

INSTRUCTION MANUAL

MAINTENANCE MANUAL
for
COMMUNICATIONS SERVICE MONITOR

MODEL FM-10C

INCLUDING PLUG-IN MODULES
For Serial Numbers 301 and above

SINGER
INSTRUMENTATION

MAINTENANCE MANUAL
for
COMMUNICATIONS SERVICE MONITOR

MODEL FM-10C

INCLUDING PLUG-IN MODULES
For Serial Numbers 301 and above

MAINFRAME SERIAL NO. _____

MANUAL NO. 1-500783-260

Reprint 2/74 Lib

For operating instructions for the FM-10C system refer to Operator's Manual No. 1-500783-258. This manual begins with Section III. Sections I and II are contained in the Operators Manual.

SINGER
INSTRUMENTATION

NOTE:

The following information is presented to indicate the serial number effectivity of the RFM-10A and RFM-10B sections presented in this manual.

Sections referenced to RFM-10A are intended for serial numbers 101 thru 500.

Sections referenced to RFM-10B are intended for serial numbers 101 thru 125.

Sections referenced to RFM-10A and RFM-10B are intended for RFM-10A serial numbers 501 and above and RFM-10B serial numbers 126 and above.

CONTENTS

SECTION		PAGE
III	THEORY OF OPERATION	3-1
3.1	Introduction to FM-10C System	3-1
3.2	Mainframe, Model Fm-10C	3-1
3.2.1	Introduction	3-1
3.2.2	General	3-1
3.2.3	TCXO, Primary Dividers and Multipliers	3-1
3.2.4	VCO Circuitry	3-2
3.2.5	Frequency Synthesis Circuitry	3-2
3.2.6	ALC Circuitry	3-3
3.2.7	Measure Input Circuitry	3-3
3.2.8	Frequency Modulation Circuitry	3-4
3.2.9	Amplitude Modulation Circuitry	3-4
3.2.10	Tone Generator Circuitry	3-4
3.2.11	Power Supply Circuitry	3-4
3.3	Radio Frequency Module, Model RFM-10	3-5
3.3.1	Introduction	3-5
3.3.2	General	3-5
3.3.3	Generate Circuitry	3-5
3.3.4	Measure Circuitry	3-5
3.3.5	Gen Mod Cal Circuitry	3-5
3.3.6	Tone Generator Circuitry	3-6
3.4	Radio Frequency Module, Model RFM-10A	3-6
3.4.1	Introduction	3-6
3.4.2	General	3-6
3.4.3	Measure Circuitry	3-6
3.4.5	Gen Mod Cal Circuitry	3-6
3.4.6	Tone Generator Circuitry	3-7
3.5	Frequency Indicating Module, Model FIM-1	3-7
3.5.1	Introduction	3-7
3.5.2	General	3-7
3.5.3	Operate Lamp Circuitry	3-7
3.5.4	Beat Lamp Circuitry	3-7
3.5.5	Meter Circuitry	3-7
3.5.6	Calibrate Circuitry	3-7
3.5.7	Power Supply Circuitry	3-7
3.6	Frequency Indicating Module, Model FIM-3	3-8
3.6.1	Introduction	3-8
3.6.2	General	3-8
3.6.3	Operate Lamp Circuitry	3-8
3.6.4	Beat Lamp Circuitry	3-8
3.6.5	Meter Circuitry	3-8
3.6.6	Calibrate Circuitry	3-8
3.6.7	Squelch Circuitry	3-8
3.6.8	Power Supply Circuitry	3-8
3.7	Amplitude Modulation Module, Model OAM-1	3-9
3.7.1	Introduction	3-9
3.7.2	General	3-9
3.7.3	Vertical Deflection Circuitry	3-9
3.7.4	Horizontal Deflection Circuitry	3-9
3.7.5	Internal Modulator Circuitry	3-9
3.7.6	Power Supply Circuitry	3-9

CONTENTS (Cont)

SECTION	PAGE	
3.8	Frequency Modulation Module, Model ODM-1	3-10
3.8.1	Introduction	3-10
3.8.2	General	3-10
3.8.3	Operate and Overload Lamp Circuitry	3-10
3.8.4	Discriminator Output Circuitry	3-10
3.8.5	Vertical Deflection Circuitry	3-10
3.8.6	Horizontal Deflection Circuitry	3-10
3.8.7	Internal Modulator Circuitry	3-10
3.8.8	Power Supply Circuitry	3-11
3.9	Frequency Modulation Module, Model MDM-1	3-11
3.9.1	Introduction	3-11
3.9.2	General	3-11
3.9.3	Limiter Current Circuitry	3-11
3.9.4	Deviation Circuitry	3-11
3.9.5	Modulator Circuitry	3-11
3.10	AM/FM Module, Model AFM-1	3-12
3.10.1	Introduction	3-12
3.10.2	General	3-12
3.10.3	Frequency Modulation	3-12
3.10.4	Amplitude Modulation	3-12
3.11	AM/FM Module, Model AFM-2	3-12
3.11.1	Introduction	3-12
3.11.2	General	3-12
3.11.3	Frequency Modulation	3-12
3.11.4	Amplitude Modulation	3-12
3.11.5	2 MHz IF Output	3-12
3.11.6	10 MHz Output	3-12
3.12	Radio Frequency Module, Model RFM-10D	3-29
3.12.1	Introduction	3-29
3.12.2	General	3-29
3.12.3	Generate Circuitry (Mainframe MODE Switch Set to GEN)	3-29
3.12.4	Measure Circuitry (Mainframe MODE Switch Set to MEAS)	3-30
3.12.5	Gen Mod Cal Circuitry (Mainframe MODE Switch Set to GEN MOD CAL)	3-31
3.12.6	Tone Generator Circuitry (Mainframe MODE Switch Set to TONE GEN)	3-31
3.13	Radio Frequency Module, Model RFM-11A	3-37
3.13.1	Introduction	3-37
3.13.2	General	3-37
3.13.3	Generate Circuitry (Mainframe MODE Switch Set to GEN)	3-37
3.13.4	Measure Circuitry (Mainframe MODE Switch Set to MEAS)	3-38
3.13.5	Gen Mod Cal Circuitry (Mainframe MODE Switch Set to GEN MOD CAL)	3-39
3.13.6	Tone Generator Circuitry (Mainframe MODE Switch Set to TONE GEN)	3-40
3.14	Radio Frequency Module, Model RFM-10B	3-47
3.15	Radio Frequency Module, Models RFM-10A and RFM-10B	3-48
3.15.1	Introduction	3-48
3.15.2	General	3-48
3.15.3	Generate Circuitry (Mainframe MODE Switch Set to GEN)	3-48
3.15.4	Measure Circuitry (Mainframe MODE Switch Set to MEAS)	3-49
3.15.5	Gen Mod Cal Circuitry (Mainframe MODE Switch Set to GEN MOD CAL)	3-50
3.15.6	Tone Generator Circuitry (Mainframe MODE Switch Set to TONE GEN)	3-50

CONTENTS (Cont)

SECTION	PAGE
IV	4-1
MAINTENANCE	4-1
4.1	4-1
General	4-1
4.2	4-1
Test Equipment Required (Model FM-10C Mainframe)	4-1
4.3	4-3
Minimum Performance Checkout Procedure (Model FM-10C Mainframe)	4-3
4.3.1	4-3
Tone Generator Mode Check	4-3
4.3.2	4-3
Frequency Accuracy Check	4-3
4.3.3	4-4
Output Level Check	4-4
4.3.4	4-4
Remote 2 MHz IF Output Check	4-4
4.3.5	4-4
External VCO Input Check	4-4
4.3.6	4-4
10 MHz TCXO Output Check	4-4
4.3.7	4-4
External Time Base Input Check	4-4
4.3.8	4-4
1 MHz TCXO Output Check	4-4
4.3.9	4-5
+9 Vdc Power Output Check	4-5
4.4	4-5
Alignment and Adjustment (Model FM-10C Mainframe)	4-5
4.4.1	4-5
Preliminary Adjustments	4-5
4.4.2	4-5
10 MHz Amplifier Adjustment	4-5
4.4.3	4-5
A21 Board Adjustment, 3.6 MHz and 30 MHz	4-5
4.4.4	4-5
A20 Board Adjustment, 3.7 MHz and 37 MHz	4-5
4.4.5	4-30
A19 Board Adjustment, 3.8 MHz and 38 MHz	4-30
4.4.6	4-30
A18 Board Adjustment, 3.9 MHz and 39 MHz	4-30
4.4.7	4-30
A17 Board Adjustment, 4.0 MHz and 40 MHz	4-30
4.4.8	4-30
A16 Board Adjustment, 4.1 MHz and 41 MHz	4-30
4.4.9	4-30
A15 Board Adjustment, 4.2 MHz and 42 MHz	4-30
4.4.10	4-30
A14 Board Adjustment, 4.3 MHz and 43 MHz	4-30
4.4.11	4-30
A13 Board Adjustment, 4.4 MHz and 44 MHz	4-30
4.4.12	4-30
A12 Board Adjustment, 4.5 MHz and 45 MHz	4-30
4.4.13	4-30
90 MHz #3 Adjustment	4-30
4.4.14	4-30
A2 Board Adjustment	4-30
4.4.15	4-31
A3A Board Adjustment	4-31
4.4.16	4-31
A3B Board Adjustment	4-31
4.4.17	4-31
A3C Board Adjustment	4-31
4.4.18	4-31
A3D Board Adjustment	4-31
4.4.19	4-31
A6 Board Adjustment	4-31
4.4.20	4-32
A20 Board Adjustment, 70 MHz	4-32
4.4.21	4-32
A19 Board Adjustment, 80 MHz	4-32
4.4.22	4-32
A18 Board Adjustment, 90 MHz	4-32
4.4.23	4-32
A17 Board Adjustment, 100 MHz	4-32
4.4.24	4-32
A16 Board Adjustment, 110 MHz	4-32
4.4.25	4-32
A15 Board Adjustment, 120 MHz	4-32
4.4.26	4-32
A21 Board Adjustment, 60 MHz	4-32
4.4.27	4-32
A14 Board Adjustment, 130 MHz	4-32
4.4.28	4-33
A13 Board Adjustment, 140 MHz	4-33
4.4.29	4-33
A12 Board Adjustment, 150 MHz	4-33
4.4.30	4-33
A1A6 Board Adjustment	4-33
4.4.31	4-33
A7 Board Adjustment	4-33
4.4.32	4-33
A8 Board Adjustment	4-33
4.4.33	4-34
A9, A10, A11 and A5 Board Adjustments	4-34
4.4.34	4-35
Amplitude Modulation Adjustment	4-35
4.4.35	4.35
ALC Adjustment	4.35

CONTENTS (Cont)

SECTION	PAGE	
4.4.36	VCO Adjustment	4-36
4.4.37	Phase Modulation Adjustment	4-36
4.4.38	Frequency Modulation (VCO) Adjustment	4-36
4.4.39	AM Distortion	4-37
4.4.40	Calibration of TCXO	4-37
4.5	Fault Isolation Procedure (Model FM-10C Mainframe)	4-37
4.5.1	Power Indication Failure (4.3.1-d.)	4-38
4.5.2	Beat Indication Failure (4.3.1-f.)	4-38
4.5.3	0–100 Hz Control Tone Failure (4.3.1-g.)	4-38
4.5.4	0–100 Hz Switch Tone Failure (4.3.1-h.)	4-38
4.5.5	1 kHz Switch Tone Failure (4.3.1-j.)	4-38
4.5.6	No Output from Audio/Tone Output Jack (4.3.1-k.)	4-38
4.5.7	Meter Fails to Zero with Zero Control (4.3.1-m.)	4-38
4.5.8	Meter Fails to Deflect to the Left in 100 Hz Increments (4.3.1-o.)	4-38
4.5.9	Frequency Accuracy Out of Tolerance (4.3.2-e. through 4.3.2-l.)	4-38
4.5.10	Output Level Out of Tolerance (4.3.4-f.)	4-39
4.5.11	Remote 2 MHz IF Output Out of Tolerance (4.3.4-f.)	4-39
4.5.12	External VCO Input Out of Tolerance (4.3.5-g. and j.)	4-39
4.5.13	10 MHz TCXO Output Out of Tolerance (4.3.6-a.)	4-39
4.5.14	External Timebase Input Inoperative (4.3.7-c.)	4-39
4.5.15	10 MHz TCXO Output Out of Tolerance (4.3.8-h.)	4-39
4.5.16	+9 Vdc Output Out of Tolerance (4.3.9-b.)	4-39
4.6	Test Equipment Required (Model RFM-10 Module)	4-39
4.7	Minimum Performance Checkout Procedure (Model RFM-10 Module)	4-41
4.7.1	Power Requirements	4-41
4.7.2	Output Level Check	4-41
4.7.3	Measure Mode Sensitivity Check	4-41
4.8	Alignment and Adjustment (Model RFM-10 Module)	4-41
4.8.1	Broadband Amplifier Alignment (A1A4)	4-41
4.8.2	ALC Detector Adjustment	4-44
4.8.3	11 MHz IF Filter and Amplifier Alignment	4-44
4.8.4	9 MHz Amplifier Alignment	4-44
4.8.5	2 MHz IF Alignment	4-44
4.8.6	Measure Input Sensitivity Alignment	4-45
4.8.7	Attenuator Dial Calibration	4-45
4.9	Fault Isolation Procedure (Model RFM-10 Module)	4-45
4.9.1	Output Level Not Within Tolerance (4.7.2-d. or 4.7.2-e.)	4-46
4.9.2	Measure Mode Sensitivity Not Within Tolerance (4.7.3-f.)	4-46
4.10	Test Equipment Required (Model RFM-10A Module)	4-46
4.11	Minimum Performance Checkout Procedure (Model RFM-10A Module)	4-47
4.11.1	Power Requirements	4-47
4.11.2	Output Level Check	4-47
4.11.3	Measure Mode Sensitivity Check	4-47

CONTENTS (Cont)

SECTION	PAGE
4.12	4-47
4.12.1	4-50
4.12.2	4-51
4.12.3	4-51
4.12.4	4-51
4.12.5	4-51
4.12.6	4-52
4.12.7	4-52
4.13	4-53
4.13.1	4-53
4.13.2	4-53
4.14	4-53
4.15	4-54
4.15.1	4-54
4.15.2	4-54
4.15.3	4-54
4.16	4-55
4.16.1	4-56
4.16.2	4-56
4.16.3	4-56
4.16.4	4-56
4.16.5	4-56
4.16.6	4-57
4.16.7	4-57
4.17	4-57
4.17.1	4-57
4.17.2	4-57
4.17.3	4-57
4.17.4	4-57
4.17.5	4-57
4.17.6	4-58
4.17.7	4-58
4.18	4-58
4.19	4-59
4.19.1	4-59
4.19.2	4-59
4.19.3	4-59
4.19.4	4-59
4.20	4-59
4.20.1	4-59
4.20.2	4-61
4.20.3	4-61
4.20.4	4-61
4.20.5	4-61
4.20.6	4-61
4.20.7	4-61

CONTENTS (Cont)

SECTION		PAGE
4.21	Fault Isolation Procedures (Model FIM-3 Module)	4-61
4.21.1	Meter Does Not Indicate Zero (4.19.1-a.)	4-62
4.21.2	Zero Control Defective (4.19.1-b.)	4-62
4.21.3	Meter Does Not Deflect in 100 Hz Increments (4.19.1-d.)	4-62
4.21.4	Audio Tone Defective (4.19.1-d.)	4-62
4.21.5	Meter Does Not Deflect in 1 kHz Increments in 5 kHz Range (4.19.1-e.)	4-62
4.21.6	Meter Does Not Deflect in 1 kHz Increments in 15 kHz Range (4.19.1-f.)	4-62
4.21.7	Sensitivity Not Within Tolerance (4.19.3-e.)	4-62
4.21.8	Squelch Inoperative (4.19.4-d.)	4-62
4.22	Test Equipment Required (Model OAM-1 Module)	4-62
4.23	Minimum Performance Checkout Procedure (Model OAM-1 Module)	4-62
4.23.1	Installation	4-62
4.23.2	Power Requirements	4-62
4.23.3	Focus and Intensity Check	4-62
4.23.4	Vertical and Horizontal Position Control Range Check	4-64
4.23.5	Sweep Range Check	4-64
4.23.6	Vertical Sensitivity Check	4-64
4.23.7	Vertical Amplifier Frequency Response Check	4-64
4.23.8	Carrier Level Control Check	4-64
4.23.9	Modulation Measurement Accuracy Check	4-65
4.23.10	Mainframe (Internal) Modulation Capability and Recovered Audio Distortion Check	4-65
4.23.11	External Modulation Capability, Frequency Response, and Recovered Audio Distortion Check	4-66
4.23.12	External Horizontal Sweep Capability Check	4-66
4.23.13	Audio Output Frequency, Level, and Distortion Check	4-66
4.24	Alignment and Adjustment (Model OAM-1 Module)	4-67
4.24.1	Test Connector Wiring	4-67
4.24.2	Location and Adjustment of Trace	4-67
4.24.3	Trace Location and Focus	4-67
4.24.4	Vertical Gain Adjustment	4-67
4.24.5	Sweep Range Adjustment	4-67
4.24.7	Detector Offset Adjustment	4-72
4.24.8	IF Dynamic Range Adjustment	4-72
4.24.9	Distortion Analyzer Amplifier Adjustment	4-72
4.24.10	Modulation Oscillator Adjustment	4-73
4.24.11	Modulation Amplifier Adjustment	4-73
4.25	Fault Isolation Procedures (Model OAM-1 Module)	4-73
4.25.1	No Trace (4.23.3-g.)	4-73
4.25.2	Vertical Centering Defective (4.23.3-g.)	4-73
4.25.3	Horizontal Centering Defective (4.23.3-g.)	4-74
4.25.4	Focus Defective (4.23.3-h.)	4-79
4.25.5	Intensity Defective (4.23.3-h.)	4-74
4.25.6	Insufficient Range of Vertical Position Control (4.23.4-b.)	4-74
4.25.7	Insufficient Range of Horizontal Position Control (4.23.4-c.)	4-74
4.25.8	Sweep Speed Cannot Adjust Below 50 Hz on Low Range (4.23.5-h.)	4-74
4.25.9	Sweep Speed Cannot Adjust Above 5000 Hz on High Range (4.23.5-m.)	4-74
4.25.10	Sweep Speed Cannot Adjust Below 500 Hz on High Range (4.23.5-q.)	4-75
4.25.11	Sweep Speed Cannot Adjust Above 500 Hz on Low Range (4.23.5-m.)	4-75
4.25.12	External Vertical Input Sensitivity Out of Specification (4.23.6-d.)	4-75
4.25.13	Cannot Adjust Trace to Vert Set Line (4.23.8-e.)	4-75
4.25.14	Cannot Set Trace to Carrier Level Set Line (4.23.8-h., l., p.)	4-75

CONTENTS (Cont)

SECTION		PAGE
4.25.15	Trace Not on CRT Centerline When Measuring Unmodulated Signal (4.23.8-t.)	4-75
4.25.16	AM Does Not Measure Within Specified Accuracy (4.23.9-j., r.)	4-75
4.25.17	Trace Cannot Set on CRT Carrier Line (Mainframe in Cal Mode) (4.23.10-e.)	4-75
4.25.18	Insufficient Modulation Using Internal Source (4.23.10-k.)	4-75
4.25.19	Modulation Distortion Exceeds 3% at 30% Modulation (4.23.10-n.)	4-76
4.25.20	External Modulation Sensitivity Not Within Specification (4.23.11-g.)	4-76
4.25.21	External Horizontal Input Sensitivity Not Within Specification (4.23.12-c.)	4-76
4.25.22	Frequency of Internal 1 kHz Tone Not Within Specification (4.23.13-f.)	4-76
4.25.23	Audio Output Less Than 1 V rms into 600 Ohm Load at 1 kHz (4.23.13-f.)	4-76
4.25.24	Audio Distortion Greater than 1% at 1 kHz (4.23.13-h.)	4-76
4.25.25	Internal 400 Hz Frequency Not Within Specification (4.23.13-m.)	4-76
4.25.26	Audio Output Less Than 1 V rms into 600 Ohm Load at 1 kHz (4.23.13-n.)	4-76
4.25.27	Audio Distortion Greater than 1% at 400 Hz (4.23.13-p.)	4-76
4.26	Test Equipment Required (Model ODM-1 Module)	4-76
4.27	Minimum Performance Checkout Procedure (Model ODM-1 Module)	4-76
4.27.1	Focus and Intensity Check	4-76
4.27.2	Vertical and Horizontal Center Control Range Check	4-78
4.27.3	Sweep Range Check	4-78
4.27.4	Vertical Sensitivity Check	4-78
4.27.5	Vertical Amplifier Frequency Response Check	4-78
4.27.6	Sensitivity Check	4-78
4.27.7	5 kHz Range Gain Check	4-79
4.27.8	15 kHz Range Gain Check	4-79
4.27.9	Internal Modulation and Vertical Gain Control Check	4-79
4.27.10	Internal/Combined and External Mode Check	4-79
4.27.11	External Horizontal Sweep Capability Check	4-79
4.27.12	Audio Output Frequency, Level, and Distortion Checks	4-79
4.28	Alignment and Adjustment (Model ODM-1 Module)	4-80
4.28.1	Test Connector Wiring	4-80
4.28.2	Location and Adjustment of Trace	4-80
4.28.3	IF Sweep Alignment	4-80
4.28.4	Level Detector Adjustment	4-86
4.28.5	Trace Alignment and Focus	4-86
4.28.6	Offset and Vertical Amplifier Gain Adjustment	4-86
4.28.7	External Vertical Gain Adjustment	4-87
4.28.8	Sweep Range Adjustment	4-87
4.28.9	Modulation Oscillator Adjustment	4-87
4.28.10	Modulation Sensitivity Adjustment	4-88
4.28.11	Distortion Analyzer Amplifier Adjustment	4-88
4.29	Fault Isolation Procedures (Model ODM-1 Module)	4-88
4.29.1	No Trace (4.27.1-g.)	4-88
4.29.2	Vertical Centering Defective (4.27.1-g.)	4-88
4.29.3	Horizontal Centering Defective (4.27.1-g.)	4-88
4.29.4	Focus Defective (4.27.1-h.)	4-89
4.29.5	Intensity Defective (4.27.1-h.)	4-89
4.29.6	Vertical Center Control Defective (4.27.2-b.)	4-89
4.29.7	Horizontal Center Control Defective (4.27.2-e.)	4-89
4.29.8	Sweep Speed Cannot Adjust Below 50 Hz on Low Range (4.27.3-h.)	4-89
4.29.9	Sweep Speed Cannot Adjust Above 5000 Hz on High Range (4.27.3-m.)	4-89
4.29.10	Sweep Speed Cannot Adjust Below 500 Hz on High Range (4.27.3-q.)	4-89
4.29.11	Sweep Speed Cannot Adjust Above 500 Hz on Low Range (4.27.3-u.)	4-89
4.29.12	External Vertical Input Sensitivity Not Within Specification (4.27.4-d)	4-89

CONTENTS (Cont)

SECTION		PAGE
4.29.13	Vertical Amplifier Frequency Response Not Within Specification (4.27.5-d.)	4-89
4.29.14	Operate Indicator Sensitivity Not Within Specification (4.27.6-e.)	4-90
4.29.15	Overload Indicator Sensitivity Not Within Specification (4.27.6-f.)	4-90
4.29.16	5 kHz Negative Range Gain Not Within Specification (4.27.7-c.)	4-90
4.29.17	15 kHz Negative Range Gain Not Within Specification (4.27.8-e.)	4-90
4.29.18	Insufficient Vertical Amplitude at 15 kHz (4.27.9-d.)	4-90
4.29.19	Insufficient Vertical Amplitude at 5 kHz in External Mode (4.27.10-g.)	4-90
4.29.20	External Horizontal Sensitivity Not Within Specification (4.27.11-c.)	4-90
4.29.21	Audio Output Frequency Not Within Specification (4.27.12-e.)	4-91
4.29.22	Audio Output Level Not Within Specification (4.27.12-e.)	4-91
4.29.23	Audio Distortion Not Within Specification (4.27.12-g.)	4-91
4.30	Test Equipment Required (Model MDM-1 Module)	4-91
4.31	Minimum Performance Checkout Procedure (Model MDM-I Module)	4-91
4.31.1	Installation	4-91
4.31.2	Power Requirements	4-91
4.31.3	Sensitivity Check	4-91
4.31.4	Meter Range Checks	4-91
4.31.5	Internal Frequency Modulation and Audio Output Checks	4-93
4.31.6	External Frequency Modulation Checks	4-93
4.32	Alignment and Adjustment (Model MDM-1 Module)	4-93
4.32.1	Test Connector Wiring	4-93
4.32.2	IF Amplifier Alignment	4-95
4.32.3	Limiter Current Adjustments	4-95
4.32.4	Modulation Oscillator Alignment	4-95
4.32.5	Meter Adjustment	4-97
4.33	Fault Isolation Procedure (Model MDM-1 Module)	4-97
4.33.1	Sensitivity ("Red Line") Not Within Specification (4.31.3-g.)	4-97
4.33.2	Dynamic Range of Meter Less Than 20 dB (4.32.3-m.)	4-98
4.33.3	6 kHz Range Not Within Specification (4.31.4-m.)	4-98
4.33.4	1.8 kHz Range Not Within Specification (4.31.4-r.)	4-98
4.33.5	18 kHz Range Not Within Specification (4.31.4-v.)	4-98
4.33.6	18 kHz Deviation Not Obtained (4.31.5-a.)	4-98
4.33.7	1 kHz Level Not Within Specification (4.31.5-f.)	4-98
4.33.8	1 kHz Frequency Not Within Specification (4.31.5-h.)	4-98
4.33.9	1 kHz Distortion Not Within Specification (4.31.5-l.)	4-98
4.33.10	External FM Sensitivity Not Within Specification (4.31.6-f.)	4-98
4.34	Test Equipment Required (Model AFM-1 Module)	4-98
4.35	Minimum Performance Checkout Procedure (Model AFM-1 Module)	4-98
4.35.1	Power Requirements	4-98
4.35.2	Amplitude Modulation Check	4-98
4.35.3	Frequency Modulation Check	4-98
4.36	Alignment and Adjustment (Model AFM-1)	4-99
4.37	Fault Isolation Procedures (Model AFM-1)	4-99
4.37.1	Amplitude Modulation Out of Tolerance (4.35.2-e.)	4-99
4.37.2	Frequency Modulation Out of Tolerance (4.35.3-f.)	4-100
4.38	Test Equipment Required (Model AFM-2 Module)	4-100

CONTENTS (Cont)

SECTION	PAGE
4.39	Minimum Performance Checkout Procedure (Model AFM-2 Module) 4-100
4.39.1	Power Requirements 4-100
4.39.2	Amplitude Modulation Check 4-100
4.39.3	Frequency Modulation Check 4-101
4.39.4	10 MHz Output Check 4-101
4.39.5	IF Output Check 4-101
4.40	Alignment and Adjustment (Model AFM-2) 4-101
4.41	Fault Isolation Procedures (Model AFM-2) 4-101
4.41.1	Amplitude Modulation Out of Tolerance (4.29.2-e.) 4-101
4.41.2	Frequency Modulation Out of Tolerance (4.39.3-f.) 4-101
4.41.3	10 MHz Output Out of Tolerance (4.39.4-b.) 4-101
4.42	Test Equipment Required (Model RFM-10D Module) 4-102
4.43	Minimum Performance Checkout Procedure (Model RFM-10D Module) 4-103
4.43.1	Power Requirements 4-103
4.43.2	Output Level Check 4-103
4.43.3	Measure Mode Sensitivity Check 4-103
4.44	Alignment and Adjustment (Model RFM-10D Module) 4-104
4.44.1	Broadband Amplifier Alignment (A1A4) 4-104
4.44.2	11 MHz and 2 MHz IF Amplifier Alignment (A1A3) 4-110
4.44.3	Broadband Amplifier Alignment (A1A2) 4-111
4.44.4	Measure Input Sensitivity and Calibration 4-113
4.44.5	Gen Mod Cal Adjustment 4-115
4.44.6	RF Output Leveling 4-115
4.45	Fault Isolation Procedures (Model RFM-10D Module) 4-115
4.45.1	Output Level Not Within Tolerance (4.43.2-d. and 4.43.2-e.) 4-116
4.45.2	Measure Mode Sensitivity Not Within Tolerance (4.43.3-f.) 4-116
4.46	Test Equipment Required (Model RFM-11A Module) 4-117
4.47	Minimum Performance Checkout Procedure (Model RFM-11A Module) 4-118
4.47.1	Power Requirements 4-118
4.47.2	Output Level Check 4-118
4.47.3	Measure Mode Sensitivity Check 4-119
4.48	Alignment and Adjustment (Model RFM-11A Module) 4-119
4.48.1	Broadband Amplifier Alignment (A1A4) 4-120
4.48.2	700 MHz Multiplier Alignment (A1A5) 4-127
4.48.3	RF Switch and Broadband Amplifier Alignment (A1A2) 4-131
4.48.4	Broadband Amplifier Alignment (A1A2) 4-135
4.48.5	11 MHz and 2 MHz IF Amplifier Alignment (A1A3) 4-138
4.48.6	Gen Mod Cal Adjustment 4-142
4.48.7	RF Output Leveling 4-142
4.49	Fault Isolation Procedures (Model RFM-11A Module) 4-143
4.49.1	Output Level Not Within Tolerance (4.47.2-d and 4.47.2-e.) 4-143
4.49.2	Measure Mode Sensitivity Not Within Tolerance (4.47.3-f.) 4-144

CONTENTS (Cont)

SECTION		PAGE
4.50	Test Equipment Required (Model RFM-10B Module)	4-145
4.51	Minimum Performance Checkout Procedure (Model RFM-10B Module)	4-145
4.52	Alignment and Adjustment (Model RFM-10B Module).	4-145
4.52.1	Broadband Amplifier Alignment (A1A2)	4-147
4.53	Fault Isolation Procedure (Model RFM-10B Module)	4-148
4.54	Test Equipment Required (Model RFM-10A and RFM-10B Modules)	4-149
4.55	Minimum Performance Checkout Procedure (Model RFM-10A and RFM-10B Modules). . .	4-150
4.55.1	Power Requirements	4-150
4.55.2	Output Level Check	4-150
4.55.3	Measure Mode Sensitivity Check	4-150
4.56	Alignment and Adjustment (Model RFM-10A and RFM-10B Modules).	4-151
4.56.1	Broadband Amplifier Alignment (A1A4)	4-151
4.56.2	11 MHz and 2 MHz IF Amplifier Alignment (A1A3)	4-157
4.56.3	Broadband Amplifier Alignment (A1A2) (RFM-10B Only).	4-158
4.56.4	Measure Input Sensitivity and Calibration	4-160
4.56.5	Gen Mod Cal Adjustment	4-162
4.56.6	Attenuation Dial Calibration	4-162
4.56.7	RF Output Leveling	4-163
4.57	Fault Isolation Procedures (Model RFM-10A and RFM-10B Modules)	4-163
4.57.1	Output Level Not Within Tolerance (4.55.2-d and 4.55.2-e.)	4-164
4.57.2	Measure Mode Sensitivity Not Within Tolerance (4.55.3-f.)	4-164
V	SCHEMATIC DIAGRAMS	5-1
VI	PARTS LIST	6-0

ILLUSTRATIONS

FIGURE		PAGE
3-1	Simplified Synthesis Block Diagram, Model FM-10C Mainframe	3-13
3-2	Detailed Block Diagram, Model RFM-10	3-15
3-3	Detailed Block Diagram, Model RFM-10A	3-17
3-4	Detailed Block Diagram, Model FIM-1	3-19
3-5	Detailed Block Diagram, Model FIM-3	3-21
3-6	Detailed Block Diagram, Model OAM-1	3-23
3-7	Detailed Block Diagram, Model ODM-1	3-25
3-8	Detailed Block Diagram, Model MDM-1	3-27
3-9	Detailed Block Diagram Model RFM-10D (Sheet 1 of 2)	3-33/3-34
3-9	Detailed Block Diagram Model RFM-10D (Sheet 2 of 2)	3-35/3-36
3-10	Detailed Block Diagram, Model RFM-11A (Sheet 1 of 3)	3-41/3-42
3-10	Detailed Block Diagram, Model RFM-11A (Sheet 2 of 3)	3-43/3-44
3-10	Detailed Block Diagram, Model RFM-11A (Sheet 3 of 3)	3-45/3-46
3-11	Detailed Block Diagram, Models RFM-10A and RFM-10B (Sheet 1 of 2)	3-53/3-54
3-11	Detailed Block Diagram, Models RFM-10A and RFM-10B (Sheet 2 of 2)	3-55/3-56
4-1	Divider/ALC Board Assembly, A1A2 (Mainframe)	4-6
4-2	Power Supply Assembly, A1A3 (Mainframe)	4-7
4-3	TCXO/IF Board Assembly, A1A5 (Mainframe)	4-8
4-4	Phase Modulator/Audio Assembly, A1A6 (Mainframe)	4-9
4-5	VCO, 6 MHz, 9 MHz Assembly, A2 (Mainframe)	4-10
4-6	0.1, 1, 10 and 100 kHz Decade Assemblies, A3A through A3D (Mainframe)	4-11
4-7	1 MHz and 10 MHz Decade Switching Programming Assemblies A4A and A4B (Mainframe)	4-12
4-8	1200 MHz Multiplier Assembly, A5 (Mainframe)	4-13
4-9	1 MHz Decade Assembly, A6 (Mainframe)	4-14
4-10	GCA/AM Assembly, A7 (Mainframe)	4-15
4-11	10 MHz Decade Assembly, A8 (Mainframe)	4-16
4-12	Assembly A7/A8 (Mainframe)	4-17
4-13	Diode Switch Assembly, A9 (Mainframe)	4-19
4-14	700–1100 MHz Multiplier Assembly, A10 (Mainframe)	4-19
4-15	Assembly, A5, A9 and A10 (Mainframe)	4-20
4-16	Buffer Amplifier Assembly, A11 (Mainframe)	4-21
4-17	Frequency Generator Assemblies, A12 through A15 (Mainframe)	4-22
4-18	Frequency Generator Assemblies, A16 through A20 (Mainframe)	4-23
4-19	Frequency Generator Assembly, A21 (Mainframe)	4-24
4-20	PC Board Locations (Mainframe Rear View)	4-25
4-21	PC Board Locations (Mainframe Top View)	4-26
4-22	PC Board Locations (Mainframe Bottom View)	4-27
4-23	Trimmer Capacitor Access Hole Locations, A1A6 through A8 (Mainframe)	4-28
4-24	Trimmer Capacitor Access Hole Locations, A10 through A21 (Mainframe)	4-29
4-25	Model AFM-2 Modification for Mainframe Tests	4-30
4-26	Access to TCXO	4-37
4-27	11 MHz IF Board Assembly, A1A3 (Model RFM-10)	4-42
4-28	Broadband Amplifier, Mixer, Detector Assembly, A1A4 (Model RFM-10)	4-43
4-29	11 MHz IF Board Assembly, A1A3 (Model RFM-10A)	4-48
4-30	Broadband Amplifier and Mixer Assembly, A1A4 (Model RFM-10A)	4-49
4-31	Circuit Board Assembly, A1 (Model FIM-1)	4-55
4-32	Test Connector Wiring (Model FIM-1)	4-56
4-33	Circuit Board Assembly, A1 (Model FIM-3)	4-60
4-34	Test Connector Wiring (Model FIM-3)	4-59
4-35	AM Detector Board Assembly, A1 (Model OAM-1)	4-68
4-36	Power Supply Board Assembly, A2 (Model OAM-1)	4-69
4-37	Vertical Amplifier Board Assembly, A3 (Model OAM-1)	4-70
4-38	Horizontal Amplifier Board Assembly, A4 (Model OAM-1)	4-71
4-39	Test Connector Schematic (Model OAM-1)	4-72
4-40	IF Amplifier Board Assembly, A1 (Model ODM-1)	4-81

ILLUSTRATIONS (Cont)

FIGURE		PAGE
4-41	Power Supply Board Assembly, A2 (Model ODM-1)	4-82
4-42	Vertical Amplifier Board Assembly, A3 (Model ODM-1)	4-83
4-43	Horizontal Amplifier Board Assembly, A4 (Model ODM-1)	4-84
4-44A	Test Connector Schematic (Model ODM-1)	4-85
4-44B	IF Response Curves (Model ODM-1)	4-85
4-45A-B	IF Response Curves (Model ODM-1)	4-86
4-46	Circuit Board Assembly, A1 (Model MDM-1)	4-94
4-47	Test Connector Wiring (Model MDM-1)	4-95
4-48	IF Amplifier Waveforms (Model MDM-1)	4-96
4-49	Broadband Amplifier Assembly, A1A2 (RFM-10D)	4-105
4-50	11 MHz IF Board Assembly, A1A3 (RFM-10D)	4-106
4-51	Broadband Amplifier & Mixer Assembly, A1A4 (RFM-10D)	4-107
4-52	RF Switch and Broadband Amplifier Assembly, A1A2 (RFM-11A)	4-121
4-53	11 MHz IF Assembly, A1A3 (RFM-11A)	4-122
4-54	Broadband Amplifier and Mixer Assembly, A1A4 (RFM-11A)	4-123
4-55	700 MHz Multiplier Assembly, A1A5 (RFM-11A)	4-124
4-56	Broadband Amplifier Assembly, A1A4 (RFM-10B)	4-146
4-57	Broadband Amplifier Assembly, A1 (RFM-10B)	4-152
4-58	11 MHz IF Board Assembly, A1A3 (RFM-10A and RFM-10B)	4-153
4-59	Broadband Amplifier and Mixer Assembly, A1A4 (RFM-10A and RFM-10B)	4-154
5-1	Schematic Diagram, Divider/ALC Board (A1A2) and TB4, R7 (Mainframe)	5-3/5-4
5-2	Schematic Diagram, Power Supply (A1A3) and Q1, Q2 and TB3 (Mainframe)	5-5/5-6
5-3	Schematic Diagram, TCXO/IF Board (A1A5) and J2, J3, J4 and S13 (Mainframe)	5-7/5-8
5-4	Schematic Diagram, \emptyset Modulator/Audio (A1A6) and J5, LS1 and R2/S10 (Mainframe)	5-9/5-10
5-5	Schematic Diagram, VCO, 6, 9 MHz Board (A2) and 0-100 Hz Controls Assembly and R4 (Mainframe)	5-11/5-12
5-6	Schematic Diagram, 0.1, 1, 10, 100 kHz Decades (A3A, A3B, A3C, A3D) (Mainframe)	5-13/5-14
5-7	Schematic Diagram, 1 MHz Decade Switching Programming Board (A4A) (Mainframe)	5-15/5-16
5-8	Schematic Diagram, 10 MHz Decade Switching Programming Board (A4B) (Mainframe)	5-17/5-18
5-9	Schematic Diagram, 1200 MHz Multiplier (A5) (Mainframe)	5-19/5-20
5-10	Schematic Diagram, 1 MHz Decade Board (A6) (Mainframe)	5-21/5-22
5-11	Schematic Diagram, Gain Control Amp/Amplitude Modulator Assembly (A7) and FL2 (Mainframe)	5-23/5-24
5-12	Schematic Diagram, 10 MHz Decade Assembly (A8) and FL1 and Z2 (Mainframe)	5-25/5-26
5-13	Schematic Diagram, Diode Switch, Mixer, Low Pass Filter (A9) and A1, FL3 and S1 (Mainframe)	5-27/5-28
5-14	Schematic Diagram, 700-1100 MHz Multiplier Assembly (A10) (Mainframe)	5-29/5-30
5-15	Schematic Diagram, Buffer Amplifier Board (A11) (Mainframe)	5-31/5-32
5-16	Schematic Diagram, Frequency Generator (A12-21) (Mainframe)	5-33/5-34
5-17	Schematic Diagram, Power Transformer Rectifier Assembly, Line Filter and S10 (Mainframe)	5-35/5-36
5-18	Switching Diagram, 100 Hz, 1 kHz, 10 kHz, 100 kHz Decade (Mainframe)	5-37/5-38
5-19	Switching Diagram, 100, 10, 1 MHz Decade, Mode, Measure Mode Audio Output, and Generator Modulation. Switching S1, S2, S3, S9, S11, S12 (Mainframe)	5-39/5-40
5-20	Connector Wiring Diagram, RF Plug-in, Meter Plug-in and Modulation Plug-in Connector Wiring, J6, J7, J8, J9 (Mainframe)	5-41/5-42
5-21	Schematic Diagram, Model RFM-10	5-45/5-46
5-22	Schematic Diagram, 11 MHz IF Board (A1A3) (Model RFM-10)	5-45/5-46
5-23	Schematic Diagram, Broadband Amp/Mixer/Det Assembly (A1A4) (Model RFM-10)	5-47/5-48
5-24	Schematic Diagram, Model RFM-10A	5-49/5-50
5-25	Schematic Diagram, 11 MHz IF Board (A1A3) (Model RFM-10A)	5-51/5-52
5-26	Schematic Diagram, Broadband Amplifier and Mixer (A1A4) (Model RFM-10A)	5-53/5-54
5-27	Schematic Diagram, Model FIM-1	5-55/5-56
5-28	Schematic Diagram, Model FIM-3	5-57/5-58

ILLUSTRATIONS (Cont)

FIGURE		PAGE
5-29	Schematic Diagram, Model OAM-1	5-59/5-60
5-30	Schematic Diagram, Model ODM-1	5-61/5-62
5-31	Schematic Diagram, Model MDM-1	5-63/5-64
5-32	Schematic Diagram, Model AFM-1	5-65/5-66
5-33	Schematic Diagram, Model AFM-2	5-67/5-68
5-34	Detailed Block Diagram, Model FM-10C (Sheet 1 of 2)	5-69/5-70
5-34	Detailed Block Diagram, Model FM-10C (Sheet 2 of 2)	5-71/5-72
5-35	Wiring Diagram, Model RFM-10D	5-73/5-74
5-36	Schematic Diagram, Broadband Amplifier, A1A2, Model RFM-10D	5-75/5-76
5-37	Schematic Diagram, 11 MHz and 2 MHz IF Amplifier, A1A3 Model RFM-10D	5-77/5-78
5-38	Schematic Diagram, Broadband Amplifier and Doubly Balanced Mixer, A1A4, Model RFM-10D	5-79/5-80
5-39	Wiring Diagram Model RFM-11A	5-81/5-82
5-40	Schematic Diagram RF Switch and Broadband Amplifier, A1A2, Model RFM-11A.	5-83/5-84
5-41	Schematic Diagram Broadband Amplifier, A1A2A1, Model RFM-11A	5-85/5-86
5-42	Schematic Diagram 11 MHz and 2 MHz IF Amplifier, A1A3, Model RFM-11A	5-87/5-88
5-43	Schematic Diagram Broadband Amplifier and Mixer, A1A4, Model RFM-11A	5-89/5-90
5-44	Schematic Diagram 700 MHz Multiplier, A1A5, Model RFM-11A	5-91/5-92
5-45	Schematic Diagram, Broadband Amplifier, A1A2, Model RFM-10B	5-93/5-94
5-46	Wiring Diagram, Model RFM-10A and RFM-10B	5-95/5-96
5-47	Schematic Diagram, Broadband Amplifier, A1A2, Model RFM-10A/RFM-10B	5-97/5-98
5-48	Schematic Diagram, 11 MHz and 2 MHz IF Amplifier, A1A3, Model RFM-10A/RFM-10B.	5-99/5-100
5-49	Schematic Diagram, Broadband Amplifier and Doubly Balanced Mixer, A1A4, Model RFM-10A/RFM-10B	5-101/5-102

TABLES

TABLE		PAGE
4-1	Test Equipment Requirements for Mainframe	4-2
4-2	Decade Fault Isolation	4-38
4-3	Digit Fault Isolation	4-39
4-4	Test Equipment Requirements for Model RFM-10	4-40
4-5	Test Equipment Requirements for Model RFM-10A	4-46
4-6	Test Equipment Requirements for Model FIM-1	4-53
4-7	Test Equipment Requirements for Model FIM-3	4-53
4-8	Test Equipment Requirements for Model OAM-1	4-63
4-9	Test Equipment Requirements for Model ODM-1	4-77
4-10	Test Equipment Requirements for Model MDM-1	4-92
4-11	Test Equipment Requirements for Model AFM-1	4-99
4-12	Test Equipment Requirements for Model AFM-2	4-100
4-13	Test Equipment Requirements for Model RFM-10D.	4-102
4-14	Attenuator Pad Resistor Values	4-112
4-15	Test Equipment Requirements for Model RFM-11A	4-117
4-16	Attenuator Pad Resistor Values	4-133
4-17	Test Equipment Requirements for Models RFM-10A and RFM-10B	4-149
4-18	Attenuator Pad Resistor Values	4-159
6-1	Code List of Manufacturers	6-1
6-2	Parts List for Model FM-10C Mainframe	6-4
6-3	Parts List for Model RFM-10	6-62
6-4	Parts List for Model RFM-10A	6-72
6-5	Parts List for Model FIM-1	6-83
6-6	Parts List for Model FIM-3	6-91
6-7	Parts List for Model OAM-1	6-98
6-8	Parts List for Model ODM-1	6-115
6-9	Parts List for Model MDM-1	6-131
6-10	Parts List for Model AFM-1	6-141
6-11	Parts List for Model AFM-2	6-142
6-12	Parts List for Model RFM-10D.	6-143
6-13	Parts List for Model RFM-11A	6-169
6-14	Parts List for Model RFM-10B	6-208
6-15	Parts List for Model RFM-10A and RFM-10B	6-212

SECTION III THEORY OF OPERATION

3.1 INTRODUCTION TO FM-10C SYSTEM

This section contains the theory of operation of the mainframe and all plug-in modules. The information is presented to assist the user in understanding the circuitry employed and is also useful in troubleshooting and maintenance of the equipment.

3.2 MAINFRAME, MODEL FM-10C

3.2.1 Introduction

This section contains the theory of operation of the FM-10C mainframe. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to simplified block diagram, figure 3-1 and detailed block diagram, figure 5-34, and the schematic diagrams, figures 5-1 through 5-20.

3.2.2 General

The FM-10C is a direct synthesizer. The output signal of the frequency synthesizer consists of various frequencies which are derived from the 10 MHz TCXO crystal oscillator by a process of frequency division and multiplication. These frequency elements are mixed, filtered, and amplified to produce the output signal. Harmonic oscillators and phase lock loops of the indirect synthesizer are eliminated by this method. The residual FM which can result from a loop closure technique is completely eliminated. All of the frequencies which represent the decade elements are selected by the decade switches. Each frequency is instantly available at the output.

Each step in the mixing process is filtered to minimize the spurious responses which are close to the desired frequency.

The internal signal which supplies the reference for the frequency meter also functions as an extremely accurate signal generator source.

Precise audio signals may also be generated through a special adaptation of the beat-note circuitry and are available at the front panel.

3.2.3 TCXO, Primary Dividers, and Multipliers

The output of the temperature-compensated crystal oscillator (TCXO), A1A5A1, is applied to the TIMEBASE switch, S13. When the TIMEBASE switch is at the INT position, the TCXO output is applied to the 10 MHz buffer, A1A5Q1, and the buffered output is applied

to the TIMEBASE jack on the rear panel. With the TIMEBASE switch in the EXT position, an external 10 MHz signal with an accuracy greater than 1 ppm may be applied to the TIMEBASE jack to increase the accuracy of the instrument.

The output of the 10 MHz buffer is also applied to the 10 MHz buffer, A11Q3, and is amplified by 10 MHz amplifier, A11Q5. This output is designated "10 MHz #1" and is used to supply the basis for the 60 to 150 MHz frequency generators. The output of A11Q3 is also applied to 10 MHz amplifier, A1A2Q1. The output of this amplifier is designated "10 MHz #2" and is applied to phase modulation board, A1A6, and to terminal 1 of the rear connector of the MOD module and to terminal 5 of the rear connector of the RF module.

The output of 10 MHz amplifier A1A2Q1 is also amplified by 10 MHz amplifier, A1A2Q2 and divided by 5 by A1A2U1A. The 2 MHz output is buffered by A1A2Q5 and applied to frequency multiplier, A2Q5. The 6 MHz output is amplified by A2Q6 and buffered by A2Q7. This output is applied to the 1 MHz decade board, A6, when the MODE switch, S9H, is in the GEN MOD CAL position, and is also applied to the 100 Hz decade board, A3A, when the VCO switch, S8B, is in the OUT position. When the VCO switch is in the OUT position, the output of A2Q7 is also applied to the 1 kHz decade board, A3B, the 10 kHz decade board, A3C, and the 100 kHz decade board, A3D, when the 100 Hz, 1 kHz and 10 kHz decade switches, respectively, are in the V position. This output (output of A2Q7) is also applied to the 1 MHz decade board, A6, when the MODE switch, S9H, is in either TONE GEN, GEN MOD CAL or the MEAS position.

The 2 MHz output of A1A2U1A is also divided by 2 by A1A2U1B and the 1 MHz output is buffered by A1A2Q4 and multiplied by 9 by multiplier A2Q2. A2Q3 and A2Q4 amplify the 1 MHz and the amplified output is applied to the 100 Hz, 1 kHz, 10 kHz and 100 kHz decade boards, A3A, A3B, A3C and A3D respectively. The output of A2Q4 is also applied to terminal 24 of the rear connector of the RF module.

The 1 MHz output of A1A2Q4 is also applied to rear connector ACC jack, J3-D and to 1 MHz amplifiers, A1A2Q7 and A1A2Q8, where the 1 MHz voltage is rectified and doubled by A1A2CR4 and A1A2CR5 and utilized as a voltage reference for ALC amplifier, A1A2U5 and A1A2U6.

The 1 MHz output of A1A2U1B is also divided by 10 by A1A2U2 and the 100 kHz output is buffered by A1A2Q3 and applied to frequency generator boards A12 through A21. The 100 kHz output of A1A2U2 is applied to terminal 4 of the rear connector of the FIM module.

3.2.4 VCO Circuitry

The voltage-controlled oscillator (VCO) A2Q10, which provides the 0–100 Hz component of the final synthesized frequency, is controlled by a +9V dc voltage adjusted by variable resistor, R1, when the VCO switch, S8A, is not in the OUT position. R1 is part of the front panel 0–100 Hz control. The dc voltage varies the capacitance of the VCO control/frequency modulator, A2CR1 and A2CR2 (variable-capacitance diodes) which provide a tuning range of 5 to 6 MHz. The output signal of the VCO oscillator circuit is amplified by Q9 and Q8 and the amplified output signal is applied to the VCO switch, S8B. The 5–6 MHz output of the VCO board is switched to the 100 Hz, 1 kHz, 10 kHz or 100 kHz decade boards when any of these decade switches are at the V position. When the 0–100 Hz control, S7, is at the OUT position, the VCO is switched off and the 6 MHz signal supplied from A2 is routed to the 100 Hz decade board.

3.2.5 Frequency Synthesis Circuitry

100 Hz Decade

The 100 kHz from the 100 kHz buffer, A1A2Q3, is applied to the 3.6 to 4.5 MHz sections of frequency generator boards, A21 through A12 respectively. The 100 kHz is multiplied by Q1, filtered by Y2, and amplified by U1. Q8 is a buffer. The 10 outputs (3.6 to 4.5 MHz) are applied to 100 Hz switch, S4A.

The 6 MHz from A2Q7 or the VCO output of A2Q9 is applied to the 100 Hz decade board, A3A, depending upon the position of the VCO switch, S8B. This frequency is divided by ten by A3AU1. The 9 MHz from A2Q4 is mixed with this signal at A3AU2 and the sum frequency is applied to mixer A3AU3. The 3.6 to 4.5 MHz frequency selected by 100 Hz frequency decade switch, S4A, is also applied to this mixer. The difference frequency is filtered, amplified and then applied to 1 kHz decade board, A3B, through 100 Hz decade switch, S4C.

1 kHz Decade

The 1 kHz decade board, A3B, is identical in all respects to the 100 Hz decade board, A3A, except the 1 kHz decade switch, S5A, applies the 3.6 to 4.5 MHz frequencies to the mixer A3BU3.

10 kHz Decade

The 10 kHz decade board, A3C, is identical in all respects to the 100 Hz decade board, A3A, except the 10 kHz decade switch, S6A, applies the 3.6 to 4.5 MHz frequencies to the mixer A3CU3.

100 kHz Decade

The 100 kHz decade board, A3D, is identical in all respects to the 100 Hz decade board, A3A, except the 100 kHz decade switch, S7A, applies the 3.6 to 4.5 MHz frequencies to the mixer A3DU3.

1 MHz Decade

3.6 to 4.5 MHz is also applied to the 36 to 45 MHz section of A21 through A12, respectively, from amplifier-limiter U1. The 3.6 to 4.5 MHz signals are multiplied by ten and applied to the 1 MHz decade reed switch assembly, A4A. The output of the 100 kHz decade, A3D, is applied to the input mixer, A6U1-L, when the 100 kHz switch is in any position except V and the MODE switch, S9H, is in any position except GEN MOD CAL. (In the GEN MOD CAL position, 6 MHz from the 6 MHz buffer, A2Q7, is applied to the mixer, A6U1-L. 90 MHz #1 derived from the 60 – 150 MHz section of A18 is applied to the mixer A6U1-R; the sum frequency, 96 MHz, is applied to mixer A6U2-L.)

1 MHz decade switch, S3A and S3B, selects the 36 to 45 MHz from the A21 through A12 boards, respectively, and applies one of the frequencies to mixer A6U2-R. The difference frequency is applied to mixer A8Z1-L.

10 MHz Decade

700 MHz is applied to mixer A8Z1-L and the sum frequency is applied to mixer Z2-R.

The 60 – 150 MHz sections of the A21 through A12 frequency generator boards derive their frequencies from the 10 MHz #1 signal. This is multiplied by Q6 and amplified by Q10 and Q11. There are two outputs on these sections, 70 through 120 MHz #1 outputs and 60 – 150 MHz #2 outputs.

The 60 – 150 MHz #2 outputs are applied to 10 MHz decade reed switch assembly, A4B, with the exception of 70 MHz #1. These frequencies are selected by 10 MHz switch, S2A, S2B and S2C and one frequency is applied to mixer, Z2-L.

The difference frequency is applied to the gain control amplifier (GCA), A7Q8 and A7Q9 where automatic leveling is accomplished and applied to the amplitude modulator, A7CR1 and A7CR2.

The output of the amplitude modulator is applied to mixer Z1-L.

100 MHz Decade

The 70 MHz #2 signal and the 80 to 110 MHz #1 signals from the 60 – 150 MHz frequency generator boards are applied to the buffer amplifiers on buffer amplifier board, A11, and the amplified outputs are applied to the

700 to 1100 MHz multiplier board, A10, where the frequencies are multiplied by five and by two to produce 700 to 1100 MHz frequencies which are applied to the 100 MHz diode switch, A9.

The 120 MHz #1 signal from the frequency generator board, A15, is applied to the 1200 MHz multiplier board, A5, where the 120 MHz is amplified and multiplied by five and by two to provide 1200 MHz which is applied to the 100 MHz diode switch, A9.

The 700 to 1200 MHz signals at the 100 MHz diode switch input are selected by the 100 MHz decade switch, S1A and S1B, and one frequency is applied to mixer Z1-R. The difference frequency is applied to the RF OUTPUT jack via the RF module.

Programming Circuitry

The 1 MHz switch, S3, and the 10 MHz switch, S2, and the 100 MHz switch, S1, are interconnected so that when the MODE switch is at the MEAS position, the synthesizer frequency is 11 MHz higher than the frequency switch settings. In the GEN position, the frequency of the synthesizer is the same as the frequency switch settings. In the GEN MOD CAL position the synthesizer is at 11 MHz for any frequency switch setting.

In the TONE GEN mode the synthesizer frequency is 11 MHz plus any frequency set by the frequency switches to the right of the 1 MHz decade switch.

Typical Frequency Synthesis

An example of frequency synthesis of 123.45678 MHz is as follows:

For this example, the frequency switches and 0–100 Hz dial are set to 123.45678 MHz.

When the 0–100 Hz dial is set to 8, the VCO output frequency is 5.2 MHz. This is divided by 10 in the 100 Hz decade board, A3A, to produce 520 kHz, which is mixed in A3AU2 to produce 9.52 MHz.

When the 0–100 Hz switch is set to 7, the generator output frequency selected is 4.3 MHz. The 9.52 MHz is mixed with the 4.3 MHz in mixer, A3AU3 to produce a difference frequency of 5.22 MHz.

The 5.22 MHz is divided by ten by A3BU1 to produce 522 kHz which is mixed with 9 MHz in mixer U3BU2 to produce a sum frequency of 9.522 MHz. The 1 kHz switch selects 4.2 MHz in the 6 position and mixes with the 9.522 MHz in mixer, A3BU3, to produce a difference frequency of 5.322 MHz.

The 5.322 MHz is divided by ten by A3CU1 to produce 532.2 kHz which is mixed with 9 MHz in A3CU2 to produce a sum frequency of 9.5322 MHz. With the 10

kHz switch in the 5 position, 4.1 MHz is selected and mixed with the 9.5322 MHz in mixer, A3CU3, to produce a difference frequency of 5.4322 MHz.

The 5.4322 MHz is divided by ten by A3DU1 to produce 543.22 kHz. This is mixed with 9 MHz in A3DU2 to produce a sum frequency of 9.54322 MHz. With the 100 kHz switch in the 4 position, 4.0 MHz is selected and mixed with the 9.54322 MHz in mixer, A3DU3, to produce a difference frequency of 5.54322 MHz.

The 5.54322 MHz is mixed with the 90 MHz #1 in mixer, A6U1, to produce a sum frequency of 95.54322 MHz. The 1 MHz decade switch selects 39 MHz in the 3 position and mixes with the 95.54322 MHz in mixer, A6U2, to produce a difference frequency of 56.54322 MHz.

The 56.54322 MHz is mixed with 700 MHz in mixer, A8Z1, to produce a sum frequency of 756.54322 MHz. The 10 MHz decade switch selects 80 MHz in the 2 position and mixes with the 756.54322 MHz in mixer, Z2, to produce a difference frequency of 676.54322 MHz.

The 100 MHz switch selects 800 MHz in the 1 position which is mixed with the 676.54322 MHz in mixer, Z1, to produce a difference frequency of 123.45678 MHz which is presented to the RF OUTPUT jack of the RF module.

3.2.6 ALC Circuitry

The automatic level control (ALC) detector in the RF module provides a dc output proportional to the RF level at its input. This dc level is applied to the ALC dc amplifier, A1A2U5 and A1A2U6. The amplified output is buffered by A1A2Q6 and applied to the gain control amplifier (GCA), A7Q8 and A7Q9, which controls the level of synthesizer signal that is applied to the RF OUTPUT jack of the RF module. This signal is continuously monitored by the ALC detector and the output level is continuously corrected. The GCA amplifier has a dynamic range of 28 dB so that the output level will be corrected throughout the temperature range specification of the instrument.

3.2.7 Measure Input Circuitry

The signal applied to the MEASURE INPUT jack of the RF module is mixed with the synthesizer output (offset 11 MHz higher in frequency by the 1 MHz, 10 MHz and 100 MHz programming circuitry) to produce an 11 MHz IF signal when the FM-10C is in a zero-beat condition. The 11 MHz IF signal is mixed with the 9 MHz developed on the A2 board, to produce a 2 MHz IF signal.

This 2 MHz IF signal is applied to three 2 MHz buffers, A1A5Q2, A1A5Q3 and A1A5Q4 and the buffered outputs are applied to the ACC jack, J3-A, on the back panel; to the MOD module to detect any modulation on the signal; and to the FIM module, respectively.

The 2 MHz IF applied to the MOD module is utilized to demodulate any modulated signals at the MEASURE INPUT jack. The recovered audio is applied to the VOLUME control when the MEASURE MODE AUDIO OUTPUT switch, S12, is in the RECOVERED AUDIO position and the MODE switch, S9G, is in the MEAS position. Also the recovered audio is applied to the VOLUME control when the MODE switch, S9G, is in the GEN MOD CAL position.

The 2 MHz IF applied to the FIM module is mixed with 2.1 MHz derived from the 4.2 MHz from the A18 frequency generator board (which is divided by 2 to produce 2.1 MHz) to derive a 100 kHz IF signal. This 100 kHz IF is applied to a discriminator. The FIM meter connected to the discriminator output will indicate any deviation from 100 kHz and display this deviation up to a maximum of ± 15 kHz.

A remote meter may be plugged into REM METER jack, J4, if a display is required at a distance from the FM-10C instrument. The internal meter will be disconnected at this time.

Also, the 100 kHz IF is mixed with 100 kHz derived from A1A2U2 and the difference frequency (error frequency) will operate the BEAT lamp at the rate of the error frequency.

Also the error frequency is applied to the VOLUME control, R2, when the MEASURE MODE switch, S12A, is in the BEAT NOTE position and the MODE switch, S9G, is in the MEAS position.

The output of the VOLUME control is amplified by A1A6U2 and the amplified output is applied to the speaker. Headphones or a remote speaker may be plugged into the AUDIO/TONE OUTPUT jack, J5, if desired. The internal speaker will be disconnected at this time.

The FIM-3 module is equipped with a SQUELCH switch. When the SQUELCH switch is ON and the OPERATE lamp is lit, the diode switch in the FIM-3 is turned off and the diode switch, CR4, in the mainframe is turned on. This allows the recovered audio from the MOD module to reach the speaker when modulation is being measured by the FM-10C system.

3.2.8 Frequency Modulation Circuitry

For peak deviation up to 18 kHz either an external signal may be applied to the MOD module EXT MOD jack or the internal modulator within the MOD module may be utilized. The FM audio signal is applied to the FM audio buffer, A1A6Q1, when the MODE switch, S9E, is in either the GEN or the GEN MOD CAL position and the GENERATOR MODULATION switch, S11, is in the ON position.

The 10 MHz #2 signal is buffered by A1A6Q2 and multiplied by 7 to produce the 70 MHz #3 signal. The 70 MHz #3 signal is further multiplied by 5 and by 2 by A8Q1

and A8Q3 respectively to produce 700 MHz which is applied to mixer A8Z1. This mixer is part of the frequency synthesizer circuitry.

The buffered FM audio signal is applied to the phase modulator, A1A6CR1 and A1A6CR2, which phase modulates the 70 MHz #3 signal, which in turn phase modulates the frequency synthesizer signal at A8Z1.

For peak deviations up to 60 kHz, an audio signal must be applied to the ACC jack, J3-B, on the rear panel. This signal is applied to the FM linearity potentiometer, R3, which is part of the VCO control. The output of this potentiometer is applied to the VCO control/frequency modulator, A2CR1 and A2CR2, which frequency modulates the VCO oscillator, A2Q10. The VCO oscillator output frequency modulates the synthesizer signal whenever the VCO switch, S8B, is not in the OUT position and one of the 100 Hz, 1 kHz, 10 kHz or 100 kHz switches is in the V position.

3.2.9 Amplitude Modulation Circuitry

An external audio signal may be applied to the EXT MOD jack of the MOD module or the internal modulator within the MOD module may be utilized. The audio signal is applied to the amplitude modulator, A7CR1 and A7CR2, when the GENERATOR MODULATION switch, S11, is in the ON position and the MODE switch, S9F, is in either the GEN or GEN MOD CAL position. The amplitude modulator modulates the synthesizer frequency.

3.2.10 Tone Generator Circuitry

The frequency synthesizer is set by the 1 MHz, 10 MHz and 100 MHz programming switches to produce 11 MHz plus any frequency switch setting to the right of the 1 MHz decade switch. This frequency is mixed with 9 MHz in the RF module to produce an IF signal of 2 MHz + which is applied to the 2 MHz IF buffer A1A5Q4. The buffered 2 MHz+ is applied to the FIM module where it is mixed with 2.1 MHz producing a 100 kHz+ IF signal which is mixed with 100 kHz to produce the frequency set on the frequency switches to the right of the 1 MHz switch. This tone frequency is applied to the VOLUME control when the MODE switch, S9G, is set to the TONE GEN position. The tone frequency is then amplified by A1A6U2 and the amplified output is available at the AUDIO/TONE OUTPUT jack J5.

3.2.11 Power Supply Circuitry

Ac operation may be accomplished by connecting the ac power cord to either 115 V rms or 230 V rms and by placing the AC/DC switch, S14, to the AC position and 115/230 V switch, S15, to the appropriate position. When the power switch, S10A, is not in the OFF position, transformer, T1, is energized and bridge rectifier, CR3 rectifies the transformer output voltage and applies approximately +17 Vdc to the reverse voltage protector, A1A3CR7.

The +9 Vdc output #1 at TB3-1,2 is sampled by 9V #1 adjustment potentiometer A1A3R7. Error amplifier A1A3Q1 compares this level with the level at the cathode of reference diode A1A3CR4 and amplifies this difference and the buffered output is applied to series regulator, Q1. Q1 regulates the +9 V #1.

The +9 Vdc output #2 circuitry is identical to the +9 Vdc output #1 which is explained above.

The +9 Vdc #2 output operates POWER lamp, DS1, and is applied to ACC jack, J3-E, on the back panel, and to the RF and the MOD modules.

Overload protector A1A3Q7 and A1A3CR6 prevents the output voltage at terminal A1A3-9,10 from exceeding approximately +12 Vdc. The +12 Vdc is applied to A1A6U2 and the FIM module.

12 Vdc operation may be accomplished by connecting an external +12 V supply to the 12 VDC jack using the 12 Vdc power cable provided. When the POWER switch, S10B is not in the OFF position and the AC/DC switch, S14, is in the DC position the +12 V is applied to the power supply board, A1A3, and regulated at 9V as explained in the ac operation above.

3.3 RADIO FREQUENCY MODULE, MODEL RFM-10

3.3.1 Introduction

This section consists of the circuit description of the RFM-10 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-2, and the schematic diagrams, figures 5-21 through 5-23.

3.3.2 General

The RFM-10 plug-in module derives its power supply and IF signal inputs via the rear connector, P2. The unit is energized whenever the mainframe is operating. Three major assemblies are contained in this unit: RF switch assembly, A1A2, 11 MHz IF board, A1A3, and broadband amplifier/mixer/detector assembly, A1A4.

The circuitry of the RFM-10 will be explained according to functions of the mainframe MODE switch: generate, measure, gen mod cal, and tone generate.

3.3.3 Generate Circuitry (Mainframe MODE switch set to GEN)

The mainframe synthesizer output enters the RFM-10 module via connector, P1, and is amplified by the broadband amplifier, Q1/Q2/Q3, on the A1A4 board. Level detector diode, CR1, rectifies this signal and returns a dc level proportional to the RF level to the AGC amplifier in the mainframe via pin 3 of connector, P2, for automatic leveling of the RF output.

The leveled output of the broadband amplifier is brought to the RF OUTPUT jack, J1, after it is attenuated by two 10dB pads and a 40 dB variable attenuator, AT2.

3.3.4 Measure Circuitry (Mainframe MODE switch set to MEAS)

The unknown signal enters the unit via MEAS INPUT connector, J2. The RF switch, A1A2, is energized and passes the signal to the beat detector, CR2, on the A1A4 board.

The mainframe frequency switches and 0–100 Hz control are adjusted for zero beat. At this time the frequency at the synthesizer input jack, P1, is 11 MHz higher than the frequency switches (in MEAS mode only). This frequency is also applied to the beat detector, CR2.

The difference frequency (11 MHz) is applied to diode attenuator, CR3. This attenuator is switched out of the circuit in MEAS mode and the 11 MHz is applied to the 11 MHz band pass filter on the A1A3 board. Diode switches, CR1 through CR4, are utilized to switch the 30 kHz crystal filter, Y1, in or out of the circuit and are operated by the MEASURE MODE switch, S2. In the narrow bandwidth (30 kHz), NARROW lamp, DS1, lights. The bandwidth in the WIDE position is approximately 175 kHz. After the diode switch, the signal is filtered by an 11 MHz bandpass filter, amplified by amplifier, Q2, and applied to mixer, Z1.

9 MHz from the mainframe is applied to the other input port of the mixer via pin 24 of connector, P2, and 9 MHz amplifier, Q3. The difference frequency (2 MHz) is applied to pin 1 of connector, P2, via a lowpass filter, a bandpass filter and a 2 MHz amplifier, Q4.

This 2 MHz is applied to the FIM module where it is mixed with 2.1 MHz to produce an IF of 100 kHz which is applied to a pulse-counting discriminator and the error frequency is indicated on the FIM meter. Also the 100 MHz IF is mixed with 100 kHz in the FIM module to produce the error frequency, if any, which may be heard in the mainframe speaker, or noted on the FIM BEAT lamp.

3.3.5 Gen Mod Cal Circuitry (Mainframe MODE switch set to GEN MOD CAL)

The synthesizer input at connector, P1, is 11 MHz and is either frequency modulated or amplitude modulated by the right-hand module. This is amplified by the BBA and applied to the beat detector.

The diode attenuator is switched into the circuit and the attenuated output is applied to the A1A3 board. The MEASURE MODE switch is bypassed so that the WIDE position is in use.

The 9 MHz is mixed with the modulated signal at mixer, Z1, and the modulated 2 MHz IF signal is applied to the right-hand module where the modulation is detected.

3.3.6 Tone Generator Circuitry (Mainframe MODE switch set to TONE GEN)

In this mode the frequency of the synthesizer input at connector P1 is 11 MHz plus any frequency dial setting to the right of the 1 MHz decade. This frequency is amplified by the BBA and applied to the beat detector. The diode attenuator is switched into the circuit and the attenuated output is applied to the A1A3 board. The MEASURE MODE switch is bypassed so that the WIDE position is in use. 9 MHz from the mainframe is mixed with the signal producing a 2 MHz+ IF signal. This 2 MHz+ IF signal is applied to the FIM module where it is mixed with 2.1 MHz producing a 100 kHz+ signal which is mixed with a 100 kHz signal from the mainframe to produce the frequency set on the mainframe dials to the right of the 1 MHz decade.

This frequency is available at the AUDIO TONE OUTPUT jack, J5, on the mainframe.

3.4 RADIO FREQUENCY MODULE, MODEL RFM-10A

3.4.1 Introduction

This section consists of the circuit description of the RFM-10A plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-3, and the schematic diagrams, figures 5-24 through 5-26.

3.4.2 General

The RFM-10A plug-in module derives its power supply and IF signal inputs via the rear connector, P2. The unit is energized whenever the mainframe is operating.

Three major assemblies are contained in this unit: RF switch assembly, A1A2, 11 MHz IF board, A1A3, and broadband amplifier/mixer/detector assembly, A1A4. The circuitry of the RFM-10A will be explained according to the functions of the mainframe MODE switch: generate, measure, gen mod cal, and tone generate.

3.4.3 Generate Circuitry (Mainframe MODE switch set to GEN)

The mainframe synthesizer output enters the RFM-10A module via connector, P1, and is amplified by the first broadband amplifier, Q1 through Q4, on the A1A4 board. Level detector diode, CR1, rectifies this signal and returns a dc level proportional to the RF level to the AGC amplifier in the mainframe via pin 3 of connector, P2, for automatic leveling.

The output of the first broadband amplifier is also brought to the RF output jack, J1, after it is attenuated by two 10 dB pads and a 40 dB variable attenuator, AT2.

3.4.4 Measure Circuitry (Mainframe MODE switch set to MEAS)

The unknown signal enters the unit via MEAS INPUT connector, J2. The RF switch, A1A2, is energized and passes the signal to the mixer, Z1, on the A1A4 board via a 3 dB pad.

The mainframe frequency switches and 0–100 Hz control are adjusted for zero beat. At this time the frequency at the synthesizer input jack, P1, is 11 MHz higher than the frequency switches (in MEAS mode only). This frequency is amplified by the first BBA and applied to the second BBA, Q5-Q8, (which is energized in this mode only). The output of the second BBA is applied to the other input port of mixer, Z1, and the difference frequency (11 MHz) is applied to the 11 MHz bandpass filter on the A1A3 board via a 3 dB pad. Diode switches, CR3 through CR6, are utilized to switch the 30 kHz crystal filter, Y1, in or out of the circuit and are operated by the MEASURE MODE switch, S2. In the narrow bandwidth (30 kHz), NARROW lamp, DS1, lights. The bandwidth in the WIDE position is approximately 175 kHz. After the diode switch the signal is filtered by an 11 MHz bandpass filter, amplified by amplifier, U1, and applied to mixer, U2.

9 MHz from the mainframe is applied to the other input port of the mixer via pin 24 of connector, P2, and a 9 MHz bandpass filter. The difference frequency (2 MHz) is applied to pin 1 of connector, P2, via a lowpass filter, a bandpass filter, and a 2 MHz amplifier, Q1.

MEASURE SENSITIVITY switch, S1, switches 30 dB of attenuation in or out of the circuit by controlling the gain of the 11 MHz amplifier, U1. MEASURE SENSITIVITY control, R1, controls the gain of the 2 MHz amplifier, Q1, over approximately 32 dB of range. The 2 MHz output is applied to the FIM module where it is mixed with 2.1 MHz to produce an IF of 100 kHz, which is applied to a pulse-counting discriminator and the error frequency, if any, may be read on the FIM meter. Also the 100 kHz IF is mixed with 100 kHz in the FIM module to produce the error frequency, if any, which may be heard in the mainframe speaker, or noted on the FIM BEAT lamp.

3.4.5 Gen Mod Cal Circuitry (Mainframe MODE switch set to GEN MOD CAL)

The synthesizer input at connector, P1, is 11 MHz and is either frequency modulated or amplitude modulated by the right-hand module. This is amplified by the first BBA and applied to the mixer, Z1, through the second BBA which is switched off at this time and acts as an attenuator. The attenuated output is applied to the A1A3 board. The MEASURE MODE switch is bypassed so that the WIDE position is in use.

The 9 MHz is mixed with the modulated signal at mixer, U2, and the modulated 2 MHz IF signal is applied to the right-hand module where the modulation is detected.

3.4.6 Tone Generator Circuitry (Mainframe MODE switch set to TONE GEN)

In this mode the frequency of the synthesizer input at connector, P1, is 11 MHz plus any frequency switch setting to the right of the 1 MHz decade switch. This frequency is amplified by the first BBA and applied to the mixer, Z1. The second BBA is switched out of the circuit and the attenuated output is applied to the A1A3 board. The MEASURE MODE switch is bypassed so that the WIDE position is in use. 9 MHz from the mainframe is mixed with the signal producing a 2 MHz+ IF signal. This 2 MHz+ IF signal is applied to the FIM module where it is mixed with 2.1 MHz producing a 100 kHz+ signal which is mixed with a 100 kHz signal from the mainframe to produce the frequency set on the mainframe switches to the right of the 1 MHz decade switch.

This frequency is available at the AUDIO TONE OUTPUT jack, J5, on the mainframe.

3.5 FREQUENCY INDICATING MODULE, MODEL FIM-1

3.5.1 Introduction

This section consists of the circuit description of the FIM-1 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-4, and the schematic diagram, figure 5-7.

3.5.2 General

The FIM-1 plug-in module derives its 9 volt power supply and IF signal inputs via the rear connector, P1. The unit is energized whenever the mainframe is operating. A single printed circuit board assembly contains the five major sections of the FIM-1: operate lamp circuitry, beat lamp circuitry, meter circuitry, calibrate circuitry, and ± 5 V dc power supply circuitry.

3.5.3 Operate Lamp Circuitry

4.2 MHz from the mainframe is applied to amplifier, A1Q2, via pin 12 of connector, P1. This frequency is divided by two by A1U1, a binary, producing 2.1 MHz which is applied to the LO port of mixer, A1U5A.

The 2 MHz IF frequency from the RF module is applied to the 2 MHz bandpass filter (adjusted by A1L1), via P1-16 to the 2.2 MHz trap (adjusted by A1L4). The output of the 2.2 MHz trap is applied through the 2 MHz buffer, A1Q1, to the signal port of mixer A1U5A, to produce a difference frequency of 100 kHz. The 2.2 MHz trap prevents the image frequency (2.2 MHz) from mixing with the 2.1 MHz at the LO port of the mixer and producing an intermediate frequency of 100 kHz.

The output of mixer A1U5A, is amplified by 100 kHz IF amplifier, A1U5B, and is applied to 100 kHz IF

amplifier, A1U5C, when RANGE switch, S1, is in the 1.5 kHz, 5 kHz or 15 kHz position.

Level detector, A1U6A/A1C22, is adjusted by variable resistor, A1R31, to fire operate lamp schmidt trigger, A1U6B/C, when the 2 MHz IF input level is exactly 2.5 mV rms. This triggers operate lamp switch, A1U6D, and lights the OPERATE lamp, DS1.

3.5.4 Beat Lamp Circuitry

100 kHz from the mainframe is applied to the LO port of mixer, A1U7A, via pin 14 of connector, P1. This mixes with the 100 kHz at the output of 100 kHz amplifier, A1U5C, and the difference frequency is amplified by beat amplifiers, A1U7B/C and D, and drives beat lamp switch, A1Q3, which in turn flashes the beat lamp, DS2, at the beat rate. The beat note is also applied to the mainframe via pin 1 of connector, P1. Audio squelch diode, A1CR1, enables the beat circuitry to function whenever the OPERATE lamp, DS1, is lit.

3.5.5 Meter Circuitry

The 100 kHz from 100 kHz amplifier, A1U5C, is converted into a square wave by limiter, A1U5D, and is applied to one-shot multivibrator, A1U3, which operates as a pulse-counting discriminator. The two complementary outputs are amplified by the meter amplifier, A1U4A through A1U4D, and applied to both plates of capacitor, A1C9. If the intermediate frequency becomes higher, Capacitor, A1C9, will become charged more positive on the positive plate than the negative plate and the meter, M1, which is effectively connected across A1C9, will indicate a positive difference frequency. If the intermediate frequency becomes lower, the opposite procedure will occur. Calibration of the three ranges is accomplished by variable resistors, A1R18, A1R21 and A1R23. When the schmidt trigger fires and the OPERATE lamp is lit, meter enable switches, A1U4E and A1U6E, allow the meter amplifier, A1U4A through A1U4D, to operate.

3.5.6 Calibrate Circuitry

100 kHz from the mainframe is applied to the discriminator, A1U3, via terminal 14 of P1 when the RANGE switch is in the ZERO position. With the ZERO control, R1, at mid-position, variable resistor, A1R8, is adjusted for zero on the FIM-1 meter.

3.5.7 Power Supply Circuitry

+9 Vdc is applied to voltage regulator, A1U2, via terminal 9 of P1. Variable resistor, A1R4, is adjusted to produce +5 Vdc which is required for some of the integrated circuits employed in the FIM-1.

3.6 FREQUENCY INDICATING MODULE, MODEL FIM-3

3.6.1 Introduction

This section consists of the circuit description of the FIM-3 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-5, and the schematic diagram, figure 5-28.

3.6.2 General

The FIM-3 plug-in module derives its power supply and IF signal inputs via the rear connector, P1. The unit is energized whenever the mainframe is operating. A single printed circuit board assembly contains the six major sections of the FIM-3: operate lamp circuitry, beat lamp circuitry, meter circuitry, calibrate circuitry, +5 Vdc power supply circuitry, and squelch circuitry.

3.6.3 Operate Lamp Circuitry

4.2 MHz from the mainframe is applied to amplifier, A1Q2, via pin 12 of connector, P1. This frequency is divided by two by A1U1, (a binary), producing 2.1 MHz which is applied to the LO port of mixer, A1U5A. The 2 MHz IF frequency from the RF module is applied to the 2 MHz bandpass filter (adjusted by A1L1), via P1-16 to the 2.2 MHz trap (adjusted by A1L4). The output of the 2.2 MHz trap is applied through the 2 MHz buffer, A1Q1, to the signal port of mixer, A1U5A, to produce a difference frequency of 100 kHz. The 2.2 MHz trap prevents the image frequency (2.2 MHz) from mixing with the 2.1 MHz at the LO port of the mixer and producing an intermediate frequency of 100 kHz.

The output of mixer, A1U5A, is amplified by 100 kHz IF amplifier, A1U5B, and is applied to 100 kHz IF amplifier, A1U5C, when RANGE switch, S1, is in the 1.5 kHz, 5 kHz or 15 kHz position.

Level detector, A1U6A/A1C22, is adjusted by variable resistor, A1R31, to fire operate lamp schmidt trigger, A1U6B/C, when the 2 MHz IF input level is exactly 2.5 mV rms. This triggers operate lamp switch, A1U6D, and lights the OPERATE lamp, DS1.

3.6.4 Beat Lamp Circuitry

100 kHz from the mainframe is applied to the LO port of mixer, A1U7A, via pin 14 of connector P1. This mixes with the 100 kHz at the output of the 100 kHz amplifier, A1U5C, and the difference frequency is amplified by beat amplifiers, A1U7B/C and D, and drives beat lamp switch, A1Q3, which in turn flashes the beat lamp, DS2, at the beat rate. The beat note is also applied to the mainframe via pin 1 of connector P1. Audio squelch diode, A1CR1, enables the beat circuitry to function whenever the OPERATE lamp, DS1, is lit.

3.6.5 Meter Circuitry

The 100 kHz from 100 kHz amplifier, A1U5C, is converted into a square wave by limiter, A1U5D, and is applied to one-shot multivibrator, A1U3, which operates as a pulse-counting discriminator. The two complementary outputs are amplified by the meter amplifier, A1U4A through A1U4D, and applied to both plates of capacitor A1C9. If the intermediate frequency becomes higher, capacitor, A1C9, will become charged more positive on the positive plate than the negative plate and the meter, M1, which is effectively connected across A1C9, will indicate a positive difference frequency. If the intermediate frequency becomes lower, the opposite procedure will occur. Calibration of the three ranges is accomplished by variable resistors, A1R18, A1R21 and A1R23. When the schmidt trigger fires and the OPERATE lamp is lit, meter enable switches, A1U4E and A1U6E, allow the meter amplifier, A1U4A through A1U4D, to operate.

3.6.6 Calibrate Circuitry

100 kHz from the mainframe is applied to the discriminator, A1U3, via terminal 14 of P1 when the RANGE switch is in the ZERO position. With the ZERO control, R1, at mid-position, variable resistor, A1R8, is adjusted for zero on the FIM-3 meter.

3.6.7 Squelch Circuitry

Operate lamp switch, A1U6D, also operates squelch diode switch, A1CR2. When the OPERATE lamp, DS1, is lit and the SQUELCH switch, S2, is in the ON position, diode switch, A1CR2 is reverse-biased and the diode switch, CR4, in the mainframe is forward-biased, allowing the recovered audio from the right-hand module to reach the VOLUME control in the mainframe and eventually reach the speaker in the mainframe.

If the OPERATE lamp is not lit, diode switch, A1CR2, is forward-biased and the diode switch, CR4, in the mainframe is reverse-biased, and the audio circuit is open circuited.

With the SQUELCH switch in the OFF position, the diode switch, CR4, in the mainframe is always forward-biased and the audio circuit is completed.

3.6.8 Power Supply Circuitry

+9 Vdc is applied to voltage regulator, A1U2, via terminal 9 of P1. Variable resistor, A1R4, is adjusted to produce +5 Vdc which is required for some of the integrated circuits employed in the FIM-3.

3.7 AMPLITUDE MODULATION MODULE, MODEL OAM-1

3.7.1 Introduction

This section consists of the circuit description of the OAM-1 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-6, and the schematic diagram, figure 5-29.

3.7.2 General

The OAM-1 plug-in module derives its operating power and signal input from the mainframe via the rear connector, P1. It contains its own power switch to permit use of the mainframe while the plug-in is switched off. High voltages for the CRT are developed within the module by a dc-to-dc inverter operating from the +9 volts dc supplied by the mainframe. There are four subassemblies in the OAM-1: AM detector board, A1; high voltage power supply board, A2; vertical amplifier board, A3; and horizontal amplifier board, A4. The circuitry contained in the OAM-1 may be divided into four major sections: vertical deflection circuitry, horizontal deflection circuitry, internal modulator circuitry and power supply circuitry.

3.7.3 Vertical Deflection Circuitry

The 2 MHz IF signal from the mainframe is applied to a 2 MHz active filter, Q601/L601/L602/L603 via pin 16 of connector P1. This is followed by a 2 MHz tuned differential amplifier, U602/L606, and a buffer amplifier, Q603. The gain of the differential amplifier is controlled by CARRIER LEVEL potentiometer, R1.

The output of buffer amplifier, Q603, is applied to operational amplifier, Q604/Q605, peak detector, Q606, and buffer amplifier, Q607. The operational amplifier, Q604/Q605, has 100% feedback so that the loop gain is unity. The RC time constant of C628/R630 is sufficiently short that the modulation envelope is accurately followed. An AGC loop from the output of buffer amplifier, Q607, to differential amplifier, U602, provides output stability with fluctuations of 6 to 10 dB in IF input signal level.

The output of buffer amplifier, Q607, is impressed across precision voltage divider, R656/R658/R659 and is also applied to recovered audio amplifier, Q608, when the VERT MODE switch, S2, is in any position except the EXT position. The output of recovered audio amplifier, Q608, is applied through buffer amplifier, Q609, to the mainframe via pin 14 of connector, P1, and to distortion analyzer output amplifier, Q105. This output is connected to DIST ANAL jack, J2.

The output of buffer amplifier, Q607, is also applied to buffer amplifier, Q101, whenever VERT MODE switch, S2, is in either the MEAS AM or the CARR SET position. (In the CARR SET position, capacitor C3 removes the ac component of the modulated signal.) Q102 is a

constant current source for buffer amplifier, Q101, and the output of the buffer amplifier is applied to the high gain, dc-coupled vertical amplifier consisting of U101A/B, Q103 and Q104. (U101C is a constant current source for U101A/B.) The vertical amplifier drives the CRT vertical deflection plates and VERT POS control, R6, sets the bias of U101B. When VERT MODE switch, S2, is in the EXT position, an external signal may be applied to VERT IN connector J1 for general oscilloscope use. VERT GAIN control, R3, provides attenuation of this external signal.

3.7.4 Horizontal Deflection Circuitry

The sweep generator contains a current source, Q200, and a regenerative trigger, Q201/Q202. Sweep speed is controlled by SWEEP RANGE switch, S4, and SWEEP SPEED control, R5. The output level is controlled by variable resistor, R204. Synchronization is provided by the vertical signal output of Q104. The sweep generator output is applied to buffer amplifier, Q203, when MOD MODE switch, S6, is in either the INT or EXT position. The output of buffer amplifier, Q203, is applied to the dc-coupled horizontal deflection amplifier, Q204/Q205, having differential outputs which drive the horizontal deflection plates of the CRT. HORIZ POS control, R8, sets the bias of Q205. The horizontal amplifier may be driven from an external source connected to the EXT MOD/HORIZ IN receptacle, J4, when the MOD MODE switch, S6, is in the EXT HORIZ position. The mainframe may be modulated from the EXT MOD/HORIZ IN receptacle, J4, when the MOD MODE switch, S6, is in the EXT position and the RANGE switch, S3, is in the GEN 30% position via the amplitude modulation amplifier, Q616/Q617, through pin 11 of connector P1.

3.7.5 Internal Modulator Circuitry

The 400 Hz/1 kHz Wein-bridge oscillator, Q610/Q611, is buffered by Q613 and automatically leveled by level detector, CR602/CR603 and ALC control, Q611. The oscillator frequency is selected by MOD/AUDIO OUT FREQ switch, S5, which selects feedback variable resistors R674 and R675 and frequency variable resistors R671 and R673 corresponding to the frequency selected. The output of the oscillator is impressed across INT MOD/AUDIO OUT control, R2, and the wiper of R2 is connected to 400 Hz/1 kHz driver amplifier, Q614. The output of Q614 is applied to AUDIO OUT connector, J3, via buffer amplifier, Q615. When the MOD MODE switch, S6, is in the INT position, the output from the Wein-bridge oscillator is first amplified by the 400 Hz/1 kHz driver and buffer, Q614/Q615, and then by AM modulation amplifier, Q616/Q617, and applied to the mainframe through pin 11 of connector, P1, when the RANGE switch, S3, is in the GEN 30% position.

3.7.6 Power Supply Circuitry

The power supply is a dc-to-dc inverter that converts +9 volts from the mainframe when the PWR switch, S1, is on, to -1000 volts and +300 volts required by the CRT. The inverter also supplies -15 volts required by

the vertical and horizontal deflection amplifiers and the AM detector board. 6.2 V rms required by the CRT heater is also supplied. The inverter consists of a 400 kHz oscillator, Q1/Q2, a power transformer, T401, and three rectifiers, CR401/CR402, CR403/CR404, and CR405/CR406. The astigmatism control, R217, utilizes the +300 Vdc while the FOCUS and INTENSITY controls, R11 and R13 respectively, require the -1000 Vdc.

3.8 FREQUENCY MODULATION MODULE, MODEL ODM-1

3.8.1 Introduction

This section consists of the circuit description of the ODM-1 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-7 and the schematic diagram, figure 5-30.

3.8.2 General

The ODM-1 plug-in module derives its operating power and signal input from the mainframe via the rear connector, P1. It contains its own power switch to permit use of the mainframe while the plug-in is switched off. High voltage power supplies for the CRT are also developed within the module. There are four subassemblies in the ODM-1: 2 MHz IF board, A1, high voltage power supply board, A2, vertical amplifier board, A3, and horizontal amplifier board, A4. The circuitry contained in the ODM-1 may be divided into six sections: operate and overload lamp circuitry, discriminator output circuitry, vertical deflection circuitry, horizontal deflection circuitry, internal modulation circuitry and power supply circuitry.

3.8.3 Operate and Overload Lamp Circuitry

A 2 MHz active filter consisting of Q501, L501, L502, and L503 amplifies and filters the 2 MHz IF signal at pin 16 of connector P1. The amplified output is buffered by Q503 and amplified by Q504. Level detector, CR502/Q505/C526, rectifies the IF signal and this output is applied to two potentiometers, R527 and R528. Potentiometer R528 is adjusted to fire the operate lamp schmidt trigger, Q506/Q507, when the level of the 2 MHz at pin 16 of connector, P1 is 2.5 mV. This triggers the operate lamp switch, Q508 and OPER lamp, DS1, lights. R527 is adjusted to fire the overload schmidt trigger, Q509/Q510, with 25 mVrms (2.5 mVrms + 20 dB) at the 2 MHz IF input, pin 16 of connector, P1, which triggers the overload lamp switch, Q511, and OVL lamp, DS2, lights. Interlock diode, CR503, prevents both lamps being lit simultaneously.

3.8.4 Discriminator Output Circuitry

The output of the 2 MHz active filter is also applied to the limiter-discriminator, U501. The demodulated output is buffered by Q502 and applied to pin 5 of connector, P1. The buffered output of Q502 is also

amplified by the distortion analyzer amplifier, Q105, for use at the DIST ANAL output connector, J2.

3.8.5 Vertical Deflection Circuitry

The output of the limiter-discriminator, U501, is also applied to the voltage divider string, R2/R3/R4, through potentiometer, R516. DEV RANGE switch, S2, selects a voltage from the voltage divider string and when the VERT IN switch, S1, is in the INT position. The recovered audio is amplified by the recovered audio amplifier, Q512/Q513/Q514, and applied to the mainframe via pin 14 of connector, P1.

The signal level selected by the DEV RANGE switch, S2, is also applied to the vertical deflection amplifier, Q101/U101/Q103/Q104, and VERT CENT control, R9, sets the bias of U101B. Q102 and U101C are constant current sources for the vertical deflection amplifier.

3.8.6 Horizontal Deflection Circuitry

The sweep generator contains a current source, Q200, and a regenerative trigger, Q201/Q202. Sweep speed is controlled by SWEEP RANGE switch, S3, and SWEEP SPEED control, R11. The output level is controlled by variable resistor, R204. Synchronization is provided by the vertical signal output of Q104. The sweep generator output is applied to buffer amplifier, Q203, when MOD MODE switch, S4, is in either the INT or EXT position. The output of buffer amplifier, Q203, is applied to the dc-coupled horizontal deflection amplifier, Q204, Q205, having differential outputs which drive the horizontal deflection plates of the CRT. HORIZ CENTER control, R12, sets the bias of Q205. The horizontal amplifier may be driven from an external source connected to the EXT MOD/HORIZ IN receptacle, J4, when the MOD MODE switch, S4, is in the EXT HORIZ position. The mainframe may be modulated from the EXT MOD/HORIZ IN receptacle, J4, when the MOD MODE switch, S4, is in either the EXT or INT COMB positions via the modulation amplifier, U102, through pin 12 of connector, P1.

3.8.7 Internal Modulator Circuitry

The 1 kHz Wein-bridge oscillator, Q515/Q516 is buffered by Q517 and automatically leveled by level detector, CR504/CR505 and ALC control, Q518. The output of the oscillator is impressed across the INT MOD/AUDIO OUT control, R13. The wiper of R13 is connected to the audio driver amplifier, Q519/Q520. The output of Q520 is applied to the AUDIO OUT connector, J3. When the MOD MODE switch, S4, is in the INT COMB position, the output from the Wein-bridge oscillator is amplified by the modulation amplifier, U102 and applied to the mainframe through pin 12 of connector, P1.

3.8.8 Power Supply Circuitry

The power supply is a dc-to-dc inverter that converts +9 volts from the mainframe when the PWR switch, S1, is closed to -1000 volts and +300 volts required by the CRT. The inverter also supplies -15 volts required by the vertical and horizontal deflection amplifiers and 2 MHz IF board. The 6.2 Vrms required by the CRT heater is also supplied. The inverter consists of a 40 kHz oscillator, Q1/Q2, a power transformer, T401, and three voltage doublers, CR401/CR402, CR403/CR404, and CR405/CR406. The astigmatism control, R217, utilizes the +300 Vdc while the FOCUS and INTENSITY controls, R21 and R18 respectively, require the -1000 Vdc.

3.9 FREQUENCY MODULATION MODULE, MODEL MDM-1

3.9.1 Introduction

This section consists of the circuit description of the MDM-1 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, figure 3-8 and the schematic diagram, figure 5-31.

3.9.2 General

The MDM-1 plug-in module derives its power supply and IF signal inputs via the rear connector, P1. The unit is energized whenever the mainframe is operating. A single printed circuit board assembly contains the three major sections of the MDM-1: Limiter current circuitry, deviation circuitry, and modulating circuitry.

3.9.3 Limiter Current Circuitry

A 2 MHz active filter consisting of A1Q1, A1L1, A1L2 and A1L3 amplifies and filters the 2 MHz IF signal at pin 16 of connector, P1. The 3 dB bandwidth of the filter is approximately 50 kHz. The amplified output of the 2 MHz active filter is applied to emitter follower, A1Q2, acting as a buffer amplifier. The 2 MHz tuned amplifier, A1Q3, and A1L5, supplies the voltage doubler rectifier, A1CR7 and A1Q4, which acts as a signal threshold detector. The output of the threshold detector is a dc voltage proportional to the IF signal level which is fed to the MTR switch, S3.

With S3 in the LIM position, variable resistor, A1R40 is adjusted so that the meter indicates the minimum allowable 2 MHz input signal level required to achieve full limiting of the limiter-discriminator, A1U2. A red line on the meter scale indicates this level.

Meter protection is achieved by diodes CR8 and CR9. The limiter, A1CR1 through A1CR6, is designed to allow 20 dB of dynamic range at the 2 MHz IF signal.

3.9.4 Deviation Circuitry

The amplified output of the active filter is also

applied to the limiter-discriminator, A1U1 and A1L4. This is a quadrature-type discriminator containing a de-emphasis network, and its output is applied via the emitter follower, A1Q5, acting as a buffer amplifier, to the front panel SCOPE/DIST ANAL connector, J1, and to the rear connector, P1-5, which is not used at the present time.

The discriminator output is also applied to the deviation range divider network, A1R16, A1R17, A1R18, and A1R19. The DEVIATION RANGE switch, S1, selects one of the three ranges: 1.8, 6 or 18 kHz, and applies the signal to the phase splitter, A1Q6.

A1Q6 is a field effect transistor with a high input impedance so that it will not load the deviation range divider network. The two identical outputs from A1Q6, 180° apart in phase, are selected by the DEV switch, S2. This allows positive or negative-going peaks to be read on the front panel deviation meter. The signal selected by the DEV switch S2, is applied to the recovered audio amplifier, A1Q7 and A1Q8. A1Q7 is a field effect transistor with a high input impedance so that the drain of A1Q6 is not heavily loaded when the DEV switch, S2, is in the -position. The output of A1Q2 is applied to emitter follower, A1Q9.

The output of the buffer amplifier, A1Q9, is applied to the rear connector, P1-14. This supplies the mainframe audio amplifier with the recovered audio signal.

The output of A1Q8 also is applied to the peak detector, A1U2 and A1CR10. The output of the peak detector supplies a dc voltage proportional to the peak value of the recovered audio to the MTR switch, S3.

With the MTR switch, S3, in the DEV position, the meter indicates the peak deviation in kilohertz.

The meter is in series with the dc feedback path of A1U2. Calibration of the meter is accomplished by variable resistor, A1R47.

3.9.5 Modulator Circuitry

The internal modulator circuitry consists of an automatically levelled 1 kHz Wein-bridge oscillator. The basic Wein-bridge oscillator consists of A1Q10 and A1Q11 and is buffered by the emitter follower, A1Q12, and is automatically amplitude levelled by the field effect transistor, A1Q15.

Automatic levelling is achieved by sampling the output voltage of the emitter of A1Q12 and rectifying it by the voltage doubler rectifier, A1CR11 and A1CR12. The output of level detector A1CR11 and A1CR12, is a dc voltage proportional to the level of the 1 kHz output and varies the resistance between source and drain of the automatic level control field effect transistor, A1Q15, which in turn varies the bias of A1Q10. Variable resistor, A1R58, is adjusted for the desired output level, and variable resistor, A1R56, is adjusted for the desired frequency (1 kHz).

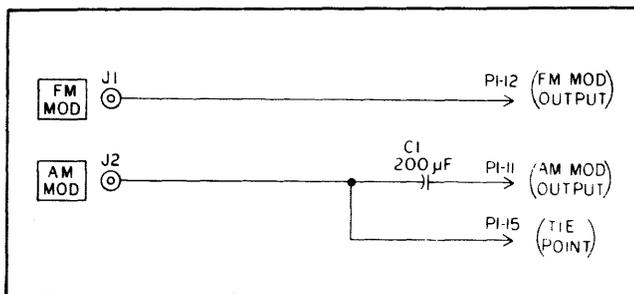
With the MOD switch, S4, in the INT/COMB position, the INT MOD/AUDIO OUT control, R63, may be rotated to the desired peak deviation of the mainframe. MOD switch, S4, couples the internal 1 kHz oscillator to the mainframe via the rear panel connector, P1-12, for modulation purposes. With the MOD switch, S4, in this same position (INT/COMB), an external test tone frequency may simultaneously be injected into the mainframe via the EXT MOD front panel connector, J2.

With the MOD switch in the EXT position, an external test tone frequency may be applied to the EXT MOD front panel connector for modulating the mainframe with frequencies other than 1 kHz. In this switch position, the internal 1 kHz oscillator output is applied to the front panel AUDIO OUT connector, J3, for modulation of external transmitters via the audio driver amplifier, A1Q13 and A1Q14.

3.10 AM/FM MODULE, MODEL AFM-1

3.10.1 Introduction

This section consists of the circuit description of the AFM-1 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram below, and the schematic diagram, figure 5-32.



DETAILED BLOCK DIAGRAM MODEL AFM-1

3.10.2 General

The AFM-1 plug-in module has two functions: frequency modulation, and amplitude modulation.

3.10.3 Frequency Modulation

The FM MOD jack, J1, is directly connected to the mainframe via pin 12 of connector, P1.

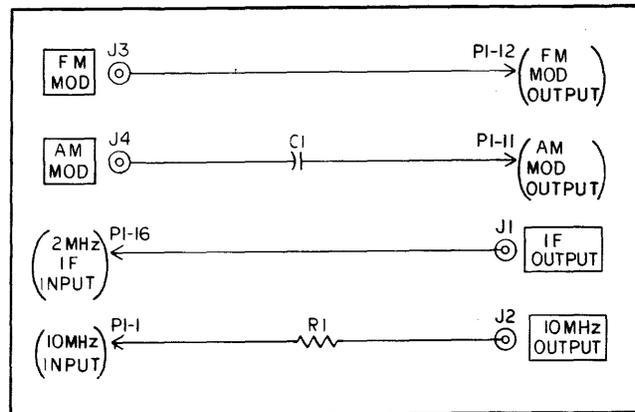
3.10.4 Amplitude Modulation

The AM MOD jack, J2, is connected to the mainframe via a dc blocking capacitor, C1, through pin 11 of connector, P1.

3.11 AM/FM MODULE, MODEL AFM-2

3.11.1 Introduction

This section consists of the circuit description of the AFM-2 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram below, and the schematic diagram, figure 5-33.



DETAILED BLOCK DIAGRAM MODEL AFM-2

3.11.2 General

The AFM-2 plug-in module has four functions: frequency modulation, amplitude modulation, 2 MHz IF output, and 10 MHz output.

3.11.3 Frequency Modulation

The FM MOD jack, J3, is directly connected to the mainframe via pin 12 of connector, P1.

3.11.4 Amplitude Modulation

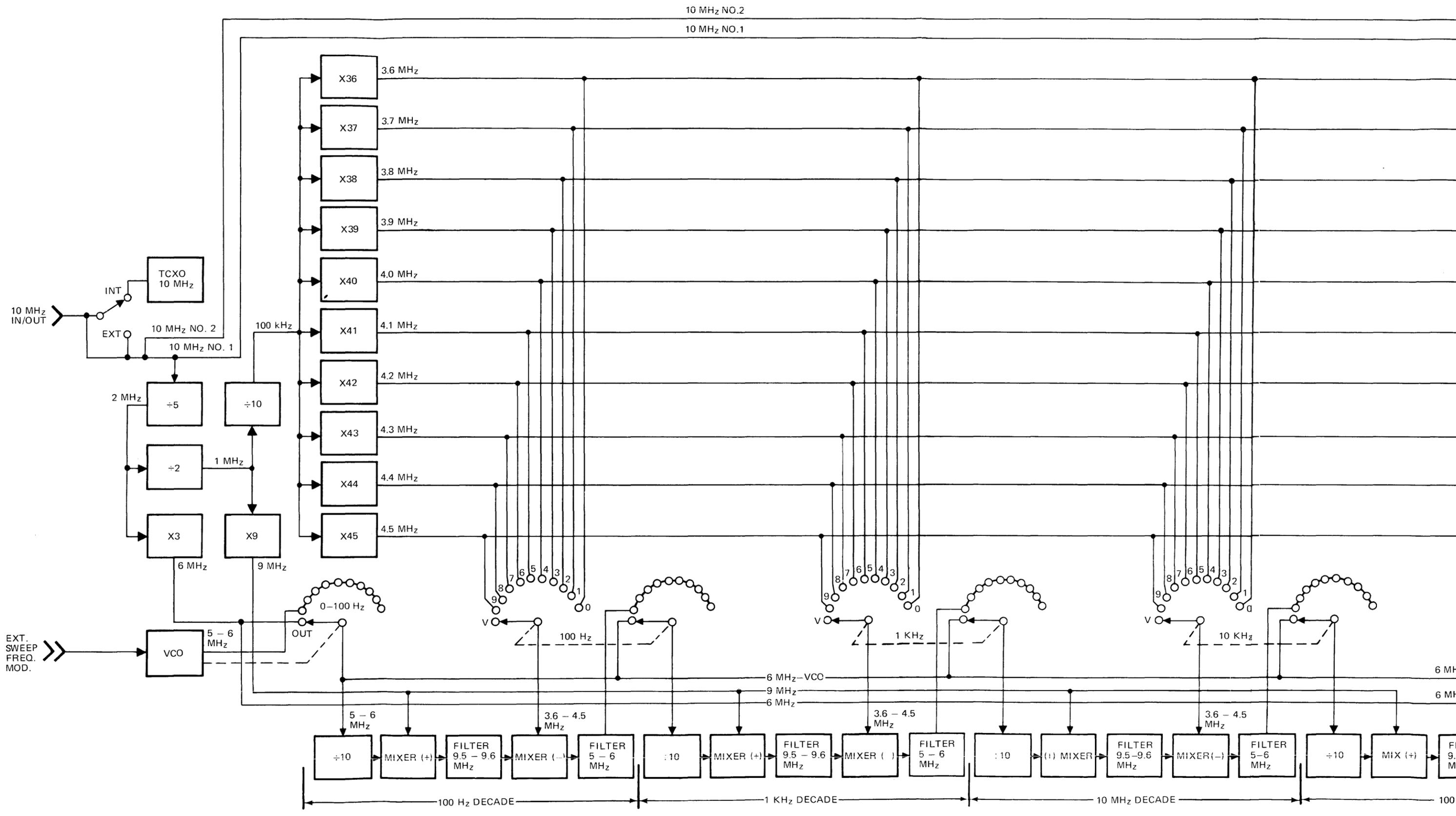
The AM MOD jack, J4, is connected to the mainframe via a dc blocking capacitor, C1, through pin 11 of connector, P1.

