATION SHEET

PERFORMANCE TEST RECORD

SECTION 3 ADJUSTMENTS

3-1. INTRODUCTION	3-1
3-2. SAFETY CONSIDERATIONS	3-1
3-3. ADJUSTABLE AND FACTORY SELECTED COMPONENTS	3-2
3-4. ADJUSTMENT INTERACTIONS	3-2
3-5. ADJUSTMENT LOCATIONS	3-2
3-6. PREPARATION FOR ADJUSTMENT	3-2
3-6-1. CONSTRUCTION OF ADJUSTMENT INSTRUCTION	3-3
3-6-2. SERVICE FUNCTION	3-3
3-6-3. EXTERNAL REFERENCE	3-3
3-7. SPECIAL DEVICE FOR ADJUSTMENT	3-3
3-8. SWITCHING POWER SUPPLY ADJUSTMENTS	3-10
3-8-1. SWITCHING FREQUENCY ADJUSTMENT	3-10
3-8-2. OUTPUT VOLTAGE ADJUSTMENT	3-12
3-9. HIGH STABILITY OSCILLATOR ADJUSTMENTS (OPT. 001 ONLY)	3-14
3-9-1. SUPPLY VOLTAGE ADJUSTMENT	3-14
3-9-2. HIGH STABILITY OSCILLATOR FREQUENCY ADJUSTMENT	3-15