3.11.5 2 MHz IF Output

The 2 MHz IF from the mainframe is connected directly to the IF OUTPUT jack, J1, via pin 16 of connector, P1.

3.11.6 10 MHz Output

The 10 MHz from the mainframe is connected to the 10 MHz OUTPUT jack, J2, through isolation resistor, R1, via pin 1 of connector, P1.



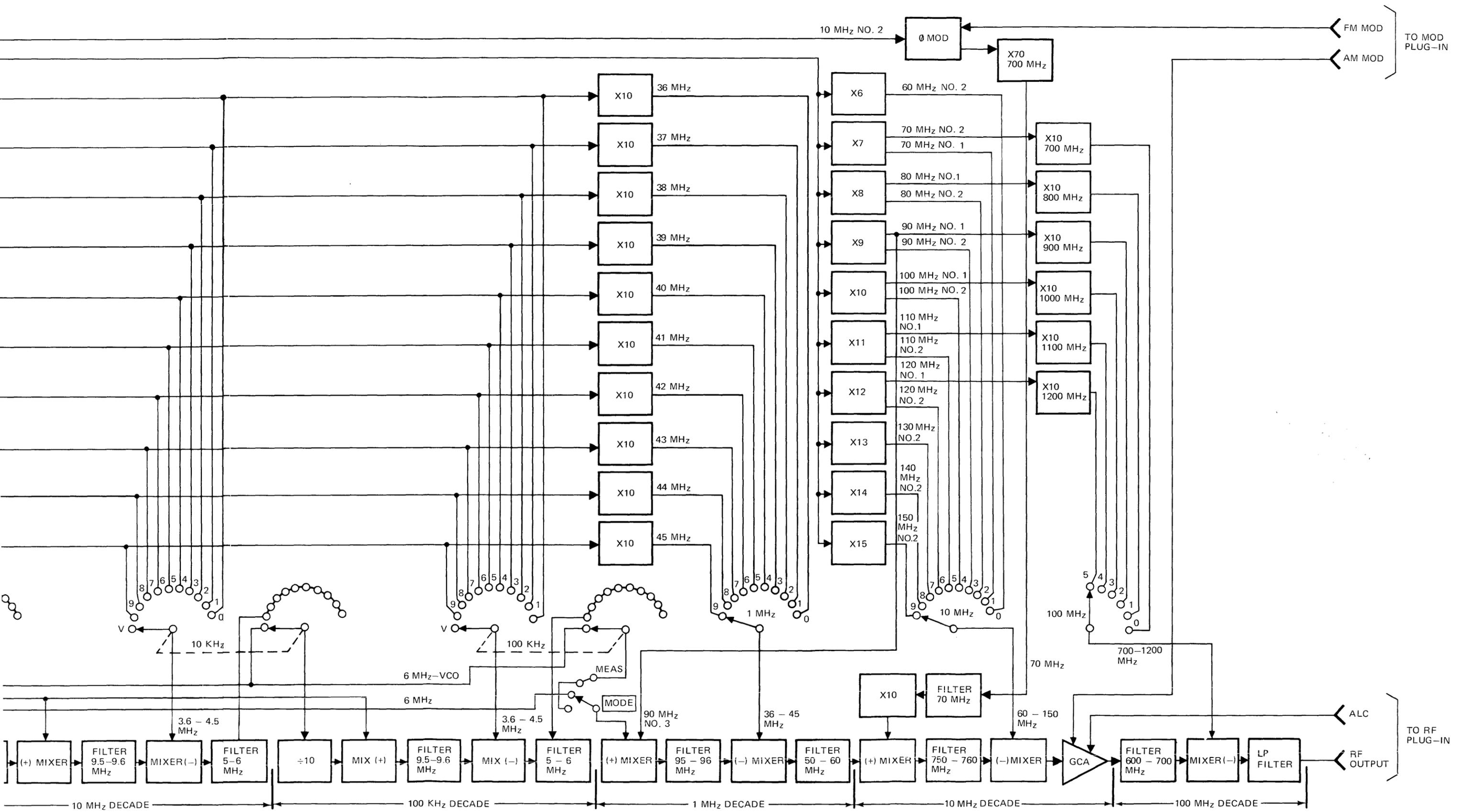


Figure 3-1 - Simplified Synthesis Block Diagram Model FM-10C Mainframe

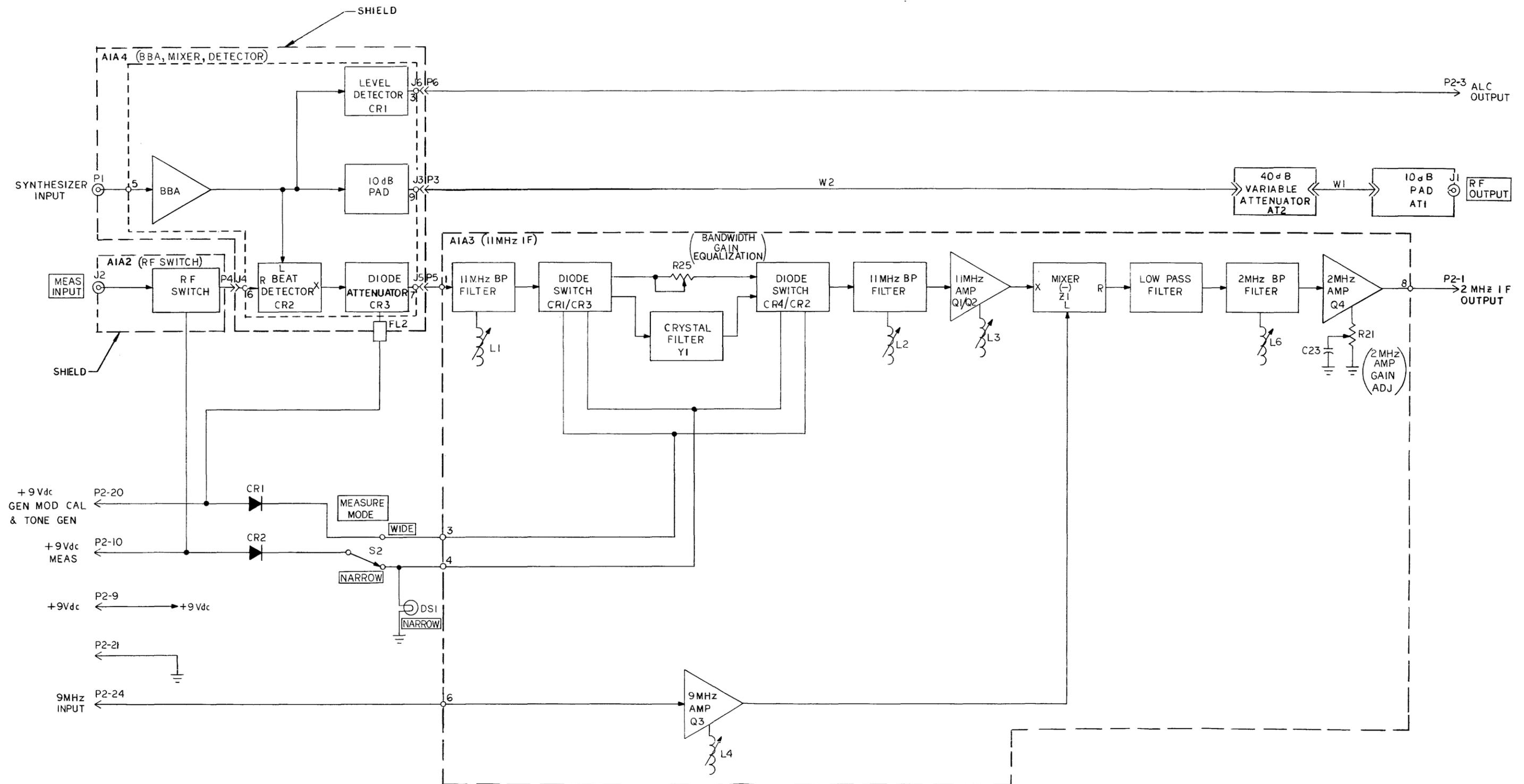


Figure 3-2 - Detailed Block Diagram
Model RFM-10

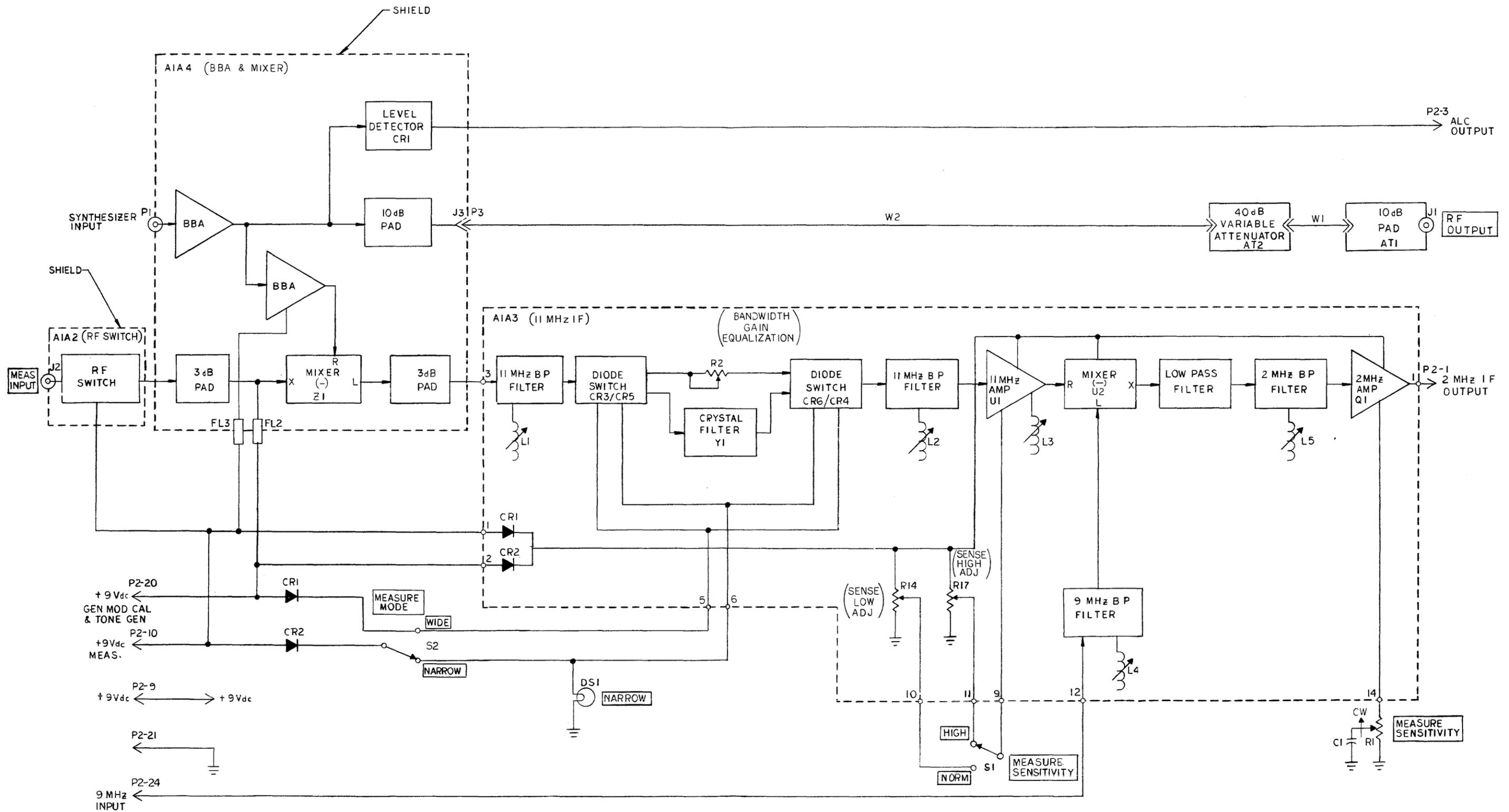


Figure 3-3 - Detailed Block Diagram
Model RFM-10A

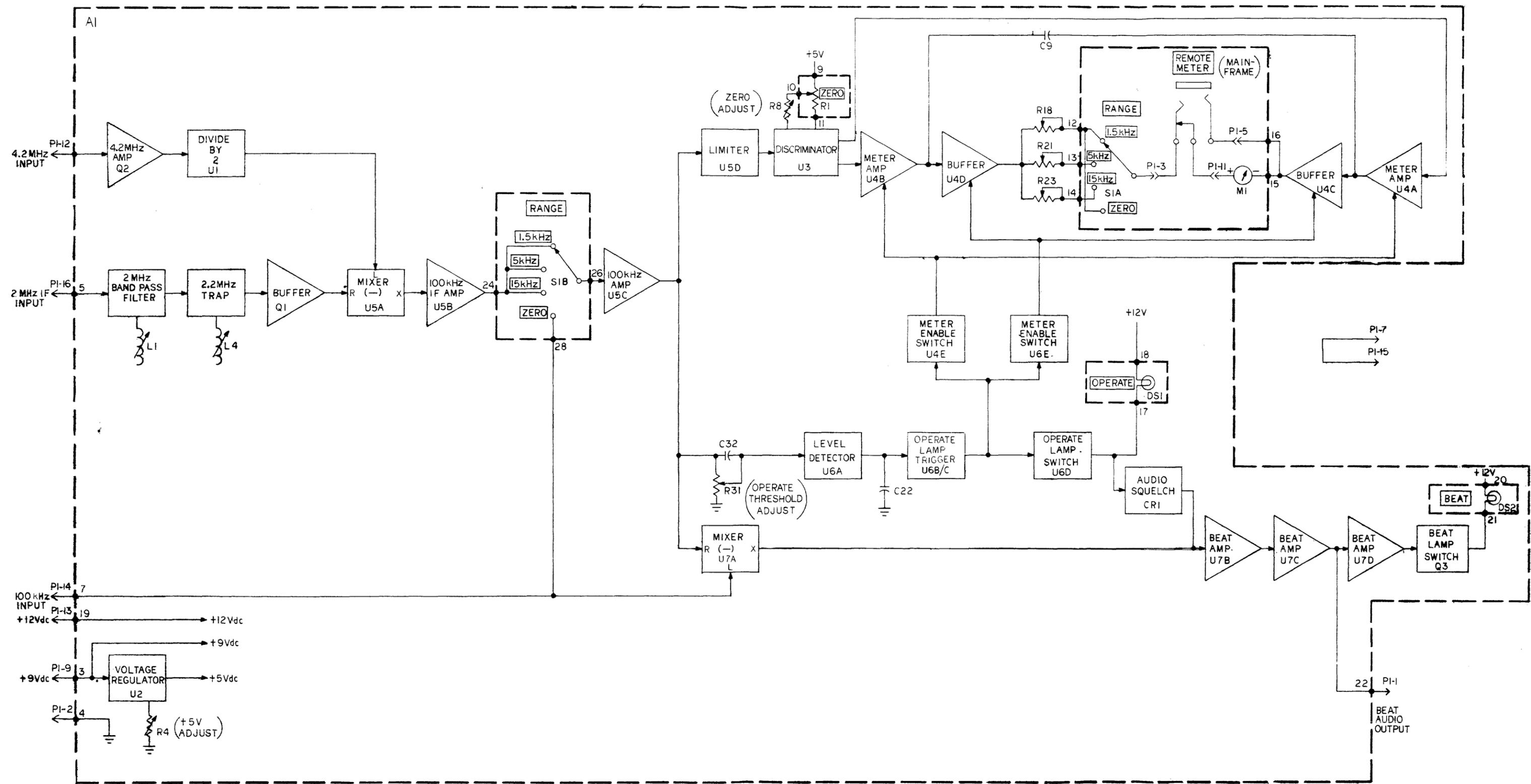


Figure 3-4 - Detailed Block Diagram
Model FIM-1

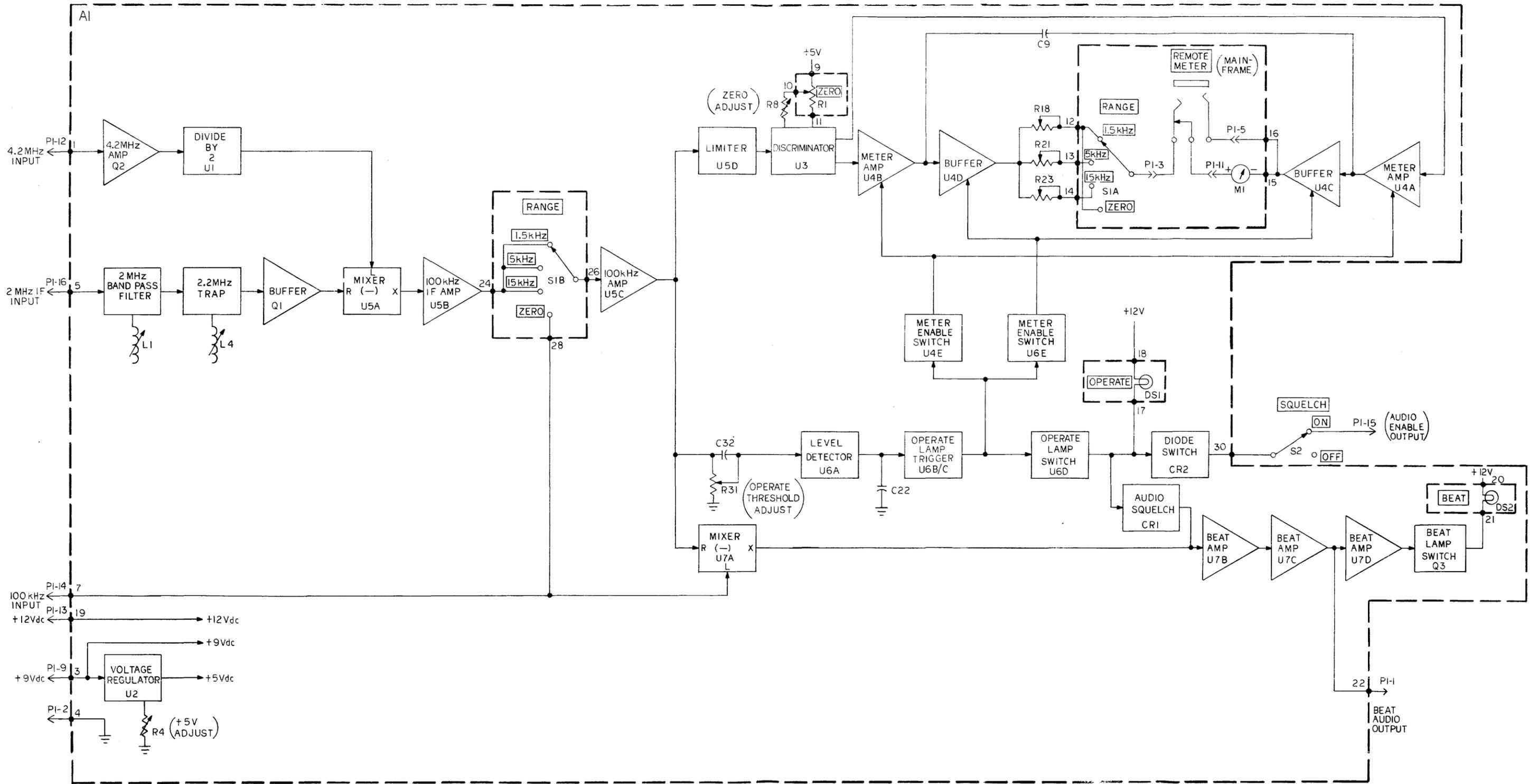


Figure 3-5 - Detailed Block Diagram Model FIM-3

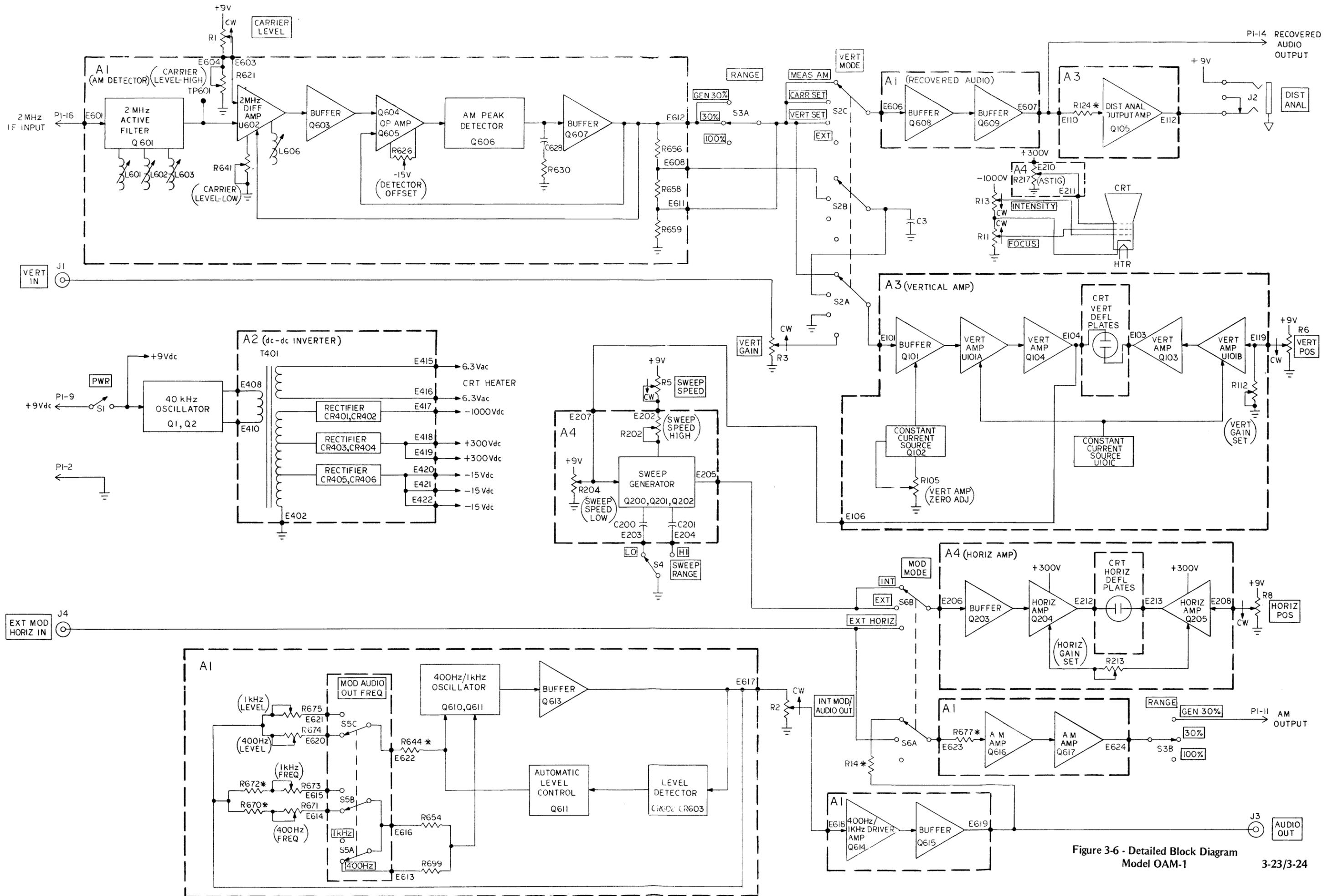


Figure 3-6 - Detailed Block Diagram
Model OAM-1

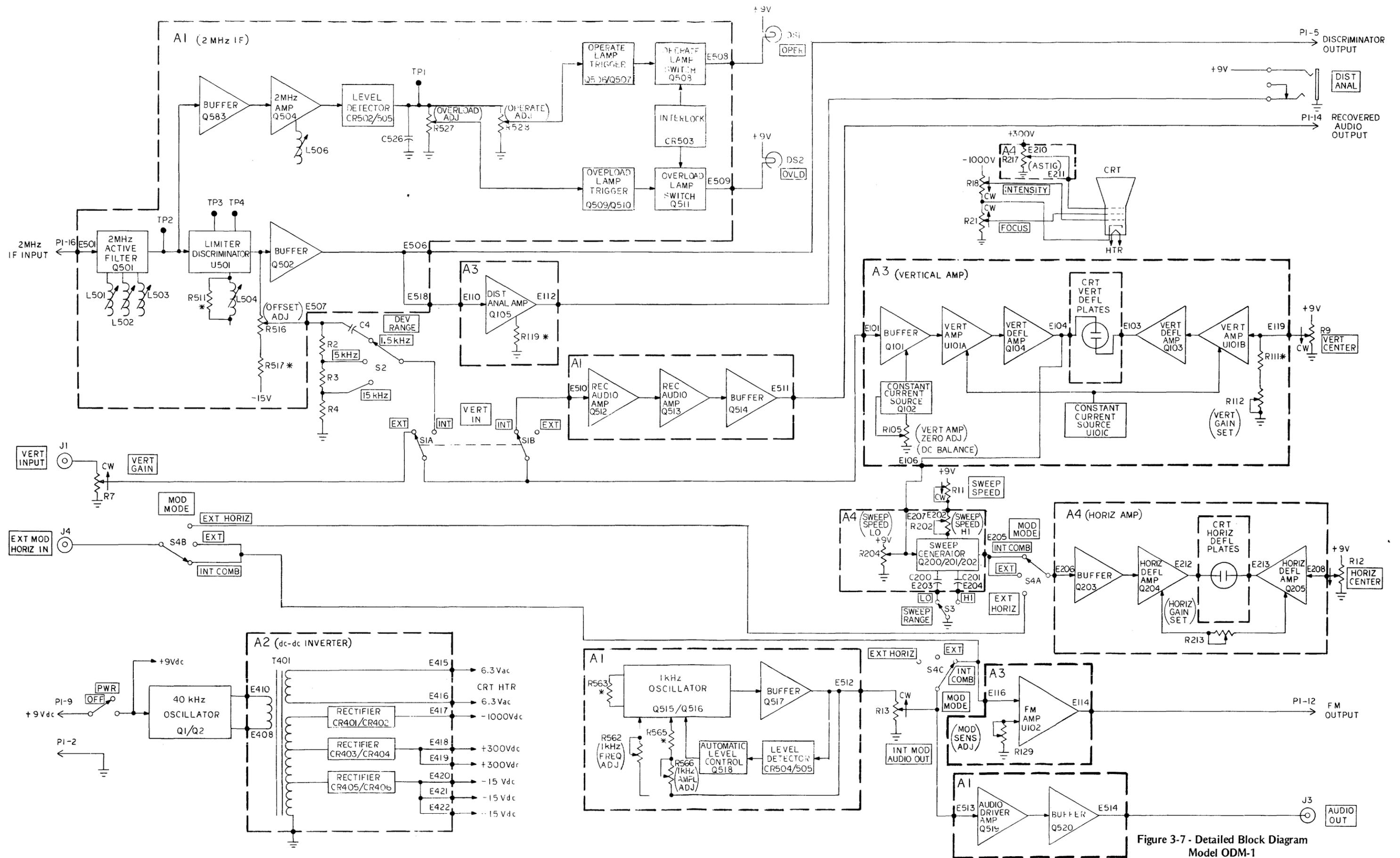


Figure 3-7 - Detailed Block Diagram Model ODM-1

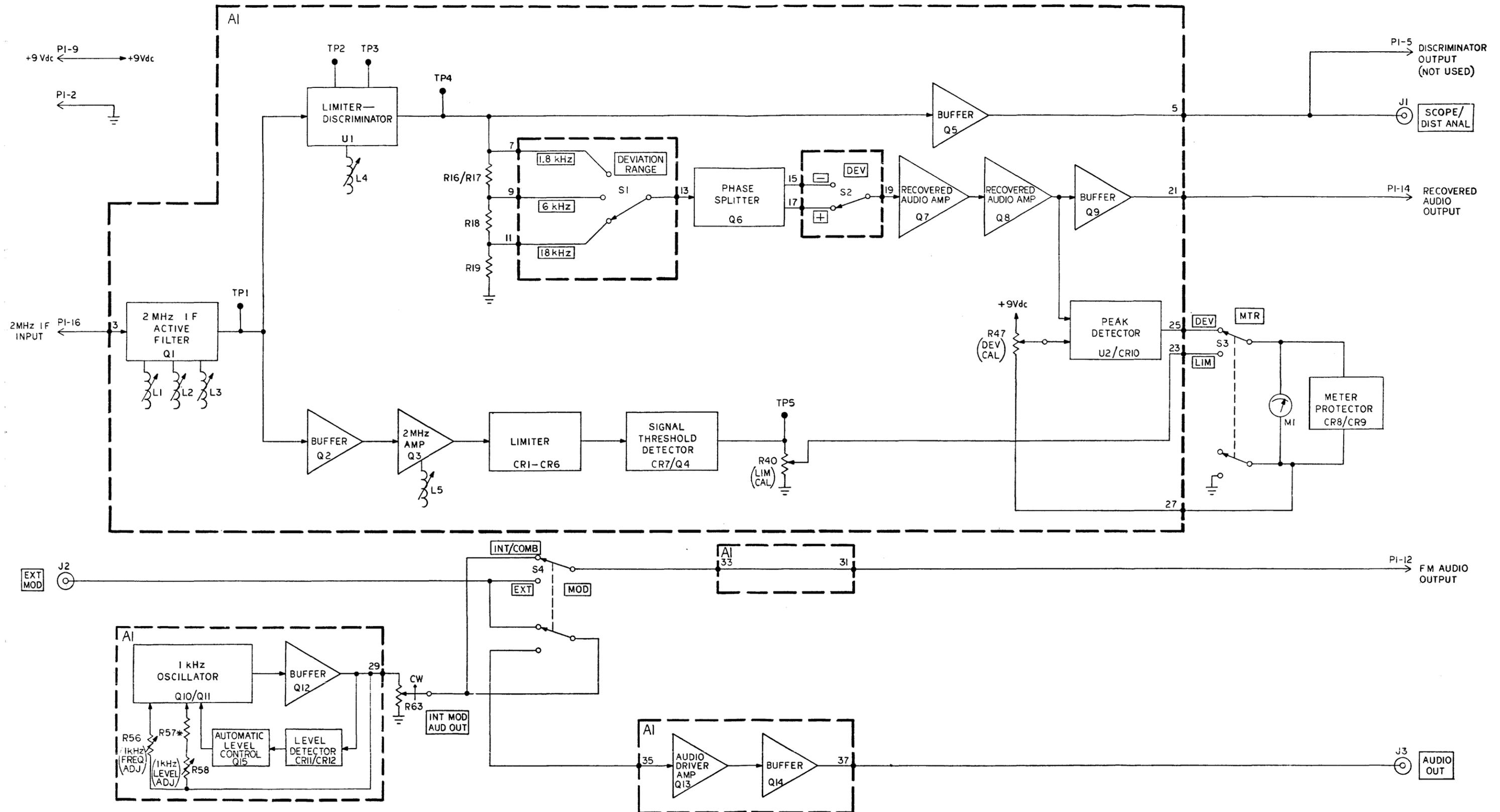


Figure 3-8 - Detailed Block Diagram
Model MDM-1

3.12 RADIO FREQUENCY MODULE, MODEL RFM-10D

3.12.1 Introduction

This section consists of the circuit description of the RFM-10D plug-in module.

The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, Figure 3-9, and the schematic diagrams, Figures 5-35 through 5-38.

3.12.2 General

The RFM-10D plug-in module derives its power supply and RF signal inputs via the rear connectors, P2 and P1. The unit is energized whenever the mainframe is operating.

Three major assemblies are contained in this unit: broadband amplifier assembly, A1A2, 11 MHz IF board, A1A3, and broadband amplifier/mixer/detector assembly, A1A4. The circuitry of the RFM-10D will be explained according to the functions of the mainframe MODE switch: generate, measure, gen mod cal, and tone generate.

3.12.3 Generate Circuitry (Mainframe MODE switch set to GEN)

The mainframe synthesizer output enters the RFM-10D module via connector, P1, and is amplified by the 42 dB broadband amplifier, Q1 through Q8, on the A1A4 board. Level detector diode, CR1, rectifies this signal and returns a dc level proportional to the RF level to the AGC amplifier in the mainframe via pin 3 of connector, P2, for automatic leveling.

The output of the 42 dB broadband amplifier is also brought to the RF OUTPUT jack, J1, through a 110 dB step attenuator, AT1.

3.12.4 Measure Circuitry (Mainframe MODE switch set to MEAS)

The unknown signal enters the unit via MEAS INPUT connector, J2. The 20 dB broadband amplifier, A1A2, is energized and passes the signal to the mixer, Z1, on the A1A4 board via a 3 dB pad.

The mainframe frequency switches and 0-100 Hz control are adjusted for zero beat. At this time the frequency at the synthesizer input jack, P1, is 11 MHz higher than the frequency switches. This frequency is amplified by the 42 dB BBA and applied to the 4 dB BBA, Q9. The 40 dB pad is bypassed by diode switch, CR3, and the transistor switch, Q10, removes the 50 ohm load, R34, from the circuit.

The output of the 4 dB BBA is applied to the L port of mixer, Z1, and the difference frequency (11 MHz) from Z1-R is applied to the 11 MHz bandpass filter on the A1A3 board. Diode switches, CR3 through CR6, are utilized to switch the 30 kHz crystal filter, FL1, in or out of the circuit and are operated by the MEASURE MODE switch, S2. In the narrow bandwidth (30 kHz), NARROW lamp, DS1, lights. The bandwidth in the WIDE position is approximately 200 kHz. After the diode switch the signal is filtered by an 11 MHz bandpass filter, amplified by amplifier, Q6, and applied to mixer, U1.

9 MHz from the mainframe is applied to the other input port of the mixer via pin 24 of connector, P2, and a 9 MHz bandpass filter. The difference frequency (2 MHz) is applied to pin 1 of connector, P2, via a lowpass filter and a 2 MHz amplifier, Q9.

MEASURE SENSITIVITY switch, S1, switches 30 dB of gain in or out of the circuit by switching the output of the 11 MHz amplifier, Q6. MEASURE SENSITIVITY

control, R1, controls the output of the 11 MHz buffer, Q7, over approximately 30 dB of range. The 2 MHz output is applied to the FIM module where it is mixed with 2.1 MHz to produce an IF of 100 kHz, which is applied to a pulse-counting discriminator and the error frequency, if any, may be read on the FIM meter. Also the 100 kHz IF is mixed with 100 kHz in the FIM module to produce the error frequency, if any, which may be heard in the mainframe speaker, or noted on the FIM BEAT lamp.

3.12.5 Gen Mod Cal Circuitry (Mainframe MODE switch set to GEN MOD CAL)

The synthesizer input at connector, P1, is 11 MHz and is either frequency modulated or amplitude modulated by the right-hand module. This is amplified by the 42 dB BBA and applied to the mixer, Z1-L port through the 4 dB BBA which is switched off at this time and the 40 dB pad attenuates the signal. The attenuated output is applied to the A1A3 board. At this time, mixer, Z1, is turned on via A1A4R44 and acts as a closed switch. The MEASURE MODE switch is bypassed so that the WIDE position is in use.

The 9 MHz is mixed with the modulated signal at mixer, U1, and the modulated 2 MHz IF signal is applied to the right-hand module where the modulation is detected.

3.12.6 Tone Generator Circuitry (Mainframe MODE switch set to TONE GEN)

In this mode the frequency of the synthesizer input at connector, P1, is 11 MHz plus any frequency switch setting to the right of the 1 MHz decade switch. This frequency is amplified by the 42 dB BBA and applied to the mixer, Z1-L. The

4 dB BBA is switched out of the circuit and the attenuated output is applied to the A1A3 board. The MEASURE MODE switch is bypassed so that the WIDE position is in use. 9 MHz from the mainframe is mixed with the signal producing a 2 MHz + IF signal. This 2 MHz + IF signal is applied to the FIM module where it is mixed with 2.1 MHz producing a 100 kHz + signal which is mixed with a 100 kHz signal from the mainframe to produce the frequency set on the mainframe switches to the right of the 1 MHz decade switch.

This frequency is available at the AUDIO TONE OUTPUT jack, J5, on the mainframe.

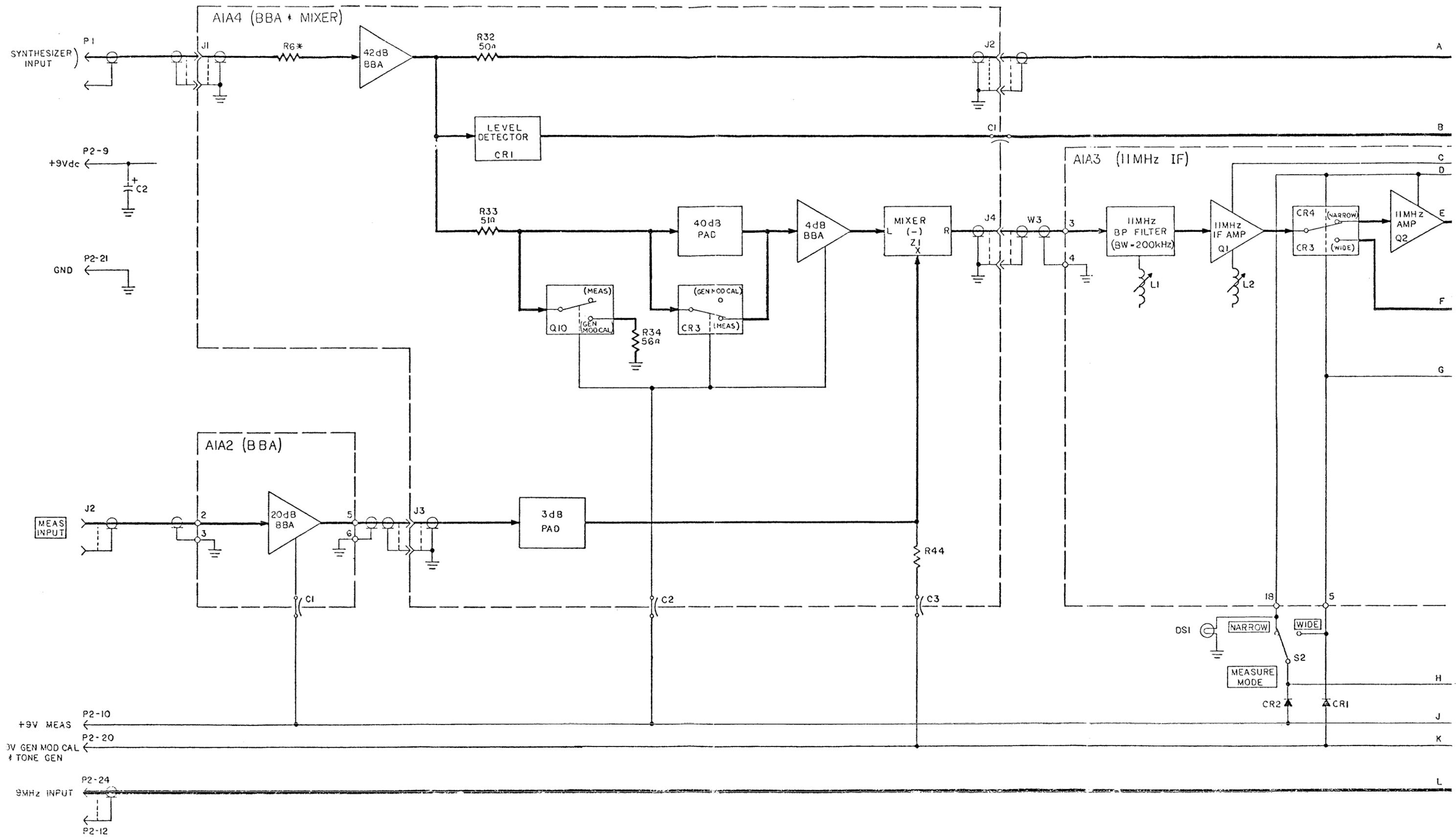


Figure 3-9
Detailed Block Diagram
Model RFM-10D

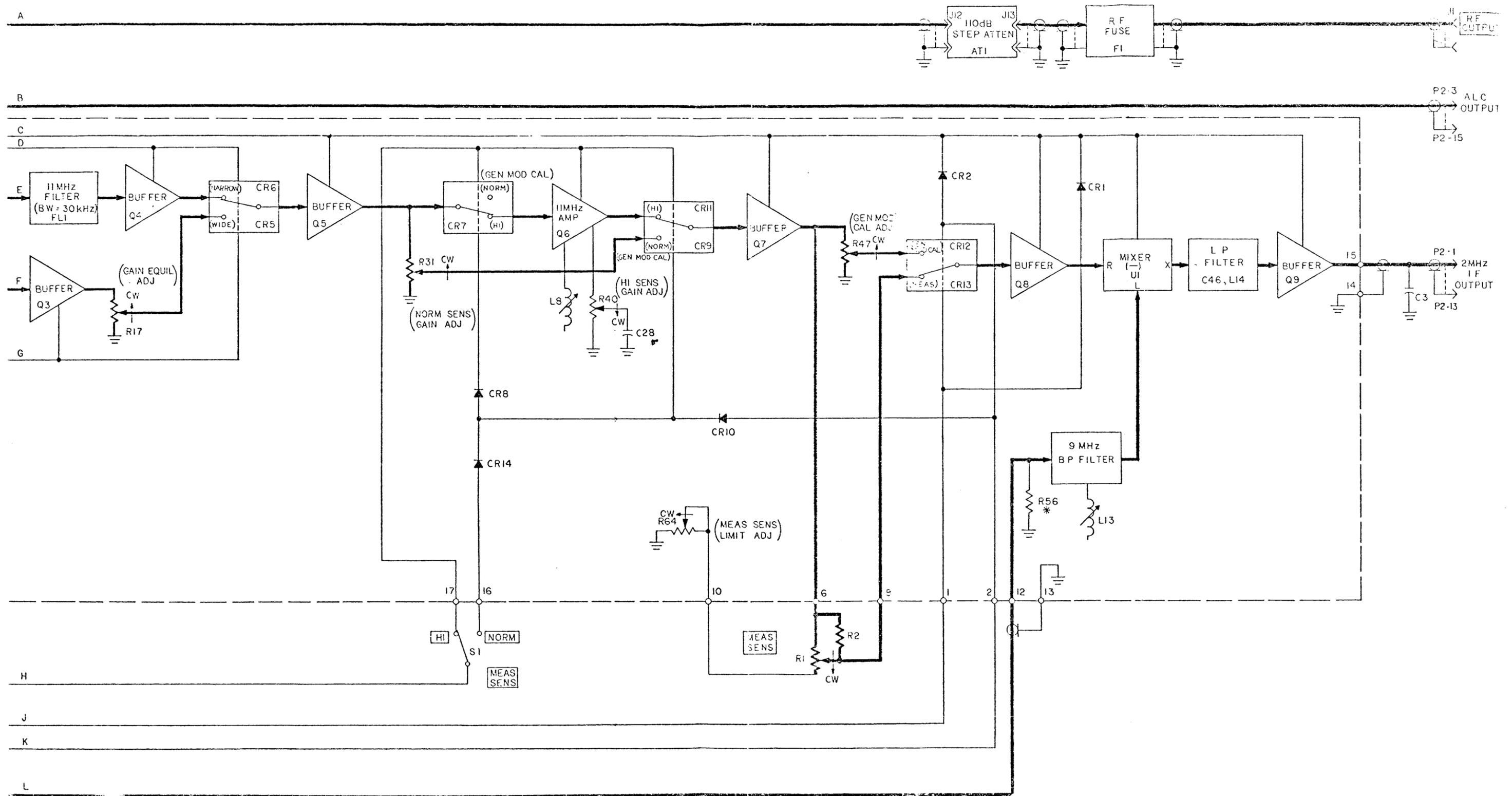


Figure 3-9 (Cont.)
 Detailed Block Diagram
 Model RFM-10D

3.13 RADIO FREQUENCY MODULE, MODEL RFM-11A

3.13.1 Introduction

This section consists of the circuit description of the RFM-11A plug-in module.

The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, Figure 3-10, and the schematic diagrams, Figures 5-39 thru 5-44.

3.13.2 General

The RFM-11A plug-in module derives its power supply and RF signal inputs via the rear connectors, P2 and P1. The unit is energized whenever the mainframe is operating.

Four major assemblies are contained in this unit: RF switch and broadband amplifier assembly, A1A2; 11 MHz IF board, A1A3; broadband amplifier/mixer/detector assembly, A1A4; and 700 MHz multiplier board, A1A5. The circuitry of the RFM-11A will be explained according to the functions of the mainframe MODE switch: generate, measure, gen mod cal, and tone generate.

3.13.3 Generate Circuitry (Mainframe MODE switch set to GEN)

The mainframe synthesizer output enters the RFM-11A module via connector, P1, and is amplified by the 42 dB broadband amplifier, Q1 through Q8, on the A1A4 board. Level detector diode, A1A4CR1, rectifies this signal and returns a dc level proportional to the RF level to the AGC amplifier in the mainframe via pin 3 of connector, P2, for automatic leveling.

The output of the 42 dB broadband amplifier is also brought to the RF switch, A1A2, through a 110 dB step attenuator, AT1.

When at the low band position, the RF output is applied to the RF OUTPUT connector, J1. When at the high band position the RF output is applied to the X port of mixer, Z1. 10 MHz from the mainframe is multiplied by 70 in the 700 MHz multiplier board, A1A5, and applied to the L port of mixer, Z1 through bandpass filter, FL2. The sum of the two frequencies at Z1 appears at the RF output receptacle, J2.

3.13.4 Measure Circuitry (Mainframe MODE switch set to MEAS)

The unknown signal enters the unit via one of the MEASURE INPUT connectors, J1 or J2. In the high frequency mode, the unknown signal is applied to the R port of mixer, Z1. 700 MHz is applied to the L port, and the difference frequency is applied to the RF switch, A1A2. The difference frequency is amplified by the 15 dB nominal BBA and then applied to the X port of mixer A1A4Z1.

In the low frequency mode, the unknown signal is applied to the RF switch, A1A2, and amplified by the 20 dB BBA. This frequency is then applied to the X port of mixer A1A4Z1.

The mainframe frequency switches and 0-100 Hz control are adjusted for zero beat. At this time the frequency at the synthesizer input receptacle, P1, is 11 MHz higher than the frequency switches. This frequency is amplified by the 42 dB BBA and applied to the 4 dB BBA, A1A4Q9. The 40 dB pad is bypassed by diode switch, A1A4CR3, and the transistor switch, A1A4Q10, removes the 50 ohm load, A1A4R34, from the circuit. The output of the 4 dB BBA is applied to the L port of mixer, A1A4Z1,

and the difference frequency (11 MHz) from A1A4 Z1-R is applied to the 11 MHz bandpass filter on the A1A3 board. Diode switches, A1A3CR3 through A1A3CR6, are utilized to switch the 30 kHz crystal filter, A1A3FL1, in or out of the circuit and are operated by the MEASURE MODE switch, S2. In the narrow bandwidth (30 kHz), NARROW lamp, DS1, lights. The bandwidth in the WIDE position is approximately 200 kHz. After the diode switch the signal is filtered by an 11 MHz bandpass filter, amplified by amplifier, A1A3Q6, and applied to mixer, A1A3U1. 9 MHz from the mainframe is applied to the other input port of the mixer A1A3U1 via pin 24 of connector, P2, and a 9 MHz bandpass filter. The difference frequency (2 MHz) is applied to pin 1 of connector, P2, via a lowpass filter and a 2 MHz amplifier, A1A3Q9.

MEASURE SENSITIVITY switch, S1, switches 30 dB of gain in or out of the circuit by switching the output of the 11 MHz amplifier, A1A3Q6. MEASURE SENSITIVITY control, R1, controls the output of the 11 MHz buffer, A1A3Q7, over approximately 30 dB of range. The 2 MHz output is applied to the FIM module where it is mixed with 2.1 MHz to produce an IF of 100 kHz, which is applied to a pulse-counting discriminator and the error frequency, if any, may be read on the FIM meter. Also the 100 kHz IF is mixed with 100 kHz in the FIM module to produce the error frequency, if any, which may be heard in the mainframe speaker, or noted on the FIM BEAT lamp.

3.13.5 Gen Mod Cal Circuitry (Mainframe MODE switch set to GEN MOD CAL)

The synthesizer input at connector, P1, is 11 MHz and is either frequency modulated

or amplitude modulated by the right-hand module. This is amplified by the 42 dB BBA and applied to the mixer, A1A4Z1-L port through the 4 dB BBA which is switched off at this time and the 40 dB pad attenuates the signal. The attenuated output is applied to the A1A3 board. At this time, mixer, A1A4Z1, is turned on via A1A4R44 and acts as a closed switch. The MEASURE MODE switch is bypassed so that the WIDE position is in use.

The 9 MHz is mixed with the modulated signal at mixer, A1A3U1, and the modulated 2 MHz IF signal is applied to the right-hand module where the modulation is detected.

3.13.6 Tone Generator Circuitry (Mainframe MODE switch set to TONE GEN)

In this mode the frequency of the synthesizer input at connector, P1, is 11 MHz plus any frequency switch setting to the right of the 1 MHz decade switch. This frequency is amplified by the 42 dB BBA and applied to the mixer, A1A4Z1-L. The 4 dB BBA is switched out of the circuit and the attenuated output is applied to the A1A3 board.

The MEASURE MODE switch is bypassed so that the WIDE position is in use. 9 MHz from the mainframe is mixed with the signal producing a 2 MHz + IF signal. This 2 MHz + IF signal is applied to the FIM module where it is mixed with 2.1 MHz producing a 100 kHz + signal which is mixed with a 100 kHz signal from the mainframe to produce the frequency set on the mainframe switches to the right of the 1 MHz decade switch.

This frequency is available at the AUDIO TONE OUTPUT jack, J5, on the mainframe.

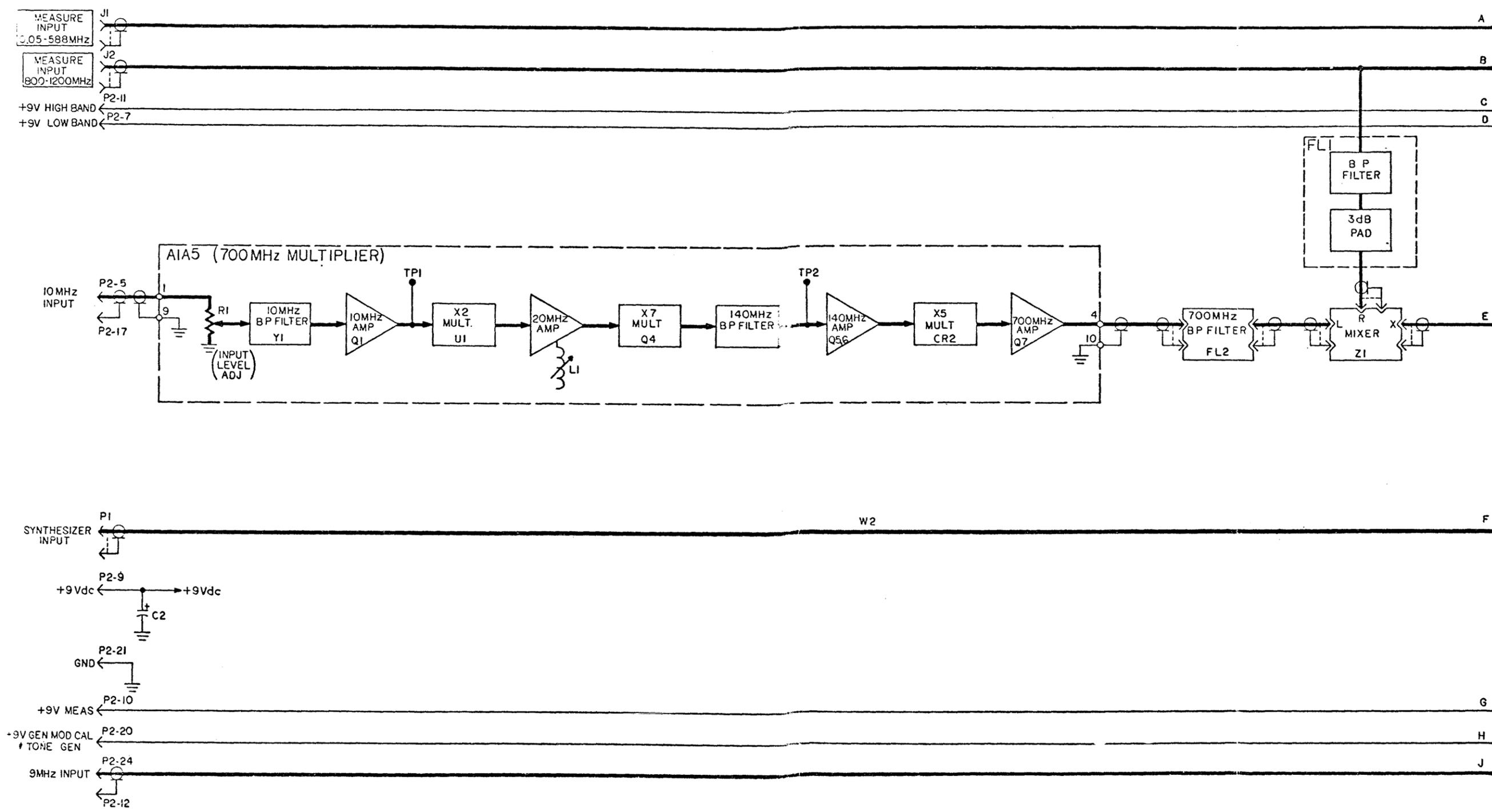


Figure 3-10. Detailed Block Diagram, Model RFM-11A (Sheet 1 of 3)

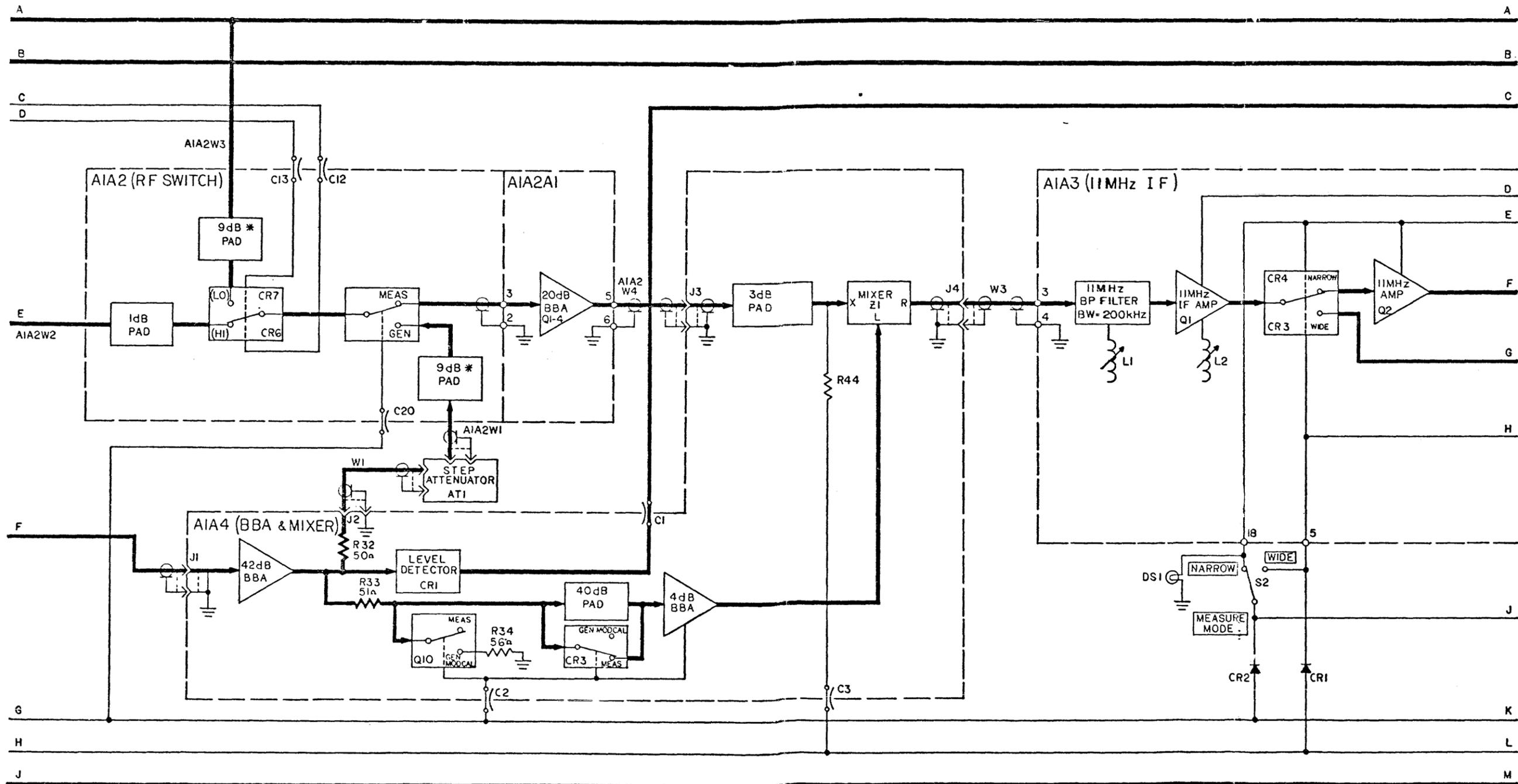


Figure 3-10. Detailed Block Diagram, Model RFM-11A (Sheet 2 of 3)

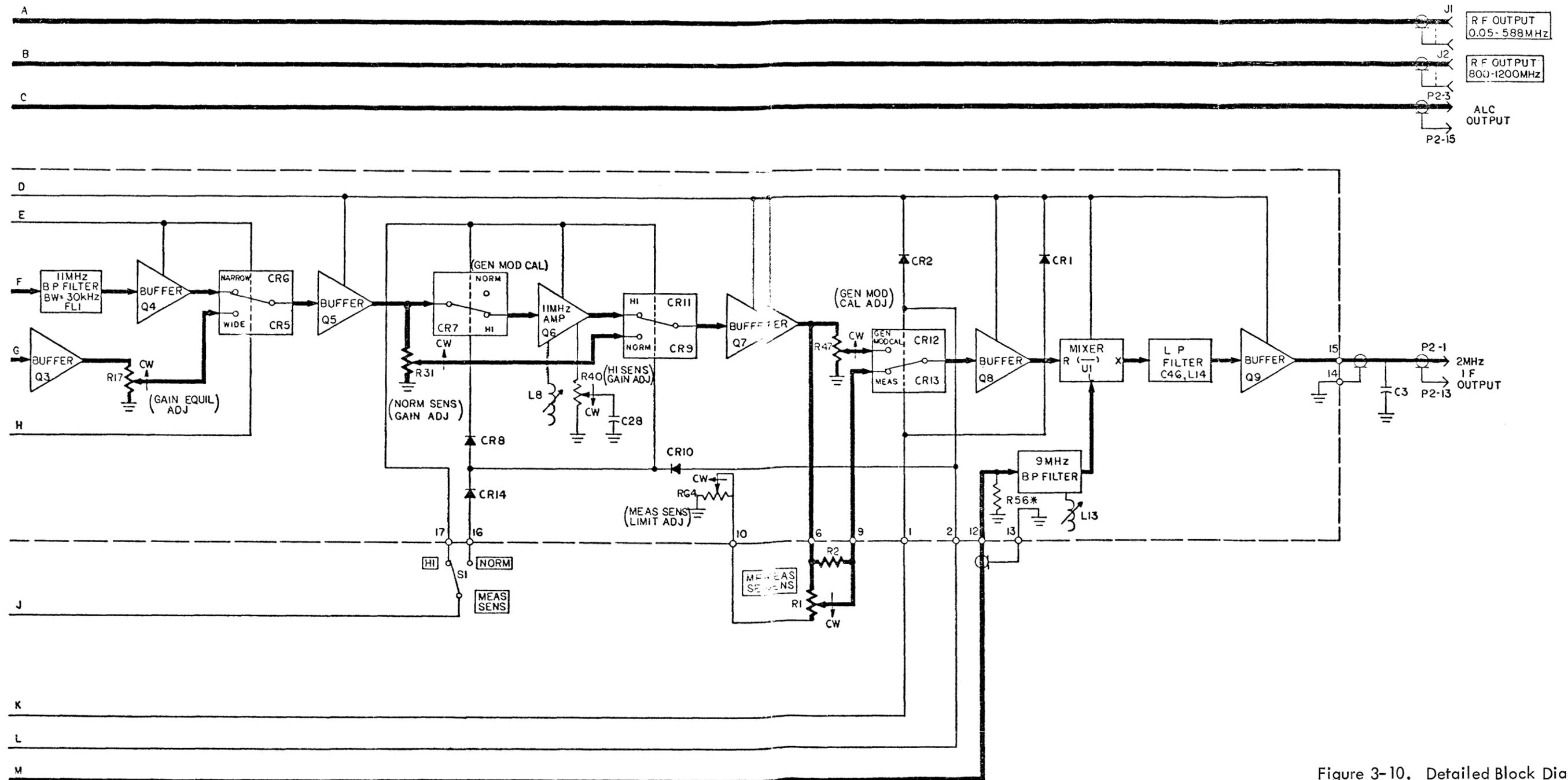


Figure 3-10. Detailed Block Diagram, Model RFM-11A (Sheet 3 of 3)

3.14 RADIO FREQUENCY MODULE, MODEL RFM-10B

The Theory of Operation for the Model RFM-10B is the same as that of the Model RFM-10A with the following exceptions (refer to Paragraphs 3.4 thru 3.4.6):

- a) The detailed block diagram, Figure 3-3, should have a Broadband Amplifier as the A1A2 Assembly.
- b) The overall schematic diagram, Figure 5-24, should have a Broadband Amplifier as the A1A2 Assembly.
 - 1) The feedthru capacitor should be C12, 1000 pF.
- c) The addition of a schematic diagram, Figure 5-45.
- d) All text references to the RF switch should be replaced with the Broadband Amplifier.

3.15. RADIO FREQUENCY MODULE, MODELS RFM-10A AND RFM-10B

3.15.1 Introduction

This section consists of the circuit descriptions of the RFM-10A and RFM-10B plug-in modules. The information is presented to assist the user in the troubleshooting and maintenance of the unit. Refer to the detailed block diagram, Figure 3-11, and the schematic diagrams, Figures 5-46 thru 5-49.

3.15.2 General

The RFM-10A and RFM-10B plug-in modules derive their power supply and RF signal inputs via the rear connectors, P2 and P1. The unit is energized whenever the mainframe is operating.

Three* major assemblies are contained in this unit: broadband amplifier assembly, A1A2; 11 MHz IF board, A1A3; and broadband amplifier/mixer/detector assembly, A1A4. The circuitry of the RFM-10A and RFM-10B will be explained according to the functions of the mainframe MODE switch: generate, measure, gen mod cal, and tone generate.

3.15.3 Generate Circuitry (Mainframe MODE switch set to GEN)

The mainframe synthesizer output enters either the RFM-10A or RFM-10B module via connector, P1, and is amplified by the 42 dB broadband amplifier, Q1 thru Q8, on the A1A4 board. Level detector diode, CR1, rectifies this signal and returns a dc level proportional to the RF level to the AGC amplifier in the mainframe via pin 3 of connector, P2, for automatic leveling.

The output of the 42 dB broadband amplifier is also brought to the RF OUTPUT jack, J1, through a 23 dB attenuator, AT3, 40 dB variable attenuator, AT2, and a 10 dB attenuator, AT1.

*The RFM-10A has no A1A2 assembly.

3.15.4 Measure Circuitry (Mainframe MODE switch set to MEAS)

The unknown signal enters the unit via the MEAS INPUT connector, J2. In the RFM-10A, the signal passes directly to the A1A4 board. In the RFM-10B, the 20 dB broadband amplifier, A1A2, is energized and passes the signal to the mixer, Z1, on the A1A4 board via a 3 dB pad.

The mainframe frequency switches and 0-100 Hz control are adjusted for zero beat. At this time the frequency at the synthesizer input jack, P1, is 11 MHz higher than the frequency switches. This frequency is amplified by the 42 dB BBA and applied to the 4 dB BBA, Q9. The 40 dB pad is bypassed by diode switch, CR3, and the transistor switch, Q10, removes the 50 ohm load, R34, from the circuit.

The output of the 4 dB BBA is applied to the L port of mixer, Z1, and the difference frequency (11 MHz) from Z1-R is applied to the 11 MHz bandpass filter on the A1A3 board. Diode switches, CR3 through CR6, are utilized to switch the 30 kHz crystal filter, FL1, in or out of the circuit and are operated by the MEASURE MODE switch, S2. In the narrow bandwidth (30 kHz), NARROW lamp, DS1, lights. The bandwidth in the WIDE position is approximately 200 kHz. After the diode switch the signal is filtered by an 11 MHz bandpass filter, amplified by amplifier, Q6, and applied to mixer, U1.

9 MHz from the mainframe is applied to the other input port of the mixer via pin 24 of connector, P2, and a 9 MHz bandpass filter. The difference frequency (2 MHz) is applied to pin 1 of connector, P2, via a lowpass filter and a 2 MHz amplifier, Q9.

MEASURE SENSITIVITY switch, S1, switches 30 dB of gain in or out of the circuit by switching the output of the 11 MHz amplifier, Q6. MEASURE SENSITIVITY

control, R1, controls the output of the 11 MHz buffer, Q7, over approximately 30 dB of range. The 2 MHz output is applied to the FIM module where it is mixed with 2.1 MHz to produce an IF of 100 kHz, which is applied to a pulse-counting discriminator and the error frequency, if any, may be read on the FIM meter. Also the 100 kHz IF is mixed with 100 kHz in the FIM module to produce the error frequency, if any, which may be heard in the mainframe speaker, or noted on the FIM BEAT lamp.

3.15.5 Gen Mod Cal Circuitry (Mainframe MODE switch set to GEN MOD CAL)

The synthesizer input at connector, P1, is 11 MHz and is either frequency modulated or amplitude modulated by the right-hand module. This is amplified by the 42 dB BBA and applied to the mixer, Z1-L port through the 4 dB BBA which is switched off at this time and the 40 dB pad attenuates the signal. The attenuated output is applied to the A1A3 board. At this time, mixer, Z1, is turned on via A1A4R44 and acts as a closed switch. The MEASURE MODE switch is bypassed so that the WIDE position is in use.

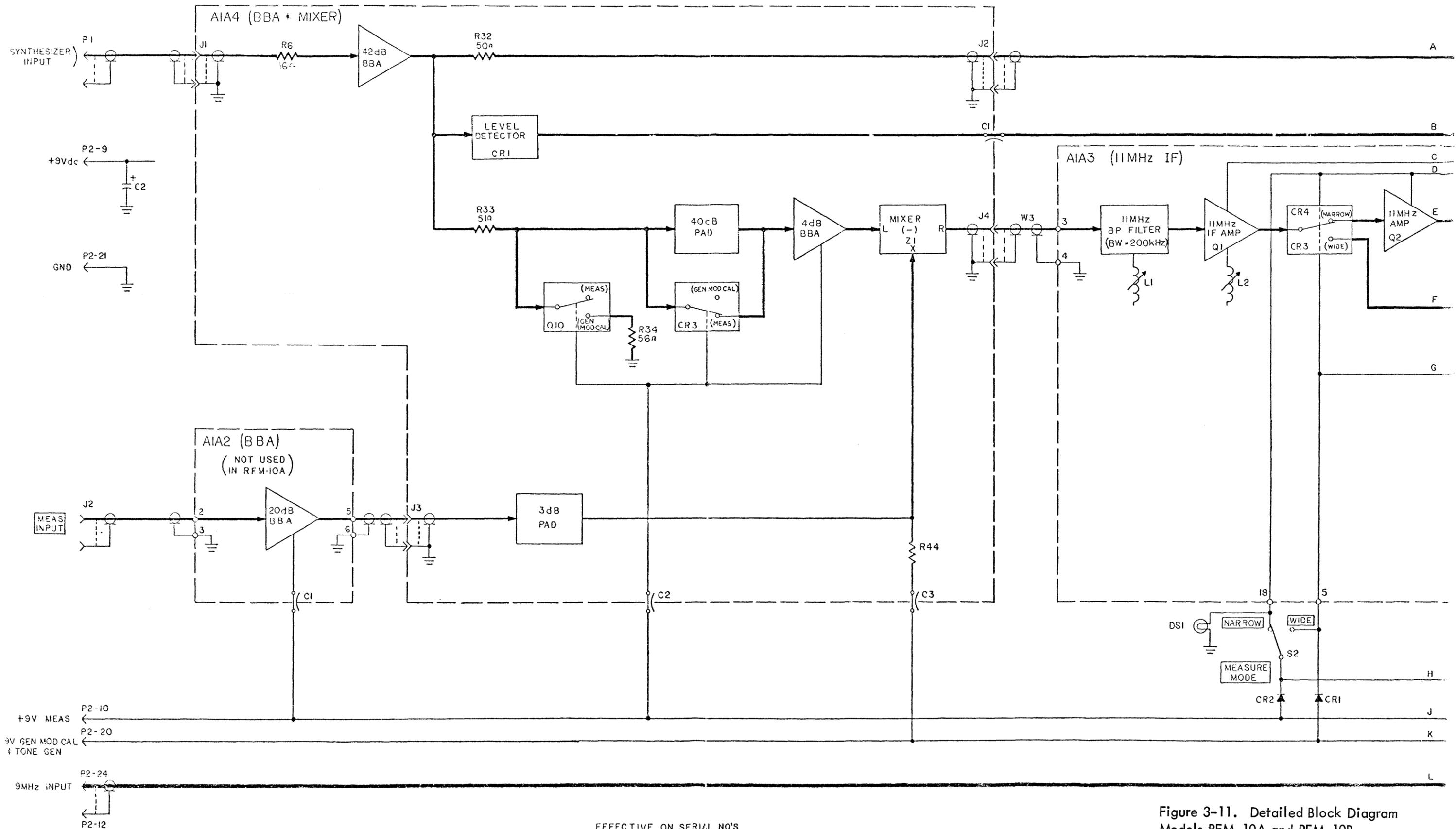
The 9 MHz is mixed with the modulated signal at mixer, U1, and the modulated 2 MHz IF signal is applied to the right-hand module where the modulation is detected.

3.15.6 Tone Generator Circuitry (Mainframe MODE switch set to TONE GEN)

In this mode the frequency of the synthesizer input at connector, P1, is 11 MHz plus any frequency switch setting to the right of the 1 MHz decade switch. This frequency is amplified by the 42 dB BBA and applied to the mixer, Z1-L. The

4 dB BBA is switched out of the circuit and the attenuated output is applied to the A1A3 board. The MEASURE MODE switch is bypassed so that the WIDE position is in use. 9 MHz from the mainframe is mixed with the signal producing a 2 MHz + IF signal. This 2 MHz + IF signal is applied to the FIM module where it is mixed with 2.1 MHz producing a 100 kHz + signal which is mixed with a 100 kHz signal from the mainframe to produce the frequency set on the mainframe switches to the right of the 1 MHz decade switch.

This frequency is available at the AUDIO TONE OUTPUT jack, J5, on the mainframe.



EFFECTIVE ON SERIAL NO'S
 RFM-10A 501 & ABOVE
 RFM-10B 126 & ABOVE

Figure 3-11. Detailed Block Diagram
 Models RFM-10A and RFM-10B
 (Sheet 1 of 2)

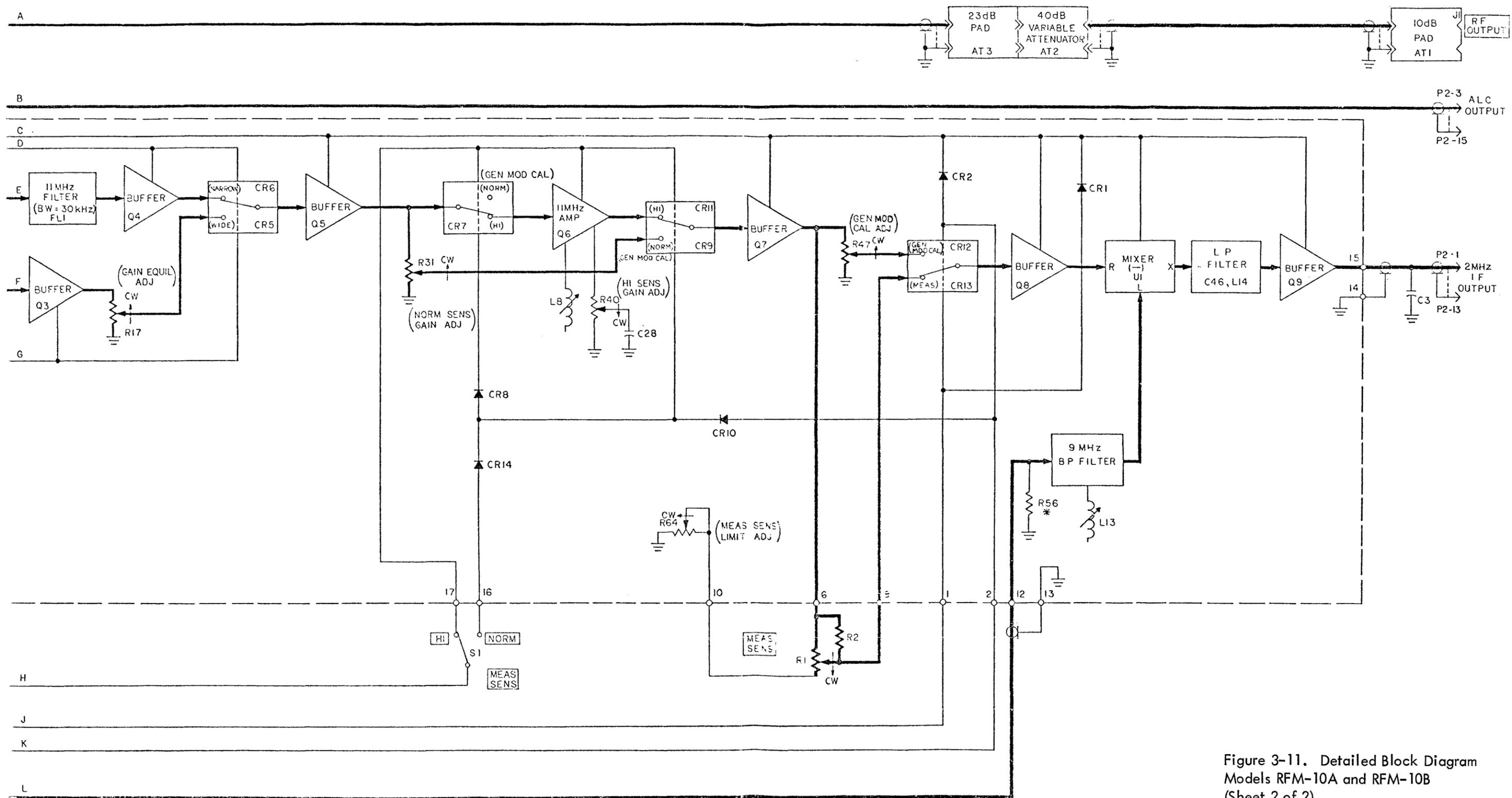


Figure 3-11. Detailed Block Diagram
Models RFM-10A and RFM-10B
(Sheet 2 of 2)

SECTION IV MAINTENANCE

4.1 GENERAL

This section contains information for the maintenance of the Model FM-10C mainframe and its associated plug-in modules. Included are minimum performance checks, alignment procedures, and fault isolation procedures.

All ac and dc voltages shown without tolerances on the schematic diagrams in Section V are typical. The dc voltages may vary widely (+100%, -50%) and the ac voltages may vary widely (± 6 dB) due to component tolerances and wide beta ranges of the transistors. This does not imply that instruments in which measured voltages are at the tolerance

extremes will not perform to the specifications, since the instrument has been designed to make allowances for these tolerances.

4.2 TEST EQUIPMENT REQUIRED (MODEL FM-10C MAINFRAME)

The test equipment required for checkout, alignment, calibration, and troubleshooting the model FM-10C mainframe is listed in table 4-1. Minimum parameters are provided to aid in the selection of equivalent types.

**TABLE 4-1
TEST EQUIPMENT REQUIREMENTS FOR MAINFRAME**

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Audio Oscillator	Frequency range: 400 Hz – 1000 Hz Level: 0 to 2 V rms Impedance: 600 ohms	Hewlett-Packard Model 651
Signal Generator	Frequency range: 1 MHz to 250 MHz Level: 0.2 mV to 90 mV rms Stability: Better than $\pm 0004\%/5$ min Output impedance: 50 ohm nominal	Singer Model FM-2748
Oscilloscope with 10 X Probe and 50 ohm load	Frequency response: 100 MHz Sensitivity: 5 mV/cm	Tektronix Model 454
Frequency Counter	Frequency response: 50 kHz to 500 MHz Sensitivity: 10 mV rms Accuracy: 1×10^{-7}	Hewlett-Packard Model 5246L
AC VTVM	Frequency response: 50 Hz to 2 MHz Level: 2 mV to 400 mV rms	Hewlett-Packard Model 400D
DC Digital Voltmeter	Level: 10 mV to 30 Vdc Accuracy: $\pm 1\%$	Hewlett-Packard Model 3440A
RF Voltmeter with 50 ohm load and high impedance probe	Frequency response: 50 kHz to 1200 MHz Level: 500 μ V to 1 V rms	Hewlett-Packard Model 3406A/ 11063A/6064

Table 4-1. Test Equipment Requirements For Mainframe (Cont.)

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Spectrum Analyzer	Frequency response: 10 MHz to 1.2 GHz Dispersion: 10 kHz/div to 100 MHz/div Dynamic range: 60 dB minimum Maximum level measured: +10 dBm	Singer Model SPA-3000
Sweep Generator	Frequency range: 500 to 800 MHz Level: 0 dBm to -20 dBm	Wavetek Model 2001
RF Detector	Frequency response: dc to 800 MHz	Wavetek Model D152
Speaker/Headset	Impedance: 8 ohm/2000 ohm	Not applicable
Broadband Amplifier	Frequency response: 50 kHz to 500 MHz Gain: 20 dB minimum	Singer Model BBA-1
Signal Generator	Frequency range: 10 MHz Output level: +5 dBm	Hewlett-Packard Model 606
VOM	Resistance range: 20 ohm to 50 k ohm	Simpson, Model 260
Distortion Analyzer	Frequency response 1 kHz Input level: 1 V rms Accuracy: $\pm 0.1\%$	Hewlett-Packard Model 333A
DC Power Supply	Level: 12 V at 2.5 Amps	Harrison Model 6291A
DC Power Supply	Level: 0 V to 5 V at 10 mA Regulation: $\pm 5\%$	Hewlett-Packard Model 721A
Variable Transformer	0-230 Vac	General Radio Type 100-R
Meter with Phone Plug	100-0-100 uAdc Full-scale deflection	Singer P/N 1-937011-001 and phone plug
Peak Deviation Meter	Peak deviation range: 5 kHz Accuracy: $\pm 0.1\%$	Singer Model FM-2748 /ODM-1
Oscilloscope Deviation Monitor Module	Mainframe must be tested with this associated plug-in module	Singer Model ODM-1 Model ODM-1
Oscilloscope Amplitude Modulation Monitor Module	Mainframe must be tested with this associated plug-in module	Singer Model OAM-1
AM/FM Module	Mainframe must be tested with this associated plug-in module	Singer Model AFM-2
RF Module	Mainframe must be tested with this associated plug-in module	Singer Model RFM-10 or RFM-10A
FIM Module	Mainframe must be tested with this associated plug-in module	Singer Model FIM-1 or FIM-3
Extender cables	Not applicable	Singer Model PC 2652 and PC 2653
Load resistors	10 ohm, 10 watt and 220 ohm, $\frac{1}{4}$ W	Not applicable

4.3 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL FM-10C MAINFRAME)

The following performance checks verify that the Model FM-10C mainframe is operating within specification. These checks may be used as part of incoming quality control inspection, as a periodic operational check, and a check after repairs or adjustments have been performed. Left-hand and center modules are required for these checks.

WARNING: High voltages are present throughout the unit and appropriate precautions should be taken while operating the unit with cover removed.

NOTE: The FM-10C is supplied pre-set to 115 Vac for use in North America, unless otherwise indicated by a decal over the AC/DC switch. Power cord supplied is 3-pin for use with 115 V grounded mains supply.

4.3.1 Tone Generator Mode Check

- a. Install the left-hand module and center module into the mainframe.
- b. Connect power source to mainframe.
- c. Rotate PWR switch clockwise.
- d. For ac power, set AC/DC switch on back of unit to AC. (Approximate ac power required is 32 VA.)
For dc power, set AC/DC switch on back of unit to DC. (2.5A maximum dc current required.)
- e. Verify that power indicator lights.
- f. Set mainframe controls as follows:

MODE	TONE GEN
VOLUME	Fully cw
Frequency Switches	000.0000 MHz
MEASURE MODE	IN-BEAT
AUDIO OUTPUT	NOTE
TIMEBASE	INT
(Rear of unit)	
- f. Adjust 0–100 Hz frequency control for a BEAT lamp indication on the center module of approximately 1 flash per second.
- g. Set VOLUME control to desired level and adjust 0–100 Hz frequency control throughout its range. A 0–100 Hz tone should be audible from the internal speaker.

h. Rotate 100 Hz frequency switch from 0 position to 9 position. Tone frequency should increase at each switch position.

j. Repeat step 4.3.1-h. with the 1 kHz switch.

k. Plug a 45 ohm speaker or 2000 ohm headset into AUDIO/TONE OUTPUT jack. Repeat step 4.3.1-j. Tone frequency from remote speaker/headset should increase at each switch position.

l. Install the center module into the mainframe and set the FIM RANGE switch to ZERO.

m. Verify that the remote 100–0–100 uAdc meter indicates zero. Adjust mechanical zero on meter face if necessary. Plug the remote meter into the REM METER jack on the rear of the mainframe and adjust the remote meter to zero with the FIM module ZERO control.

n. Set center module RANGE switch to 1.5 position.

o. Vary the mainframe 100 Hz and 1 kHz switches in 100 Hz steps up to 1.5 kHz. The remote meter pointer should deflect to the left in 100 Hz increments.

4.3.2 Frequency Accuracy Check

a. Connect broadband amplifier input to left-hand module RF OUTPUT jack with a 50 ohm coaxial cable.

b. Connect broadband amplifier output to frequency counter input jack.

c. Set RF OUTPUT control of left-hand module to maximum output level.

d. Set frequency switches to 100.000 MHz and 0–100 Hz frequency control to OUT position.

e. Frequency counter should indicate 100.000 MHz \pm 1 ppm.

f. Set 100 MHz frequency switch to 2, 3, 4, and 5, while verifying frequency accuracy.

g. Reset 100 MHz frequency switch to 1.

h. Set 10 MHz frequency switch to 1, 2, 3, 4, 5, 6, 7, 8, and 9 while verifying frequency accuracy.

j. Set 100 MHz frequency switch to 0 and 10 MHz frequency switch to 1 and verify frequency accuracy.

k. Check all positions of 100 kHz, 10 kHz, 1 kHz and 100 Hz frequency switch verifying frequency accuracy.

l. Set frequency switches to 001.000 MHz and rotate 0-100 Hz frequency control throughout its range. Verify that frequency is within ± 5 Hz of frequency control reading.

4.3.3 Output Level Check

a. Connect RF voltmeter to RF OUTPUT jack of left-hand module.

b. Set RF OUTPUT level to 5 μ V.

c. Set frequency switches to 100.000 MHz and 0-100 Hz frequency control to OUT position.

d. Verify that RF voltmeter indicates 353 μ V to 707 μ V (500 μ V ± 3 dB.)

e. Repeat for all frequencies in steps f. through l. of paragraph 4.3.2.

f. Verify that all levels are 353 μ V to 707 μ V (500 μ V ± 3 dB.)

4.3.4 Remote 2 MHz IF Output Check

a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION to OUT-OFF and frequency controls to 150 MHz.

b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT - WIDE and set the SENSITIVITY to 6 mV.

c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 150 MHz and level to 6 mV rms.

d. Connect the ac VTVM with a 50 ohm load resistor across its terminals to the mainframe ACC connector, J3 pin A, and the ground terminal to chassis.

e. Adjust the signal generator frequency slightly to obtain a zero beat indication.

f. The ac VTVM should read exactly 1.5 mV rms. If not exactly 1.5 mV rms re-adjust the signal generator output level to obtain exactly 1.5 mV rms on the ac VTVM. The signal generator output level should be between 4.2 and 8.2 mV rms (6 mV ± 3 dB).

4.3.5 External VCO Input Check

a. Connect the broadband amplifier input to the RF module RF OUTPUT connector.

b. Connect the broadband amplifier output to the frequency meter /ODM-1 measure input connector. NOTE: If an RF module with 6 mV rms or greater RF output is installed in the mainframe, the broadband amplifier is not necessary.

c. Set the frequency meter frequency switches to 17.000 MHz, 0-1 kHz control out, audio switch mod and 10 MHz switch out.

d. Set the ODM-1 controls as follows:

deviation range: 5 kHz

vertical input: internal

modulation mode: internal combined

vertical center: for trace at center line of graticule

e. Set the mainframe frequency switches to 015.0V00, 0-100 Hz control to 0, MODE switch to TONE GEN and GENERATOR MODULATION switch to OUT - OFF.

f. Connect the audio oscillator and the ac VTVM to J3-B and H (rear panel ACC connector). Set the audio oscillator frequency to 1 kHz and output level to 500 mV rms $\pm 5\%$ as read on the VTVM.

g. The ODM-1 should indicate 5 kHz $\pm 15\%$ peak deviation.

h. Set the mainframe frequency switches to 014.9V00 and 0-100 Hz control to 10.

j. The ODM-1 should indicate 5 kHz $\pm 15\%$ peak deviation.

4.3.6 10 MHz TCXO Output Check

a. Connect the oscilloscope to the mainframe TIME BASE connector. The internal time base 10 MHz waveform should be present. Level should be 0.5 V p-p min.

4.3.7 External Time Base Input Check

a. Set the TIME BASE switch to EXT.

b. Connect the signal generator (Hewlett-Packard Model 606) to the mainframe TIME BASE connector. Set its frequency to 10 MHz and output level to +5 dBm.

c. Set mainframe frequency switches to 000.0000 MHz, 0-100 Hz control to OUT and MODE switch to TONE GEN. Set the VOLUME control to approximately mid-range and rotate the 0-1 kHz switch from 0 to 9 and back. A varying tone should be heard from the speaker.

4.3.8 1 MHz TCXO Output Check

a. Connect the oscilloscope to the mainframe ACC connector J3 pin D, ground to chassis.

b. A 1 MHz square wave should be present at a level of approximately 2.5 V p-p.

4.3.9 +9 Vdc Power Output Check

a. Connect the DVM to the mainframe ACC connector J3 pin D, ground to chassis.

b. The DVM should read +9 Vdc \pm 1%.

4.4 ALIGNMENT AND ADJUSTMENT (MODEL FM-10C MAINFRAME)

Refer to figures 4-1 through 4-19 for test point and trimmer locations. Refer to figures 4-20 through 4-22 for PC board locations. Refer to figures 4-23 and 4-24 for trimmer capacitor access hole locations.

4.4.1 Preliminary Adjustments

a. Measure resistance to ground from TB3-1, 2 and TB3-3, 4. Should be greater than 20 ohms.

b. Measure resistance to ground from the cases of series-pass transistors Q1 and Q2 (mounted on chassis, rear). Should be greater than 50 k ohms. Reverse ohmmeter leads. Should be greater than 20 ohms.

c. Modify the AFM-2 as in figure 4-25 and install the modified AFM-2 in the right-hand compartment. Also install an RF module and FIM module in the left and center compartments respectively.

d. Set 115/230V switch to 115V and plug power cable into 115 Vac outlet. Set POWER switch on. Measure voltage at TB3-1, 2 and TB3-3, 4. Should be +9 Vdc \pm 0.5%. Reset A1A3R7 and A1A3R16 respectively, if necessary.

e. Connect the oscilloscope to TB3-1, 2 and TB3-3, 4 and verify that the ripple is less than 2.7 mV p-p.

f. Measure unregulated voltage at terminal A1A3-3. Should be approximately +17.5V.

g. Measure voltage at A1A3-9, 10. Should be +12 V \pm 1.2 V.

h. Set POWER switch to OFF. Set 115/230 V switch to 230 V. Plug power cord into 230 Vac source.

j. Set POWER switch on and repeat steps 4.4.1-e. through 4.4.1-g.

k. Set POWER switch to OFF and disconnect power cord from 230 Vac source. Set 115/230 V switch back to 115 V.

l. Set AC/DC switch to DC. Connect the dc

power cord to 12 VDC connector and to the dc power source.

m. Set POWER switch on. Set dc power source output to 11.5 Vdc.

n. Measure the voltage at TB3-1, 2 and TB3-3, 4. Should be +9 V \pm 0.5%.

p. Set POWER switch to OFF and dc power source off, disconnect dc power cable from unit; set AC/DC switch to AC, plug ac power cable into 115 Vac outlet and set POWER switch on.

4.4.2 10 MHz Amplifier Adjustment

a. Pull out A11 board.

b. Connect oscilloscope 10X probe to A11-36. Observe that a 10 MHz waveform of approximately 500 mV p-p is present.

c. Connect oscilloscope 10X probe to A11-39. Adjust A11L5 for maximum output. It should be approximately 3.2 V p-p.

d. Dress all wires above center of board toward top of chassis and all wires below center of board toward bottom of chassis. Reinstall A11 board.

4.4.3 A21 Board Adjustment, 3.6 MHz and 36 MHz

a. Connect the RF voltmeter with a high impedance probe to A6-14 and pull out board A21.

b. Set 100 kHz and 1 MHz frequency switches to 0.

c. Connect oscilloscope 10X probe to A21-6. Observe that a 100 kHz spike of approximately 1.5 V p-p is present. Connect oscilloscope 10X probe to junction A21Y2 and A21C6. Adjust A21L1 for maximum amplitude (approximately 100 mV p-p).

d. Tune A21L3, A21L4 and A21L5 for maximum output on the RF voltmeter.

e. If output level is other than -20 dBm, \pm 1 dB, select A21R28.

f. Dress all wires above center of board toward top of chassis and all wires below center of board toward bottom of chassis. Reinstall board A21.

4.4.4 A20 Board Adjustment, 3.7 MHz and 37 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 1. Pull out board A20 and repeat steps c. through f. of paragraph 4.4.3, except substitute A20 for all A21 designations.

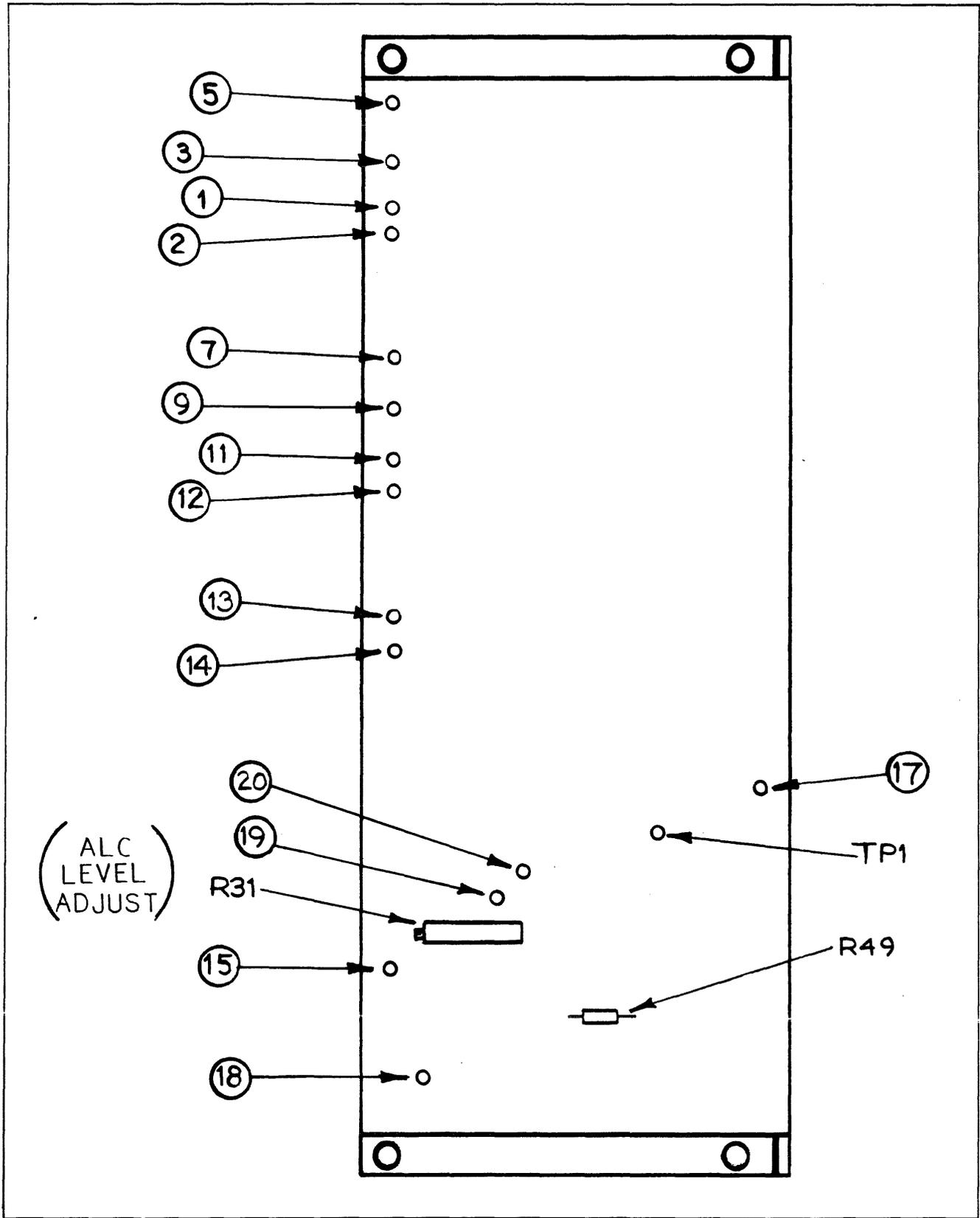


FIGURE 4-1 DIVIDER/ALC BOARD ASSEMBLY,
A1A2 (MAINFRAME)

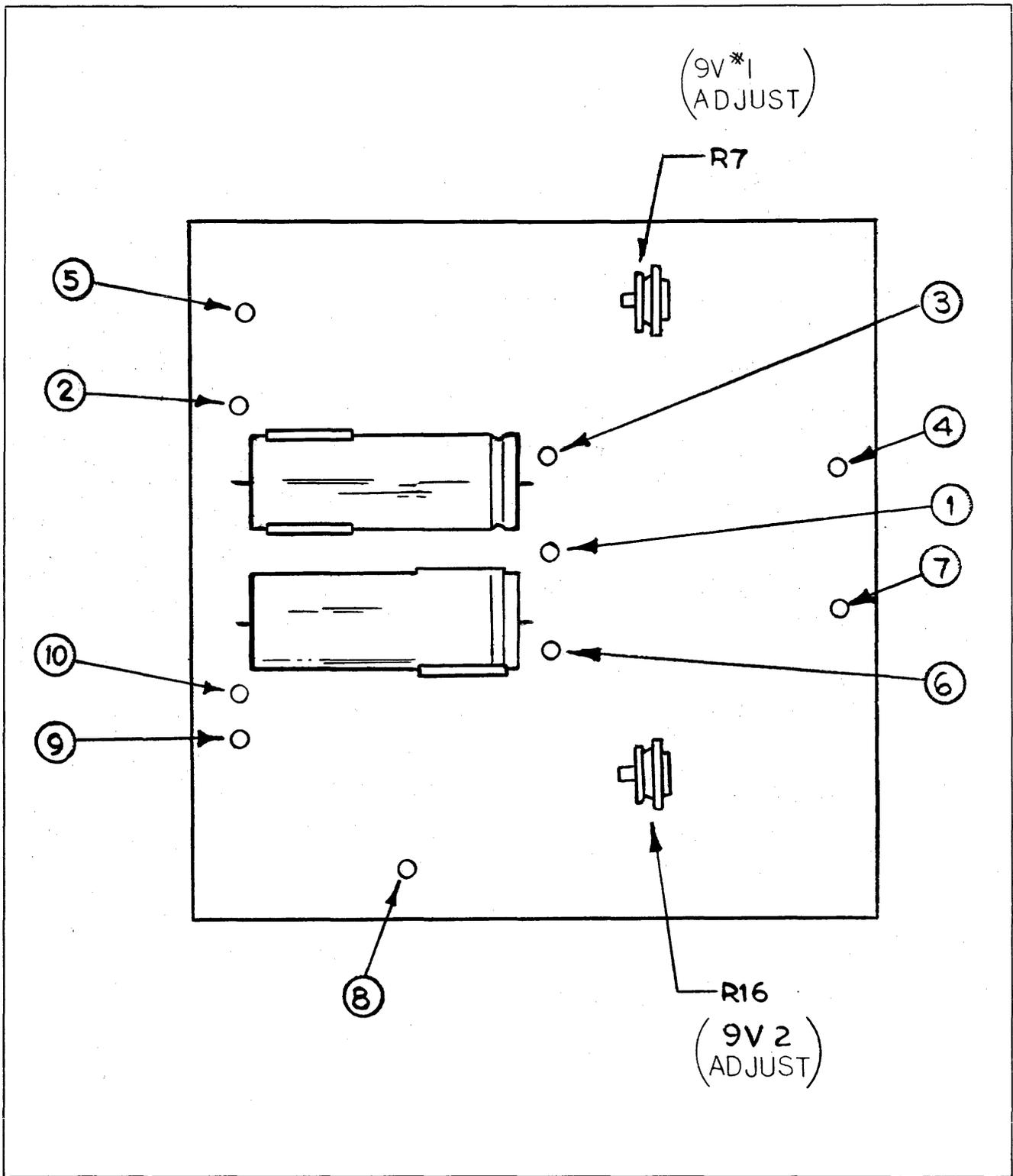


FIGURE 4-2 POWER SUPPLY ASSEMBLY,
A1A3 (MAINFRAME)

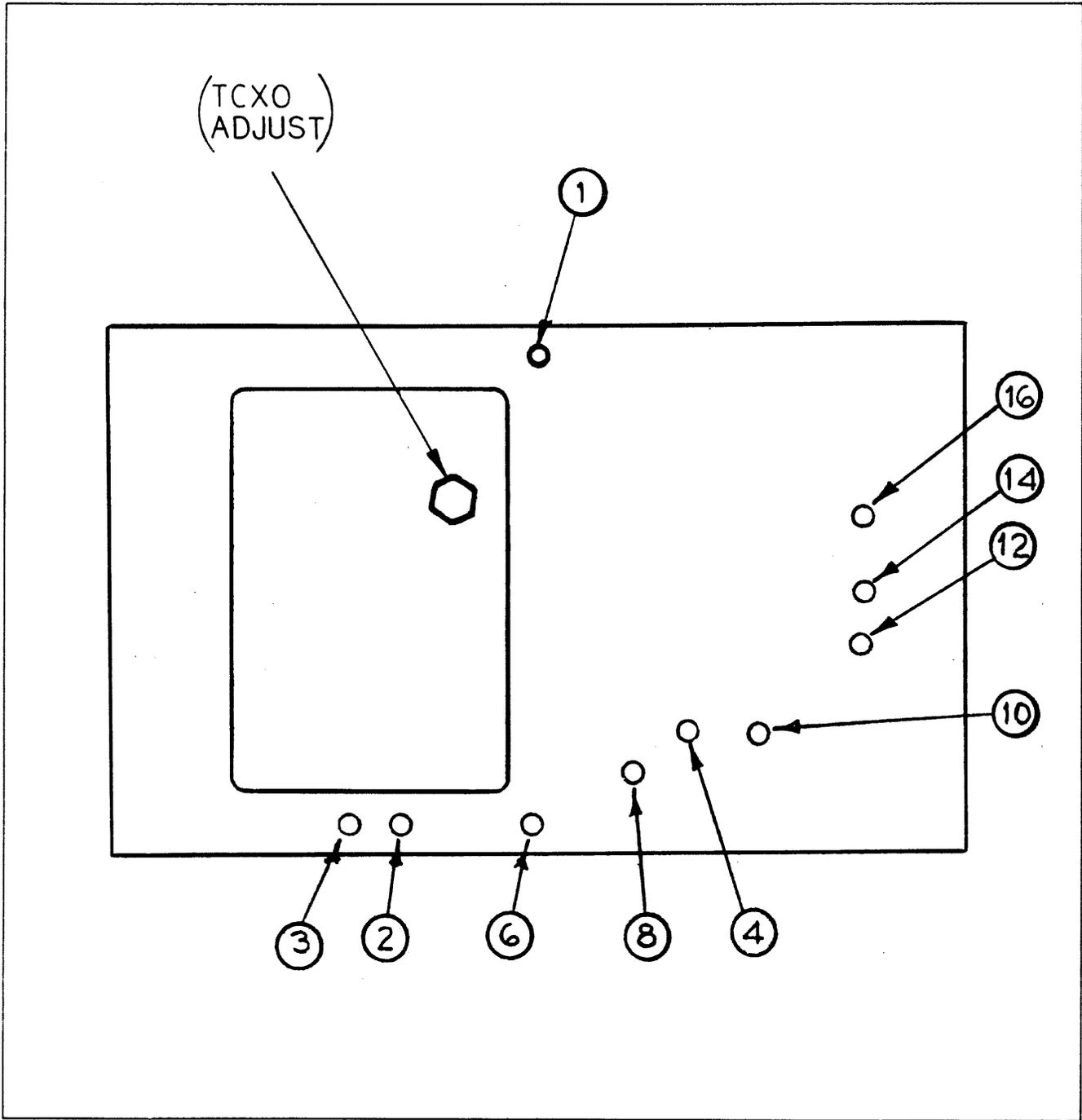


FIGURE 4-3 TCXO/IF BOARD ASSEMBLY,
A1A5 (MAINFRAME)

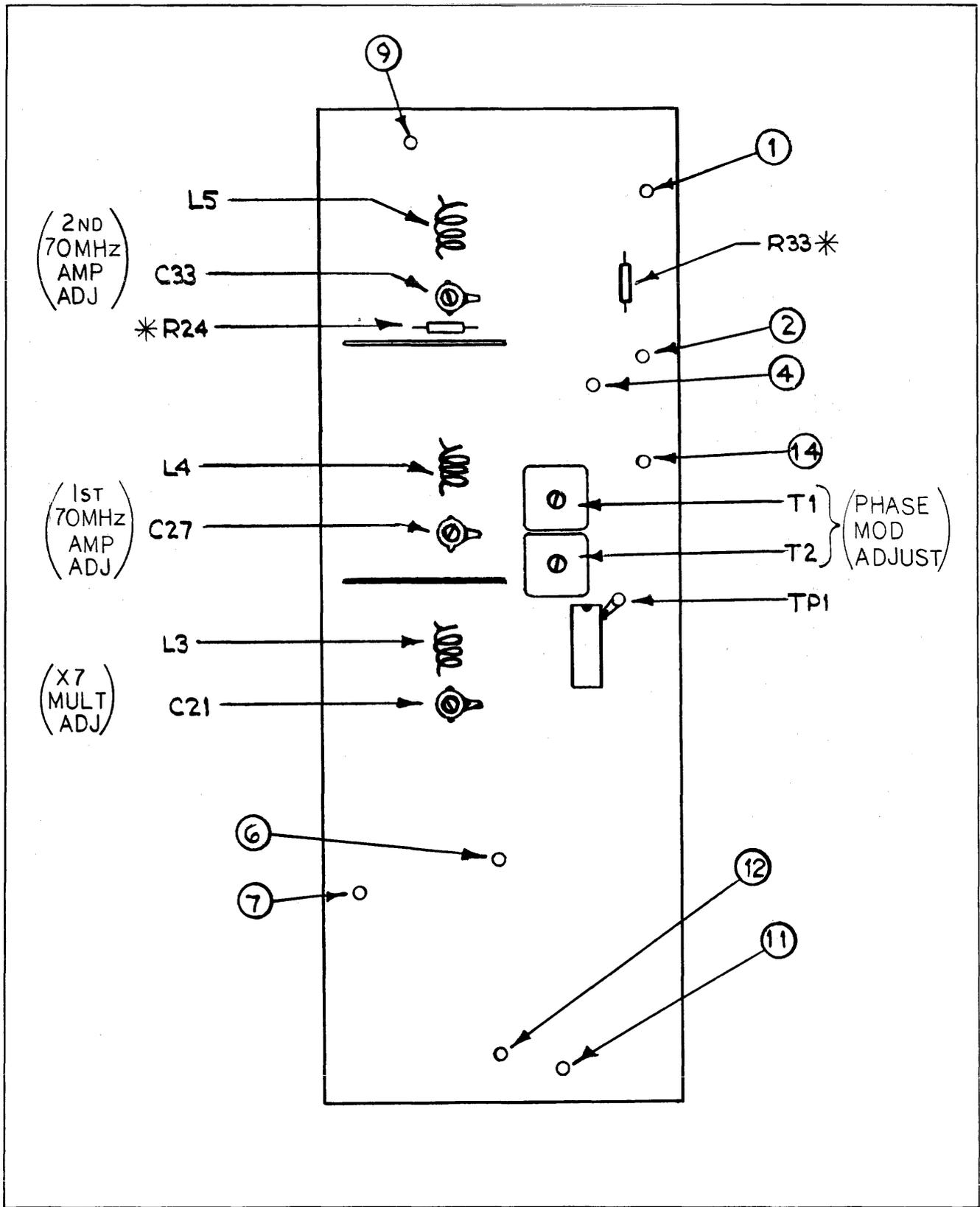


FIGURE 4-4 PHASE MODULATOR/AUDIO ASSEMBLY, A1A6 (MAINFRAME)

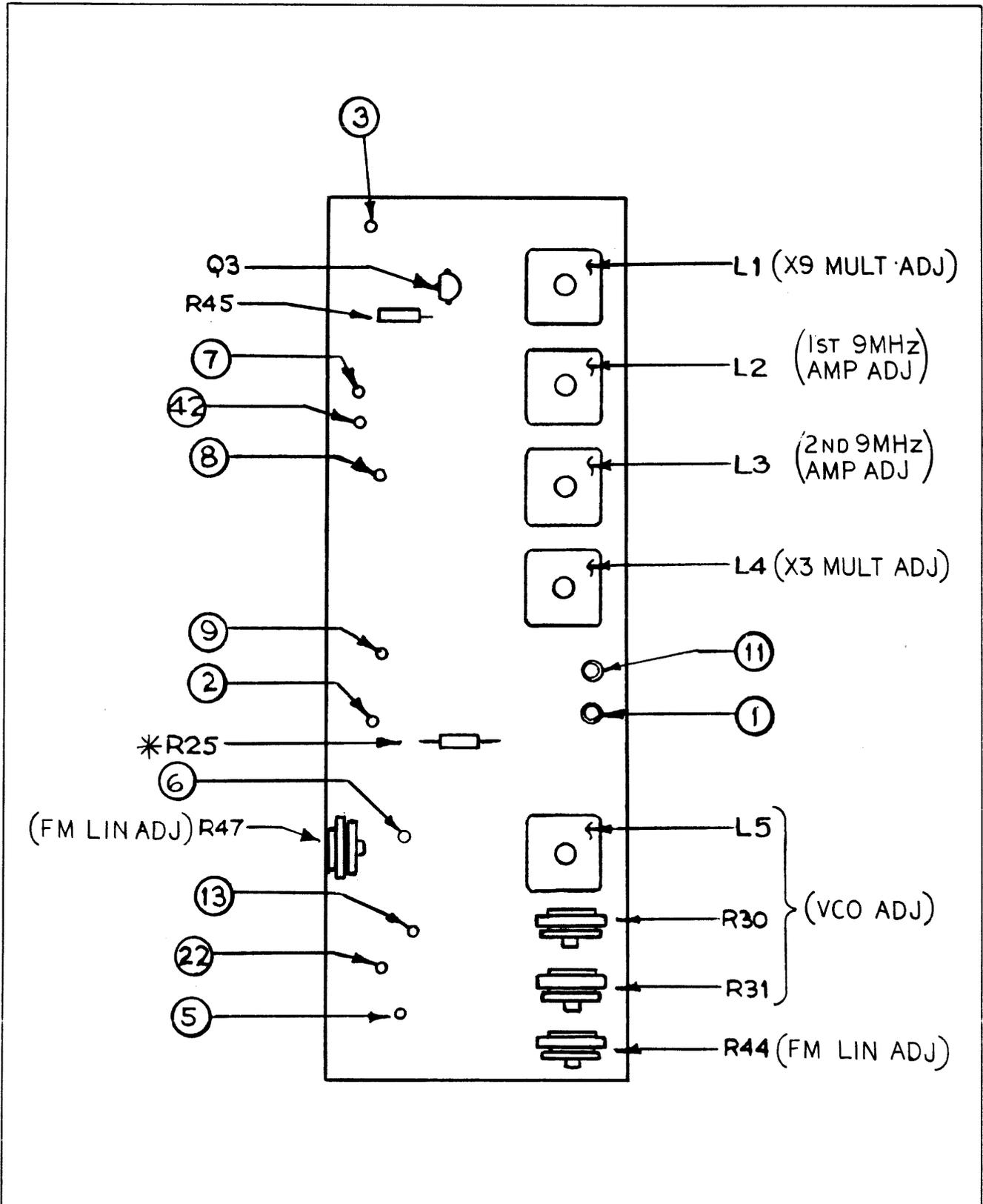


FIGURE 4-5 VCO, 6 MHz, 9 MHz ASSEMBLY,
A2 (MAINFRAME)

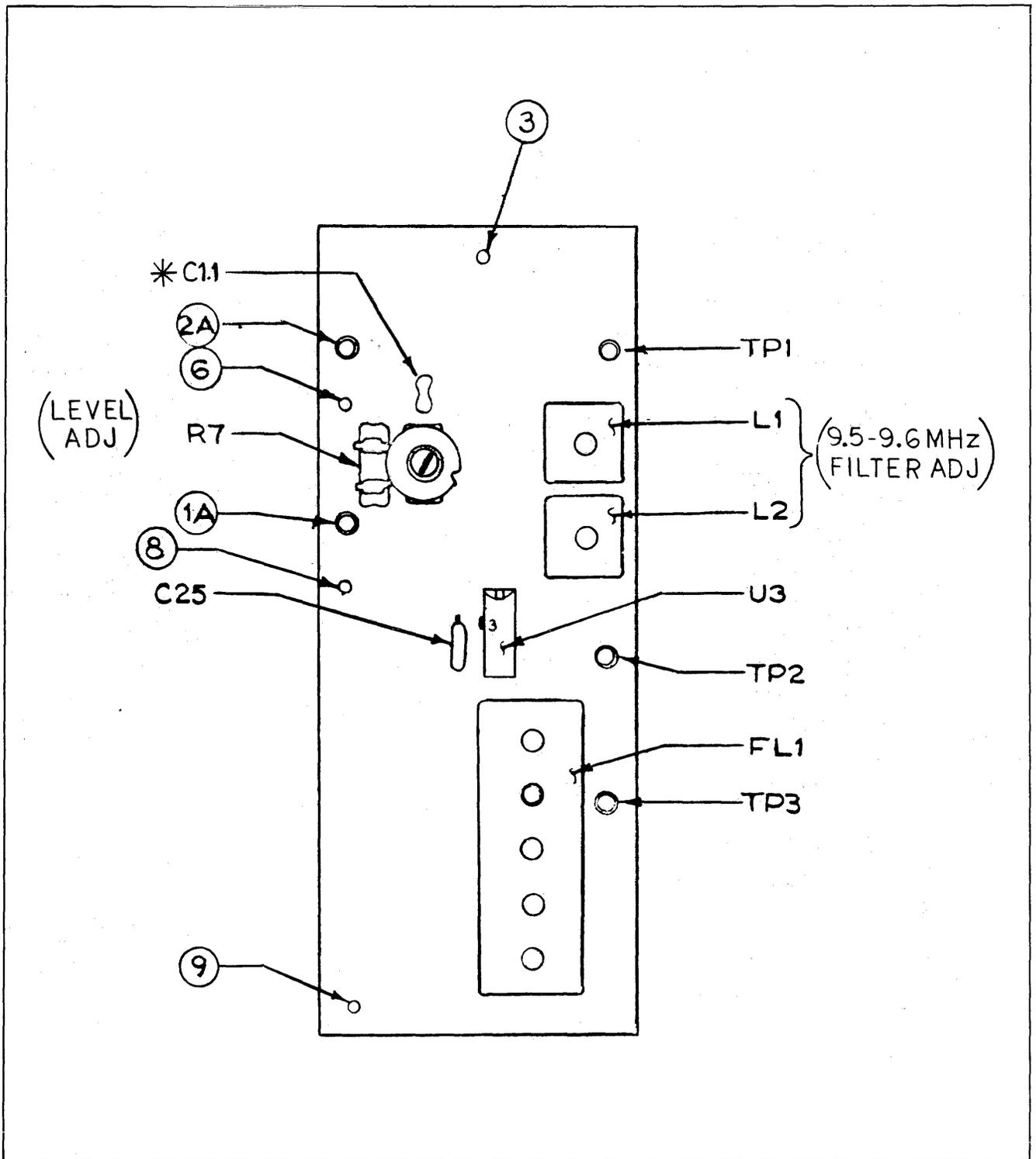


FIGURE 4-6 0.1, 1, 10 AND 100 kHz DECADE ASSEMBLIES, A3A THROUGH A3D (MAINFRAME)

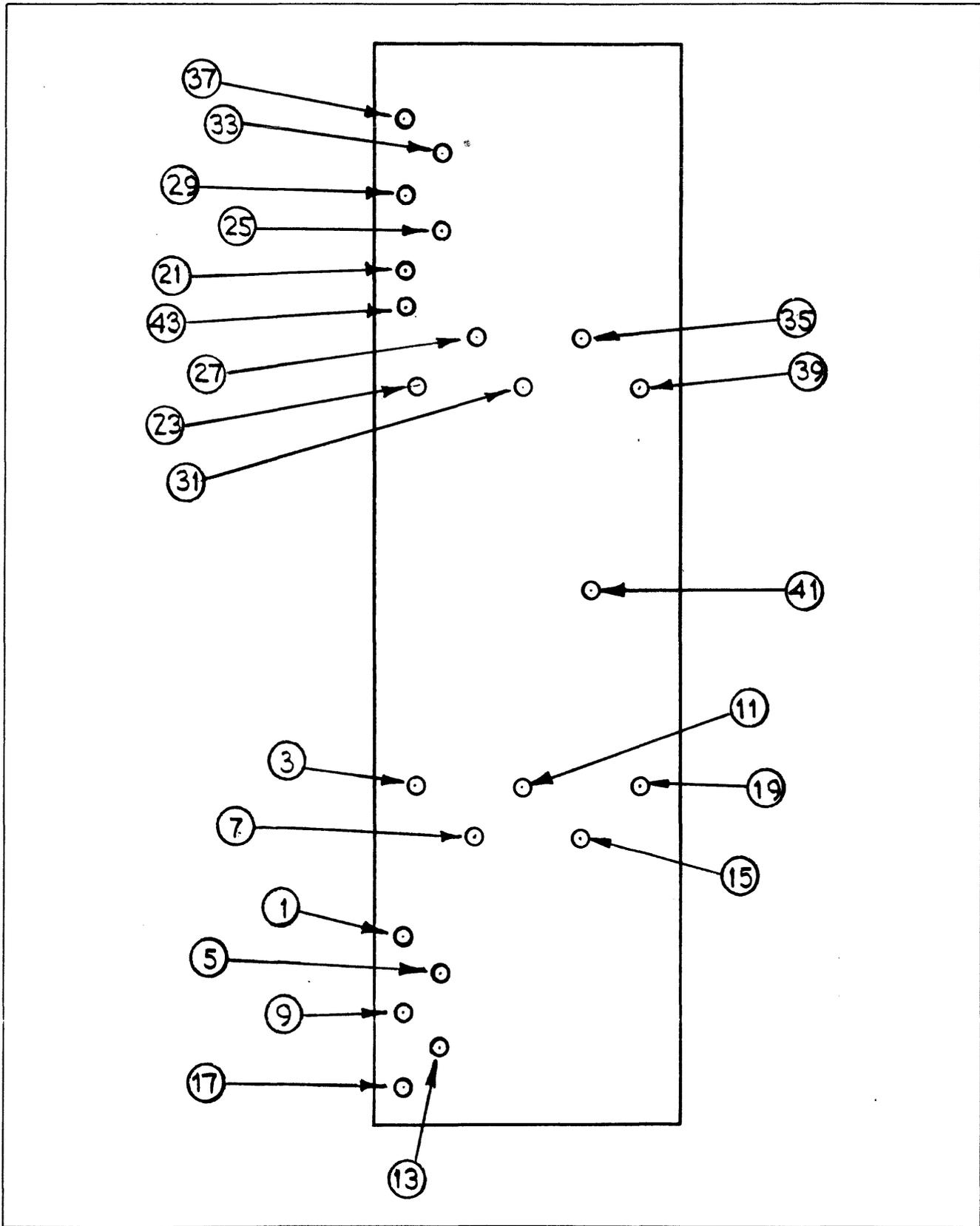


FIGURE 4-7 1 MHz AND 10 MHz DECADE SWITCHING PROGRAMMING ASSEMBLIES, A4A AND A4B (MAINFRAME)

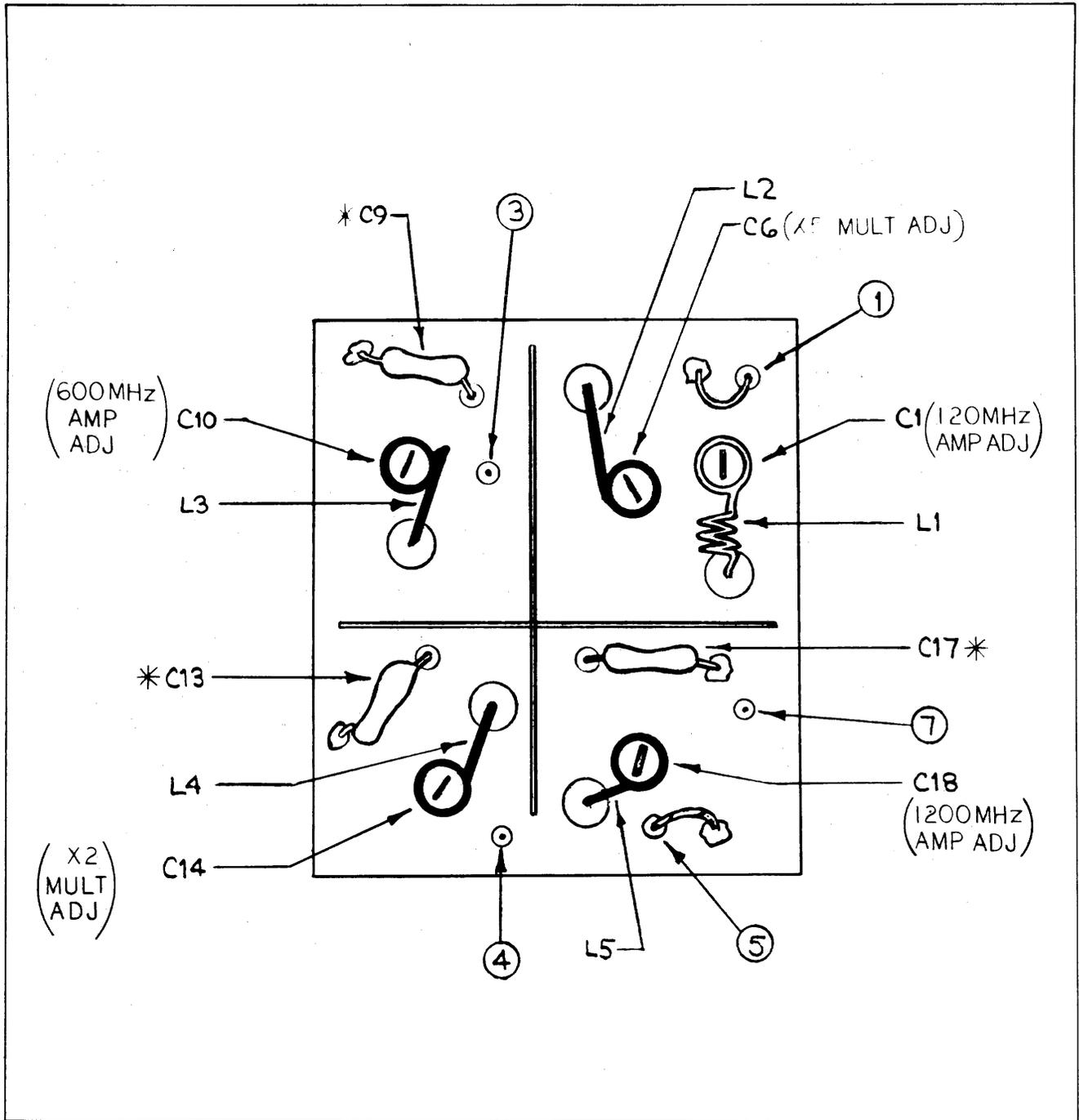


FIGURE 4-8 1200 MHz MULTIPLIER ASSEMBLY, A5 (MAINFRAME)

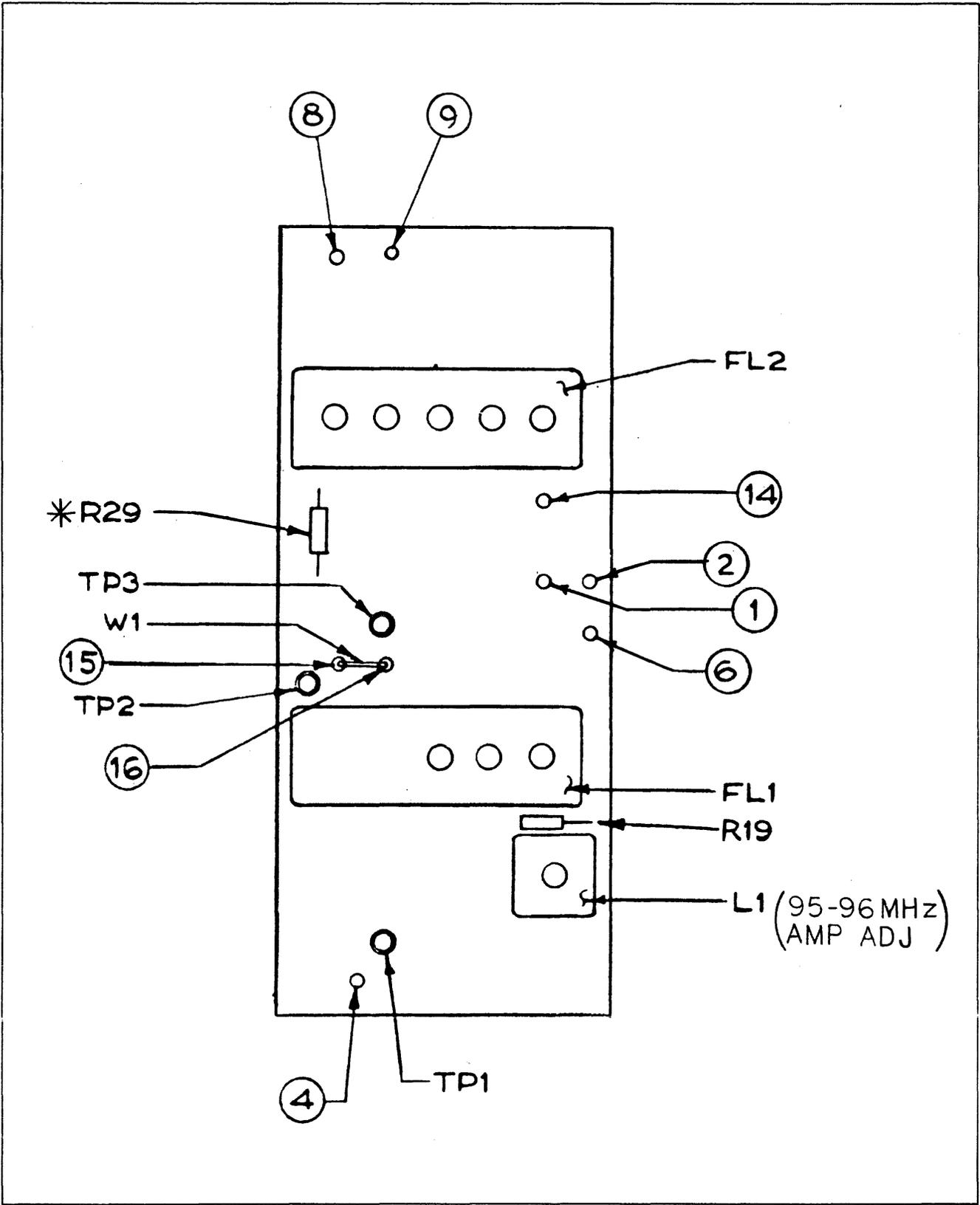


FIGURE 4-9 1 MHz DECADE ASSEMBLY,
A6 (MAINFRAME)

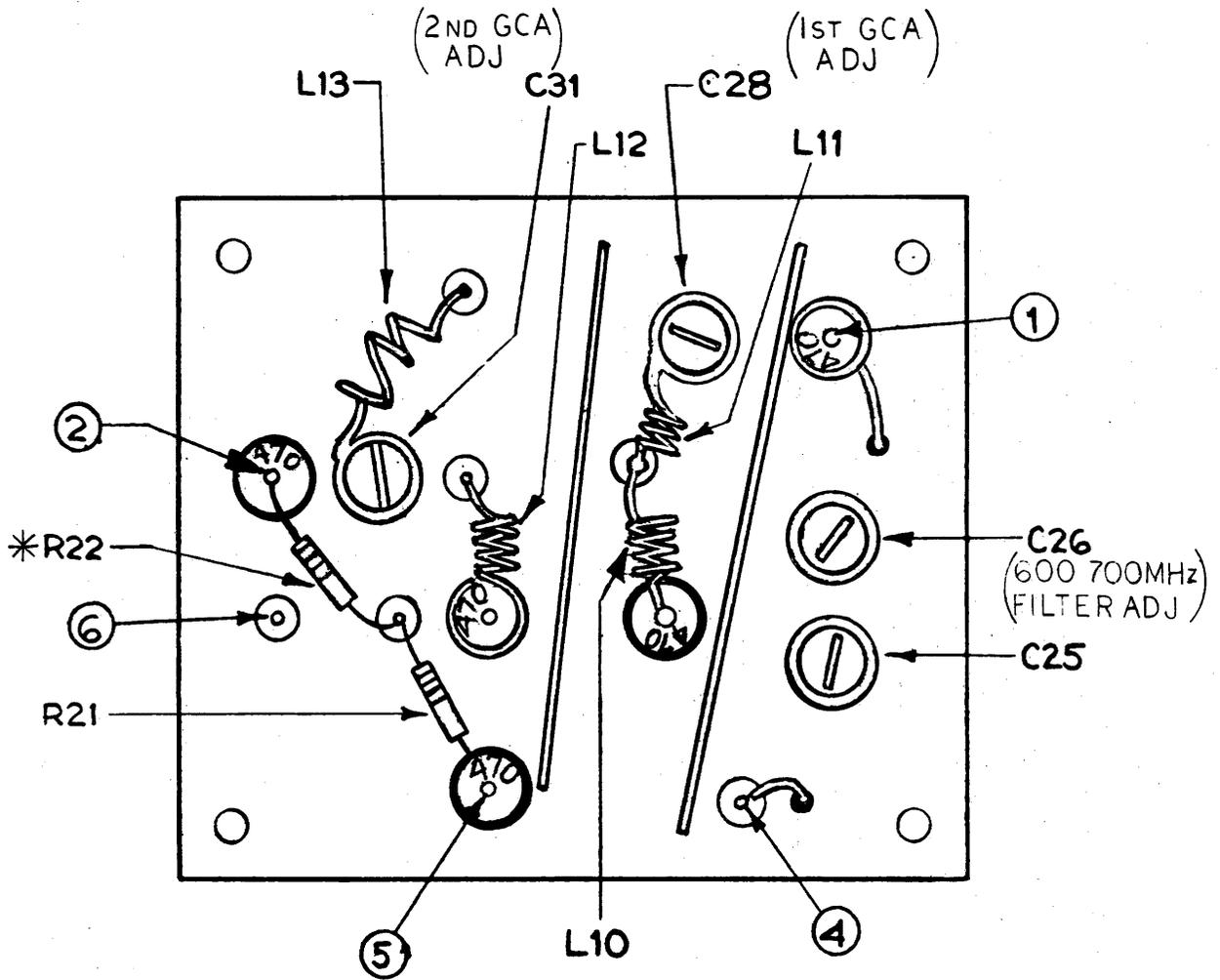


FIGURE 4-10 GCA/AM ASSEMBLY,
A7 (MAINFRAME)

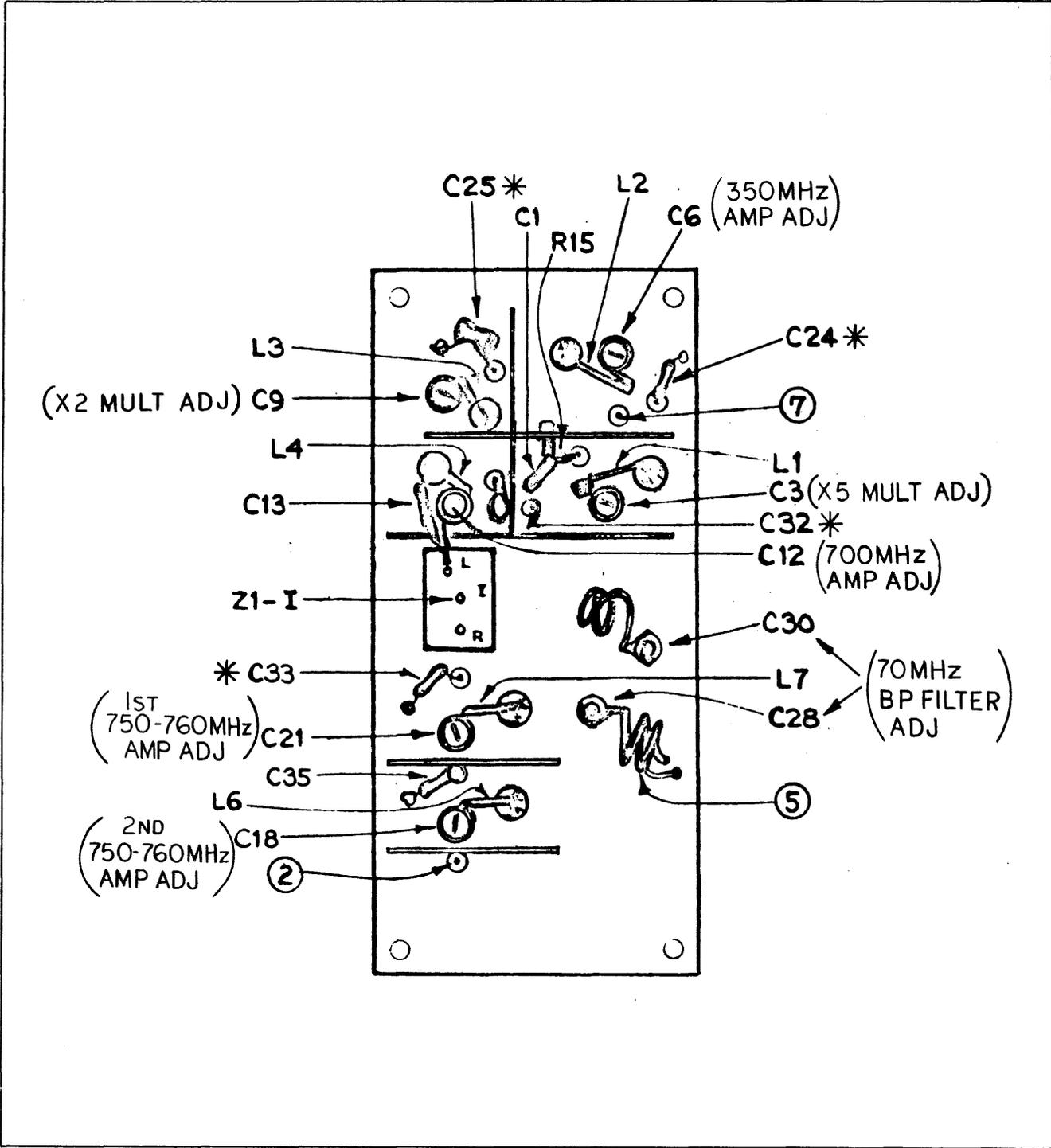


FIGURE 4-11 10 MHz DECADE ASSEMBLY,
A8 (MAINFRAME)

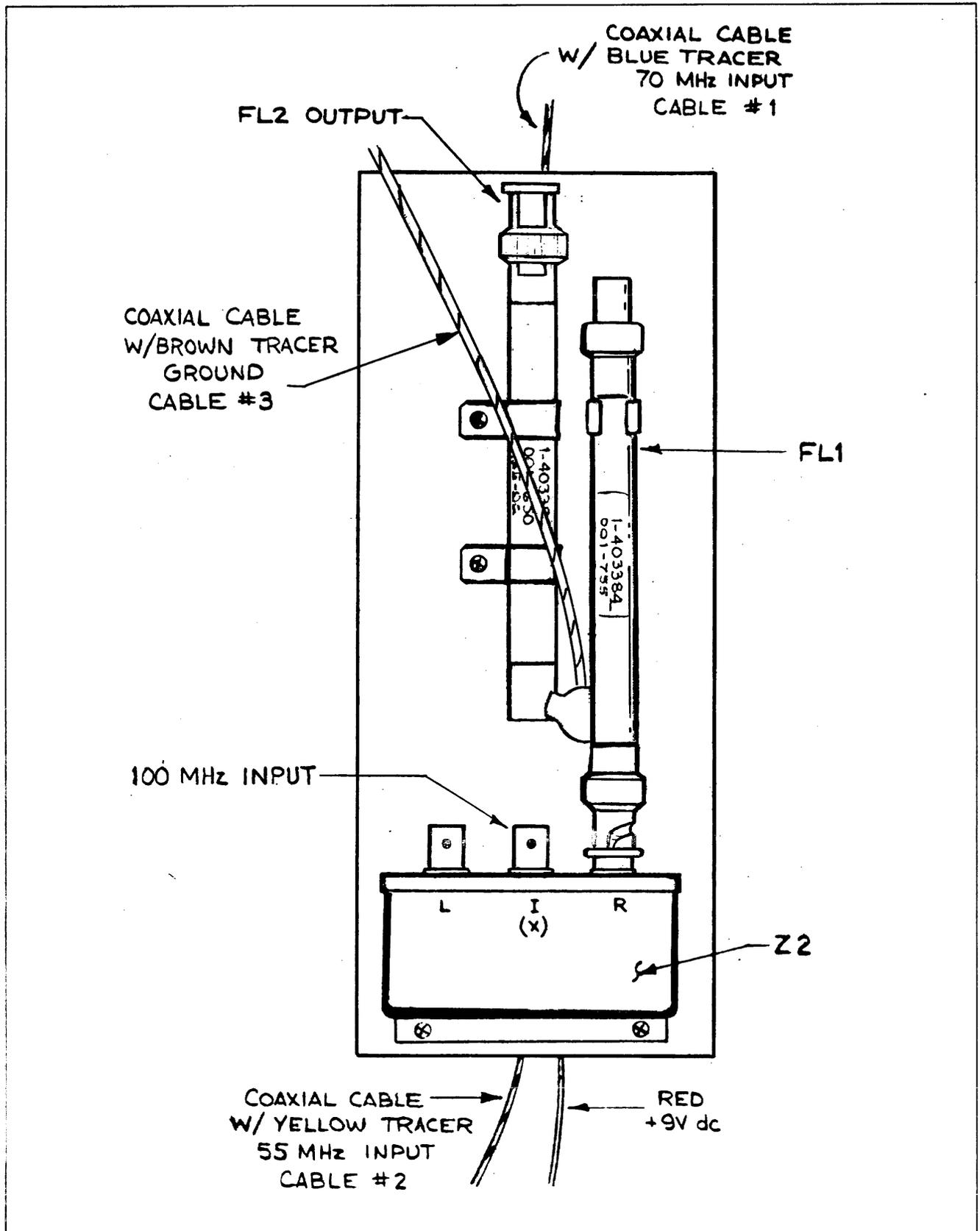


FIGURE 4-12 ASSEMBLY A7/A8 (MAINFRAME)

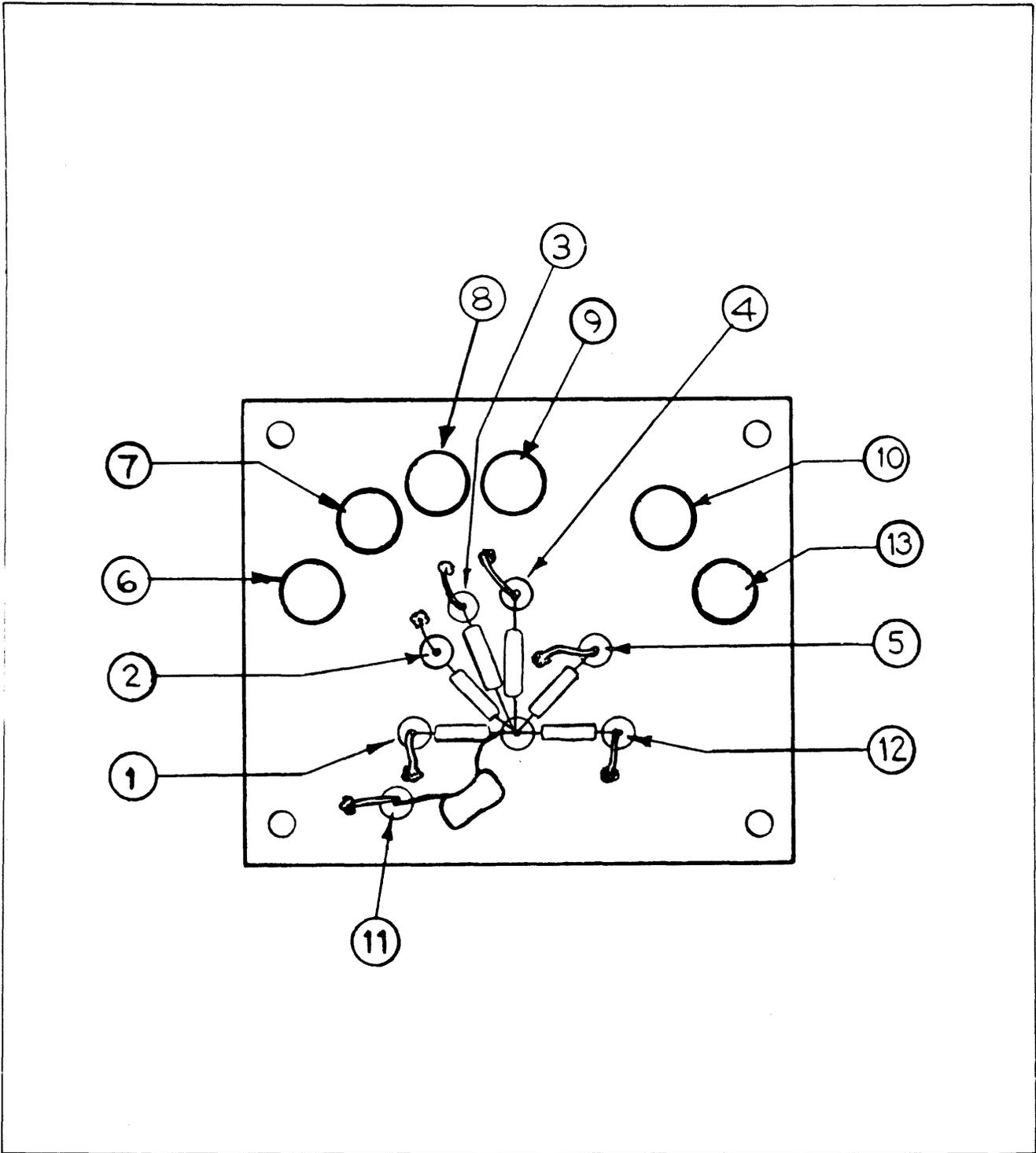


FIGURE 4-13 DIODE SWITCH ASSEMBLY,
A9 (MAINFRAME)

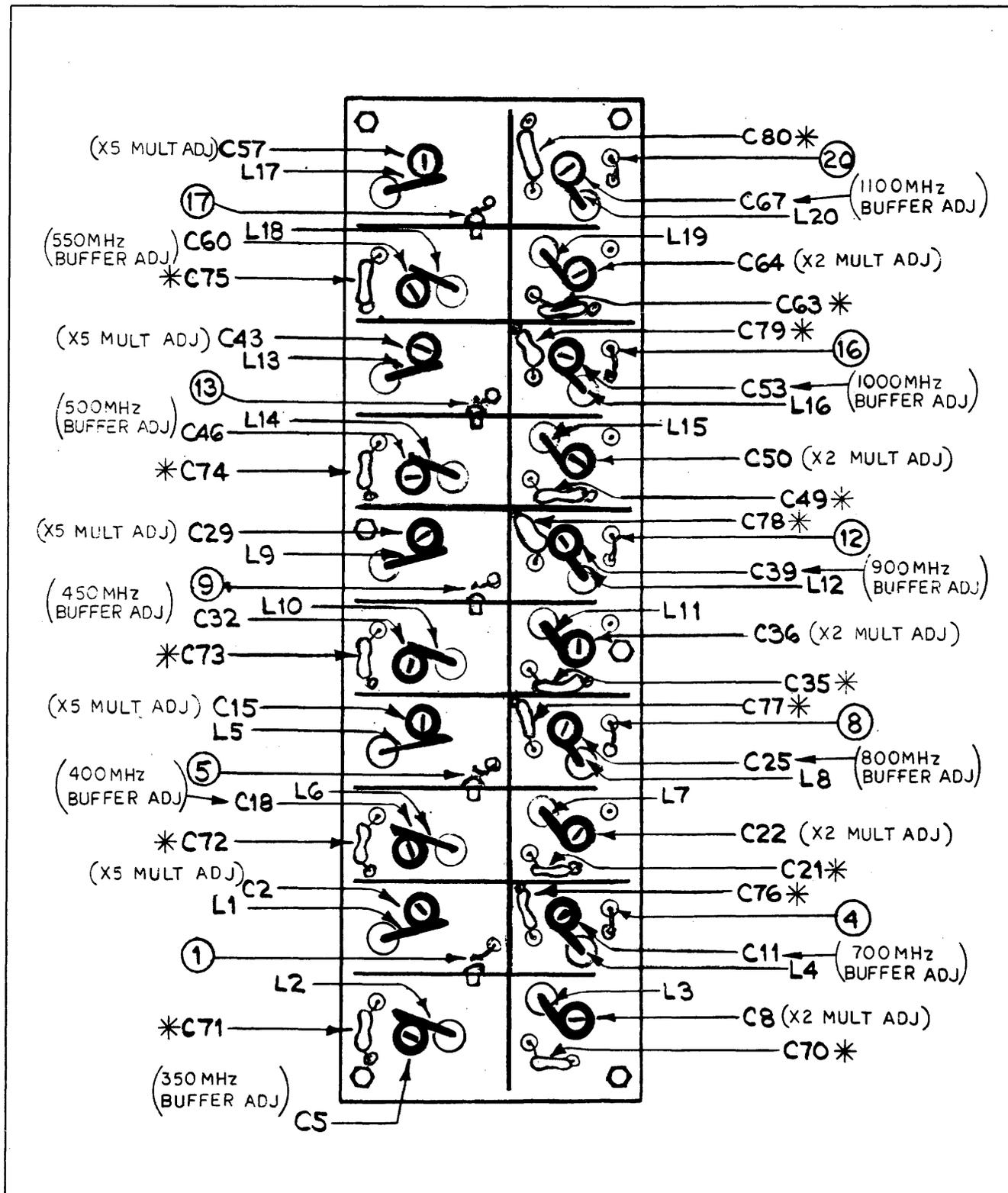


FIGURE 4-14 700-1100 MHz MULTIPLIER ASSEMBLY, A10 (MAINFRAME)

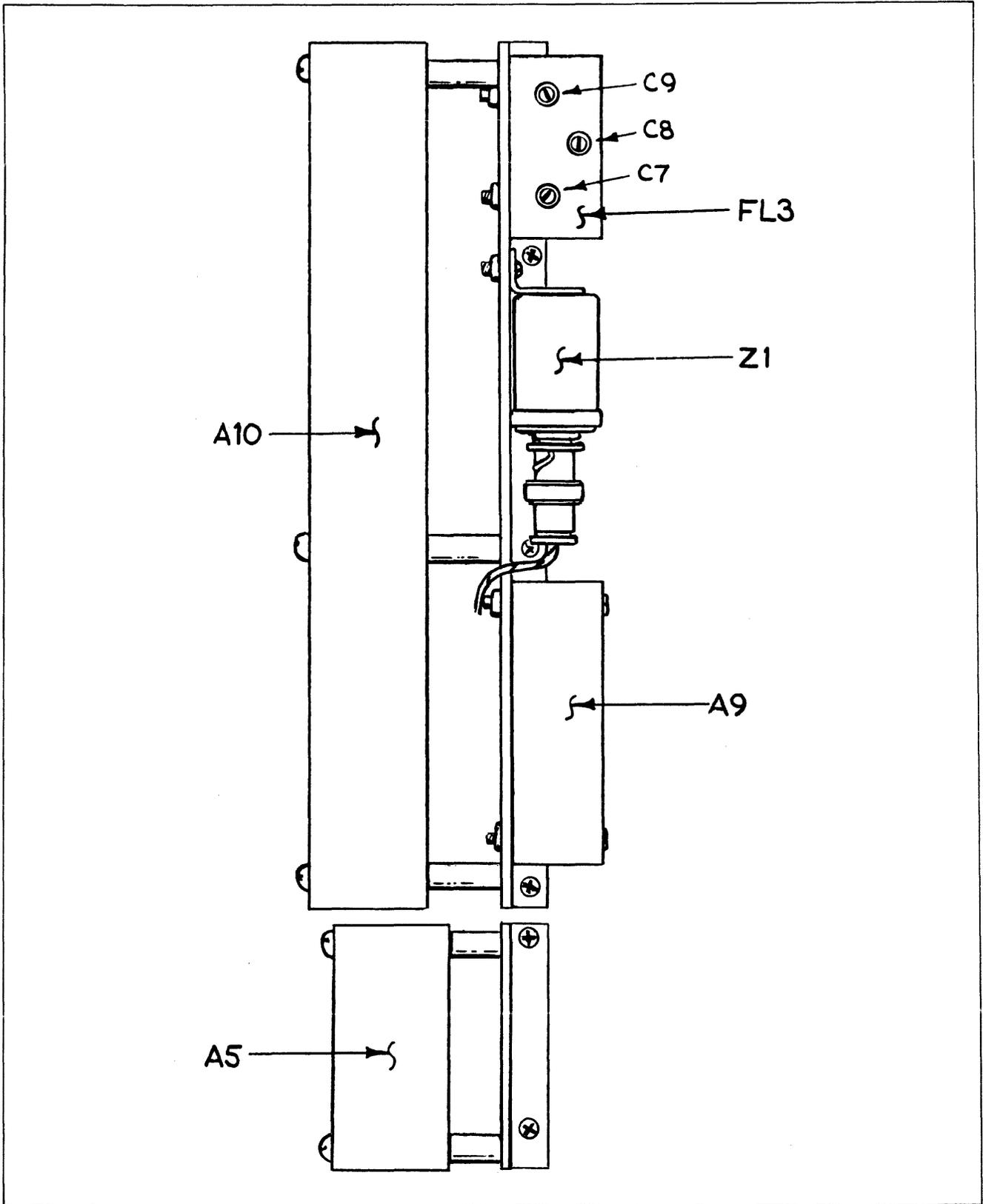


FIGURE 4-15 ASSEMBLY, A5, A9 AND A10 (MAINFRAME)

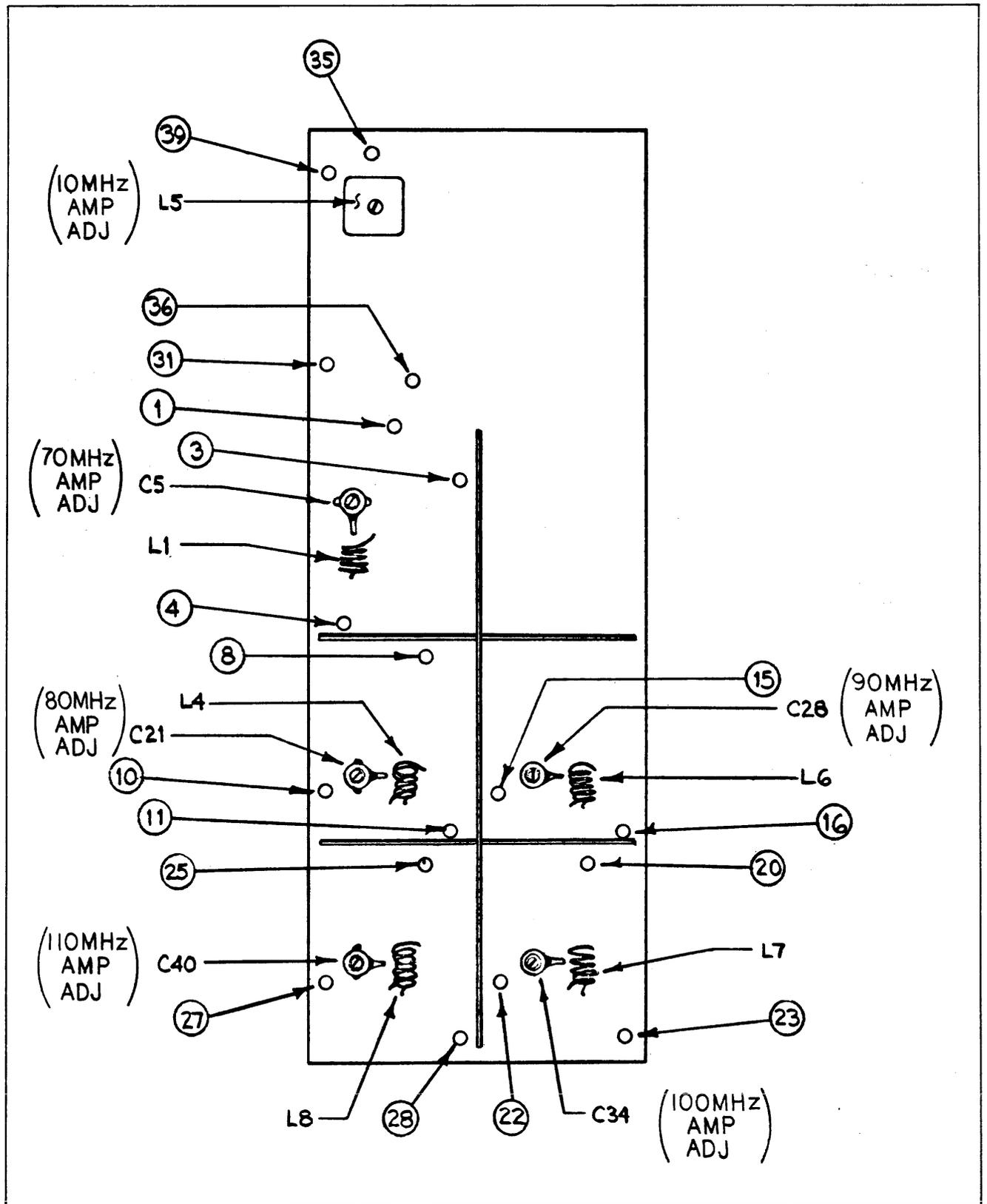


FIGURE 4-16 BUFFER AMPLIFIER ASSEMBLY,
A11 (MAINFRAME)

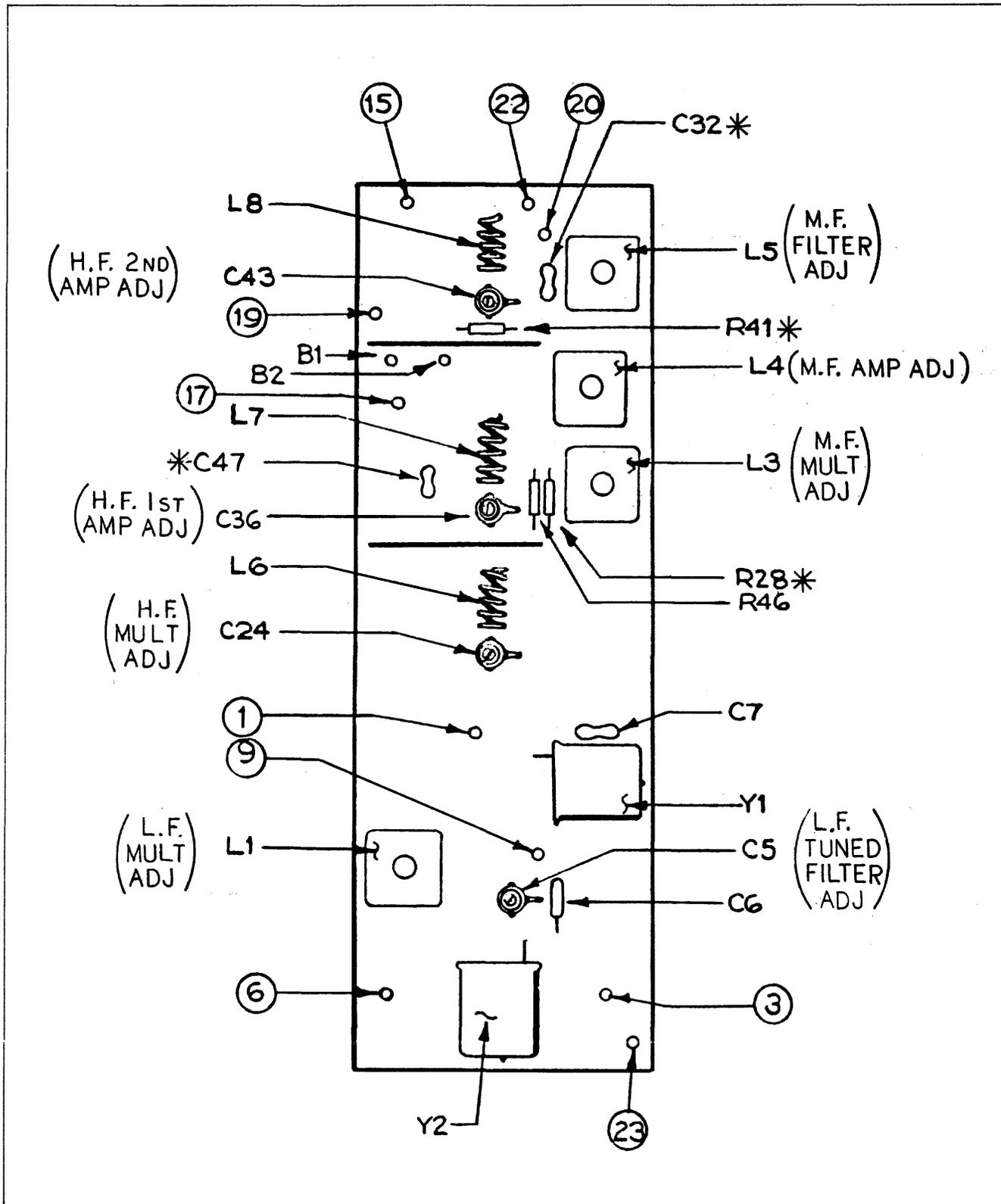


FIGURE 4-17 FREQUENCY GENERATOR ASSEMBLIES, A12 - A15 (MAINFRAME)

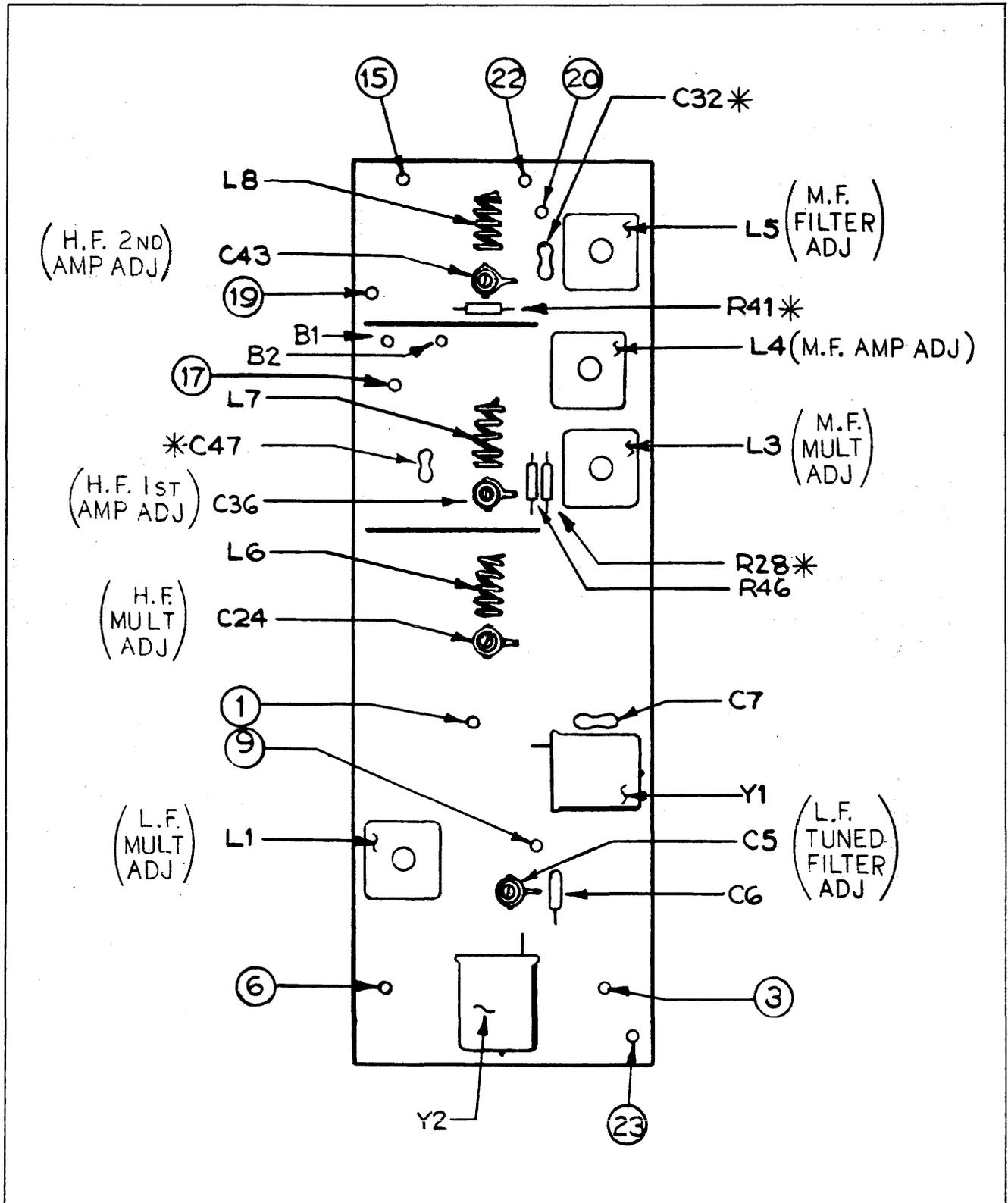


FIGURE 4-18 FREQUENCY GENERATOR ASSEMBLIES,
A16 - A20 (MAINFRAME)

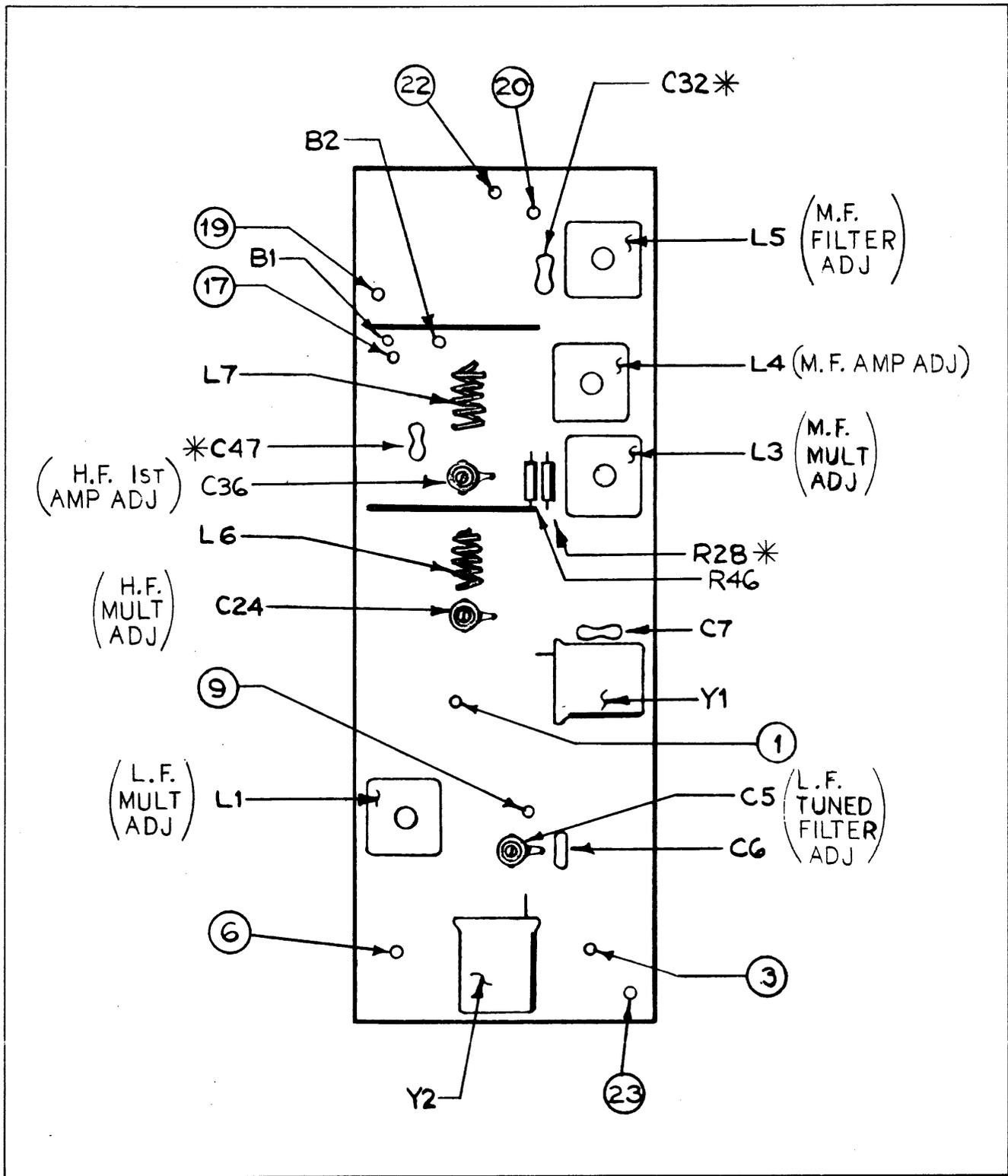
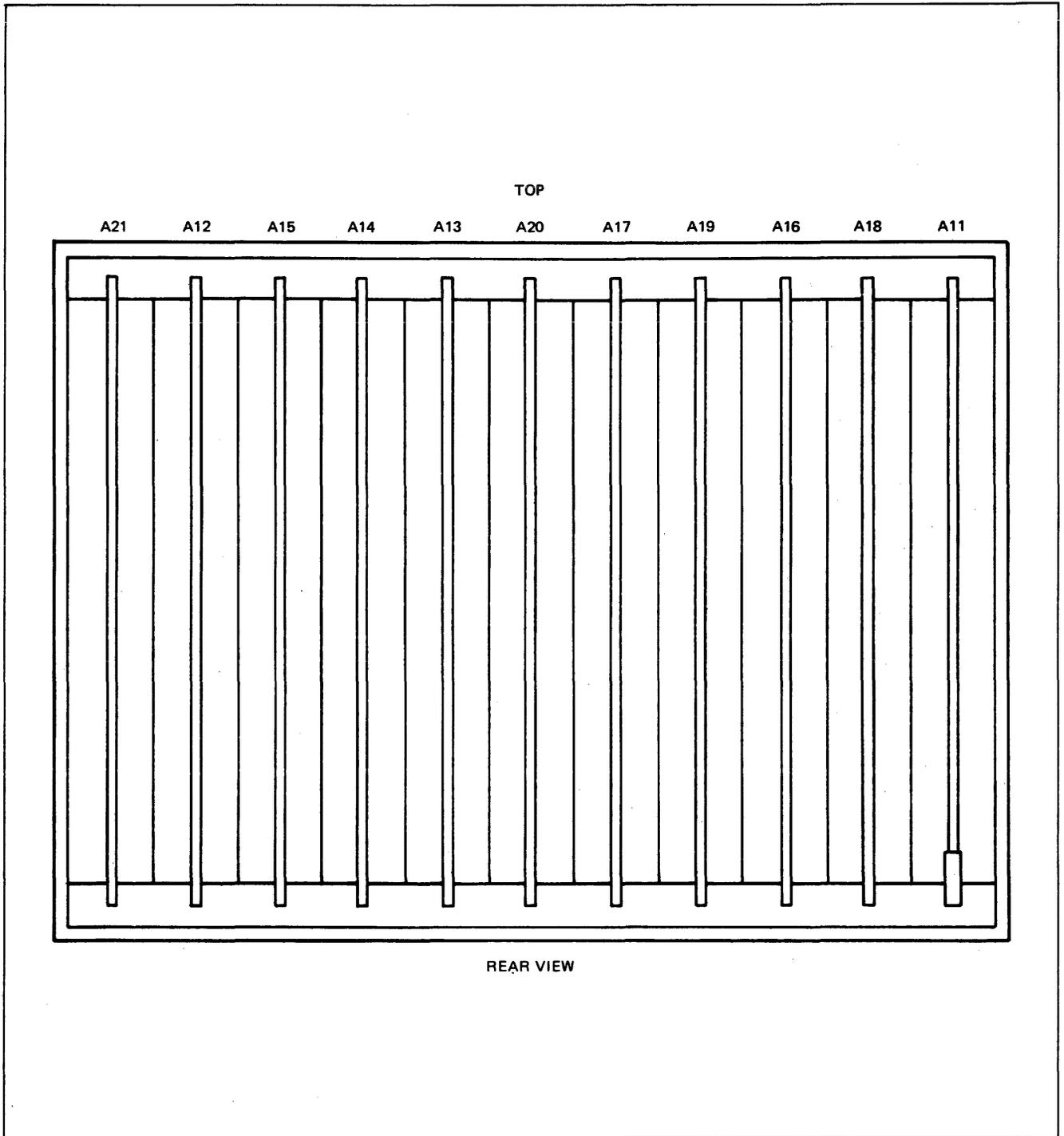
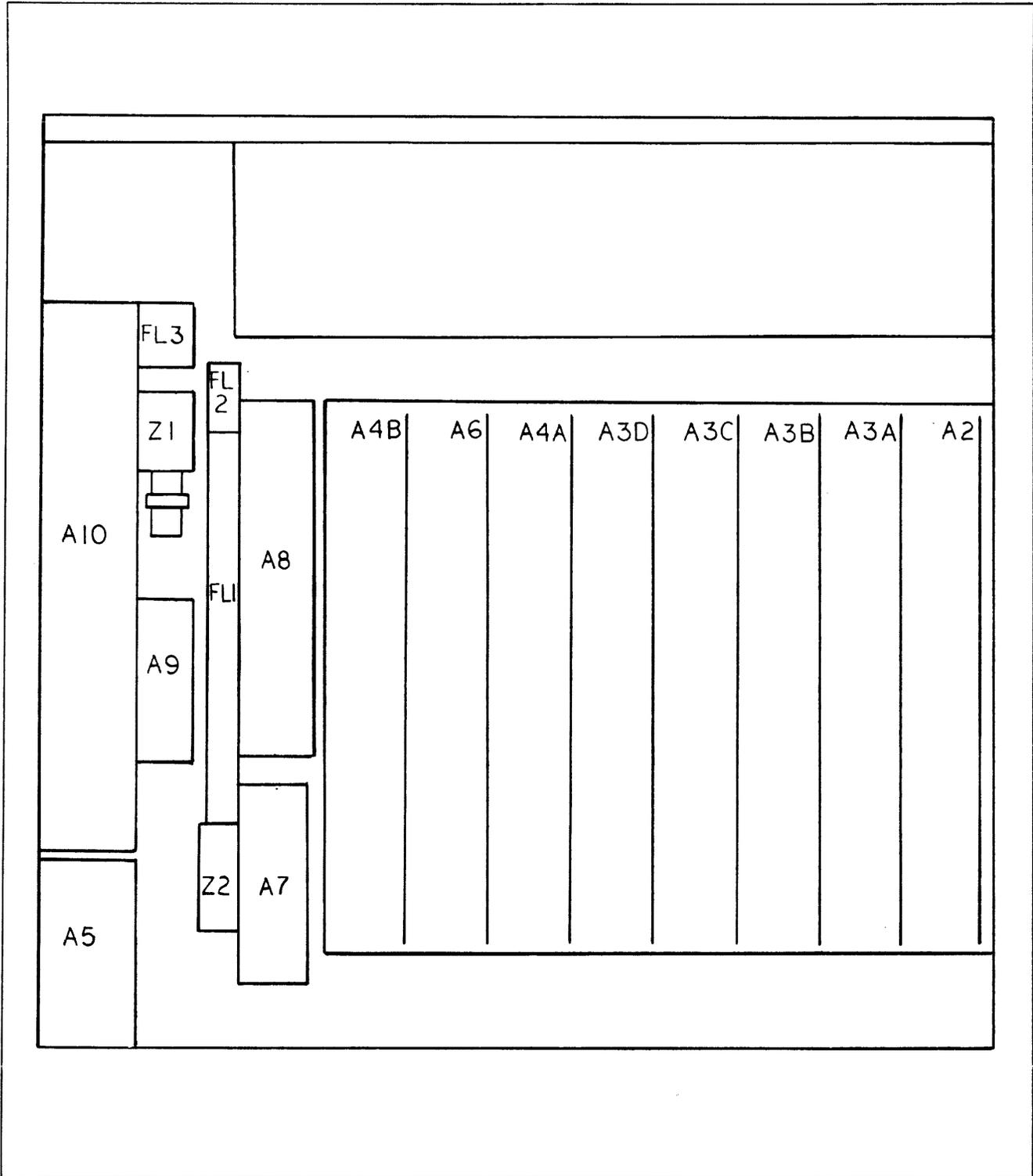


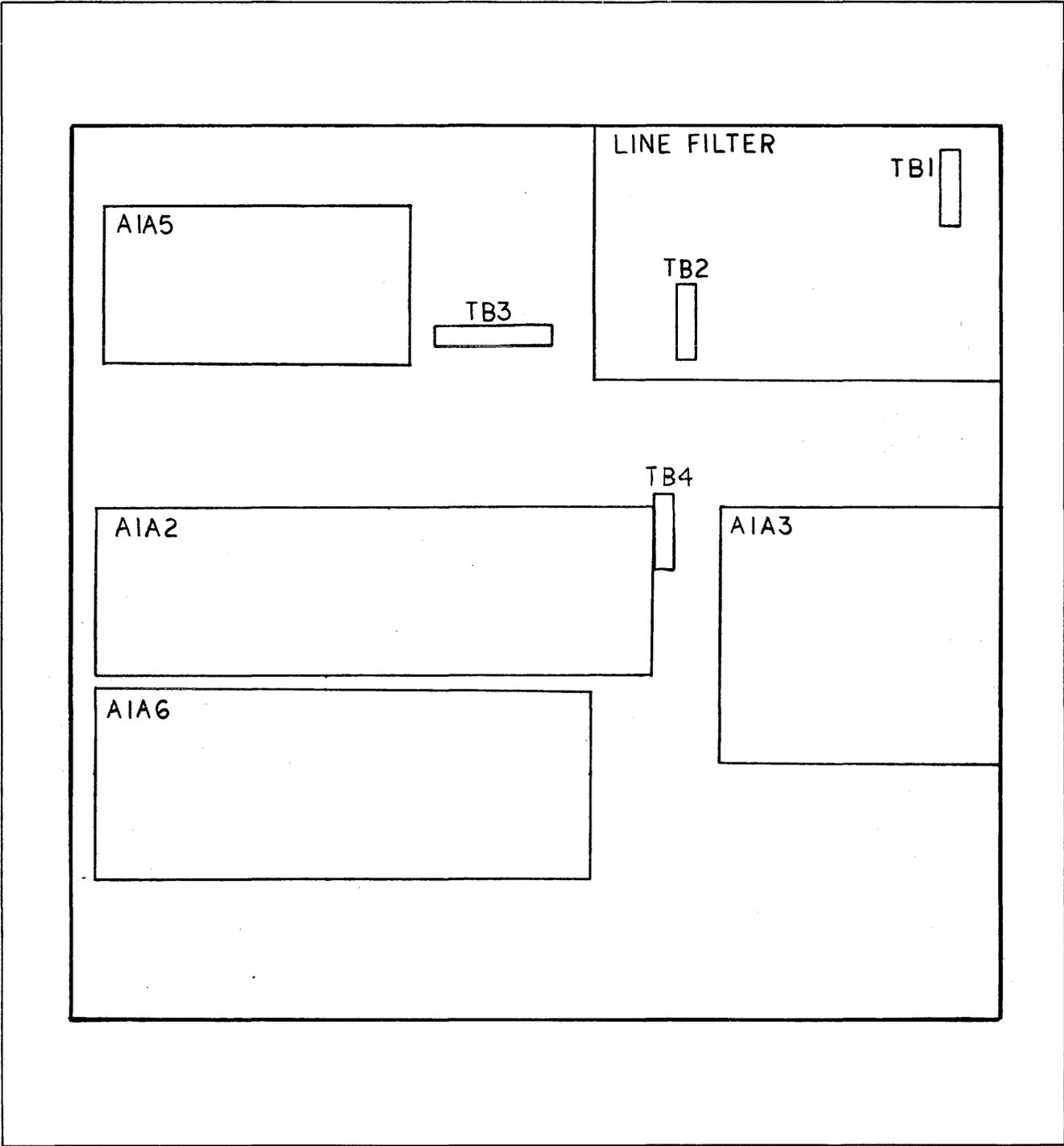
FIGURE 4-19 FREQUENCY GENERATOR ASSEMBLY, A21 (MAINFRAME)



**FIGURE 4-20 PC BOARD LOCATIONS
(MAINFRAME REAR VIEW)**



**FIGURE 4-21 PC BOARD LOCATIONS
(MAINFRAME TOP VIEW)**



**FIGURE 4-22 PC BOARD LOCATIONS
(MAINFRAME BOTTOM VIEW)**

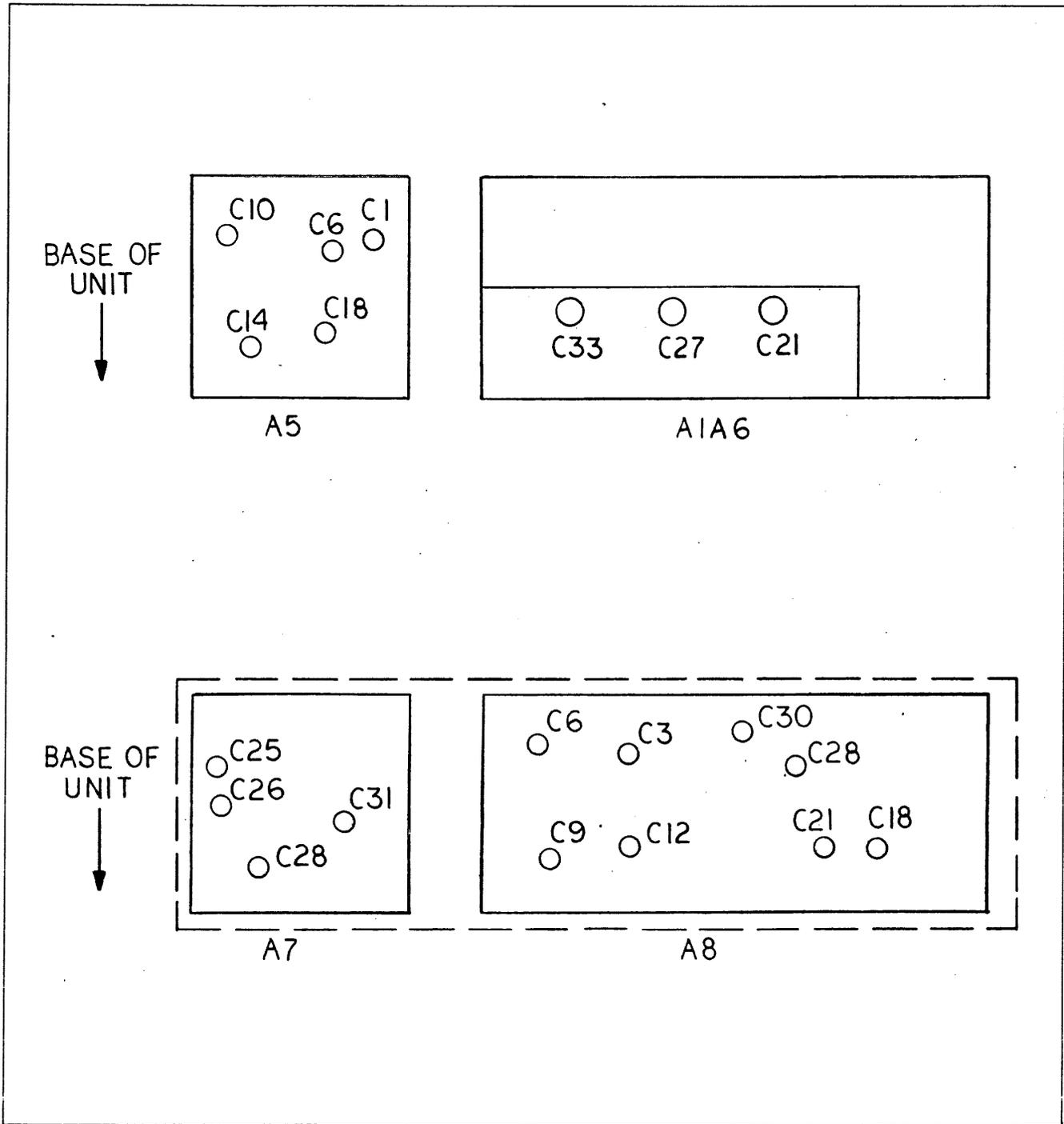
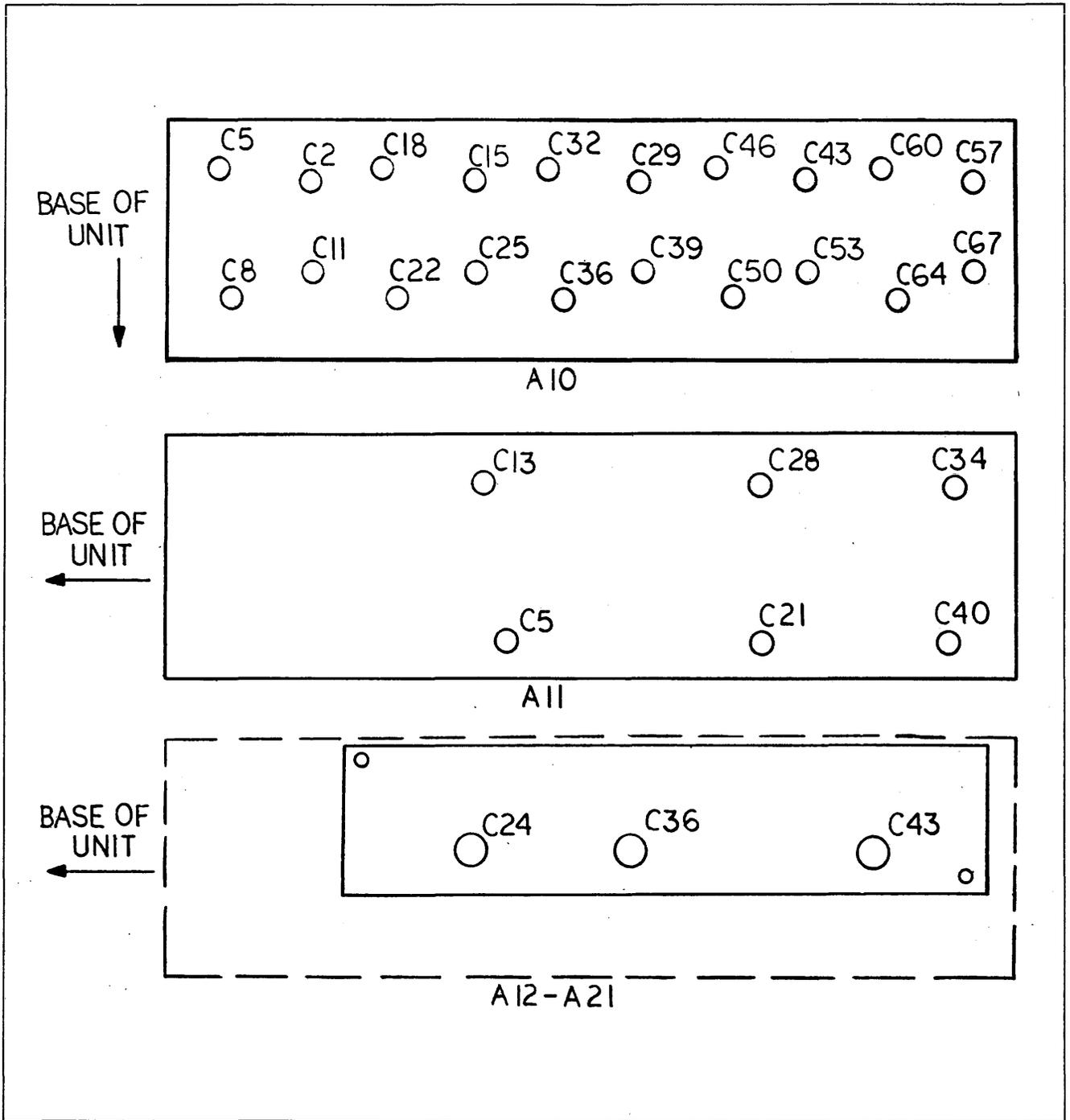


FIGURE 4-23 TRIMMER CAPACITOR ACCESS HOLE LOCATIONS
A1A6 THROUGH A8 (MAINFRAME)



**FIGURE 4-24 TRIMMER CAPACITOR ACCESS HOLE LOCATIONS
A10 THROUGH A21 (MAINFRAME)**

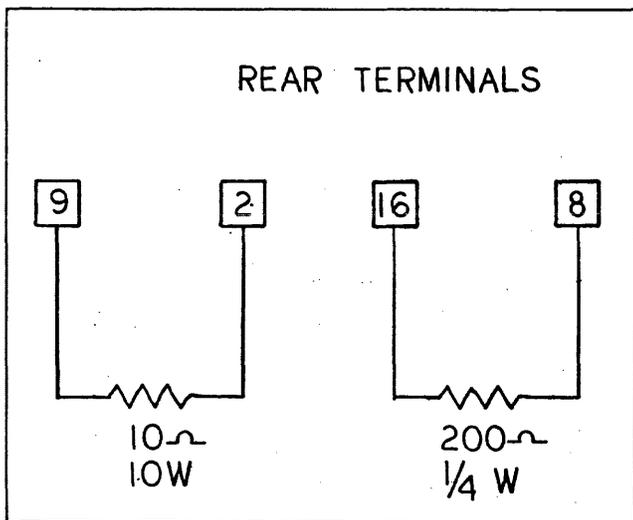


FIGURE 4-25 AFM-2 MODIFICATION FOR MAINFRAME TESTS

4.4.5 A19 Board Adjustment, 3.8 MHz and 38 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 2. Pull out board A19 and repeat steps c. through f. of paragraph 4.4.3, except substitute A19 for all A21 designations.

4.4.6 A18 Board Adjustments, 3.9 MHz and 39 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 3. Pull out board A18 and repeat steps c. through f. of paragraph 4.4.3, except substitute A18 for all A21 designations.

4.4.7 A17 Board Adjustments, 4.0 MHz and 40 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 4. Pull out board A17 and repeat steps c. through f. of paragraph 4.4.3, except substitute A17 for all A21 designations.

4.4.8 A16 Board Adjustment, 4.1 MHz and 41 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 5. Pull out board A16 and repeat steps c. through f. of paragraph 4.4.3, except substitute A16 for all A21 designations.

4.4.9 A15 Board Adjustment, 4.2 MHz and 42 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 6. Pull out board A15 and repeat steps c. through f. of paragraph 4.4.3, except substitute A15 for all A21 designations.

4.4.10 A14 Board Adjustment, 4.3 MHz and 43 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 7. Pull out board A14 and repeat steps c. through f. of paragraph 4.4.3, except substitute A14 for all A21 designations.

4.4.11 A13 Board Adjustment, 4.4 MHz and 44 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 8. Pull out board A13, and repeat steps c. through f. of paragraph 4.4.3, except substitute A13 for all A21 designations.

4.4.12 A12 Board Adjustment, 4.5 MHz and 45 MHz

a. Rotate 100 kHz and 1 MHz frequency switches to 9. Pull out board A12 and repeat steps c. through f. of paragraph 4.4.3, except substitute A12 for all A21 designations.

4.4.13 90 MHz No. 3 Adjustment

a. Connect the RF voltmeter with a high impedance probe to terminal A6-4.

b. Set the frequency switches to 30.000 MHz.

c. Pull A18 board half-way out and adjust A18C24 and A18C36 to obtain between 200 and 250 mV rms on the RF voltmeter.

d. If not within tolerance, select the value of A18C47.

CAUTION: A18C47 may cause oscillation if too large in value.

e. Disconnect RF voltmeter probe and install A18 board back in unit.

4.4.14 A2 Board Adjustment

a. Set mainframe frequency switches to "0" position 0 - 100 Hz control to OUT.

b. Lift A2 board and connect oscilloscope 10X probe to terminal A2-3. Measure the amplitude of the 1 MHz input. Should be approximately 2.5 V p-p square wave.

c. Connect oscilloscope 10X probe to terminal A2-8, 2 MHz input. Should measure approximately 3.0 V p-p square wave.

d. Connect oscilloscope 10X probe to terminal A2-7. Tune A2L1, A2L2 and A2L3 for 9 MHz maximum output. Should be approximately 500 mV p-p.

e. Connect oscilloscope 10X probe to terminal A2-9. Tune A2L4 for maximum output. Should be 2.2 V p-p minimum at 6 MHz.

f. Reinstall A2 board.

4.4.15 A3A Board Adjustment

a. Lift board A3A and connect oscilloscope 10X probe to A3A-3 (5-6 MHz input) and ground. Voltage should be > 2.2 V p-p.

b. Connect oscilloscope 10X probe to A3A-6 (9 MHz input) and ground. Voltage should be approximately 500 mV p-p.

c. Connect oscilloscope 10X probe to A3A-8 (3.6 to 4.5 MHz input) and ground. Should be a sawtooth waveform of approximately 700 mV p-p.

d. Connect oscilloscope 10X probe to A3ATP1 (500-600 kHz output). Voltage should be approximately 600 mV p-p.

e. Connect the oscilloscope 10X probe to A3ATP2 and set the mainframe 0–100 Hz control to OUT.

f. Adjust A3AL1 and A3AL2 for maximum voltage and purest sine wave (9.6 MHz). The voltage should be approximately 150 mV p-p.

g. If the voltage at A3ATP2 is less than 150 mV p-p, increase the value of A3AC11 to obtain 150 mV p-p.

h. Connect the oscilloscope 10X probe to A3ATP3 and set the mainframe 100 Hz switch to “5”.

j. Adjust A3AR7 for 3 V p-p (5.5 MHz) AT A3ATP3.

k. Rotate the 100 Hz switch between 0 and 9 and observe that the level is > 2.2 V p-p in all positions. Return the 100 Hz switch to “5”.

l. Reinstall A3A board.

4.4.16 A3B Board Adjustment

a. Pull out board A3B and repeat steps a. through l. of paragraph 4.4.15, except substitute A3B for all A3A designations, and 1 kHz switch for 100 Hz switch.

4.4.17 A3C Board Adjustment

a. Pull out board A3C and repeat steps a. through l. of paragraph 4.4.15, except substitute A3C for all A3A designations and 10 kHz switch for 100 Hz switch.

4.4.18 A3D Board Adjustment

a. Pull out board A3D and repeat steps a. through l. of paragraph 4.4.15, except substitute A3D for all A3A designations, and 100 kHz switch for 100 Hz switch.

4.4.19 A6 Board Adjustment

a. Lift board A6 and connect oscilloscope 10X probe to A6-6 (5 to 6 MHz input). Voltage should be approximately 2.5 V p-p.

b. Connect oscilloscope 10X probe to A6-14 (36 to 45 MHz input). Voltage should be approximately 60 mV p-p.

c. Connect oscilloscope 10X probe to A6-4 (90 MHz input). Voltage should be approximately 630 mV p-p at 90 MHz.

d. Set the mainframe 100 kHz switch to “5”, 10 kHz, 1 kHz and 100 Hz switches to “0”. Connect the oscilloscope 10X probe to A6TP1. The voltage should be approximately 150 mV p-p (95.5 MHz).

e. Connect the oscilloscope 10X probe to A6TP2. Adjust A6L1 for maximum output at 95.5 MHz. The voltage should be approximately 220 mV p-p.

f. Set the mainframe 10 MHz switch to “0” and 1 MHz switch to 5. Connect the oscilloscope 10X probe to A6TP3. The voltage should be approximately 120 mV p-p (55 MHz).

g. Unsolder wire on A6-8. Connect center conductor of a 50 ohm coaxial test cable to A6-8 and connect outer conductor to A6-9.

h. Connect the other end of test cable to RF voltmeter with 50 ohm termination. Measure voltage level. Level should be -1 dBm ± 2 dB.

i. Rotate the 100 kHz and 1 MHz decade switches throughout their ranges. The output level should be -1 dBm ± 2 dB.

k. Disconnect test cable from RF voltmeter and connect test cable to the spectrum analyzer.

l. Rotate the 100 kHz decade switch to zero.

m. Set the spectrum analyzer dispersion for 100 kHz/division, frequency dial to 50 MHz and other controls so that signal is 50 dB above the noise.

n. Adjust A21C5 for minimum 100 kHz sidebands.

p. Repeat for all positions of 100 kHz decade adjusting A20C5, A19C5, etc., as required.

r. Reinstall A6 board.

4.4.20 A20 Board Adjustment, 70 MHz

a. Set the 10 MHz switch to 1. Pull board A20 half-way out.

b. Unsolder the coaxial cable center conductor from A20-17. Connect the BNC test cable center conductor to A20-17 and shield to ground. Connect the RF voltmeter with 50 ohm termination to the test cable.

c. Adjust A20C24 and A20C36 for 0 dBm \pm 1 dB on RF voltmeter.

d. If out of tolerance, check the taps on A20L6 and A20L7 (should not be greater than $\frac{1}{2}$ turn up) and select the value of A20C47. CAUTION: A20C47 may cause oscillation if made too large in value.

e. Disconnect RF voltmeter from BNC test cable and unsolder test cable from A20-17. Solder back normal cable to A20-17.

f. Disconnect the BNC connector from Z2-X port (center connector) and connect it to the RF voltmeter (with 50 ohm termination). Peak A20C24, A20C36 and A20C43. The output should be -1 dBm \pm 1 dB.

g. If out of tolerance, select the value of A20R41.

h. Reinstall the cover and repeak A20C24, A20C36 and A20C43.

j. Disconnect the RF voltmeter and reconnect the BNC cable back to Z2-X port. Push board back into compartment.

4.4.21 A19 Board Alignment, 80 MHz

a. Set the 10 MHz switch to 2. Pull board A19 half-way out.

b. Repeat steps 4.4.20-b. through 4.4.20-j. except substitute A19 for A20.

4.4.22 A18 Board Adjustment, 90 MHz

a. Set the 10 MHz switch to 3. Pull board A18 half-way out.

b. Repeat steps 4.4.20-b. through 4.4.20-j. except substitute A18 for A20.

4.4.23 A17 Board Adjustment, 100 MHz

a. Set the 10 MHz switch to 4. Pull board A17 half-way out.

b. Repeat steps 4.4.20-b. through 4.4.20-j. except substitute A17 for A20.

4.4.24 A16 Board Adjustment, 110 MHz

a. Set the 10 MHz switch to 5. Pull board A16 half-way out.

b. Repeat steps 4.4.20-b. through 4.4.20-j. except substitute A16 for A20.

4.4.25 A15 Board Adjustment, 120 MHz

a. Set the 10 MHz switch to 6. Pull board A15 half-way out.

b. Repeat steps 4.4.20-b. through 4.4.20-j. except substitute A15 for A20.

4.4.26 A21 Board Adjustment, 60 MHz

a. Set the 100 MHz and 10 MHz switches to 0. Pull board A21 half-way out.

b. Disconnect the BNC connector on Z2-X port (center connector) and connect BNC to the RF voltmeter (with 50 ohm termination).

c. Adjust A21C24 and A21C36 for -1 dBm \pm 1 dB on RF voltmeter.

d. If out of tolerance, check the taps on A21L6 and A21L7 (should not be greater than $\frac{1}{2}$ turn up) and select the value of A21C47.

CAUTION: A21C47 may cause oscillation if made too large in value.

e. Reinstall cover and repeak A21C24 and A21C36. Dress all wires above center of board toward top of chassis and all wires below center of board toward bottom of chassis. Push board back into compartment. Leave RF voltmeter connected as in step 4.4.26-b.

4.4.27 A14 Board Adjustment, 130 MHz

a. Set the 10 MHz switch to 7. Pull board A14 half-way out.

b. Adjust A14C24, A14C36 and A14C43 for -1 dBm \pm 1 dB on the RF voltmeter.

c. If the output is too high or low, remove cover and repeak A14C24, A14C36 and A14C43.

d. If output is too high, decrease the value of A14C47 or increase the value of A14R41 until the output is -1 dBm \pm 1 dB. Repeak A14C24, A14C36 and A14C43, after changing A14C47 or A14R41.

e. If output is too low, increase the value of A14C47 or decrease the value of A14R41 until the output is $-1 \text{ dBm} \pm 1 \text{ dB}$. Repeak A14C24, A14C36 and A14C43 after changing A14C47 or A14R41. Check the taps on A14L6, A14L7 and A14L8 (should not be greater than $\frac{1}{2}$ turn up).

CAUTION: A14C47 may cause oscillation if made too large in value.

f. Reinstall cover and repeak A14C24, A14C36 and A14C43. Push the board back into compartment; dress all wires above center of board toward top of chassis and all wires below center of board toward bottom of chassis.

4.4.28 A13 Board Adjustment, 140 MHz

a. Set the 10 MHz switch to 8. Pull board A13 half-way out.

b. Repeat steps 4.4.27-b. through 4.4.27-f. except substitute A13 for A14.

4.4.29 A12 Board Adjustment, 150 MHz

a. Set the 10 MHz switch to 9. Pull board A12 half-way out.

b. Repeat steps 4.4.27-b. through 4.4.27-f. except substitute A12 for A14.

4.4.30 A1A6 Board Adjustment

a. Connect oscilloscope 10X probe to A1A6TP1. Adjust A1A6T1 and A1A6T2 for maximum amplitude at 10 MHz.

b. Connect oscilloscope 10X probe to A1A6-9. Adjust A1A6C21, A1A6C27 and A1A6C33 for maximum amplitude at 70 MHz.

c. Disconnect oscilloscope 10X probe and cable center conductor from A1A6-9. Connect the BNC test cable center conductor to A1A6-9 and shield to ground.

d. Connect RF voltmeter (with 50 ohm termination) to the test cable connector. Output level should be $+10 \text{ dBm} \pm 1 \text{ dB}$.

e. If out of tolerance, select A1A6R24 and re-adjust A1A6C21, A1A6C27 and A1A6C33.

f. Disconnect RF voltmeter and test cable and reconnect cable center conductor to A1A6-9.

4.4.31 A7 Board Adjustment

a. Remove mounting screws and lift out assembly A7/A8. Disconnect the BNC connector from Z2-L

port and connect it to the sweep generator RF output jack.

b. Disconnect the center conductor of the coaxial cable at A7-6 and connect the center conductor of 50 ohm coaxial cable (BNC connector on other end) to A7-6, and shield to ground. Connect the BNC connector on this cable to the RF detector RF input and the dc output of the detector to the sweep generator demodulator input jack.

c. Set the sweep generator output to -8 dBm (Δf).

d. Connect the oscilloscope vertical input jack and external horizontal input jack to the sweep generator vertical and horizontal output jacks respectively.

e. Adjust the sweep generator sweep width and center frequency controls so that the 600 and 700 MHz markers are displayed on the oscilloscope.

f. Disconnect the ALC lead at A7-1 and connect the 0-5 Vdc power supply positive lead to A7-1. Connect the negative lead to ground. Set the output voltage to 0 V.

g. Adjust A7C25, A7C26, A7C28 and A7C31 for maximum output and flattest response between 600 and 700 MHz.

h. Disconnect the BNC connector at the RF detector RF input and connect it to the RF voltmeter (with 50 ohm termination). Set the sweep generator mode switch to CW.

j. Verify that the level at A7-4 is -8 dBm . Vary the sweep generator center frequency control from 600 MHz to 700 MHz. The output level should not change more than $\pm 2 \text{ dB}$ from -12 dBm .

k. Increase the 0-5 Vdc power supply connected to A7-1 to $+5 \text{ Vdc}$. The output level should drop a minimum of 28 dB from the level measured in previous step.

l. Disconnect the test equipment from the board and reconnect the cables and wire to their proper locations.

4.4.32 A8 Board Adjustment

a. With oscilloscope 10X probe observe 70 MHz at A8-5. The voltage should be between 1.8 and 2.2 V p-p. Connect oscilloscope 10X probe to A8-1 and peak A8C28 and A8C30 for maximum output.

b. Lift A8C13 from A8Z1-L and connect the BNC test cable center conductor to A8C13 and shield to ground. Connect the RF voltmeter (with 50 ohm termination) to the BNC connector. Peak A8C3, A8C6, A8C9 and A8C12 for maximum output on RF voltmeter

connected to L on A8Z1. Verify that RF voltmeter reads $> +5$ dBm. Disconnect the RF voltmeter and connect spectrum analyzer to the BNC test cable. Observe the 770 MHz spur. Should be at least 40 dB down from the 700 MHz level. If not, lower taps on A8L3 and A8L4 and repeak A8C9 and A8C12. Disconnect spectrum analyzer and connect RF voltmeter to the BNC test cable. Repeak A8C9 and A8C12 and verify that output level is $+5$ dBm. Disconnect RF voltmeter and BNC test cable from A8C13 and reconnect it to A8Z1-L.

c. Rotate 100 kHz and 1 MHz frequency switches to 4. Disconnect the BNC connector from Z2-R and connect the RF voltmeter (with 50 ohm termination) to filter, FL1. Peak A8C21, A8C18 and select A8C33 and A8C35 for $+5$ dBm ± 1 dB on the RF voltmeter.

d. Rotate 100 kHz and 1 MHz frequency switches from 0 to 9. Output should be $+5$ dBm ± 2 dB.

e. Disconnect RF voltmeter and reconnect BNC to R port of Z2.

4.4.33 A9, A10, A11 and A5 Board Adjustments

a. Set the 100 MHz and 10 MHz switches to 0.

b. Disconnect the BNC connector from Z1-R and connect the spectrum analyzer input to this cable.

c. Set the spectrum analyzer dispersion to 100 MHz/division with 700 MHz center frequency.

d. Remove cover from A10. Connect the oscilloscope 10X probe to A10-1. Tune A11C5 for maximum output on the oscilloscope. Remove the oscilloscope probe.

e. Tune A10C2, A10C5, A10C8 and A10C11 for maximum output with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L1 through A10L4. Repeak A10C2, A10C5, A10C8 and A10C11.

f. Disconnect the spectrum analyzer and connect the RF voltmeter (with 50 ohm termination) and repeak A10C11. The output should be $+5$ dBm, -2 $+4$ dB.

g. If the output is too high or low, select value of A10C71, A10C70 or A10C76 until the output is $+5$ dBm, -2 $+4$ dB. Disconnect RF voltmeter and reconnect spectrum analyzer.

h. Set the 100 MHz switch to 1 and the 10 MHz switch to 1. Set the spectrum analyzer center frequency to 800 MHz.

j. Connect the oscilloscope 10X probe to

A10-5. Tune A11C21 for maximum output on the oscilloscope. Remove the oscilloscope 10X probe.

k. Tune A10C15, A10C18, A10C22, and A10C25 for maximum-output with minimum sidebands, 30 dB down or greater on the spectrum analyzer. Reduce sideband levels as far as possible by moving down taps on A10L5 through A10L8. Repeak A10C15, A10C18, A10C22 and A10C25.

l. Repeat step 4.4.33-f., except substitute A10C25 for A10C11.

m. If the output is too high or low, select value of A10C72, A10C21 or A10C77 until the output is $+5$ dBm, -2 $+4$ dB. Disconnect RF voltmeter and reconnect spectrum analyzer.

n. Set the 100 MHz switch to 2 and the 10 MHz switch to 2. Set the spectrum analyzer center frequency to 900 MHz.

p. Connect the oscilloscope 10X probe to A10-9. Tune A11C28 for maximum output on the oscilloscope. Remove the oscilloscope 10X probe.

r. Tune A10C29, A10C32, A10C36 and A10C39 for maximum output with minimum sidebands, 30 dB down or greater on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L9 through A10L12. Repeak A10C29, A10C32, A10C36 and A10C39.

s. Repeat step 4.4.33-f., except substitute A10C39 for A10C11.

t. If the output is too high or low, change value of A10C73, A10C35 or A10C78 until the output is $+5$ dBm, -2 $+4$ dB. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

u. Set the 100 MHz switch to 3 and the 10 MHz switch to 3. Set the spectrum analyzer center frequency to 1 GHz.

v. Connect the oscilloscope 10X probe to A10-13. Tune A11C34 for maximum output on the oscilloscope. Remove the oscilloscope 10X probe.

w. Tune A10C43, A10C46, A10C50 and A10C53 for maximum output with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L13 through A10L16. Repeak A10C43, A10C46, A10C50 and A10C53.

x. Repeat step 4.4.33-f., except substitute A10C43 for A10C11.

y. If the output is too high or low, select value of A10C74, A10C49 or A10C79 until the output is

+5 dBm, -2 +5 dB. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

z. Set the 100 MHz switch to 4 and the 10 MHz switch to 4. Set the spectrum analyzer center frequency to 1.1 GHz.

aa. Connect the oscilloscope 10X probe to A10-17. Tune A11C40 for maximum output on the oscilloscope. Remove the oscilloscope 10X probe.

ab. Tune A10C57, A10C60, A10C64 and A10C67 for maximum output with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A10L17 through A10L20. Repeak A10C57, A10C60, A10C64 and A10C67.

ac. Repeat step 4.4.33-f., except substitute A10C67 for A10C11.

ad. If the output is too high or low, select value of A10C75, A10C63 or A19C80 until the output is +5 dBm, -2 +4 dB. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

ae. Reinstall cover on A10 and set the 100 MHz and 10 MHz switches to 0. Push board A11 back into compartment.

af. Repeat steps 4.4.33-c., e. and f.

ag. Disconnect RF voltmeter and reconnect the spectrum analyzer.

ah. Repeat steps 4.4.33-h., k. and f., except substitute A10C25 for A10C11 in step 4.4.33-f.

aj. Disconnect RF voltmeter and reconnect the spectrum analyzer.

ak. Repeat steps 4.4.33-n., r. and f., except substitute A10C39 for A10C11 in step 4.4.33-f.

al. Disconnect RF voltmeter and reconnect the spectrum analyzer.

am. Repeat steps 4.4.33-u., w. and f., except substitute A10C53 for A10C11 in step 4.4.33-f.

an. Disconnect the RF voltmeter and reconnect the spectrum analyzer.

ap. Repeat steps 4.4.33-z., ab., and f., except substitute A10C67 for A10C11 in step 4.4.33-f.

ar. Set 100 MHz and 10 MHz switches to 5.

as. Disconnect the RF voltmeter and reconnect the spectrum analyzer. Set center frequency to 1.2 GHz.

at. Remove cover from A5. Connect oscilloscope 10X probe to A5-1. Verify that level is between 560 and 710 mV p-p. Remove the oscilloscope 10X probe.

au. Tune A5C1, A5C6, A5C10, A5C14 and A5C18 for maximum output with minimum sidebands, 30 dB down or greater, on the spectrum analyzer. Reduce sideband levels as far as possible by moving taps down on A5L1 through A5L5. Repeak A5C1, A5C6, A5C10, A5C14 and A5C18.

av. Repeat step 4.4.33-f. except substitute A5C18 for A10C11.

aw. If the output is too high or low, select value of A5C9, A5C13 or A5C17 until the output is +5 dBm, -2 +4 dB.

ax. Reinstall cover on A5.

ay. Repeat steps 4.4.33-au. and f., except substitute A5C18 for A10C11 in step 4.4.33-f.

az. Disconnect the RF voltmeter from BNC cable and reconnect the cable to Z1-R port.

4.4.34 Amplitude Modulation Adjustment

a. Disconnect the BNC cable from FL3 at Z1-X port. Connect a 50 ohm termination to the oscilloscope vertical input jack. Connect a 50 ohm BNC coaxial cable between the 50 ohm termination and Z1-X port.

b. Connect the audio oscillator to the AM MOD jack on the AFM-2 (Right Hand Module) and the oscilloscope external horizontal input jack.

c. Set the mainframe frequency switches to 5 MHz. Connect the ac VTVM to A7-2.

d. Set the audio oscillator frequency to 1 kHz and adjust its output level to obtain 75 mV rms at A7-2.

e. Adjust the oscilloscope controls to obtain a trapezoid pattern 5 divisions in width and 4 divisions in amplitude for E max. E min should be between 2.3 and 2.0 divisions (24% to 36% modulation). If E min is not within 2.3 and 2.0 divisions, select A7R22 for approximately 2.15 divisions (30% modulation). Observe that there is no visible distortion on the scope. Reconnect the BNC cable back to Z1-X port.

4.4.35 ALC Adjustment

a. Set mainframe POWER switch of OFF position and pull RFM module half-way out. Install extender cable PC2652 and set POWER switch on.

b. Disconnect BNC cable on input variable attenuator and connect RF voltmeter with a 50 ohm termination to the BNC jack (BBA output) mounted on BBA enclosure.

c. Set synthesizer frequency to 250 MHz and adjust A1A2R31 for an output of -23 dBm on RF voltmeter.

d. Rotate 100 MHz, 10 MHz and 1 MHz frequency switches throughout their ranges. Output should not vary more than ± 1 dB. Re-adjust A1A2R31 if necessary.

e. Disconnect RF voltmeter and reconnect input to variable attenuator. Remove extender cable and install RFM module.

4.4.36 VCO Adjustment

a. Measure at terminal A2-5 with the oscilloscope with 10X probe. Set the 100 kHz decade switch to V position. Set the 0-100 Hz control to zero. Adjust A2L5 for approximately 6 MHz on the oscilloscope. The level should be 2.3 V p-p ± 0.2 V p-p. If not within tolerance, select the value of A2R25. Set the 100 kHz decade switch to zero. Set the mainframe frequency switches to 1.0000 MHz.

b. Connect the broadband amplifier input to left-hand module RF OUTPUT jack and the output to the frequency counter input. Set the RF OUTPUT attenuator of the RF module to maximum output.

c. Set the mainframe 0-100 Hz control to "0" and adjust A2L5 for exactly 1 MHz on the counter.

d. Set the mainframe 0-100 Hz control to "5" and adjust A2R30 for exactly 1.00005 MHz.

e. Set the mainframe 0-100 Hz control to "10" and adjust A2R31 for exactly 1.0001 MHz.

f. Repeat steps 4.4.36-c., d. and e. until the frequencies are within ± 5 Hz of setting of the 0-100 Hz control.

g. Set the 0-100 Hz control to 5 and the mainframe switches to 1.0000 MHz.

h. Connect the oscilloscope 10X probe to A3ATP2.

j. Adjust A3AL1 and A3AL2 for maximum voltage and purest sine wave.

4.4.37 Phase Modulation Adjustment

a. Connect the broadband amplifier input to the RF module RF OUTPUT connector. Set the mainframe frequency switches to 15 MHz and the MODE switch to GEN.

b. Connect the broadband amplifier output to the frequency meter/ODM-1 measure input connector. NOTE: If an RFM module with 6 mV rms or greater RF output, such as an RFM-11A, is installed in the mainframe, the broadband amplifier is not necessary.

c. Set the frequency meter frequency controls to 17.000 MHz 0-1 kHz control out, audio switch to mod and 10 MHz switch out.

d. Set the ODM-1 controls as follows:

deviation range: 5 kHz

vertical input: internal

modulation mode: internal combined

vertical center: for trace at center line of graticule

e. Connect the audio oscillator and ac VTVM to the AFM-2 FM MOD connector. Set the audio oscillator frequency to 400 Hz and output level to 100 mV rms $\pm 0.5\%$ as read on the VTVM. Set the mainframe GENERATOR MODULATION switch to IN - ON.

f. Adjust the RFM Module variable output attenuator until the ODM-1 OPERATE lamp lights.

g. Select A1A6R33 for 5 kHz $\pm 15\%$ deviation on the ODM-1.

4.4.38 Frequency Modulation (VCO) Adjustment

a. Repeat steps 4.4.37-a. through 4.4.37-d.

b. Set the mainframe frequency switches to 015.0V00, 0-100 Hz control to 0, MODE switch to GEN and GENERATOR MODULATION switch to OUT - OFF.

c. Connect the audio oscillator and the ac VTVM to J3-B and H (rear panel ACC connector). Set the audio oscillator frequency to 1 kHz and output level to 500 mV rms $\pm 0.5\%$ as read on the VTVM.

d. Set A2R44 to mid-range position.

e. Adjust A2R47 for 5 kHz $\pm 15\%$ peak deviation on the ODM-1.

f. Set the mainframe frequency switches to 014.9V00 and 0-100 Hz control to 10.

g. Adjust A2R44 for exactly 5 kHz peak deviation on the ODM-1.

h. Repeat steps 4.4.38-b. e., f. and g. because there is interaction between the two trimmer resistors.

4.4.39 AM Distortion

- a. Remove the AFM-2 and install the OAM-1 in its place.
- b. Set the mainframe GENERATOR MODULATION switch to IN – ON.
- c. Set the mainframe MODE switch to GEN MOD CAL. Allow 2 minutes warm-up time.
- d. Set OAM-1 VERT MODE switch to VERT SET.
- e. Position CRT trace on VERTICAL SET line of the graticule with VERT POS control.
- f. Set VERT MODE switch to CARR SET.
- g. Position CRT trace on CARRIER SET line of the graticule with CARRIER LEVEL control.
- h. Set RANGE switch to GEN 30%.
- j. Set MOD/AUDIO OUT FREQ switch to 1 kHz.
- k. Rotate INT MOD/AUDIO OUT control for exactly full-scale deflection.
- l. Connect distortion analyzer to DIST ANAL jack and calibrate it to the modulating frequency.
- m. Verify that measured distortion is less than 3% at 30% modulation.
- n. If the distortion is $> 3\%$, slightly tune A7C31. If it cannot be brought into spec with A7C31, select the value of A7R21 and retune A7C31.
- p. Switch off the OAM-1.

4.4.40 Calibration of TCXO

- a. Mainframe must be turned off and remain in a 25°C ambient for at least 2 hours.
- b. Connect RFM module RF OUTPUT jack to input jack of the broadband amplifier. Connect output jack of the broadband amplifier to the frequency counter. (Broadband amplifier not necessary when RFM-11A is used.)
- c. Set the mainframe frequency switches to 10.000 MHz.
- d. Remove protective cap screw on TCXO cover (Figure 4-26).

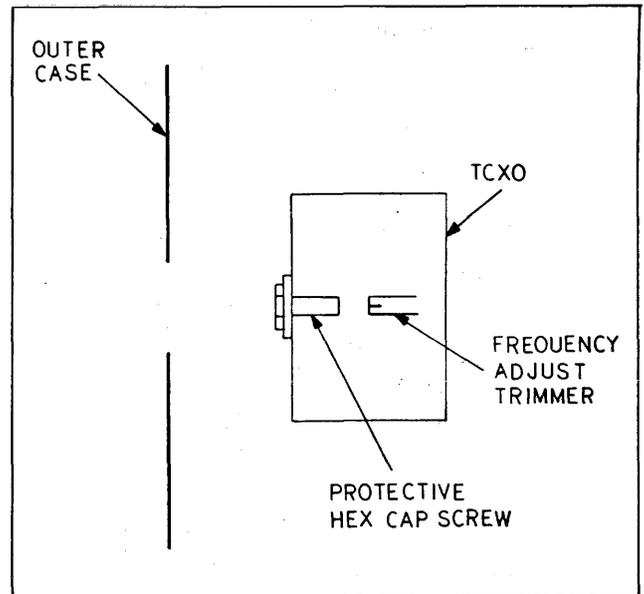


FIGURE 4-26. ACCESS TO TCXO

- e. Observe small slot-head frequency adjustment trimmer behind cap screw and the frequency offset given on the TCXO housing.
- f. Turn unit on and quickly (within 60 sec) adjust trimmer for 10 MHz \pm the offset given on the TCXO housing.

4.5 FAULT ISOLATION PROCEDURE (MODEL FM-10C MAINFRAME)

Fault isolation procedures are presented to provide a guide in servicing the FM-10C mainframe. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.3, with each subsection keyed to the paragraph in Section 4.3 that first indicates a fault. When a fault is noted during FM-10C mainframe operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.3.
- b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.
- c. When the fault is isolated to a function, such as the A1A6 board, refer to the alignment procedure for that board in Section 4.4 and check alignment of that board before proceeding with fault isolation.
- d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.5.1 POWER Indication Failure (4.3.1-d)

- a. Refer to figures 5-2 and 5-17 and check voltages and waveforms.
- b. If voltages and waveforms are within tolerance, replace POWER indicator lamp, DS1.

4.5.2 BEAT Indication Failure (4.3.1-f)

- a. Check for 2 MHz at J8-16. If 2 MHz is present, check FIM module as described in FIM maintenance section of the manual.
- b. If 2 MHz is absent, check for 2 MHz at J6-1; if 2 MHz is present, check buffer A1A5Q4.
- c. If 2 MHz is absent, check for 11 MHz at the synthesizer input jack, J7. If 11 MHz is present, trouble is in the RF module. Check the RF module as described in the RF module maintenance section of the manual.
- d. If 11 MHz is absent, check the synthesizer circuitry as described in paragraph 4.8.9.

4.5.3 0-100 Hz Control Tone Failure (4.3.1-g)

- a. Check the VCO circuitry by referring to figure 5-5 and utilizing the voltages and waveforms indicated.

4.5.4 0-100 Hz Switch Tone Failure (4.3.1-h)

- a. Check the appropriate frequency generator board assembly, A12 through A21, and 100 Hz decade board, A3A, and 100 Hz switch, S4, wiring.

4.5.5 1 kHz Switch Tone Failure (4.3.1-j)

- a. Check the appropriate frequency generator board assembly, A12 through A21, and 1 kHz decade board, A3B, and 1 kHz switch, S5, wiring.

4.5.6 No Output from AUDIO/TONE OUTPUT Jack (4.3.1-k)

- a. Check AUDIO/TONE OUTPUT jack, J5, and its associated wiring.

4.5.7 Meter Fails to Zero with ZERO Control (4.3.1-m)

- a. If FIM meter will zero with ZERO control and remote meter will not zero, check REM METER jack, J4, and its associated wiring. Also check FIM remote meter wiring.
- b. If FIM meter will not zero with ZERO control, trouble is in the FIM module. Check as described in FIM maintenance section of the manual.

4.5.8 Meter Fails to Deflect to the Left in 100 Hz Increments (4.3.1-o)

- a. Trouble is in the FIM module. Check FIM module as described in FIM maintenance section of the manual.

4.5.9 Frequency Accuracy Out of Tolerance (4.3.2-e through 4.3.2-l)

- a. Check accuracy of TCXO output and calibrate as directed in paragraph 4.4.40.
- b. If all frequencies in a decade are out of tolerance, check as in table 4-2.
- c. If any digit is out of tolerance, check as in table 4-3.

TABLE 4-2

DECADE FAULT ISOLATION

Decade	Assembly Number
100 MHz	A5,A9,A10,A11
10 MHz	A8
1 MHz	A6
100 kHz	A3D
10 kHz	A3C
1 kHz	A3B
100 Hz	A3A
0-100 Hz	A2

TABLE 4-3
DIGIT FAULT ISOLATION

DIGIT	100 MHz	10 MHz	1 MHz	100 kHz - 100 Hz
0	A9,A10 (700 MHz)	A21 (60 MHz)	A21 (36 MHz)	A21 (3.6 MHz)
1	A9,A10 (800 MHz)	A20 (70 MHz)	A20 (37 MHz)	A20 (3.7 MHz)
2	A9,A10 (900 MHz)	A19 (80 MHz)	A19 (38 MHz)	A19 (3.8 MHz)
3	A9,A10 (1000 MHz)	A18 (90 MHz)	A18 (39 MHz)	A18 (3.9 MHz)
4	A9,A10 (1100 MHz)	A17 (100 MHz)	A17 (40 MHz)	A17 (4.0 MHz)
5	A9/A5 (1200 MHz)	A16 (110 MHz)	A16 (41 MHz)	A16 (4.1 MHz)
6		A15 (120 MHz)	A15 (42 MHz)	A15 (4.2 MHz)
7		A14 (130 MHz)	A14 (43 MHz)	A14 (4.3 MHz)
8		A13 (140 MHz)	A13 (44 MHz)	A14 (4.4 MHz)
9		A12 (150 MHz)	A12 (45 MHz)	A12 (4.5 MHz)

4.5.10 Output Level Out of Tolerance (4.3.4-f)

a. If output level out of tolerance at some frequencies (not all frequencies), use the information in paragraph 4.8.9 to isolate the trouble to the particular assembly causing the trouble.

b. If output level out of tolerance at all frequencies, verify that the level at J6-3 is $-20 \text{ mVdc} \pm 3 \text{ mV}$. If level is out of tolerance, check RF module as described in the RF module maintenance section of the manual and the gain control amplifier (GCA), A7, in the mainframe.

4.5.11 Remote 2 MHz IF Output Out of Tolerance (4.3.4-f)

a. Check 2 MHz buffer, A1A5Q2.

4.5.12 External VCO Input Out of Tolerance (4.3.5-g and j)

a. Check FM linearity circuitry, R3 and R4 and A2R47 and A2R44 and VCO circuitry, A2.

4.5.13 10 MHz TCXO Output Out of Tolerance (4.3.6-a)

a. Calibrate TCXO as described in paragraph 4.4.40.

b. Check TIMEBASE switch, S13, circuitry.

4.5.14 External Timebase Input Inoperative (4.3.7-c)

a. Check TIMEBASE switch, S13, circuitry.

b. Check TIMEBASE jack, J2, circuitry.

4.5.15 10 MHz TCXO Output Out of Tolerance (4.3.8-h)

a. Check 1 MHz TCXO OUTPUT connector, J3-D, and its associated wiring.

b. Check R7 between TB4-1 and TB4-3.

c. Check for continuity between TB4-1 and A1A2-9.

4.5.16 +9 Vdc Output Out of Tolerance (4.3.9-b)

a. Check +9 Vdc output connector, J3-E and its associated wiring.

b. Check adjustment of A1A3R16 as described in paragraph 4.4.1.

4.6 TEST EQUIPMENT REQUIRED (MODEL RFM-10 MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in Table 4-4. Minimum parameters are provided to aid in the selection of the equivalent types.

TABLE 4-4

TEST EQUIPMENT REQUIREMENTS FOR MODEL RFM-10

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Sweep Generator	Frequency range: 50 kHz to 512 MHz Output level: -56 dBm to -23 dBm	Wavetek Model 2001
RF Detector	Frequency range: 50 kHz to 512 MHz	Wavetek Model D152
Signal Generator	Frequency range: 50 kHz to 500 MHz Level: -53 dBm to -23 dBm Output impedance: 50 ohms	Singer Model FM-2748
Oscilloscope with 10 X Probe	Frequency response: 11 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 531A
RF Voltmeter with 50 ohm load & T	Frequency response: 50 kHz – 512 MHz Level: -56 dBm to -27 dBm	Hewlett-Packard Model 3406A/ 11063A/6064
AC VTVM	Frequency response: 2 MHz Voltage measurement: 1.8 mV to 3.5 mV rms	Hewlett-Packard Model 427 A
DC Digital Voltmeter	Level: 17 – 23 mV dc Accuracy: $\pm 1\%$	Hewlett-Packard Model 3440A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
Radio Interference/ Field Intensity Meter	Frequency response: 250 MHz Level: 50 μ V	Singer Model NM-30A
9 MHz Signal Source	Frequency: 9 MHz Level: 100 mV rms Impedance: 50 ohms	Singer Model FM-2748
DC Amplifier	Gain: 40 dB Input & Output impedance: 2 M ohms	Hewlett-Packard Model 8875A
Mainframe/RF & MDM-1 Modules	Required for testing RFM-10 plug-in module	Singer Model FM-10C Mainframe with RF & MDM-1 plug-ins
Connector	24 pin, female	Singer P/N 1-910072-002
Connector	BNC	Singer P/N 1-910022-004
Connector	Push-on	Singer P/N 1-910173-001
Resistor	200 ohm	Not applicable

4.7 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL RFM-10 MODULE)

4.7.1 Power Requirements

All power required by the RFM-10 is supplied by the mainframe.

4.7.2 Output Level Check

a. Install the RFM-10 module in the mainframe left-hand compartment. Connect the RF voltmeter (with the 50 ohm termination) to the RF OUTPUT jack at the RFM-10 module. Set mainframe MODE switch to GEN.

b. Set the RF OUTPUT attenuator to 5uV on the dial.

c. Set the mainframe frequency switches to 100.0000 MHz and the 0-100 Hz control to the OUT position.

d. The RF voltmeter should indicate 500 uV \pm 3 dB (354-707 uV rms)

e. Repeat step 4.7.2-d. at 50 kHz, 1 MHz, 10 MHz and every 50 MHz up to 512 MHz.

4.7.3 Measure Mode Sensitivity Check

a. Install the MDM-1 module into the FM-10C mainframe right-hand compartment and a FIM module into the center compartment. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF and frequency switches to 150 MHz.

b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE.

c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 150 MHz and level to 6 mV rms.

d. Set the MDM-1 MTR switch to LIM (IN) position.

e. Adjust the signal generator frequency slightly to obtain a zero beat indication on the FIM module.

f. The MDM-1 meter should indicate "red line." If not, re-adjust the signal generator output level to obtain exactly "red line" on the MDM-1 meter. The signal generator output level should be between 4.2 and 8.2 mV rms (6 mV \pm 3 dB).

4.8 ALIGNMENT AND ADJUSTMENT (MODEL RFM-10 MODULE)

NOTE: The alignment and adjustment procedure is performed with the RFM-10 disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the RFM-10. Refer to figures 4-27 and 4-28 for test point and trimmer locations. Remove the five screws from the back of the RFM-10 and slide the cover off.

4.8.1 Broadband Amplifier Alignment (A1A4)

a. Place the connector P/N 1-910072-002 onto its mating plug at the back of the RFM-10. Fabricate a BNC to "push-on" connector cable 10 inches long.

b. Connect the power supply positive lead to terminal 9 and the negative lead to terminal 21 of the connector at the back of the RFM-10.

c. Connect the RF output jack, A1A4J3, to the detector RF input with a 6" to 12" 50 ohm BNC cable.

d. Connect the detector dc output to the sweep generator demodulator input jack.

e. Connect the sweep generator vertical jack to the dc amplifier input jack and the dc amplifier output jack to the oscilloscope vertical input jack.

f. Connect the sweep generator horizontal jack to the oscilloscope external horizontal input jack using a 50 ohm coaxial cable.

g. Connect the sweep generator RF output to the RF input connector at the back of the RFM-10 using the push-on to BNC cable fabricated in step 4.8.1-a. Set the sweep generator center frequency to 250 MHz, sweep width to approximately 520 MHz, 50 MHz harmonic switch on and output level to -33 dBm.

h. Set the oscilloscope vertical attenuator so that the display covers $\frac{1}{2}$ to $\frac{3}{4}$ of the CRT graticule.

i. Individually short one-half, one, or more turns of A1A4L1, A1A4L2, A1A4L4, and A1A4L5 together, using two insulated tuning sticks, to obtain the flattest possible response curve. Solder the necessary turns together.

j. To increase the level at the low frequency end, increase value of A1A4R14.

k. If the high frequency gain is still too high or the amplifier has tendencies to oscillate, reduce the value of the A1A4R16 and/or increase the value of A1A4R8 until the required flatness at the high frequencies is obtained or the oscillation ceases.

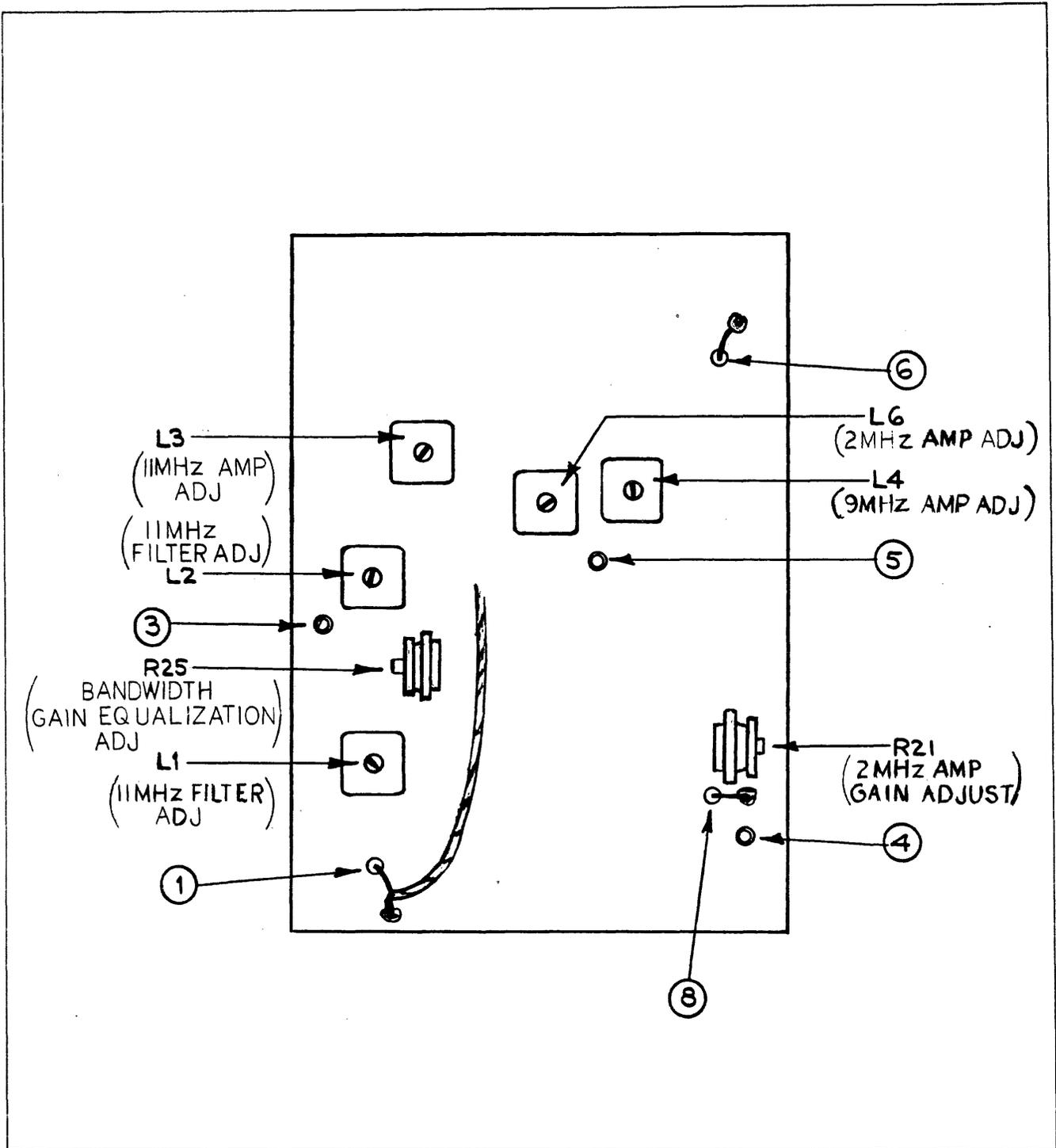


FIGURE 4-27. 11 MHz IF BOARD ASSEMBLY, A1A3 (RFM-10)

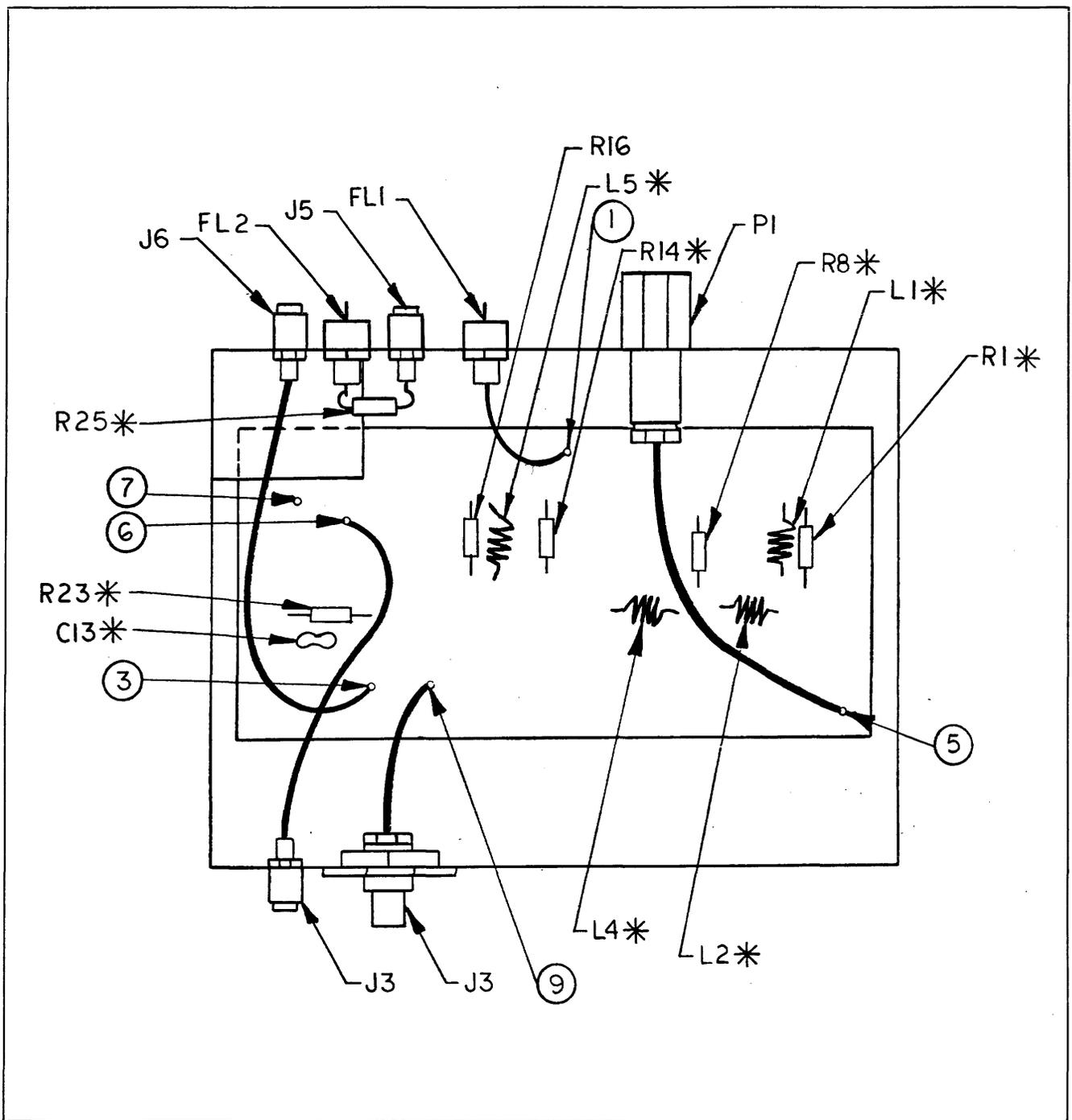


FIGURE 4-28. BROADBAND AMPLIFIER, MIXER, DETECTOR ASSEMBLY, A1A4 (RFM-10)

l. Once the response curve is flat within ± 1.5 dB, disconnect the detector from the amplifier output and replace with an RF voltmeter. Set the sweep generator to the CW position. The amplifier RF output level should be -23 dBm ± 3 dB. Rotate the sweep generator center frequency control from 50 kHz to 500 MHz. The level should not change more than ± 3 dB from -23 dBm.

4.8.2 ALC Detector Adjustment

a. Connect the digital voltmeter to the ALC output (terminal 3) of the connector at back of the RFM-10.

b. Set the sweep generator frequency to 50 kHz and its output level to produce -23 dBm on the RF voltmeter.

c. Observe the detected ALC voltage, it should be -20 mV ± 3 mVdc.

d. Set the sweep generator frequency to 500 MHz and adjust its output level to produce -23 dBm on the RF voltmeter.

e. Observe the detected ALC voltage, it should be -20 mV ± 3 mVdc.

f. Select the values of A1A4R23 and A1A4C13 to produce -20 mV ± 3 mVdc at 50 kHz and 500 MHz respectively.

g. Repeat steps 4.8.2-b. and 4.8.2-c. at 1 MHz, 50 MHz and every 50 MHz up to 500 MHz. Maintain the amplifier output level at -23 dBm at each frequency. The ALC voltage shall not vary from the voltage observed at 50 kHz greater than ± 3 mVdc.

4.8.3 11 MHz IF Filter and Amplifier Alignment

a. Disconnect the 11 MHz IF plug, P5, from A1A4J5. Connect it to the sweep generator RF output jack via the BNC-to-phono jack cable or connector adapter.

b. Unsolder A1A3C15 at the junction of A1A3C15 and A1A3C17. Connect a 50 ohm BNC coaxial cable center conductor to the unsoldered end of A1A3C15 and connect the shield to ground. Connect the other end of the cable to the detector RF input.

c. Connect the necessary cables for displaying the swept signal on the oscilloscope.

d. Connect a jumper between terminals 9 and 10 of the test connector.

e. Set the sweep generator center frequency to 11 MHz, sweep width to approximately zero, 10 MHz markers on, and output level to -33 dBm.

f. Set the oscilloscope for a display that covers $\frac{1}{2}$ to $\frac{3}{4}$ of the graticule.

g. Set the MEASURE MODE BANDWIDTH switch to the OUT-WIDE position.

h. Adjust the sweep generator center frequency control so that the 10 MHz marker is on the left side of the CRT center graticule line.

j. Set the sweep generator 1 MHz harmonic switch on and adjust both the sweep width and center frequency controls so that the 11 MHz marker is exactly on the center graticule line and the 10 MHz and 12 MHz markers are approximately 4 cm away on either side of the 11 MHz marker.

k. Adjust A1A3L1, A1A3L2 and A1A3L3 to center the peak of the response curve exactly on the 11 MHz marker and for the best slope symmetry on either side.

l. Set the MEASURE MODE BANDWIDTH switch to the IN-NARROW position. The narrow 11 MHz crystal filter response should be exactly on the 11 MHz marker and the NARROW indicator lamp should be lit.

m. Set the sweep generator sweep time to the 100-10 second position and the variable control to the maximum cw position. Adjust the sweep width and center frequency controls to spread the narrow response out to approximately 2 cm wide. Note the average ripple level on the CRT.

n. Set MEASURE MODE BANDWIDTH switch back to the WIDE position. The wide response is drastically spread out so that only the peak portion of it is visible on the CRT. The level of the peak should exactly equal the average ripple level of the crystal filter. If it is not equal, adjust A1A3R25 until it is equal. Switch back and forth from NARROW to WIDE a few times to make sure that they are equal.

4.8.4 9 MHz Amplifier Alignment

a. Connect the oscilloscope 10X probe to A1A3Z1-L.

b. Connect the 9 MHz signal source to terminal 24 of the connector at the rear of the RFM-10.

c. Adjust A1A3L4 for maximum response on the oscilloscope. The level should be 500-650 mV p-p.

4.8.5 2 MHz IF Alignment

a. Set the oscilloscope controls back to sweep operation. Remove the 10X probe and connect a 50 ohm BNC coaxial cable between the vertical input jack and the sweep generator vertical jack. Solder A1A3C15 back into the circuit.

b. Connect a 50 ohm BNC cable between the detector RF input and terminal 1 of the connector at the rear of the RFM-10.

c. Unsolder the cable from A1A3-1 and solder a 50 ohm coaxial cable with a BNC connector at one end to this terminal. Connect the RF detector dc output terminal to the sweep generator demodulator input jack.

d. Set the sweep generator center frequency to 11 MHz, sweep width approximately zero, 1 MHz harmonics on, level to -56 dBm. Set A1A3R21 to mid-range.

e. Due to the mixing action of the 9 MHz input, the markers will be down-converted (the 10 MHz marker will become 1 MHz, the 11 MHz will become 2 MHz and the 12 MHz marker will become 3 MHz). Observe the oscilloscope and set the volts/cm switch so that the 2 MHz response curve covers $\frac{1}{2}$ to $\frac{3}{4}$ full scale on the CRT. The peak of the response curve should be close to the 2 MHz marker. If it is in between two markers switch out the 1 MHz markers and switch in the 10 MHz marker and move the 10 MHz marker to approximately 4 cm to the left of the center graticule line with the center frequency control. Switch out the 10 MHz marker and switch the 1 MHz markers back in. Adjust the center frequency control so that the 2 MHz marker is exactly on the center graticule line. Adjust the sweep width control so that the 1 MHz and 3 MHz markers are approximately 4 cm on either side of the center graticule line (2 MHz). Adjust A1A3L6 so that the center of the peak of the response curve is exactly on the 2 MHz marker.

4.8.6 Measure Input Sensitivity Alignment

a. Set the sweep generator to the CW position and the center frequency control to approximately 33 MHz. Calibrate the output level to -33 dBm in the CW position.

b. Connect the signal generator RF output jack to the RFM-10 MEASURE INPUT jack using a 50 ohm coaxial cable. Set and calibrate its frequency at 22 MHz and its attenuator for 6mV output level.

c. Connect the 50 ohm load to the RF voltmeter. Set the RF voltmeter range to 10 mV and zero the meter with the probe removed from terminal 1 of the connector on the rear of the RFM-10. Connect the probe pack to this terminal.

d. Connect the jumper between terminals 9 and 10 of the connector on the back of the RFM-10.

e. Observe the RF voltmeter. Adjust the sweep generator center frequency control for maximum deflection.

f. Adjust A1A3R21 for 2.5 mV on the RF voltmeter.

4.8.7 Attenuator Dial Calibration

a. Connect the signal generator to the RF

Input jack P1, and connect the RF voltmeter to RF output jack A1A4J3, using the 50 ohm load.

b. Set the signal generator frequency to 250 MHz and set its output level to read -23 dBm on the RF voltmeter.

c. Calibrate the NM-30 so that at 250 MHz and at a level of 50 uV, the meter indicates 20 dB (mid-scale).

d. Remove the RF voltmeter from A1A4J3 and reconnect the cable from the variable attenuator, AT2. Connect a 50 ohm BNC coaxial cable between the RFM-10 RF OUTPUT jack and the NM-30 input jack. Adjust the RFM-10 attenuator for a 20 dB indication on the NM-30 meter. Loosen the two set screws on the attenuator dial and rotate the dial, being careful not to disturb the attenuator shaft position, until 0.5 uV on the dial lines up exactly with the black line on the index. Tighten the two set screws.

e. Disconnect the cable at the NM-30 RF input jack. Disconnect the cable from the signal generator at the BBA RF input jack and connect it to the NM-30 RF input jack. Adjust the signal generator output level to 500 uV. Recalibrate the NM-30 so that the meter indicates 20 dB.

f. Disconnect the cable from the NM-30 RF input jack and connect it to the BBA RF input jack. Disconnect the cable from the BBA RF output jack and connect the RF voltmeter to the BBA RF output jack. Adjust the signal generator output level to -23 dBm and remove the RF voltmeter from the BBA RF output jack and reconnect the cable from the attenuator to the BBA RF output jack. Connect the cable from the RFM-10 RF OUTPUT jack to the MN-30 input jack. Rotate the attenuator dial until 5 uV lines up exactly with the black line on the index. The NM-30 meter should now indicate 20 dB \pm 3 dB.

4.9 FAULT ISOLATION PROCEDURE (MODEL RFM-10 MODULE)

Fault isolation procedures are presented to provide a guide in servicing the RFM-10. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.7, with each subsection keyed to the paragraph in Section 4.7 that first indicates a fault. When a fault is noted during RFM-10 operation, proceed as follows:

a. Perform minimum performance checkout procedures in Section 4.7.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a function, such as the ALC detector, refer to the alignment procedure for that function in Section 4.8 and check alignment of that function before proceeding with fault isolation.

d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.9.1 Output Level Not Within Tolerance (4.7.2-d. or 4.7.2-e.)

a. Check alignment of broadband amplifier as in paragraph 4.8.1.

b. Check alignment of ALC detector, as in paragraph 4.8.2.

c. Check variable attenuator, AT2, and 10 dB pad, AT1.

d. Check mainframe as in mainframe section of manual.

4.9.2 Measure Mode Sensitivity Not Within Tolerance (4.7.3-f.)

a. Check measure input sensitivity alignment as in paragraph 4.8.6. and the associated circuitry.

b. Check 11 MHz IF amplifier alignment as in paragraph 4.8.3. and the associated circuitry.

c. Check 9 MHz amplifier alignment as in paragraph 4.8.4 and the associated circuitry.

d. Check 2 MHz IF alignment as in paragraph 4.8.5 and the associated circuitry.

4.10 TEST EQUIPMENT REQUIRED (MODEL RFM-10A MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in Table 4-5. Minimum parameters are provided to aid in the selection of the equivalent types.

**TABLE 4-5
TEST EQUIPMENT REQUIREMENTS FOR MODEL RFM-10A**

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Sweep Generator	Frequency range: 50 kHz to 512 MHz Output level: -81 dBm to -23 dBm	Wavetek Model 2001
RF Detector	Frequency range: 50 kHz to 512 MHz	Wavetek Model D152
Signal Generator	Frequency range: 50 kHz -- 500 MHz Level: -80 dBm to -13 dBm Output impedance: 50 ohms	Singer Model FM-2748
Oscilloscope with 10 X Probe	Frequency response: 11 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 532 with 53/54B plug-in
RF Voltmeter with 50 ohm load & T	Frequency response: 50 kHz to 512 MHz Level: -56 dBm to -27 dBm	Hewlett-Packard Model 3406A/ 11063A/6064
AC VTVM	Frequency response: 2 MHz Level: 1.8 mV to 3.5 mV rms	Hewlett-Packard Model 427 A
DC Digital Voltmeter	Level: -20 mV dc Accuracy: ± 1%	Hewlett-Packard Model 3440A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
Radio Interference/ Field Intensity Meter	Frequency response: 250 MHz Level: 50 uV	Singer Model NM-30A

Table 4-5. Test Equipment Requirements for Model RFM-10A (Cont.)

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
9 MHz Signal Source	Frequency range: 9 MHz Level: 100 mV rms Impedance: 50 ohms	Singer Model FM-2748
Mainframe/RF Module/MDM-1 Module	Required for testing RFM-10A Module	Singer Model FM-10C Mainframe with RF & MDM-1 Module
DC Amplifier	Gain: 40 dB Input & Output impedance: 2 M ohms	Hewlett-Packard Model 8875A
Connector	24 pin, female	Singer P/N 1-910072-002
Connector	BNC	Singer P/N 1-910022-004
Connector	Push-on	Singer P/N 1-910173-001
Resistor	200 ohms \pm 5%, ¼ watt	Not applicable

4.11 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL RFM-10A MODULE)

4.11.1 Power Requirements

All power required by the RFM-10A is supplied by the mainframe.

4.11.2 Output Level Check

a. Install the RFM-10A into the mainframe left-hand compartment. Connect the RF voltmeter with the 50 ohm termination) to the RF OUTPUT jack of the RFM-10A Module. Set mainframe MODE switch to GEN.

b. Set the RF OUTPUT attenuator to 5 uV on the dial.

c. Set the mainframe frequency switches to 1000,0000 MHz and the 0-100 Hz control to the OUT position.

d. The RF voltmeter should indicate 500 uV \pm 3 dB (354-707 uV rms).

e. Repeat step 4.11.2-d. at 50 kHz, 1 MHz, 10 MHz 50 MHz and every 50 MHz up to 512 MHz.

4.11.3 Measure Mode Sensitivity Check

a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF and frequency switches to 150 MHz.

b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE. Set the MEASURE SENSITIVITY switch and MEASURE SENSITIVITY control to 6 mV.

c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 150 MHz and level to 6 mV rms.

d. Insert the MDM-1 module into the right-hand compartment and the FIM module in the center compartment. Set the MDM-1 MTR switch to the LIM (IN) position.

e. Adjust the signal generator frequency slightly to obtain a zero beat indication on the FIM BEAT lamp.

f. The MDM-1 meter should indicate "red line". If not, re-adjust the signal generator output level to obtain exactly "red line" on the MDM-1 meter. The signal generator output level should be between 4.2 and 8.2 mV rms (6 mV \pm 3 dB).

4.12 ALIGNMENT AND ADJUSTMENT (MODEL RFM-10A MODULE)

Note - The alignment and adjustment procedure is performed with the RFM-10A disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the RFM-10A. Refer to figures 4-29 and 4-30 for test point and trimmer locations. Remove the five screws from the back of the RFM-10A and slide the cover off.

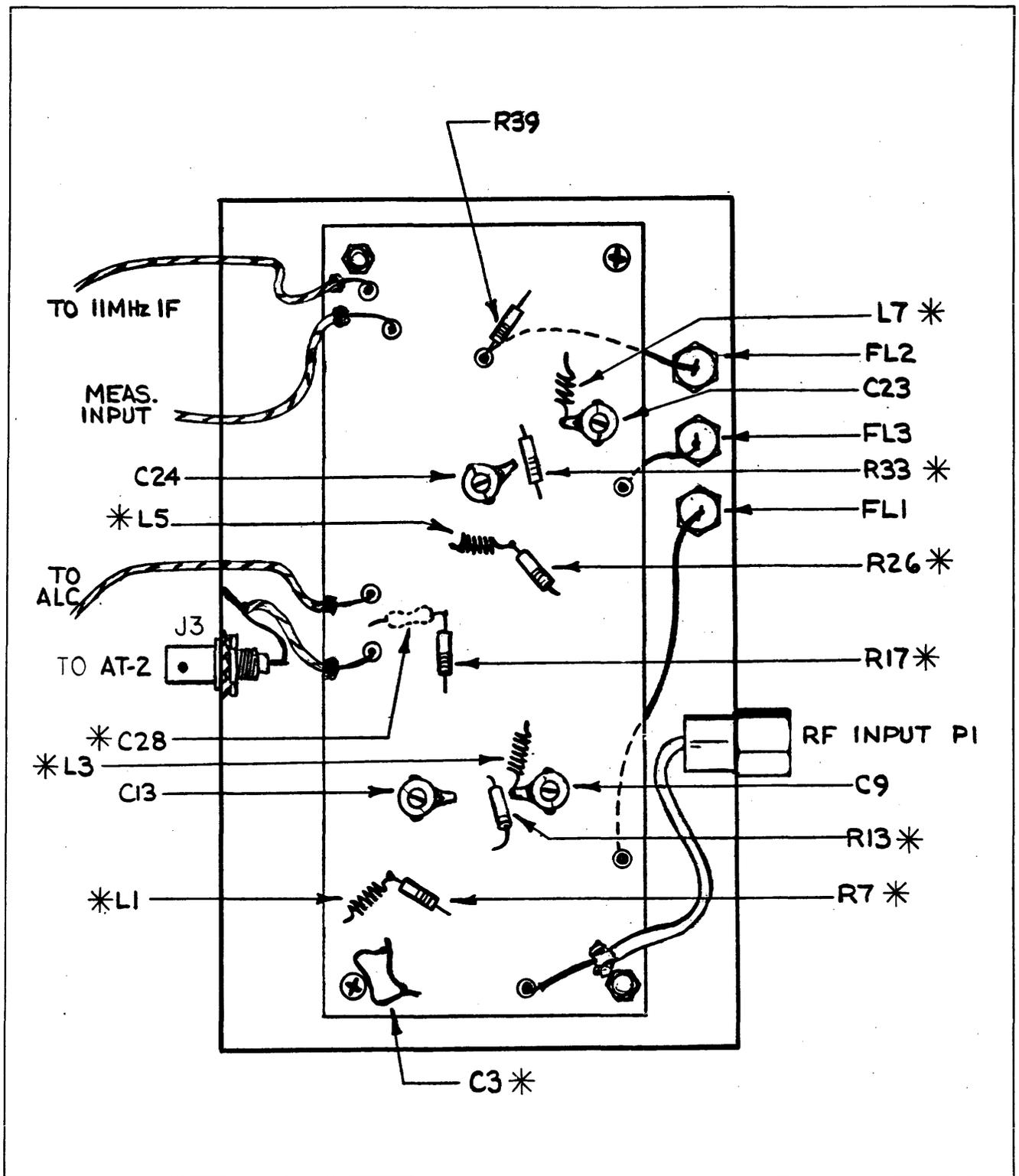


FIGURE 4-30. BROADBAND AMPLIFIER AND MIXER ASSEMBLY, A1A4 (RFM-10A)

4.12.1 Broadband Amplifier Alignment (A1A4)

a. Place the connector P/N 1-910072-002 onto its mating plug at the back of the RFM-10A. Fabricate a BNC to "Push-on" connector adapter, 10 inches in length.

b. Connect the power supply positive lead to terminal 9 and the negative lead to terminal 21 of the connector at the back of the RFM-10A.

c. Connect the sweep generator RF output to the RF input of the RFM-10A using the 10" cable adaptor fabricated in paragraph 4.12.1-a.

d. Connect the RF output jack, A1A3J3, to the detector RF input with a 6" to 12" 50 ohm BNC cable.

e. Connect the detector dc output to sweep generator demodulator input jack.

f. Connect the sweep generator vertical jack to the dc amplifier input jack and the dc amplifier output jack to the oscilloscope vertical input jack using a 50 ohm coaxial cable.

g. Connect the sweep generator horizontal jack to the oscilloscope external horizontal input jack using a 50 ohm coaxial cable.

h. Set the sweep generator center frequency to 250 MHz, sweep width to approximately 520 MHz, 50 MHz harmonics on and output level to -33 dBm.

j. Set the oscilloscope vertical attenuator switch so that the display covers $\frac{1}{2}$ to $\frac{3}{4}$ of the CRT graticule.

k. Adjust trimmer capacitors A1A4C9 and A1A4C13 for the flattest response curve on the oscilloscope.

l. Individually short one or more turns of A1A4L1 and A1A4L3 together using two insulated turning sticks, to obtain the flattest possible response curve. Solder the necessary turns together. Re-adjust A1A4C9 and A1A4C13 as necessary.

m. Individually select resistors A1A4R7 and A1A4R13 as necessary to obtain the flattest overall response curve. Decrease the resistor value to decrease the gain.

n. If the amplifier high frequency gain is too high or too low, increase or decrease the value of A1A3C3 to obtain the flattest possible response curve. Repeat steps 4.12.1-k. through 4.12.1-m. as necessary.

p. Once the amplifier response is flat within ± 1.5 dB, disconnect the detector from the amplifier output and replace with an RF voltmeter with a 50 ohm load. Set

the sweep generator mode switch to the CW position. The amplifier RF output level should be $-23 \text{ dBm} \pm 1.5 \text{ dB}$. Rotate the sweep generator center frequency control from 50 kHz to 500 MHz. The level should not change more than $\pm 1.5 \text{ dB}$ from -23 dBm .

r. If the amplifier gain is too high or too low, repeat steps 4.12.1-k. through 4.12.1-n. until the required output level and flatness is obtained.

s. Set the sweep generator mode switch back to ΔF and the center frequency control back to 250 MHz. Adjust the output level for -23 dBm on the RF voltmeter. Disconnect the RF voltmeter from the amplifier output.

t. Connect terminals 9 and 10 of the test connector together on the back of the RFM-10A. (Measure Mode). Place the BNC 50 ohm load on the amplifier output.

u. Unsolder the mixer end of A1A4C27 connected to the R port and connect a short BNC cable center conductor to the unsoldered capacitor lead and solder the shield to ground. Connect the detector to the BNC end of the cable.

v. Adjust trimmer capacitors A1A4C23 and A1A4C25 for the flattest overall response curve.

w. Individually short one or more turns of A1A4L5 and A1A4L7 together, using two insulated tuning sticks, to obtain the flattest possible response curve. Solder the necessary turns together. Re-adjust A1A4C23 and A1A4C25 as necessary.

x. Individually select resistors A1A4R26 and A2A4R33 as necessary to obtain the flattest overall response curve. Decrease the resistor value to decrease the gain.

y. Once the amplifier response is flat within $\pm 2 \text{ dB}$, remove the BNC 50 ohm load from the output jack and connect the RF voltmeter to this connector. Set the sweep generator mode switch to CW. Reset the sweep generator output level to produce -23 dBm on the RF voltmeter. Replace the 50 ohm BNC load onto the output jack and disconnect the detector from the BNC cable and connect the RF voltmeter to this cable. The amplifier output level at this point should be $+4 \text{ dBm} \pm 2 \text{ dB}$. Rotate the sweep generator center frequency control from 11 MHz to 500 MHz. The level should not change more than $\pm 2 \text{ dB}$ from $+4 \text{ dBm}$.

z. If the amplifier gain is too high or too low, repeat steps 4.12.1-v. through 4.12.1-y. until the required output level and flatness is obtained.

aa. Resolder A1A4C27 back onto the mixer R port.

4.12.2 ALC Detector Adjustment

- a. Connect the signal generator to the RF INPUT jack using a 50 ohm BNC coaxial cable. Set the source frequency to 50 kHz and output level to approximately -33 dBm.
- b. Remove the jumper from terminal 10 of the test connector.
- c. Connect the digital voltmeter to P2-3 (ALC output).
- d. Connect the RF voltmeter (with 50 ohm load) to A1A3J3.
- e. Observe the RF voltmeter and adjust the signal source output level for -23 dBm on the meter. The ALC voltage indicated on the DVM should be $-20 \text{ mV} \pm 3 \text{ mV}$.
- f. Repeat step 4.12.2-e. at 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 500 MHz. The amplifier output level must be maintained at -23 dBm at each frequency.
- g. If the ALC voltage at 50 kHz is greater than $\pm 3 \text{ mV}$ from -20 mV, increase the value of A1A4R17 to decrease the ALC voltage.
- h. If the ALC voltage at 500 MHz is greater than $\pm 3 \text{ mV}$ from -20 mV, add capacitor A1A4C28 between the junction of A1A4R17 and A1A4CR1 to ground. Select a value of 1 or 2 pF (DM-15) to equal the voltage level noted at 50 kHz.
- i. Repeat step 4.12.2-f. to assure that ALC voltage is $-20 \text{ mV} \pm 3 \text{ mV}$ across the bandwidth.

4.12.3 11 MHz IF Filter and Amplifier Alignment

- a. Connect the sweep generator RF output jack to A1A3-3.
- b. Unsolder A1A3C23 at one end. Connect a 50 ohm BNC coaxial cable center conductor to the junction of A1A3R19 and A1A3R21 and connect the shield to ground. Connect the other end to the cable to the detector RF input.
- c. Connect the necessary cables for displaying the swept signal on the oscilloscope.
- d. Reconnect the jumper between terminals 9 and 10 of the test connector.
- e. Set the sweep generator center frequency to 11 MHz. sweep width to approximately zero, 10 MHz markers on.
- f. Set the oscilloscope for a display that covers $\frac{1}{2}$ to $\frac{3}{4}$ of the graticule.

g. Set the MEASURE SENSITIVITY switch on the RFM-10A front panel to the HIGH position and the MEASURE MODE BANDWIDTH switch to the OUT-WIDE position.

h. Adjust the sweep generator center frequency control so that the 10 MHz marker is on the left side of the CRT center graticule line.

j. Set the sweep generator 1 MHz harmonics on and adjust both the sweep width and center frequency controls so that the 11 MHz marker is exactly on the center graticule line and the 10 MHz and 12 MHz markers are approximately 4 cm away on either side of the 11 MHz marker.

k. If the IF response is not visible on the CRT, adjust A1A3R17 until it is visible.

l. Adjust A1A3L1, A1A3L2 and A1A3L3 to center the peak of the response curve exactly on the 11 MHz marker and for the best slope symmetry on either side.

m. Set the MEASURE MODE BANDWIDTH switch to the IN-NARROW position. The narrow 11 MHz crystal filter response should be exactly on the 11 MHz marker and the NARROW indicator lamp should be lit.

n. Set the sweep generator sweep time switch to the 100-10 second position and the variable control to the maximum cw position. Adjust the sweep width and center frequency control to spread the narrow response out to approximately 2 cm wide. Note the average ripple level on the CRT.

p. Set MEASURE MODE BANDWIDTH switch back to the OUT-WIDE position. The wide response is drastically spread out so that only the peak portion of it is visible on the CRT. The level of the peak should exactly equal the average ripple level of the crystal filter. If it does not, adjust A1A3R2 until it is. Switch back and forth from narrowband to wideband a few times to make sure that they are equal.

4.12.4 9 MHz Filter Alignment

- a. Connect the oscilloscope 10X probe to A1A3U2-5.
- b. Connect the 9 MHz signal source to terminal 24 of the connector at the rear of the RFM-10A.
- c. Adjust A1A3L4 for maximum response on the oscilloscope. The level should be 240-360 mV p-p.

4.12.5 2 MHz IF Alignment

a. Set the oscilloscope controls back to "sweep" operation. Remove the 10X probe and connect a 50 ohm BNC coaxial cable between the vertical input jack and the sweep generator vertical jack. Solder A1A3C23

back into the circuit. Set the MEASURE SENSITIVITY control to the maximum cw position.

b. Connect a 50 ohm BNC cable between the detector RF input and terminal 1 of the connector at the rear of the RFM-10A.

c. Unsolder the cable from A1A3-3 and solder a 50 ohm coaxial cable with a BNC connector at one end to this terminal. Connect the RF detector dc output terminal to the sweep generator demodulation input jack.

d. Set the sweep generator center frequency to 11 MHz, sweep width to approximately zero. 1 MHz harmonics on, and level to -44 dBm.

e. Due to the mixing action of the 9 MHz input, the markers will be down-converted (the 10 MHz marker will become 1 MHz, the 11 MHz will become 2 MHz and the 12 MHz marker will become 3 MHz). Observe the oscilloscope and set the volts/cm switch so that the 2 MHz response curve covers $\frac{1}{2}$ to $\frac{3}{4}$ full scale on the CRT. If unable to obtain this amplitude, adjust A1A3R17. The peak of the response curve should be close to the 2MHz marker. If it is in between two markers, switch off the 1 MHz markers and switch on the 10 MHz marker and set the 10 MHz marker approximately 4 cm to the left of the center graticule line with the center frequency control. Switch off the 10 MHz marker and switch the 1 MHz markers back on. Adjust the center frequency control so that the 2 MHz marker is exactly on the center graticule line. Adjust the sweep width control so that the 1 MHz and 3 MHz markers are approximately 4 cm on either side of the center graticule line (2 MHz). Adjust A1A3L5 so that the center of the peak of the response curve is exactly on the 2 MHz marker.

4.12.6 Measure Input Sensitivity Alignment

a. Connect the sweep generator to the RF INPUT jack and set the sweep generator mode switch to the CW position and the center frequency control to approximately 33 MHz. Calibrate the output level to -33 dBm in the CW position.

b. Connect the signal generator RF output jack to the RFM-10A MEASURE INPUT jack using a 50 ohm coaxial cable. Set and calibrate its frequency at 22 MHz and its attenuator for 600 uV output level.

c. Set the RFM-10A MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to 0.6 mV (fully cw).

d. Connect the 50 ohm load to the RF voltmeter type N tee. Set the RF voltmeter to the 10 mV range and zero the meter with the probe removed from terminal 1 of the connector on the rear of the RFM-10A. Connect the probe back to this terminal.

e. Connect the jumper between terminals 9 and 10 of the connector on the back of the RFM-10A.

f. Observe the RF voltmeter. If there is an up-scale deflection, adjust the sweep generator center frequency control for maximum deflection. If there is no deflection or greater than full-scale deflection, adjust A1A3R14 to bring the pointer on-scale, adjust the sweep generator center frequency control for maximum deflection.

h. Set the signal source RF output level to 20 uV.

j. Set the RFM-10A MEASURE SENSITIVITY switch to the HIGH position.

k. Adjust A1A3R17 for 2.5 mV on the RF voltmeter.

l. Rotate the RFM-10A MEASURE SENSITIVITY control to the maximum ccw position.

m. Set the signal source output level to 800 uV. The RF voltmeter should indicate approximately 2.5 mV.

n. Set the MEASURE SENSITIVITY switch to the NORMAL position and set the signal source output level to 24 mV. The RF voltmeter should read approximately 2.5 mV.

4.12.7 Attenuator Dial Calibration

a. Connect the signal generator to the RF input connector, P1, and connect the RF voltmeter to RF output jack A1A4J3 using the 50 ohm load.

b. Set the signal generator frequency to 250 MHz and set its output level to read -23 dBm on the RF voltmeter.

c. Calibrate the NM-30 so that at 250 MHz, 50 uV, the meter indicates 20 dB (mid-scale).

d. Remove the RF voltmeter from A1A4J3 and reconnect the cable from the variable attenuator, AT2. Connect a 50 ohm BNC coaxial cable between the RFM-10A RF OUTPUT jack and the NM-30 RF input jack. Adjust the RFM-10A attenuator for a 20 dB indication on the NM-30 meter. Loosen the two set screws on the attenuator dial and rotate the dial, being careful not to disturb the attenuator shaft position, until 0.5 uV on the dial lines up exactly with the black line on the index. Tighten the two set screws.

e. Disconnect the cable at the NM-30 RF input jack. Disconnect the cable from the signal generator at the BBA rf output jack and connect it to the NM-30 RF input jack. Adjust the signal generator output level to 500 uV. Recalibrate the NM-30 so that the meter indicates 20 dB.

f. Disconnect the cable from the signal generator at the NM-30 rf input jack and connect it to the

BBA RF input jack. Disconnect the cable from the BBA rf output jack and connect the RF voltmeter to the BBA RF output jack. Adjust the signal generator output level to -23 dBm and remove the RF voltmeter from the BBA RF output jack and reconnect the cable from the attenuator to the BBA RF output jack. Connect the cable from the RFM-10A RF OUTPUT jack to the NM-30 RF input jack. Rotate the attenuator dial until 5 uV lines up exactly with the black line on the index. The NM-30 meter should now indicate 20 dB \pm 3 dB.

4.13 FAULT ISOLATION PROCEDURES (MODEL RFM-10A MODULE)

Fault isolation procedures are presented to provide a guide in servicing the RFM-10A. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.11, with each subsection keyed to the paragraph in Section 4.11 that first indicates a fault. When a fault is noted during RFM-10A operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.11.
- b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.
- c. When the fault is isolated to a function, such as the 11 MHz amplifier, refer to the alignment procedure for that function in Section 4.12 and check alignment of that function before proceeding with fault isolation.
- d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.13.1 Output Level Not Within Tolerance (4.11.2-d. and 4.11.2-e.)

- a. Check alignment of broadband amplifier as in paragraph 4.12.1.
- b. Check alignment of ALC detector as in paragraph 4.12.2.
- c. Check variable attenuator, AT2 and 10 dB pad, AT1.
- d. Check mainframe as in mainframe section of manual.

4.13.2 Measure Mode Sensitivity Not Within Tolerance (4.11.3-f.)

- a. Check measure input sensitivity alignment as in paragraph 4.12.6.
- b. Check 11 MHz IF alignment as in paragraph 4.12.3.
- c. Check 9 MHz filter alignment as in paragraph 4.12.4.
- d. Check 2 MHz IF alignment as in paragraph 4.12.5.

4.14 TEST EQUIPMENT REQUIRED (MODEL FIM-1 MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in Table 4-6. Minimum parameters are provided to aid in the selection of the equivalent types.

TABLE 4-6

TEST EQUIPMENT REQUIREMENTS FOR MODEL FIM-1

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Signal Generator	Frequency range: 2 MHz to 150 MHz Level: 2.5 mV to 8.2 mV rms Output impedance: 50 ohms	Singer Model FM-2748
Oscilloscope with 10X Probe	Frequency response: 4.2 MHz Vertical sensitivity: 5 mV/div	Tektronix Model 531 with 53/54B plug-in
AC VTVM	Frequency response: 2 MHz Level: 2.5 mV	Hewlett-Packard Model 400 D
DC Digital Voltmeter	Level: +5 Vdc Accuracy: \pm 0.1%	Hewlett-Packard Model 3440A

Table 4-6. Test Equipment Requirements for Model FIM-1 (Cont.)

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
4.2 MHz Signal Source	Frequency range: 4.2 MHz Output level: +1 dBm Output impedance: 50 ohms	Singer Model FM-2748
100 kHz Signal Source	Frequency range: 100 kHz Output level: 1.4 V rms Output impedance: 600 ohms	Hewlett-Packard Model 652A
Power Supply	Level: 12 Vdc \pm 10% at 100 mA	Hewlett-Packard Model 721A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
Mainframe/RF Module	Required for testing FIM-3 Module	Singer Model FM-10C Mainframe with RF Module
Resistor	5 k ohm, \pm 5% $\frac{1}{4}$ watt	Not applicable
Connector	16 pin	Singer P/N 1-910072-001

4.15 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL FIM-1 MODULE)

4.15.1 Power Requirement

All power required by the FIM-1 is supplied by the mainframe.

4.15.2 Calibration Check

a. Install the FIM-1 part way into the center compartment of the mainframe. Verify that the meter indicates zero. Adjust the mechanical zero if necessary.

b. Install FIM-1 in mainframe and set FIM-1 RANGE switch to ZERO position. Adjust meter to zero with the ZERO control.

c. Set mainframe MODE switch to TONE GEN, frequency switches to 000.0000 MHz, 0-100 Hz control to OUT and VOLUME control to approximately mid-range.

d. Set FIM-1 RANGE switch to 1.5 position. Vary the mainframe 100 Hz and 1 kHz controls in 100 Hz steps up to 1.5 kHz. The FIM meter pointer should deflect to the left in 100 Hz increments \pm 5% of full scale and an audio tone corresponding to the frequency should be heard from the speaker.

e. Set the 100 Hz and 1 kHz controls to zero. Set the FIM-1 RANGE switch to 5. Vary the 1 kHz

switch up to 5 kHz. The FIM-1 meter pointer should deflect to the left in 1 kHz increments \pm 5% of full scale and an audio tone corresponding to the frequency should be heard from the speaker.

f. Set the 1 kHz switch to zero. Set the FIM-1 RANGE switch to 15. Vary the 1 kHz and 10 kHz switches in 1 kHz steps up to 15 kHz. The FIM-1 meter pointer should deflect to the left in 1 kHz increments \pm 5% of full scale and an audio tone corresponding to the frequency should be heard from the speaker (up to the tester's hearing limit).

4.15.3 Sensitivity Check

a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF, frequency switches to 150 MHz and VOLUME control to fully cw.

b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE and set the SENSITIVITY to 6 mV.

c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 150 MHz and level to 6 mV rms.

d. Adjust the signal generator frequency slightly to obtain a zero beat indication.

e. The OPERATE lamp on the FIM-1 should light. If not, re-adjust the signal generator output level to light the OPERATE lamp. The signal generator output level should be between 4.2 and 8.2 mV rms (6 mV \pm 3 dB).

NOTE: The alignment and adjustment procedure is performed with the FIM-1 disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the FIM-1. Refer to Figure 4-31 for test point and trimmer locations. Remove the four screws from the back of the FIM-1 and slide the cover off.

4.16 ALIGNMENT AND ADJUSTMENT
(MODEL FIM-1 MODULE)

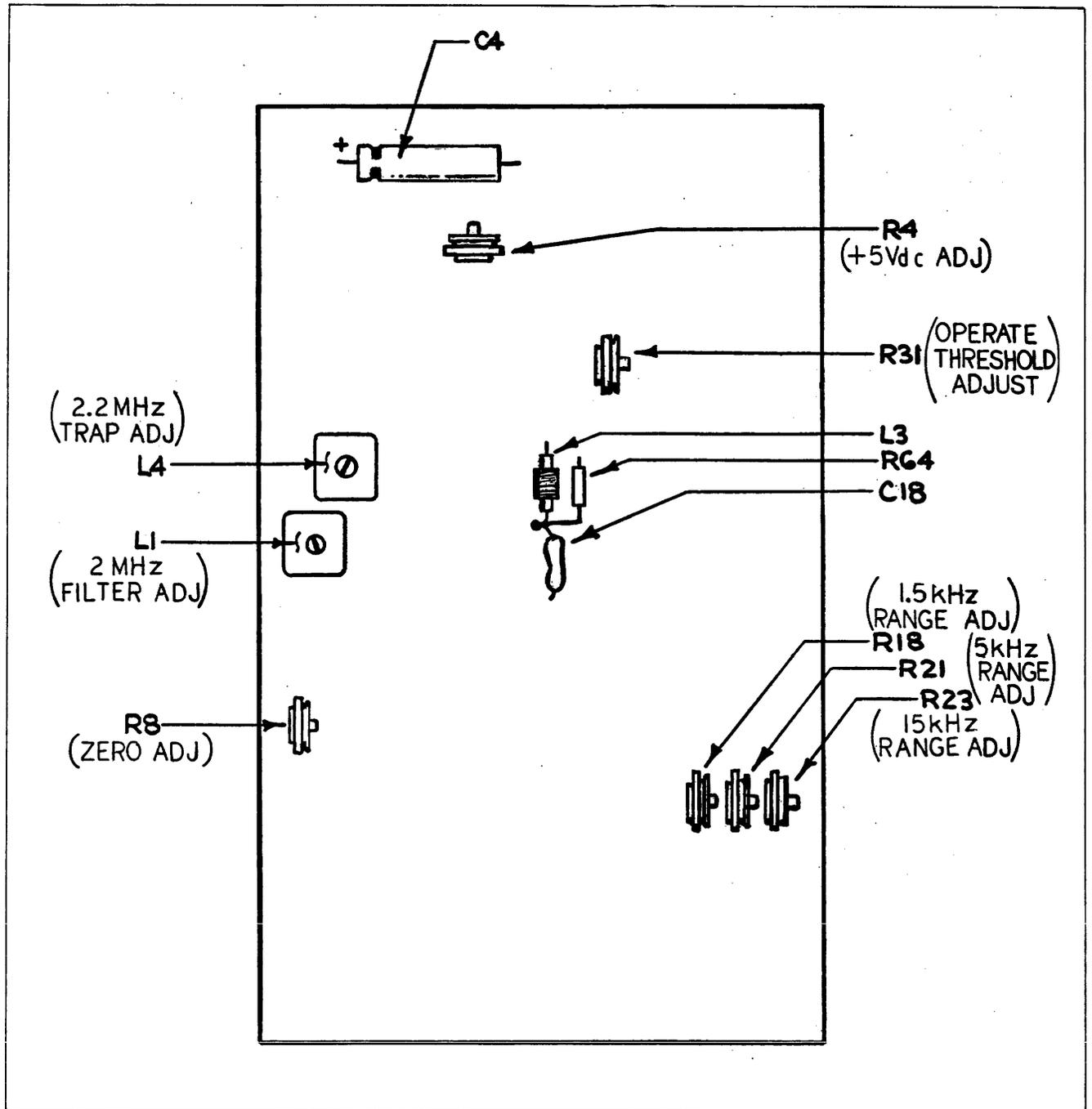


FIGURE 4-31. CIRCUIT BOARD ASSEMBLY, A1 (FIM-1)

4.16.1 Test Connector Wiring

a. See Figure 4-32 for schematic of test connector wiring.

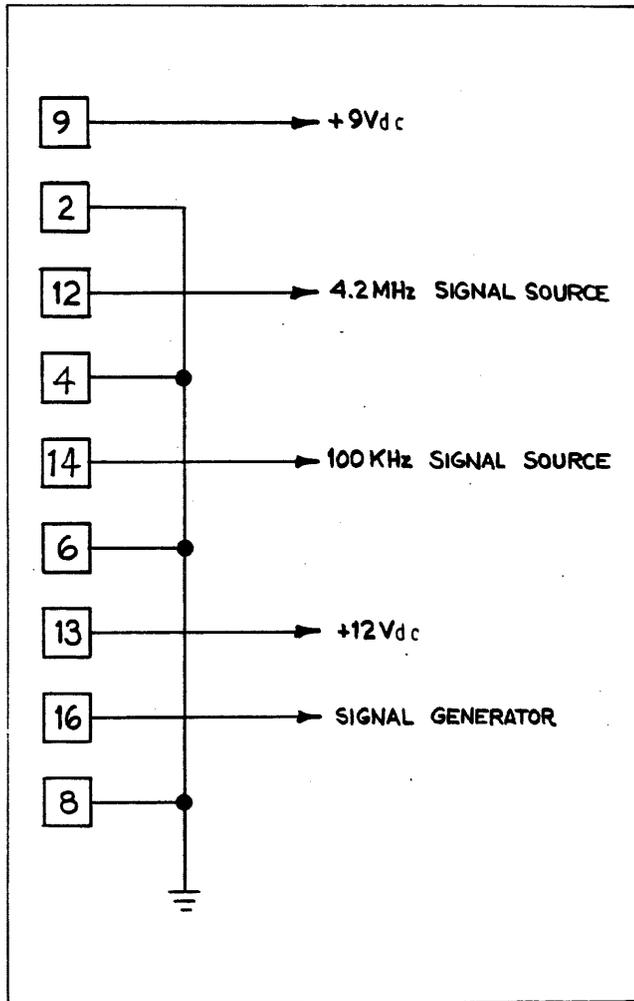


FIGURE 4-32. TEST CONNECTOR WIRING (FIM-1)

4.16.2 +5V Power Supply Adjustment

a. Plug the test connector onto the connector on the back of the FIM-1.

b. Connect the digital voltmeter positive lead to positive side of A1C4 and negative lead to chassis ground.

c. Adjust A1R4 for +5 Vdc on the digital voltmeter.

d. Disconnect the digital voltmeter.

4.16.3 2 MHz IF Input Filter Alignment

a. Connect the ac VTVM to terminal 16 of the test connector.

b. Set the signal generator frequency to 2.2 MHz and its attenuator to read 2.5 mV on the ac VTVM.

c. Connect the oscilloscope using 10X probe to the junction of A1R64, A1L3 and A1C18.

d. Observe the oscilloscope and adjust A1L4 for minimum 100 kHz output.

e. Set the signal generator frequency to 2 MHz.

f. Observe the oscilloscope and adjust A1L1 for maximum 100 kHz signal output.

g. Repeat steps 4.16.3-a. through 4.16.3-f.

h. Remove the oscilloscope from the junction of A1R64, A1L3, and A1C18.

4.16.4 Operate Light Adjustment

a. Adjust A1R31 to the point where the OPERATE lamp just lights.

4.16.5 Meter Calibration, 1.5 kHz Range

a. Set the mechanical zero on the FIM-1 meter.

b. Connect a jumper lead to pin 3 and pin 11 on the test connector.

c. Set ZERO control to mid-range.

d. Set the RANGE switch to the ZERO position.

e. Adjust A1R8 for zero on the FIM-1 meter.

f. Set the signal generator frequency to 2.0015 MHz.

g. Set the signal generator attenuator to produce 3.5 mV on the ac VTVM.

- h. Set the RANGE switch to the 1.5 kHz position.
- k. Observe the FIM-1 meter and adjust A1R18 for +1.5 kHz.
- l. Observe BEAT lamp. It should be lit.
- m. Set the signal generator frequency to 1.9985 MHz. The FIM-1 meter should read -1.5 kHz.

4.16.6 Meter Calibration, 5 kHz Range

- a. Set the RANGE switch to the 5 kHz position.
- b. Set the signal generator frequency to 2.005 MHz.
- c. Adjust A1R21 on the FIM-1 for +5 kHz on the FIM-1 meter.
- d. Set the signal generator frequency to 1.995 MHz. The FIM-1 meter should read -5 kHz.

4.16.7 Meter Calibration, 15 kHz Range

- a. Set the RANGE switch to the 15 kHz position.
- b. Set the signal generator frequency to 2.015 MHz.
- c. Adjust A1R23 for +15 kHz on the FIM-1 meter.
- d. Set the signal generator frequency to 1.985 MHz. The FIM-1 meter should read -15 kHz.

4.17 FAULT ISOLATION PROCEDURES (MODEL FIM-1 MODULE)

Fault isolation procedures are presented to provide a guide in servicing the FIM-1. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.15, with each subsection keyed to the paragraph in Section 4.15 that first indicates a fault. When a fault is noted during FIM-1 operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.15.
- b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a function, such as the discriminator, refer to the alignment procedure for that function in Section 4.16 and check alignment of that function before proceeding with fault isolation.

d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.17.1 Meter Does Not Indicate Zero (4.15.2-a.)

a. Adjust the mechanical zero on the meter for zero indication on the meter.

4.17.2 Zero Control Defective (4.15.2-b.)

a. Check for 100 kHz at the output of limiter, A1U5D.

b. Check both outputs of discriminator, A1U3.

c. Check meter amplifier, A1U4A through A1U4D.

d. Check RANGE switch, S1A, and associated wiring.

e. Check REMOTE METER jack on the mainframe and associated wiring.

f. Check that meter enable switches, A1U4E and A1U6E, are operating.

g. Check meter, M1.

4.17.3 Meter Does Not Deflect in 100 Hz Increments (4.15.2-d.)

a. Repeat paragraph 4.17.2.

4.17.4 Audio Tone Defective (4.15.2-d.)

a. Check for jumper between pins 30 and 31 on A1.

b. Check for audio at mixer, A1U7A, output.

c. Check for audio at pin 22 of A1.

d. Check audio squelch diode, A1CR1.

4.17.5 Meter Does Not Deflect in 1 kHz Increments in 5 kHz Range (4.15.2-e.)

a. Check A1R21.

b. Check RANGE switch, S1.

4.17.6 Meter Does Not Deflect in 1 kHz Increments in 15 kHz Range (4.15.2-f.)

- a. Check A1R23.
- b. Check RANGE switch, S1.

b. Check level detector, A1U6A, operate lamp trigger, A1U6B/C and operate lamp switch, A1U6D.

4.18 TEST EQUIPMENT REQUIRED (MODEL FIM-3 MODULE)

4.17.7 Sensitivity Not Within Tolerance (4.15.3-e.)

- a. Check alignment of operate threshold adjustment A1R31 as in step 4.16.4-a.

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in Table 4-7. Minimum parameters are provided to aid in the selection of the equivalent types.

**TABLE 4-7
TEST EQUIPMENT REQUIREMENTS FOR MODEL FIM-3**

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Signal Generator	Frequency range: 2 MHz to 150 MHz Level: 2.5 mV to 8.2 mV rms Output impedance: 50 ohms	Singer Model FM-2748
Oscilloscope with 10X Probe	Frequency response: 4.2 MHz Vertical sensitivity: 5 mV/div	Tektronix Model 531 with 53/54B plug-in
AC VTVM	Frequency response: 2 MHz Level: 2.5 mV	Hewlett-Packard Model 400 D
DC Digital Voltmeter	Level: +5 Vdc Accuracy: $\pm 0.1\%$	Hewlett-Packard Model 3440A
4.2 MHz Signal Source	Frequency range: 4.2 MHz Output level: +1 dBm Output impedance: 50 ohms	Singer Model FM-2748
100 kHz Signal Source	Frequency range: 100 kHz Output level: 1.4 V rms Output impedance: 600 ohms	Hewlett-Packard Model 652A
Power Supply	Level: 12 Vdc $\pm 10\%$ at 100 mA	Hewlett-Packard Model 721A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
Mainframe/RF Module	Required for testing FIM-3 Module	Singer Model FM-10C Mainframe with RF Module
Resistor	5 k ohm, $\pm 5\%$ $\frac{1}{4}$ watt	Not applicable
Connector	16 pin	Singer P/N 1-910072-001

4.19 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL FIM-3 MODULE)

4.19.1 Power Requirements

All power required by the FIM-3 is supplied by the mainframe.

4.19.2 Calibration Check

a. Install the FIM-3 part way into the center compartment of the mainframe. Verify that the meter indicates zero. Adjust the mechanical zero if necessary.

b. Install FIM-3 in mainframe and set FIM-3 RANGE switch to ZERO position. Adjust meter to zero with the ZERO control.

c. Set mainframe MODE switch to TONE GEN, frequency switches to 000.0000 MHz, 0–100 Hz control to OUT and VOLUME control to approximately mid-range.

d. Set FIM-3 RANGE switch to 1.5 position. Vary the mainframe 100 Hz and 1 kHz controls in 100 Hz steps up to 1.5 kHz. The FIM-3 meter pointer should deflect to the left in 100 Hz increments $\pm 5\%$ of full scale and an audio tone corresponding to the frequency should be heard from the speaker.

e. Set the 100 Hz and 1 kHz controls to zero. Set the FIM-3 RANGE switch to 5. Vary the 1 kHz switch up to 5 kHz. The FIM-3 meter pointer should deflect to the left in 1 kHz increments $\pm 5\%$ of full scale and an audio tone corresponding to the frequency should be heard from the speaker.

f. Set the 1 kHz switch to zero. Set the FIM-3 RANGE switch to 15. Vary the 1 kHz and 10 kHz switches in 1 kHz steps up to 15 kHz. The FIM-3 meter pointer should deflect to the left in 1 kHz increments $\pm 5\%$ and an audio tone corresponding to the frequency should be heard from the speaker (up to the tester's hearing limit).

4.19.3 Sensitivity Check

a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF, frequency switches to 150 MHz and VOLUME control to fully cw.

b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE and set the SENSITIVITY to 6 mV.

c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 150 MHz and level to 6 mV rms.

d. Adjust the signal generator frequency slightly to obtain a zero beat indication.

e. The OPERATE lamp on the FIM-3 should light. If not, re-adjust the signal generator output level to light the OPERATE lamp. The signal generator output level should be between 4.2 and 8.2 mV rms (6 mV ± 3 dB).

4.19.4 Squelch Check

a. Adjust the signal generator output until the OPERATE lamp just lights. There should be no background noise from the speaker.

b. There should be no background noise from the speaker in either position of the SQUELCH switch.

c. Decrease the signal generator level until the OPERATE lamp extinguishes.

d. Background noise should be audible only in the OFF position of the SQUELCH switch.

4.20 ALIGNMENT AND ADJUSTMENT (MODEL FIM-3 MODULE)

NOTE: The alignment and adjustment procedure is performed with the FIM-3 disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the FIM-3. Refer to Figure 4-33 for test point and trimmer locations. Remove the four screws from the back of the FIM-3 and slide the cover off.

4.20.1 Test Connector Wiring

a. See Figure 4-34 for schematic of test connector wiring.

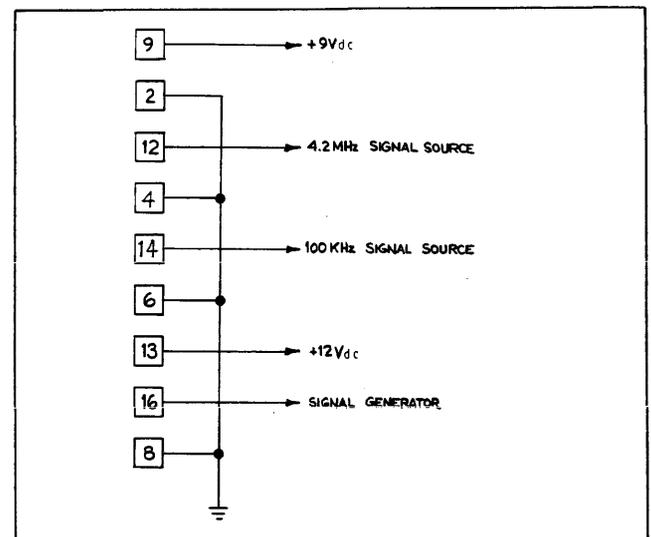


FIGURE 4-34 TEST CONNECTOR WIRING (FIM-3)

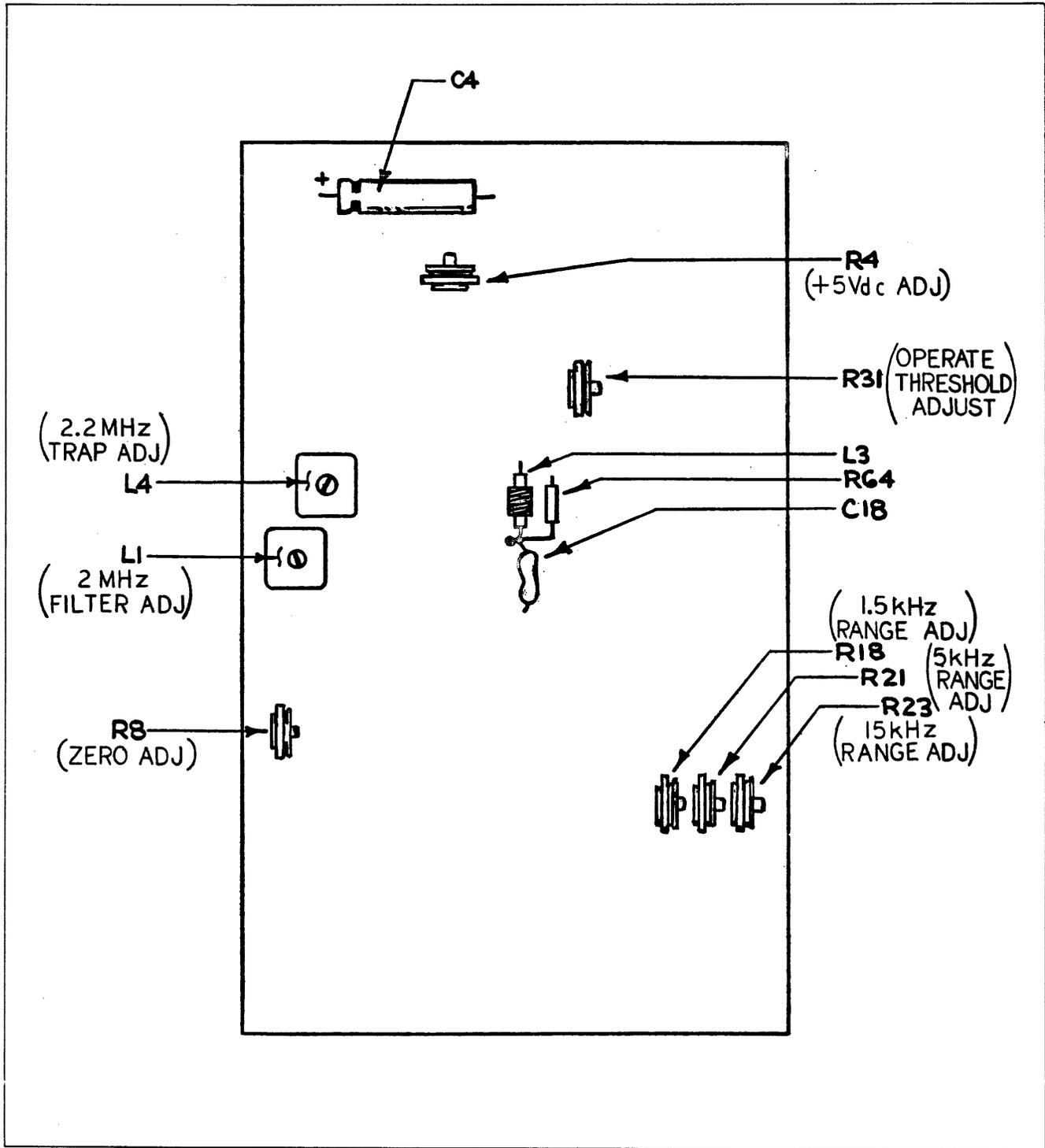


FIGURE 4-33. CIRCUIT BOARD ASSEMBLY, A1 (FIM-3)

4.20.2 +5V Power Supply Adjustment

- a. Plug the test connector onto the connector on the back of the FIM-3.
- b. Connect the digital voltmeter positive lead to positive side of A1C4 and negative lead to chassis ground.
- c. Adjust A1R4 for +5 Vdc on the digital voltmeter.
- d. Disconnect the digital voltmeter.

4.20.3 2 MHz IF Input Filter Alignment

- a. Connect the ac VTVM to terminal 16 of the test connector.
- b. Set the signal generator frequency to 2.2 MHz and its attenuator to read 2.5 mV on the ac VTVM.
- c. Connect the oscilloscope using 10X probe to the junction of A1R64, A1L3 and A1C18.
- d. Observe the oscilloscope and adjust A1L4 for minimum 100 kHz output.
- e. Set the signal generator frequency to 2 MHz.
- f. Observe the oscilloscope and adjust A1L1 for maximum 100 kHz signal output.
- g. Repeat steps 4.20.3-a. through 4.20.3-f.
- h. Remove the oscilloscope from the junction of A1R64, A1L3, and A1C18.

4.20.4 Operate Light Adjustment

- a. Adjust A1R31 to the point where the OPERATE lamp just lights.

4.20.5 Meter Calibration, 1.5 kHz Range

- a. Set the mechanical zero on the FIM-3 meter.
- b. Connect a jumper lead to pin 3 and pin 11 on the test connector.
- c. Set ZERO control to mid-range.
- d. Set the RANGE switch to the ZERO position.
- e. Adjust A1R8 for zero on the FIM-3 meter.

f. Set the signal generator frequency to 2.0015 MHz.

g. Set the signal generator attenuator to produce 3.5 mV on the ac VTVM.

h. Set the RANGE switch to the 1.5 kHz position.

k. Observe the FIM-3 meter and adjust A1R18 for +1.5 kHz.

l. Observe BEAT lamp. It should be lit.

m. Set the signal generator frequency to 1.9985 MHz. The FIM-3 meter should read -1.5 kHz.

4.20.6 Meter Calibration, 5 kHz Range

a. Set the RANGE switch to the 5 kHz position.

b. Set the signal generator frequency to 2.005 MHz.

c. Adjust the A1R21 on the FIM-3 for +5 kHz on the FIM-3 meter.

d. Set the signal generator frequency to 1.995 MHz. The FIM-3 meter should read -5 kHz.

4.20.7 Meter Calibration, 15 kHz Range

a. Set the RANGE switch to the 15 kHz position.

b. Set the signal generator frequency to 2.015 MHz.

c. Adjust A1R23 for +15 kHz on the FIM-3 meter.

d. Set the signal generator frequency to 1.985 MHz. The FIM-3 meter should read -15 kHz.

4.21 FAULT ISOLATION PROCEDURES (MODEL FIM-3 MODULE)

Fault isolation procedures are presented to provide a guide in servicing the FIM-3. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.19, with each subsection keyed to the paragraph in Section 4.19 that first indicates a fault. When a fault is noted during FIM-3 operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.19.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a function, such as the discriminator, refer to the alignment procedure for that function in Section 4.20 and check alignment of that function before proceeding with fault isolation.

d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.21.1 Meter Does Not Indicate Zero (4.19.1-a.)

a. Adjust the mechanical zero on the meter for zero indication on the meter.

4.21.2 Zero Control Defective (4.19.1-b.)

a. Check for 100 kHz at the output of limiter, A1U5D.

b. Check both outputs of discriminator, A1U3.

c. Check meter amplifier, A1U4A through A1U4D.

d. Check RANGE switch, S1A, and associated wiring.

e. Check REMOTE METER jack on the mainframe and associated wiring.

f. Check that meter enable switches, A1U4E and A1U6E, are operating.

g. Check meter, M1.

4.21.3 Meter Does Not Deflect in 100 Hz Increments (4.19.1-d.)

a. Repeat paragraph 4.21.2.

4.21.4 Audio Tone Defective (4.19.1-d.)

a. Check for jumper between pins 30 and 31 on A1.

b. Check for audio at mixer, A1U7A, output.

c. Check for audio at pin 22 of A1.

d. Check audio squelch diode, A1CR1.

4.21.5 Meter Does Not Deflect in 1 kHz Increments in 5 kHz Range (4.19.1-e.)

a. Check A1R21.

b. Check RANGE switch, S1.

4.21.6 Meter Does Not Deflect in 1 kHz Increments in 15 kHz Range (4.19.1-f.)

a. Check A1R23.

b. Check RANGE switch, S1.

4.21.7 Sensitivity Not Within Tolerance (4.19.3-e.)

a. Check alignment of operate threshold adjustment A1R31 as in step 4.20.4-a.

b. Check level detector, A1U6A, operate lamp trigger, A1U6B/C, operate lamp switch, A1U6D, diode switch, A1CR2, and SQUELCH switch, S2.

4.21.8 Squelch Inoperative (4.19.4-d.)

a. Check diode switch, A1CR2.

b. Check SQUELCH switch, S2.

c. If steps 4.21.7-a. and -b. operate properly, trouble is in mainframe. Check mainframe as in mainframe maintenance section of manual.

4.22 TEST EQUIPMENT REQUIRED (MODEL OAM-1 MODULE)

The test equipment required for checkout, alignment, calibration, and troubleshooting is tabulated in Table 4-8. Use the recommended type or equivalent.

4.23 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL OAM-1 MODULE)

4.23.1 Installation

Install the OAM-1 into the right-hand compartment of the mainframe.

4.23.2 Power Requirements

All power required by the OAM-1 is supplied by the mainframe.

<p>WARNING: High voltages are present throughout the unit and appropriate precautions should be taken while operating the unit with cover removed.</p>

4.23.3 Focus and Intensity Check

a. Set POWER switch to ON position.

b. Rotate INTENSITY control fully cw.

c. Rotate FOCUS control to mid-range.

d. Set VERT MODE switch to VERT SET position.

- e. Set MOD MODE switch to INT position.
- f. Allow 5 to 10 seconds for the CRT filaments to warm up.
- g. Adjust VERT POS and HORIZ POS controls until CRT trace is centered.

h. Re-adjust FOCUS and INTENSITY controls for sharpest trace with adequate intensity.

j. Verify the CRT trace is bright enough to see in normally lit room. Verify that FOCUS, VERT POS, and HORIZ POS controls are approximately at mid-range.

TABLE 4-8

TEST EQUIPMENT REQUIREMENTS FOR MODEL OAM-1

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Audio Oscillator	Frequency range: 45 Hz to 30 kHz Output: 100 mV rms to 3 V rms	Hewlett-Packard Model 200CD
AC VTVM	Frequency response: 50 Hz to 2 MHz Range: measure 3 mV to 3 V rms	Hewlett-Packard Model 400D
Signal Generator	Frequency range: 2 MHz Output level: < 6 mV rms to > 20 mV rms Stability: better than $\pm 0.0004\%/5$ min Leveling: ± 1 dB Output impedance: 50 ohm nominal	Singer Model FM-2748
Oscilloscope with 1X probe	Frequency response: 2 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 531 with Model 53/54B plug-in
Distortion Analyzer	Frequency response: 400 Hz to 1 kHz Input level: 1 V rms Accuracy: $\pm 0.1\%$	Hewlett-Packard Model 333A
Frequency Counter	Frequency response: 400 Hz to 1 kHz Input level: 1 V rms	Hewlett-Packard Model 5512A
DC Power Supply	Level: 9 Vdc at 1 A	Hewlett-Packard Model 6214A
VOM	Level: 0 to 1100 Vdc	Simpson Model 269
DC Digital Voltmeter	Level: 10 V to 1000 Vdc Accuracy: 0.1% of reading	Hewlett-Packard Model 3440A
Mainframe/RF and FIM Modules	Required for testing OAM-1 Module	Singer Model FM-10C Mainframe with RF and FIM Modules
Extender Cable	Not applicable	Singer Model PC-2653
Connector	16 pin	Singer P/N 1-910072-001
Resistors	62 ohm, 180 ohm, 240 ohm, 510 ohm, 510 ohm, 560 ohm (all $\pm 5\%$, $\frac{1}{4}$ watt)	Not applicable

4.23.4 Vertical and Horizontal Position Control Range Check

- a. Rotate VERT POS control from fully cw to fully ccw.
- b. Verify that CRT trace deflects off the calibrated portion of the graticule vertically when VERT POS control is at its extreme positions.
- c. Return VERT POS control to mid-range.
- d. Rotate HORIZ POS control from fully cw to fully ccw.
- e. Verify that ends of trace deflect horizontally to at least mid-screen when HORIZ POS control is at its extreme positions.
- f. Return HORIZ POS control to mid-range.
- g. Verify that trace is centered on CRT with controls set at approximately mid-range.

4.23.5 Sweep Range Check

- a. Rotate VERT GAIN control fully cw.
- b. Set VERT MODE switch to EXT.
- c. Connect audio oscillator and ac VTVM to VERT IN jack.
- d. Adjust audio oscillator frequency to 50 Hz and set ac VTVM to 300 mV scale.
- e. Rotate SWEEP SPEED control fully ccw.
- f. Set SWEEP RANGE switch to LO position.
- g. Increase audio oscillator output until sine wave deflection on CRT is full-scale. Adjust audio oscillator frequency for a stationary, one-cycle sine wave on CRT.
- h. Verify that audio oscillator frequency is less than 50 Hz (approximately 45 Hz).
- j. Rotate SWEEP SPEED control fully cw.
- k. Set SWEEP RANGE switch to HI position.
- l. Adjust audio oscillator frequency for a stationary, one-cycle sine wave on CRT.
- m. Verify that audio oscillator frequency is greater than 5000 Hz and is spread out across entire CRT.
- n. Rotate SWEEP SPEED control fully ccw.

p. Adjust audio oscillator frequency for a stationary, one-cycle sine wave on CRT.

q. Verify that audio oscillator frequency is less than 500 Hz (approximately 450 Hz).

r. Set SWEEP RANGE switch to LO position.

s. Rotate SWEEP SPEED control fully cw.

t. Adjust audio oscillator frequency for a stationary, one-cycle sine wave.

u. Verify that audio oscillator frequency is more than 500 Hz (approximately 550 Hz).

4.23.6 Vertical Sensitivity Check

a. Adjust audio oscillator frequency to 1 kHz.

b. Set SWEEP RANGE switch and adjust SWEEP SPEED control for a stationary pattern on CRT.

c. Adjust output of audio oscillator for full-scale deflection on CRT.

d. Verify that output of audio oscillator is between 95 and 117 mV rms.

4.23.7 Vertical Amplifier Frequency Response Check

a. Adjust audio oscillator output to obtain exactly full-scale deflection on CRT at 1 kHz frequency.

b. Increase audio oscillator frequency to 30 kHz and note p-p deflection on CRT.

c. Decrease audio oscillator frequency to 50 Hz and note p-p deflection on CRT.

d. Verify that signal on CRT did not change more than 3 dB (less than 7 divisions p-p) from 50 Hz to 30 kHz.

4.23.8 Carrier Level Control Check

a. Connect signal generator to left-hand module MEASURE INPUT jack.

b. Set signal generator frequency to 25 MHz and output to 10 mV rms (CW).

c. Set mainframe frequency switches to 25 MHz and MODE switch to MEAS position.

d. Set VERT MODE switch to VERT SET position.

- e. Adjust VERT POS control so that CRT trace is exactly on VERTICAL SET line of the graticule.
- f. Set VERT MODE switch to CARR SET position.
- g. Adjust signal generator frequency vernier for maximum upward deflection of trace on CRT.
- h. Adjust CARR LEVEL control so that CRT trace is exactly on CARRIER SET line of the graticule.
- j. Decrease signal generator output 3 dB from 10 mV rms (7.07 mV rms).
- k. Rotate CARRIER LEVEL control until CRT trace is exactly on CARRIER SET line.
- l. Verify that CARRIER LEVEL control has sufficient range to set CRT trace on CARRIER SET line of the graticule $\pm \frac{1}{2}$ division.
- m. Increase signal generator output 6 dB (14.1 mV rms).
- n. Rotate CARRIER LEVEL control until CRT trace is exactly on CARRIER SET line.
- p. Verify that CARRIER LEVEL control has sufficient range to set CRT trace on CARRIER SET line of the graticule $\pm \frac{1}{2}$ division.
- q. Re-adjust signal generator output to 10 mV rms and frequency for maximum upward deflection of CRT trace.
- r. Recalibrate VERT SET and CARR SET (step 4.28.8-d. through 4.23.8-h.).
- s. Set VERT MODE switch to MEAS AM position.
- t. Verify that CRT trace is on the 0 center line of graticule. (A slight amount of noise on the trace is normal.)

4.23.9 Modulation Measurement Accuracy Check

- a. Recalibrate as specified in paragraph 4.24.8 steps d. through h., if necessary.
- b. Set signal generator modulation mode switch to external position.
- c. Connect audio oscillator to external modulation jack of signal generator and also external horizontal jack of oscilloscope.
- d. Set audio oscillator frequency to 1 kHz and output level to approximately 8 V p-p.
- e. Set RANGE switch to 30%.

f. Adjust modulation amplitude control on signal generator to obtain full-scale deflection (30%) on CRT.

g. Remove signal generator cable from the left-hand module MEASURE INPUT jack and connect it to vertical input jack on oscilloscope.

h. On oscilloscope, set horizontal display switch to external horizontal attenuator X1; adjust external horizontal attenuator control for approximately 5 cm horizontal deflection. Set time/centimeter switch to 2 seconds, and adjust vertical sensitivity to obtain exactly 4 cm vertical deflection for E max on trapezoid pattern.

j. Verify that E min on trapezoid pattern on oscilloscope is between 2.3 and 2.0 cm (27% to 33% modulation).

k. Remove signal generator cable from vertical input jack on oscilloscope and reconnect it to left-hand module MEASURE INPUT jack.

l. Set RANGE switch to 100%.

m. Adjust signal generator modulation amplitude control to obtain 8 divisions (80% modulation) deflection on the CRT graticule.

n. Verify that sine wave pattern on CRT is symmetrical about the 0 center line of graticule and that no clipping of the peaks is present.

p. Reconnect signal generator cable to the vertical input jack of oscilloscope.

q. Re-adjust vertical sensitivity to obtain 4 cm vertical deflection for E max on trapezoid pattern.

r. Verify that E min on trapezoid pattern on oscilloscope is between 0.70 and 0.21 cm (70% to 90% modulation).

4.23.10 Mainframe (Internal) Modulation Capability and Recovered Audio Distortion Check

a. Set mainframe MODE switch to GEN MOD CAL.

b. Set GENERATOR MODULATION switch to IN-ON.

c. Set VERT MODE switch to VERT SET.

d. Position CRT trace on VERTICAL SET line of the graticule with VERT POS control.

e. Set VERT MODE switch to CARR SET. Position CRT trace on CARRIER SET line of the graticule with CARRIER LEVEL control.

f. Set RANGE switch to GEN 30%.

g. Set MOD/AUDIO OUT FREQ switch to either 1 kHz or 400 Hz.

h. Rotate INT MOD/AUDIO OUT control fully cw.

j. Set VERT MODE switch to MEAS AM.

k. Verify that recovered audio on CRT is greater than full-scale deflection.

l. Rotate INT MOD/AUDIO OUT control for exactly full-scale deflection.

m. Connect distortion analyzer to DIST ANAL jack and calibrate it to modulating frequency.

n. Verify that measured distortion is less than 3% at 30% modulation.

4.23.11 External Modulation Capability, Frequency Response, and Recovered Audio Distortion Check

a. Connect audio oscillator and ac VTVM to EXT MOD/HORIZ IN jack.

b. Set audio oscillator frequency to 1 kHz and its output to approximately 500 mV rms.

c. Set MOD MODE switch to EXT.

d. Recalibrate VERT SET and CARR SET and set VERT MODE switch to MEAS AM.

e. Adjust audio oscillator output to obtain full-scale deflection (30% modulation) on CRT.

f. Note VTVM reading.

g. Verify that external signal level required to produce 30% modulation is 500 mV rms \pm 20%.

h. Calibrate distortion analyzer at 1 kHz.

j. Vary audio oscillator frequency between 50 Hz and 3 kHz.

k. Verify that measured distortion is less than 3% at 30% modulation and that recovered audio level on CRT does not change more than 3 dB over the frequency range of 50 Hz to 3 kHz.

4.23.12 External Horizontal Sweep Capability Check

a. Set MOD MODE switch to EXT HORIZ.

b. Set audio oscillator frequency to 1 kHz.

c. Apply output of audio oscillator to EXT MOD/HORIZ IN jack.

d. Adjust output of audio oscillator until trace is spread over the diameter of CRT.

e. Verify that level required for full-diameter deflection is no greater than 600 mV rms.

4.23.13 Audio Output Frequency, Level, and Distortion Check

a. Connect ac VTVM and frequency counter to AUDIO OUT 600 OHM jack.

b. Connect a 600 ohm resistive load across the ac VTVM terminals.

c. Set MOD/AUDIO OUT FREQ switch to 1 kHz.

d. Rotate INT MOD/AUDIO OUT control fully cw.

e. Note readings on ac VTVM and frequency counter.

f. Verify that frequency is 1 kHz \pm 5%. The level should be 1 V rms minimum into 600 ohms.

g. Disconnect frequency counter from AUDIO OUT 600 OHM jack and connect distortion analyzer. Set INT MOD AUDIO OUT control from 1 V rms output into 600 ohm load.

h. Calibrate distortion analyzer at 1 kHz and note the distortion. Distortion should be less than 1%.

j. Disconnect distortion analyzer and reconnect frequency counter to AUDIO OUT 600 OHM jack.

k. Set MOD/AUDIO OUT FREQ switch to 400 Hz.

l. Note readings on ac VTVM and frequency counter.

m. Verify that frequency is 400 Hz \pm 5%. The level should be 1 V rms minimum into 600 ohms.

n. Disconnect frequency counter and connect distortion analyzer.

p. Calibrate distortion analyzer at 400 Hz and note the distortion. Distortion should be less than 1%.

4.24 ALIGNMENT AND ADJUSTMENT (MODEL OAM-1 MODULE)

NOTE: The alignment and adjustment procedure is performed with the OAM-1 disconnected from the mainframe so that any problem in the mainframe will not affect the alignment of the OAM-1. Refer to Figures 4-35 through 4-38 for test point and trimmer locations. Remove the five screws in the back panel of the OAM-1 and slide the cover off the back.

4.24.1 Test Connector Wiring

a. See Figure 4-39 for schematic of test connector wiring.

4.24.2 Location and Adjustment of Trace

a. Connect the test connector to the OAM-1 and set the OAM-1 controls as follows:

INTENSITY	Fully cw
VERT POS	Mid-range
VERT MODE	VERT SET
MOD MODE	INT
HORIZ POS	Mid-range

b. Connect the VOM between pins E103 and E104 on the vertical amplifier board, A3.

c. Adjust A3R105 for 0 Vdc on the VOM.

d. The trace should be visible. If so, set the SWEEP RANGE control to LO and the SWEEP SPEED control fully ccw.

e. If the trace is not visible, connect the VOM between pins E212 and E213 on the horizontal amplifier board A4. Adjust the HORIZ POS control for 0 Vdc on the VOM.

f. The trace should now be visible. If not, connect the DVM to pin E211 on the A4 board and ground. Adjust A4R217 (astigmatism) for approximately +150 Vdc on the DVM.

g. Once trace is visible, revert to step 4.24.2-d.

4.24.3 Trace Alignment and Focus

a. Loosen the CRT clamp screw and set the trace on the 0 center line of the graticule with the VERT POS control.

b. Grasp the large end of the CRT (away from the high voltage) and rotate it until the trace is parallel to the 0 center line, then rotate it so that the right end of the trace is 1/3 division high. This is to compensate for the cw rotation of the CRT when the clamp screw is tightened. Tighten the clamp screw.

c. Repeat step 4.24.3-b. as necessary to align trace exactly parallel to the 0 center line.

d. Set the FOCUS control to mid-range and adjust A4R217 (astigmatism) for the sharpest trace.

4.24.4 Vertical Gain Adjustment

a. Set the OAM-1 controls as follows:

VERT MODE	EXT
VERT GAIN	Fully cw
VERT POS	Trace on 0 center line

b. Connect the ac VTVM and the audio oscillator to the VERT IN jack.

c. Set the audio oscillator frequency to 1 kHz and output level to 110 mV rms.

d. Adjust A3R112 for exactly full scale deflection on the CRT graticule.

4.24.5 Sweep Range Adjustment

a. Set the OAM-1 controls as follows:

VERT POS	Trace on 0 center line
HORIZ POS	Trace centered on CRT
SWEEP RANGE	LO
SWEEP SPEED	Fully ccw

b. Set the audio oscillator frequency to 45 Hz and its output level for full-scale deflection on the CRT.

c. Adjust A4R204 for a one-cycle stationary display on the CRT.

d. Set the audio oscillator frequency to 5.2 kHz. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control to fully cw.

e. Adjust A4R202 for a one-cycle stationary display on the CRT.

f. Repeat steps 4.24.5-f. through 2.24.5-e.

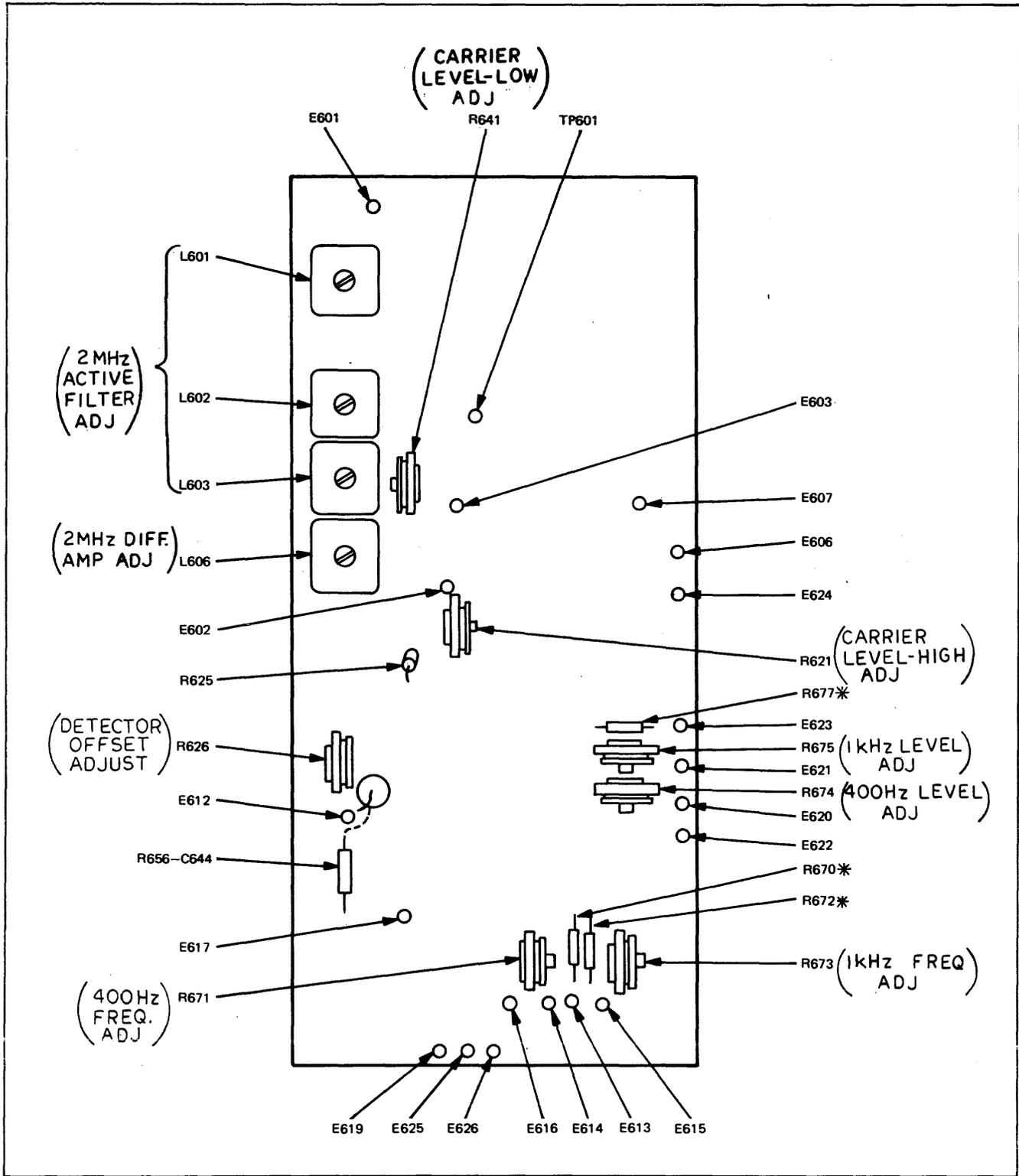


FIGURE 4-35. AM DETECTOR BOARD ASSEMBLY, A1 (OAM-1)

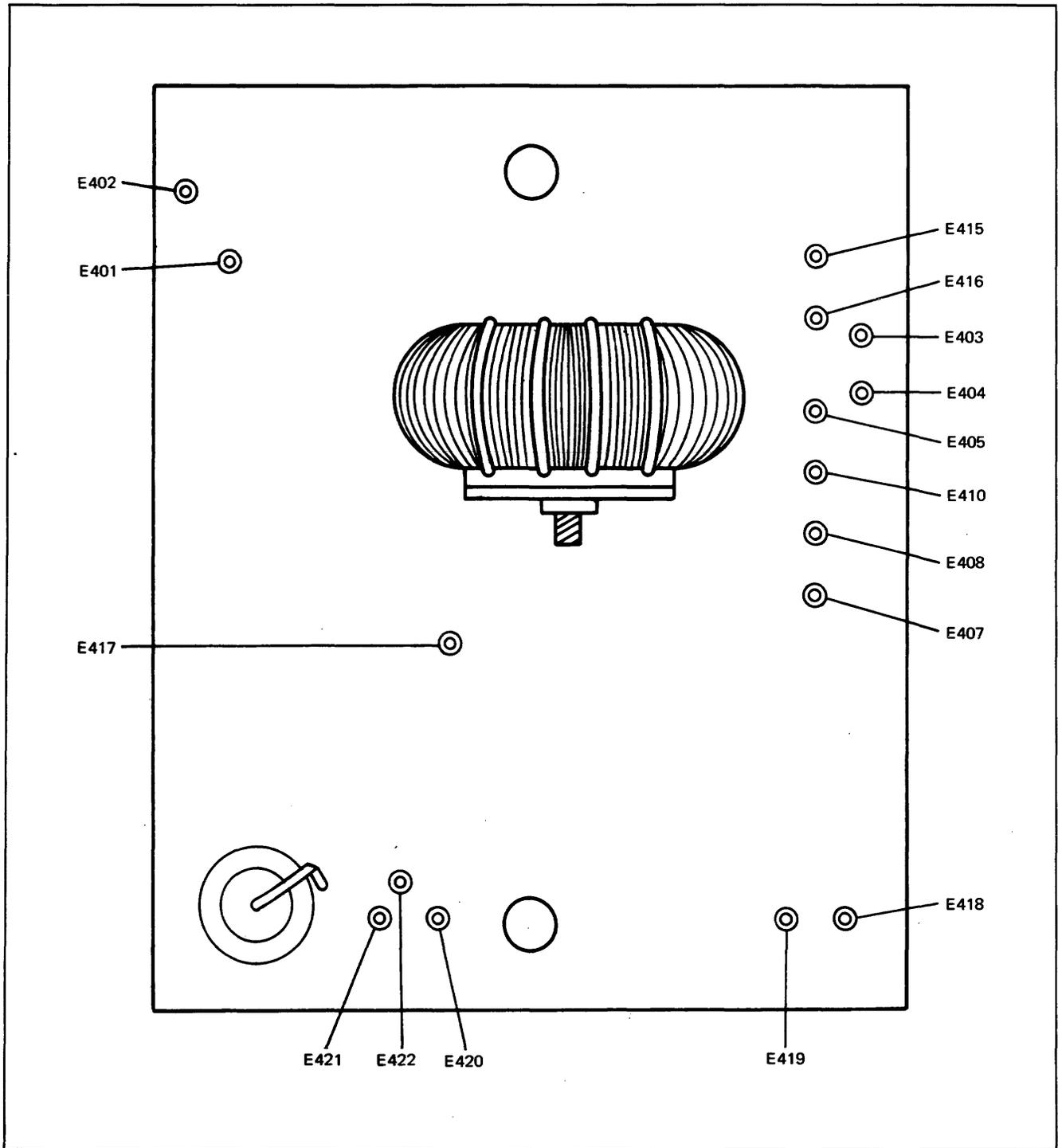


FIGURE 4-36. POWER SUPPLY BOARD ASSEMBLY, A2 (OAM-1)

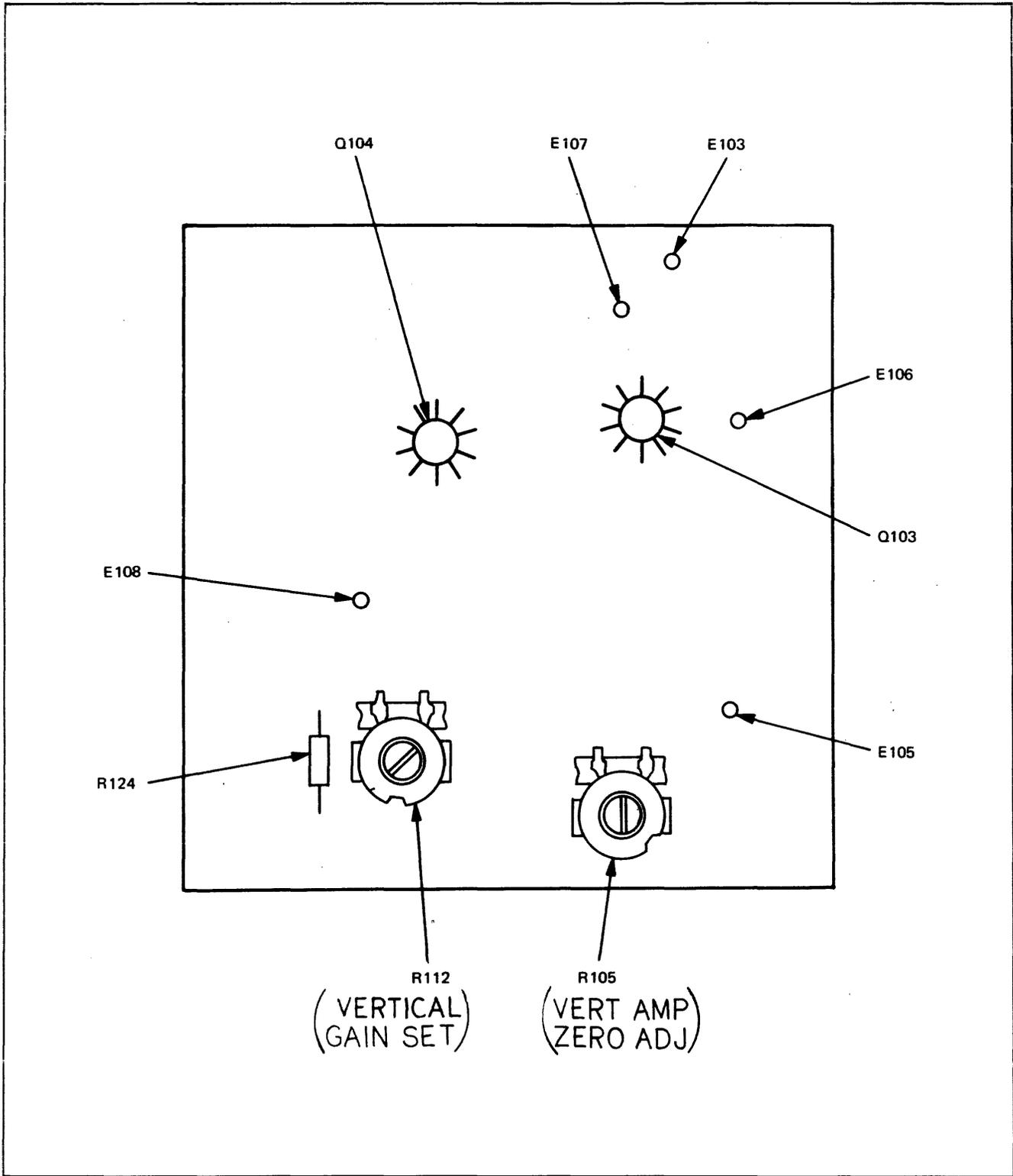


FIGURE 4-37. VERTICAL AMPLIFIER BOARD ASSEMBLY, A3 (OAM-1)

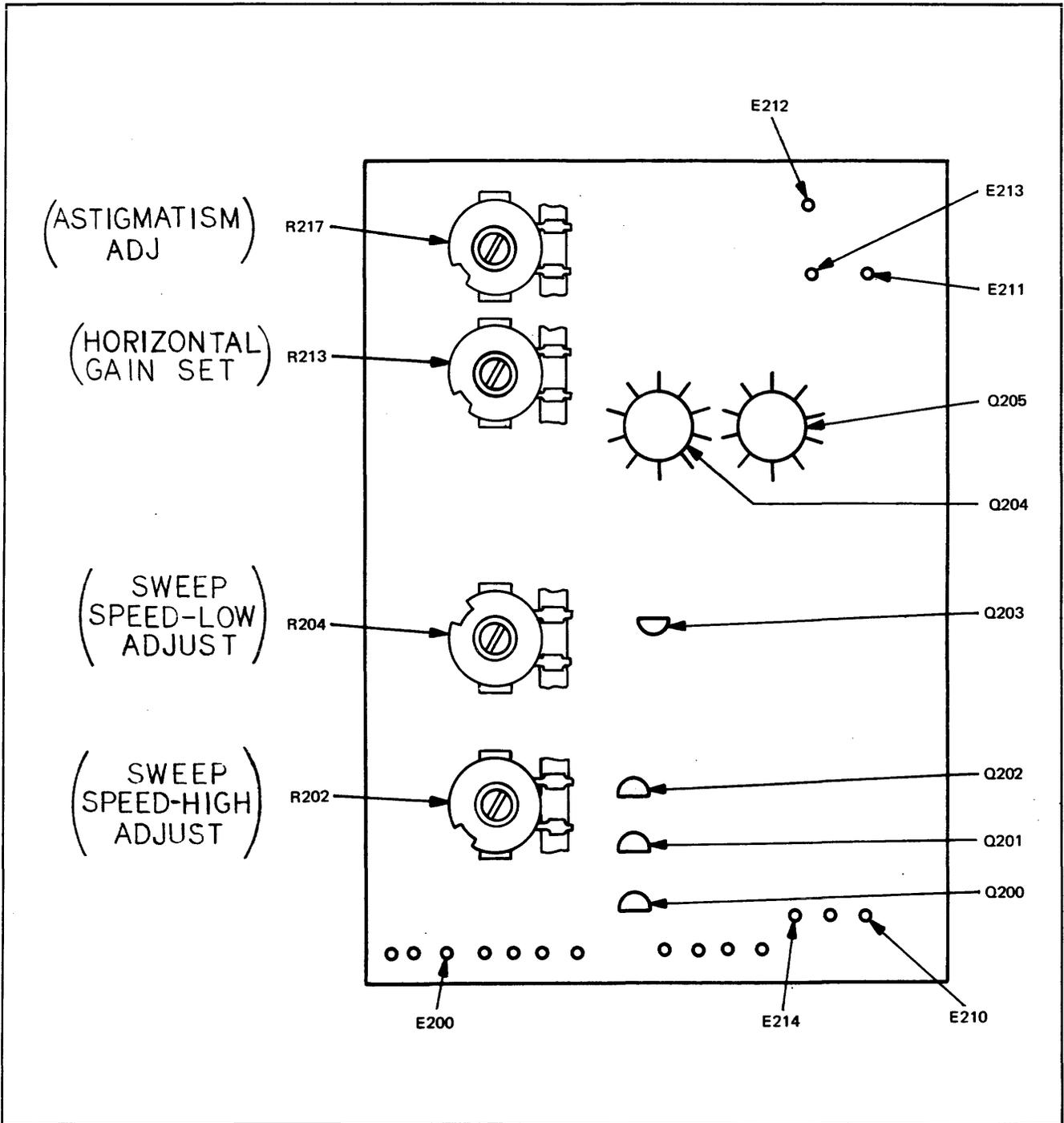


FIGURE 4-38. HORIZONTAL AMPLIFIER BOARD ASSEMBLY, A4 (OAM-1)

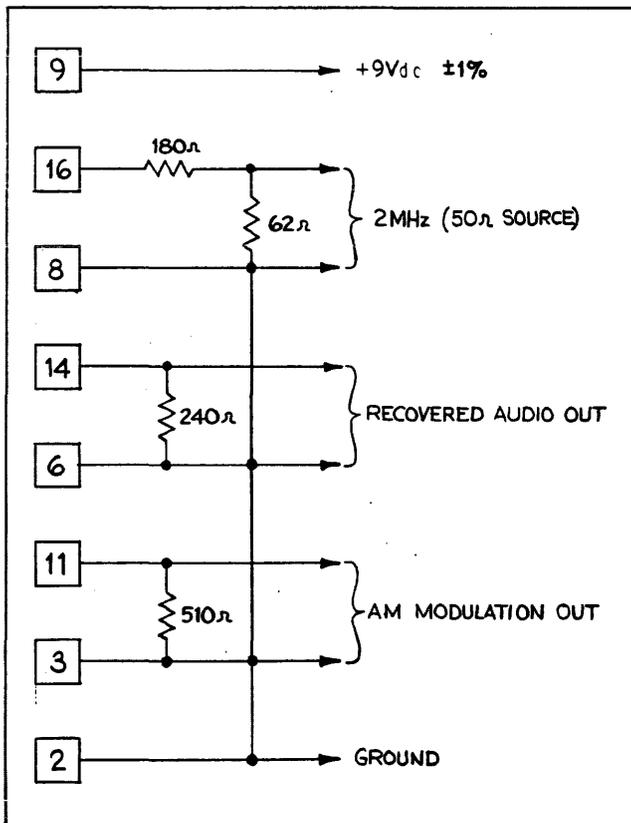


FIGURE 4-39
TEST CONNECTOR SCHEMATIC (OAM-1)

g. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control to fully ccw. Adjust the audio oscillator frequency to produce a one-cycle stationary display.

h. The audio oscillator frequency should now be less than 500 Hz.

j. Set the SWEEP RANGE switch to LO and the SWEEP SPEED control to fully ccw.

k. Adjust the audio oscillator control to produce a one-cycle stationary display.

l. The audio oscillator frequency should now be greater than 500 Hz.

m. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control to fully cw. Set the audio oscillator frequency to 1 kHz.

n. Adjust A4R213 until the trace extends slightly beyond the edges of the CRT.

4.24.6 2 MHz IF Amplifier Alignment

a. Connect the 2 MHz signal source to the test connector (Figure 4-35). Connect the ac VTVM between A1 pin E601 and ground. Adjust the 2 MHz signal source output level for 2.5 mV rms on the VTVM.

b. Connect the oscilloscope probe to TP601 on the AM detector board, A1.

c. Adjust A1L601, A1L602 and A1L603 for maximum amplitude on the oscilloscope. The voltage should be approximately 30-40 mV p-p.

d. Connect the oscilloscope probe across A1R625.

e. Adjust A1L606 for maximum amplitude and re-adjust A1L601, A1L602 and A1L603. Disconnect the oscilloscope probe.

4.24.7 Detector Offset Adjustment

a. Disconnect the 2 MHz signal source and short circuit A1 pin E601 to ground.

b. Set the OAM-1 VERT MODE switch to VERT SET and adjust the VERT POS control so that the trace is exactly on the VERTICAL SET line of the CRT graticule.

c. Set the VERT MODE switch to CARR SET and adjust A1R626 so that the trace is exactly on the VERTICAL SET line.

d. Repeat steps 4.24.7-b. and 4.24.7-c.

4.24.8 IF Dynamic Range Adjustment

a. Reconnect the 2 MHz signal source and set its output level, at A1 pin E601, to 3 mV rms on the VTVM.

b. Set the OAM-1 VERT MODE switch to VERT SET and adjust the VERT POS control so that the trace is exactly on the VERTICAL SET line. Set the CARRIER LEVEL control to fully cw.

c. Set the VERT MODE switch to CARR SET and adjust A1R641 so that the trace is exactly on the CARRIER SET line of the CRT graticule.

d. Set the 2 MHz signal source output level at A1 pin E601, to 6 mV rms on the VTVM. Set the CARRIER LEVEL control to fully cw.

e. Adjust A1R621 so that the trace is exactly on the CARRIER SET line.

f. Repeat steps 4.24.8-a. through 4.24.8-e.

g. Set the VERT MODE switch to MEAS AM. The trace should be exactly on the 0 center line of the CRT graticule. If it is not, repeat paragraphs 4.24.7 and 4.24.8.

4.24.9 Distortion Analyzer Amplifier Adjustment

a. Connect the DVM to pin 2 of the DIST ANAL jack and verify that +9 Vdc \pm 1% is present.

b. Connect the ac VTVM to pin 1 of the DIST ANAL jack. The voltage should be between 270 and 330 mV rms. If it is not within this range, select the value of A3R124 to obtain 300 mV rms.

4.24.10 Modulation Oscillator Adjustment

a. Connect the ac VTVM (with 560 ohm resistor across terminals), frequency counter and the distortion analyzer to the OAM-1 AUDIO OUT 600 OHM jack.

b. Set the OAM-1 INT MOD/AUDIO OUT control to fully cw and the MOD/AUDIO OUT FREQ switch to 1 kHz.

c. Adjust A1R674 for 1.15 V rms on the VTVM.

d. Adjust A1R671 for 1 kHz \pm 1 Hz on the frequency counter. Readjust A1R674 for 1.15 V rms if necessary. If unable to obtain 1 kHz, set A1R671 to mid-range and select the value of A1R670 to obtain 1 kHz \pm 25 Hz. (Increase A1R670 to reduce frequency.)

e. Adjust the INT MOD/AUDIO OUT control to obtain 1 V rms on the VTVM. Calibrate the distortion analyzer at 1 kHz and measure the distortion. It should be less than 1% and decrease as the audio output level is decreased.

f. Set the MOD/AUDIO OUT FREQ switch to 400 Hz and set the INT MOD/AUDIO OUT control to fully cw.

g. Adjust A1R675 for 1.15 V rms on the VTVM.

h. Adjust A1R673 for 400 Hz \pm 1 Hz on the frequency counter. Readjust A1R675 for 1.15 V rms if necessary. If unable to obtain 400 Hz, set A1R673 to mid-range and select the value of A1R672 to obtain 400 Hz \pm 10 Hz. (Increase A1R672 to reduce frequency.)

j. Adjust the INT MOD/AUDIO OUT control to obtain 1 V rms on the VTVM. Calibrate the distortion analyzer at 400 Hz and measure the distortion. It should be less than 1% and decrease as the audio output level is decreased.

4.24.11 Modulation Ampifier Adjustment

a. Connect the audio oscillator and ac VTVM to the OAM-1 EXT MOD/HORIZ IN jack. Set the audio oscillator frequency to 1 kHz and output level to 500 mV rms.

b. Set the OAM-1 MOD MODE switch to EXT and connect the ac VTVM across the 510 ohm resistor on the test connector.

c. The VTVM should read 75 mV rms \pm 5%. If the level is not 75 mV rms \pm 5%, select the value of A1R677 to obtain 75 mV rms \pm 5%. (Reduce A1R677 to increase level.)

d. Connect the ac VTVM and the 560 ohm load resistor across the AUDIO OUT 600 OHM jack.

e. Set the MOD MODE switch to INT and adjust the INT MOD/AUDIO OUT control for 1 V rms on the VTVM. Disconnect the VTVM, but leave the 560 ohm load resistor across the AUDIO OUT 600 OHM jack.

f. Connect the ac VTVM across the 510 ohm resistor on the test connector. The VTVM should read greater than 80 mV rms.

4.25 FAULT ISOLATION PROCEDURES (MODEL OAM-1 MODULE)

Fault isolation procedures are presented to provide a guide in servicing the OAM-1. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.23, with each subsection keyed to the paragraph in Section 4.23 that first indicates a fault. When a fault is noted during OAM-1 operation, proceed as follows:

a. Perform checkout procedures in Section 4.23.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a circuit, refer to the alignment procedure for that circuit in Section 4.24 and check alignment of that circuit before proceeding with fault isolation.

d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

WARNING: High voltages are present throughout the unit. Appropriate precautions should be taken while operating the instrument with the cover removed.

4.25.1 No Trace (4.23.3-g.)

a. Remove socket from V1 (CRT) and check V1 voltages per Figure 5-29.

b. If voltages are within tolerance, replace V1.

c. If any voltage is absent or out of tolerance, check voltage source on board A2, A3 or A4 output terminals.

4.25.2 Vertical Centering Defective (4.23.3-g.)

a. Check voltages at pins 9 and 10 of V1. Voltage should be adjustable over an 80 V minimum span within the range of +95 Vdc to +235 Vdc as the VERT POS control is rotated throughout its range.

b. If voltages are within tolerance, replace V1.

c. If voltages are not within tolerance, check voltage at E119 on board A3. This voltage should vary from less than +0.1 Vdc to greater than +2.3 Vdc as the VERT POS control is rotated throughout its range.

d. If voltage at E119 is within tolerance, use voltages and waveforms on Figure 5-29 to isolate fault on board A3.

e. If voltage at E119 is not within tolerance, check R6, R7 and associated wiring.

4.25.3 Horizontal Centering Defective (4.23.3-g.)

a. Check voltages at pins 6 and 7 of V1. Voltages should vary over a 240 V minimum span within the range of 0 Vdc to +330 Vdc as the HORIZ POS control is rotated throughout its range.

b. If voltages are within tolerance, replace V1.

c. If voltages are not within tolerance, check voltage at E208 on board A4. This voltage should vary from 0 Vdc to +4.8 Vdc nominal as HORIZ POS control, R8, is rotated throughout its range.

d. If voltage at E208 is not within tolerance, check voltage at E209. Voltage should be 4.3 Vdc to 5.3 Vdc.

e. If voltage at E208 is within tolerance, use voltages and waveforms on Figure 5-29 to isolate fault on the board A4.

4.25.4 Focus Defective (4.23.3-h.)

a. Check voltage on pin 5 of V1. Voltage should vary over at least a 100-volt span within -650 Vdc and -920 Vdc as FOCUS control, R11, is adjusted throughout its range.

b. If voltage is within tolerance, change V1.

c. If voltage is not within tolerance, check for -1000 Vdc \pm 10% at E417 on board A2.

d. If voltage is within tolerance at E417, check wiring and neon indicator DS-1.

e. If voltage at E417 is out of tolerance, use Figure 5-29 voltages and waveforms to isolate fault on board A2.

4.25.5 Intensity Defective (4.23.3-h.)

NOTE The OAM-1 operates in a mainframe designed for 12 Vdc operation. The normal maximum intensity is not as high as that of oscilloscopes designed for 115 Vac operation because a lower power CRT is used to conserve current drain in battery operation.

a. Check voltage on pin 3 of V1 and determine if the voltage varies over a 50-volt span within the range of -850 Vdc to -1100 Vdc as INTENSITY control, R13, is rotated throughout its range.

b. If voltage is within tolerance, replace V1.

c. If voltage is out of tolerance, check voltage at E417 of A2.

d. If voltage is in tolerance at E417, check associated wiring and INTENSITY control, R13.

e. If voltage at E417 is out of tolerance, use Figure 5-29 voltages and waveforms to isolate fault in board A2.

4.25.6 Insufficient Range of Vertical Position Control (4.23.4-b.)

a. Perform procedures of paragraph 4.25.2.

4.25.7 Insufficient Range of Horizontal Position Control (4.23.4-c.)

a. Perform procedures of paragraph 4.25.3.

b. Perform procedures of paragraph 4.25.21.

4.25.8 Sweep Speed Cannot Adjust Below 50 Hz on Low Range (4.23.5-h.)

a. On board A4, check resistance of E203 to ground. If resistance is greater than 10 ohms, check wiring of SWEEP RANGE switch, S4.

b. If E203 is grounded, check voltage at E203 to determine if the voltage varies over a span of at least 0.6 Vdc within the range of +7.4 Vdc to +9.9 Vdc.

c. If voltage is within tolerance, use voltages and waveforms on Figure 5-29 to isolate fault on board A4.

4.25.9 Sweep Speed Cannot Adjust Above 5000 Hz on High Range (4.23.5-m.)

a. On board A4, check resistance of E203 to ground. If resistance is less than 100 k ohms, check wiring of SWEEP RANGE switch, S4.

b. If resistance is greater than 100 k ohms, check voltage at E202 to determine if the voltage varies over a span of at least 0.6 Vdc within the range of +7.4 Vdc to +9.9 Vdc.

4.25.10 Sweep Speed Cannot Adjust Below 500 Hz on High Range (4.23.5-q.)

a. Perform procedures of paragraph 4.25.9.

4.25.11 Sweep Speed Cannot Adjust Above 500 Hz on Low Range (4.23.5-m.)

a. Perform procedures of paragraph 4.25.8.

4.25.12 External Vertical Input Sensitivity Out of Specification (4.23.6-d.)

a. Apply a 1 kHz signal of 106 mV rms to VERT IN connector and check voltage with an oscilloscope at E101. Voltage should be 300 mV p-p.

b. If voltage is not 300 mV p-p, check VERT GAIN control, R3, R4, and associated wiring.

c. If voltage is 300 mV p-p, use voltages and waveforms on Figure 5-29 to isolate fault.

4.25.13 Cannot Adjust Trace to Vert Set Line (4.23.8-e.)

a. Perform procedures of paragraph 4.25.2.

4.25.14 Cannot Set Trace to Carrier Level Set Line (4.23.8-h., l., p.)

a. Check signal level at E601 to board A1. If level is not 11 mV p-p \pm 10%, fault is in mainframe; refer to mainframe Maintenance Section.

b. If signal level is correct, check dc voltage at E603. Voltage should vary over a span of at least 1V within the range of 0 to +2.0 Vdc as CARRIER LEVEL control, R1, is rotated throughout its range.

c. If voltage at E603 is not within tolerance, check R1 and associated wiring. Also, check voltages on E602 and E604 to verify that levels are within tolerances specified on Figure 5-29.

d. If voltage at E603 is within tolerance, check dc voltage at E101 on board A3. Voltage should be +0.3 Vdc \pm 10%.

e. If voltage at E101 is within tolerance, use Figure 5-29 voltages and waveforms to isolate fault on board A3.

f. If voltage is not within tolerance at E101, check voltage at E608.

g. If voltage at E608 differs from voltage at E101, check S2, S3, and associated wiring.

h. If voltage at E608 is the same as that at E101, use Figure 5-29 voltages and waveforms to locate fault on board A1.

4.25.15 Trace Not on CRT Centerline When Measuring Unmodulated Signal (4.23.8-t.)

a. Measure dc voltage at E101 on board A3. Voltage should be between 0.13 and 0.17 Vdc.

b. If voltage is within tolerance, use Figure 5-29 voltages and waveforms to isolate fault on board A3.

c. If voltage is not within tolerance, check voltage at E611 on board A1. If this voltage differs from voltage at E101, check S2, S3, and associated wiring.

d. If voltage at E611 is the same as voltage at E101 and not between +0.12 Vdc and +0.17 Vdc, use Figure 5-29 voltages and waveforms to isolate fault on board A1.

4.25.16 AM Does Not Measure Within Specified Accuracy (4.23.9-j., r.)

a. Check waveform at E101 with oscilloscope. Level should be between 270 and 330 mV p-p. If not, use Figure 5-29 voltages and waveforms to isolate fault on board A3.

b. If voltage at E101 is not within above tolerance, check signal at E611 on board A1. If level at E611 differs from signal at E101, check S2, S3, and associated wiring.

c. If signal at E611 is the same as signal at E101 and not between 270 and 330 mV p-p, use Figure 5-29 voltages and waveforms to isolate fault on board A1.

4.25.17 Trace Cannot Set on CRT Carrier Set Line (Mainframe in Cal Mode) (4.23.10-e.)

If procedures of paragraph 4.23.8 can be accomplished and those of step 4.23.10-e. cannot, the problem is in the mainframe. Refer to mainframe maintenance section.

4.25.18 Insufficient Modulation Using Internal Source (4.23.10-k.)

a. Check signal level at P1-11 with oscilloscope. Level should be greater than 300 mV p-p. If it is, fault is in mainframe. Refer to mainframe maintenance section.

b. If level at P1-11 is less than 300 mV p-p, check level at E624 on board A1. If level at E624 differs from level at P1-11, check S3 and associated wiring.

c. If signal at E624 is the same as signal at P1-11 and over 300 mV p-p, check signal at E628. This signal should be greater than 1.2 V p-p. If it is, fault is in buffer stages Q616 and Q617.

d. If level is less than 1.2 V p-p at E623, check level at E614. If level at E614 differs from level at E623, check AUDIO OUT control, R2, S6, and associated wiring.

e. If level at E614 is the same as at E623 and less than 1.2 V p-p, use Figure 5-29 voltages and waveforms to isolate fault on board A1.

4.25.19 Modulation Distortion Exceeds 3% at 30% Modulation (4.23.10-n.)

a. Adjust INT MOD/AUDIO OUT control for 1 V rms out of AUDIO OUT jack into a 600 ohm load.

b. Connect distortion analyzer input across 600 ohm load and measure distortion.

c. Distortion should be less than 1%. If it is, the fault is in the mainframe. Refer to mainframe maintenance section.

d. If distortion is greater than 1% at AUDIO OUT 600 OHM jack, check distortion at E617. If distortion at E617 is less than 1%, fault is in stages Q614 and Q615.

e. If distortion at E617 exceeds 1%, use Figure 5-29 voltages and waveforms to isolate fault on board A1.

4.25.20 External Modulation Sensitivity Not Within Specification (4.23.11-g.)

a. Set external modulation input level to exactly 500 mV rms and measure level at E623.

b. If level at E623 is not 500 mV rms, check S6 and associated wiring.

c. If level at E623 is 500 mV rms, check level at E624. Level at E624 should be between 60 mV rms and 90 mV rms. If not, fault is in stages Q616 and Q617.

4.25.21 External Horizontal Input Sensitivity Not Within Specification (4.23.12-c.)

a. Set audio oscillator output level to exactly 600 mV rms and check level at E206 on board A4. If level is not equal to input level, check S6 and associated wiring.

b. If level at E206 is equal to input, use Figure 5-29 voltages and waveform to isolate fault on board A4.

4.25.22 Frequency of Internal 1 kHz Tone Not Within Specification (4.23.13-f.)

Use Figure 5-29 voltages and waveforms to isolate fault on board A1.

4.25.23 Audio Output Less Than 1 V rms into 600 Ohm Load at 1 kHz (4.23.13-f.)

a. Check level at E618. Level should be greater than 1.2 V p-p. If it is, fault is in stages Q614 and Q615. Use Figure 5-29 voltages to further isolate fault.

b. If level at E618 is within tolerance, check level at E617. If level at E617 differs from level at E618, check R2, S6, and associated wiring.

c. If level at E617 is equal to level at E618 and is less than 1.2 V p-p, use Figure 5-29 voltages and waveforms to isolate fault on board A1.

4.25.24 Audio Distortion Greater than 1% at 1 kHz (4.23.13-h.)

Perform steps d. and e. of paragraph 4.25.19.

4.25.25 Internal 400 Hz Frequency Not Within Specification (4.23.13-m.)

Use Figure 5-29 voltage and waveforms to isolate fault on board A1.

4.25.26 Audio Output Less than 1 V rms into 600 Ohm Load at 1 kHz (4.23.13-n.)

Perform procedures of paragraph 4.25.23.

4.25.27 Audio Distortion Greater than 1% at 400 Hz (4.23.13-p.)

Perform steps d. and e. of paragraph 4.25.19.

4.26 TEST EQUIPMENT REQUIRED (MODEL ODM-1 MODULE)

The test equipment required for checkout, alignment, calibration, and troubleshooting is tabulated in Table 4-9. Minimum parameters are provided to aid in the selection of equivalent types.

4.27 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL ODM-1 MODULE)

CAUTION: High voltages are present throughout the unit and appropriate precautions should be taken while operating the unit with cover removed.

4.27.1 Focus and Intensity Check

a. Install the ODM-1 into the right-hand compartment of the mainframe. Set power switch to ON.

b. Rotate INTENSITY control fully cw.

c. Rotate FOCUS control to mid-range.

d. Set VERT IN switch to EXT.

TABLE 4-9

TEST EQUIPMENT REQUIREMENTS FOR MODEL ODM-1

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Audio Oscillator	Frequency response: 45 Hz to 30 kHz Output level: 25 mV to 400 mV rms	Hewlett-Packard Model 200CD
AC VTVM	Frequency response: 50 Hz to 2 MHz Level: 100 to 400 mV rms	Hewlett-Packard Model 400D
Frequency Source/ Peak Deviation Monitor	Frequency range: 25 MHz to 150 MHz Output impedance: 50 ohm nominal Output: < 6 mV rms to > 60 mV rms Stability: better than $\pm 0.0004\%/5$ min Leveling: ± 1 dB	Singer Model FM-2748 with with ODM-1 plug-in
Oscilloscope with 1X probe	Frequency response: 2 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 531 with 53/54B plug-in
Distortion Analyzer	Frequency response: 1 kHz Input level: 1 V rms Accuracy: $\pm 0.1\%$	Hewlett-Packard Model 333A
Frequency Counter	Frequency response: 1 kHz Input level 1 V rms	Hewlett-Packard Model 5512A
VOM	Level: 0 to 1100 Vdc	Simpson Model 269
DC Digital Voltmeter	Level: 1 mV to 1000 Vdc Accuracy: $\pm 0.1\%$ of reading	Hewlett-Packard Model 3440A
Sweep Generator	Frequency range: 2 MHz Output level: -27dBm	Wavetek Model 2001
DC Power Supply	Level: 9 Vdc at 1 Amp	Hewlett-Packard Model 6214A
Mainframe/RF & FIM Modules	Required for testing ODM-1 Module	Singer Model FM-10C
Extender Cable	Not available	Singer Model PC-2653
Connector	16 pin	Singer P/N 1-910072-001
Capacitors	0.1 uF, 100 uF	Not applicable
Resistors	16 ohm (3), 62 ohm, 100 ohm, 180 ohm, 560 ohm, 5.6 ohm (all $\pm 5\%$, $\frac{1}{4}$ watt)	Not applicable

- e. Set MOD MODE switch to INT/COMB.
- f. Allow 5 to 10 seconds for the CRT filaments to warm up.
- g. Adjust VERT CENTER and HORIZ CENTER controls until CRT trace is centered.
- h. Re-adjust FOCUS and INTENSITY controls for sharpest trace with adequate intensity.
- j. Verify that CRT trace is bright enough to see in a normally lit room. Verify that FOCUS, VERT CENTER, and HORIZ CENTER controls are approximately at mid-range.

4.27.2 Vertical and Horizontal Center Control Range Check

- a. Rotate VERT CENTER control from fully cw to fully ccw.
- b. Verify that CRT trace deflects beyond calibrated portion of graticule vertically when VERT CENTER control is rotated throughout its range.
- c. Return VERT CENTER control to mid-range.
- d. Rotate HORIZ CENTER control from fully cw to full ccw.
- e. Verify that ends of trace deflect horizontally to at least mid-screen when HORIZ CENTER control is rotated throughout its range.
- f. Return HORIZ CENTER control to mid-range.
- g. Verify that trace is centered on CRT with controls set at approximately mid-range.

4.27.3 Sweep Range Check

- a. Rotate VERT GAIN control fully cw.
- b. Set VERT IN switch to EXT.
- c. Connect audio oscillator and ac VTVM to VERT IN jack.
- d. Adjust audio oscillator frequency to 50 Hz and set ac VTVM to 30 mV scale.
- e. Rotate SWEEP SPEED control fully ccw.
- f. Set SWEEP RANGE switch at LO.
- g. Increase audio oscillator output until sine wave on CRT deflects to full-scale. Adjust audio oscillator frequency for a stationary, one-cycle sine wave on CRT.

- h. Verify that audio oscillator frequency is less than 50 Hz (approximately 45 Hz).
- j. Rotate SWEEP SPEED control fully cw.
- k. Set SWEEP RANGE switch to HI.
- l. Adjust audio oscillator frequency for a stationary, one-cycle sine wave on CRT.
- m. Verify that audio oscillator frequency is greater than 5000 Hz and deflects across entire CRT.
- n. Rotate SWEEP SPEED control fully ccw.
- p. Adjust audio oscillator frequency for a stationary, one-cycle sine wave on CRT.
- q. Verify that audio oscillator frequency is less than 500 Hz (approximately 450 Hz).
- r. Set SWEEP RANGE switch to LO.
- s. Rotate SWEEP SPEED control fully ccw.
- t. Adjust audio oscillator frequency for a stationary, one-cycle sine wave.
- u. Verify that audio oscillator frequency is greater than 500 Hz (approximately 550 Hz).

4.27.4 Vertical Sensitivity Check

- a. Adjust audio oscillator frequency to 1 kHz.
- b. Set SWEEP RANGE switch and adjust SWEEP SPEED control for a stationary pattern on CRT.
- c. Adjust output of audio oscillator for full-scale deflection on CRT.
- d. Verify that output of audio oscillator output level is between 22 and 27 mV rms.

4.27.5 Vertical Amplifier Frequency Response Check

- a. Adjust audio oscillator output to obtain exactly full-scale deflection on CRT at 1 kHz frequency.
- b. Increase audio oscillator frequency to 30 kHz and note p-p deflection on CRT.
- c. Decrease audio oscillator frequency to 50 Hz and note p-p deflection on CRT.
- d. Verify that signal on CRT did not change more than 3 dB (less than 3 divisions p-p) from 50 Hz to 30 kHz.

4.27.6 Sensitivity Check

- a. Install ODM-1 in mainframe.
- b. Set mainframe frequency switches to 150 MHz and 0–100 Hz frequency control to OUT.
- c. Connect signal generator to left-hand module MEASURE INPUT jack and set signal generator for an output of 150 MHz at the rated sensitivity of the left-hand module. Set mainframe MODE switch to MEAS.
- d. Tune signal generator until FM-10C indicates zero beat.
- e. The OPER indicator should come on with signal generator output within the rated sensitivity range of the left-hand module.
- f. Increase signal generator output by 20 dB and verify that OVLD indicator comes on.

4.27.7 5 kHz Range Gain Check

- a. Set mainframe to 000.000 MHz and 0–100 Hz frequency control to OUT.
- b. Set DEV RANGE switch to 5 kHz.
- c. Adjust VERT CENTER control so that trace is on 0 center line.
- d. Set mainframe to 000.0050 MHz.
- e. Verify that CRT trace is on bottom line \pm $\frac{1}{2}$ division.

4.27.8 15 kHz Range Gain Check

- a. Set mainframe to 000.000 MHz and 0–100 Hz frequency control to OUT.
- b. Set DEV RANGE switch to 15 kHz.
- c. Adjust VERT CENTER control so that trace is on 0 center line.
- d. Set mainframe to 000.0150 MHz.
- e. Verify that CRT trace is on bottom line \pm $\frac{1}{2}$ division.

4.27.9 Internal Modulation and Vertical Gain Control Check

- a. Set MODE switch to GEN MOD CAL and GENERATOR MODULATION switch to IN/ON.
- b. Set MOD MODE switch to INT/COMB.
- c. Set DEV RANGE switch to 15 kHz.
- d. Rotate INT MOD/AUDIO OUT control to fully cw and verify that trace exceeds full-scale deflection.

- e. Adjust MOD/AUDIO OUT control for full-scale deflection of CRT trace.

4.27.10 Internal/Combined and External Mode Check

- a. Set DEV RANGE switch to 5 kHz.
- b. Set mainframe to 000.000 MHz, 0–100 Hz frequency control to OUT, MODE switch to GEN MOD CAL, and GENERATOR MODULATION to IN/ON.
- c. Adjust INT MOD/AUDIO OUT control for a full-scale trace.
- d. Set MOD MODE switch to EXT.
- e. Connect audio oscillator to EXT MOD/HORIZ IN jack.
- f. Set audio oscillator for 1 kHz output and adjust output level for full-scale deflection on CRT.
- g. Verify that audio oscillator output level is 80 mV rms \pm 20%.
- h. Set MOD MODE switch to INT/COMB and verify display of two 1 kHz signals beating.

4.27.11 External Horizontal Sweep Capability Check

- a. Set MOD MODE switch to EXT HORIZ. Connect audio oscillator to EXT MOD/HORIZ IN jack and set frequency to 1 kHz.
- b. Increase audio oscillator output until trace is deflected beyond the diameter of CRT.
- c. Verify that amplitude required for full-diameter deflection is less than 500 mV rms.

4.27.12 Audio Output Frequency, Level, and Distortion Checks

- a. Connect ac VTVM and frequency counter to AUDIO OUT 1 kHz 600 OHM jack.
- b. Connect a 600 ohm resistive load across the ac VTVM terminals.
- c. Rotate INT MOD/AUDIO OUT control fully cw.
- d. Note readings on ac VTVM and frequency counter.
- e. Verify that frequency is 1 kHz \pm 5% level should be 1 V rms minimum into 600 ohm.
- f. Disconnect frequency counter from AUDIO OUT 1 kHz 600 OHM jack and connect distortion analyzer.

g. Calibrate distortion analyzer at 1 kHz and note the distortion. Distortion should be less than 1%.

4.28 ALIGNMENT AND ADJUSTMENT (MODEL ODM-1 MODULE)

NOTE The Alignment and Adjustment Procedure is performed with the ODM-1 disconnected from the mainframe so that any problem in the mainframe will not affect the alignment of the ODM-1. Refer to figures 4-40 through 4-43 for test point and for trimmer locations. Remove the five screws from the back of the ODM-1 and slide the cover off the back.

4.28.1 Test Connector Wiring

a. See Figure 4-44A for schematic of test connector wiring.

4.28.2 Location and Adjustment of Trace

a. Connect the test connector to the ODM-1 and set the ODM-1 controls as follows

INTENSITY	Fully cw
VERT CENTER	Mid-range
VERT IN	EXT
MOD MODE	INT/COMB
HORIZ CENTER	Mid-range

b. Connect the VOM between pins E103 and E104 on the vertical amplifier board, A3.

c. Adjust A3R105 for 0V dc on the VOM.

d. The trace should be visible. If so, set the SWEEP RANGE control to LO and the SWEEP SPEED control fully ccw.

e. If the trace is not visible, connect the VOM between pins E212 and E213 on the horizontal amplifier board, A4. Adjust the HORIZ CENTER control for 0V dc on the VOM.

f. The trace should now be visible. If not, connect the DVM to pin E211 on the A4 board and ground. Adjust A4R217 (Astigmatism) for approximately +150V dc on the DVM.

g. If the trace is still not visible, check the CRT socket wiring. If the wiring is correct, substitute another CRT.

4.28.3 IF Sweep Alignment

a. Connect the sweep generator RF output jack to the test connector "sweep generator" input.

b. Connect the frequency source RF output jack to the test connector "marker generator" input.

c. Connect the BNC test cable via the 0.1 uF capacitor to A1TP2. Connect the BNC end to the oscilloscope vertical input jack. (Figure 4-44B)

d. Connect the sweep generator horizontal output jack to the oscilloscope external horizontal input jack.

e. Set the sweep generator mode switch to f, center freq control to 2 MHz, sweep width control to approx. 100 kHz, and RF output level to approx. -27 dBm.

f. On the oscilloscope, set the horizontal display switch to external horizontal attenuator X1 and adjust the external horizontal attenuator as necessary to display the response curve, set the time/centimeter switch to 2 sec., and adjust the vertical sensitivity as necessary to display the response curve.

g. Set the frequency source to 2 MHz and adjust its output level for a visible marker on the oscilloscope. Adjust the sweep generator center frequency and sweep width controls so that the response curve is centered on the oscilloscope CRT and has approx. the same width as in Figure 4-45A.

h. Adjust A1L501, A1L502 and A1L503 for maximum amplitude and to set the center of the response curve on the 2 MHz marker.

j. Adjust A1L502 and A1L503 for the flattest response and optimum balance on both sides of the 2 MHz marker.

k. Adjust the oscilloscope vertical sensitivity so that the response curve is vertically deflected 4 cm.

l. Set the frequency source frequency to 1.975 MHz and 2.025 MHz alternately and verify that the markers are not down on the slopes more than 3 dB (70% of maximum deflection). (Figure 4-45B)

m. Disconnect the BNC test cable from the oscilloscope vertical input jack and connect the 1X probe.

n. Connect the 1X probe to A1 pin E518 and verify that an "S" curve is present.

p. Disconnect the sweep generator from the test connector and connect the ac VTVM to A1 pin E501. Set the frequency source output level for 2.5 mV rms on the ac VTVM.

q. Connect the oscilloscope probe to A1TP3 and verify that a square wave of approx. 1.4V p-p is present.

r. Connect the oscilloscope probe to A1TP4 and verify that 2 MHz sine wave is present with pips near the peaks. Adjust A1L504 so that the pips are exactly on the peaks of the sine wave.

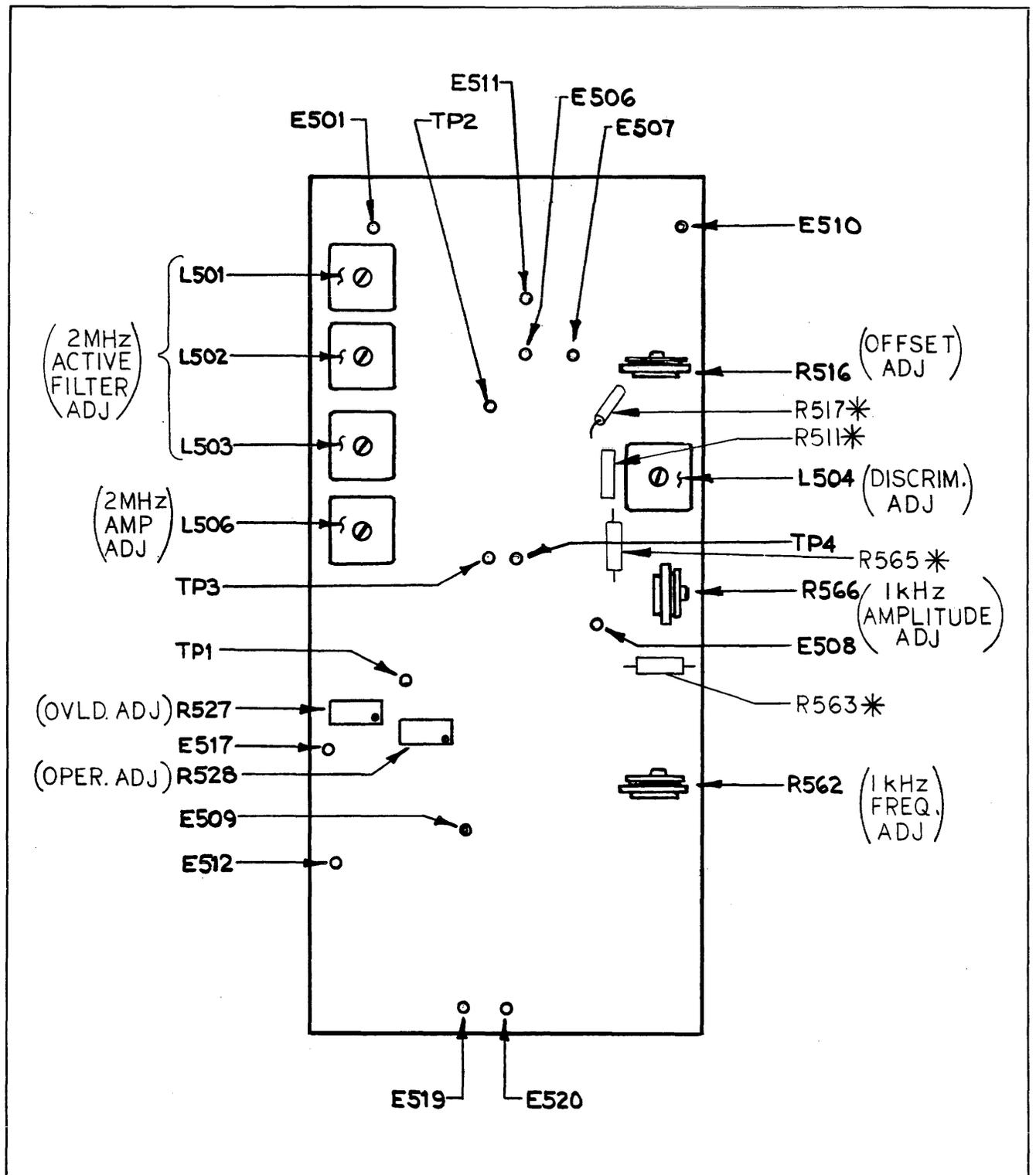


FIGURE 4-40. IF AMPLIFIER BOARD ASSEMBLY, A1 (ODM-1)

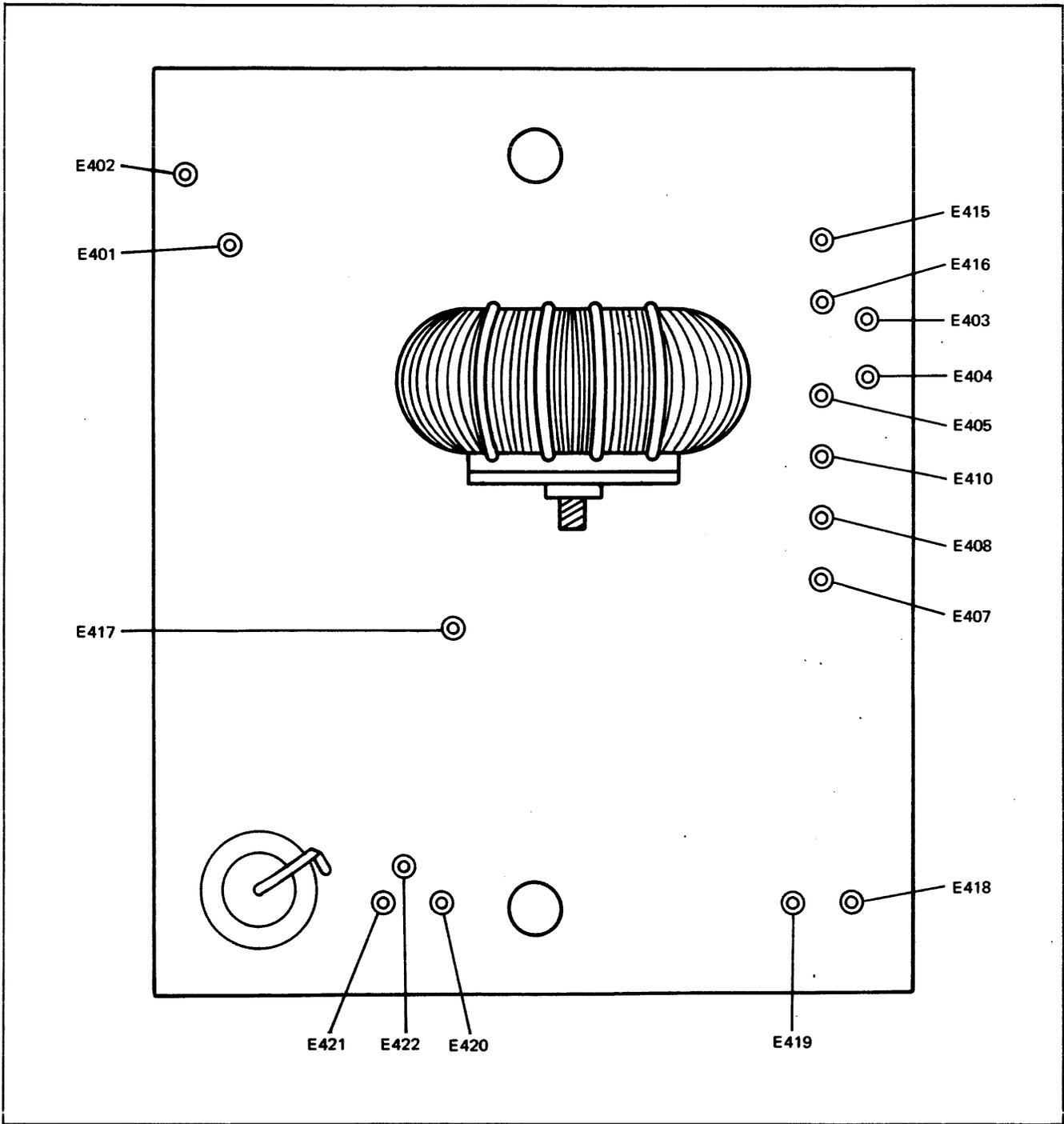


FIGURE 4-41. POWER SUPPLY BOARD ASSEMBLY, A2 (ODM-1)

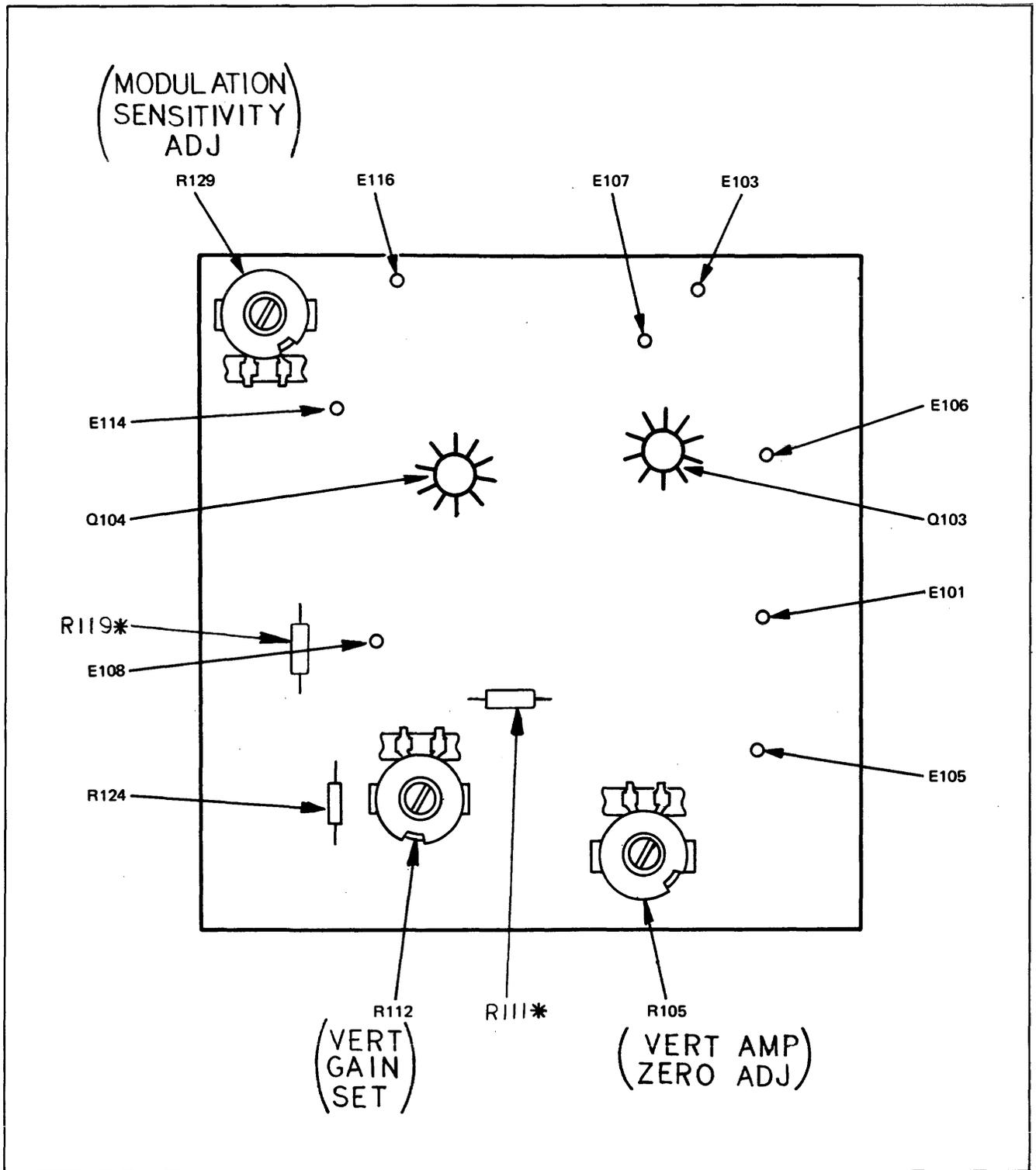


FIGURE 4-42. VERTICAL AMPLIFIER BOARD ASSEMBLY, A3 (ODM-1)

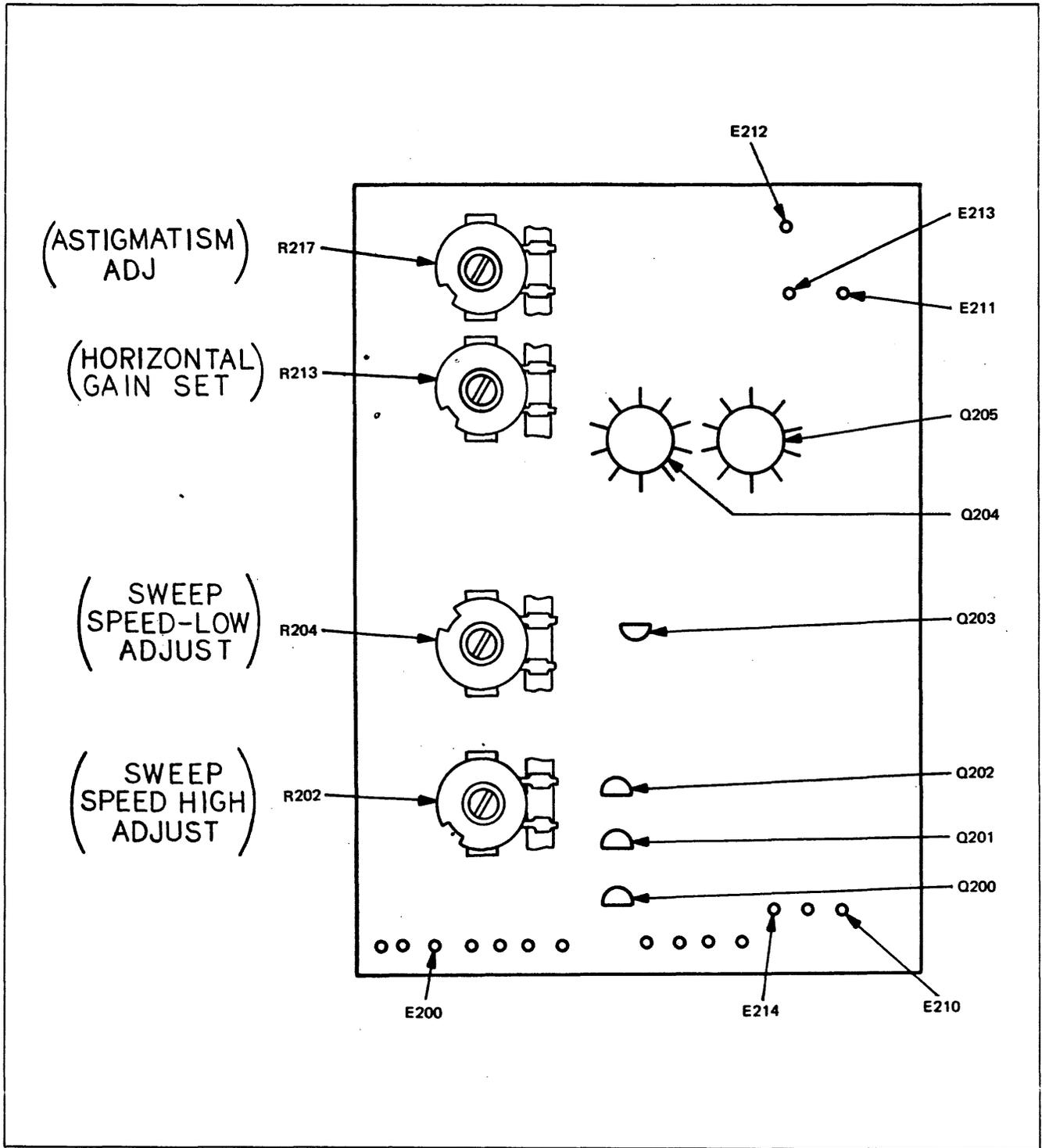


FIGURE 4-43. HORIZONTAL AMPLIFIER BOARD ASSEMBLY, A4 (ODM-1)

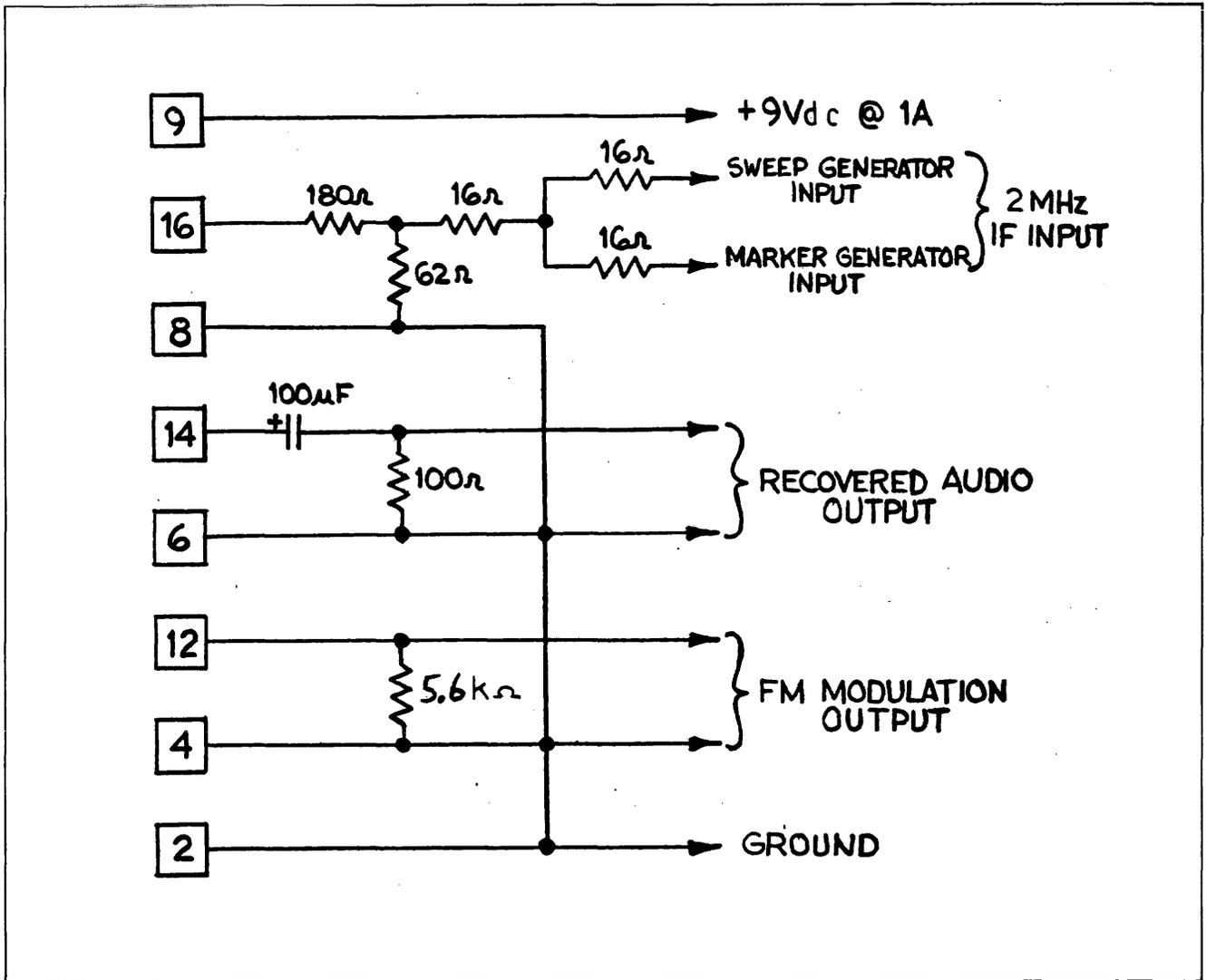


FIGURE 4-44A. TEST CONNECTOR SCHEMATIC, (ODM-1)

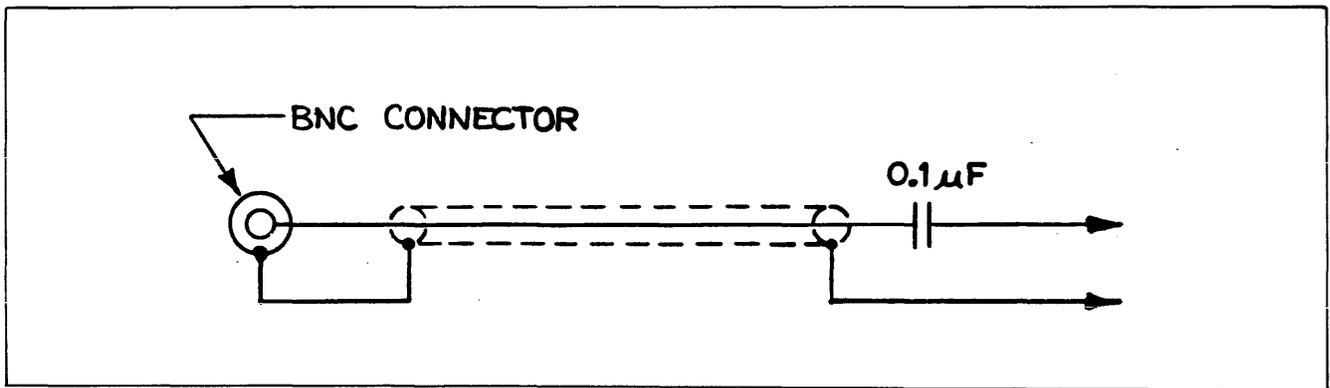
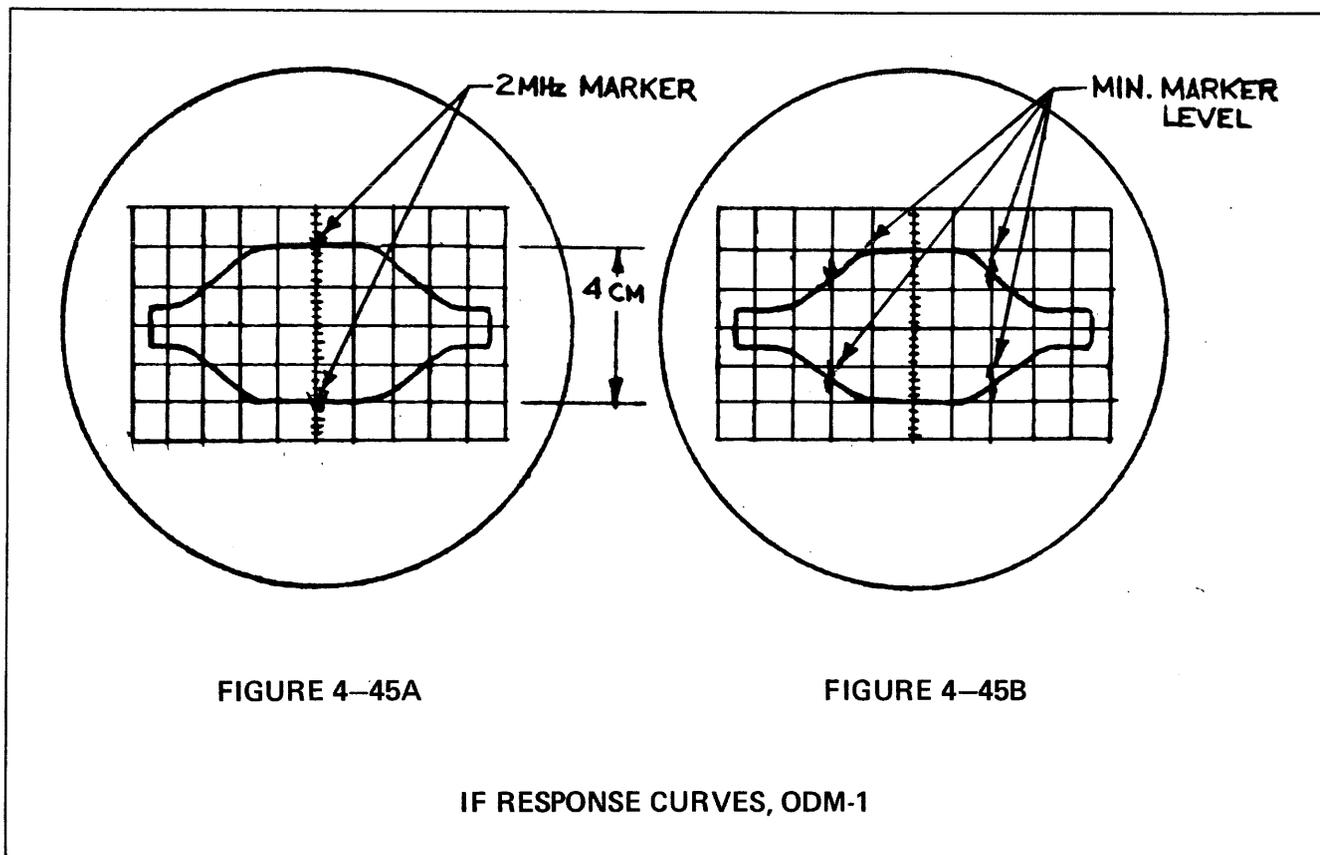


FIGURE 4-44B. BNC TEST CABLE/CAPACITOR SCHEMATIC, (ODM-1)



4.28.4 Level Detector Adjustment

- a. Connect the DVM to A1TP1 and adjust A1L506 for maximum voltage on the DVM. Should be 1.8V dc or greater.
- b. Adjust A1R528 until the OPER lamp just turns on.
- c. Set the frequency source output level to 25 mV rms at A1 pin E501.
- d. Adjust A1R527 until the OVLD lamp just turns on. The OPER lamp should be off.
- e. Repeat steps 4.28.4-b. through 4.28.4-d. until both lamps function as described.
- f. Repeat step 4.28.4-b. and rotate A1L506 slightly in both directions while observing the OPER lamp. If more than 1/2 turn in either direction is required before the OPER lamp turns off, repeat steps 4.28.4-b. through 4.28.4-f.

4.28.5 Trace Alignment and Focus

- a. Loosen the CRT clamp screw and set the trace on the 0 center line of the graticule with the VERT CENTER control.

- b. Grasp the large end of the CRT (away from the high voltage) and rotate it until the trace is parallel to the 0 center line, then rotate it so that the right end of the trace is 1/3 division high. This is to compensate for cw rotation of the CRT when the clamp screw is tightened. Tighten the clamp screw.

- c. Repeat step 4.28.5-c. as necessary to align trace exactly parallel with the 0 center line.

- d. Set the FOCUS control to mid-range and adjust A4R217 (Astigmatism) for the sharpest trace.

4.28.6 Offset and Vertical Amplifier Gain Adjustment

- a. Set the VERT IN switch to EXT and adjust the VERT CENTER control to mid-range.

- b. Set the DEV RANGE switch to 5 kHz. Adjust A3R105 (vertical position) to set the trace on the 0 center line.

- c. Set the frequency source frequency controls to 008.005 MHz, 0-1 kHz control to 0, 10 MHz switch in, audio switch to the modulation position, and output level to 2.5 mV rms.

- d. Set the VERT IN switch to INT and adjust A3R112 (vertical gain) to set the trace on the +5 kHz line (top line of graticule).

e. A3R105 and A3R112 interact with one another, therefore repeat steps 4.28.6-b. through 4.28.6-d.

f. Set the frequency source frequency controls to 007.995 MHz. The trace should be on the -5 kHz line (bottom line of graticule).

g. Set the frequency source to 2 MHz, 10 MHz switch out, and adjust A1R516 (offset adjust) to set the trace on the 0 center line.

h. Set the DEV RANGE switch alternately to the 5 kHz and 15 kHz positions and verify that the trace remains on the 0 center line $\pm \frac{1}{2}$ division.

4.28.7 External Vertical Gain Adjustment

a. Set the ODM-1 controls as follows:

VERT IN	EXT
VERT GAIN	Fully cw
VERT CENTER	Trace on 0 center line

b. Connect the ac VTVM and the audio oscillator to the VERT IN jack on the ODM-1.

c. Set the audio oscillator frequency to 1 kHz and output level for full-scale deflection on the CRT.

d. The ac VTVM should read 25 mV rms \pm 10% (22.5 to 27.5 mV rms).

e. If the level required for full-scale deflection is less than 22.5 mV rms, increase the value of A1R511 from 9.1 k ohms to 10 k ohms. Disconnect the audio oscillator and repeat steps 4.28.6-a. through 4.28.6-d.

f. If the level required for full-scale deflection is more than 27.5 mV rms, decrease the value of A1R511 from 9.1 k ohms to 8.2 k ohms. Disconnect the audio oscillator and repeat steps 4.28.6-a. through 4.28.6-d.

4.28.8 Sweep Range Adjustment

a. Set the ODM-1 controls as follows:

VERT CENTER	To center trace on graticule
HORIZ CENTER	To center trace on graticule
SWEEP RANGE	LO
SWEEP SPEED	Fully ccw
VERT IN	EXT
VERT GAIN	Fully cw

b. Connect the audio oscillator to the VERT IN jack. Set the audio oscillator frequency to 45 Hz and adjust its output level for full-scale deflection on the CRT.

c. Adjust A4R204 for a one-cycle stationary display on the CRT.

d. Set the oscillator frequency to 5.2 kHz. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control fully cw.

e. Adjust A4R202 for a one-cycle stationary display on the CRT.

f. Repeat steps 4.28.8-c. through 4.28.8-e.

g. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control to fully ccw. Adjust the audio oscillator frequency control to produce a one-cycle stationary display.

h. The audio oscillator frequency should now be less than 500 Hz.

j. Set the SWEEP RANGE switch to LO and the SWEEP SPEED control to fully cw.

k. Adjust the audio oscillator control to produce a one-cycle stationary display.

l. The audio oscillator frequency should now be more than 500 Hz.

m. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control fully cw.

n. Set audio oscillator frequency to 1 kHz.

o. Adjust A4R213 until the trace extends slightly beyond the edges of the CRT.

4.28.9 Modulation Oscillator Adjustment

a. Connect the ac VTVM (with 560 ohm resistor across terminals), frequency counter and distortion analyzer to the AUDIO OUT jack.

b. Set the INT MOD/AUDIO OUT control fully cw.

c. Adjust A1R562 for 1 kHz \pm 1 Hz on the frequency counter.

d. Adjust A1R566 for 1.15 mV rms on the ac VTVM.

e. Repeat steps 4.28.9-c. and 4.28.9-d. until both are as specified.

f. Set the output level to 1.0 V rms with the INT MOD/AUDIO OUT control. Calibrate the distortion analyzer at 1 kHz and measure the distortion. The distortion should be less than 1%.

g. Disconnect the equipment installed in step 4.28.9-a.

4.28.10 Modulation Sensitivity Adjustment

a. Connect the ac VTVM to the EXT MOD/HORIZ IN jack and adjust the audio oscillator output for 400 mV rms \pm 0.5%.

b. Connect the ac VTVM across the 5.6 ohm resistor on test connector.

c. Adjust A3R129 for 500 mV rms \pm 0.5% indication on the VTVM.

4.28.11 Distortion Analyzer Amplifier Adjustment

a. Connect the DVM to pin 2 of the DIST ANAL jack and verify that +9 Vdc \pm 1% is present.

b. Connect the DVM to pin 4 of the DIST ANAL jack.

c. Select the value of A3R119 to obtain +4.50 Vdc \pm 0.25 V on the DVM.

4.29 FAULT ISOLATION PROCEDURES (MODEL ODM-1 MODULE)

Fault isolation procedures are presented to provide a guide in servicing the ODM-1. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.27, with each subsection keyed to the paragraph in Section 4.27 that first indicates a fault. When a fault is noted during ODM-1 operation, proceed as follows:

a. Perform checkout procedures in Section 4.27.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a function, such as the discriminator, refer to the alignment procedure for that function in Section 4.28, and check alignment of function before proceeding with fault isolation.

d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

WARNING: High voltages are present throughout the unit. Appropriate precautions should be taken while operating the instrument with the cover removed.

4.29.1 No Trace (4.27.1-g.)

a. Remove socket from V1 (CRT) and check V1 voltages per Figure 5-30.

b. If voltages are within tolerance, replace V1.

c. If any voltage is absent or out of tolerance, check voltage source on board A2, A3, or A4 output terminals.

d. If voltages are within tolerance at A2, A3, or A4 output terminals check wiring harness for open or shorted leads.

e. If any voltage is absent or out of tolerance at output terminals of A2, A3, or A4 use voltages and waveforms shown on Figure 5-30 to isolate the fault.

4.29.2 Vertical Centering Defective (4.27.1-g.)

a. Check voltages at pins 9 and 10 of V1. Voltage should be adjustable over an 80 V minimum span within the range of +95 Vdc to +235 Vdc as the VERT CENTER control is rotated throughout its range.

b. If voltages are within tolerance, replace V1.

c. If voltages are not within tolerance, check voltage at E119 on board A3. This voltage should vary from less than +0.1 Vdc to greater than 2.3 Vdc as the VERT CENTER control is rotated throughout its range.

d. If voltage at E119 is within tolerance, use voltages and waveforms on Figure 5-30 to isolate fault on board A3.

e. If voltage at E119 is not within tolerance, check R8, R9 and associated wiring.

4.29.3 Horizontal Centering Defective (4.27.1-g.)

a. Check voltages at pins 6 and 7 of V1. Voltages should vary over a 240 V minimum span within the range of 0 Vdc to +330 Vdc as the HORIZ CENTER control is rotated throughout its range.

b. If voltages are within tolerance, replace V1.

c. If voltages are not within tolerance, check voltage at E208 on board A4. This voltage should vary from 0 Vdc to +4.8 Vdc nominal as HORIZ CENTER control, R12, is rotated throughout its range.

d. If voltage at E208 is not within tolerance, check voltage at E209. Voltage should be 4.3 Vdc to 5.3 Vdc.

e. If voltage at E208 is within tolerance, use

voltages and waveforms on Figure 5-30 to isolate fault on board A4.

4.29.4 Focus Defective (4.27.1-h.)

a. Check voltage on pin 5 of V1. Voltage should vary over at least a 100-volt span within -650 Vdc and -920 Vdc as FOCUS control, R21, is adjusted throughout its range.

b. If voltage is within tolerance, change V1.

c. If voltage is not within tolerance, check for -1000 Vdc \pm 10% at E417 on board A2.

d. If voltage is within tolerance at E417, check wiring and neon indicator, D51.

e. If voltage at E417 is out of tolerance, use Figure 5-30 voltages and waveforms to isolate fault on board A2.

4.29.5 Intensity Defective (4.27.1-h.)

NOTE: The ODM-1 operates in mainframes designed for 12 Vdc operation. The normal maximum intensity is not as high as that of oscilloscope designed for 115 Vac operation because a lower power CRT is used to conserve current drain in battery operation.

a. Check voltage on pin 3 of V1 and check that voltage varies over a 50 volt span in the range of -850 Vdc to -1100 Vdc as INTENSITY control, R18, is rotated throughout its range.

b. If voltage is within tolerance, replace V1.

c. If voltage is out of tolerance, check voltage at E417 of A2.

d. If voltage is within tolerance at E417, check associated wiring and INTENSITY control, R18.

e. If voltage at E417 is out of tolerance, use Figure 5-30 voltages and waveforms to isolate fault in board A2.

4.29.6 Vertical Center Control Defective (4.27.2-b.)

Perform procedures of paragraph 4.29.2.

4.29.7 Horizontal Center Control Defective (4.27.2-e.)

Perform procedures of paragraph 4.29.3.

4.29.8 Sweep Speed Cannot Adjust Below 50 Hz on Low Range (4.27.3-h.)

a. On board assembly A4, check resistance of E203 to ground. If resistance is greater than 10 ohms, check wiring of SWEEP RANGE switch, S4.

b. If E203 is grounded, check voltage at E202 to determine if voltage varies over a span of at least 0.6 Vdc within the range of +7.4 Vdc to +9.9 Vdc.

c. If voltage is within tolerance, use voltages and waveforms on Figure 5-30 to isolate fault on board assembly A4.

4.29.9 Sweep Speed Cannot Adjust Above 5000 Hz on High Range (4.27.3-m.)

a. On board assembly A4, check resistance of E203 to ground. If resistance is less than 100 k ohms, check wiring of SWEEP RANGE switch, S4.

b. If resistance is greater than 100 k ohms, check voltage at E202 to determine if voltage varies over a span of at least 0.6 Vdc within the range of +7.4 Vdc to +9.9 Vdc.

4.29.10 Sweep Speed Cannot Adjust Below 500 Hz on High Range (4.27.3-q.)

Perform procedures of paragraph 4.29.9.

4.29.11 Sweep Speed Cannot Adjust Above 500 Hz on Low Range (4.27.3-u.)

Perform procedures of paragraph 4.29.8.

4.29.12 External Vertical Input Sensitivity Not Within Specification (4.27.4-d.)

a. Apply a 1 kHz signal with a level of 25 mV rms to EXT VERT input connector and check voltage with oscilloscope at E101. Voltage should be 70 mV p-p.

b. If voltage is not 70 mV p-p, check VERT GAIN control, R7, R6 and associated wiring.

c. If voltage is 70 mV p-p, use voltages and waveforms on Figure 5-30 to isolate fault.

4.29.13 Vertical Amplifier Frequency Response Not Within Specification (4.27.5-d.)

a. Check voltage at pin E101. Verify that voltage changes less than 1 dB from 50 Hz to 30 kHz.

b. If voltage changes more than 1 dB over this range, check C1, R6, R7 (VERT GAIN), S1 and associated wiring.

c. If voltage does not vary more than \pm 1 dB, use voltages and waveforms of Figure 5-30 to isolate fault on board assembly A3.

4.29.14 Operate Indicator Sensitivity Not Within Specification (4.27.6-e.)

a. Connect high impedance probe of RF voltmeter to pin E501 and ground. Verify that 2 MHz level is 2.5 mV rms \pm 10%.

b. If level is not 2.5 mV rms \pm 10% at pin E501, the fault is in the mainframe. Refer to mainframe maintenance section of manual.

c. If level is 2.5 mV \pm 10% at pin E501, use Figure 5-30 voltages and waveforms to isolate fault on board assembly A1.

4.29.15 Overload Indicator Sensitivity Not Within Specification (4.27.6-f.)

a. Connect high impedance probe of RF voltmeter to pin E501 and ground. Verify that 2 MHz level is 25 mV rms \pm 10%.

b. If level is not 25 mV rms \pm 10% at pin E501, the fault is in the mainframe. Refer to mainframe maintenance section of manual.

c. If level is 25 mV rms \pm 10% at pin E501, use Figure 5-30 voltages and waveforms to isolate fault on board assembly A1.

4.29.16 5 kHz Negative Range Gain Not Within Specification (4.27.7-c.)

a. Connect dc VTVM to pin E507 and ground. Verify that voltage is +233 mV dc \pm 20 mV.

b. If voltage is not +233 mV dc \pm 20 mV at pin E507, use Figure 5-30 voltages and waveforms to isolate fault on board assembly A1.

c. If voltage at pin E507 is correct, check voltage on pin E101 (vertical amplifier board assembly A3). Verify that voltage is +233 mV dc \pm 20 mV.

d. If voltage at pin E101 is correct, use Figure 5-30 voltages and waveforms to isolate fault on vertical amplifier board assembly, A3.

e. If voltage is not +233 mV dc \pm 20 mV at pin E101, check DEV RANGE switch S2, R2, R3, R4 and associated wiring.

4.29.17 15 kHz Negative Range Gain Not Within Specification (4.28.8-e.)

Repeat procedures of paragraph 4.29.16 except that voltage at pins E507 and E101 should be -400 mV dc \pm 40 mV.

4.29.18 Insufficient Vertical Amplitude at 15 kHz (4.27.9-d.)

a. Connect ac VTVM to pin E114 and ground. Verify that voltage is $>$ 480 mV.

b. If voltage at pin E114 is $>$ 480 mV, the fault is in the mainframe. Refer to mainframe maintenance section of manual.

c. If voltage at pin E114 is $<$ 480 mV, check voltage between pin E116 and ground. Verify that voltage is $>$ 113 mV rms.

d. If voltage at pin E116 is $>$ 113 mV rms, connect audio oscillator to EXT MOD/HORIZ IN jack, set MOD MODE switch to EXT, set oscillator to 400 mV rms and adjust A3R129 for a 400 mV rms indication at pin E114.

e. If unable to attain correct voltage at pin E114, use Figure 5-30 voltages and waveforms to isolate fault in U102 circuit on vertical amplifier board assembly A3.

f. If voltage at pin E116 is not correct, check R14, R15, R16 and MOD MODE switch, S4, wiring. Verify that voltage at pin E513 is 321 mV rms \pm 10%.

g. If voltage at pin E513 is not correct, check INT MOD/AUDIO OUT control, R13, and associated wiring. Verify that voltage at pin E512 is 640 mV rms \pm 10%.

h. If voltage at pin E512 is not correct, use Figure 5-30 voltages and waveforms to isolate fault in modulation oscillator on board assembly A1.

4.29.19 Insufficient Vertical Amplitude at 5 kHz in External Mode (4.27.10-g.)

a. Connect ac VTVM to EXT MOD/HORIZ IN jack. Verify that voltage is 80 mV rms \pm 20%.

b. If voltage is not correct, adjust audio oscillator output to obtain this level.

c. If voltage is correct, verify that voltage at pin E114 is 500 mV rms \pm 5%.

d. If voltage at pin E114 is correct, the fault is in the mainframe. Refer to mainframe maintenance section of manual.

e. If voltage is not correct at pin E114, perform steps 4.29.18-d. and 4.29.18-e.

4.29.20 External Horizontal Sensitivity Not Within Specification (4.27.11-c.)

a. Set audio oscillator at 500 mV rms and measure voltage at pin E206.

b. If voltage at E206 is less than 500 mV rms, check S4 and associated wiring.

c. If voltage at E206 is 500 mV rms, use Figure 5-30 voltages to isolate fault on board assembly A4.

4.29.21 Audio Output Frequency Not Within Specification (4.27.12-e.)

Use Figure 5-30 voltages and waveforms to isolate fault on board assembly A1.

4.29.22 Audio Output Level Not Within Specification (4.27.12-e.)

a. Check the level at E513. This level should be greater than 1.2 V p-p. If it is, the fault is in stages Q519 and Q520. Use schematic voltages, Figure 5-30, to isolate the fault.

b. If the level at E513 is within tolerance, check the level at E512. If the level at E512 differs from the level at E513 check R13, R15, R15, R16, S4 and associated wiring.

c. If the level at E512 is equal to the level at E513 and is less than 1.2 V p-p, use the voltage and waveform information on the schematic Figure 5-30, to isolate the fault on board assembly A1.

4.29.23 Audio Distortion Not Within Specification (4.27.12-g.)

a. Connect distortion analyzer to pin E512 and calibrate it at 1 kHz. Distortion should be 0.5% or less.

b. If distortion at pin E512 is greater than 0.5%, use Figure 5-30 voltages and waveforms to isolate fault on board assembly A1.

c. If distortion at pin E512 is less than 0.5% the fault is in stages Q519 and Q520. Use Figure 5-30 voltages and waveforms to isolate the fault.

4.30 TEST EQUIPMENT REQUIRED (MODEL MDM-1 MODULE)

The test equipment required for checkout, alignment, calibration, and troubleshooting is tabulated in Table 4-10. Minimum parameters are provided to aid in the selection of the equivalent types.

4.31 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL MDM-1 MODULE)

4.31.1 Installation

Install the MDM-1 into the right-hand compartment of the mainframe.

4.31.2 Power Requirements

All power required by MDM-1 is supplied by the mainframe.

4.31.3 Sensitivity Check

a. Turn power switch on.

b. Set mainframe frequency switches to 150.000 MHz.

c. Connect signal source to left-hand module MEASURE INPUT jack and set signal source for an output of 150 MHz at rated sensitivity of left-hand module.

d. Set mainframe MODE switch to MEAS.

e. Tune signal source until mainframe indicates zero beat.

f. Set MDM-1 MTR switch to LIM (IN) position.

g. MDM-1 meter should indicate "red line" with signal source output within the rated sensitivity range of the left-hand module.

h. Modulate the signal source at a 1 kHz deviation rate.

i. Set MDM-1 MTR switch to DEV (OUT) position and DEVIATION RANGE switch to 6 kHz position.

k. Adjust modulation level of signal source for exactly 5 kHz on the MDM-1 meter.

l. Increase the signal source output level by 20 dB

m. The MDM-1 meter should read exactly 5 kHz.

4.31.4 Meter Range Checks

a. Set MDM-1 MOD switch to EXT (OUT) position.

b. Connect differential voltmeter to MDM-1 SCOPE/DIST ANAL jack. Use care in connecting to SCOPE/DIST ANAL jack as a short may damage the MDM-1.

c. Set mainframe frequency switches to 000.0000 MHz, MODE switch to TONE GEN.

d. Measure and record for reference the dc voltage reading on differential voltmeter.

e. Set mainframe frequency switches to 000.0050.

f. Measure and record the dc voltage reading on differential voltmeter.

TABLE 4-10

TEST EQUIPMENT REQUIREMENTS FOR MODEL MDM-1

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Audio Oscillator	Frequency range: 400 Hz – 1 kHz Output level: 100-500 mV rms \pm 20% Output impedance: 600 ohms	Hewlett-Packard Model 652A
AC VTVM	Frequency response: 1 kHz to 2 MHz Level: 120 mV–1.1 V rms	Hewlett-Packard Model 400D
Signal Source/ Peak Deviation Monitor	Frequency range: 150 MHz Output level: < 6 mV – > 60 mV rms Stability: \pm 0.0004%/5 min Leveling: \pm 1 dB Output impedance: 50 ohms	Singer Model FM-2748/ODM-1
Oscilloscope with 1X probe	Frequency response: 2 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 531 with 53/54B plug-in
Distortion Analyzer	Frequency response: 1 kHz Input level: 1 V rms Accuracy: \pm 0.1%	Hewlett-Packard Model 330D
Frequency Counter	Frequency response: 1 kHz Input level: 1 V rms Input impedance: > 10 k ohms	Hewlett-Packard Model 5512A
AC/DC Differential Voltmeter	Dc accuracy: \pm 0.01% Ac accuracy: \pm 0.3%	Fluke Model 883AB
Sweep Generator	Frequency range: 2 MHz Output level: -27 dBm	Wavetek Model 2001
Power Supply	Output: 9 V at 150 mA dc	Hewlett-Packard Model 721A
Mainframe/RF and FIM Modules	Required for testing MDM-1 Module	Singer Model FM-10C Mainframe with RF and FIM Modules
Connector	16 pin	Singer P/N 1-910072-001
Load Resistors	16 ohm, 3 required, 62 ohm, 150 ohm, 180 ohm, 650 ohm and 5.6 k ohm (all \pm 5% ¼ watt)	Not applicable
Capacitors	0.1 uF and 100 uF	Not applicable

g. Subtract voltage reading in step 4.32.4-d. from that taken in step 4.32.4-f. and multiply the difference by 0.707.

h. Set the differential voltmeter for ac and dial in the result obtained in step 4.31.4-g.

i. Set mainframe GENERATOR MODULATION switch to ON (IN) position and MODE switch to GEN MOD CAL position.

j. Set MDM-1 MOD switch to INT/COMB (IN).

k. Adjust INT MOD/AUDIO OUT control on the MDM-1 for a null on the differential voltmeter.

l. MDM-1 meter should indicate 5 kHz \pm 400 Hz in both + and - positions of the DEV switch.

m. Set the MDM-1 INT MOD/AUDIO OUT control fully ccw and set the DEVIATION RANGE switch to 1.8 kHz.

n. Divide the result of step 4.31.4-g. by 3.33 and dial this result on the differential voltmeter.

p. Adjust INT MOD/AUDIO OUT control on the MDM-1 to null the differential voltmeter.

q. The MDM-1 meter should indicate 1.5 kHz \pm 190 Hz in both + and - positions of the DEV switch.

r. Set mainframe frequency switches to 012.V00 MHz.

s. Multiply the result of step 4.31.4-g., by 3 and dial this result on the differential voltmeter.

t. Adjust INT MOD/AUDIO OUT control on the MDM-1 to null the differential voltmeter.

u. The MDM-1 meter should indicate 15 kHz \pm 850 Hz in both + and - positions of the DEV switch.

4.31.5 Internal Frequency Modulation and Audio Output Checks

a. Verify that 18 kHz minimum may be obtained on the MDM-1 meter by rotating the INT MOD/AUDIO OUT control.

b. Connect ac VTVM to AUDIO OUTPUT jack.

c. Connect a 600 ohm load resistor across the VTVM terminals.

d. Set INT MOD/AUDIO OUT control for maximum output (fully cw).

e. Set MOD switch to EXT (OUT) position.

f. VTVM should indicate 1 V rms minimum.

g. Remove VTVM and replace with frequency counter.

h. Frequency counter should indicate 1 kHz \pm 50 Hz.

j. Remove frequency counter and replace with distortion analyzer.

k. Measure distortion.

l. Should be 1% maximum distortion.

m. Remove distortion analyzer.

4.31.6 External Frequency Modulation Checks

a. Connect audio oscillator 600 ohm output and ac VTVM to the MDM-1 EXT MOD jack with a BNC T connector.

b. Set frequency of audio oscillator to 400 Hz.

c. Set MDM-1 MOD switch to EXT (OUT) position and DEVIATION RANGE switch to 6 kHz.

d. Set the mainframe frequency switches to 000.0000 MHz.

e. Adjust output level of audio oscillator to produce exactly 5 kHz on MDM-1 meter.

f. Note level of audio oscillator on the ac VTVM. Should be 100 mV rms \pm 20%.

4.32 ALIGNMENT AND ADJUSTMENT (MODEL MDM-1 MODULE)

NOTE: The alignment and adjustment procedure is performed with the MDM-1 disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the MDM-1. Refer to Figure 4-46 for test point and trimmer locations. Remove the four screws from the top of the MDM-1 and remove the shield.

4.32.1 Test Connector Wiring

a. See Figure 4.47 for schematic of test connector wiring.

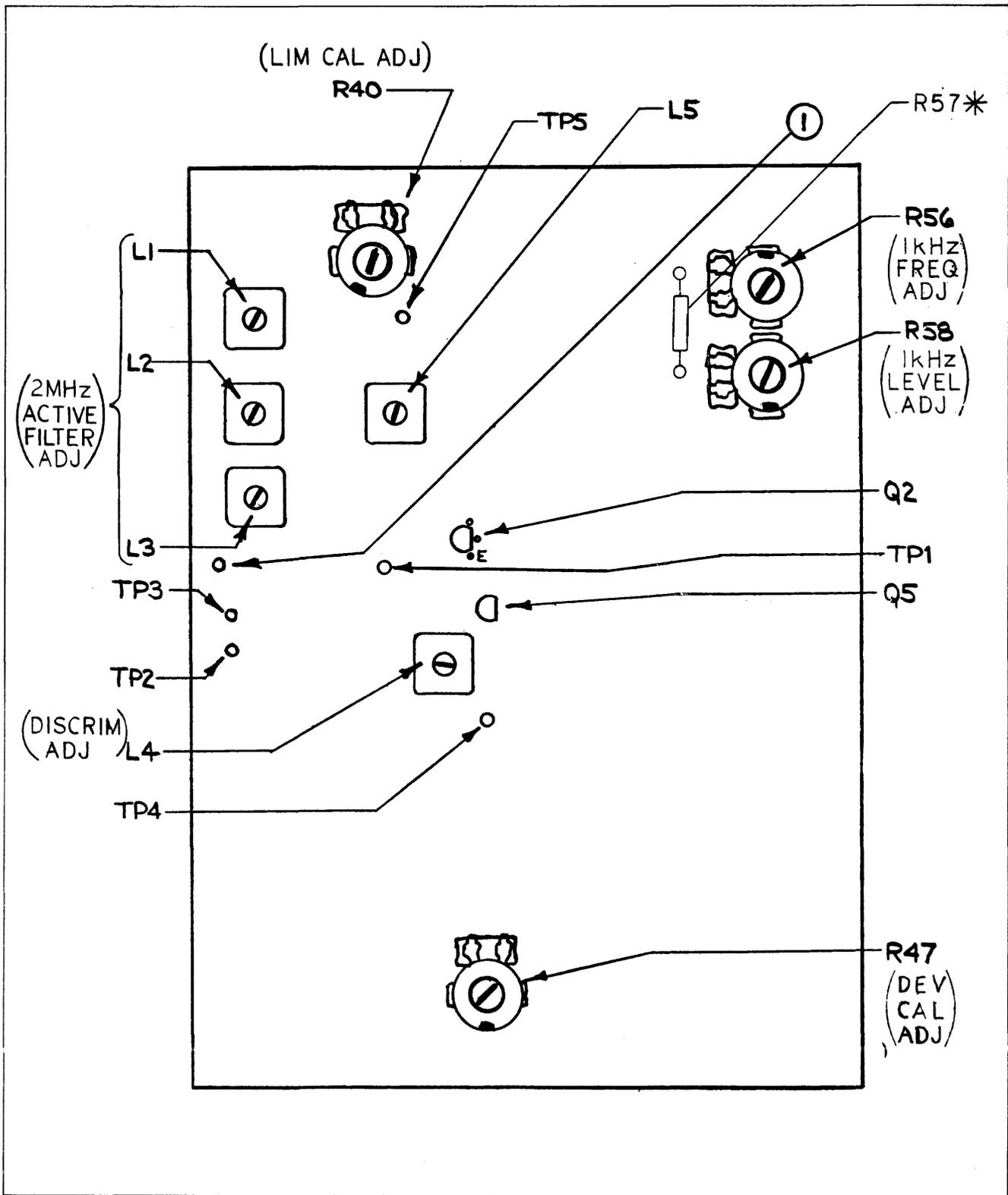


FIGURE 4-46. CIRCUIT BOARD ASSEMBLY, A1 (MDM-1)

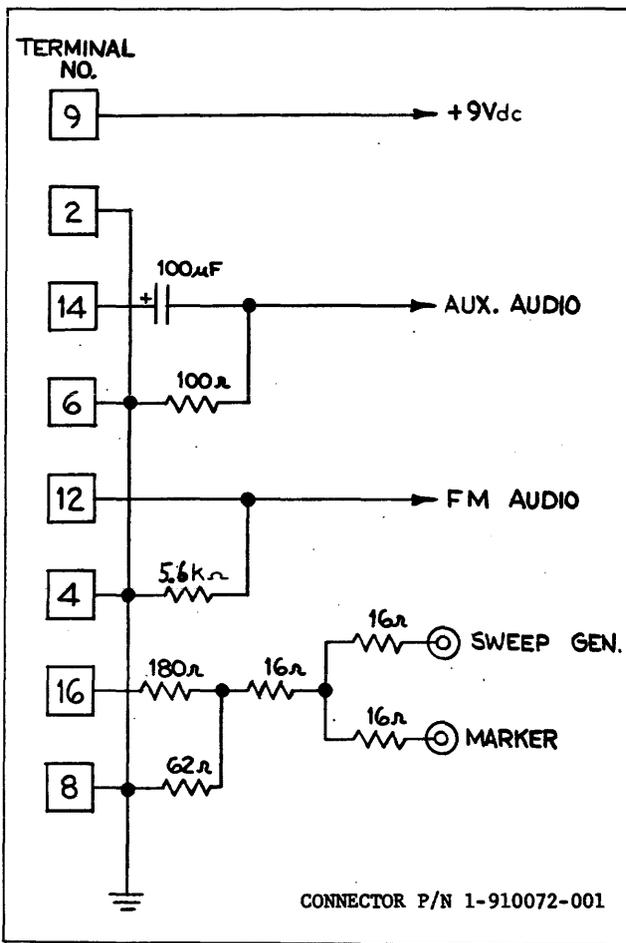


FIGURE 4-47.

TEST CONNECTOR WIRING MODEL MDM-1

4.32.2 IF Amplifier Alignment

- Connect the sweep generator rf output jack to the "Sweep Generator" terminal of the test connector.
- Connect the positive lead of the power supply to terminal 9 of the test connector and the negative lead to terminal 2.
- Connect the frequency source to the "Marker Generator" jack of the test connector.
- Connect the oscilloscope vertical input jack to A1TPI through a 0.1 uF capacitor with a 50 ohm BNC cable.
- Connect the oscilloscope horizontal input jack to the sweep generator oscilloscope horizontal jack.
- Set the sweep generator to Δf mode, 2 MHz center frequency, approximately 100 kHz sweep width and approximately -27 dBm output level.

g. Set the signal source to 2.000 MHz and adjust its output level so that the marker is visible on the oscilloscope screen.

h. Adjust A1L1, A1L2 and A1L3 for maximum indication on the oscilloscope and to set the 2 MHz marker in the center of the response curve as on Figure 4-48-A.

j. Adjust A1L2 and A1L3 for the flattest response and optimum balance on both sides of the 2 MHz marker.

k. Set the external marker (FM-2748) for 1.975 and 2.025 MHz and verify that the markers are not down more than 3 dB (70% of maximum deflection). (See Figure 4-48-B)

l. Set the sweep generator to CW mode.

m. Connect the oscilloscope probe to A1TP2.

n. A square wave of approximately 1.4 Vpp should be displayed.

o. Connect the oscilloscope probe to A1TP3 and adjust A1L4 so that the "pips" on the waveform are exactly on the peaks of the waveform. (See Figure 4-48-C)

p. Connect the oscilloscope probe to terminal 5 and verify that the "S" curve is displayed on the oscilloscope. (See Figure 4-48-D)

4.32.3 Limiter Current Adjustments

a. Remove the sweep generator signal from the test connector and connect the ac VTVM to the terminal 16 of the test connector.

b. Set the METER switch to LIM IN position.

c. Set the output level of the signal source (FM-2748) to obtain 2.5 mV rms on the ac VTVM.

d. Peak A1L5 for maximum on the MDM-1 meter.

e. Adjust A1R40 for a reading of "red line" on the MDM-1 meter.

4.32.4 Modulation Oscillator Alignment

a. Connect the ac VTVM and frequency counter to the AUDIO OUT jack. Connect a 600 ohm load resistor across the VTVM terminals.

b. Set the INT MOD/AUDIO OUT control for maximum output (fully cw).

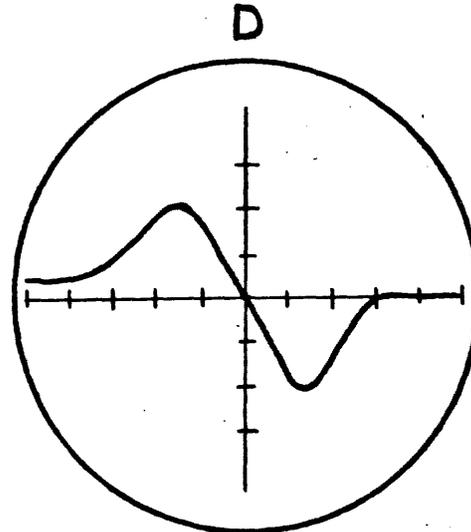
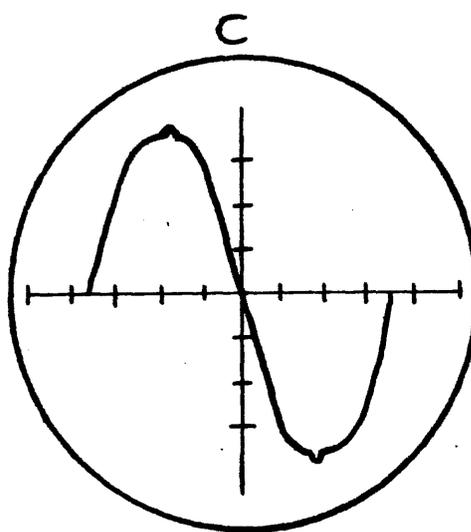
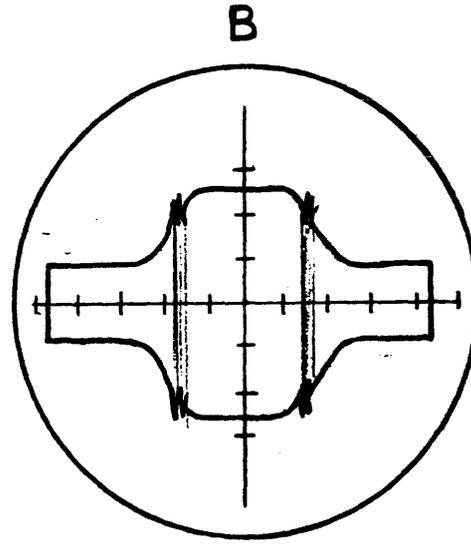
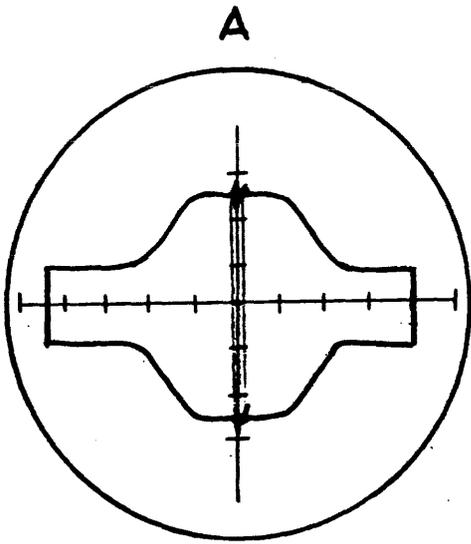


FIGURE 4-48. IF AMPLIFIER WAVEFORMS MODEL MDM-1

c. Set the MOD switch to the EXT/AUDIO OUT position.

d. Adjust A1R58 for a 1.0 V_{rms} indication on the VTVM and adjust A1R56 for a 1 kHz \pm 30 Hz frequency on the frequency counter. If A1R58 has insufficient range, select the value of A1R57.

e. Repeat step 4.32.4-d. as necessary.

4.32.5 Meter Adjustment

a. Set the METER switch to the DEV position.

b. Set the DEVIATION RANGE switch to the 6 kHz position.

c. Connect the ac/dc differential voltmeter to SCOPE/DIST ANAL jack.

d. Set the differential voltmeter for + dc voltage, the range switch to the 10 volt position and the null switch to TVM.

e. Set the frequency of the signal source (FM-2748) to 2.000 MHz and note the differential voltmeter indication. Should be +4.5V dc \pm 10%.

f. "Null out" the differential voltmeter with the differential voltmeter dials, switching the null switch from 1 to 0.001 as required. Note the dial readings.

g. Set the 1 kHz dial on the signal source to "5" and null out the differential voltmeter and note the dial readings.

h. Subtract the reading in step 4.32.5-f. from the reading in step 4.32.5-g.

j. Multiply the result of step 4.32.5-h. by 0.707.

k. Set the differential voltmeter to ac operation.

l. Set its dials to the result in step 4.32.5-j.

m. Insert the ODM-1 module into the right-hand compartment of the FM-2748.

n. Set the FM-2748 frequency dials to 0080V0 and the 0-1 kHz control to zero.

p. Set the 10 MHz switch to the in position and the audio switch to the out/mod position.

r. Set the ODM-1 deviation range switch to 5 kHz and calibrate the ODM-1.

s. Adjust the int mod out mod control of the ODM-1 to obtain a null on the differential voltmeter.

t. Adjust A1R47 for exactly 5 kHz on the MDM-1 meter.

u. Increase the input level 20 dB and verify that the MDM-1 meter indicates 5 kHz \pm 400 Hz.

v. Divide the result in step 4.32.5-j. by 3.333 and set the differential voltmeter to this value.

w. Adjust the int mod audio out control to null the differential voltmeter.

x. Press the 1.8 kHz switch on the MDM-1 and note the MDM-1 meter reading. Should be 1.5 kHz \pm 190 Hz.

y. Press the 18 kHz switch and set the differential voltmeter dials to 3 times the value found in step 4.32.5-j.

z. Set the FM-2748 frequency dials to 008V00 and null the differential voltmeter with the int mod aud out control of the ODM-1.

aa. Note the MDM-1 meter reading. It should be 15 kHz \pm 850 Hz.

bb. Change positions of the DEV switch on the MDM-1. The meter deflection should change 500 Hz maximum.

4.33 FAULT ISOLATION PROCEDURES (MODEL MDM-1 MODULE)

Fault isolation procedures are presented to provide a guide in servicing the MDM-1. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.31, with each subsection keyed to the paragraph in Section 4.31 that first indicates a fault. When a fault is noted during MDM-1 operation, proceed as follows:

a. Perform minimum performance checkout procedures in Section 4.31.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a function, such as the discriminator, refer to the alignment procedure for that function in Section 4.32 and check alignment of that function before proceeding with fault isolation.

d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.33.1 Sensitivity ("Red Line") Not Within Specification (4.32.3-g.)

a. Check alignment of 2 MHz active filter, (steps 4.32.1-a. through 4.32.1-h.).

b. Check alignment of signal threshold circuitry (steps 4.32.2-a. through 4.32.2-h.).

c. Check MTR switch, S3, circuitry.

4.33.2 Dynamic Range of Meter Less Than 20 dB (4.31.3-m.)

a. Check threshold limiter diodes A1CR1 through A1CR6.

4.33.3 6 kHz Range Not Within Specification (4.31.4-m.)

a. Check remainder of IF amplifier tuning (steps 4.32.1-h. through 4.32.1-l.).

b. Check DEVIATION RANGE switch, S1, circuitry; phase splitter, A1Q6, circuitry; DEV switch, S2, circuitry; recovered audio amplifier, A1Q7 and A1Q8; peak detector, A1U2; and MTR switch, S3, circuitry.

4.33.4 1.8 kHz Range Not Within Specification (4.31.4-q.)

a. Check voltage divider network, A1R16 through A1R19.

b. Check DEVIATION RANGE switch circuitry.

4.33.5 18 kHz Range Not Within Specification (4.31.4-u.)

a. Check voltage divider network, A1R16 through A1R19.

b. Check DEVIATION RANGE switch circuitry.

4.33.6 18 kHz Deviation Not Obtained (4.31.5-a.)

a. Check modulation oscillator alignment (step 4.32.3-a. through 4.32.3-d.).

b. Check INT MOD/AUDIO OUT control, R63.

c. Check MOD switch, S4, circuitry.

4.33.7 1 kHz Level Not Within Specification (4.31.5-f.)

a. Check EXT MOD jack circuitry.

4.33.8 1 kHz Frequency Not Within Specification (4.31.5-h.)

a. Perform steps 4.33.6 and 4.33.7.

4.33.9 1 kHz Distortion Not Within Specification (4.31.5-l.)

a. Perform steps 4.33.6 and 4.33.7.

4.33.10 External FM Sensitivity Not Within Specification (4.31.6-f.)

a. Check 1 kHz driver amplifier, A1Q13 and A1Q14.

4.34 TEST EQUIPMENT REQUIRED (MODEL AFM-1 MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in table 4-11. Minimum parameters are provided to aid in the selection of the equivalent types.

4.35 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL AFM-1 MODULE)

4.35.1 Power Requirements

All power required by the AFM-1 is supplied by the mainframe.

4.35.2 Amplitude Modulation Check

a. Install the AFM-1 into the right-hand compartment of the FM-10C mainframe. Connect the broadband amplifier input to the FM-10C RF module RF OUTPUT connector.

b. Connect the broadband amplifier output to the amplitude modulation meter (FM-2748/OAM-1) measure input connector.

NOTE: The broadband amplifier is not necessary if an RFM module with 6 mV rms or greater RF output, such as an RFM-11A, is installed in the FM-10C mainframe.

c. Connect the audio oscillator and ac VTVM to the AFM-1 AM MOD connector. Set the audio oscillator frequency to 1 kHz and output level to 75 mV rms \pm 0.5% as read on the VTVM.

d. Set the mainframe GENERATOR MODULATION switch to IN-ON, frequency switches to 11 MHz, and MODE switch to GEN.

e. Adjust the RFM module RF OUTPUT attenuator as required to produce an AM measurement on the AM meter (FM-2748/OAM-1). Should be 24–36%.

4.35.3 Frequency Modulation Check

a. Connect the broadband amplifier input to the FM-10C RF module RF OUTPUT connector.

b. Connect the broadband amplifier output to the frequency modulation meter (FM-2748/ODM-1) measure input connector.

TABLE 4-11

TEST EQUIPMENT REQUIREMENTS FOR MODEL AFM-1

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Amplitude Modulation Meter	Modulation range: 30% Accuracy: 27-33% Sensitivity: 6 mV rms	Singer Model FM-2748/OAM-1
Frequency Modulation Meter	Peak deviation range: 5 kHz Accuracy: $\pm 5\%$	Singer Model ODM-1 Plug-in for above FM-2748 mainframe
Audio Oscillator	Frequency range: 400 Hz to 1 kHz Output level: 75 mV to 100 mV rms	Hewlett-Packard Model 200CD
Broadband Amplifier	Frequency response: 11 MHz Gain: 20 dB minimum	Singer Model BBA-1
AC VTVM	Frequency response: 400 Hz to 1 kHz Level: 75 to 100 mV rms	Hewlett-Packard Model 400D
Mainframe/RF Module	Required for testing AFM-1 Module	Singer Model FM-10C mainframe with RF module

NOTE: The broadband amplifier is not necessary if an RFM module with 6 mV rms or greater RF output, such as an RFM-11A, is installed in the FM-10C mainframe.

c. Connect the audio oscillator and ac VTVM to the AFM-1 FM MOD connector. Set the audio oscillator frequency to 400 Hz and output level to 100 mV rms $\pm 0.5\%$ as read on the VTVM.

d. Set the mainframe GENERATOR MODULATION switch to IN-ON, frequency switches to 11 MHz and MODE switch to GEN.

e. Adjust the RFM module RF OUTPUT attenuator as required to produce an FM measurement on the FM meter.

f. The FM meter should indicate 5 kHz $\pm 5\%$ peak deviation.

4.36 ALIGNMENT AND ADJUSTMENT (MODEL AFM-1)

No alignment nor adjustment is necessary due to the simplicity of the circuitry within the AFM-1.

4.37 FAULT ISOLATION PROCEDURES (MODEL AFM-1)

Fault isolation procedures are presented to provide a guide in servicing the AFM-1. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.35, with each subsection keyed to the paragraph in Section 4.35 that first indicates a fault. When a fault is noted during AFM-1 operation, proceed as follows:

a. Perform minimum performance checkout procedures in Section 4.35.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.37.1 Amplitude Modulation Out of Tolerance (4.35.2-e.)

a. Check for 1 kHz at 75 mV rms at P1-11. If 1 kHz at 75 mV rms is at P1-11, trouble is in mainframe. Refer to mainframe maintenance section of manual.

b. If 1 kHz at 75 mV rms is not at P1-11, check circuitry between J2 and P1-11.

4.37.2 Frequency Modulation Out of Tolerance (4.35.3-f.)

a. Check for 400 Hz at 100 mV rms at P1-12. If 400 Hz at 100 mV rms is at P1-12, trouble is in mainframe. Refer to mainframe maintenance section of manual.

b. If 400 Hz at 100 mV rms is not at P1-12, check wiring between J1 and P1-12.

4.38 TEST EQUIPMENT REQUIRED (MODEL AFM-2 MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in table 4-12. Minimum parameters are provided to aid in the selection of the equivalent types.

4.39 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL AFM-2 MODULE)

4.39.1 Power Requirement

All power required by the AFM-2 is supplied by the mainframe.

4.39.2 Amplitude Modulation Check

a. Install the AFM-2 into the right-hand compartment of the FM-10C mainframe. Connect the broadband amplifier input to the FM-10C RF module RF OUTPUT connector.

b. Connect the broadband amplifier output to the amplitude modulation meter (FM-2748/OAM-1) measure input connector.

NOTE: The broadband amplifier is not necessary if an RFM module with 6 mV rms or greater RF output, such as an RFM-11A, is installed in the FM-10C mainframe.

c. Connect the audio oscillator and ac VTVM to the AFM-2 AM MOD connector. Set the audio oscillator frequency to 1 kHz and output level to 75 mV rms \pm 0.5% as read on the VTVM.

d. Set the mainframe GENERATOR MODULATION switch to IN-ON, frequency switches to 11 MHz, and MODE switch to GEN.

TABLE 4-12

TEST EQUIPMENT REQUIREMENTS FOR MODEL AFM-2

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Oscilloscope with 10X probe	Frequency response: 10 MHz Vertical sensitivity: 5 mV/div	Tektronix Model 531 with 53/54B plug-in
VOM	Resistance range: 0 to 10 ohms	Simpson Model 260
Amplitude Modulation Meter	Modulation range: 30% Accuracy: 27-33% Sensitivity: 6 mV rms	Singer Model FM-2748 with model OAM-1 plug-in
Frequency Modulation Meter	Peak deviation range: 5 kHz Accuracy: \pm 5%	Singer Model ODM-1 plug-in (with above FM-2748 mainframe)
Audio Oscillator	Frequency range: 400 Hz to 1 kHz Output level: 75 mV to 100 mV	Hewlett-Packard Model 200CD
Broadband Amplifier	Frequency response: 11 MHz Gain: 20 dB min	Singer Model BBA-1
AC VTVM	Frequency response: 400 Hz to 2 MHz Level: 2.5 to 100 mV rms	Hewlett-Packard Model 400D
Mainframe/RF Module	Required for testing AFM-2 module	Singer Model FM-10C mainframe with RF Module

e. Adjust the RFM module RF OUTPUT attenuator as required to produce an AM measurement on the AM meter (FM-2748/OAM-1). Should be 24–36%.

4.39.3 Frequency Modulation Check

a. Connect the broadband amplifier input to the FM-10C RF module RF OUTPUT connector.

b. Connect the broadband amplifier output to the frequency modulation (FM-2748/ODM-1) measure input connector.

NOTE: The broadband amplifier is not necessary if an RFM module with 6 mV rms or greater RF output, such as an RFM-11A, is installed in the FM-10C mainframe.

c. Connect the audio oscillator and ac VTVM to the AFM-2 FM MOD connector. Set the audio oscillator frequency to 400 Hz and output level to 100 mV rms \pm 0.5% as read on the VTVM.

d. Set the mainframe GENERATOR MODULATION switch to IN-ON, frequency switches to 11 MHz, and MODE switch to GEN.

e. Adjust the RFM module RF OUTPUT attenuator as required to produce an FM measurement on the FM meter.

f. The FM meter should indicate 5 kHz \pm 15% peak deviation.

4.39.4 10 MHz Output Check

a. Connect the oscilloscope 10X probe to the 10 MHz OUTPUT jack.

b. Should indicate a 10 MHz sine wave at 280 mV p-p minimum.

4.39.5 IF Output Check

a. Check the continuity between J1 and P1-16 with the ohmmeter.

4.40 ALIGNMENT AND ADJUSTMENT (MODEL AFM-2)

No alignment nor adjustment is necessary due to the simplicity of the circuitry within the AFM-2.

4.41 FAULT ISOLATION PROCEDURES (MODEL AFM-2)

Fault isolation procedures are presented to provide a guide in servicing the AFM-2. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.39, with each subsection keyed to the paragraph in Section 4.39 that first indicates a fault. When a fault is noted during AFM-2 operation, proceed as follows:

a. Perform minimum performance checkout procedures in Section 4.39.

b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

c. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.41.1 Amplitude Modulation Out of Tolerance (4.39.2-e.)

a. Check for 1 kHz at 75 mV rms at P1-11. If 1 kHz at 75 mV rms is at P1-11, trouble is in mainframe. Refer to mainframe maintenance section of manual.

b. If 1 kHz at 75 mV rms is not at P1-11, check circuitry between J2 and P1-11.

4.41.2 Frequency Modulation Out of Tolerance (4.39.3-f.)

a. Check for 400 Hz at 100 mV rms at P1-12. If 400 Hz at 100 mV rms is at P1-12, trouble is in mainframe. Refer to mainframe maintenance section of manual.

b. If 400 Hz at 100 mV rms is not at P1-12, check wiring between J1 and P1-12.

4.41.3 10 MHz Output Out of Tolerance (4.39.4-b.)

a. Check for 10 MHz at 280 mV p-p min at P1-1. If 10 MHz at 280 mV p-p is not at P1-1, trouble is in mainframe. Refer to mainframe maintenance section of manual.

b. If 10 MHz at 280 mV p-p is at P1-1, check circuitry between P1-1 and J2.

4.42 TEST EQUIPMENT REQUIRED (MODEL RFM-10D MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in Table 4-13. Minimum parameters are provided to aid in the selection of the equivalent types.

TABLE 4-13
TEST EQUIPMENT REQUIREMENTS FOR MODEL RFM-10D

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Sweep Generator	Frequency range: 50 kHz to 512 MHz Output level: -81 dBm to -23 dBm	Wavetek Model 2001
RF Detector	Frequency range: 50 kHz to 512 MHz	Wavetek Model D152
Signal Generator	Frequency range: 50 kHz to 500 MHz Level: -81 dBm to 0 dBm Output impedance: 50 ohms	Singer Model FM- 2748
Oscilloscope with 10 X Probe	Frequency response: 11 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 454
RF Voltmeter with 50 ohm load & T	Frequency response: 50 kHz to 512 MHz Level: -56 dBm to -27 dBm	Hewlett-Packard Model 3406A/ 11063A/6064
DC Digital Voltmeter	Level: -20 mV dc Accuracy: ±1%	Hewlett-Packard Model 3440A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
9 MHz Signal Source	Frequency range: 9 MHz Level: 100 mV rms Impedance: 50 ohms	Singer Model FM-2748
Mainframe/RF Module/ FIM Module/MDM-1 Module	Required for testing RFM-10D Module	Singer Model FM-10C Mainframe with RF, FIM and MDM-1 Modules

Table 4-13. Test Equipment Requirements for Model RFM-10D (Cont.)

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
RF Module extender jig	Required for testing RFM-10D Module	Singer Model PC-2653
Connector	24 pin, female	Singer P/N 1-910072-002
Connector	BNC	Singer P/N 1-910022-004
Connector	Push-on	Singer P/N 1-910173-001
Resistor	200 ohms $\pm 5\%$, 1/4 watt	Not applicable

4.43 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL RFM-10D MODULE)

4.43.1 Power Requirements

All power required by the RFM-10D is supplied by the mainframe.

4.43.2 Output Level Check

- a. Install the RFM-10D into the mainframe left-hand compartment. Connect the RF voltmeter with the 50 ohm termination to the RF OUTPUT jack of the RFM-10D module. Set mainframe MODE switch to GEN.
- b. Set the RF OUTPUT attenuator to -53 dBm.
- c. Set the mainframe frequency switches to 100.0000 MHz and the 0-100 Hz control to the OUT position.
- d. The RF voltmeter should indicate 500 $\mu\text{V} \pm 3 \text{ dB}$ (354-707 $\mu\text{V rms}$).
- e. Repeat step 4.43.2-d at 50 kHz, 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 512 MHz.

4.43.3 Measure Mode Sensitivity Check

- a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF and frequency switches to 15¹ MHz.
- b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE. Set the MEASURE SENSITIVITY switch and MEASURE SENSITIVITY control to 2 mV.

- c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 151 MHz and level to 2 mV rms.
- d. Insert the MDM-1 module into the right-hand compartment and the FIM module in the center compartment. Set the MDM-1 MTR switch to the LIM(IN) position.
- e. Adjust the signal generator frequency slightly to obtain a zero beat indication on the FIM BEAT lamp.
- f. The MDM-1 meter should indicate "red-line". If not, readjust the signal generator output level to obtain exactly "red-line" on the MDM-1 meter. The signal generator output level should be between 6 mV rms ± 3 dB (4.2 mV to 8.2 mV).

4.44 ALIGNMENT AND ADJUSTMENT (MODEL RFM-10D MODULE)

NOTE:

The alignment and adjustment procedure is performed with the RFM-10D disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the RFM-10D. Refer to figures 4-49 through 4-51 for test point and trimmer locations. Remove the five screws from the back of the RFM-10D and slide the cover off.

4.44.1 Broadband Amplifier Alignment (A1A4)

- a. Place the connector P/N 1-910072-002 onto its mating plug on the rear panel of the RFM-10D. Make up a BNC to "push-on" connector cable adapter (using the push-on connector P/N 1-910173-001) with an overall length of approximately 10".
- b. Connect the power supply positive lead to pin 9 and the negative lead to terminal 21 of the rear panel 24 pin connector. Disconnect the positive lead of A1A4C35 from the circuit board.
- c. Connect the sweep generator RF output connector to the rear panel RF input connector, P1, of the RFM-10D using the 10" BNC to "push-on" cable adapter made up in step a.
- d. Disconnect BNC coaxial cable W1 from A1A4J2 and connect A1A4J2 to the detector RF input with a 6" to 12" 50 ohm BNC cable.
- e. Connect the detector dc output to sweep generator demodulator input connector.

- f. Connect the sweep generator oscilloscope vertical connector to the oscilloscope vertical input connector using a 50 ohm coaxial cable.
- g. Connect the sweep generator oscilloscope horizontal connector the the oscilloscope horizontal input connector using a 50 ohm coaxial cable.
- h. Set the sweep generator center frequency control to 250 MHz, sweep width control to approximately 520 MHz, 50 MHz marker switch on, and output level to -33 dBm.

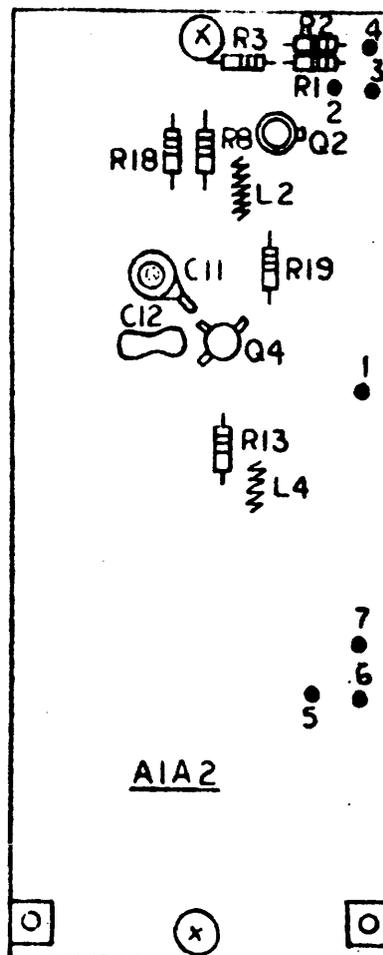


FIGURE 4-49. BROADBAND AMPLIFIER ASSEMBLY, A1A2 (RFM-10D)

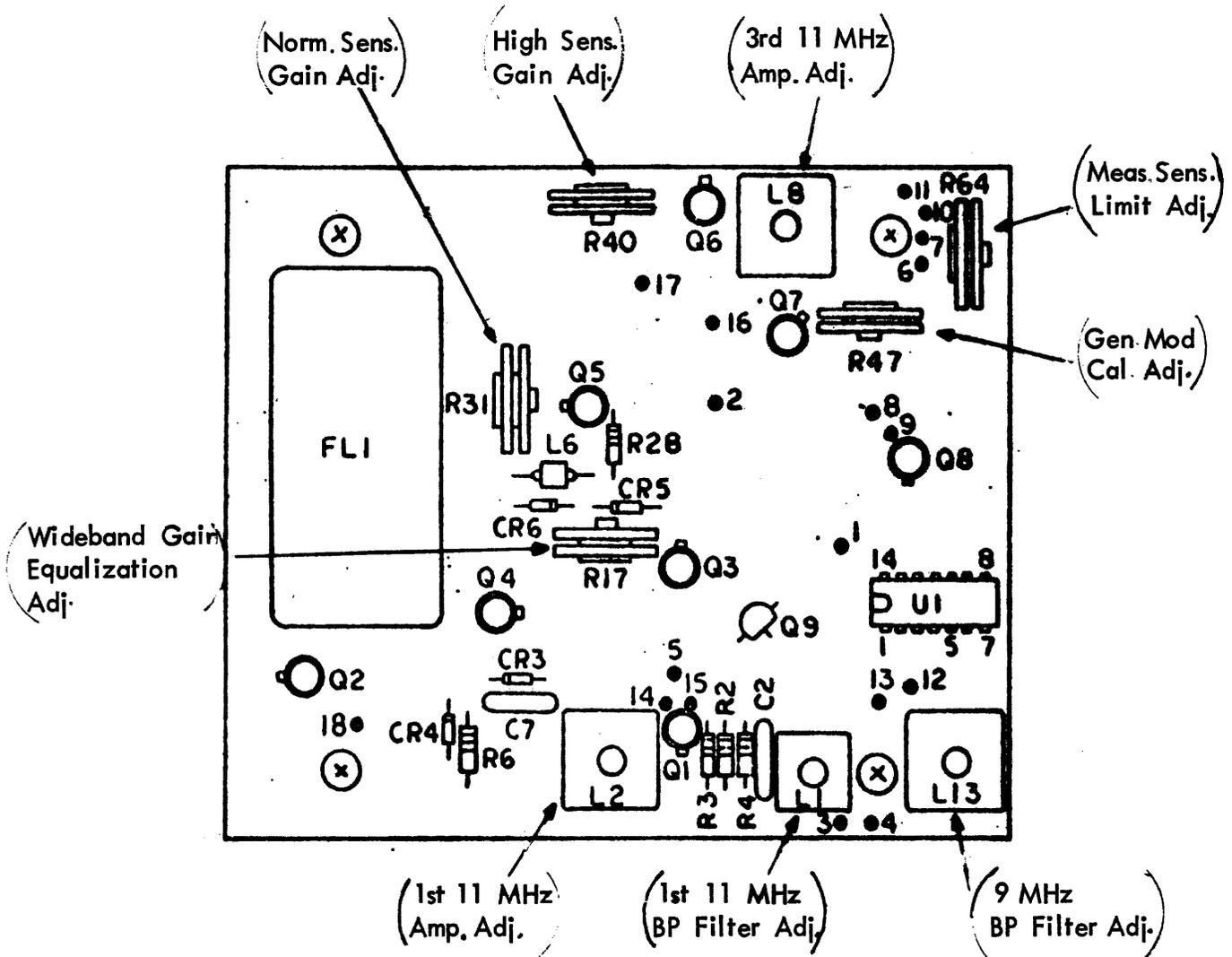


FIGURE 4-50. 11 MHz IF BOARD ASSEMBLY, A1A3 (RFM-10D)

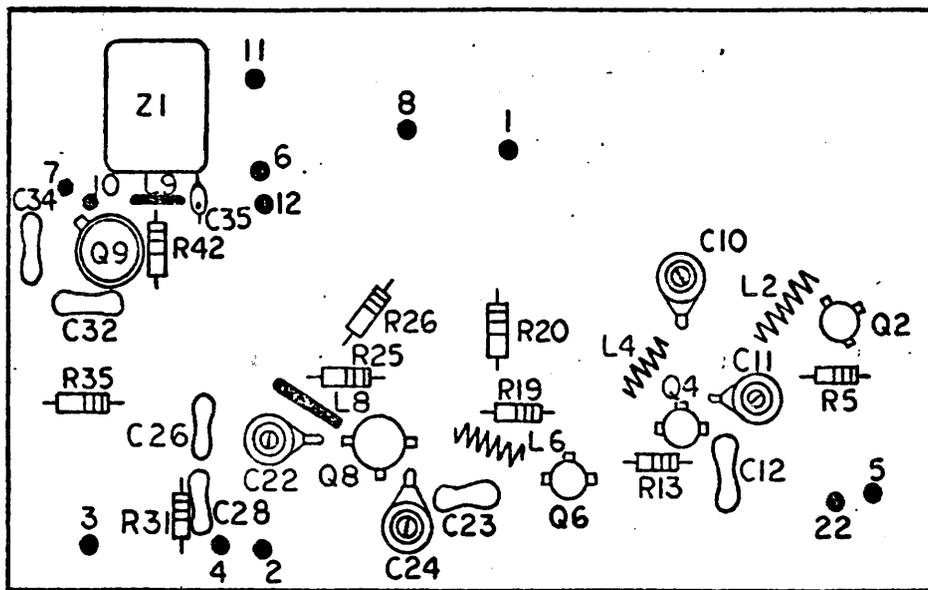


FIGURE 4-51. BROADBAND AMPLIFIER & MIXER ASSEMBLY, ATA4 (RFM-10D)

- j. Set the oscilloscope timebase to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- k. Adjust the sweep generator marker amplitude controls to display the 50 MHz markers. Adjust the center frequency control if necessary to display all 50 MHz markers between 50 kHz and 500 MHz.
- l. Adjust trimmer capacitors A1A4C10, A1A4C11, A1A4C22 and A1A4C24, and select A1A4C12 and A1A4C23 for the flattest possible response curve on the oscilloscope. Readjust as necessary as there is interaction between the adjustments.
- m. Individually short one or more turns of A1A4L2, A1A4L4, A1A4L6 and A1A4L8 together, using two insulated tuning sticks, to obtain the flattest possible response from 50 kHz to 512 MHz. Solder the necessary turns together. Readjust the trimmer capacitors as necessary.
- n. Individually select resistors A1A4R5, A1A4R13, A1A4R19 and A1A4R25 as necessary to obtain the flattest overall response. Decrease the resistance values to decrease the gain.
- p. If the high frequency gain is too high or the amplifier has tendencies to oscillate, reduce the values of A1A4R20 and A1A4R26 until the required flatness at the high frequency end is obtained or the oscillations cease.
- r. After the response curve is flat within ± 1 dB from 50 kHz to 512 MHz, disconnect the detector from A1A4J2 and connect the power meter to A1A4J2. Set the sweep generator to the CW mode. The output level at A1A4J2 should be 0 dBm ± 1 dB. Rotate the sweep generator center frequency control from 50 kHz to 512 MHz. The level should not vary more than ± 1 dB from 0 dBm.
- s. Rotate the sweep generator center frequency control to 250 MHz. Adjust the sweep generator output level if necessary to obtain exactly 0 dBm on the power meter.
- t. Disconnect the power meter from A1A4J2 and connect the 50 ohm BNC load to A1A4J2. Set the sweep generator to the Δf mode. Connect a jumper between pin 9 and pin 10 on the rear panel 24 pin connector.
- u. Solder the positive lead of A1A4C35 in its printed circuit pad connected to A1A4L9. Remove the negative lead of A1A4C35 from its printed circuit pad.

Solder the center conductor of a BNC test cable to the negative lead of A1A4C35 and solder the shield to ground. Connector the detector to this BNC cable.

CAUTION

Be careful not to short the case of A1A4Q9 to ground as it is internally connected to the collector.

- v. Select the values of A1A4R42, A1A4C32 and A1A4C34 to obtain the flattest possible response. Capacitor A1A4C32 may be deleted if necessary.
- w. Set the sweep generator to the CW mode. Set the center frequency to 250 MHz. The output level at A1A4J4 should be +4 dBm \pm 2 dB.
- x. Disconnect the BNC cable from A1A4C35 and solder the negative lead of A1A4C35 to the printed circuit pad.
- y. Disconnect the BNC to push-on cable adapter from the sweep generator RF output connector and connect it to the signal generator RF output receptacle.
- z. Disconnect the BNC 50 ohm load from A1A4J2 and connect the power meter to A1A4J2.
- aa. Set the signal generator frequency to 50 kHz and the output level to produce +6 dBm on the power meter.
- ab. Reduce the signal generator output level 10 dB and reduce the power meter range 10 dB. The power meter should read -3 dBm minimum.
- ac. Repeat steps aa and ab at 1 MHz, 10 MHz, 50 MHz, and every 50 MHz up to 512 MHz.
- ad. Connect the digital voltmeter between pin 3 of the 24 pin rear panel connector and the chassis.
- ae. Set the signal generator frequency to 50 kHz and the output to produce 0 dBm on the power meter and observe the digital voltmeter indication.
- af. Select the value of A1A4R31 until the indication on the digital voltmeter is approximately -20 mV dc. (Increasing A1A4R31 increases the voltage.)
- ag. Set the signal generator frequency to 512 MHz and adjust the output level to obtain 0 dBm on the power meter.

- ah. If the voltage on the digital voltmeter is more negative than -23 mV dc, add capacitor A1A4C28 across A1A4R31 (value from 1 pF to 5 pF DM-15) until the voltage is approximately equal to that at 50 kHz. If the voltage is less negative than -17 mV dc, add capacitor A1A4C26 across A1A4R30 (value from 0.1 pF to 1.0 pF tubular P/N 1-900066-001) until the voltage is approximately equal to that at 50 kHz.
- aj. Repeat step ae at 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 512 MHz. Maintain the amplifier output level at 0 dBm at each frequency. The voltage should not vary greater than ± 3 mV dc from the voltage observed at 50 kHz.

4.44.2 11 MHz and 2 MHz IF Amplifier Alignment (A1A3)

- a. Disconnect the phono plug from A1A4J4 and connect the phono plug to the BNC to phono plug adapter. Connect the BNC to phono plug adapter to the signal generator RF output connector via a 50 ohm BNC cable. Set the signal generator frequency to 11 MHz and set the output level to -39 dBm.
- b. Connect a BNC test cable to the 24 pin connector on the rear panel; center conductor to pin 24 and shield to pin 12. Connect the 9 MHz signal source to the BNC test cable connector. Set the 9 MHz signal source output level to 125 mV rms.
- c. Set the front panel MEASURE MODE BANDWIDTH switch to the IN-NARROW position, MEASURE SENSITIVITY switch to the HIGH position, and the MEASURE SENSITIVITY control to 2 μ V.
- d. Connect the oscilloscope 10 X probe to the junction of A1A3R2 and A1A3R3. Adjust A1A3L1 for maximum amplitude at 11 MHz. The level should be 30 mV p-p approximately.
- e. Connect the oscilloscope 10 X probe to the junction of A1A3C7 and A1A3R6. Adjust A1A3L2 for maximum amplitude at 11 MHz. The level should be 120 mV p-p approximately.
- f. Connect the oscilloscope 10 X probe to the junction of A1A3L6 and A1A3R28. The level should be 95 mV p-p approximately.
- g. Set the MEASURE MODE BANDWIDTH switch to the OUT-WIDE position. Adjust A1A3R17 (Wideband Gain Equalization) for same level measured in step f. If A1A3R17 has insufficient range to obtain the same level as in step f, increase the value of A1A3R12 slightly and repeat steps c through f.
- h. Set A1A3R31, A1A3R40 and A1A3R47 to mid-range. Connect the oscilloscope 10 X probe to A1A3-6. Adjust A1A3L8 for maximum amplitude. Adjust A1A3R40 (High Sens. Gain Adj.) for a level of 2.1 V p-p approximately.

- j. Set the MEASURE SENSITIVITY switch to the NORMAL position. Connect the oscilloscope 10 X probe to A1A3U1-5. Adjust A1A3L13 for maximum amplitude at 9 MHz. The level should be 370 mV p-p approximately.
- k. Disconnect all jumper wires, test cables and test equipment previously installed, except the wire between pins 9 and 10 on the rear panel 24 pin connector.

4.44.3 Broadband Amplifier Alignment (A1A2)

- a. Connect the sweep generator RF output receptacle to the MEASURE INPUT receptacle using a 50 ohm BNC cable.
- b. Disconnect the BNC cable connector at A1A4J3. Connect the detector RF input connector to this cable connector. Connect the detector output to the sweep generator demodulator input jack.
- c. Connect the sweep generator oscilloscope vertical connector to the oscilloscope vertical input connector using a 50 ohm coaxial cable.
- d. Connect the sweep generator oscilloscope horizontal connector to the oscilloscope horizontal input connector using a 50 ohm coaxial cable.
- e. Set the sweep generator center frequency control to 250 MHz, sweep width control to approximately 520 MHz, 50 MHz marker switch on, and output level to -21 dBm.
- f. Set the oscilloscope timebase to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- g. Adjust the sweep generator marker amplitude controls to display the 50 MHz markers. Adjust the center frequency control if necessary to display all 50 MHz markers between 50 kHz and 500 MHz.
- h. Adjust trimmer capacitor A1A2C11 and select A1A2C12 for the flattest possible response curve on the oscilloscope. Readjust as necessary as there is interaction between the two adjustments.
- j. Individually short one or more turns of A1A2L2 and A1A2L4 together using two insulated tuning sticks to obtain the flattest possible response up to 512 MHz. Solder the necessary turns together. Readjust the trimmer capacitors as necessary.
- k. Individually select resistors A1A2R8 and A1A2R13 as necessary to obtain the flattest overall response. Decrease the resistance to decrease the gain.

- l. Individually select resistors A1A2R18 and A1A2R19 as necessary to obtain the flattest overall response. Do not decrease the value of A1A2R18 or A1A2R19 to less than 680 ohms as it will affect the bias of transistors A1A2Q2 and A1A2Q4.
- m. When the amplifier response is flat within ± 1.5 dB from 50 kHz to 600 MHz, disconnect the detector RF input connector from the A1A2 BNC cable and connect the power meter to this cable.
- n. Set the sweep generator to the CW mode, center frequency control to 50 kHz, and the output level to -1 dBm.
- p. Vary the sweep generator center frequency control from 50 kHz to 512 MHz. The output level should be -1 dBm ± 1.5 dB.
- r. If the output level is not -1 dBm ± 1.5 dB, the value of the 3 dB attenuator pad A1A2R1 through A1A2R3 must be changed. Select the proper resistor values from Table 4-14.

TABLE 4-14. ATTENUATOR PAD RESISTOR VALUES

ATTENUATION	$\pm 5\%$ SERIES RESISTOR	$\pm 5\%$ SHUNT RESISTORS
2 dB	12 Ω	430 Ω
3 dB	16 Ω	300 Ω
6 dB	39 Ω	150 Ω
7 dB	43 Ω	130 Ω
8 dB	51 Ω	120 Ω
10 dB	68 Ω	100 Ω
11 dB	82 Ω	91 Ω
12 dB	91 Ω	82 Ω

- s. Set the sweep generator output level to -21 dBm. Rotate the center frequency control from 50 kHz to 512 MHz. The output level should be -0.75 dBm ± 1.25 dB (-2 dBm to +0.5 dBm).
- t. If the output level is not within tolerance the amplifier must be realigned so that it is not in compression with an input level of -21 dBm.

- u. Disconnect all test equipment and associated cables from the unit. Reconnect all internal cables within the instrument. Remove the 24 pin test connector from the rear panel connector.

4.44.4 Measure Input Sensitivity and Calibration

- a. Install the RFM-10D into the mainframe using the RFM Module extender test jig. Install the FIM and MDM-1 into the mainframe.
- b. Set the mainframe MODE switch to the MEAS position and the MEASURE MODE AUDIO OUTPUT switch to the IN-BEAT NOTE position. Set the FIM RANGE switch to ZERO and zero the FIM meter with the ZERO control. Set the FIM RANGE switch to the 5 kHz position. Set the MDM-1 MTR switch to the LIM-IN position. Set the RFM-10D MEASURE MODE BANDWIDTH switch to the IN-NARROW position and verify that the NARROW lamp is lit. Set the RFM-10D MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to the fully cw position (0.064 mV).
- c. Set the mainframe Frequency switches to a frequency above 11 MHz that does not produce limiter current on the MDM-1 meter due to internal spurs. Connect the signal generator RF output connector to the RFM-10D MEASURE INPUT connector, J1. Set the signal generator frequency to that of the mainframe and the output level to the minimum level required to produce a beat indication on the BEAT lamp and the speaker.
- d. Zero beat the signal generator to the mainframe and reduce the signal generator output level to -71 dBm.
- e. Adjust A1A3R31 (Normal Sensitivity Gain Adj.) to obtain red line limiter current on the MDM-1 meter.
- f. Set the RFM-10D MEASURE SENSITIVITY control to fully ccw position (2.0 mV) and set the signal generator output level to -41 dBm.
- g. Adjust A1A3R64 (Meas. Sens. Limit Adj.) to obtain red line limiter current on the MDM-1 meter.
- h. Repeat steps d through g until the MEASURE SENSITIVITY control range is exactly 30 dB (0.064 mV to 2.0 mV).
- i. Set the RFM-10D MEASURE SENSITIVITY switch to the HIGH position and the MEASURE SENSITIVITY control to the 2.0 μ V position.
- k. Set the signal generator output level to -101 dBm. Adjust A1A3R40 (High Sens. Gain Adj.) to obtain red-line limiter current on the MDM-1 meter.

- l. Temporarily disconnect the signal generator from the RFM-10D and verify that the MDM-1 meter indication is zero. If the meter does not indicate zero, set the mainframe Frequency switches to a frequency that internal spurs do not produce limiter current on the MDM-1 meter.
- m. If step e was performed, repeat steps b through k.
- n. Set the signal generator output level to -71 dBm.
- p. Set the RFM-10D MEASURE SENSITIVITY control to the fully ccw position (64 μ V) and verify that the MDM-1 meter indicates red-line limiter current.
- r. Set the MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to the 1 mV position. Adjust the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be -47 dBm \pm 3 dB.
- s. Repeat step r except substitute 0.5 mV for 1 mV and -53 dBm \pm 3 dB for -47 dBm \pm 3 dB.
- t. Repeat step 4 except substitute 0.025 mV for 1 mV and -59 dBm \pm 3 dB for -47 dBm \pm 3 dB.
- u. Repeat step 4 except substitute 0.125 mV for 1 mV and -65 dBm \pm 3 dB for -47 dBm \pm 3 dB.
- v. Set the RFM-10D MEASURE SENSITIVITY switch to HIGH and the control to 64 μ V. Adjust the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be -71 dBm.
- w. Repeat step v except substitute 32 μ V for 64 μ V and -77 dBm \pm 3 dB for -71 dBm.
- x. Repeat step v except substitute 16 μ V for 64 μ V and -83 dBm \pm 3 dB for -71 dBm.
- y. Repeat step v except substitute 8 μ V for 64 μ V and -89 dBm \pm 3 dB for -71 dBm.
- z. Repeat step v except substitute 4 μ V for 64 μ V and -95 dBm \pm 3 dB for -71 dBm.
- aa. Repeat step v except substitute 2 μ V for 64 μ V and -101 dBm for -71 dBm.
- ab. Set the mainframe Frequency switches to 1 MHz and the RFM-10D MEASURE SENSITIVITY switch to NORMAL. Set the signal generator frequency to 1 MHz and set the output level to produce a zero beat note/lamp indication. Zero beat the signal generator to the mainframe and reduce the signal generator output level to obtain red line limiter current on the MDM-1 meter. The signal generator output level should be 70 μ V \pm 30 μ V rms (40 μ V to 100 μ V rms).
- ac. Repeat step ab at 50 MHz and every 50 MHz up to 550 MHz and at 512 MHz.

4.44.5 Gen Mod Cal Adjustment

- a. Set the mainframe MODE switch to the GEN MOD CAL position and the RFM-10D MEASURE MODE BANDWIDTH switch to the OUT-WIDE position. Set the RFM-10D A1A3R47 to mid-range.
- b. Select the value of A1A4R35 to obtain a limiter current indication of approximately 15 on the 18 kHz scale.
- c. Readjust A1A3R47 to obtain a limiter current indication of exactly 15 on the 18 kHz scale.
- d. Remove the MDM-1 from the mainframe and install the OAM-1. Calibrate the OAM-1 and verify that the OAM-1 CARRIER LEVEL control can position the CRT trace above and below the CARRIER SET line of the graticule.

4.44.6 RF Output Leveling

- a. Set the mainframe MODE switch to the GEN position, Frequency switches to 250 MHz and the RFM-10D RF OUTPUT switch to -30 dBm.
- b. Connect the power meter, with 50 ohm termination, to the RFM-10D RF OUTPUT connector, J1. Set the power meter range to -30 dBm.
- c. Adjust the mainframe A1A2R31 to obtain -30 dBm on the power meter. Rotate the mainframe Frequency switches to each position (100 MHz control 0 to 5 only). The RF output shall be -30 dBm \pm 3 dB from 50 kHz to 512 MHz.

4.45 FAULT ISOLATION PROCEDURES (MODEL RFM-10D MODULE)

Fault isolation procedures are presented to provide a guide in servicing the RFM-10D. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.43, with each subsection keyed to the paragraph in Section 4.43 that first indicates a fault. When a fault is noted during RFM-10D operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.43.
- b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.

- c. When the fault is isolated to a function, such as the 11 MHz amplifier, refer to the alignment procedure for that function in Section 4.44 and check alignment of that function before proceeding with fault isolation.
- d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.45.1 Output Level Not Within Tolerance (4.43.2-d and 4.43.2-e)

- a. Check alignment of broadband amplifier as in paragraph 4.44.1.
- b. Check alignment of ALC detector as in paragraph 4.44.2.
- c. Check variable attenuator, AT1.
- d. Check mainframe as in mainframe section of manual.

4.45.2 Measure Mode Sensitivity Not Within Tolerance (4.43.3-f)

- a. Check measure input sensitivity alignment as in paragraph 4.44.4.
- b. Check 11 MHz IF alignment as in paragraph 4.44.2.
- c. Check 9 MHz filter alignment as in paragraph 4.44.2.
- d. Check 2 MHz IF alignment as in paragraph 4.44.2

4.46 TEST EQUIPMENT REQUIRED (MODEL RFM-11A MODULE)

The test equipment required for the checkout, alignment, calibration and troubleshooting is tabulated in Table 4-15. Minimum parameters are provided to aid in the selection of the equivalent types.

TABLE 4-15

TEST EQUIPMENT REQUIREMENTS FOR MODEL RFM-11A

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Sweep Generator	Frequency range: 50 kHz to 1.3 GHz Output level: -81 dBm to +1 dBm (20 uV to 224 mV) Markers: 50 MHz and 10 MHz	Wavetek Model 2001 (Use Singer Model FM-2748 below 200 kHz)
RF Defector	Frequency range: 50 kHz to 1.3 GHz	Wavetek Model D152
Signal Generator	Frequency range: 50 kHz to 1.288 GHz Level: -81 dBm to 0 dBm (20 uV to 224 mV) Output impedance: 50 ohms	Singer Model FM-2748
Oscilloscope with 10 X Probe	Frequency response: 140 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 454
RF Voltmeter with 50 ohm load & T	Frequency response: 50 kHz to 1.3 GHz Level: -56 dBm to -6 dBm (355 uV to 112 mV) Accuracy: ±1 dB	Hewlett-Packard Model 3406A/11063A/6064
DC Digital Voltmeter	Level: -20 mV dc Accuracy: ±1%	Hewlett-Packard Model 3440A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
9 MHz Signal Source	Frequency range: 9 MHz Level: -7 dBm (100 mV rms) Impedance: 50 ohms	Singer Model FM-2748

Table 4-15. Test Equipment Requirements for Model RFM-11A (Cont.)

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Mainframe/FIM Module/ MDM-1 Module	Required for testing RFM-11A Module	Singer Model FM-10C Mainframe with FIM and MDM-1 Modules
Spectrum Analyzer	Frequency range: 700 MHz Level: -60 dBm to +4 dBm	Singer Model SPA-3000
RF Module extender jig	Required for testing RFM-11A Module	Singer Model PC-2653
Connector	24 pin, female	Singer P/N 1-910072-002
Connector	BNC	Singer P/N 1-910022-004
Connector	Push-on	Singer P/N 1-910173-001
Capacitor BNC to phono jack adapter	0.01 uF	Not applicable Not applicable

4.47 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL RFM-11A MODULE)

4.47.1 Power Requirements

All power required by the RFM-11A is supplied by the mainframe.

4.47.2 Output Level Check

- a. Install the RFM-11A into the mainframe left-hand compartment. Connect the RF voltmeter with the 50 ohm termination to the 0.05-588 MHz MEASURE INPUT/ RF OUTPUT receptacle of the RFM-11A module. Set mainframe MODE switch to the GEN position.
- b. Set the RF OUTPUT attenuator to -30 dBm.
- c. Set the mainframe Frequency switches to 250.0000 MHz and the 0-100 Hz control to the OUT position.
- d. The RF voltmeter should indicate $-30 \text{ dBm} \pm 3 \text{ dB}$ (-33 dBm to -27 dBm).

- e. Repeat step c and d at 50 kHz, 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 599 MHz.
- f. Set the mainframe Frequency switches to 800 MHz. Disconnect the RF voltmeter from the RFM-11A 0.05-588 MHz MEASURE INPUT/RF OUTPUT receptacle and connect it to the 800-1288 MHz MEASURE INPUT/RF OUTPUT receptacle.
- g. The RF output level should be $-30 \text{ dBm} \pm 4 \text{ dB}$ (-34 dBm to -26 dBm). Rotate the mainframe Frequency switches to 850 MHz, 900 MHz and every 50 MHz up to 1200 MHz. The output level should be $-30 \text{ dBm} \pm 4 \text{ dB}$ (-34 dBm to -26 dBm) for all test frequencies.

4.47.3 Measure Mode Sensitivity Check

- a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF and Frequency switches to 151 MHz.
- b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE. Set the MEASURE SENSITIVITY switch and MEASURE SENSITIVITY control to 0.64 mV.
- c. Connect the signal generator to the RF module 0.05-588 MHz MEASURE INPUT/RF OUTPUT receptacle. Set its frequency to 151 MHz and level to -51 dBm .
- d. Insert the MDM-1 module into the right-hand compartment and the FIM module in the center compartment. Set the MDM-1 MTR switch to the LIM (IN) position.
- e. Adjust the signal generator frequency slightly to obtain a zero beat indication on the FIM BEAT lamp.
- f. The MDM-1 meter should indicate "red-line". If not, readjust the signal generator output level to obtain exactly "red-line" on the MDM-1 meter. The signal generator output level should be $0.64 \text{ mV rms} \pm 3 \text{ dB}$ (0.45 mV to 0.89 mV).

4.48 ALIGNMENT AND ADJUSTMENT (MODEL RFM-11A MODULE)

NOTE:

The alignment and adjustment procedure is performed with the RFM-11A disconnected from the mainframe so that no problem in the mainframe will affect the alignment of the

RFM-11A. Refer to Figure 4-52 through 4-55 for test point and trimmer locations. Remove the five screws from the back of the RFM-11A and slide the cover off.

4.48.1 Broadband Amplifier Alignment (A1A4)

- a. Place the connector P/N 1-910072-002 onto its mating plug on the rear panel of the RFM-11A. Make up a BNC to "push-on" connector cable adapter (using the push-on connector P/N 1-910173-001) with an overall length of approximately 10".
- b. Connect the power supply positive lead to pin 9 and the negative lead to pin 21 of the rear panel 24 pin connector. Disconnect the positive lead of A1A4C35 from the circuit board.
- c. Connect the sweep generator RF output connector to the rear panel RF input connector, P1, of the RFM-11A using the 10" BNC to "push-on" cable adapter made up in Step a.
- d. Disconnect BNC coaxial cable W1 from A1A4J2 and connect A1A4J2 to the detector RF input with a 6" to 12" 50 ohm BNC cable.
- e. Connect the detector dc output to the sweep generator demodulator input receptacle.
- f. Connect the sweep generator oscilloscope vertical receptacle to the oscilloscope vertical input receptacle with a 50 ohm coaxial cable.
- g. Connect the sweep generator oscilloscope horizontal receptacle to the oscilloscope horizontal input receptacle with a 50 ohm coaxial cable.
- h. Set the sweep generator center frequency to 250 MHz, sweep width to approximately 520 MHz, 50 MHz markers on, and output level to -33 dBm.
- j. Adjust the sweep generator marker amplitude controls to display the 50 MHz markers. Adjust the center frequency control if necessary to display all 50 MHz markers between 50 kHz and 500 MHz.
- l. Adjust trimmer capacitors A1A4C10, A1A4C11, A1A4C22 and A1A4C24, and select A1A4C12 and A1A4C23 for the flattest possible response curve on the oscilloscope. Readjust as necessary as there is interaction between the adjustments.

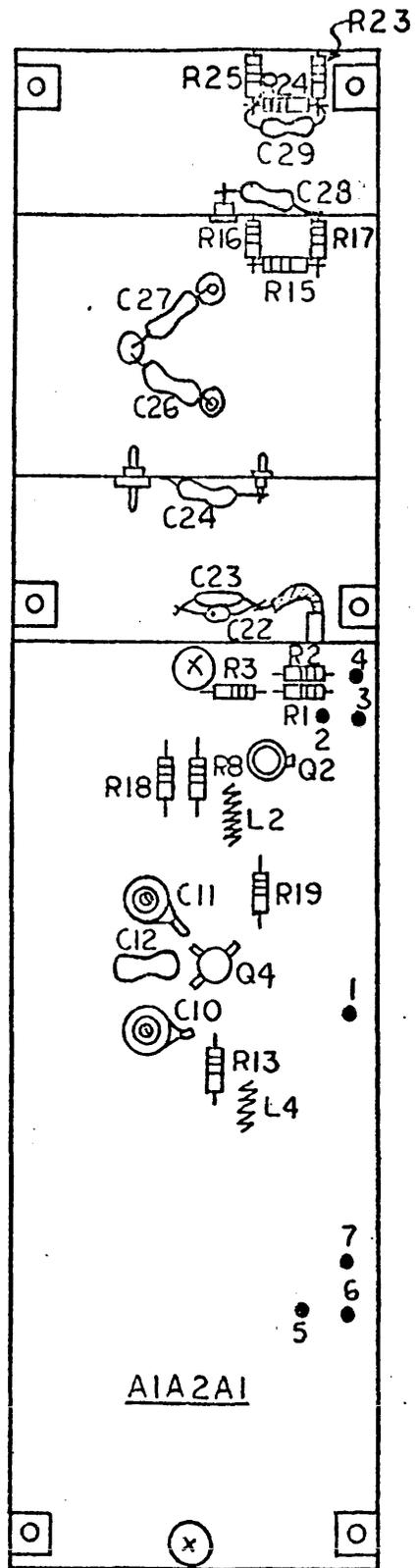


Figure 4-52. RF Switch and Broadband Amplifier Assembly, A1A2 (RFM-11A)

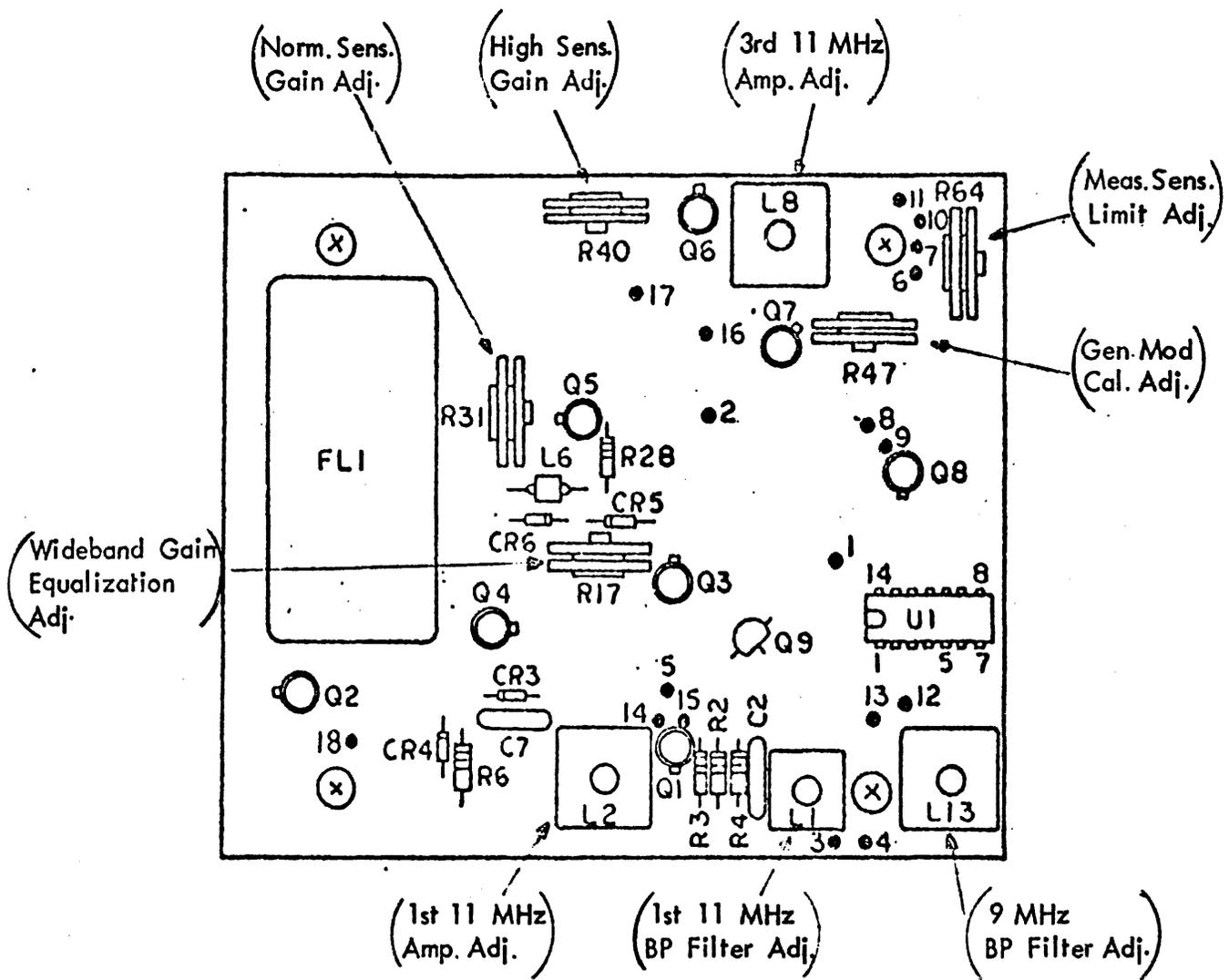


Figure 4-53. 11 MHz IF Assembly, A1A3 (RFM-11A)

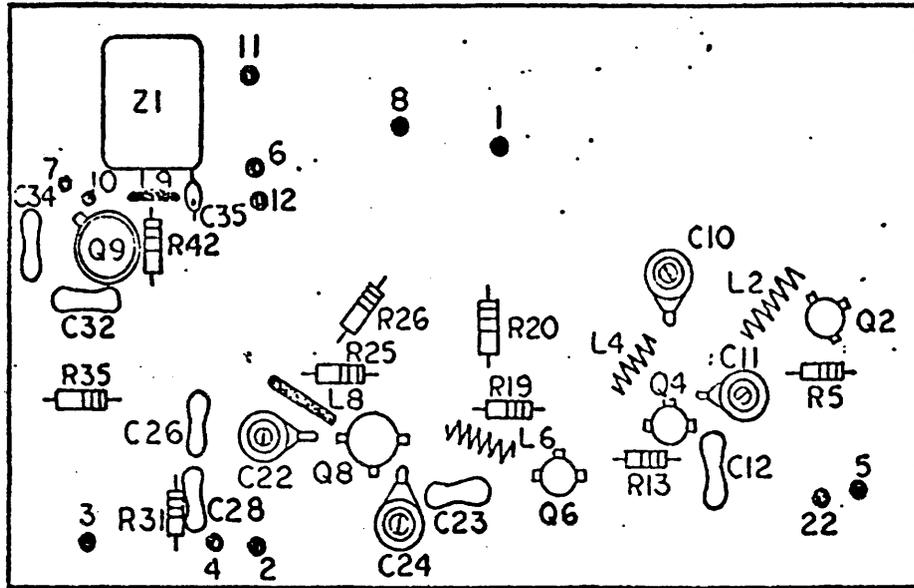


Figure 4-54. Broadband Amplifier and Mixer Assembly, A1A4 (RFM-11A)

(input Level Adjust)

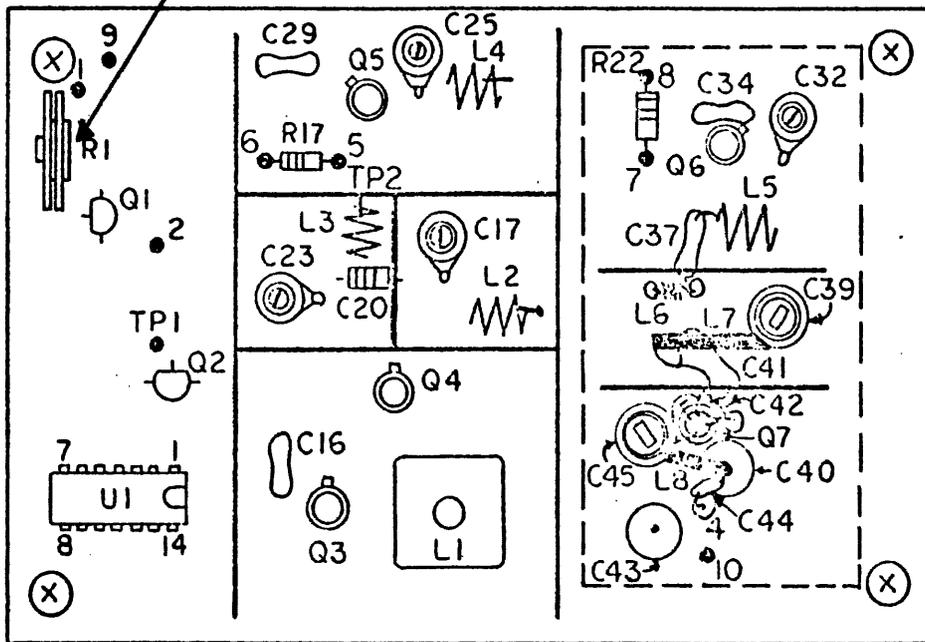


Figure 4-55. 700 MHz Multiplier Assembly, A1A5 (RFM-11A)

- m. Set the sweep generator frequency range to 450 MHz to 600 MHz and individually short one or more turns of A1A4L2, A1A4L4, A1A4L6 and A1A4L8 together, using two insulated tuning sticks, to obtain the flattest possible response from 450 MHz to 600 MHz. Solder the necessary turns together. Readjust the trimmer capacitors as necessary.
- n. Individually select resistors A1A4R5, A1A4R13, A1A4R19 and A1A4R25 as necessary to obtain the flattest overall response. Decrease the resistance values to decrease the gain.
- p. If the high frequency gain is too high or the amplifier has tendencies to oscillate, reduce the values of A1A4R20 and A1A4R26 until the required flatness at the high frequency end is obtained or the oscillations cease.
- r. After the response curve is flat within ± 1 dB from 50 kHz to 600 MHz, disconnect the detector from A1A4J2 and connect the RF voltmeter with 50 ohm load to A1A4J2. Set the sweep generator to the CW mode. The output level at A1A4J2 should be 0 dBm ± 1 dB. Rotate the sweep generator center frequency control from 200 kHz to 600 MHz. The level should not vary more than ± 1 dB from 0 dBm. Use the signal generator to check the flatness from 50 kHz to 200 kHz.
- s. Rotate the sweep generator center frequency control to 250 MHz. Adjust the sweep generator output level if necessary to obtain exactly 0 dBm on the power meter.
- t. Disconnect the RF voltmeter from A1A4J2 and connect the 50 ohm BNC load to A1A4J2. Set the sweep generator to the Δf mode. Connect a jumper between pin 9 and pin 10 on the rear panel 24 pin connector.
- u. Solder the positive lead of A1A4C35 into its printed circuit pad connected to A1A4L9. Remove the negative lead of A1A4C35 from its printed circuit pad. Solder the center conductor of a BNC test cable to the negative lead of A1A4C35 and solder the shield to ground. Connect the detector to this BNC cable.

CAUTION

Be careful not to short the case of A1A4Q9 to ground as it is internally connected to the collector.

- v. Select the values of A1A4R42, A1A4C32 and A1A4C34 to obtain the flattest possible response. Capacitor A1A4C32 may be deleted if necessary.

- w. Set the sweep generator to the CW mode. Vary the frequency from 50 kHz to 600 MHz. The output level at A1A4J4 should be +4 dBm \pm 2 dB.
- x. Disconnect the BNC cable from A1A4C35 and solder the negative lead of A1A4C35 into the printed circuit pad.
- y. Disconnect the BNC to push-on cable adapter from the sweep generator RF output receptacle and connect it to the signal generator RF output receptacle.
- z. Disconnect the BNC 50 ohm load from A1A4J2 and connect the RF voltmeter with 50 ohm load to A1A4J2.
- aa. Set the signal generator frequency to 50 kHz and the output level to produce +6 dBm on the RF voltmeter.
- ab. Reduce the signal generator output level 10 dB. The RF voltmeter should indicate -3 dBm minimum.
- ac. Repeat Steps aa and ab at 1 MHz, 10 MHz, 50 MHz, and every 50 MHz up to 600 MHz.
- ad. Connect the digital voltmeter between pin 3 of the 24 pin rear panel connector and the chassis.
- ae. Set the signal generator frequency to 50 kHz and the output level to produce 0 dBm on the RF voltmeter. Observe the digital voltmeter indication.
- af. Select the value of A1A4R31 until the indication on the digital voltmeter is approximately -20 mV dc. (Increasing A1A4R31 increases the voltage.)
- ag. Set the signal generator frequency to 600 MHz and adjust the output level to obtain 9 dBm on the RF voltmeter.
- ah. If the voltage on the digital voltmeter is more negative than -23 mV dc, add capacitor A1A4C28 across A1A4R31 (value from 1 pF to 5 pF DM-15) until the voltage is approximately equal to that at 50 kHz. If the voltage is less negative than -17 mV dc, add capacitor A1A4C26 across A1A4R30 (value from 0.1 pF to 1.0 pF tubular P/N 1-900066-xxx) until the voltage is approximately equal to that at 50 kHz.
- aj. Repeat Step ae at 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 600 MHz. Maintain the amplifier output level at 0 dBm at each frequency. The voltage should not vary greater than \pm 3 mV dc from the voltage observed at 50 kHz.

4.48.2 700 MHz Multiplier Alignment (A1A5)

- a. Disconnect the jumper wires between pins 9 and 10 on the rear panel 24 pin connector. Connect a jumper wire between pins 9 and 11.
- b. Solder the BNC test cable to the rear panel 24 pin connector, center conductor to pin 5 and shield to pin 17.
- c. Connect the signal generator to the BNC test cable. Set the frequency to 10 MHz and the output level to -7 dBm.
- d. Connect the oscilloscope 10 X probe to A1A5TP1. Adjust A1A5R1 to obtain a 10 MHz sine wave of approximately 320 mV p-p.
- e. Connect the oscilloscope 10 X probe to the collector of A1A5Q4. Adjust A1A5L1 for maximum amplitude at 20 MHz. If the amplitude is less than 6.5 V p-p, increase the value of A1A5C16 to obtain 6.5 V p-p. If the value of A1A5C16 is too large, it will cause the A1A5Q3 stage to oscillate.
- f. Unsolder the tap from A1A5L2 and connect a BNC test cable through a 0.01 uF capacitor to A1A5L2, approximately 1/2 turn from the grounded end. Connect the BNC connector to the sweep generator RF output receptacle.
- g. Unsolder the tap from A1A5L3 and connect a BNC test cable through a 0.01 uF capacitor to A1A5L3 approximately 1/2 turn from the grounded end. Connect the BNC connector to the detector RF input receptacle. Connect the detector dc output receptacle to the sweep generator demodulator input receptacle.
- h. Repeat Steps 4.48.1-f and 4.48.1-g.
- i. Set the sweep generator center frequency control to 140 MHz, attenuator to 0 dBm, and 50 MHz harmonic switch on.
- j. Set the oscilloscope horizontal and vertical controls so that the display deflects approximately three-quarters of the CRT graticule.
- l. Adjust the sweep generator center frequency control so that the 150 MHz marker is on the right side of the oscilloscope CRT graticule. Set the sweep generator 10 MHz harmonics switch on. Adjust the sweep generator center frequency and sweep width controls to place the 140 MHz marker (1st marker on left side of 150 MHz marker) on the center graticule line and the 130 MHz and 150 MHz markers so that they are present on each side of the 140 MHz marker.

- m. Adjust A1A5C17 and A1A5C23; spread the turns of A1A5L2 and A1A5L3 to center the response curve on the 140 MHz marker and for the best symmetry.
- n. If the response curve is overcoupled (dip in the center), decrease the value of A1A5C20 to obtain the narrowest possible response curve with minimum insertion loss.
- p. Disconnect the BNC test cable connector from the detector RF input receptacle and connect the cable to the RF voltmeter.
- r. Set the sweep generator mode to CW and adjust the output attenuator to produce 0 dBm on the RF voltmeter.
- s. Set the sweep generator center frequency control to 130 MHz. The RF voltmeter should indicate -26 dBm minimum.
- t. Set the sweep generator center frequency control to 150 MHz. The RF voltmeter should indicate -26 dBm minimum.
- u. Set the sweep generator center frequency control to 140 MHz. The RF voltmeter should indicate -6 dBm maximum.
- v. Disconnect the sweep generator RF voltmeter and BNC test cables. Resolder the taps to A1A5L2 and A1A5L3, 1/2 turn from ac ground.
- w. Connect the oscilloscope 10 X probe to A1A5TP2. The level should be 200 mV p-p. If the level is less than 200 mV p-p, move A1A5L2 and A1A5L3 taps up to obtain 200 mV p-p (3/4 turn is the maximum allowed).
- x. Disconnect the oscilloscope 10 X probe from A1A5TP2 and connect it to terminal post A1A5-7. Tune A1A5C25 for maximum output level at 140 MHz. The level should be 800 mV p-p. If it is less than 800 mV p-p, move A1A5L4 tap up (3/4 turn maximum) and increase the value of A1A5C29 if necessary to obtain 800 mV p-p. If A1A5C29 is too large, the A1A5Q5 stage may oscillate. If oscillation occurs, increase the value of A1A5R17 and decrease the value of A1A5C29 until the oscillation stops.
- y. Disconnect the oscilloscope 10 X probe from terminal post A1A5-7 and connect it to junction of A1A5C37 and A1A5L6. Tune A1A5C32 for maximum output level at 140 MHz. The output level should be approximately 3.2 V p-p. If it is less than 3.2 V p-p, move A1A5C37 up on A1A5L5 (3/4 turn maximum) and increase the value of A1A5C34, if necessary, to obtain 3.2 V p-p. If A1A5C34 is too large, A1A5Q6 stage may oscillate. If oscillation occurs, increase the value of A1A5R22 and decrease the value of A1A5C34 until the oscillation stops.

- z. Disconnect the oscilloscope 10 X probe from the standoff terminal. Unsolder the coaxial cable center conductor from standoff terminal A1A5-4 and connect the BNC test cable to standoff terminal A1A5-4.
- aa. Connect the signal generator to the spectrum analyzer RF input receptacle. Set the signal generator frequency to 700 MHz and center the 700 MHz response on the spectrum analyzer.
- ab. Disconnect the signal source from the spectrum analyzer and connect the spectrum analyzer RF input receptacle to the BNC test cable installed in Step z.
- ac. Tune A1A5C39 and A1A5C45 for maximum output level at 700 MHz on the spectrum analyzer. Move A1A5C41 on A1A5L7 to obtain the maximum possible output level on the spectrum analyzer. Select the value of A1A5C42 to obtain the maximum possible output level on the spectrum analyzer. Move A1A5C44 on A1A5L8 to obtain the maximum possible output level. Return A1A5L1, A1A5C17, A1A5C23, A1A5C32, A1A5C39 and A1A5C45 for maximum output level with minimum sidebands. The sidebands are 10 MHz, 20 MHz and 140 MHz out from 700 MHz and should be -45 dB minimum.
- ad. Disconnect the spectrum analyzer from the BNC test cable and connect the RF voltmeter, with 50 ohm termination, to the BNC test cable. The output level shall be +4 dBm minimum. If the output level is less than +4 dBm, select the value of A1A5C42 and move A1A5C41 on A1A5L7 and A1A5C44 on A1A5L8 to obtain +5 dBm minimum.
- ae. Disconnect the RF voltmeter and BNC test cable from standoff terminal A1A5-4 and resolder the coaxial cable center conductor to standoff terminal A1A5-4. Install the cover on the board.
- af. Disconnect the 700 MHz filter, FL2, BNC cable from mixer Z1-L port and connect it to the spectrum analyzer RF input receptacle. Tune the trimmer capacitor on FL2 for maximum output with minimum sidebands at 700 MHz.
- ag. Readjust A1A5C32, A1A5C39, A1A5C45 and the trimmer capacitor on FL2 for maximum output with minimum sidebands at 700 MHz. The sidebands are 10 MHz, 20 MHz and 140 MHz out from the 700 MHz and should be -60 dB minimum.
- ah. Disconnect the spectrum analyzer from the FL2 BNC cable and connect the BNC cable to the RF voltmeter with 50 ohm termination. The output level should be +3 dBm minimum.
- ai. If the output level is less than +3 dBm and the sidebands are less than 60 dB down, disconnect the RF voltmeter from the FL2 BNC cable and connect the

cable to the detector RF input receptacle. Connect the detector dc output receptacle to the sweep generator demodulator input receptacle. Remove the cover from A1A5 and unsolder the coaxial cable center conductor from standoff terminal A1A5-4. Connect the BNC test cable to the coaxial cable center conductor and shield to ground. Connect the BNC connector of the test cable to the sweep generator RF output receptacle.

- aj. Set the sweep generator controls as follows: center frequency control to 700 MHz, sweep width control to approximately 550 MHz, output attenuator to 0 dBm, 50 MHz harmonic switch to on and mode to Δf .
- ah. Connect the sweep generator oscilloscope vertical receptacle to the oscilloscope vertical input receptacle with a 50 ohm coaxial cable.
- al. Connect the sweep generator oscilloscope horizontal receptacle to the oscilloscope horizontal input receptacle with a 50 ohm coaxial cable.
- am. Set the oscilloscope time base to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- an. Adjust the sweep generator center frequency to position the 700 MHz marker on the center line of the CRT graticule and adjust the sweep width control to position the 650 MHz and 750 MHz markers on the outside lines of the graticule.
- ao. Pull the filter, FL2, away from the filter cover mounted on the side chassis. Adjust the trimmer on FL2 to position the response curve peak exactly on the 700 MHz marker. Decrease the filter insertion loss by moving the input and output cable coupling links (center conductors) equally closer to the resonator while maintaining symmetry of the response curve.
- ap. Install the filter into the filter cover and readjust the trimmer on FL2 if necessary to center the response curve on the 700 MHz marker. Disconnect the BNC test cable connector from the sweep generator RF output receptacle and connect it to the signal generator RF output receptacle. Set the signal generator frequency to 700 MHz and set the output level to 0 dBm.
- aq. Disconnect the FL2 BNC cable from the detector RF receptacle and connect it to the RF voltmeter with 50 ohm termination. The output level shall be -1.5 dBm minimum.
- ar. Set the signal generator frequency to 690 MHz. The output level should be -5.5 dBm maximum.
- as. Set the signal generator frequency to 710 MHz. The output level should be -5.5 dBm maximum.

- at. Set the signal generator frequency to 840 MHz. The output level should be -20 dBm maximum.
- au. Set the signal generator frequency to 560 MHz. The output level should be -20 dBm maximum.
- av. Disconnect the signal generator and the BNC test cable from the coaxial cable center conductor on A1A5. Resolder the coaxial cable center conductor to standoff terminal A1A5-4. Reinstall the cover on A1A5.
- aw. Retune A1A5C32, A1A5C39, A1A5C45 and the trimmer capacitor on FL2 for maximum output. The output level should be +3 dBm minimum.
- ax. Disconnect the RF voltmeter from the FL2 BNC cable and connect the BNC cable to the spectrum analyzer RF input receptacle. Verify that the 10 MHz, 20 MHz and 140 MHz sidebands are 60 dB minimum below the 700 MHz level.
- ay. Disconnect the FL2 BNC cable from the spectrum analyzer RF input receptacle and connect it back to Z1-L port. Sport solder FL2 into the housing cover.

4.48.3 RF Switch and Broadband Amplifier Alignment (A1A2)

- a. Connect a jumper wire between pins 9 and 11, in addition to the jumper wire between pins 9 and 10, on the rear panel 24 pin connector.
- b. Disconnect the coaxial cable center conductor from the junction of A1A2C22 and A1A2C23 and connect it to the detector RF input receptacle using the BNC test cable.
- c. Connect the detector DC output receptacle to the sweep generator demodulator input receptacle.
- d. Connect the sweep generator RF output receptacle to the RFM-11A MEASURE INPUT/RF OUTPUT 800-1288 MHz receptacle with a BNC cable.
- e. Connect the sweep generator vertical receptacle to the oscilloscope vertical input receptacle with a 50 ohm coaxial cable.
- f. Connect the sweep generator horizontal receptacle to the oscilloscope horizontal input receptacle with a 50 ohm coaxial cable.
- g. Set the sweep generator center frequency to 875 MHz, sweep width to approximately 160 MHz, 50 MHz markers on, and output level to 0 dBm.

- h. Set the oscilloscope timebase to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- i. Note the flatness of the response curve.
- j. Set the sweep generator center frequency to 1100 MHz and set the sweep width to approximately 420 MHz. Note the flatness of the response curve.
- k. The flatness should be ± 1.5 dB from 800 MHz to 1300 MHz.
- l. Set the sweep generator mode to CW, center frequency to 800 MHz.
- m. Disconnect the detector RF receptacle from the BNC test cable and connect the RF voltmeter with 50 ohm termination to the BNC test cable. Rotate the sweep generator center frequency between 800 MHz and 950 MHz and note the minimum and maximum output level on the RF voltmeter.
- n. Rotate the center frequency between 900 MHz and 1300 MHz and note the minimum and maximum output level on the RF voltmeter.
- o. If the output level variation between 800 MHz and 1500 MHz is greater than ± 1.5 dB, disconnect the RF voltmeter and connect the detector RF receptacle to the BNC test cable. Repeat Steps e through j and select the values of A1A2C24 and A1A2C26 to reduce the output level variation to less than ± 1.5 dB.
- p. Repeat Steps m and n.
- q. Once the level is flat within ± 1.5 dB between 800 MHz and 1300 MHz, note the average output level for use in a following step. The output level should be approximately -12 dBm.
- r. Disconnect the RF voltmeter from the BNC test cable and connect the detector RF input receptacle to the BNC test cable.
- s. Disconnect the jumper wire between pins 9 and 11 on the rear panel 24 pin connector and connect it between pins 9 and 7.
- t. Disconnect the sweep generator RF output receptacle from the RFM-11A MEASURE INPUT/RF OUTPUT 800-1288 MHz receptacle and connect it to the MEASURE INPUT/RF OUTPUT .05-588 MHz receptacle.
- u. Set the sweep generator mode to Δf , center frequency to 250 MHz, sweep width to 520 MHz.

- v. Observe the response curve on the oscilloscope. Set the sweep generator center frequency to 700 MHz and set the sweep width to 500 MHz. The flatness should be ± 1.5 dB from 50 kHz to 600 MHz.
- w. Set the sweep generator mode to CW, center frequency to 50 kHz.
- x. Disconnect the detector RF input receptacle from the BNC test cable and connect the RF voltmeter with 50 ohm termination to the BNC test cable. Rotate the sweep generator center frequency between 50 kHz and 500 MHz and note the minimum and maximum output level on the RF voltmeter.
- y. Rotate the center frequency between 450 MHz and 600 MHz and note the minimum and maximum output level on the RF voltmeter.
- z. If the output level variation between minimum and maximum is greater than ± 1.5 dB, disconnect the RF voltmeter and connect the detector RF input receptacle to the BNC test cable. Repeat Steps u and v and select the value of A1A2C27 to reduce the output level variation to less than ± 1.5 dB. Repeat Steps w, x and y.
- aa. Once the output level is flat within ± 1.5 dB between 50 kHz and 600 MHz, the average output level on this band must equal the average output level on the 800 MHz to 1300 MHz band (Step q). This is achieved by selecting the value of attenuator pad A1A2R15, A1A2R16 and A1A2R17. Determine the number of dB that the 50 kHz to 600 MHz band average output level must be increased or decreased by to equal the 800 MHz to 1300 MHz band average output level and select the proper resistor values from Table 4-16.

TABLE 4-16. ATTENUATOR PAD RESISTOR VALUES

ATTENUATION	$\pm 5\%$ SERIES RESISTOR	$\pm 5\%$ SHUNT RESISTORS
2 dB	12 Ω	430 Ω
3 dB	16 Ω	300 Ω
6 dB	39 Ω	150 Ω
7 dB	43 Ω	130 Ω
8 dB	51 Ω	120 Ω
10 dB	68 Ω	100 Ω
11 dB	82 Ω	91 Ω
12 dB	91 Ω	82 Ω

- ab. Disconnect the RF voltmeter from the BNC test cable and the BNC test cable from the junction of A1A2C22 and A1A2C23. Connect the coaxial cable center conductor from A1A2A1-4 and A1A2A1-3 to A1A2C22 and A1A2C23.
- ac. Disconnect cable, W1, from AT1-J12 (front panel end). Connect the sweep generator RF output receptacle to AT1-J12 with a 50 ohm BNC cable. Set AT1 to -20 dBm.
- ad. Connect the detector RF receptacle to the RFM-11A MEASURE INPUT/RF OUTPUT 0.05-588 MHz receptacle.
- ae. Disconnect the jumper wire between pins 9 and 10 on the rear panel 24 pin connector.
- af. Set the sweep generator mode to Δf , center frequency to 250 MHz, and sweep width to approximately 520 MHz.
- ag. Observe the response curve on the oscilloscope. Set the sweep generator center frequency to 525 MHz and the sweep width to 150 MHz. The flatness should be ± 1.5 dB from 50 kHz to 600 MHz.
- ah. Set the sweep generator mode to CW, center frequency to 50 kHz.
- ai. Disconnect the detector RF input receptacle from the MEASURE INPUT/RF OUTPUT 0.05-588 MHz receptacle and connect the RF voltmeter with 50 ohm termination to this receptacle.
- aj. Rotate the sweep generator center frequency between 50 kHz and 500 MHz. The output level should be -20 dBm ± 1.5 dB.
- ak. Rotate the sweep generator center frequency between 450 MHz and 600 MHz. The output level should be -20 dBm ± 1.5 dB.
- al. If the output level variation is greater than ± 1.5 dB from 50 kHz to 600 MHz, disconnect the RF voltmeter from the MEASURE INPUT/RF OUTPUT 0.05-599 MHz receptacle and connect the detector RF receptacle to this receptacle. Repeat Steps af and ag and select the values of A1A2C28 and A1A2C29 to reduce the output level variation to less than ± 1.5 dB.
- am. If the average output level is not -20 dBm, set the sweep generator mode to CW, and center frequency to 250 MHz.
- an. Repeat Step ai. Select the value of attenuator pad A1A2R23, A1A2R24 and A1A2R25 to achieve the output level -20 dBm ± 1.5 dB. The nominal value of the attenuator pad is 9 dB. Select the proper resistor values from Table 4-16.

- ao. Disconnect the RF voltmeter from the MEASURE INPUT/RF OUTPUT 0.05-588 MHz receptacle. Connect the detector RF input receptacle to the MEASURE INPUT/RF OUTPUT 800-1288 MHz receptacle.
- ap. Disconnect the jumper wire between pins 9 and 7 and connect it between pins 9 and 11 on the rear panel 24 pin connector.
- aq. Set the sweep generator mode to Δ f, center frequency to 250 MHz, and sweep width to 520 MHz.
- ar. Observe the response curve on the oscilloscope. Set the sweep generator center frequency to 525 MHz. Set the sweep width to 150 MHz. The flatness should be ± 1.5 dB between 100 MHz and 600 MHz.
- as. Disconnect the detector from the MEASURE INPUT/RF OUTPUT 800-1288 MHz receptacle and connect the RF voltmeter with 50 ohm termination to this receptacle.
- at. Set the sweep generator mode to CW and center frequency to 100 MHz.
- au. Rotate the sweep generator center frequency between 100 MHz and 500 MHz. The output level should be -20 dBm ± 1.5 dB. Rotate the center frequency between 450 MHz and 600 MHz. The output level should be -20 dBm ± 1.5 dB.
- av. If the output level is not -20 dBm ± 1.5 dB between 100 MHz and 600 MHz, a compromise must be made in the attenuator pad value selected in Step .an. Select a value for the attenuator pad that will produce the output levels on both bands as close as possible to -20 dBm ± 1.5 dB.
- aw. Disconnect the sweep generator RF output cable from AT1-J12 and reconnect cable W1 to AT1-J12. Disconnect the RF voltmeter from the MEASURE INPUT/RF OUTPUT 800-1300 MHz receptacle. Disconnect the jumper wire between pins 9 and 11 on the rear panel 24 pin connector.

4.48.4 Broadband Amplifier Alignment (A1A2)

- a. Connect jumper wires between pins 9 and 7 and pins 9 and 10 on the rear panel 24 pin connector.
- b. Connect the sweep generator RF output receptacle to the MEASURE INPUT/RF OUTPUT 0.05-588 MHz receptacle using a 50 ohm BNC cable.

- c. Disconnect the BNC cable connector at A1A4J3. Connect the detector RF input connector to this cable connector. Connect the detector output to the sweep generator demodulator input receptacle.
- d. Connect the sweep generator oscilloscope vertical connector to the oscilloscope vertical input connector using a 50 ohm coaxial cable.
- e. Connect the sweep generator oscilloscope horizontal connector to the oscilloscope horizontal input connector using a 50 ohm coaxial cable.
- f. Set the sweep generator center frequency control to 250 MHz, sweep width control to approximately 520 MHz, 50 MHz markers on, and output level to -21 dBm.
- g. Set the oscilloscope timebase to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- h. Adjust the sweep generator marker amplitude controls to display the 50 MHz markers. Adjust the center frequency control if necessary to display all 50 MHz markers between 50 kHz and 500 MHz.
- i. Adjust the trimmer capacitors A1A2C10 and A1A2C11 and select A1A2C12 for the flattest possible response curve on the oscilloscope. Readjust as necessary as there is interaction between the two adjustments.
- j. Set the sweep generator to sweep from 450 MHz to 600 MHz.
- k. Individually short one or more turns of A1A2L2 and A1A2L4 together using two insulated tuning sticks to obtain the flattest possible response up to 600 MHz. Solder the necessary turns together. Readjust the trimmer capacitors as necessary.
- l. Individually select resistors A1A2R8 and A1A2R13 as necessary to obtain the flattest overall response. Decrease the resistance to decrease the gain.
- m. Individually select resistors A1A2R18 and A1A2R19 as necessary to obtain the flattest overall response. Do not decrease the value of A1A2R18 or A1A2R19 to less than 680 ohms as it will affect the bias of transistors A1A2Q2 and A1A2Q4.
- n. When the amplifier response is flat within ± 1.5 dB from 50 kHz to 600 MHz, disconnect the detector RF input connector from the A1A2 BNC cable and connect the RF voltmeter with 50 ohm load to this cable.

- o. Set the sweep generator to the CW mode, center frequency control to 50 kHz, and the output level to -21 dBm.
- p. Vary the sweep generator center frequency control from 200 kHz to 500 MHz and between 450 MHz and 600 MHz. The output level should be -21 dBm \pm 1.5 dB. Use the signal generator to check the flatness from 50 kHz to 200 kHz.
- q. If the output level is not -21 dBm \pm 1.5 dB, the value of the 5 dB attenuator pad A1A2R1 through A1A2R3 must be selected. Select the proper resistor values from Table 4-16.
- r. Disconnect the RF voltmeter from the A1A2A1 BNC cable and connect the detector RF input receptacle to this cable.
- s. Disconnect the sweep generator RF output receptacle from the MEASURE INPUT/RF OUTPUT 0.05-588 MHz receptacle and connect it to the MEASURE INPUT/RF OUTPUT 800-1288 MHz receptacle.
- t. Disconnect the jumper wire between pins 9 and 7 and connect it between pins 9 and 11 on the rear panel 24 pin connector.
- u. Set the sweep generator mode to Δf , center frequency to 875 MHz, sweep width to 160 MHz, and output level to -21 dBm.
- v. Note the response curve on the oscilloscope. Set the sweep generator center frequency to 1100 MHz and the sweep width to 420 MHz. The output level should be flat within \pm 1.5 dB from 800 MHz to 1300 MHz.
- w. Disconnect the detector RF input receptacle from the A1A2A1 BNC cable and connect the RF voltmeter with 50 ohm load to this cable.
- x. Set the sweep generator mode to CW, center frequency to 800 MHz, and output level to -21 dBm.
- y. Rotate the sweep generator center frequency control between 800 MHz and 950 MHz. The output level should be -21 dBm \pm 1.5 dB. Rotate the center frequency control between 900 MHz and 1300 MHz. The output level should be -21 dBm \pm 1.5 dB.
- z. If the output level is not -21 dBm \pm 1.5 dB between 800 MHz and 1300 MHz, a compromise must be made in the alignment performed in steps f through o to make the output levels on both bands as close as possible to -21 dBm \pm 1.5 dB. If realignment is necessary, repeat Steps f thru y.
- aa. Set the sweep generator output level to -1 dBm. Rotate the center frequency control between 900 MHz and 1300 MHz. The output level should be -0.75 dBm

± 1.25 dB (-2 dBm to $+0.5$ dBm). Rotate the center frequency control from 800 MHz to 950 MHz. The output level should be -0.75 dBm ± 1.25 dB (-2 dBm to $+0.5$ dBm).

- ab. If the output level is not within tolerance between 800 MHz and 1300 MHz, the amplifier must be realigned so that it is not in compression with a measure input level of -1 dBm.

4.48.5 11 MHz and 2 MHz IF Amplifier Alignment (A1A3)

- a. Disconnect the jumper wire between pins 9 and 11 on the rear panel 24 pin connector. Connect a jumper wire between pins 9 and 10.
- b. Disconnect the phono plug from A1A4J4 and connect the phono plug to the BNC to phono plug adapter. Connect the BNC to phono plug adapter to the signal generator RF output connector via a 50 ohm BNC cable. Set the signal generator frequency to 11 MHz and set the output level to -39 dBm.
- c. Connect a BNC test cable to the 24 pin connector on the rear panel; center conductor to pin 24 and shield to pin 12. Connect the 9 MHz signal source to the BNC test cable connector. Set the 9 MHz signal source output level to 125 mV rms.
- d. Set the front panel MEASURE MODE BANDWIDTH switch to the IN-NARROW position, MEASURE SENSITIVITY switch to the HIGH position, and the MEASURE SENSITIVITY control to 20 mV.
- e. Connect the oscilloscope 10 X probe to the junction of A1A3R2 and A1A3R3. Adjust A1A3L1 for maximum amplitude at 11 MHz. The level should be 30 mV p-p approximately.
- f. Connect the oscilloscope 10 X probe to the junction of A1A3C7 and A1A3R6. Adjust A1A3L2 for maximum amplitude at 11 MHz. The level should be 120 mV p-p approximately.
- g. Connect the oscilloscope 10 X probe to the junction of A1A3L6 and A1A3R28. The level should be 95 mV p-p approximately.
- h. Set the MEASURE MODE BANDWIDTH switch to the OUT-WIDE position. Adjust A1A3R17 for same level measured in step g. If A1A3R17 has insufficient range to obtain the same level as in step g, increase the value of A1A3R12 slightly and repeat steps d through f.
- i. Set A1A3R31, A1A3R40 and A1A3R47 to mid-range. Connect the oscilloscope 10 X probe to A1A3-6. Adjust A1A3L8 for maximum amplitude. Adjust A1A3R40 for a level of 2.1 V p-p approximately.

- k. Set the MEASURE SENSITIVITY switch to the NORMAL position. Connect the oscilloscope 10 X probe to A1A3U1-5. Adjust A1A3L13 for maximum amplitude at 9 MHz. The level should be 370 mV p-p approximately.
- l. Disconnect all jumper wires, test cables and test equipment previously installed except the wire between pins 9 and 10 on the rear panel 24 pin connector.
- m. Install the RFM-11A into the mainframe using the RFM module extender test jig. Install the FIM and MDM-1 into the mainframe.
- n. Set the mainframe MODE switch to the MEAS position and the MEASURE MODE AUDIO OUTPUT switch to the IN-BEAT NOTE position. Set the FIM RANGE switch to ZERO and zero the FIM meter with the ZERO control. Set the FIM RANGE switch to the 5 kHz position. Set the MDM-1 MTR switch to the LIM-IN position. Set the RFM-11D MEASURE MODE BAND-WIDTH switch to the IN-NARROW position and verify that the NARROW lamp is lit. Set the RFM-11D MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to the fully cw position (0.64 mV).
- o. Set the mainframe Frequency switches to a frequency above 11 MHz that does not produce limiter current on the MDM-1 meter due to internal spurs. Connect the signal generator RF output receptacle to the RFM-11A MEASURE INPUT/RF OUTPUT 0.05-588 MHz receptacle. Set the signal generator frequency to that of the mainframe and the output level to the minimum level required to produce a beat indication on the BEAT lamp and the speaker.
- p. Zero beat the signal generator to the mainframe and reduce the signal generator output level to -51 dBm.
- q. Adjust A1A3R31 to obtain red-line limiter current on the MDM-1 meter.
- r. Set the RFM-11A MEASURE SENSITIVITY control to the fully ccw position (20 mV) and set the signal generator output level to -21 dBm.
- s. Adjust A1A3R64 to obtain red-line limiter current on the MDM-1 meter.
- t. Repeat Steps p through s until the MEASURE SENSITIVITY control range is exactly 30 dB (0.64 mV to 20 mV).
- u. Set the RFM-11A MEASURE SENSITIVITY switch to the HIGH position and the MEASURE SENSITIVITY control to the 20 uV position.

- v. Set the signal generator output level to -81 dBm. Adjust A1A3R40 to obtain red-line limiter current on the MDM-1 meter.
- w. Temporarily disconnect the signal generator from the RFM-11A and verify that the MDM-1 meter indication is zero. If the meter does not indicate zero, set the mainframe Frequency switches to a frequency that internal spurs do not produce limiter current on the MDM-1 meter.
- x. If Step q was performed, repeat Steps n through v.
- y. Set the signal generator output level to -51 dBm.
- z. Set the RFM-11A MEASURE SENSITIVITY control to the fully ccw position (640 μ V) and verify that the MDM-1 meter indicates red-line limiter current.
- aa. Set the MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to the 10 mV position. Adjust the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be -27 dBm ± 3 dB.
- ab. Repeat Step aa except substitute 0.5 mV for 10 mV and -33 dBm ± 3 dB for -27 dBm ± 3 dB.
- ac. Repeat Step aa except substitute 2.5 mV for 1 mV and -39 dBm ± 3 dB for -27 dBm ± 3 dB.
- ad. Repeat Step aa except substitute 1.25 mV for 10 mV and -45 dBm ± 3 dB for -27 dBm ± 3 dB.
- ae. Set the RFM-11A MEASURE SENSITIVITY switch to HIGH and the control to 640 μ V. Adjust the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be -51 dBm.
- af. Repeat Step ae except substitute 320 μ V for 640 μ V and -57 dBm ± 3 dB for -51 dBm.
- ag. Repeat Step ae except substitute 160 μ V for 640 μ V and -63 dBm ± 3 dB for -51 dBm.
- ah. Repeat Step ae except substitute 80 μ V for 640 μ V and -69 dBm ± 3 dB for -51 dBm.

- ai. Repeat Step ae except substitute 40 μV for 640 μV and $-75 \text{ dBm} \pm 3 \text{ dB}$ for -51 dBm .
- aj. Repeat Step ae except substitute 20 μV for 640 μV and -81 dBm for -51 dBm .
- ak. Set the mainframe Frequency switches to 1 MHz and the RFM-11A MEASURE SENSITIVITY switch to NORMAL. Set the signal generator frequency to 1 MHz and set the output level to produce a zero beat note/lamp indication. Zero beat the signal generator to the mainframe and reduce the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be $675 \mu\text{V} \pm 225 \mu\text{V rms}$ (450 μV to 900 $\mu\text{V rms}$).
- al. Repeat Step ak at 50 MHz and every 50 MHz up to 550 MHz and at 588 MHz.
- am. Set the mainframe Frequency switches to a frequency above 811 MHz that does not produce limiter current due to internal spurs. Disconnect the signal generator from the RFM-11A 0.05-588 MHz MEASURE INPUT/RF OUTPUT receptacle. Connect the signal generator RF output receptacle to the RFM-11A 800-1288 MHz MEASURE INPUT/RF OUTPUT receptacle. Set the signal generator frequency to that of the mainframe and set the output level just high enough to produce a beat note/lamp indication. Set the RFM-11A MEASURE SENSITIVITY switch to the HIGH position.
- an. Zero beat the signal generator with the mainframe and reduce the signal generator output level to -81 dBm .
- ao. Adjust the RFM-11A MEASURE SENSITIVITY control to obtain red-line limiter current on the MDM-1. It should indicate approximately 20 μV .
- ap. Set the signal generator output level to -75 dBm . Adjust the MEASURE SENSITIVITY control to obtain red-line limiter current. It should indicate approximately 40 μV .
- aq. Repeat Step ap except substitute -69 dBm for -75 dBm and 80 μV for 40 μV .
- ar. Repeat Step ap except substitute -63 dBm for -75 dBm and 160 μV for 40 μV .
- as. Repeat Step ap except substitute -57 dBm for -75 dBm and 320 μV for 40 μV .
- at. Repeat Step ap except substitute -51 dBm for -75 dBm and 640 μV for 40 μV .
- au. Set the signal generator output level to -45 dBm . Set the MEASURE SENSITIVITY switch to NORMAL and adjust the MEASURE SENSITIVITY control to obtain red-line limiter current on the MDM-1. It should indicate approximately 1.25 mV.

- av. Repeat Step ap except substitute -39 dBm for -75 dBm and 2.5 mV for 40 uV.
- aw. Repeat Step ap except substitute -33 dBm for -75 dBm and 5 mV for 40 uV.
- ax. Repeat Step ap except substitute -27 dBm for -75 dBm and 10 mV for 40 uV.
- ay. Repeat Step ap except substitute -21 dBm for -75 dBm and 20 mV for 40 uV.
- az. Set the mainframe Frequency switches to 800 MHz and the RFM-11A MEASURE SENSITIVITY control to 0.64 mV. Set the signal generator frequency to 800 MHz and set the output level high enough to produce a zero beat note/lamp indication. Zero beat the signal source to the mainframe and reduce the signal generator output level to obtain red-line limiter current on the MDM-1. The signal generator output level should be 700 uV \pm 300 uV rms (400 uV to 1000 uV).
- ba. Repeat Step av at 850 MHz and every 50 MHz up to 1288 MHz.
- bb. Disconnect the signal source from the RFM-11A.

4.48.6 Gen Mod Cal Adjustment

- a. Set the mainframe MODE switch to the GEN MOD CAL position and the RFM-11A MEASURE MODE BANDWIDTH switch to the OUT-WIDE position. Set the RFM-11A A1A3R47 to mid-range.
- b. Select the value of A1A4R35 to obtain a limiter current indication of approximately 15 on the 18 kHz scale.
- c. Readjust A1A3R47 to obtain a limiter current indication of exactly 15 on the 18 kHz scale.
- d. Remote the MDM-1 from the mainframe and install the OAM-1. Calibrate the OAM-1 and verify that the CRT trace can be positioned above and below the CARRIER SET line of the graticule with the OAM-1 CARRIER LEVEL control.

4.48.7 RF Output Leveling

- a. Set the mainframe MODE switch to the GEN position, Frequency switches to 250 MHz and the RFM-11A RF OUTPUT switch to -30 dBm.

- b. Connect the RF voltmeter with 50 ohm termination to the RFM-11A 0.05-588 MHz MEASURE INPUT/RF OUTPUT receptacle.
- c. Adjust the mainframe A1A2R31 to obtain -30 dBm on the RF voltmeter. Rotate the mainframe Frequency switches to each position (100 MHz control 0 to 5 only). The RF output shall be -30 dBm \pm 3 dB (-33 dBm to -27 dBm) from 50 kHz to 500 MHz.

4.49 FAULT ISOLATION PROCEDURES (MODEL RFM-11A MODULE)

Fault isolation procedures are presented to provide a guide in servicing the RFM-11A. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.47, with each subsection keyed to the paragraph in Section 4.47 that first indicates a fault. When a fault is noted during RFM-11A operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.47.
- b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.
- c. When the fault is isolated to a function, such as the 11 MHz amplifier, refer to the alignment procedure for that function in Section 4.48 and check alignment of that function before proceeding with fault isolation.
- d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.49.1 Output Level Not Within Tolerance (4.47.2-d and 4.47.2-e)

- a. Check alignment of broadband amplifier as in Paragraph 4.48.1.
- b. Check alignment of RF switch as in Paragraph 4.48.3.
- c. Check step attenuator, AT1.
- d. Check 700 MHz multiplier as in Paragraph 4.48.2.
- e. Check RF output leveling as in Paragraph 4.48.7.
- f. Check mainframe as in mainframe section of manual.

4.49.2 Measure Mode Sensitivity Not Within Tolerance (4.47.3-f)

- a. Check measure input sensitivity alignment beginning at Paragraph 4.48.5-m.
- b. Check 11 MHz IF alignment as in Paragraph 4.48.5.

4.50 TEST EQUIPMENT REQUIRED (MODEL RFM-10B MODULE)

The test equipment requirements of the Model RFM-10B are identical to those of the Model RFM-10A (refer to Table 4-5).

4.51 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL RFM-10B MODULE)

The minimum performance checkout procedure for the Model RFM-10B is the same as that for the Model RFM-10A with the following exceptions (refer to Paragraphs 4.11 thru 4.11.3):

- a. The Measure Mode Sensitivity Check should require that the MEASURE SENSITIVITY switch and the signal generator level be set to 0.6 mV.

4.52 ALIGNMENT AND ADJUSTMENT (MODEL RFM-10B MODULE)

The alignment and adjustment procedure for the Model RFM-10B is the same as for the Model RFM-10A with the following exceptions (refer to Paragraph 4.12 thru 4.12.6):

- a) There is an additional figure, Figure 4-56, BROADBAND AMPLIFIER ASSEMBLY, A1A2 (RFM-10B).
- b) The MEASURE INPUT SENSITIVITY ALIGNMENT:
 - 1) Step b should have the attenuator output level set at 60 μ V.
 - 2) Step c should have the MEASURE SENSITIVITY control set to 60 μ V.
 - 3) Step h should have the signal source output level set to 2 μ V.
 - 4) Step m should have the signal source output level set to 80 μ V.
 - 5) Step n should have the signal source output level set to 2.4 mV.
- c) There is an additional alignment procedure for the A1A2 assembly, as follows:

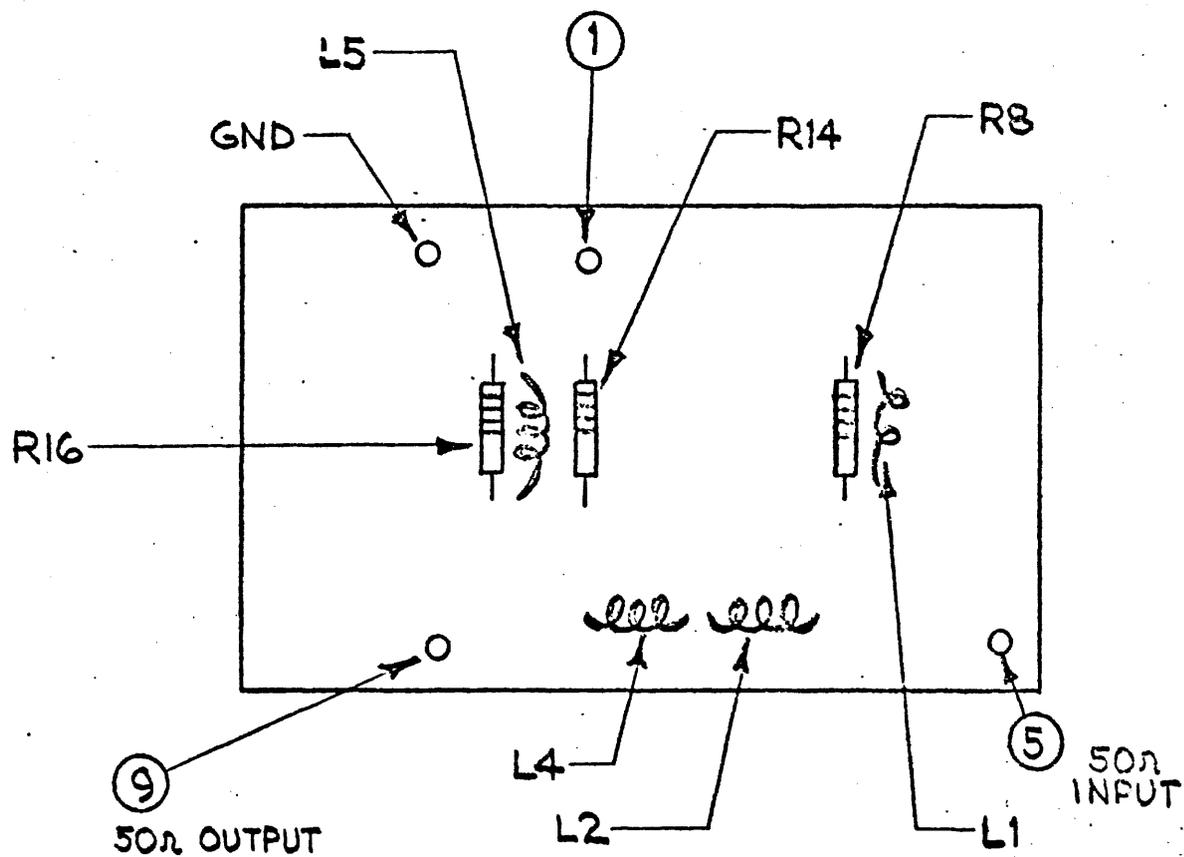


FIGURE 4-56. BROADBAND AMPLIFIER ASSEMBLY, A1A4 (RFM-10B)

4.52.1 Broadband Amplifier Alignment (A1A2)

- a. Connect the sweep generator RF output to the MEASURE INPUT on the Model RFM-10B.
- b. Connect terminals 9 and 10 of the test connector together.
- c. Connect the BBA (A1A2) RF output to the detector RF input using the BNC to phono jack adapter.
- d. Connect the detector dc output to the sweep generator demodulator input jack.
- e. Connect the sweep generator vertical output jack to the dc amplifier input jack.
- f. Connect the dc amplifier output to the oscilloscope vertical input jack.
- g. Connect the sweep generator horizontal output to the oscilloscope external horizontal input.
- h. Set the sweep generator output level to -33 dBm.
- j. Set the oscilloscope controls as required to display the 50 kHz to 500 MHz response of the BBA amplifier.
- k. Set the 50 MHz harmonics switch on the sweep generator on.
- l. Individually short one or more turns of A1A2L1, A1A2L2, A1A2L4 and A1A2L5 together using two insulated tuning sticks, to obtain the flattest possible response curve. Solder the necessary turns together.
- m. To increase the level at the low frequency end, increase the value of A1A2R14.
- n. If the high frequency gain is still too high or the amplifier has tendencies to oscillate, reduce the value of A1A2R16 and/or increase the value of A1A2R8 until the required flatness at the high frequencies is obtained or the oscillation ceases.
- o. Once the response curve is flat within ± 1.5 dB, disconnect the detector from the amplifier output and replace with an RF voltmeter. Set the sweep generator mode switch to the CW position. The amplifier RF output level should be -13 dBm ± 3 -0 dB. Rotate the sweep generator center frequency control from 50 kHz to 500 MHz. The level should not change more than ± 1.5 dB -11.5 dBm.

4.53 FAULT ISOLATION PROCEDURE (MODEL RFM-10B MODULE)

The fault isolation procedure for the Model RFM-10B is the same as that for the Model RFM-10A with the following exception (refer to Paragraphs 4.13 thru 4.13.2).

- a) The Output Level Not Within Tolerance section should also refer to paragraph 4 for broadband amplifier alignment.

4.54 TEST EQUIPMENT REQUIRED (MODEL RFM-10A AND RFM-10B MODULES)

The test equipment required for the checkout, alignment, calibration and trouble-shooting is tabulated in Table 4-17. Minimum parameters are provided to aid in the selection of the equivalent types.

TABLE 4-17
TEST EQUIPMENT REQUIREMENTS FOR MODELS RFM-10A AND RFM-10B

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Sweep Generator	Frequency range: 50 kHz to 512 MHz Output level: -41 dBm to 0 dBm	Wavetek Model 2001
RF Detector	Frequency range: 50 kHz to 512 MHz	Wavetek Model D152
Signal Generator	Frequency range: 50 kHz to 500 MHz Level: -101 dBm to 0 dBm Output impedance: 50 ohms	Singer Model FM-2748
Oscilloscope with 10 X Probe	Frequency response: 15 MHz Vertical sensitivity: 5 mV/cm	Tektronix Model 454
RF voltmeter with 50 ohm load & T	Frequency response: 50 kHz to 512 MHz Level: +6 dBm to -40 dBm	Hewlett-Packard Model 3406A/ 11063A/6064
DC Digital Voltmeter	Level: -23 mV dc Accuracy: ±1%	Hewlett-Packard Model 3440A
Power Supply	Level: 9 Vdc at 250 mA	Hewlett-Packard Model 721A
Radio Interference/ Field Intensity Meter	Frequency response: 250 MHz Level: 50 uV to 500 uV	Singer Model NM-30
9 MHz Signal Source	Frequency range: 9 MHz Level: 100 mV rms Impedance: 50 ohms	Singer Model FM-2748
Mainframe/RF Module/ FIM Module/MDM-1 Module/OAM-1 Module	Required for testing RFM-10A and RFM-10B Modules	Singer Model FM-10C Mainframes with RF, OAM-1, FIM and MDM-1 Modules

Table 4-17. Test Equipment Requirements for Models RFM-10A and RFM-10B (Cont.)

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
RF Module extender jig	Required for testing RFM-10B and RFM-10B Modules	Singer Model PC-2652
Connector	24 pin, female	Singer P/N 1-910072-002
Connector	BNC	Singer P/N 1-910022-004
Connector	Push-on	Singer P/N 1-910173-001
Resistor	200 ohms, $\pm 5\%$, 1/4 watt	Not applicable

4.55 MINIMUM PERFORMANCE CHECKOUT PROCEDURE (MODEL RFM-10A AND RFM-10B MODULES)

4.55.1 Power Requirements

All power required by the RFM-10A or RFM-10B is supplied by the mainframe.

4.55.2 Output Level Check

- a. Install either the RFM-10A or RFM-10B into the mainframe left-hand compartment. Connect the RF voltmeter with the 50 ohm termination to the RF OUTPUT jack of either the RFM-10A or RFM-10B module. Set mainframe MODE switch to GEN.
- b. Set the RF OUTPUT attenuator to -93 dBm.
- c. Set the mainframe frequency switches to 100.0000 MHz and the 0-100 Hz control to the OUT position.
- d. The RF voltmeter should indicate 500 $\mu\text{V} \pm 3 \text{ dB}$ (354-707 $\mu\text{V rms}$).
- e. Repeat step 4.55.2-d at 50 kHz, 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 512 MHz.

4.55.3 Measure Mode Sensitivity Check

- a. Set the mainframe MODE switch to MEAS, MEASURE MODE AUDIO OUTPUT switch to IN-BEAT NOTE, GENERATOR MODULATION switch to OUT-OFF and frequency switches to 151 MHz.
- b. Set the RF module MEASURE MODE BANDWIDTH switch to OUT-WIDE. Set the MEASURE SENSITIVITY switch and MEASURE SENSITIVITY control to 0.64 mV for the RFM-10A or 0.064 mV for the RFM-10B.

- c. Connect the signal generator to the RF module MEASURE INPUT connector. Set its frequency to 151 MHz and level to either 0.64 mV rms or 0.064 mV rms respectively.
- d. Insert the MDM-1 module into the right-hand compartment and the FIM module in the center compartment. Set the MDM-1 MTR switch to the LIM(IN) position.
- e. Adjust the signal generator frequency slightly to obtain a zero beat indication on the FIM BEAT lamp.
- f. The MDM-1 meter should indicate "red-line." If not, readjust the signal generator output level to obtain exactly "red-line" on the MDM-1 meter. The signal generator output level should be 0.64 mV rms ± 3 dB (0.45 mV to 0.89 mV) for the RFM-10A or 0.064 mV rms ± 3 dB (0.045 mV to 0.089 mV) for the RFM-10B.

4.56 ALIGNMENT AND ADJUSTMENT (MODEL RFM-10A AND RFM-10B MODULES)

NOTE:

The alignment and adjustment procedure is performed with the RFM-10A or RFM-10B disconnected from the mainframe so that no problem in the mainframe will affect the alignment of either the RFM-10A or RFM-10B. Refer to Figures 4-57 thru 4-59 for test point and trimmer locations. Remove the five screws from the back of the RFM-10A or RFM-10B and slide the cover off.

4.56.1 Broadband Amplifier Alignment (A1A4)

- a. Place the connector P/N 1-910072-002 onto its mating plug on the rear panel of either the RFM-10A or RFM-10B. Make up a BNC to "push-on" connector cable adapter (using the push-on connector P/N 1-910173-001) with an overall length of approximately 10".
- b. Connect the power supply positive lead to pin 9 and the negative lead to terminal 21 of the rear panel 24 pin connector. Disconnect the positive lead of the A1A4C35 from the circuit board.
- c. Connect the sweep generator RF output connector to the rear panel RF input connector, P1, of either the RFM-10A or RFM-10B using the 10" BNC to "push-on" cable adapter made up in Step a.
- d. Disconnect BNC coaxial cable W1 from A1A4J2 and connect A1A4J2 to the detector RF input with a 6" to 12" 50 ohm BNC cable.
- e. Connect the detector dc output to the sweep generator demodulator input connector.

- f. Connect the sweep generator oscilloscope vertical connector to the oscilloscope vertical input connector using a 50 ohm coaxial cable.
- g. Connect the sweep generator oscilloscope horizontal connector to the oscilloscope horizontal input connector using a 50 ohm coaxial cable.
- h. Set the sweep generator center frequency control to 250 MHz, sweep width control to approximately 520 MHz, 50 MHz marker switch on, and output level to -33 dBm.

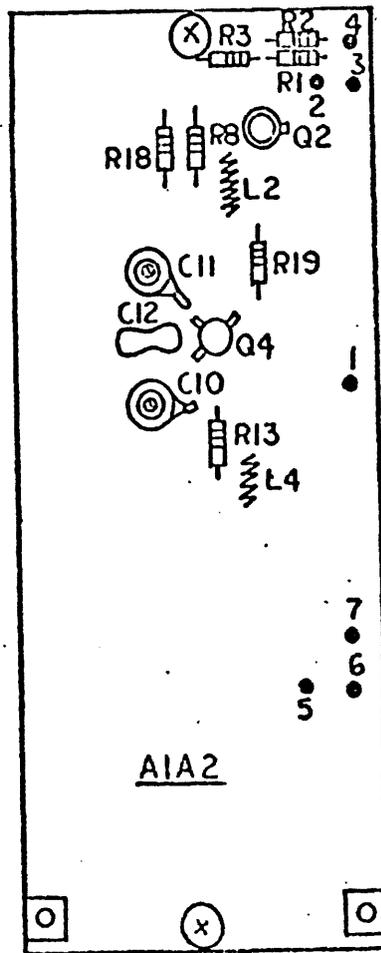


FIGURE 4-57. BROADBAND AMPLIFIER ASSEMBLY, A1A2 (RFM-10B)

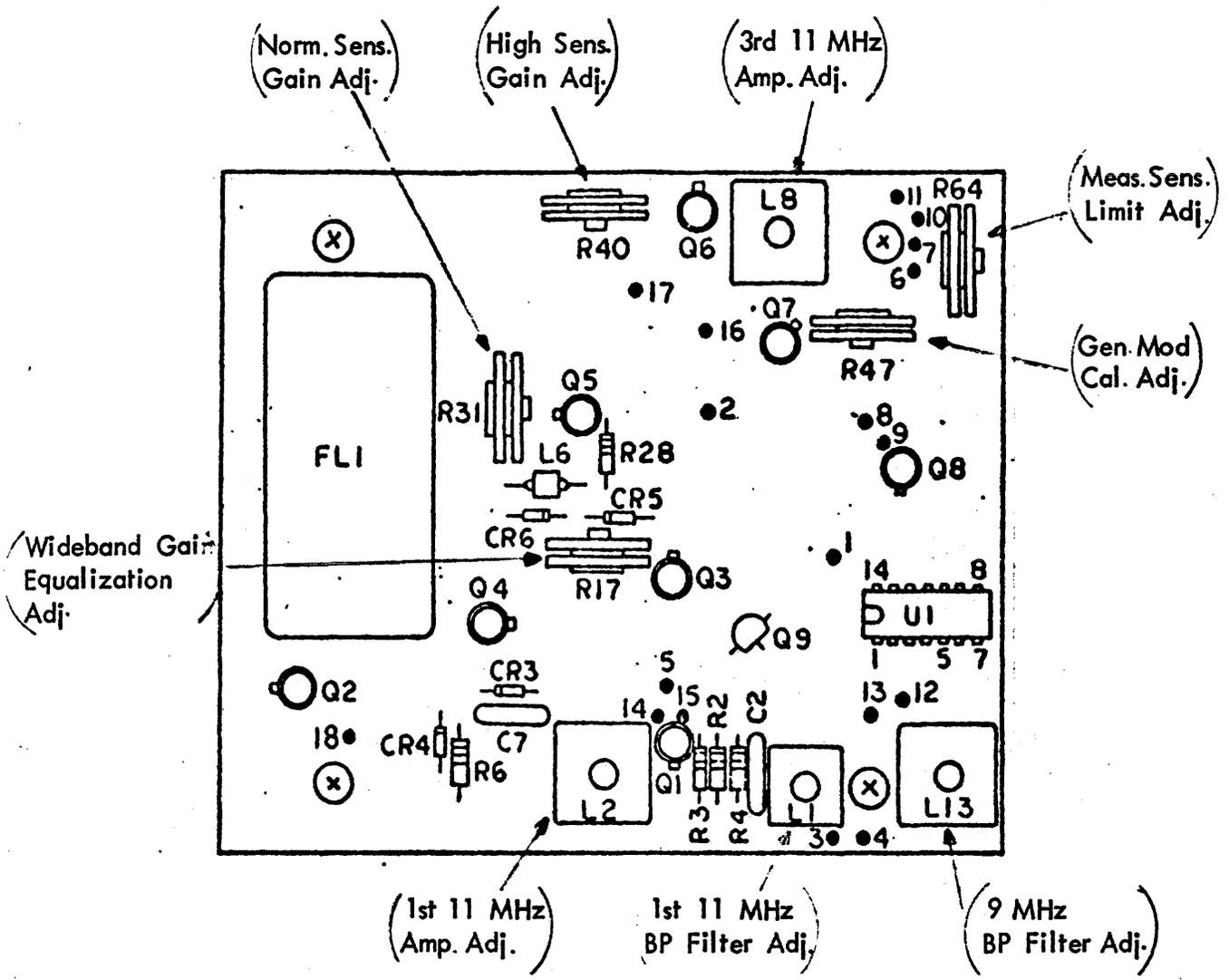


FIGURE 4-58. 11 MHz IF BOARD ASSEMBLY, A1A3 (RFM-10A AND RFM-10B)

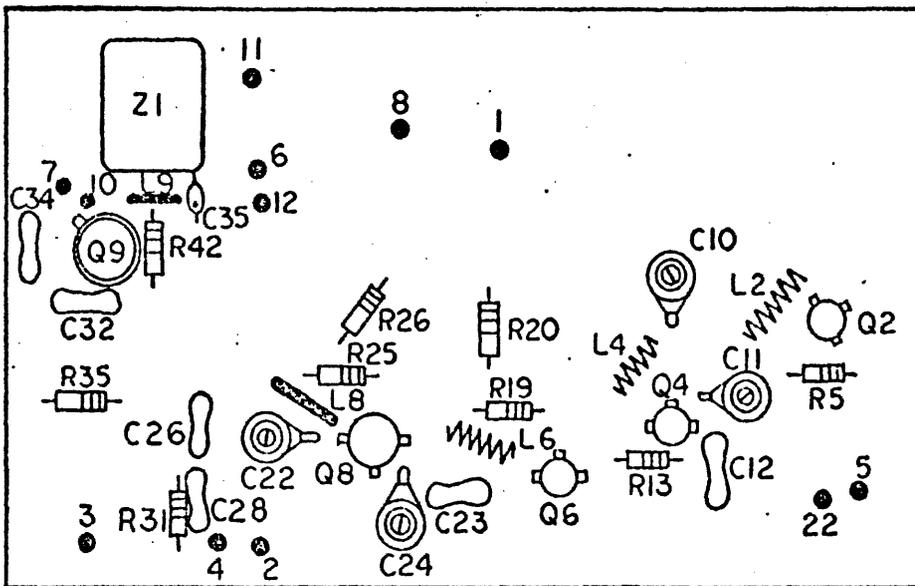


FIGURE 4-59. BROADBAND AMPLIFIER & MIXER ASSEMBLY, A1A4 (RFM-10A AND RFM-10B)

- j. Set the oscilloscope timebase to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- k. Adjust the sweep generator marker amplitude controls to display the 50 MHz markers. Adjust the center frequency control, if necessary, to display all 50 MHz markers between 50 kHz and 500 MHz.
- l. Adjust trimmer capacitors A1A4C10, A1A4C11, A1A4C22 and A1A4C24, and select A1A4C12 and A1A4C23 for the flattest possible response curve on the oscilloscope. Readjust as necessary as there is interaction between the adjustments.
- m. Individually short one or more turns of A1A4L2, A1A4L4, A1A4L6 and A1A4L8 together, using two insulated tuning sticks, to obtain the flattest possible response from 50 kHz to 512 MHz. Solder the necessary turns together. Readjust the trimmer capacitors as necessary.
- n. Individually select resistors A1A4R5, A1A4R13, A1A4R19 and A1A4R25 as necessary to obtain the flattest overall response. Decrease the resistance values to decrease the gain.
- p. If the high frequency gain is too high or the amplifier has tendencies to oscillate, reduce the values of A1A4R20 and A1A4R26 until the required flatness at the high frequency end is obtained or the oscillations cease.
- r. After the response curve is flat within ± 1 dB from 50 kHz to 512 MHz, disconnect the detector from A1A4J2 and connect the RF voltmeter A1A4J2. Set the sweep generator to the CW mode. The output level at A1A4J2 should be 0 dBm ± 1 dB. Rotate the sweep generator center frequency control from 50 kHz to 512 MHz. The level should not vary more than ± 1 dB from 0 dBm.
- s. Rotate the sweep generator center frequency control to 250 MHz. Adjust the sweep generator output level, if necessary, to obtain exactly 0 dBm on the RF voltmeter.
- t. Disconnect the RF voltmeter from A1A4J2 and connect the 50 ohm BNC load to A1A4J2. Set the sweep generator to the Δf mode. Connect a jumper between pin 9 and pin 10 on the rear panel 24 pin connector.
- u. Solder the positive lead of A1A4C35 in its printed circuit pad connected to A1A4L9. Remove the negative lead of A1A4C35 from its printed circuit pad.

Solder the center conductor of a BNC test cable to the negative lead of A1A4C35 and solder the shield to ground. Connector the detector to this BNC cable.

CAUTION

Be careful not to short the case of A1A4Q9 to ground as it is internally connected to the collector.

- v. Select the values of A1A4R42, A1A4C32 and A1A4C34 to obtain the flattest possible response. Capacitor A1A4C32 may be deleted if necessary.
- w. Set the sweep generator to the CW mode. Set the center frequency to 250 MHz. The output level at A1A4J4 should be +4 dBm \pm 2 dB.
- x. Disconnect the BNC cable from A1A4C35 and solder the negative lead of A1A4C35 to the printed circuit pad.
- y. Disconnect the BNC to push-on cable adapter from the sweep generator RF output connector and connect it to the signal generator RF output receptacle.
- z. Disconnect the BNC 50 ohm load from A1A4J2 and connect the RF voltmeter to A1A4J2.
- aa. Set the signal generator frequency to 50 kHz and the output level to produce +6 dBm on the RF voltmeter.
- ab. Reduce the signal generator output level 10 dB and reduce the RF voltmeter range 10 dB. The RF voltmeter should read -3 dBm minimum.
- ac. Repeat steps aa and ab at 1 MHz, 10 MHz, 50 MHz, and every 50 MHz up to 512 MHz.
- ad. Connect the digital voltmeter between pin 3 of the 24 pin rear panel connector and the chassis.
- ae. Set the signal generator frequency to 50 kHz and the output to produce 0 dBm on the RF voltmeter and observe the digital voltmeter indication.
- af. Select the value of A1A4R31 until the indication on the digital voltmeter is approximately -20 mV dc. (Increasing A1A4R31 increases the voltage.)
- ag. Set the signal generator frequency to 512 MHz and adjust the output level to obtain 0 dBm on the RF voltmeter.

- ah. If the voltage on the digital voltmeter is more negative than -23 mV dc, add capacitor A1A4C28 across A1A4R31 (value from 1 pF to 5 pF DM-15) until the voltage is approximately equal to that at 50 kHz. If the voltage is less negative than -17 mV dc, add capacitor A1A4C26 across A1A4R30 (value from 0.1 pF to 1.0 pF tubular P/N 1-900066-001) until the voltage is approximately equal to that at 50 kHz.
- aj. Repeat Step ae at 1 MHz, 10 MHz, 50 MHz and every 50 MHz up to 512 MHz. Maintain the amplifier output level at 0 dBm at each frequency. The voltage should not vary greater than ± 3 mV dc from the voltage observed at 50 kHz.

4.56.2 11 MHz and 2 MHz IF Amplifier Alignment (A1A3)

- a. Disconnect the phono plug from A1A4J4 and connect the phono plug to the BNC to phono plug adapter. Connect the BNC to phono plug adapter to the signal generator RF output connector via a 50 ohm BNC cable. Set the signal generator frequency to 11 MHz and set the output level to -39 dBm.
- b. Connect a BNC test cable to the 24 pin connector on the rear panel; center conductor to pin 24 and shield to pin 12. Connect the 9 MHz signal source to the BNC test cable connector. Set the 9 MHz signal source output level to 125 mV rms.
- c. Set the front panel MEASURE MODE BANDWIDTH switch to the IN-NARROW position, MEASURE SENSITIVITY switch to the HIGH position, and the MEASURE SENSITIVITY control to 20 μ V on the RFM-10A or 2 μ V on the RFM-10B.
- d. Connect the oscilloscope 10 X probe to the junction of A1A3R2 and A1A3R3. Adjust A1A3L1 for maximum amplitude at 11 MHz. The level should be approximately 30 mV p-p.
- e. Connect the oscilloscope 10 X probe to the junction of A1A3C7 and A1A3R6. Adjust A1A3L2 for maximum amplitude at 11 MHz. The level should be approximately 120 mV p-p.
- f. Connect the oscilloscope 10 X probe to the junction of A1A3L6 and A1A3R28. The level should be approximately 95 mV p-p.
- g. Set the MEASURE MODE BANDWIDTH switch to the OUT-WIDE position. Adjust A1A3R17 (Wideband Gain Equalization) for same level measured in step f. If A1A3R17 has insufficient range to obtain the same level as in Step f, increase the value of A1A3R12 slightly and repeat Steps c through f.
- h. Set A1A3R31, A1A3R40 and A1A3R47 to mid-range. Connect the oscilloscope 10 X probe to A1A3-6. Adjust A1A3L8 for maximum amplitude. Adjust A1A3R40 (High Sens. Gain Adj.) for a level of approximately 2.1 V p-p.

- j. Set the MEASURE SENSITIVITY switch to the NORMAL position. Connect the oscilloscope 10 X probe to A1A3U1-5. Adjust A1A3L13 for maximum amplitude at 9 MHz. The level should be approximately 370 mV p-p.
- k. Disconnect all jumper wires, test cables and test equipment previously installed, except the wire between pins 9 and 10 on the rear panel 24 pin connector.

4.56.3 Broadband Amplifier Alignment (A1A2) (RFM-10B only)

- a. Connect the sweep generator RF output receptacle to the MEASURE INPUT receptacle using a 50 ohm BNC cable.
- b. Disconnect the BNC cable connector at A1A4J3. Connect the detector RF input connector to this cable connector. Connect the detector output to the sweep generator demodulator input jack.
- c. Connect the sweep generator oscilloscope vertical connector to the oscilloscope vertical input connector using a 50 ohm coaxial cable.
- d. Connect the sweep generator oscilloscope horizontal connector to the oscilloscope horizontal input connector using a 50 ohm coaxial cable.
- e. Set the sweep generator center frequency control to 250 MHz, sweep width control to approximately 520 MHz, 50 MHz marker switch on, and output level to -21 dBm.
- f. Set the oscilloscope timebase to external and adjust the horizontal and vertical amplitude controls and switches so that the display deflects approximately three-quarters of the CRT graticule.
- g. Adjust the sweep generator marker amplitude controls to display the 50 MHz markers. Adjust the center frequency control if necessary to display all 50 MHz markers between 50 kHz and 500 MHz.
- h. Adjust trimmer capacitor A1A2C11 and select A1A2C12 for the flattest possible response curve on the oscilloscope. Readjust as necessary as there is interaction between the two adjustments.
- i. Individually short one or more turns of A1A2L2 and A1A2L4 together using two insulated tuning sticks to obtain the flattest possible response up to 512 MHz. Solder the necessary turns together. Readjust the trimmer capacitors as necessary.
- k. Individually select resistors A1A2R8 and A1A2R13 as necessary to obtain the flattest overall response. Decrease the resistance to decrease the gain.

- l. Individually select resistors A1A2R18 and A1A2R19 as necessary to obtain the flattest overall response. Do not decrease the value of A1A2R18 or A1A2R19 to less than 680 ohms as it will affect the bias of transistors A1A2Q2 and A1A2Q4.
- m. When the amplifier response is flat within ± 1.5 dB from 50 kHz to 512 MHz, disconnect the detector RF input connector from the A1A2 BNC cable and connect the RF voltmeter to this cable.
- n. Set the sweep generator to the CW mode, center frequency control to 50 kHz, and the output level to -41 dBm.
- p. Vary the sweep generator center frequency control from 50 kHz to 512 MHz. The output level should be $-21 \text{ dBm} \pm 1.5 \text{ dB}$.
- r. If the output level is not $-21 \text{ dBm} \pm 1.5 \text{ dB}$, the value of the 3 dB attenuator pad A1A2R1 through A1A2R3 must be changed. Select the proper resistor values from Table 4-18.

TABLE 4-18. ATTENUATOR PAD RESISTOR VALUES

ATTENUATION	$\pm 5\%$ SERIES RESISTOR	$\pm 5\%$ SHUNT RESISTORS
2 dB	12 Ω	430 Ω
3 dB	16 Ω	300 Ω
6 dB	39 Ω	150 Ω
7 dB	43 Ω	130 Ω
8 dB	51 Ω	120 Ω
10 dB	68 Ω	100 Ω
11 dB	82 Ω	91 Ω
12 dB	91 Ω	82 Ω

- s. Set the sweep generator output level to -21 dBm. Rotate the center frequency control from 50 kHz to 512 MHz. The output level should be $-0.75 \text{ dBm} \pm 1.25 \text{ dB}$ (-2 dBm to $+0.5 \text{ dBm}$).
- t. If the output level is not within tolerance the amplifier must be realigned so that it is not in compression with an input level of -21 dBm.

- u. Disconnect all test equipment and associated cables from the unit. Reconnect all internal cables within the instrument. Remove and 24 pin test connector from the rear panel connector.

4.56.4 Measure Input Sensitivity and Calibration

- a. Install either the RFM-10A or RFM-10B into the mainframe using the RFM module extender test jig. Install the FIM and MDM-1 into the mainframe.
- b. Set the mainframe MODE switch to the MEAS position and the MEASURE MODE AUDIO OUTPUT switch to the IN-BEAT NOTE position. Set the FIM RANGE switch to ZERO and zero the FIM meter with the ZERO control. Set the FIM RANGE switch to the 5 kHz position. Set the MDM-1 MTR switch to the LIM-IN position. Set either the RFM-10A or RFM-10B MEASURE MODE BANDWIDTH switch to the IN-NARROW position and verify that the NARROW lamp is lit. Set either the RFM-10A or RFM-10B MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to the fully cw position (0.64 mV for the RFM-10A or 0.064 mV for the RFM-10B).
- c. Set the mainframe Frequency switches to a frequency above 11 MHz that does not produce limiter current on the MDM-1 meter due to internal spurs. Connect the signal generator RF output connector to either the RFM-10A or RFM-10B MEASURE INPUT connector, J2. Set the signal generator frequency to that of the mainframe and the output level to the minimum level required to produce a beat indication on the BEAT lamp and the speaker.
- d. Zero beat the signal generator to the mainframe and reduce the signal generator output level to -51 dBm for the RFM-10A or -71 dBm for the RFM-10B.
- e. Adjust A1A3R31 (Normal Sensitivity Gain Adj.) to obtain red-line limiter current on the MDM-1 meter.
- f. Set either the RFM-10A or RFM-10B MEASURE SENSITIVITY control to the fully ccw position (20 mV for the RFM-10A or 2.0 mV for the RFM-10B) and set the signal generator output level to -21 dBm for the RFM-10A or -41 dBm for the RFM-10B.
- g. Adjust A1A3R64 (Meas. Sens. Limit Adj.) to obtain red-line limiter current on the MDM-1 meter.
- h. Repeat Steps d thru g until the MEASURE SENSITIVITY control range is exactly 30 dB (0.64 mV to 20 mV for the RFM-10A or 0.064 mV to 2.0 mV for the RFM-10B).
- j. Set either the RFM-10A or RFM-10B MEASURE SENSITIVITY switch to the HIGH position and the MEASURE SENSITIVITY control to the 20 uV position for the RFM-10A or 2.0 uV for the RFM-10B.

- k. Set the signal generator output level to -81 dBm for the RFM-10A or -101 dBm for the RFM-10B. Adjust A1A3R40 (High Sens. Gain Adj.) to obtain red-line limiter current on the MDM-1 meter.
- l. Temporarily disconnect the signal generator from either the RFM-10A or RFM-10B and verify that the MDM-1 meter indication is zero. If the meter does not indicate zero, set the mainframe Frequency switches to a frequency that internal spurs do not produce limiter current on the MDM-1 meter.
- m. If Step e was performed, repeat Steps b thru k.
- n. Set the signal generator output level to -51 dBm for the RFM-10A or -71 dBm for the RFM-10B.
- p. Set either the RFM-10A or RFM-10B MEASURE SENSITIVITY control to the fully ccw position (640 μ V for the RFM-10A or 64 μ V for the RFM-10B) and verify that the MDM-1 meter indicates red-line limiter current.
- r. Set the MEASURE SENSITIVITY switch to the NORMAL position and the MEASURE SENSITIVITY control to the 10 mV position for the RFM-10A or the 1 mV position for the RFM-10B. Adjust the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be -27 dBm ± 3 dB for the RFM-10A or -47 dBm ± 3 dB for the RFM-10B.
- s. Repeat Step r except substitute 5 mV for 10 mV and -33 dBm ± 3 dB for -27 dBm for the RFM-10A or 0.5 mV for 1 mV and -53 dBm ± 3 dB for -47 dBm ± 3 dB for the RFM-10B.
- t. Repeat Step r except substitute 2.5 mV for 10 mV and -39 dBm ± 3 dB for -27 dBm ± 3 dB for the RFM-10A or 0.25 mV for 1 mV and -59 dBm ± 3 dB for -47 dBm ± 3 dB for the RFM-10B.
- u. Repeat Step r except substitute 1.25 mV for 10 mV and -45 dBm ± 3 dB for -27 dBm ± 3 dB for the RFM-10A or 0.125 mV for 1 mV and -65 dBm ± 3 dB for -47 dBm ± 3 dB for the RFM-10B.
- v. Set either the RFM-10A or RFM-10B MEASURE SENSITIVITY switch to HIGH and the control to 640 μ V for the RFM-10A or 64 μ V for the RFM-10B. Adjust the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be -51 dBm for the RFM-10A or -71 dBm for the RFM-10B.
- w. Repeat Step v except substitute 320 μ V for 640 μ V and -57 dBm ± 3 dB for -51 dBm for the RFM-10A or 32 μ V for 64 μ V and -77 dBm ± 3 dB for -71 dBm for the RFM-10B.
- x. Repeat Step v except substitute 160 μ V for 640 μ V and -63 dBm ± 3 dB for -51 dBm for the RFM-10A or 16 μ V for 64 μ V and -83 dBm ± 3 dB for -71 dBm for the RFM-10B.

- y. Repeat Step v except substitute 80 μV for 640 μV and $-69 \text{ dBm} \pm 3 \text{ dB}$ for -51 dBm for the RFM-10A or 8 μV for 64 μV and $-89 \text{ dBm} \pm 3 \text{ dB}$ for -71 dBm for the RFM-10B.
- z. Repeat Step v except substitute 40 μV for 640 μV and $-75 \text{ dBm} \pm 3 \text{ dB}$ for -51 dBm for the RFM-10A or 4 μV for 64 μV and $-95 \text{ dBm} \pm 3 \text{ dB}$ for -71 dBm for the RFM-10B.
- aa. Repeat Step v except substitute 20 μV for 640 μV and -81 dBm for -51 dBm for the RFM-10A or 2 μV for 64 μV and -101 dBm for -71 dBm for the RFM-10B.
- ab. Set the mainframe Frequency switches to 1 MHz and either the RFM-10A or RFM-10B MEASURE SENSITIVITY switch to NORMAL. Set the signal generator frequency to 1 MHz and set the output level to produce a zero beat note/lamp indication. Zero beat the signal generator to the mainframe and reduce the signal generator output level to obtain red-line limiter current on the MDM-1 meter. The signal generator output level should be $700 \mu\text{V} \pm 300 \mu\text{V}$ (400 μV to 1 mV) for the RFM-10A or $70 \mu\text{V} \pm 30 \mu\text{V rms}$ (40 μV to 100 $\mu\text{V rms}$) for the RFM-10B.
- ac. Repeat Step ab at 50 MHz and every 50 MHz up to 550 MHz and at 512 MHz.

4.56.5 Gen Mod Cal Adjustment

- a. Set the mainframe MODE switch to the GEN MOD CAL position and either the RFM-10A or RFM-10B MEASURE MODE BANDWIDTH switch to the OUT-WIDE position. Set either the RFM-10A or RFM-10B A1A3R47 to mid-range.
- b. Select the value of A1A4R35 to obtain a limiter current indication of approximately 15 on the 18 kHz scale.
- c. Readjust A1A3R47 to obtain a limiter current indication of exactly 15 on the 18 kHz scale.
- d. Remove the MDM-1 from the mainframe and install the OAM-1. Calibrate the OAM-1 and verify that the OAM-1 CARRIER LEVEL control can position the CRT trace above and below the CARRIER SET line of the graticule.

4.56.6 Attenuation Dial Calibration

- a. Connect the signal generator to the RF input connector, P1, of either the RFM-10A or the RFM-10B, and connect the RF voltmeter to the RF output connector A1A4J2 using the 50 ohm load.
- b. Set the signal generator frequency to 250 MHz and set its output level to read 0 dBm on the RF voltmeter.
- c. Calibrate the FI meter so that at 250 MHz and 50 μV the FI meter indicates 20 dB (mid-scale). Remove the RF voltmeter from A1A4J2 and reconnect the cable from the attenuator, AT3.

- d. Connect a 50 ohm BNC coaxial cable between either the RFM-10A or RFM-10B RF OUTPUT connector and the FI meter RF input connector. Adjust either the RFM-10A or RFM-10B attenuator for a 20 dB indication on the FI meter. Loosen the two set screws on the attenuator dial and rotate the dial, being careful not to disturb the attenuator shaft position, until 0.5 uV on the dial lines up exactly with the black line on the index. Tighten the two set screws.
- e. Disconnect the cable at the FI meter RF input connector. Disconnect the cable from the signal generator at the RF input connector, P1, and connect it to the FI meter RF input connector. Adjust the signal generator output level to 500 uV. Recalibrate the FI meter so that the meter indicates 20 dB.
- f. Disconnect the cable from the signal generator at the FI meter and connect it to the RF voltmeter. Adjust the signal generator output level to approximately -33 dBm. Connect the cable from either the RFM-10A or RFM-10B RF OUTPUT connector to the FI meter RF input connector. Rotate the attenuator dial until 5 uV lines up exactly with the black line on the index. The FI meter should now indicate 20 dB \pm 3 dB.

4.56.7 RF Output Leveling

- a. Disconnect the cable from A1A4-J4.
- b. Disconnect the RF output cable at the variable attenuator connector and reconnect to the A1A4-J4 receptacle.
- c. Set the mainframe MODE switch to the GEN position, frequency switches to 250 MHz.
- d. Connect the RF voltmeter, with 50 ohm termination, to the RFM-10A or RFM-10B RF OUTPUT connector, J1.
- e. Adjust the mainframe A1A2R31 to obtain -10 dBm on the RF voltmeter. Rotate the mainframe Frequency switches to each position (100 MHz control 0 to 5 only). The RF output shall be 0 dBm \pm 1 dB from 50 kHz to 512 MHz.
- f. Reconnect all cables for normal operation.

4.57 FAULT ISOLATION PROCEDURES (MODEL RFM-10A AND RFM-10B MODULES)

Fault isolation procedures are presented to provide a guide in servicing the RFM-10A and RFM-10B. The procedures follow the sequence of the minimum performance checkout procedures, Section 4.55, with each subsection keyed to the paragraph in Section 4.55 that first indicates a fault. When a fault is noted during either

RFM-10A or RFM-10B operation, proceed as follows:

- a. Perform minimum performance checkout procedures in Section 4.55.
- b. Start fault isolation procedures at the point where minimum performance cannot be satisfied.
- c. When the fault is isolated to a function, such as the 11 MHz amplifier, refer to the alignment procedures for that function in Section 4.56 and check alignment of that function before proceeding with fault isolation.
- d. After a fault is repaired, complete the minimum performance checkout procedure to determine if further alignment is necessary.

4.57.1 Output Level Not Within Tolerance (4.55.2-d and 4.55.2-e)

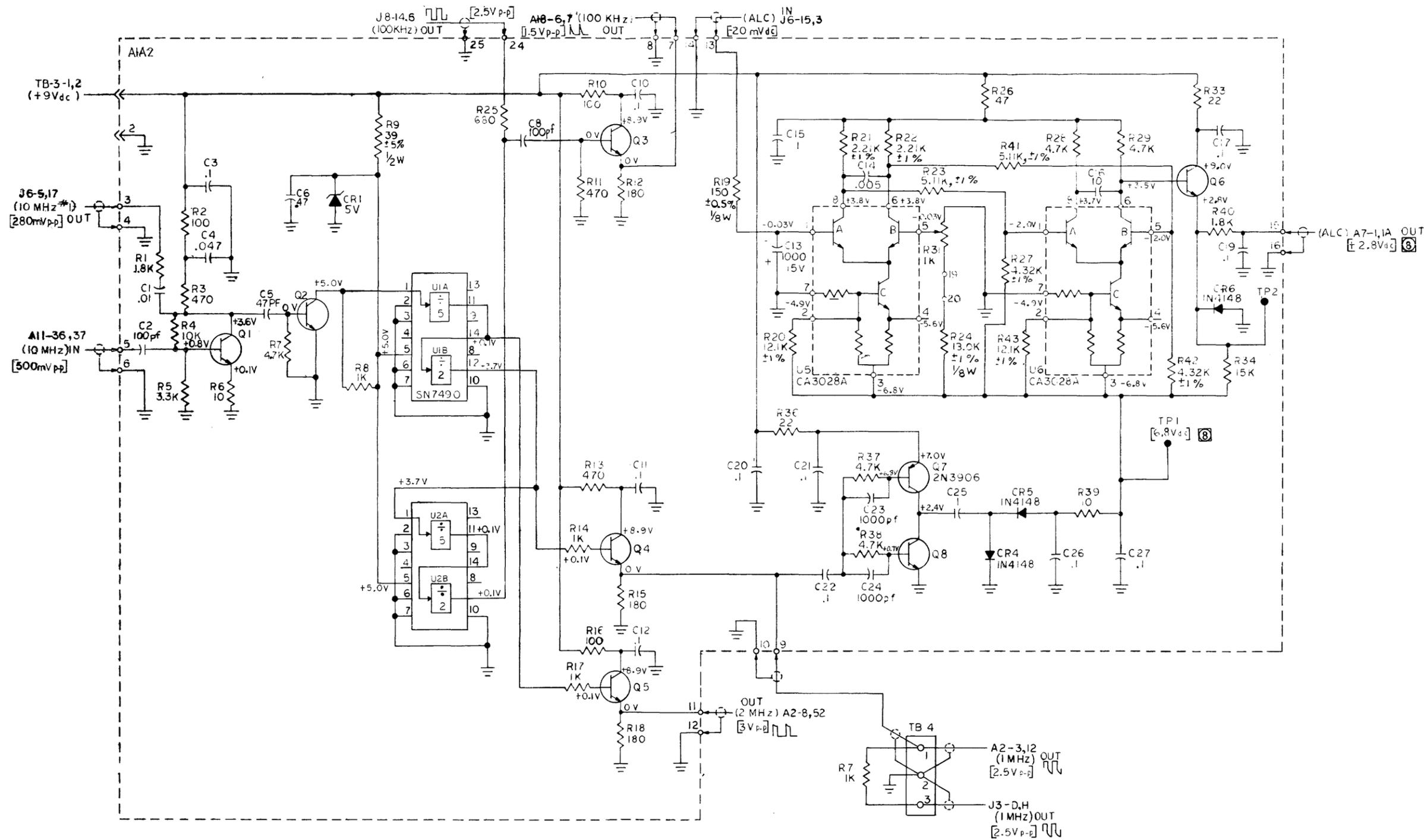
- a. Check alignment of broadband amplifier as in Paragraph 4.56.1.
- b. Check variable attenuator, AT1.
- c. Check mainframe as in mainframe section of manual.

4.57.2 Measure Mode Sensitivity Not Within Tolerance (4.55.3-f)

- a. Check measure input sensitivity alignment as in Paragraph 4.56.4.
- b. Check 11 MHz IF alignment as in Paragraph 4.56.2.
- c. Check 9 MHz filter alignment as in Paragraph 4.56.2.
- d. Check 2 MHz IF alignment as in Paragraph 4.56.2.

SECTION V

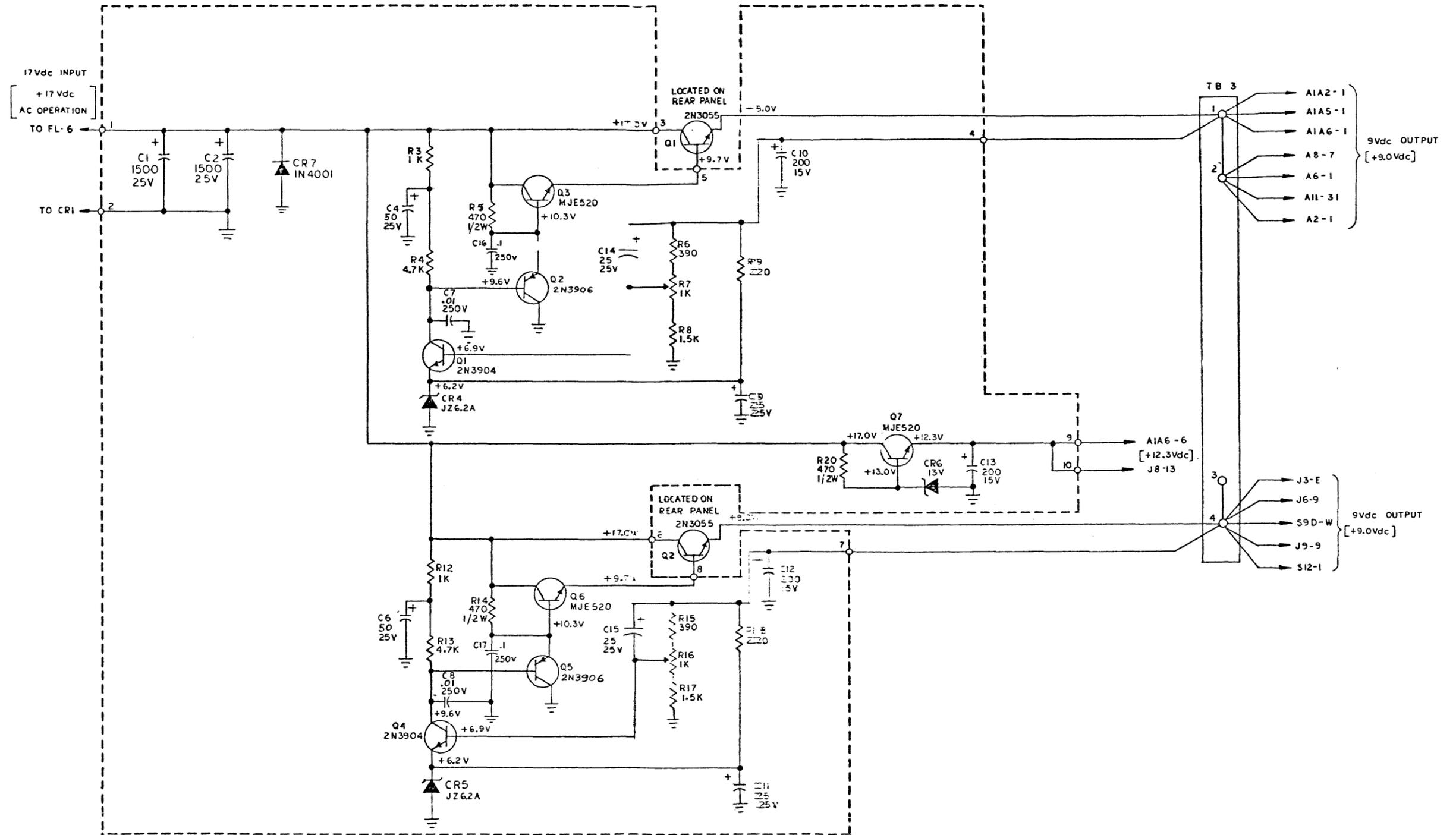
SCHEMATIC DIAGRAMS



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$ 1/4 W.
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 3. ALL TRANSISTORS ARE 2N3904.
 4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A1A2). EXAMPLE "A1A2C3."
 5. C18, C19, CR2, CR3, R30, R32, R35, U3 & U4 ARE OMITTED.
 6. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 7. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED, (DISABLE INTERNAL TIME BASE).
 8. D.C. VOLTAGES TAKEN WITH INTERNAL TIME BASE ENABLED AND ALC LOOP CLOSED.

C27
CR6
R44
Q8
TP2
U6
LAST REF DES (INCLUSIVE)

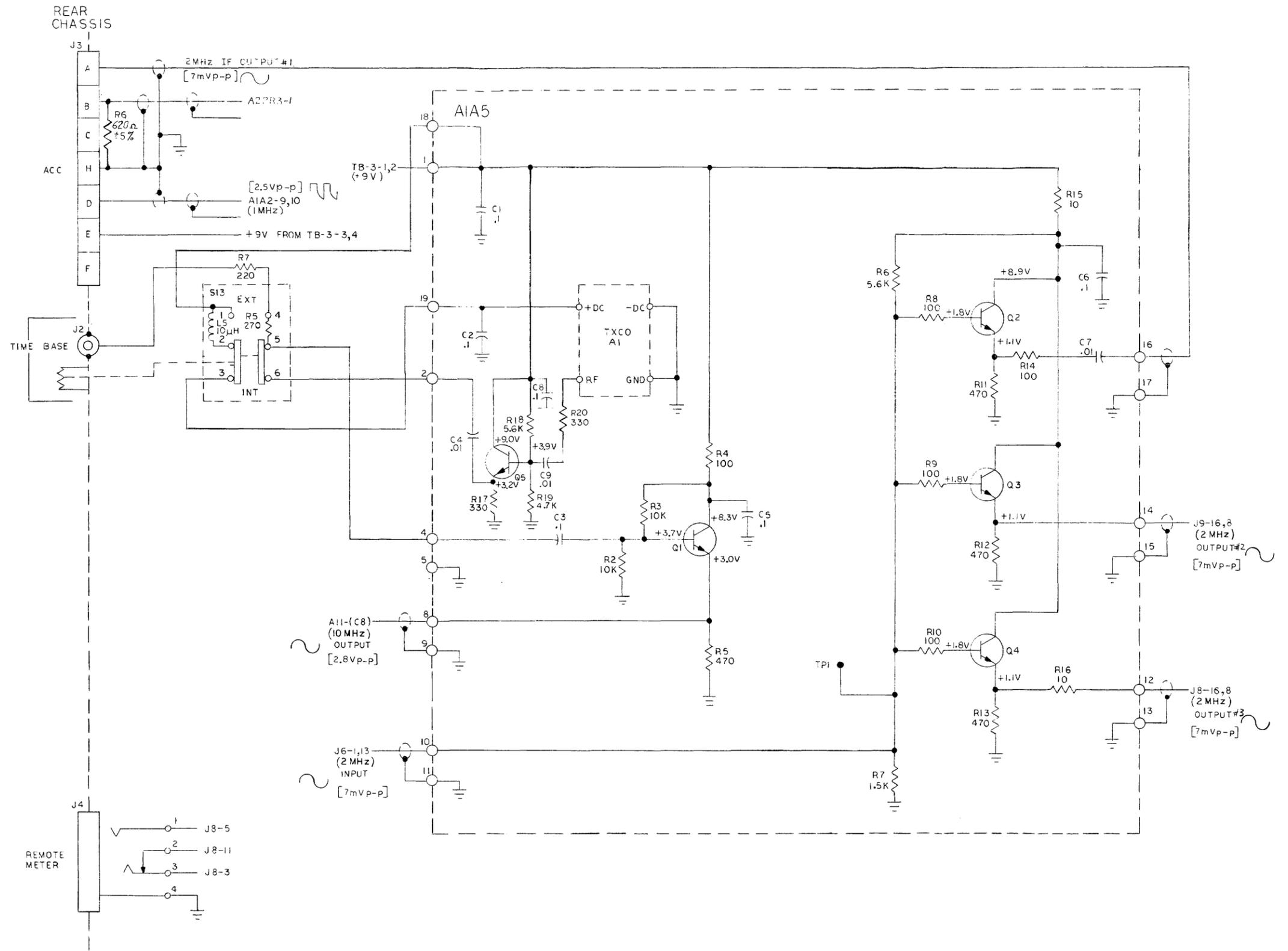
Figure 5-1 - Schematic Diagram
 Divider/ALC Board (A1A2) and TB4, R7
 (Main Frame)



HIGHEST REF DES USED			
C17	CR7	R20	Q7
REF DES NOT USED			
C3	CR4, CR5	R1, R2	
C5	CR2	R10, R11	
		R19	

3. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 2. ALL RESISTORS ARE IN OHMS, ±10%, 1/4 W.
 1. ALL CAPACITORS ARE IN MICROFARADS.
 NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-2 - Schematic Diagram
 Power Supply (A1A3) and
 Q1, Q2 and TB3
 (Main Frame)

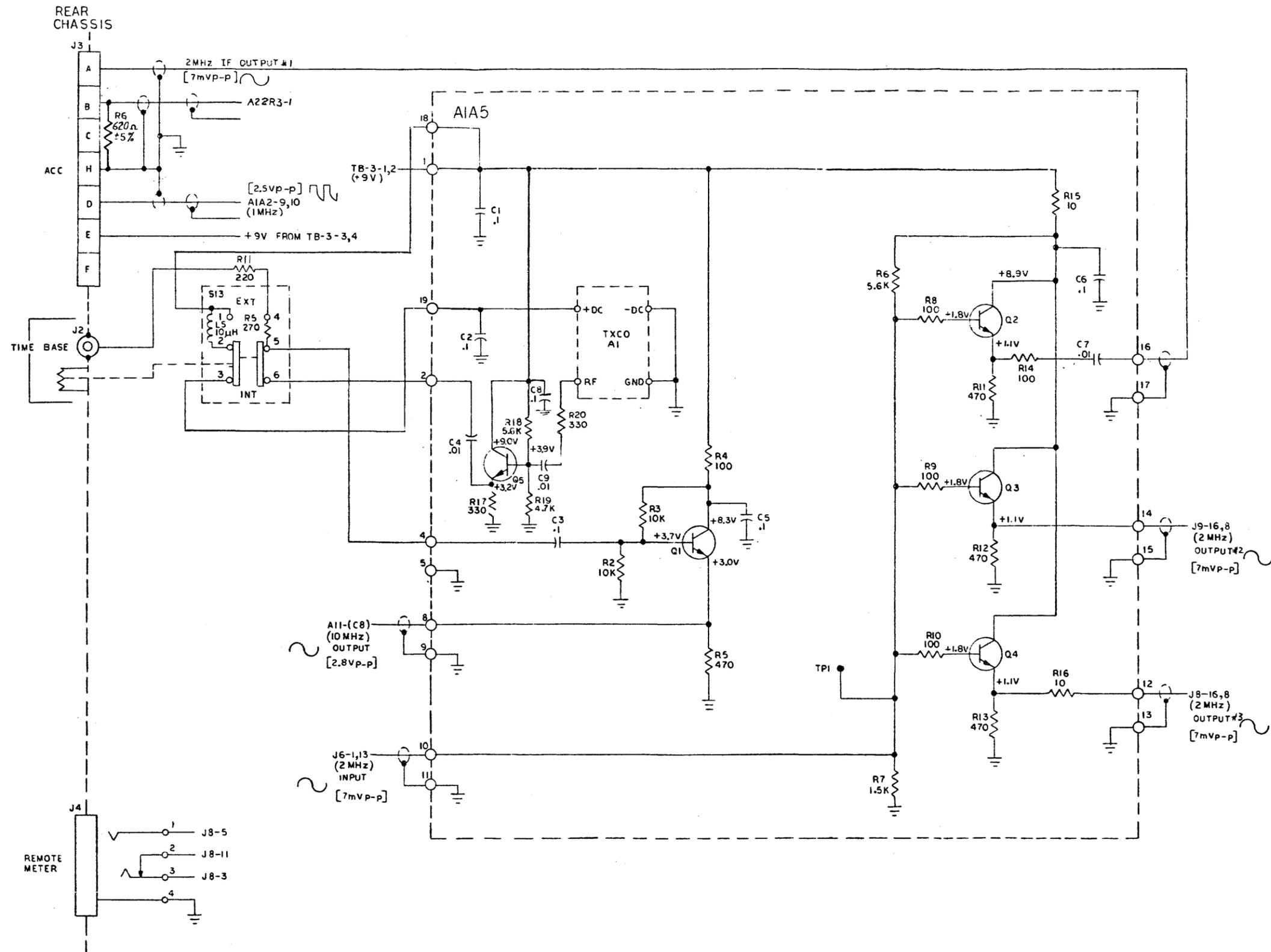


- 5 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)
- 4 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- 3 ALL TRANSISTORS ARE 2N3904.
- 2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 1 ALL RESISTOR VALUES ARE IN OHMS $\pm 10\%$, 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED

HIGHEST REF DESIGNATIONS USE	
R19	Q5 C9 A1 L5 S1 J4
REF DESIGNATIONS NOT USED	
.1	

Figure 5-3 - Schematic Diagram
TCXO/IF Board (A1A5) and
J2, J3, J4 and S13
(Main Frame)



- 5 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)
- 4 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- 3 ALL TRANSISTORS ARE 2N3904.
- 2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 1 ALL RESISTOR VALUES ARE IN OHMS $\pm 10\%, 1/4W$.

NOTES: UNLESS OTHERWISE SPECIFIED

HIGHEST REF DESIGNATIONS USE	
R19	Q5 C9 A1 L5 S13 J4
REF DESIGNATIONS NOT USED	
J1	

ADDENDUM, MODEL FM-10C
 No. 1-500783-260 (A)
 Page 2.15

Figure 5-3 - Schematic Diagram
 TCXO/IF Board (A1A5) and
 J2, J3, J4 and S13
 (Main Frame)

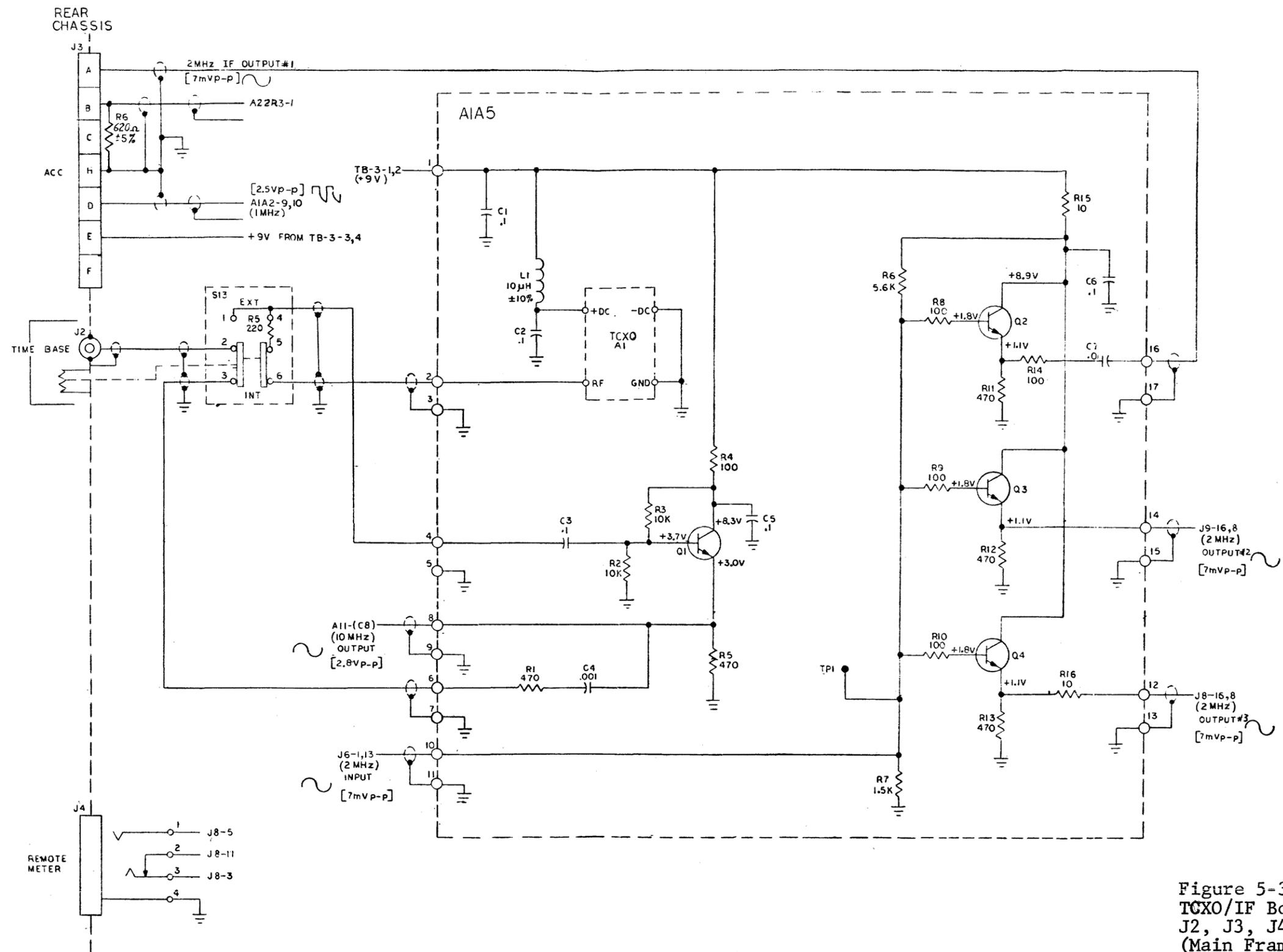


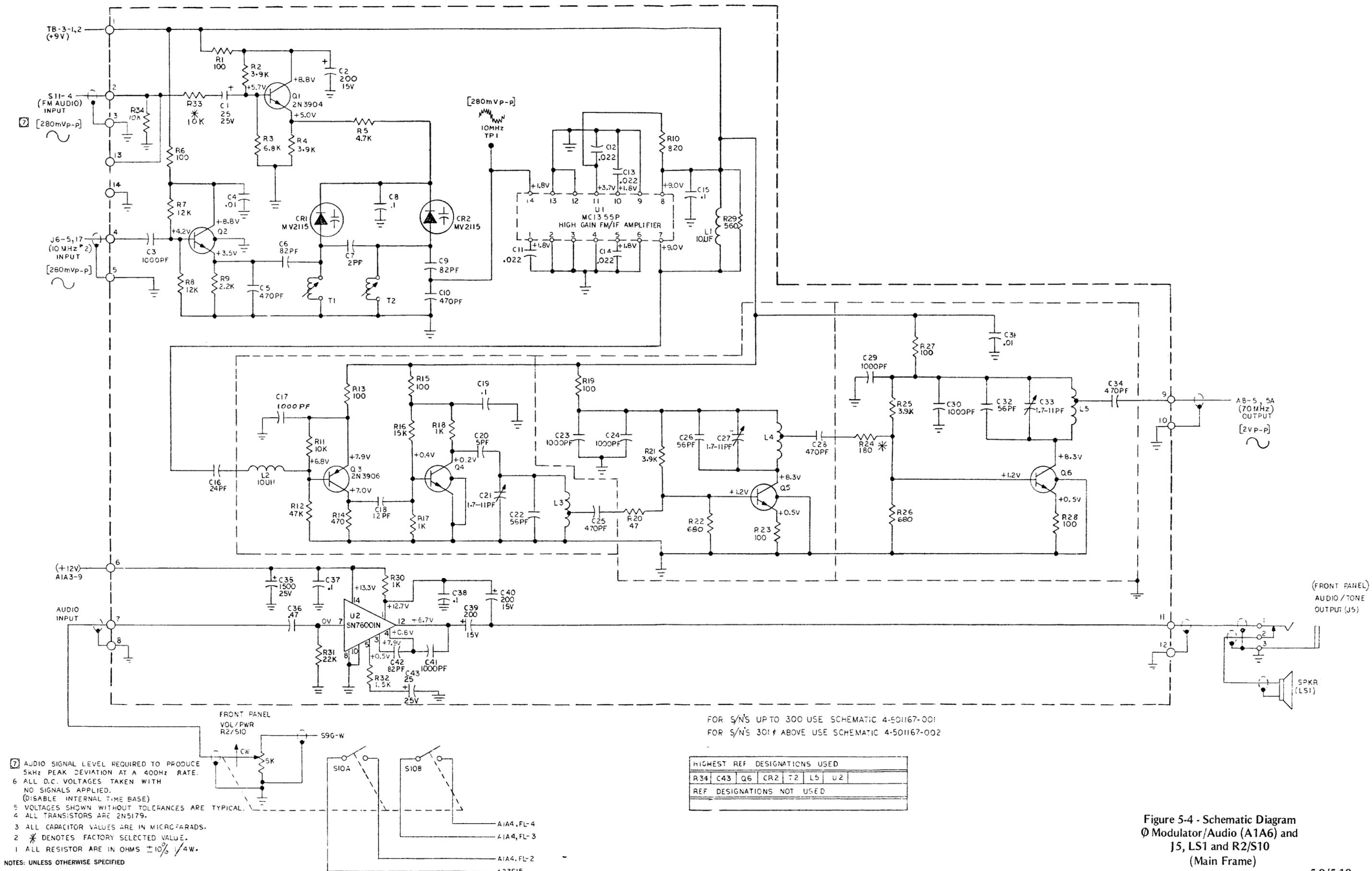
Figure 5-3-Schematic Diagram
TCXO/IF Board (A1A5) and
J2, J3, J4 and S13
(Main Frame)

Dwg. No. 4-501166-001 (G)

HIGHEST REF DESIGNATIONS USE						
R16	Q4	C7	A1	L1	S13	J4
REF DESIGNATIONS NOT USED						
J1						

- 5 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED.
(DISABLE INTERNAL TIME BASE)
- 4 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- 3 ALL TRANSISTORS ARE 2N3904.
- 2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 1 ALL RESISTOR VALUES ARE IN OHMS $\pm 10\%$, 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED



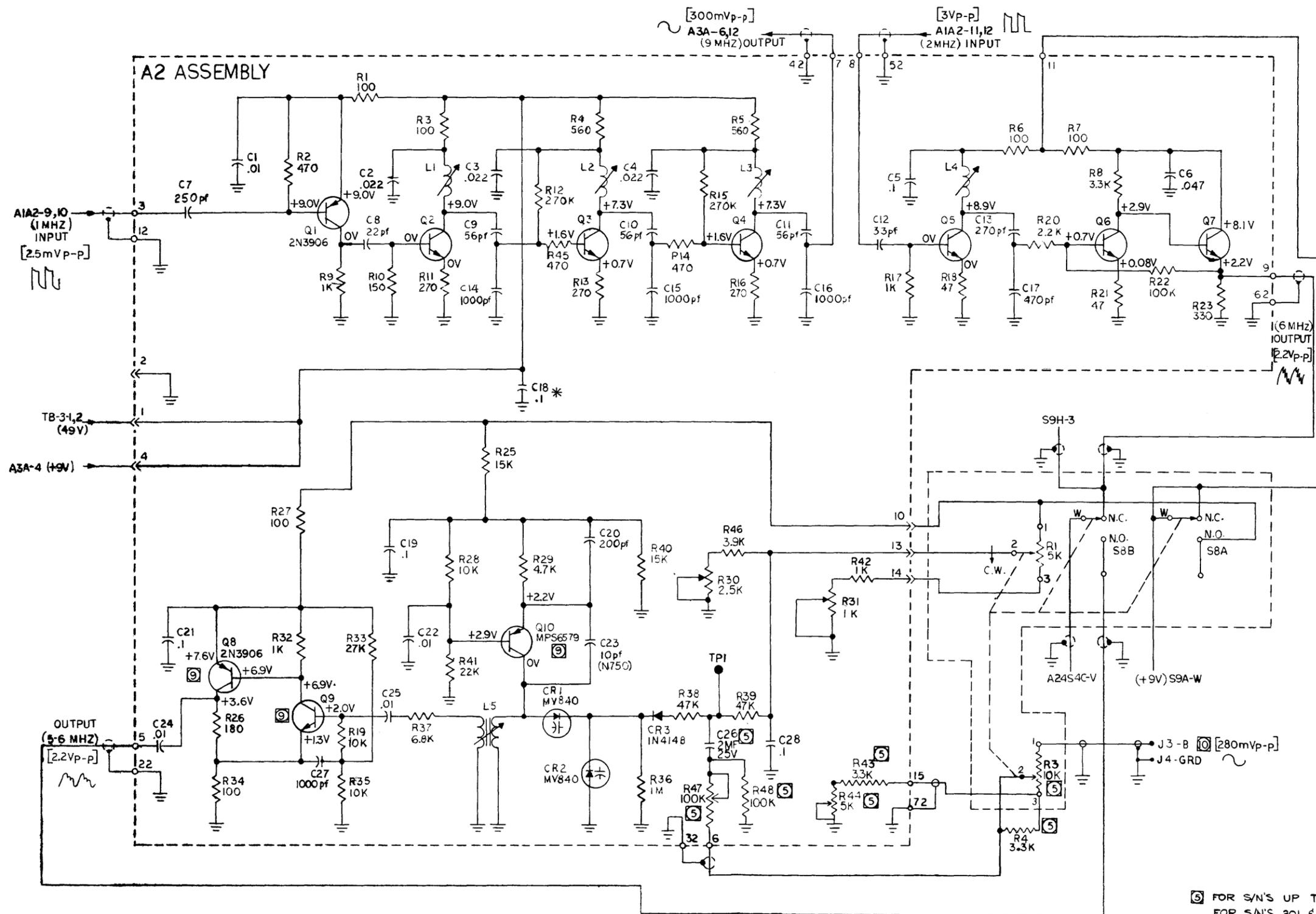
- 7 AUDIO SIGNAL LEVEL REQUIRED TO PRODUCE 5kHz PEAK DEVIATION AT A 400Hz RATE.
- 6 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)
- 5 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- 4 ALL TRANSISTORS ARE 2N5179.
- 3 ALL CAPACITOR VALUES ARE IN MICROC-FARADS.
- 2 * DENOTES FACTORY SELECTED VALUE.
- 1 ALL RESISTOR ARE IN OHMS $\pm 10\% \sqrt{4W}$.

NOTES: UNLESS OTHERWISE SPECIFIED

FOR S/N'S UP TO 300 USE SCHEMATIC 4-501167-001
 FOR S/N'S 301# ABOVE USE SCHEMATIC 4-501167-002

HIGHEST REF DESIGNATIONS USED						
R34	C43	Q6	CR2	T2	L5	U2
REF DESIGNATIONS NOT USED						

Figure 5-4 - Schematic Diagram
 Modulator/Audio (A1A6) and
 J5, LS1 and R2/S10
 (Main Frame)



TABLE

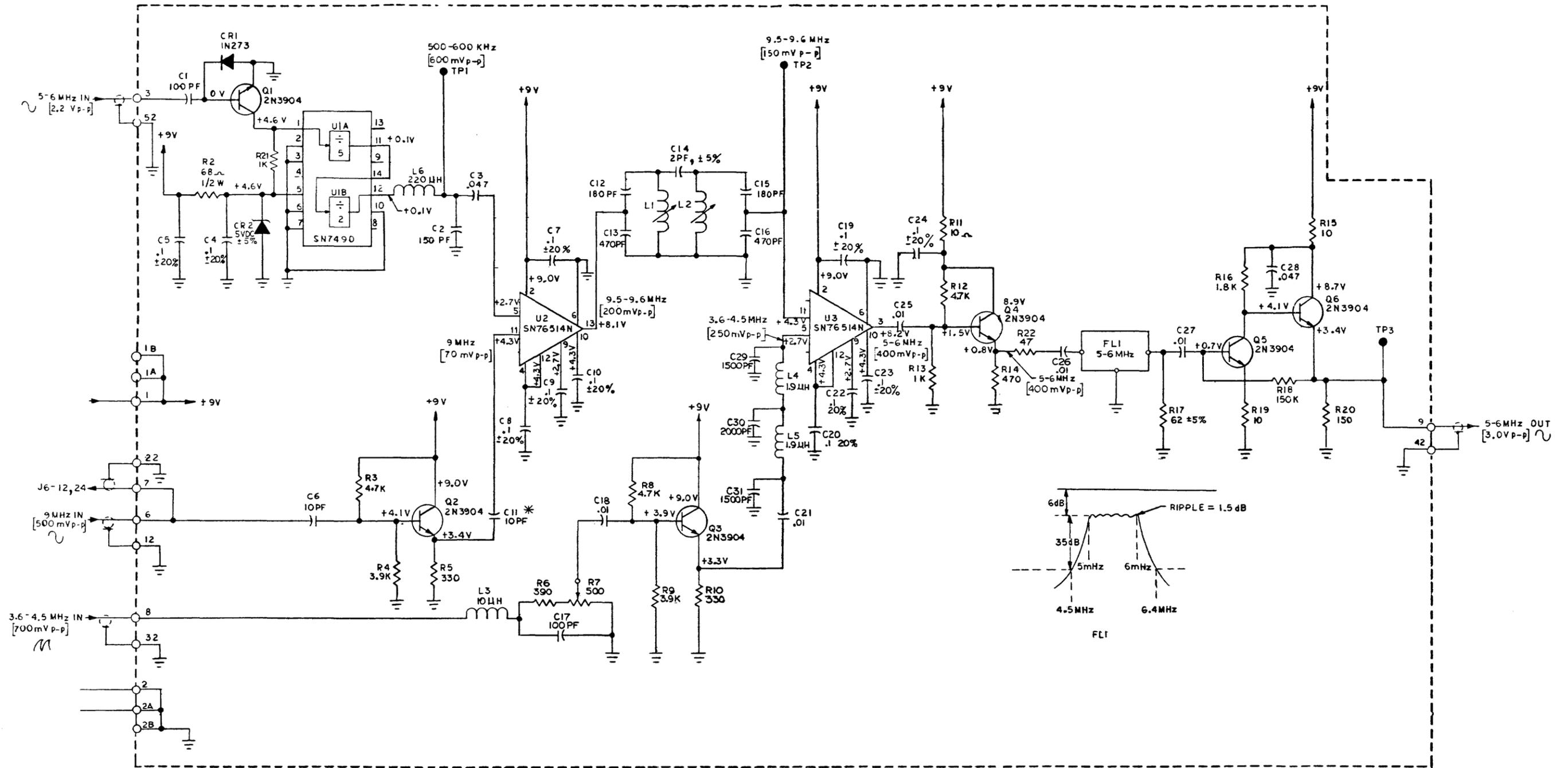
	-001	-002
A2	C26 0.14F	24F, 25V
	R43	NOT USED 3.3K
	R44	NOT USED 5K
	R47	NOT USED 100K
	R48	NOT USED 100K
A22	R4	NOT USED 3.3K
	R3	NOT USED 10K

- NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, 1/4 W.
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 3. ALL TRANSISTORS ARE 2N3904.
 4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. EXAMPLE *A2C3*.
 5. FOR COMPONENT VALUES, REFER TO TABLE.
 6. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 7. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE.)
 8. * INDICATES SELECTED VALUE.
 9. D.C. VOLTAGES TAKEN WITH VCO SWITCH S8 IN N.O. POSITION.
 10. AUDIO SIGNAL LEVEL REQUIRED TO PRODUCE 10KHz PEAK DEVIATION WITH 'V' IN 100KHz SWITCH S7.

R24	REF DES	NOT USED
CR3	L5	Q10
C28	R48	
LAST REF DES (INCLUSIVE)		

5 FOR S/N'S UP TO 300 USE SCHEMATIC 4-501178-001
 FOR S/N'S 301 & ABOVE USE SCHEMATIC 4-501178-002

Figure 5-5 - Schematic Diagram
 VCO, 6, 9 MHz Board (A2 and
 0-100 Hz Controls Assembly and R4
 (Main Frame)

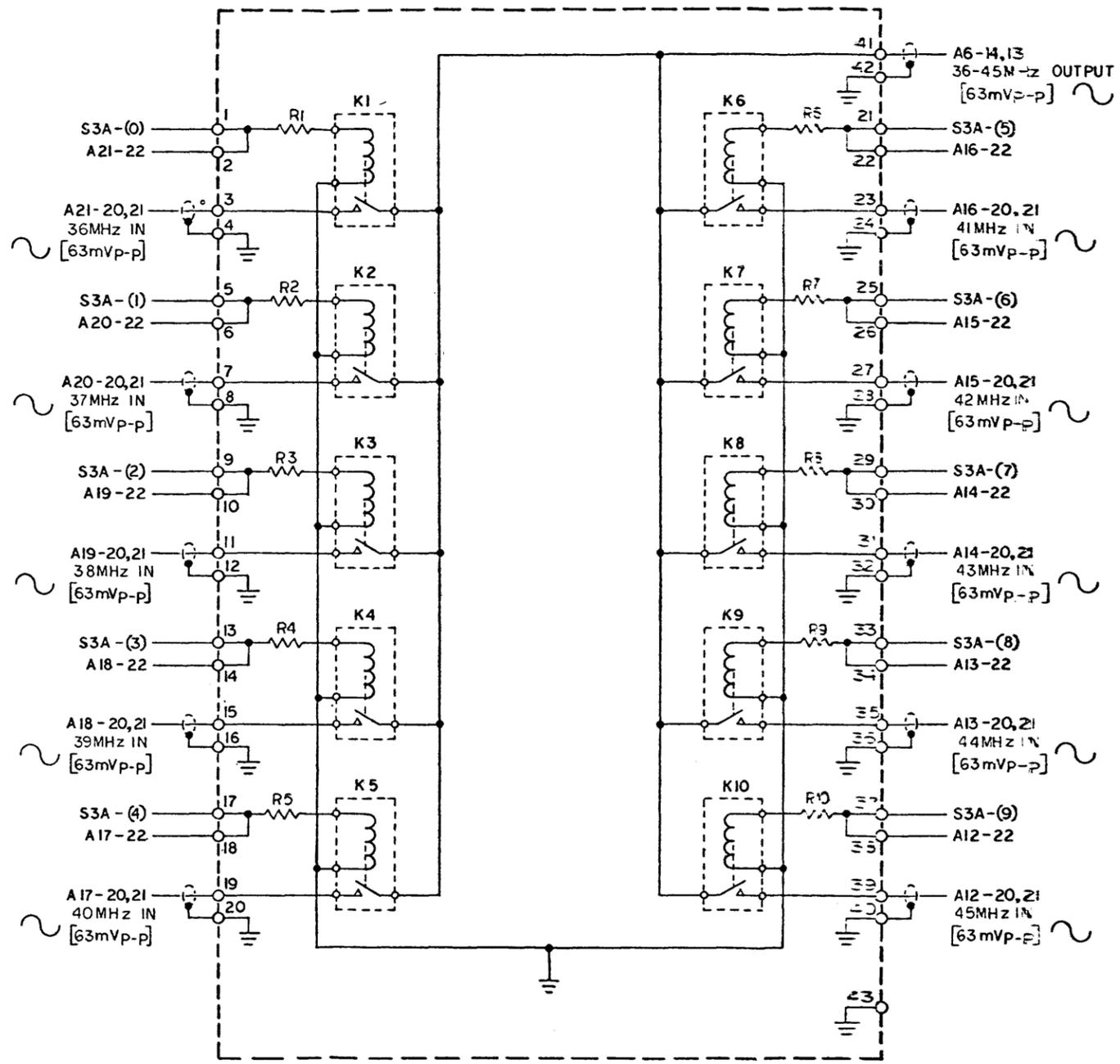


HIGHEST REFERENCE DESIGNATIONS USED					
C31	CR2	FL1	L6	Q6	R22 U3
REF DESIGNATIONS NOT USED					

PIN DESTINATIONS				
FROM:	A3A	A3B	A3C	A3D
1	A24S4B-0	A24S5B-0	A24S6B-0	A24S7B-0
3	A24S7C-V	A24S4C-W	A24S5C-W	A24S6C-W
6	A2-7,42	A3A-7,22	A3B-7,22	A3C-7,22
7	A3B-6,12	A3C-6,12	A3C-6,12	J6-24,12
8	A24S4A-W,24	A24S5A-W,23	A24S6A-W,22	A24S7A-W
9	A24S4C-0	A24S5C-0	A24S6C-0	A24S7C-0

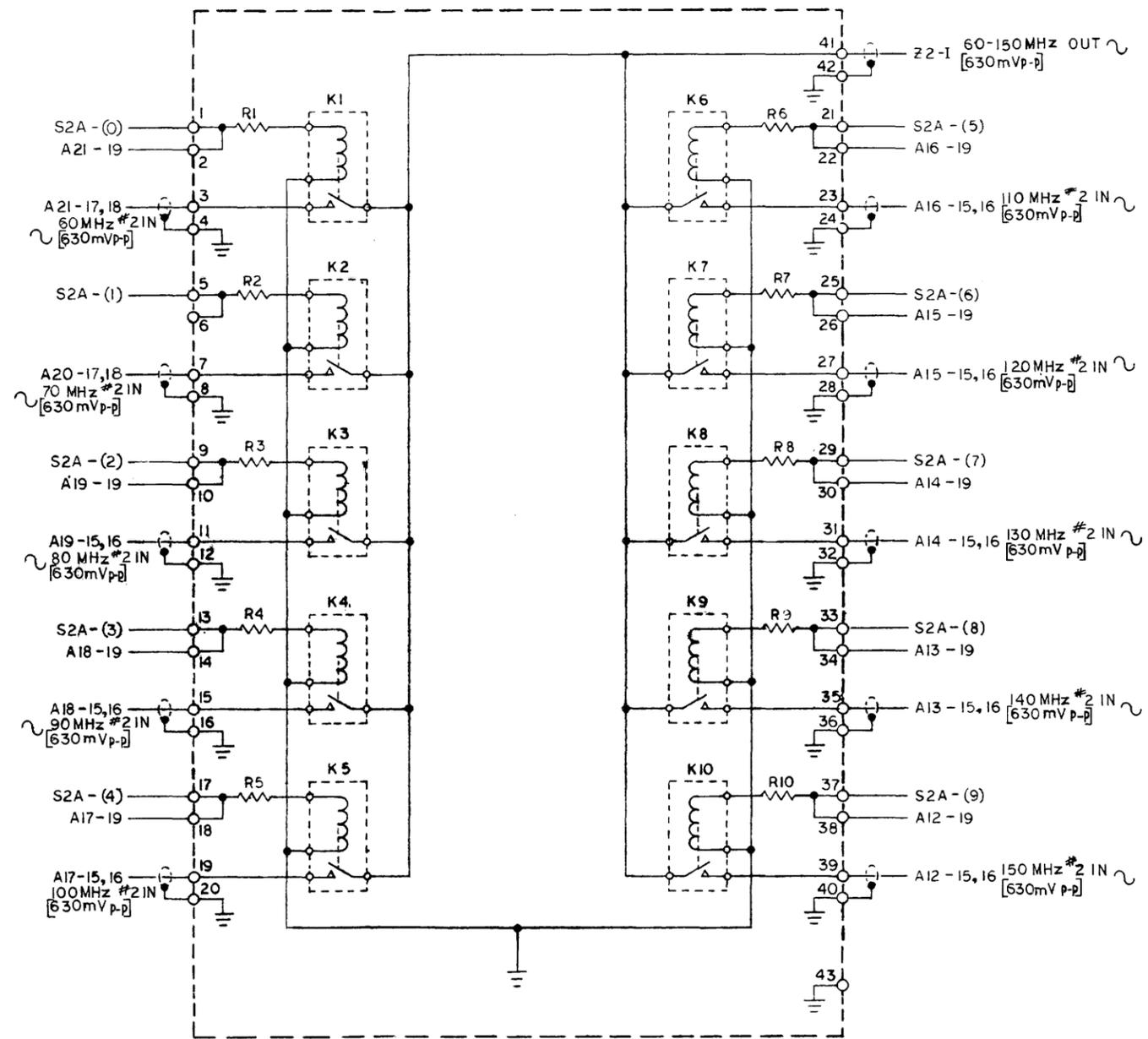
- 6. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED.(DISABLE INTERNAL TIME BASE)
 - 5. VOLTAGES SHOW WITHOUT TOLERANCES ARE TYPICAL.
 - 4. * DENOTES FACTORY SELECTED VALUE
 - 3. PARTIAL REFERENCE DESIGNATORS ARE SHOWN: FOR COMPLETE DESIGNATION PREFIX WITH ASSY N° (A3) EXAMPLE, A3C3
 - 2. ALL CAPACITORS ARE IN MICROFARADS
 - 1. ALL RESISTORS ARE IN OHMS, ±10%, 1/4W
- NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-6 - Schematic Diagram
 .1, 1, 10, 100 kHz Decades
 (A3A, A3B, A3C, A3D)
 (Main Frame)



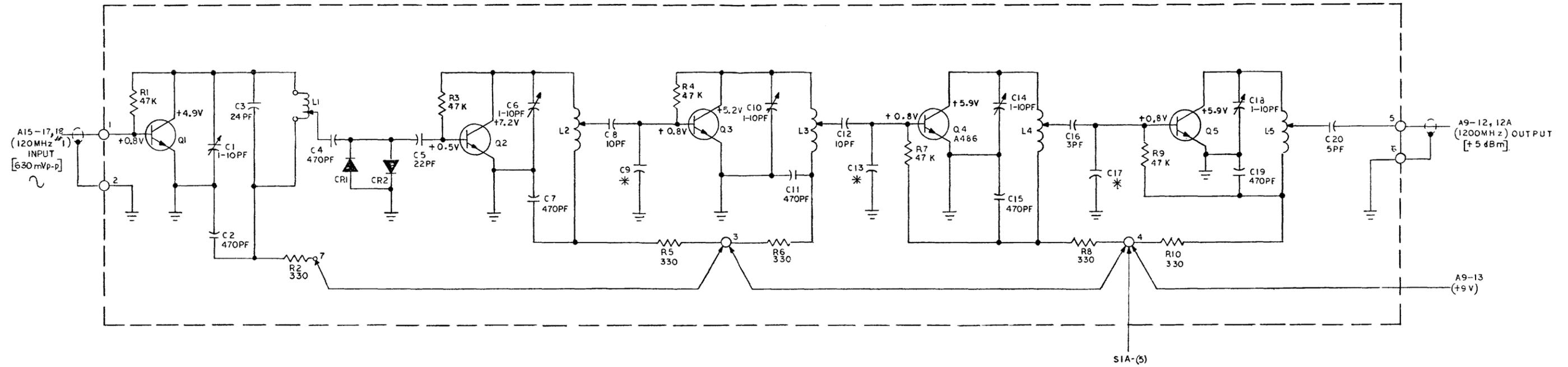
3 VOLTAGES SHOWN WITHOUT TOLERANCE ARE TYPICAL.
 2 ALL RESISTORS ARE 68Ω, ±10%, 1/2W.
 1,
 NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-7 - Schematic Diagram
 1 MHz Decade Switching
 Programming Board (A4A)
 (Main Frame)



3. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 2. ALL RESISTORS ARE, $68 \Omega \pm 10\%$, 1/2W.

Figure 5-8 - Schematic Diagram
 10 MHz Decade Switching
 Programming Board (A4B)
 (Main Frame)

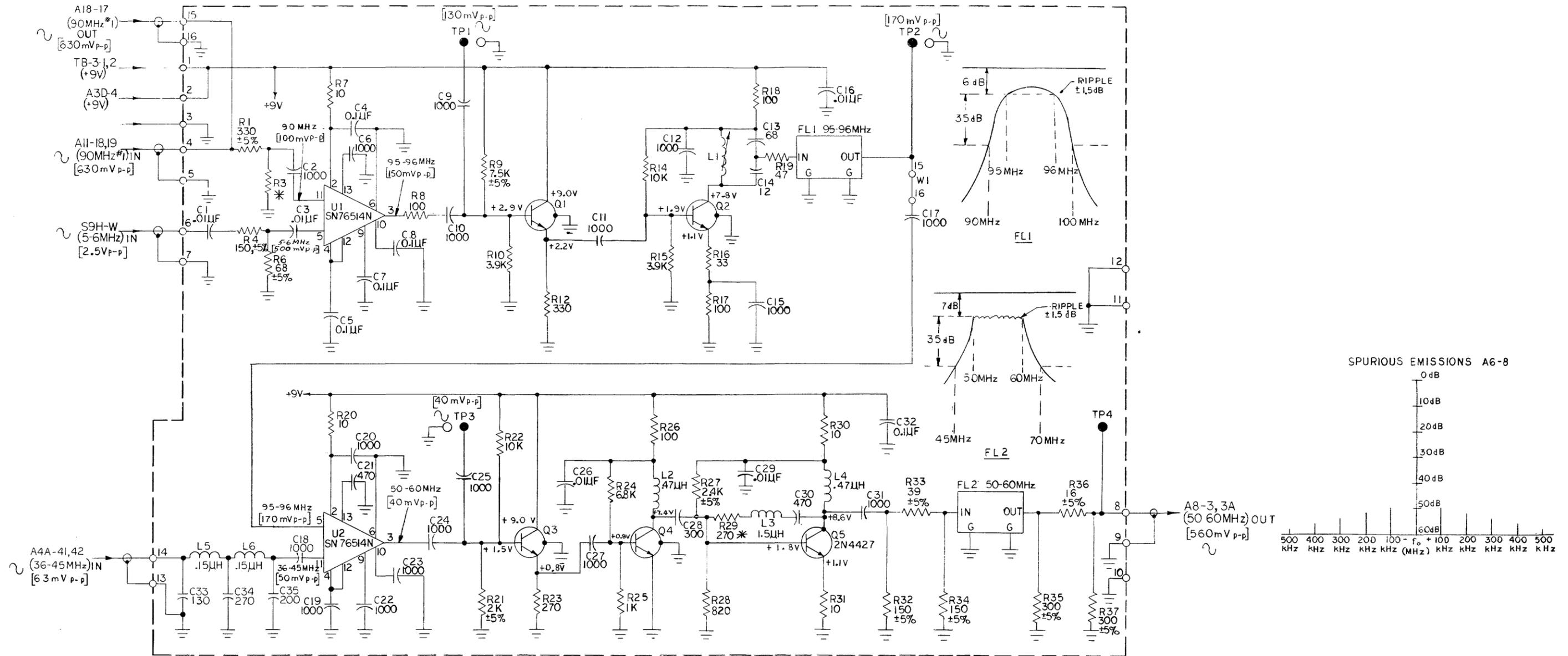


HIGHEST REF DESIGNATIONS USED					
L5	Q5	C20	R10	CR2	
REF DESIGNATIONS NOT USED					

- 6 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND 100 MHz SWITCH S1 IN THE "5" POSITION. (DISABLE INTERNAL TIME BASE).
- 5 VOLTAGES SHOWN WITHOUT TOLERANCES.
- 4 * DENOTES FACTORY SELECTED VALUE.
- 3 ALL DIODES ARE IN273.
- 2 ALL TRANSISTORS ARE 2N5179.
- 1. ALL RESISTORS ARE IN OHMS $\pm 10\%$, $1/4$ W.

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-9 - Schematic Diagram
1200 MHz Multiplier (A5)
(Main Frame)

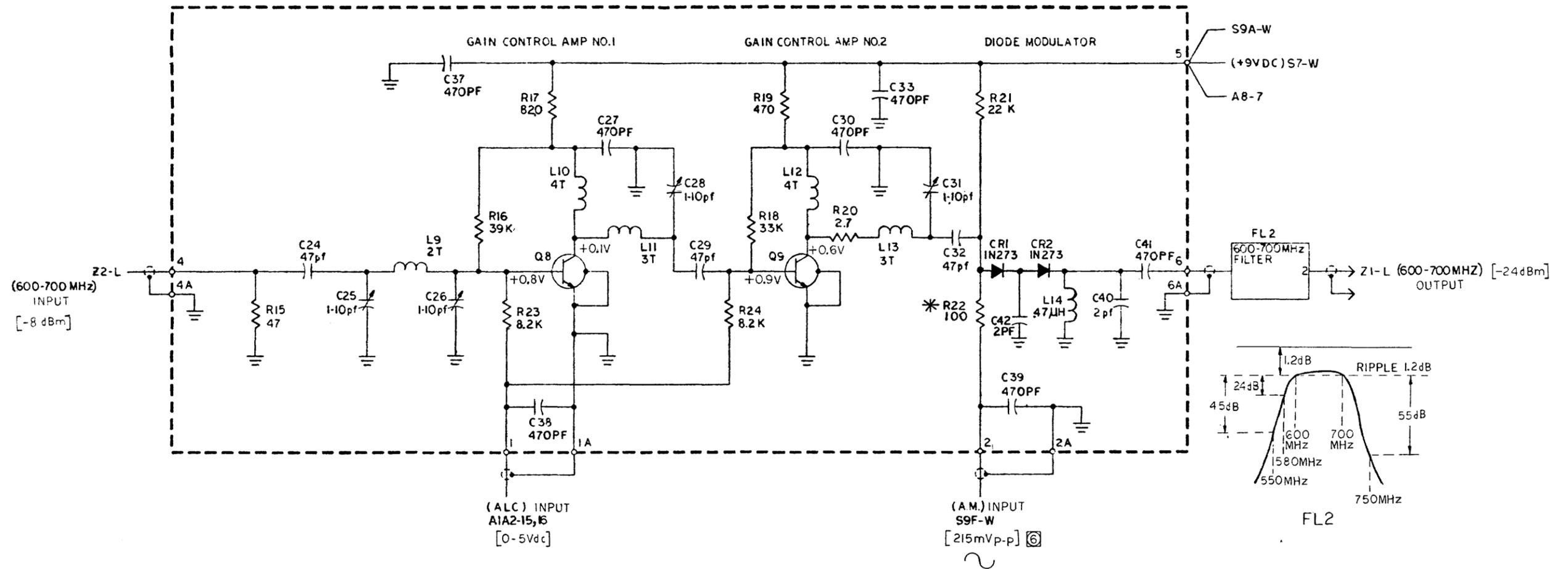


HIGHEST REF DES USED					
R37	C35	Q5	L6	U2	FL2
REF DES NOT USED					
R11					
R13					
R5					
R2					

7. ALL DC VOLTAGES TAKEN WITH NO SIGNAL APPLIED, (DISABLE INTERNAL TIME BASE)
6. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL
5. * DENOTES FACTORY SELECTED VALUE
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO (A6) EXAMPLE: "A6C3"
3. ALL CAPACITOR VALUES ARE IN PICOFARADS
2. ALL TRANSISTORS ARE 2N5179
1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 W

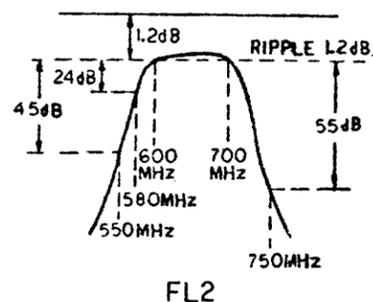
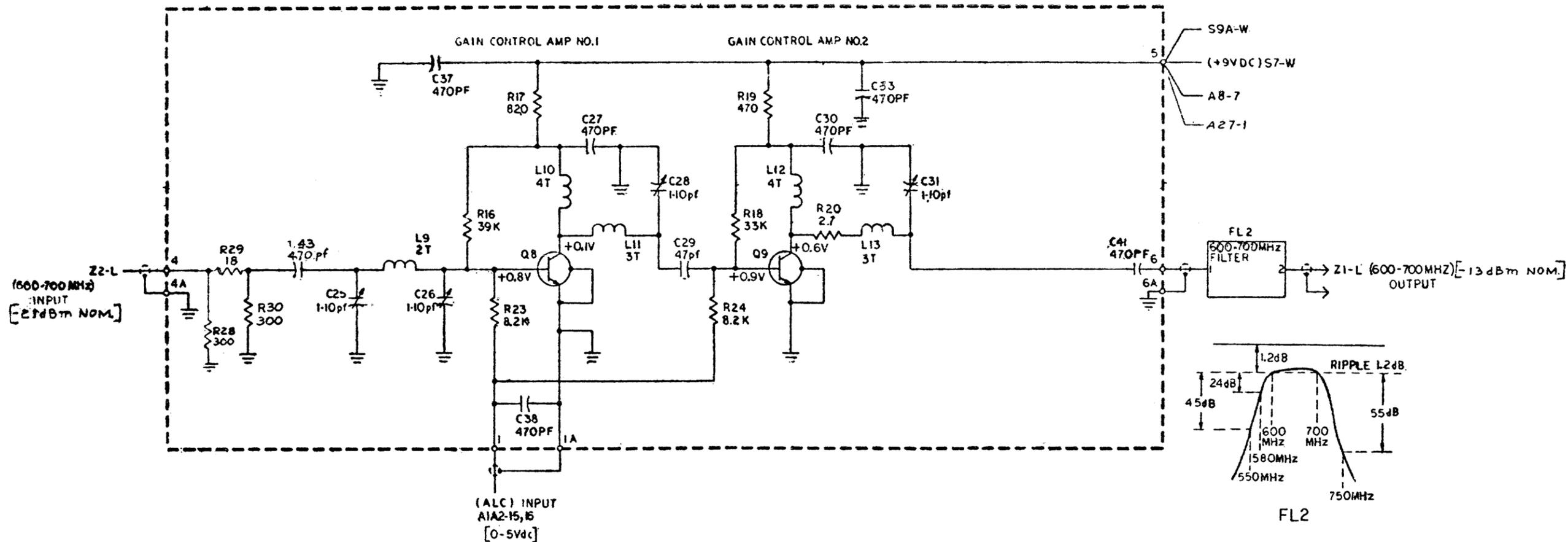
NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-10 - Schematic Diagram
1 MHz Decade Board (A6)
(Main Frame)



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, 1/4W.
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 3. ALL TRANSISTORS ARE 2N5179.
 4. * DENOTES FACTORY SELECTED VALUE.
 5. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A7), EXAMPLE "A7C3."
 6. LEVEL REQUIRED FOR 30% MODULATION.
 7. VOLTAGES & POWER LEVELS SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)

Figure 5-11 - Schematic Diagram
Gain Control Amp/Amplitude Modulator
Assembly (A7) and FL2
(Main Frame)

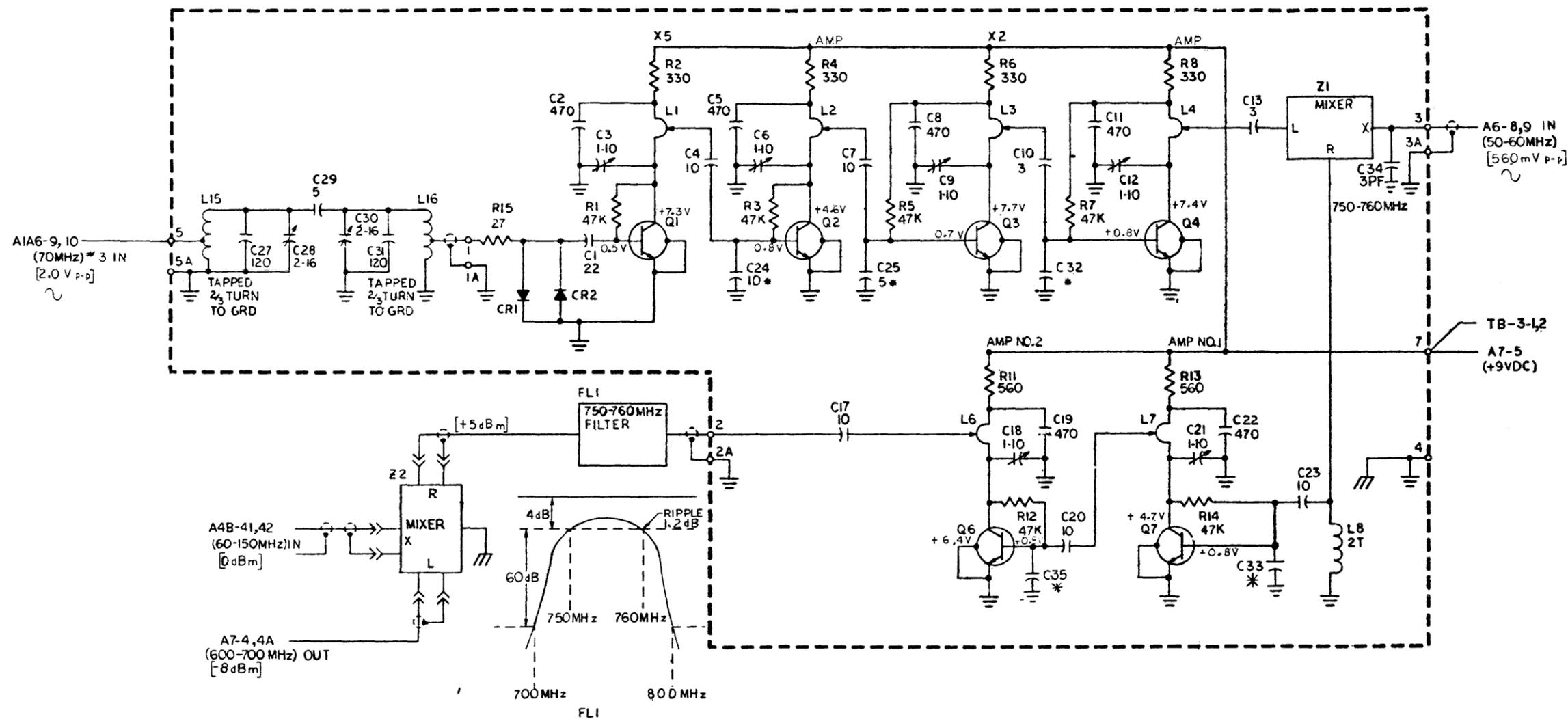


- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, 1/4W.
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 3. ALL TRANSISTORS ARE 2N5179.
 4. * DENOTES FACTORY SELECTED VALUE.
 5. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO.(A7), EXAMPLE "A7C3."
 6. LEVEL REQUIRED FOR 30% MODULATION.
 7. VOLTAGES & POWER LEVELS SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME. BASE)

FOR SN'S UP TO 800, USE SCHEMATIC 4-501181-001.
FOR SN'S 801 & ABOVE, USE SCHEMATIC 4-501181-002.

ADDENDUM, MODEL FM-10C
No. 1-500783-260 (A)
Page 2,1,10

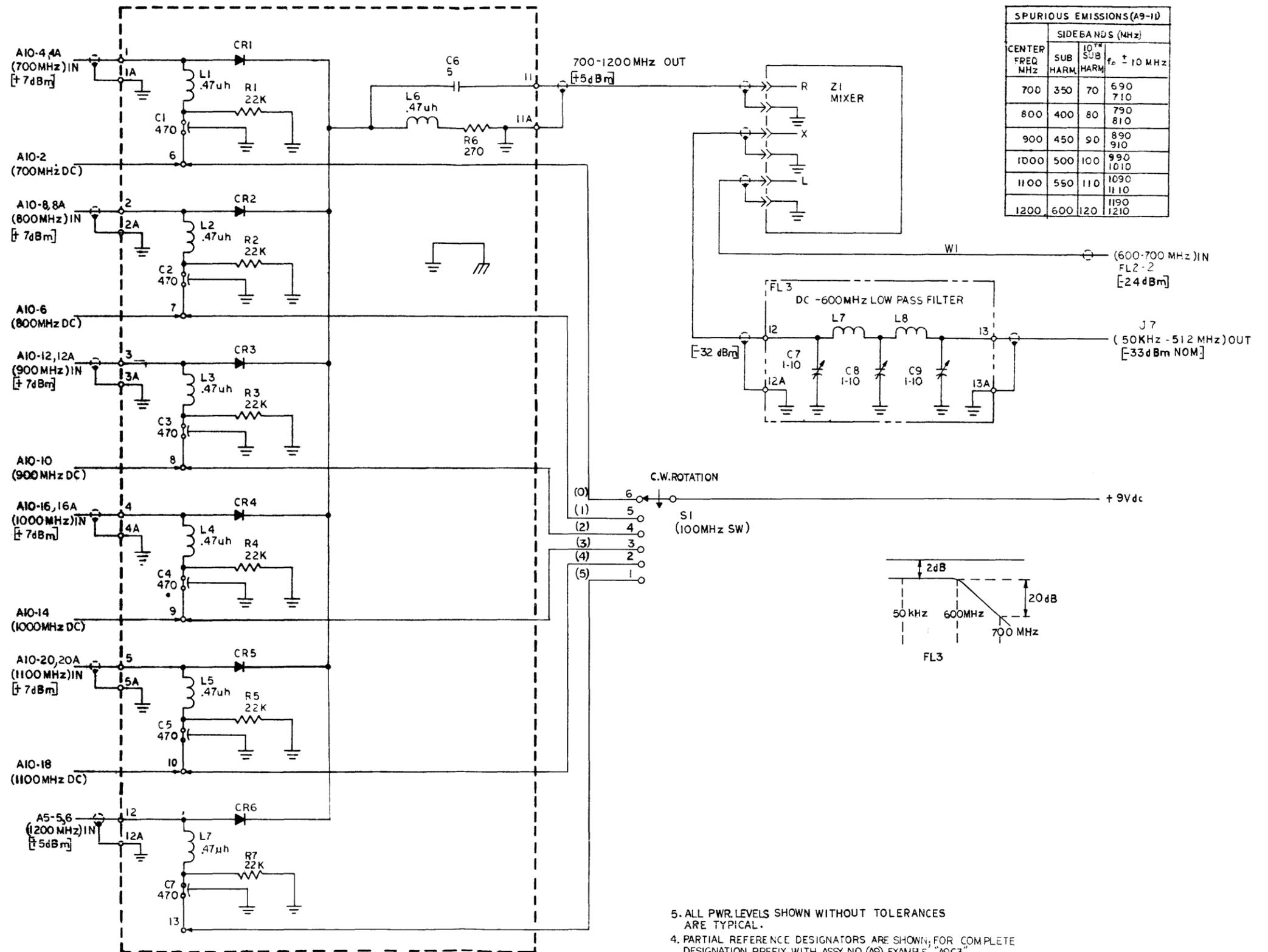
Figure 5-11. Schematic Diagram
Gain Control Amp/Amplitude Modulator
Assembly (A7) and FL2
(Main Frame)
Dwg. No. 1-501181-002



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, 1/4W.
 2. ALL CAPACITOR VALUES ARE IN PICO FARADS.
 3. ALL DIODES ARE IN 273.
 4. ALL TRANSISTORS ARE 2N5179.
 5. * DENOTES FACTORY SELECTED VALUE.
 6. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A8); EXAMPLE "ABC3".
 7. VOLTAGES AND POWER LEVELS SHOWN WITHOUT TOLERANCE ARE TYPICAL.
 8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNAL APPLIED, (DISABLE INTERNAL TIME BASE).

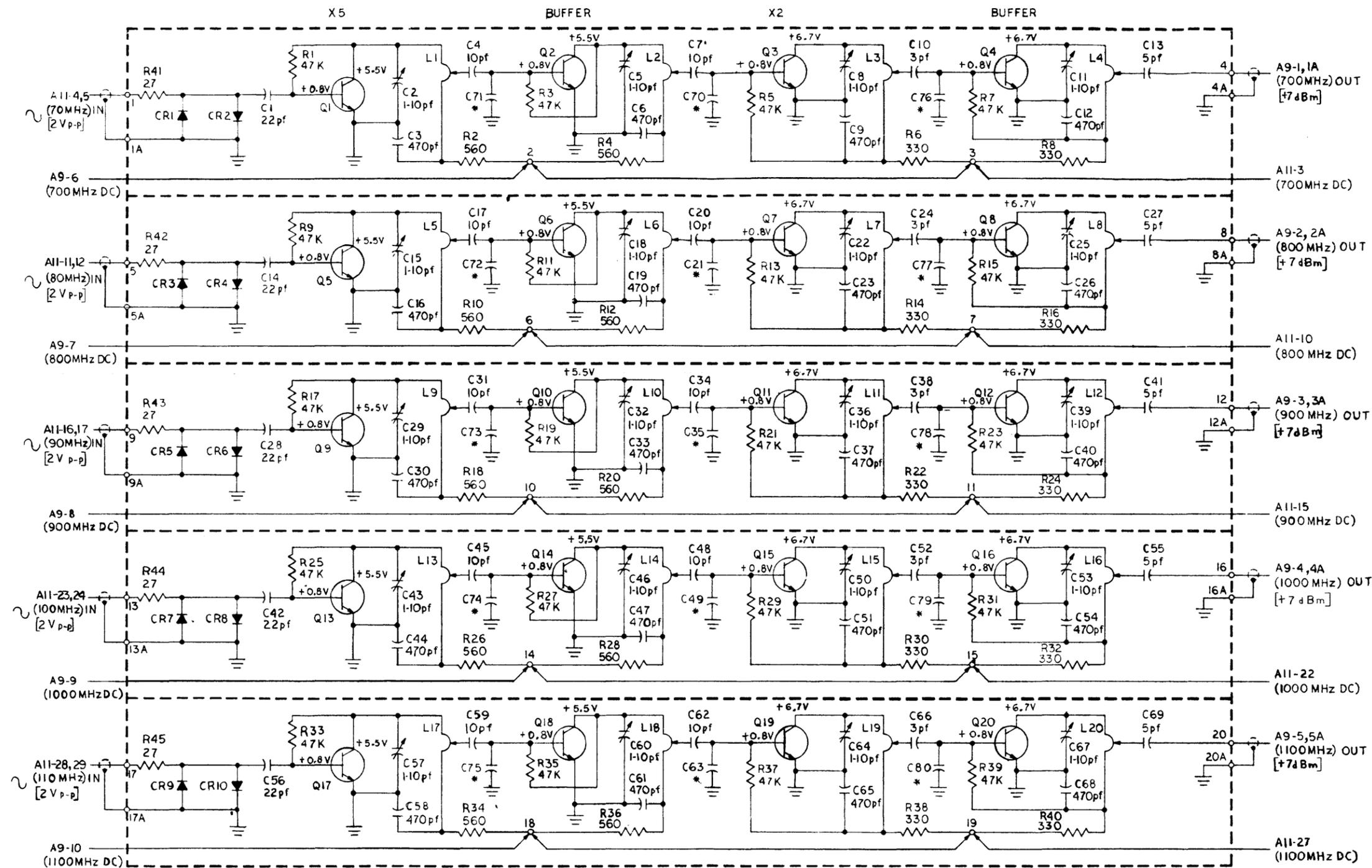
R9,10	Q5
C26,14,15,16	L9,10,11,12,13,14,5
REF DES NOT USED	
CR2	
L16	
Q7	
C35	FL1
R15	Z2
LAST REF DES (INCLUSIVE)	

Figure 5-12 - Schematic Diagram
10 MHz Decade Assembly (A8)
and FL1 and Z2
(Main Frame)



- 5. ALL PWR LEVELS SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 - 4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A9), EXAMPLE "A9C3".
 - 3. ALL DIODES ARE IN273
 - 2. ALL CAPACITOR VALUES ARE IN PICO FARADS
 - 1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4W
- NOTES: UNLESS OTHERWISE SPECIFIED

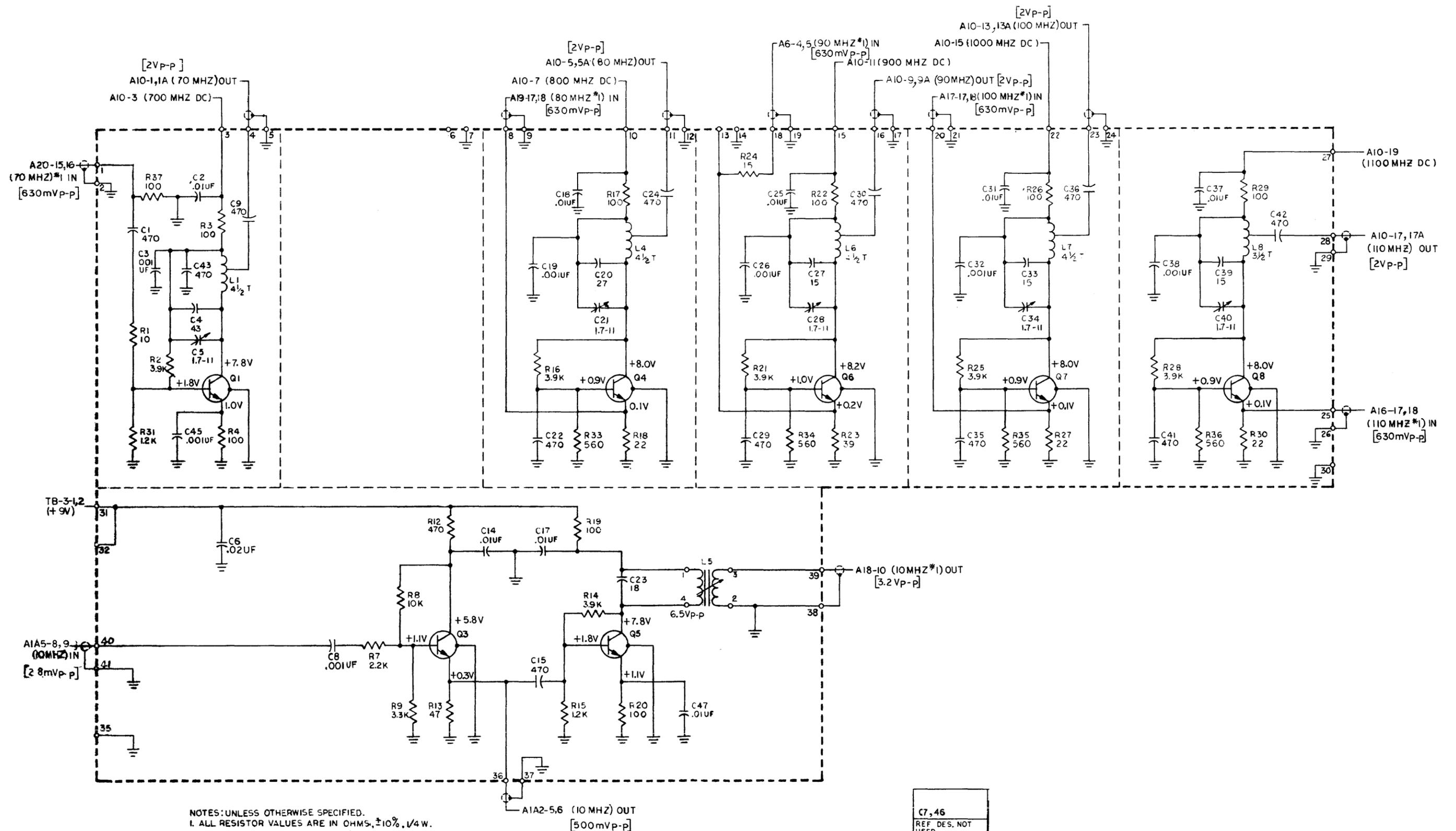
Figure 5-13 - Schematic Diagram Diode Switch, Mixer, Low Pass Filter (A9) and A1, FL3 and S1 (Main Frame)



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, 1/4 W.
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 3. ALL TRANSISTORS ARE 2N5179.
 4. ALL DIODES ARE IN273.
 5. * DENOTES FACTORY SELECTED VALUE.
 6. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO. (A10), EXAMPLE *A10C3.
 7. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED, (DISABLE INTERNAL TIME BASE).

CR10
L20
Q20
C80
R45
LAST REF DES (INCLUSIVE)

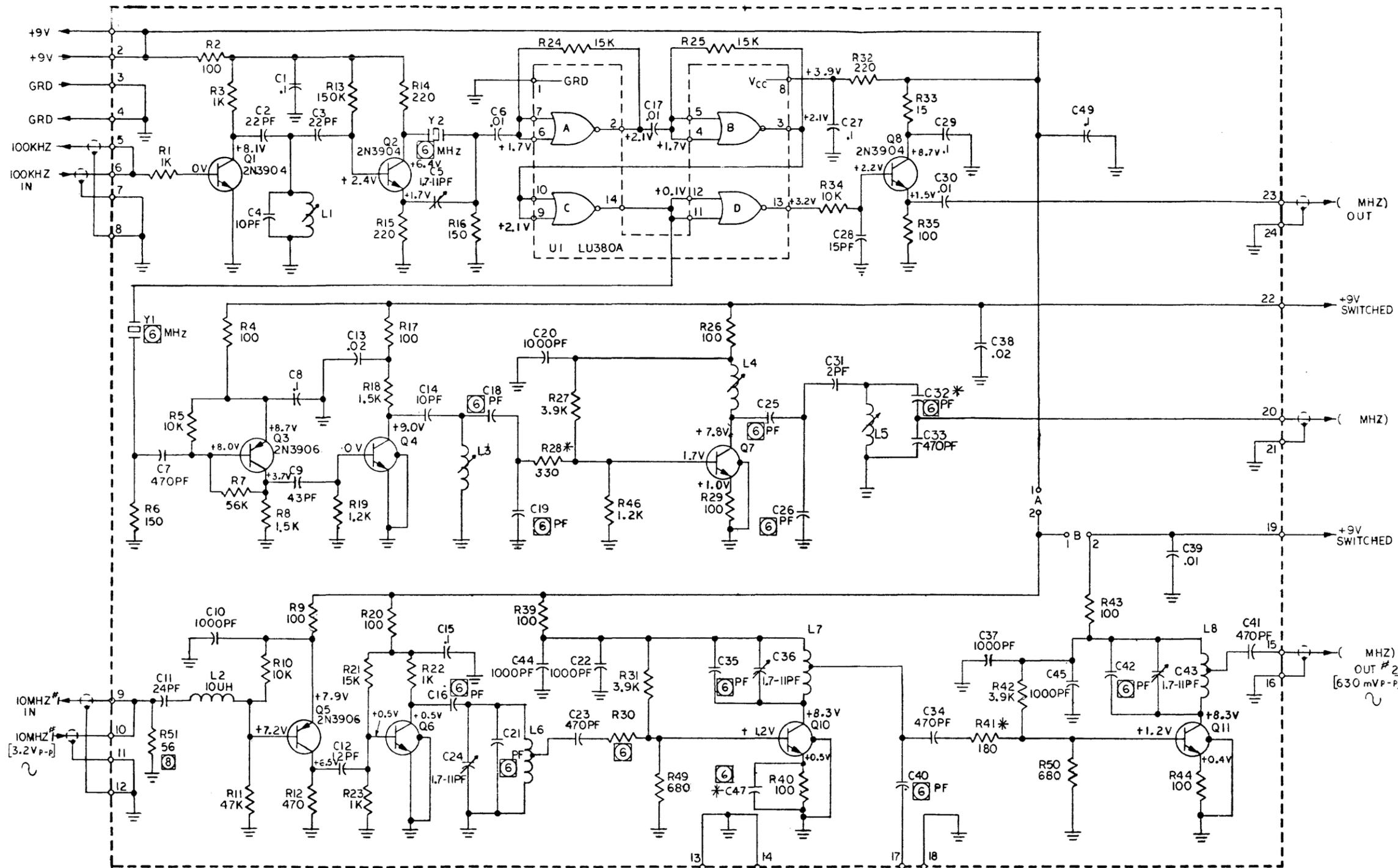
Figure 5-14 - Schematic Diagram
700-1100 MHz Multiplier Assembly (A10)
(Main Frame)



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, $1/4$ W.
 2. ALL CAPACITOR VALUES ARE IN PICO FARADS
 3. ALL TRANSISTORS ARE 2N5179.
 4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO.(A11), EXAMPLE "A11C3"; COMPONENTS OMITTED ARE C10, 11, 12, 13, 16, 44; Q2; R5, 6, 10, 11, 32 AND L2, L3
 5. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 6. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INTERNAL TIME BASE)

C7, 46
REF DES. NOT USED
L8
Q8
C47
R37
LAST REF DES (INCLUSIVE)

Figure 5-15 - Schematic Diagram
Buffer Amplifier Board (A11)
(Main Frame)



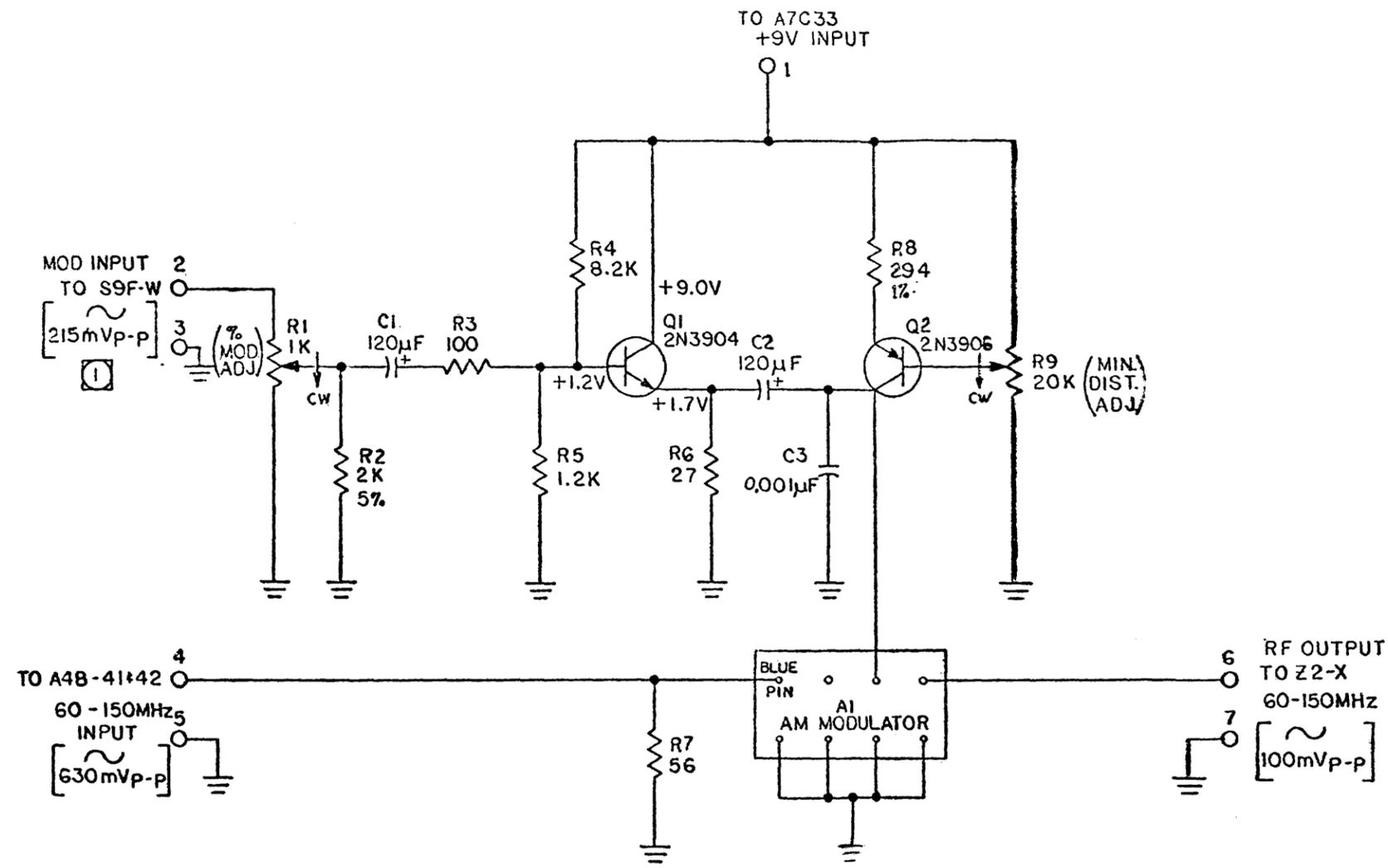
		ASSEMBLY									
FROM PIN:		A12	A13	A14	A15	A16	A17	A18	A19	A20	A21
TO:		TO:	TO:	TO:	TO:	TO:	TO:	TO:	TO:	TO:	
WIRE DESTINATIONS	23	S7A-9 (4,5)	S7A-8 (4,4)	S7A-7 (4,3)	J0-2A (4,2)	S7A-5 (4,1)	S7A-4 (4,0)	S7A-3 (3,9)	S7A-2 (3,8)	S7A-1 (3,7)	S7A-0 (3,6)
	22	A4A-38 (4,5)	A4A-37 (4,4)	A4A-36 (4,3)	A4A-35 (4,2)	A4A-34 (4,1)	A4A-33 (4,0)	A4A-32 (3,9)	A4A-31 (3,8)	A4A-30 (3,7)	A4A-29 (3,6)
	20	A4A-39 (4,5)	A4A-38 (4,4)	A4A-37 (4,3)	A4A-36 (4,2)	A4A-35 (4,1)	A4A-34 (4,0)	A4A-33 (3,9)	A4A-32 (3,8)	A4A-31 (3,7)	A4A-30 (3,6)
	19	A4B-38 (4,5)	A4B-37 (4,4)	A4B-36 (4,3)	A4B-35 (4,2)	A4B-34 (4,1)	A4B-33 (4,0)	A4B-32 (3,9)	A4B-31 (3,8)	A4B-30 (3,7)	A4B-29 (3,6)
	17	—	—	—	A5-1	A11-25	A11-20	A6-15	A11-8	A4B-7	A4B-3
	15	A4B-39 (1,50)	A4B-38 (1,40)	A4B-37 (1,30)	A4B-36 (1,20)	A4B-35 (1,10)	A4B-34 (1,00)	A4B-33 (9,0)	A4B-32 (8,0)	A4B-31 (7,0)	—
10	A15-10	A14-10	A13-10	A12-10	A11-10	A20-10	A11-39	A16-10	A17-10	—	
9	A2-9	A20-9	A15-9	A14-9	A18-9	A19-9	A16-9	A17-9	A13-9	A12-9	
6	A15-6	A14-6	A13-6	A12-6	A19-6	A20-6	A1A-27	A16-6	A17-6	—	
5	A21-5	A20-5	A15-5	A14-5	A18-5	A19-5	A16-5	A17-5	A13-5	A12-5	
COMPONENT VALUES	Y1	4.5 MHz	4.4 MHz	4.3 MHz	4.2 MHz	4.1 MHz	4.0 MHz	3.9 MHz	3.8 MHz	3.7 MHz	3.6 MHz
	Y2	4.5 MHz	4.4 MHz	4.3 MHz	4.2 MHz	4.1 MHz	4.0 MHz	3.9 MHz	3.8 MHz	3.7 MHz	3.6 MHz
	R30	47 Ω	47 Ω	47 Ω	47 Ω	10 Ω					
	C18	82 PF	82 PF	82 PF	91 PF	68 PF	68 PF	68 PF	68 PF	68 PF	68 PF
	C21	10 PF	15 PF	18 PF	24 PF	15 PF	24 PF	33 PF	43 PF	56 PF	56 PF
	C25	82 PF	82 PF	82 PF	91 PF	68 PF	68 PF	68 PF	68 PF	68 PF	68 PF
	C26	470 PF	470 PF	680 PF	680 PF	680 PF					
	C32	91 PF	91 PF	91 PF	100 PF	82 PF	82 PF	82 PF	82 PF	82 PF	82 PF
	C35	10 PF	15 PF	18 PF	24 PF	15 PF	24 PF	33 PF	43 PF	56 PF	56 PF
	C42	10 PF	15 PF	18 PF	24 PF	15 PF	24 PF	33 PF	43 PF	56 PF	—
C16	2 PF	2 PF	2 PF	2 PF	5 PF	5 PF	5 PF	5 PF	5 PF	5 PF	
C19	470 PF	470 PF	470 PF	470 PF	470 PF	470 PF	470 PF	470 PF	680 PF	680 PF	
C40	—	—	—	470 PF	470 PF	470 PF	470 PF	470 PF	470 PF	470 PF	
W1	B	B	B	A	A	A	A	A	A&B	B	
C47	—	—	3 PF	5 PF	5 PF	10 PF	12 PF	12 PF	15 PF	27 PF	

- NOTES: UNLESS OTHERWISE SPECIFIED;
- PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO (A), EXAMPLE A12R1.
 - ALL RESISTORS VALUES ARE IN OHMS, $\pm 10\%$, 1/4W.
 - ALL CAPACITORS VALUES ARE IN MICROFARADS.
 - ALL TRANSISTORS (Q) ARE 2N5179.
 - ALL DIODES (CR) ARE IN 4148.
 - FOR COMPONENT VALUES, REFER TO TABLE.
 - * INDICATES FACTORY SELECTED, NOMINAL VALUES SHOWN.
 - TO BE ADDED ON THE A21 BOARD ONLY AT FINAL ASSY.
 - VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 - ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND 1MHz SW, S3 AND 10MHz SW, S2 IN THEIR APPROPRIATE POSITIONS, (DISABLE INTERNAL TIME BASE)

FOR S/N'S UP TO 300, USE SCHEMATIC 4-501185-001
 FOR S/N'S 301 & ABOVE, USE SCHEMATIC 4-501185-002

ON A21, THE FOLLOWING COMPONENTS ARE NOT USED:
 R41, 42, 43, 44, 50
 C34, 37, 41, 42, 43, 45
 Q11 L8

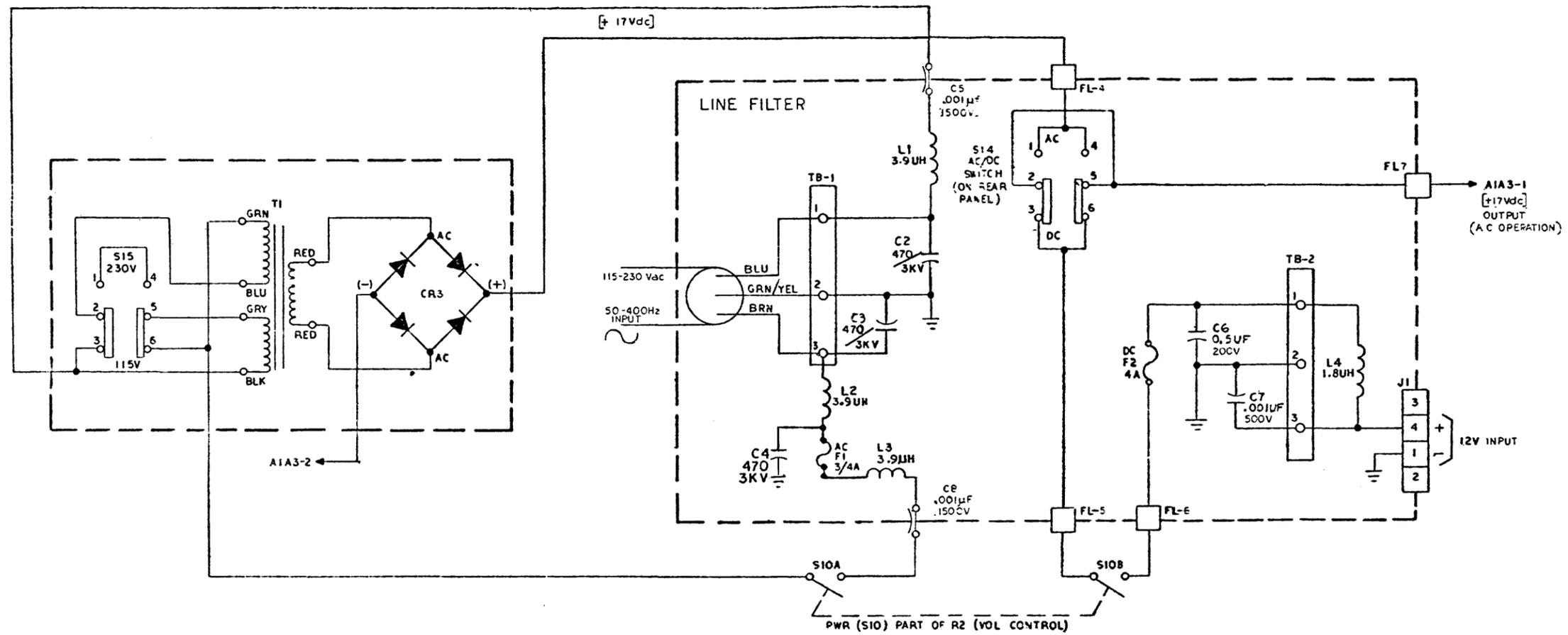
Figure 5-16 - Schematic Diagram
 Frequency Generator (A12-21)
 (Main Frame)



3. ALL VOLTAGES ARE TYPICAL.
 2. RESISTORS ARE 10%, 1/4W.
 ① LEVEL REQUIRED FOR 30% MODULATION.
 NOTES: UNLESS OTHERWISE SPECIFIED

ADDENDUM, MODEL FM-10C
 Dwg. No. 1-500783-260 (A)
 Page 2,1,12

Figure 5-16A. Schematic Diagram
 AM Modulator Board, A27
 Dwg. No. 3-501379-001



3. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 2. COMPONENTS SHOWN INSIDE LARGE DASHED LINE BLOCK ARE ACCESSIBLE BY REMOVING CORNER SHIELD COVER ON CHASSIS BOTTOM.
 1. CAPACITOR VALUES ARE IN PICOFARADS.
 NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-17 - Schematic Diagram
 Power Transformer Rectifier Assembly,
 Line Filter and S10
 (Main Frame)

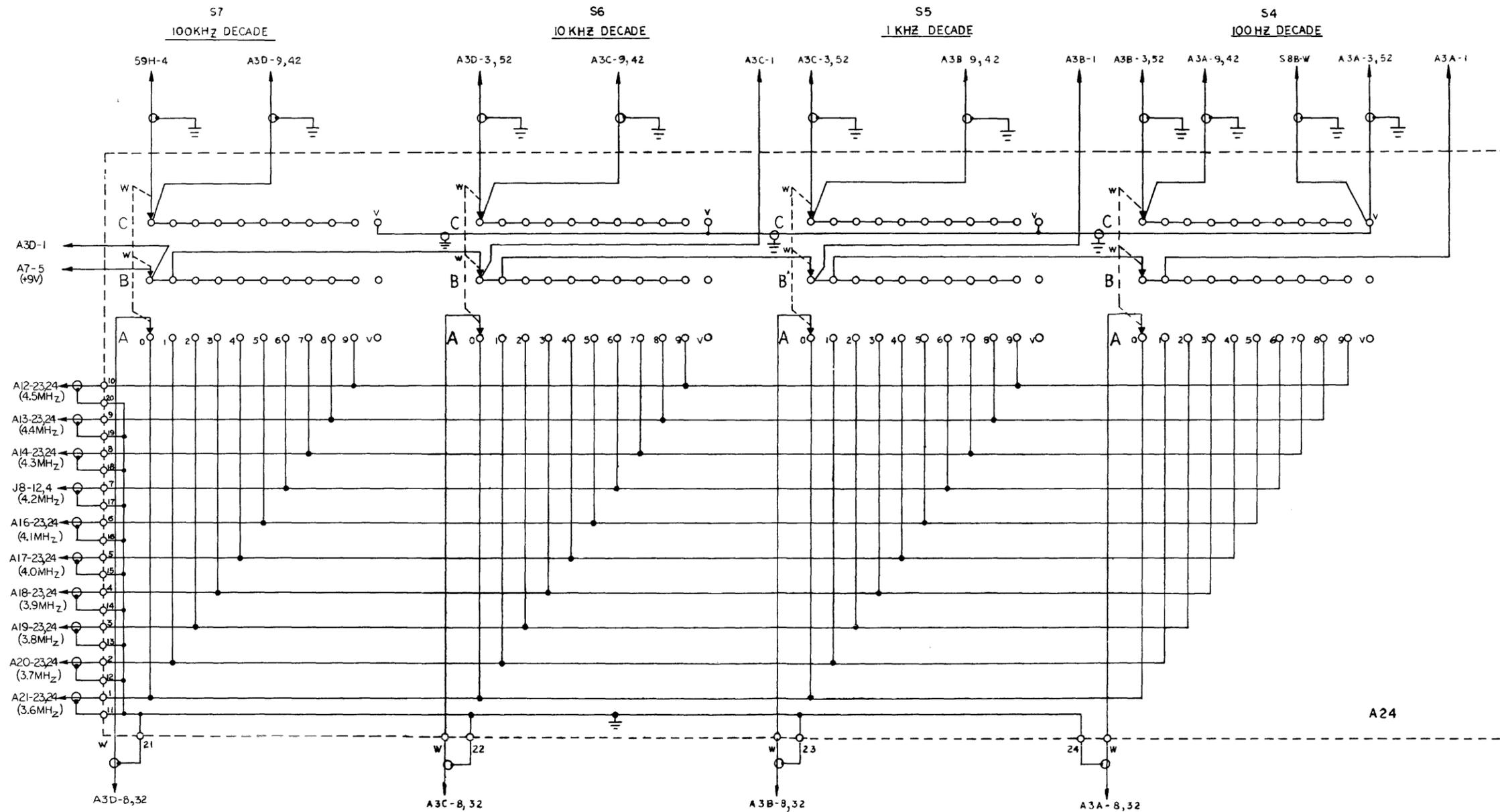


Figure 5-18 - Switching Diagram
 100 Hz, 1 kHz, 10 kHz, 100 kHz Decade
 (Main Frame)

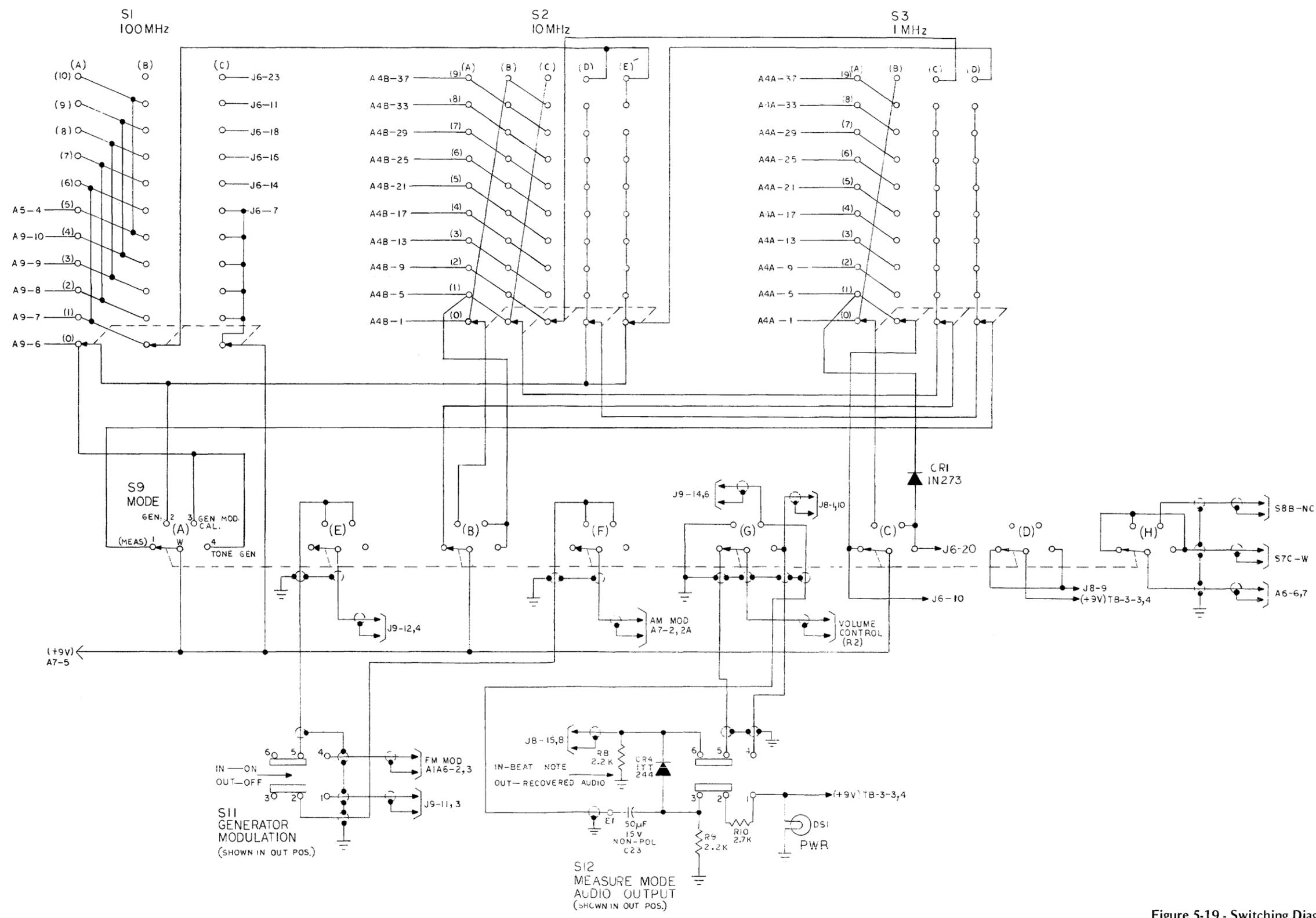
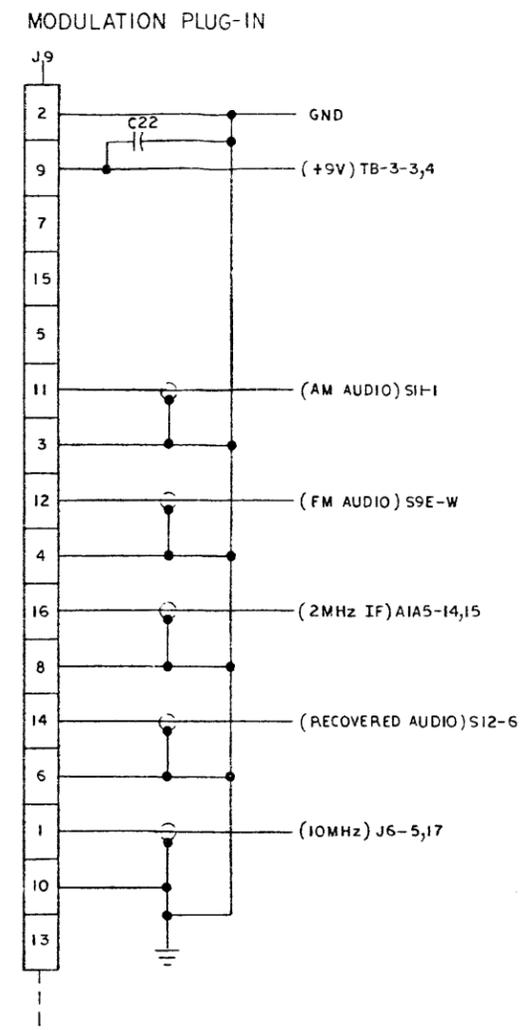
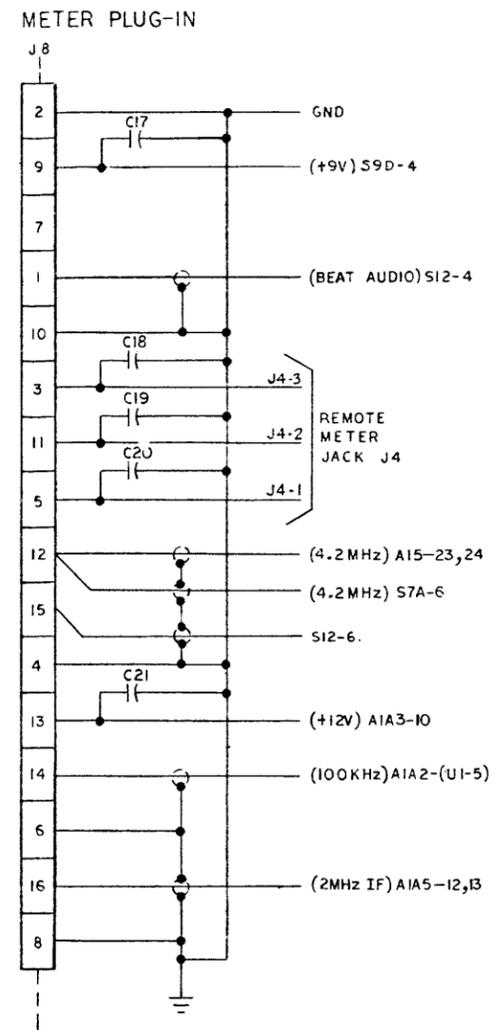
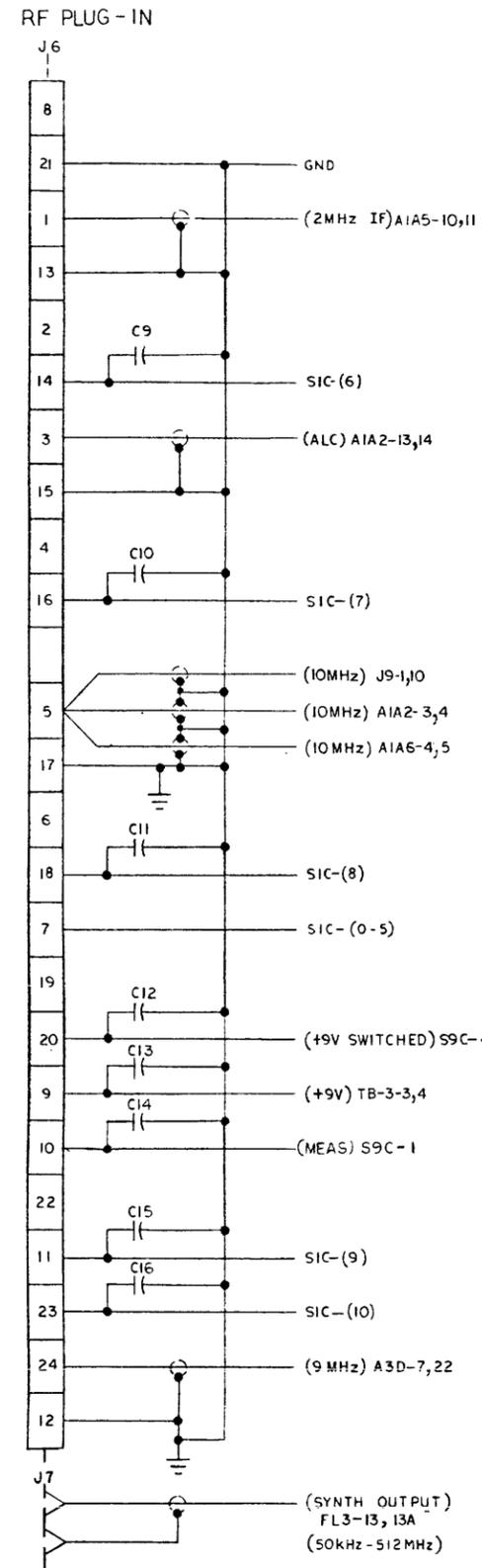


Figure 5-19 - Switching Diagram
 100, 10, 1 MHz Decade, Mode,
 Measure Mode Audio Output, and Generator Modulation.
 Switching S1, S2, S3, S9, S11, S12
 (Main Frame)



1. ALL CAPACITORS VALUES ARE .001UF (CK60).
 NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-20 - Connector Wiring Diagram
 RF Plug-in, Meter Plug-in and Modulation
 Plug-in Connector Wiring, J6, J7, J8, J9
 (Main Frame)

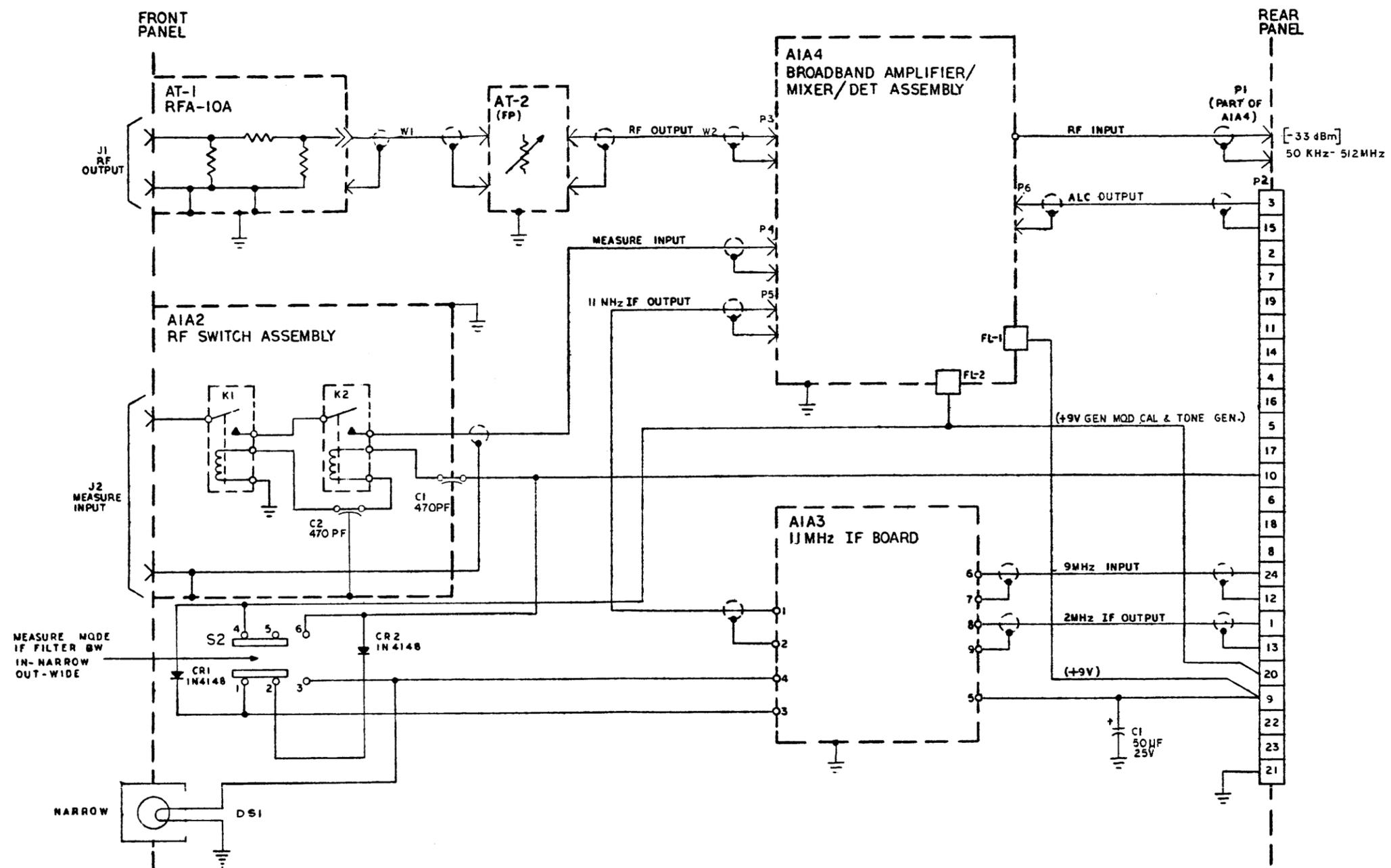
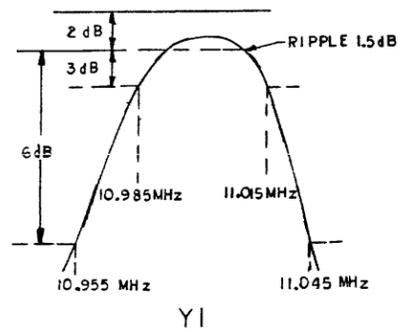
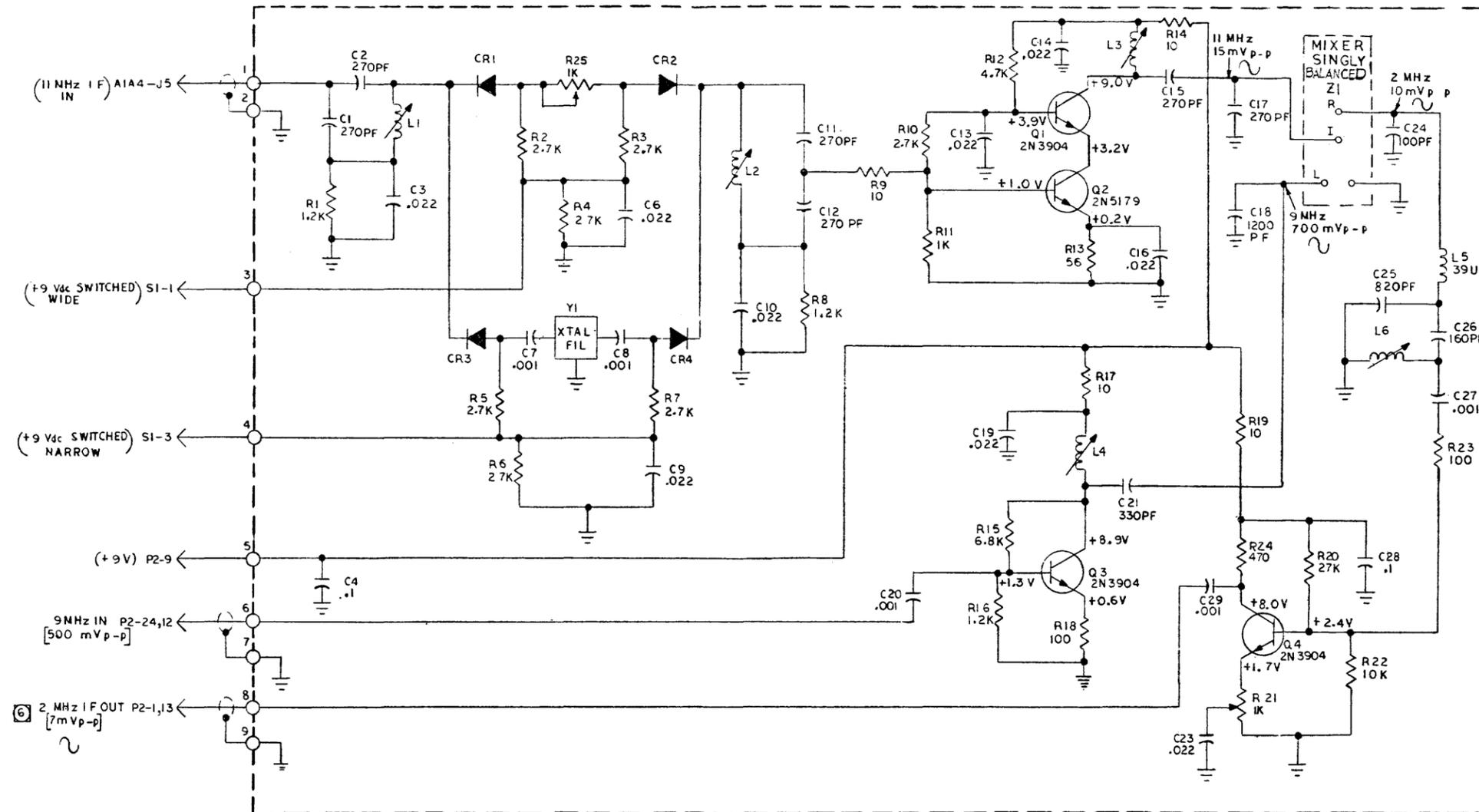


Figure 5-21 - Schematic Diagram
Model RFM-10

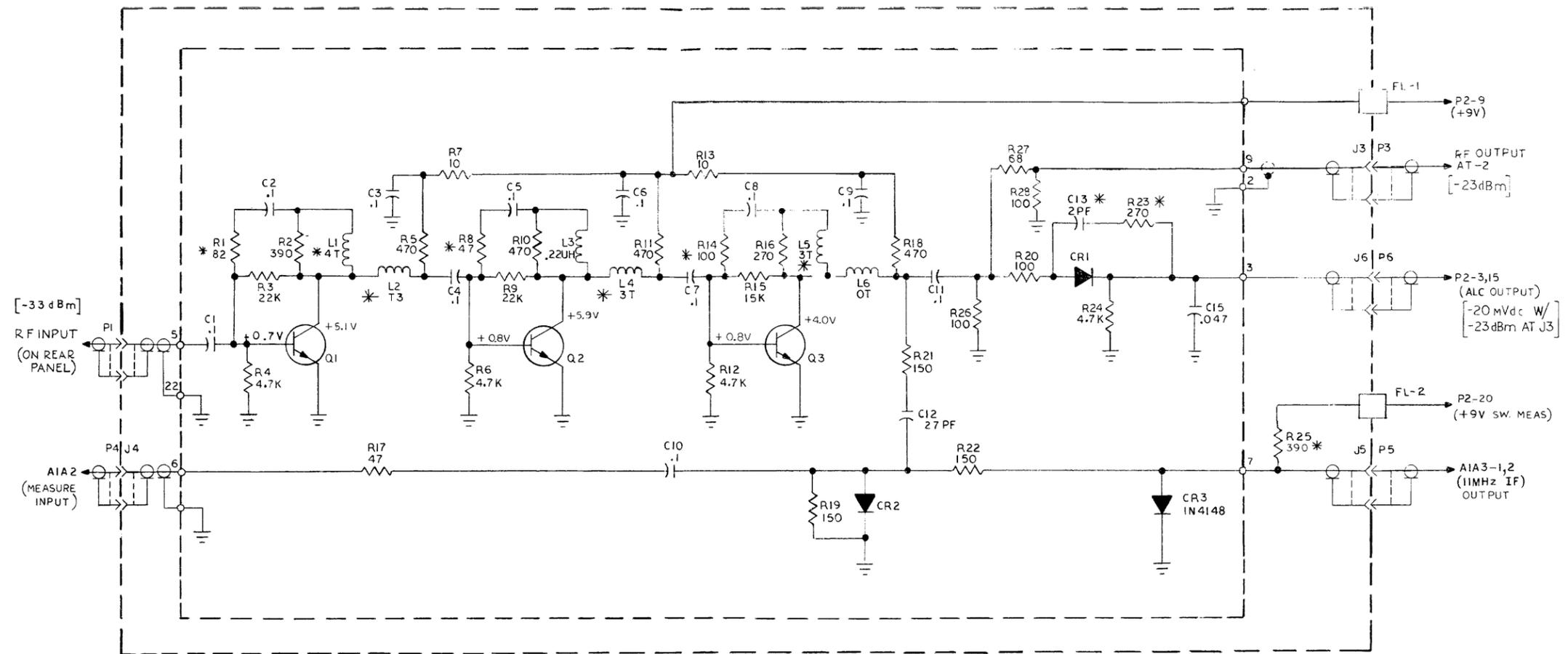


HIGHEST REF DESIGNATIONS USED						
C29	Q4	L6	CR4	R25	Y1	Z1
REF DESIGNATIONS NOT USED						
C22						
C5						

- ⑥ LEVEL PRESENT WITH 6 mV r_{ms} AT MEASURE INPUT JACK J2.
- 5 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED, (DISABLE INTERNAL TIME BASE)
- 4 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL
- 3 ALL DIODES ARE IN4148.
- 2 ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 1 ALL RESISTOR VALUES ARE IN OHMS ±10%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-22 - Schematic Diagram
11 MHz IF Board (A1A3), Model RFM-10



8. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED.
(DISABLE INTERNAL TIME BASE)
7. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
6. ALL RESISTOR VALUES ARE IN OHMS, $\pm 10\%$, 1/4W.
5. ALL CAPACITOR VALUES ARE IN MICROFARADS, 200V.
4. ALL TRANSISTORS ARE 2N5179
3. ALL DIODES ARE GENERAL ELEC PART NO. BD3.
2. * DENOTES FACTORY SELECTED VALUE.
1. PARTIAL REFERENCE DESIGNATORS ARE SHOWN FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO (A1A4) EXAMPLE *A1A4R1?
- NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-23 - Schematic Diagram
Broadband Amp/Mixer/Det Assembly (A1A4)
(Model RFM-10)

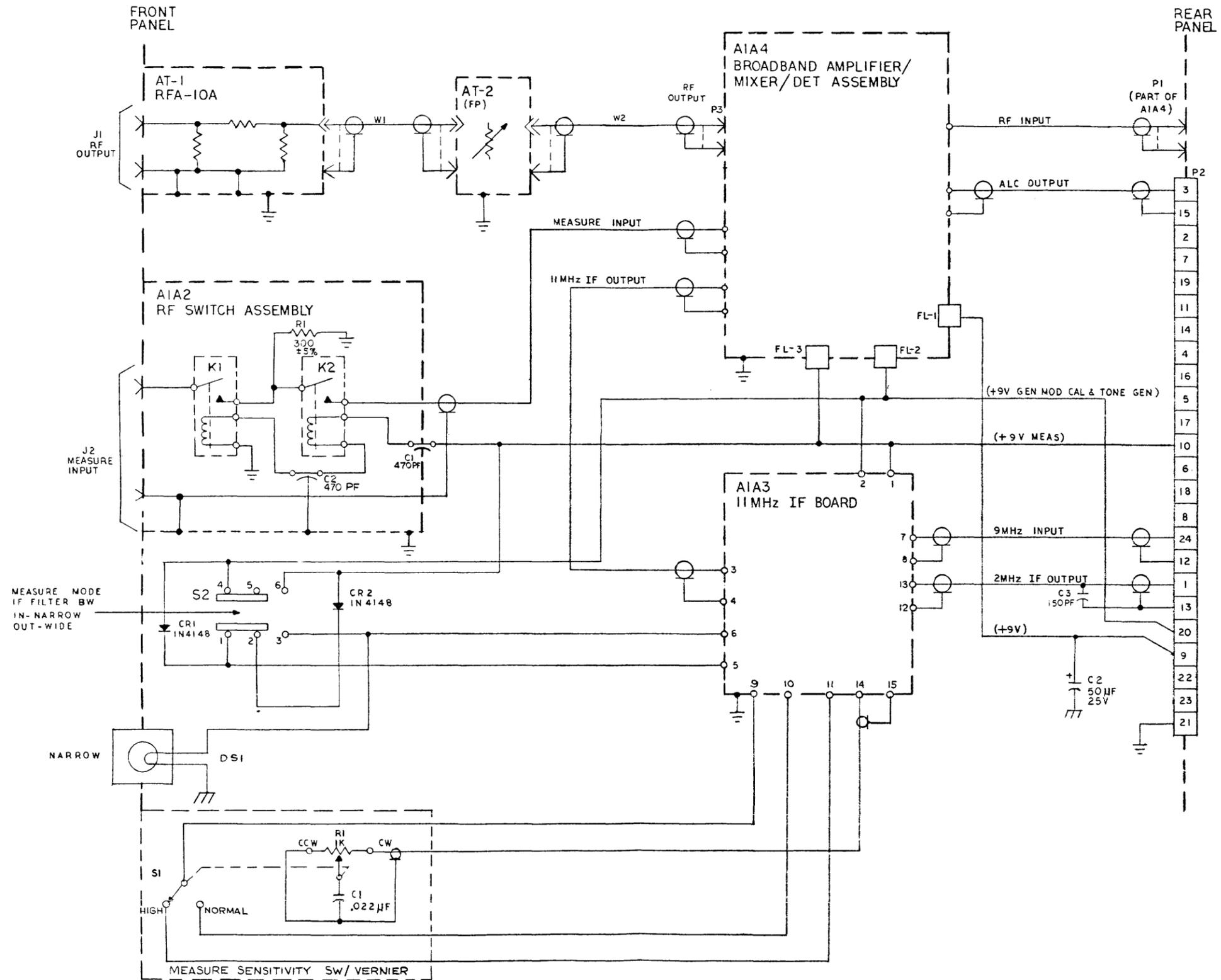
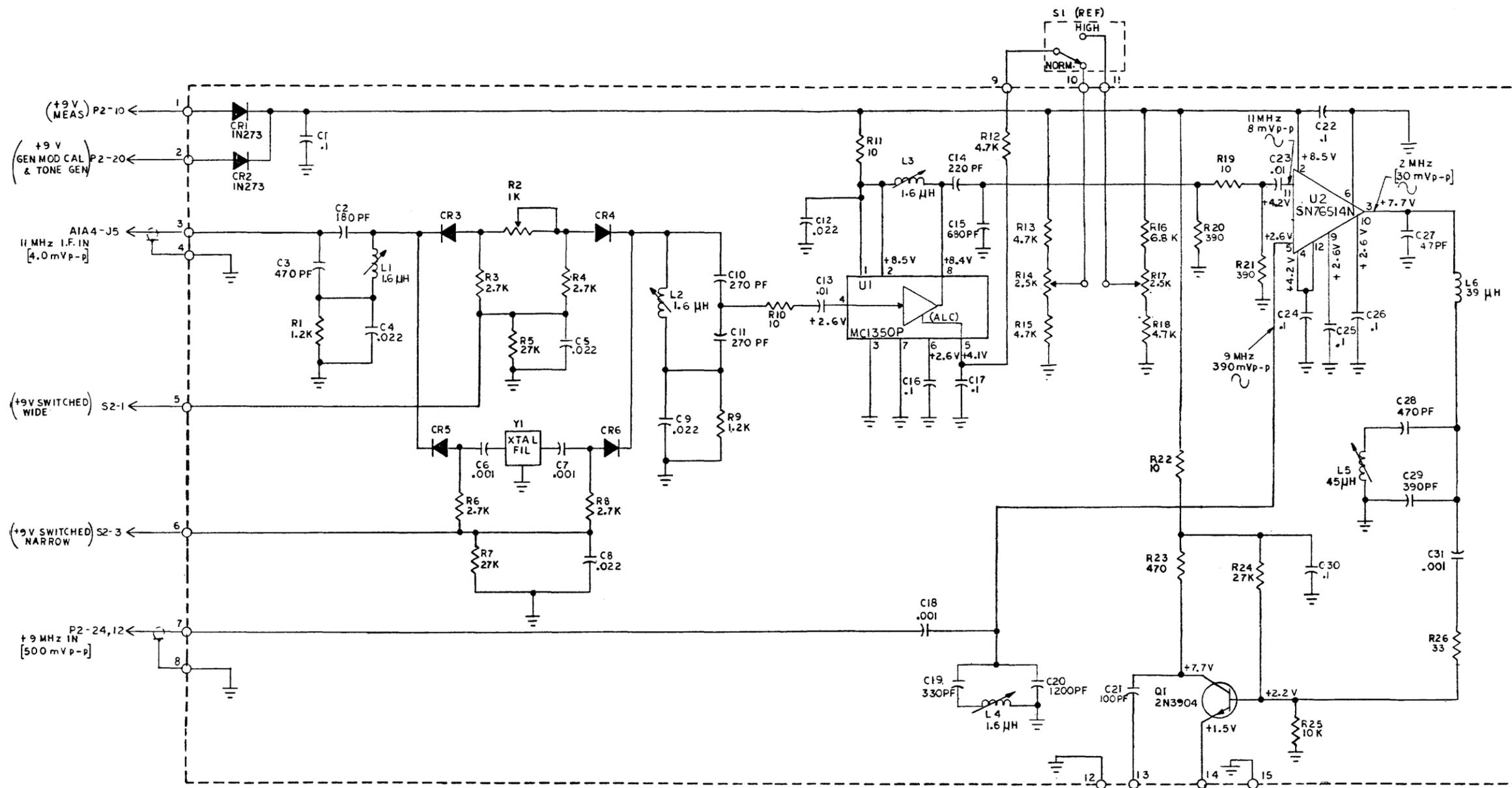
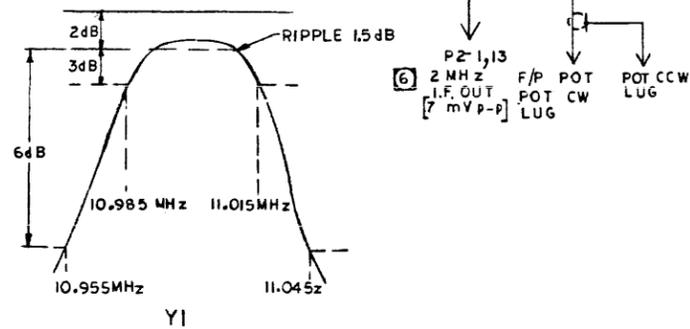


Figure 5-24 – Schematic Diagram
Model RFM-10A



HIGHEST REF DESIGNATIONS USED						
C31	CR6	L6	Q1	R26	Y1	L2
REF DESIGNATIONS NOT USED						



⑥ LEVEL PRESENT WITH 6mV_{rms} AT MEASURE INPUT JACK J2 AND MEASURE SENSITIVITY CONTROL ADJUSTED TO TURN ON FIM 1 OR 3 OPERATE LAMP.

5 ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND FM-IOC MODE SWITCH IN EITHER MEASURE, GEN MOD CAL OR TONE GEN POSITION (DISABLE INTERNAL TIME BASE)

4 ALL VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL

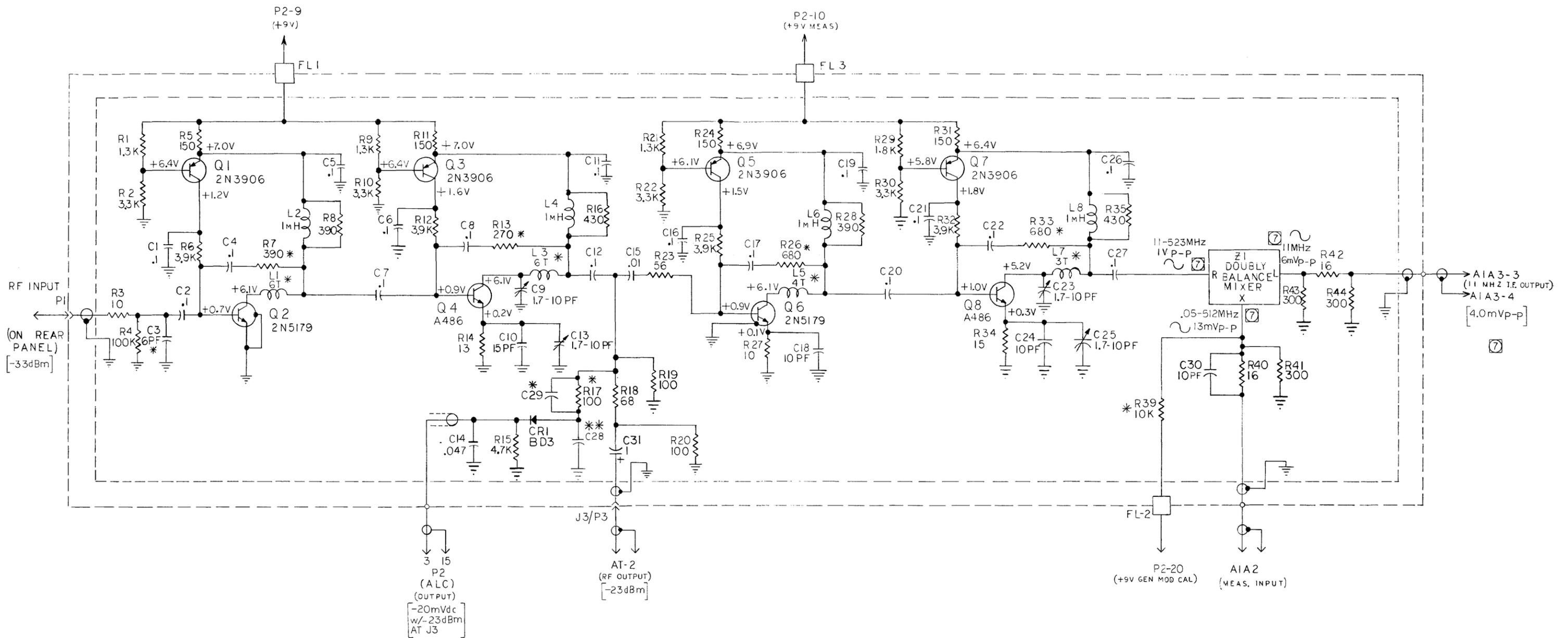
3. ALL DIODES ARE IN4148

2. ALL CAPACITOR VALUES ARE IN MICROFARADS

1. ALL RESISTOR VALUES ARE IN OHMS ±10%, 1/4W

NOTES: UNLESS OTHERWISE SPECIFIED

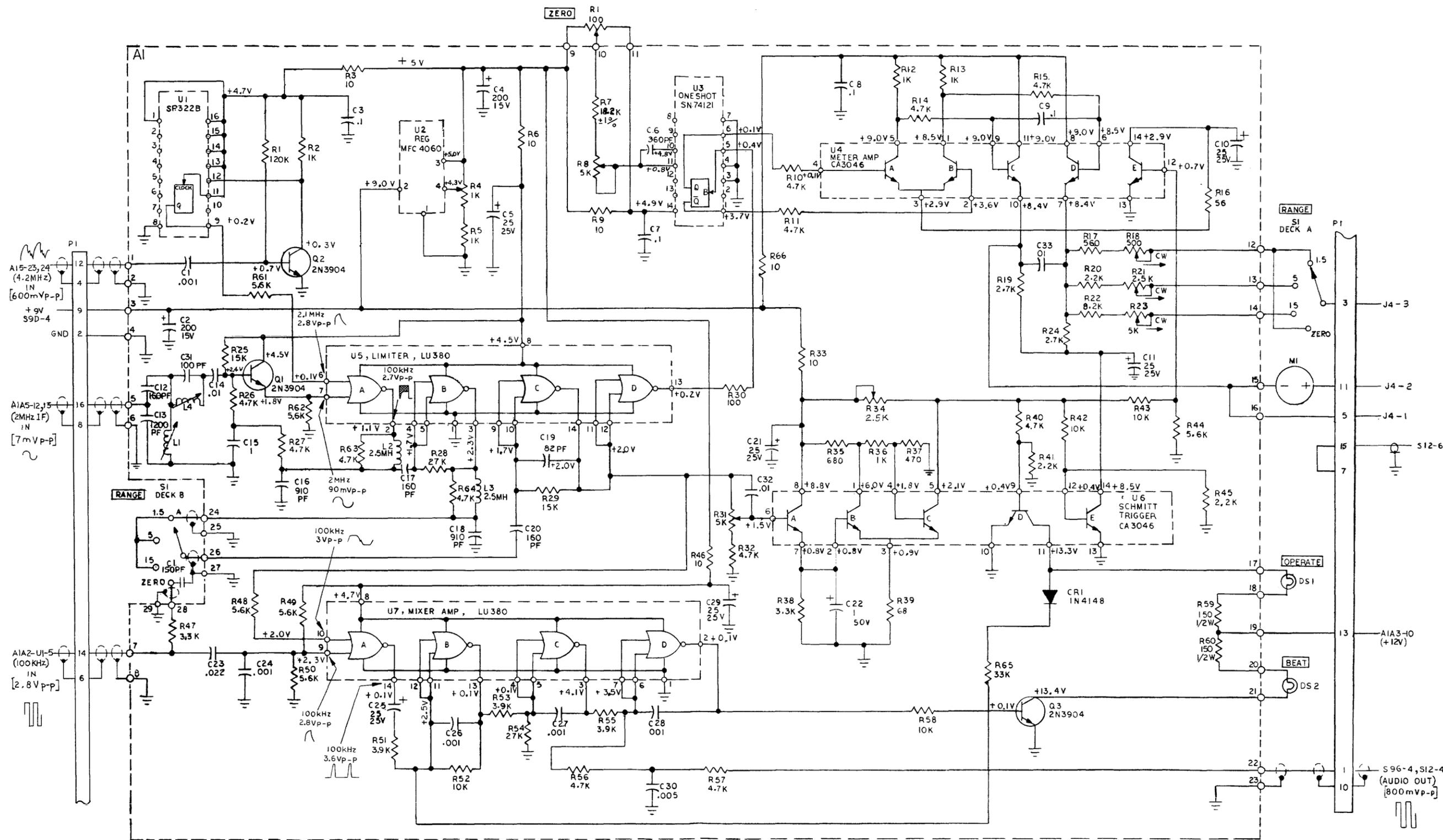
Figure 5-25 — Schematic Diagram
11 MHz IF Board (A1A3)
(Model RFM-10A)



- ⑦ VOLTAGES TAKEN WITH FM-IOC MODE SWITCH IN MEAS POSITION AND 6mV_{RMS} (.05-512MHz) AT MEAS INPUT JACK J2.
6. ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED & FM-IOC MODE SWITCH IN THE MEAS POSITION, (DISABLE INTERNAL TIME BASE)
5. ALL VOLTAGES AND POWERS SHOWN WITHOUT TOLERANCES ARE TYPICAL.
4. ** INDICATES FACTORY SELECTED VALUES, MAY BE OMITTED.
3. * INDICATES FACTORY SELECTED VALUES.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
1. ALL RESISTOR VALUES ARE IN OHMS ± 5% 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

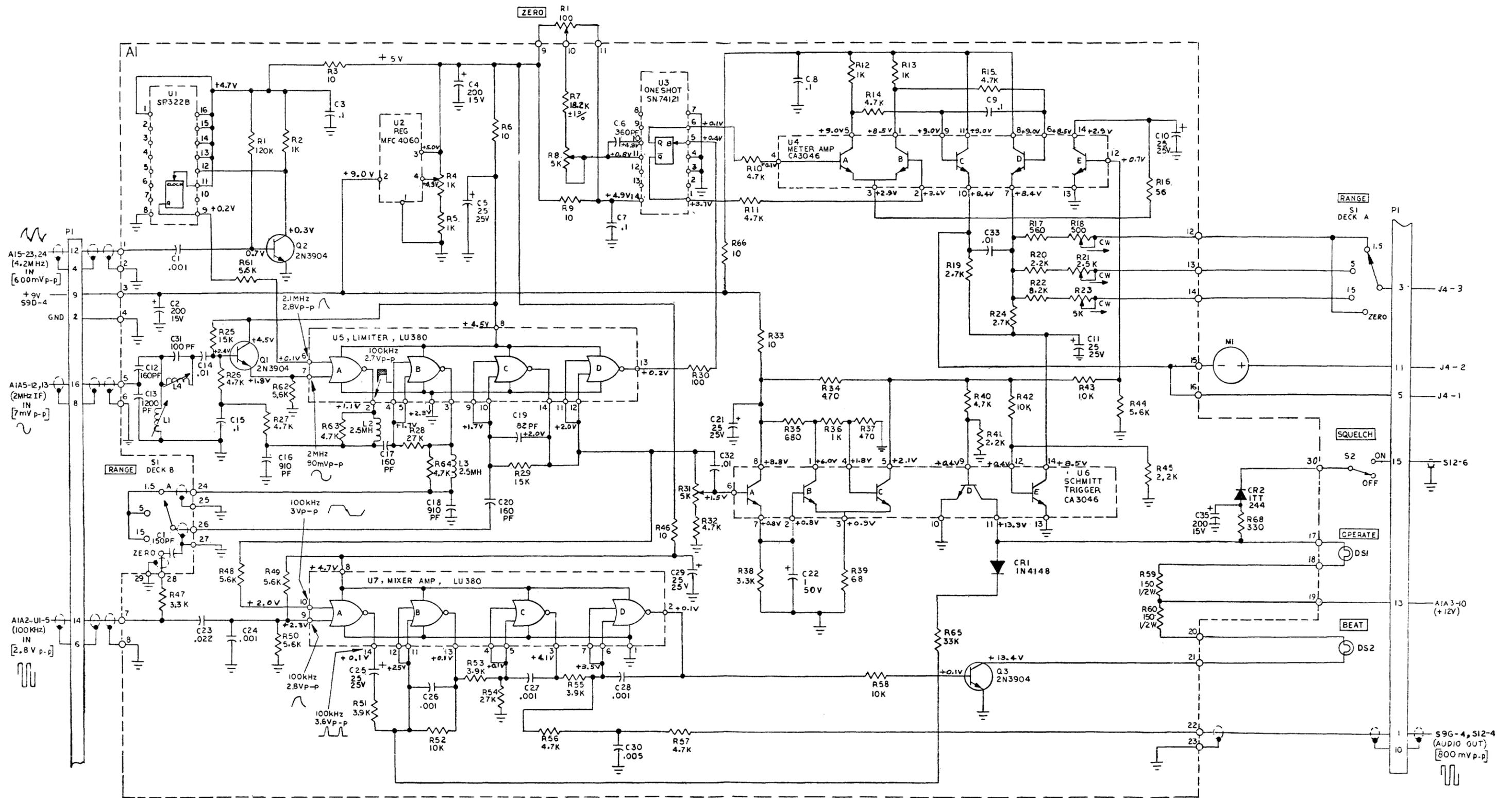
Figure 5-26 – Schematic Diagram
Broadband Amplifier and Mixer (A1A4)
(Model RFM-10A)



- ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND FM-10C MODE SWITCH IN THE MEASURE POSITION, (DISABLE INTERNAL TIME BASE)
- VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL
- ALL CAPACITOR VALUES ARE IN MICROFARADS
- ALL RESISTORS ARE IN OHMS $\pm 10\%$, 1/4W.

HIGHEST REF DESIGNATIONS USED					
L4	U7	C33	R66	Q3	CR1
REF DESIGNATIONS NOT USED					

Figure 5-27 – Schematic Diagram Model FIM-1

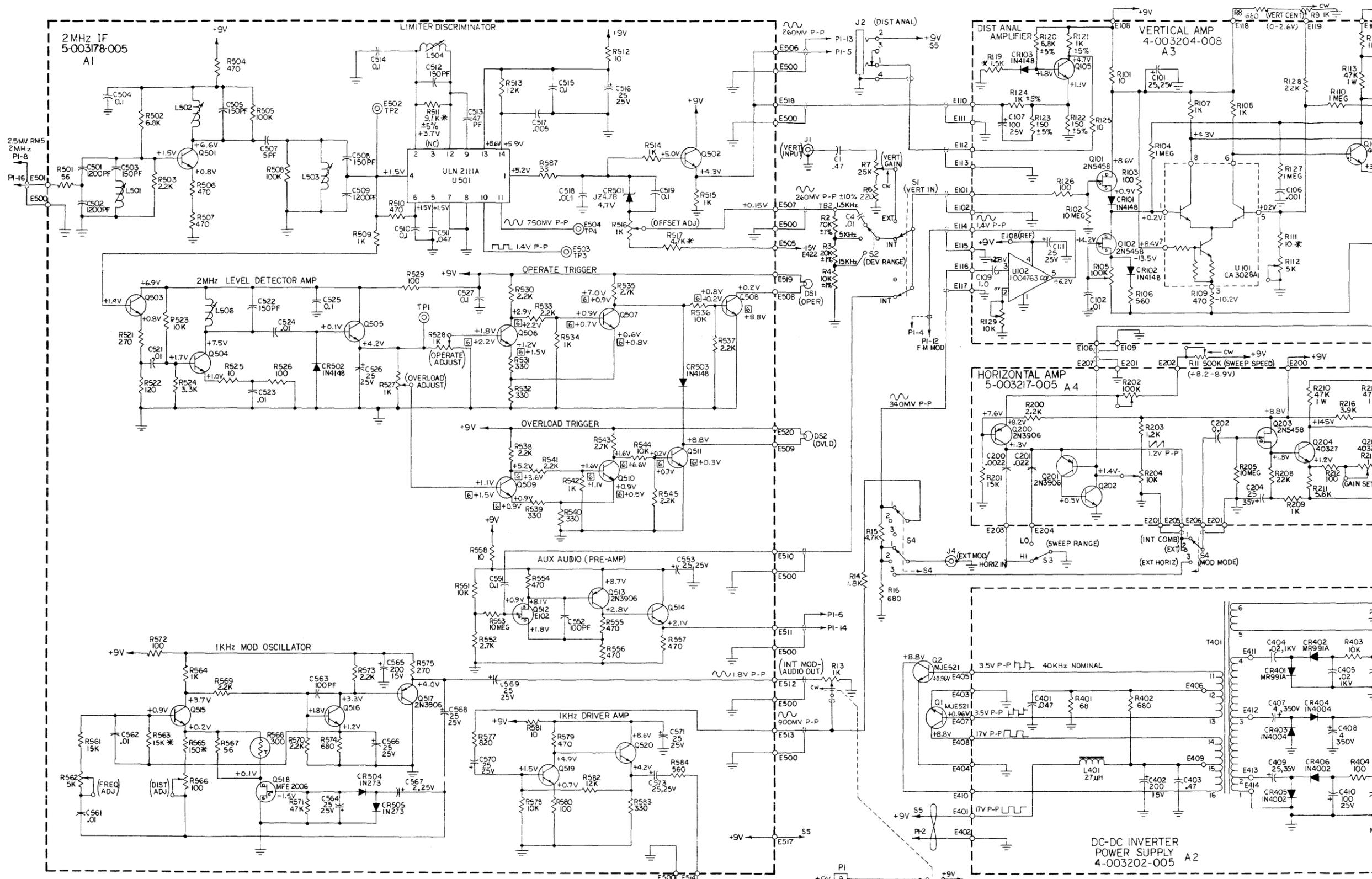


- 4 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND FM-10C MODE SWITCH IN THE MEASURE POSITION, (DISABLE INTERNAL TIME BASE)
- 3 VALUES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
1. ALL RESISTORS ARE IN OHMS $\pm 10\%$, $1/4W$.

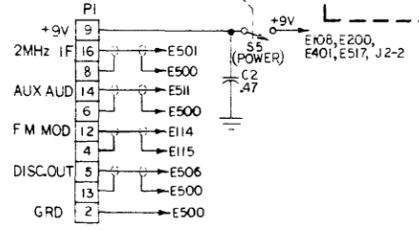
NOTES: UNLESS OTHERWISE SPECIFIED

HIGHEST REF DESIGNATIONS USED					
L4	U7	C33	R68	Q3	CR1
REF DESIGNATIONS NOT USED					
R67					

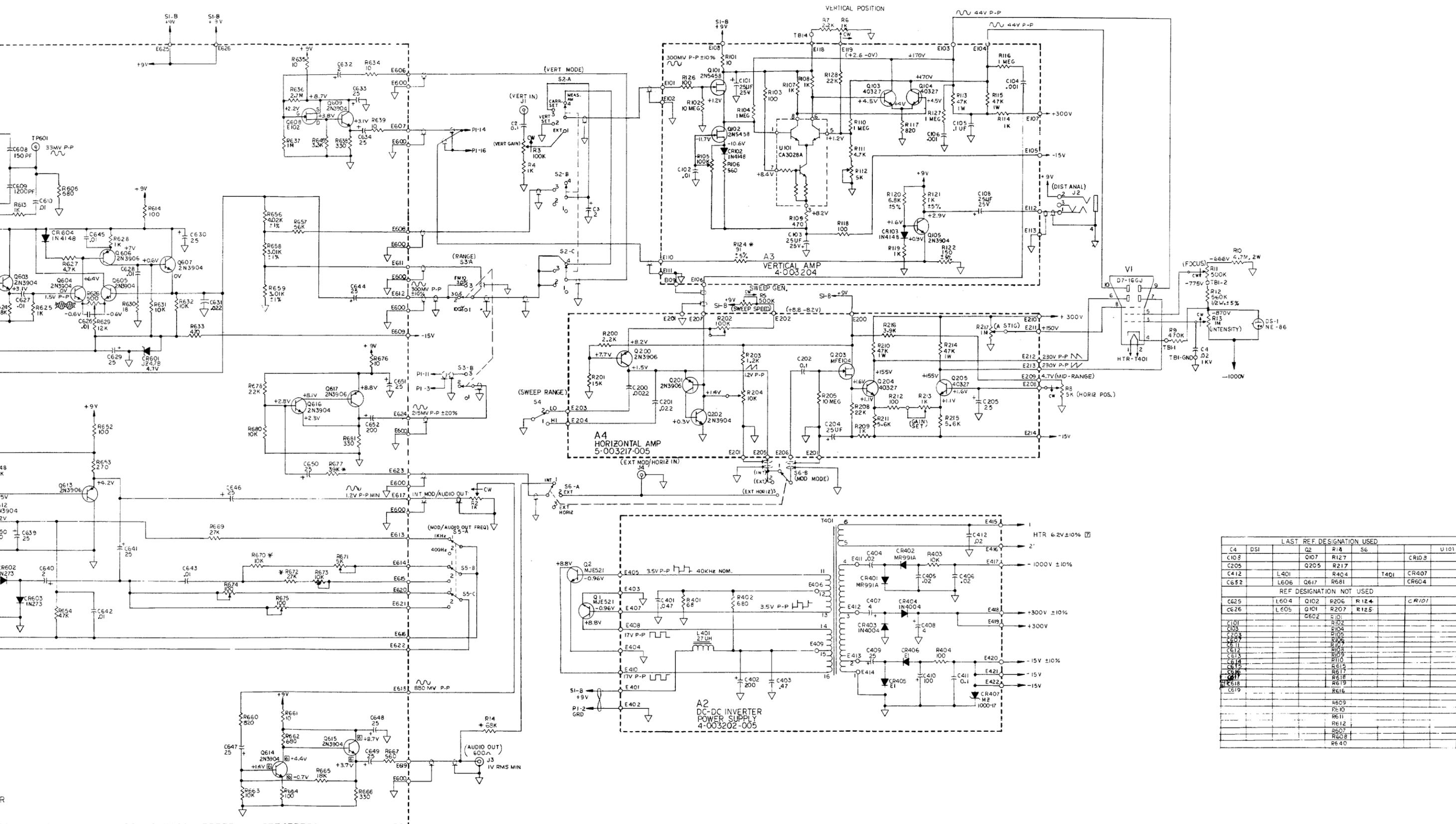
Figure 5-28 – Schematic Diagram Model FIM-3



LAST REF DES USED							REF DES NOT USED								
R22	C4	Q2			V1	S5	DS3		R15,10,17						
R129	C111	Q105	CR103		U102				E119		C108,110,112				
R217	C205	Q205							E214	R206,207	C203				
R404	C412		CR407	L401		T401			E422						
R587	C573	Q520	CR505	L506	U501				E520	R515,520,540,550,555,558,560,565,568,586	C506,520,525,550,555,558,560				E515,516

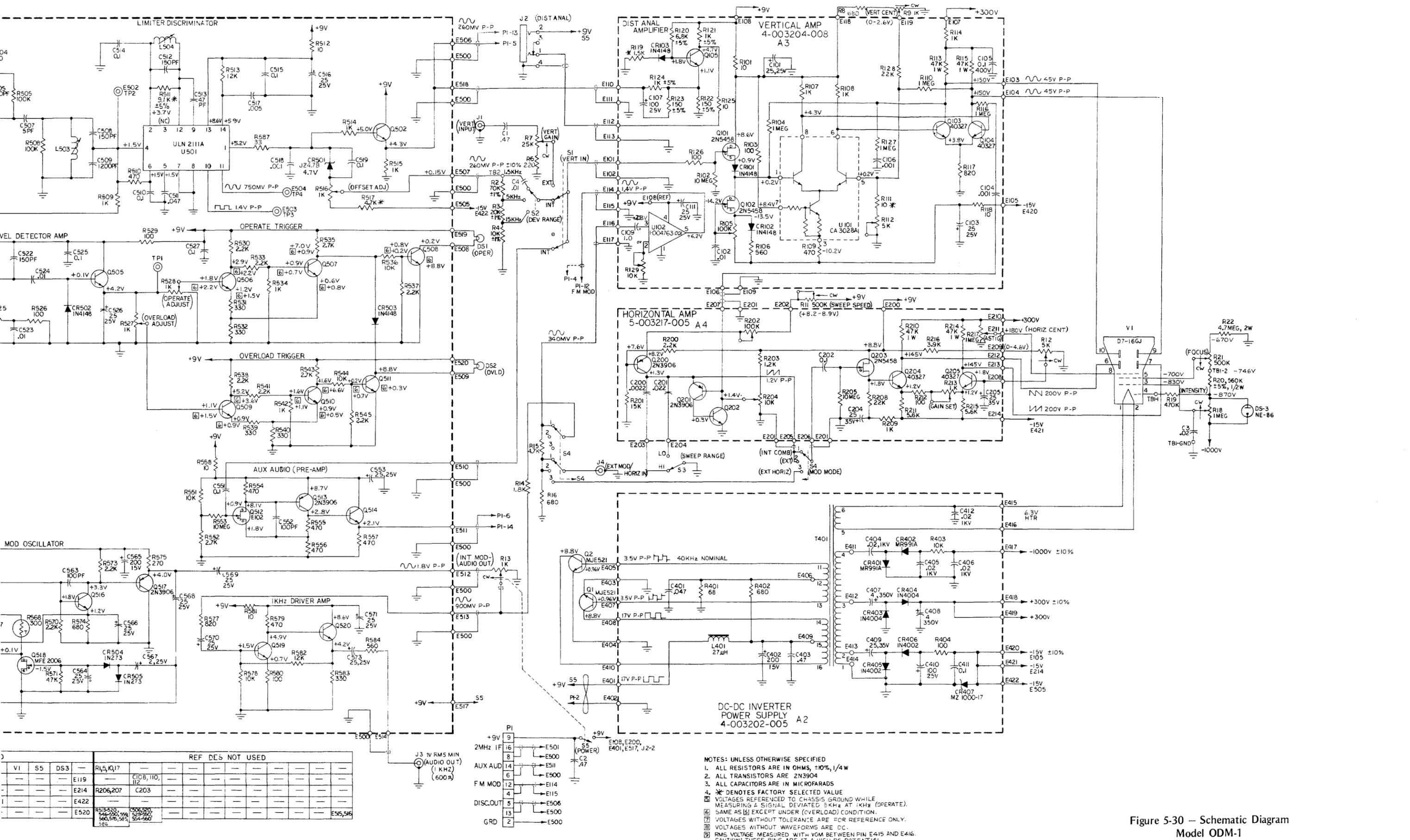


NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTORS ARE IN OHMS, ±10%, 1/4W
 2. ALL TRANSISTORS ARE 2N3904
 3. ALL CAPACITORS ARE IN MICROFARADS
 4. * DENOTES FACTORY SELECTED VALUE
 5. VOLTAGES REFERENCED TO CHASSIS GROUND WHILE MEASURING A SIGNAL DEVIATED 5KHz AT 1KHz (OPERATE).
 6. SAME AS 5 EXCEPT UNDER (OVERLOAD) CONDITION.
 7. VOLTAGES WITHOUT TOLERANCE ARE FOR REFERENCE ONLY.
 8. VOLTAGES WITHOUT WAVEFORMS ARE DC.
 9. RMS VOLTAGE MEASURED WITH VOM BETWEEN PIN E415 AND E416. CAUTION: THESE PINS ARE AT A HIGH DC POTENTIAL.

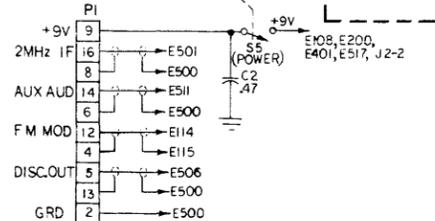


LAST REF. DESIGNATION USED					
C4	DS1	Q2	R18	S6	U101
C103		Q107	R12		CR103
C205		Q205	R217		
C412	L401	Q102	R404	T401	CR407
C652	L606	Q617	R681		CR604
REF DESIGNATION NOT USED					
C625	L604	Q102	R206	R124	CR101
C626	L605	Q101	R207	R125	
C101		R102			
C103		R104			
C203		R105			
C607		R106			
C611		R108			
C612		R109			
C613		R110			
C614		R111			
C615		R112			
C616		R113			
C617		R114			
C618		R115			
C619		R116			
		R117			
		R118			
		R119			
		R120			
		R121			
		R122			
		R123			
		R124			
		R125			
		R126			
		R127			
		R128			
		R129			
		R130			
		R131			
		R132			
		R133			
		R134			
		R135			
		R136			
		R137			
		R138			
		R139			
		R140			

Figure 5-29 – Schematic Diagram Model OAM-1

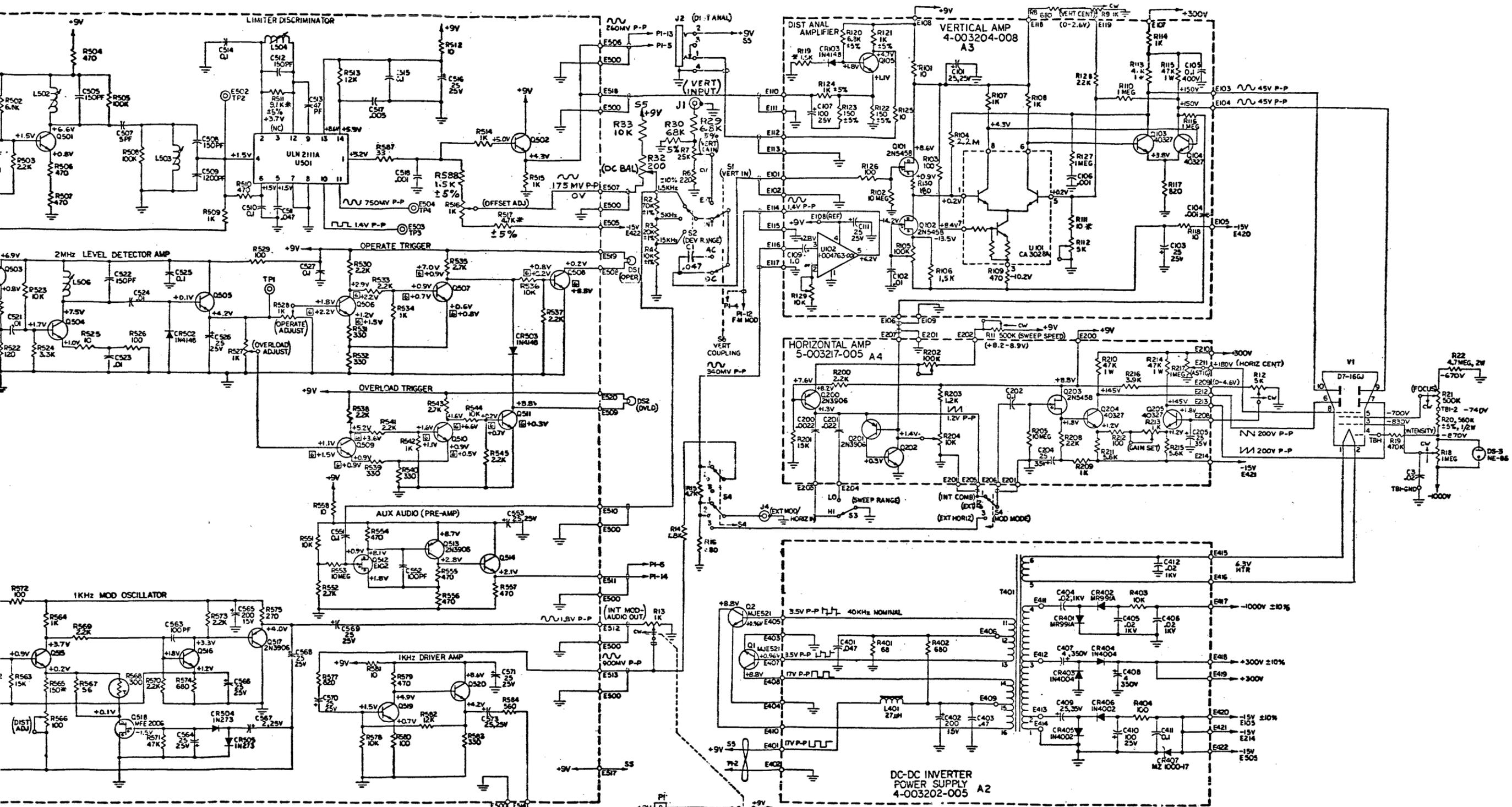


REF DES NOT USED									
VI	S5	DS3		R1,5,Q17					
			E119		C108, 110, 112				
			E214	R206, 207	C203				
			E422						
			E520	R516-520, 546-550, 561, 560, 576, 583, 584-590, 586	Q506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600				

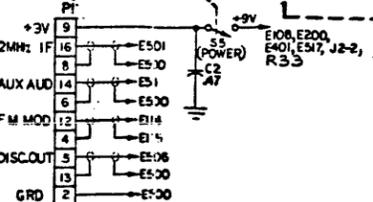


- NOTES: UNLESS OTHERWISE SPECIFIED
- ALL RESISTORS ARE IN OHMS, $\pm 10\%$, 1/4 W
 - ALL TRANSISTORS ARE 2N3904
 - ALL CAPACITORS ARE IN MICROFARADS
 - Ⓜ DENOTES FACTORY SELECTED VALUE
 - VOLTAGES REFERENCED TO CHASSIS GROUND WHILE MEASURING A SIGNAL DEVIATED $\pm 5\text{KHz}$ AT 1KHz (OPERATE).
 - SAME AS [5] EXCEPT UNDER (OVERLOAD) CONDITION.
 - VOLTAGES WITHOUT TOLERANCE ARE FOR REFERENCE ONLY.
 - VOLTAGES WITHOUT WAVEFORMS ARE DC.
 - RMS VOLTAGE MEASURED WITH VOM BETWEEN PIN E415 AND E416. CAUTION: THESE PINS ARE AT A HIGH DC POTENTIAL.

Figure 5-30 — Schematic Diagram Model ODM-1



LAST REF DES USED				REF DES NOT USED			
		VI	SS	DS3	R15, Q17	C4	
CR103	U102				E119	C18, 110, 112	CR101, 112
CR407	L401				E2:4	R206, 207	C203
CR504	L506	U501			E522	R518 - 520, 546 - 550, 559, 560, 576, 585, 586	C506, 520, 523, 550, 554 - 560

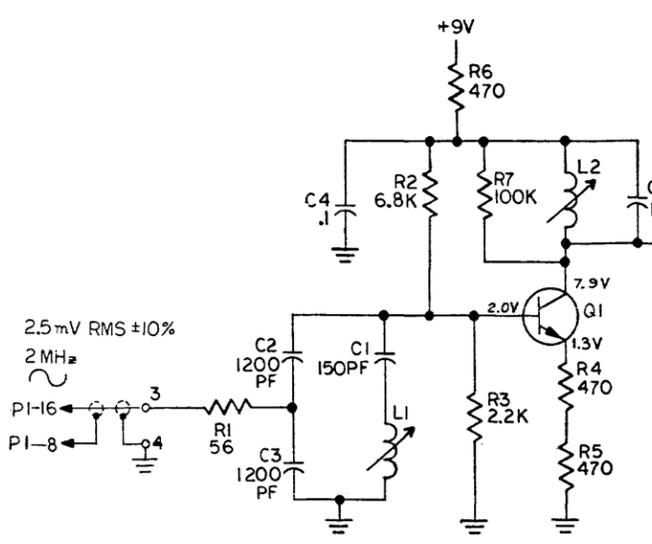


- NOTES: UNLESS OTHERWISE SPECIFIED
- ALL RESISTORS ARE IN OHMS, 10%, 1/4W
 - ALL TRANSISTORS ARE 2N3904
 - ALL CAPACITORS ARE IN MICROFARADS
 - * DENOTES FACTORY SELECTED VALUE
 - VOLTAGES REFERENCED TO CHASSIS GROUND WHILE MEASURING AT SIGNAL DEVIATED 5KHz AT 1KHz (OPERATE).
 - SAME AS [] EXCEPT UNDER (OVERLOAD) CONDITION.
 - VOLTAGES WITHOUT TOLERANCE ARE FOR REFERENCE ONLY.
 - VOLTAGES WITHOUT WAVEFORMS ARE DC.
 - RMS VOLTAGE MEASURED WITH VOM BETWEEN PIN E415 AND E416. CAUTION: THESE PINS ARE AT A HIGH DC POTENTIAL.

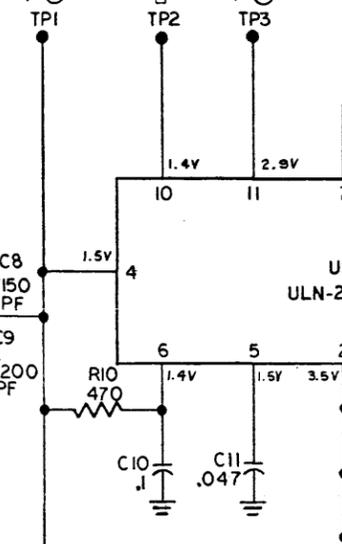
Figure 5-30. Schematic Diagram Model ODM-1 Dwg. No. 4-501376-001(A)

LIMITER-DISCRIMINATOR

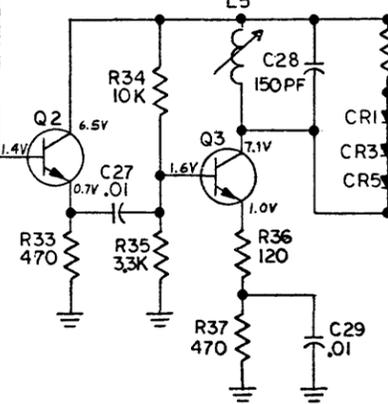
2 MHz IF FILTER AMPLIFIER



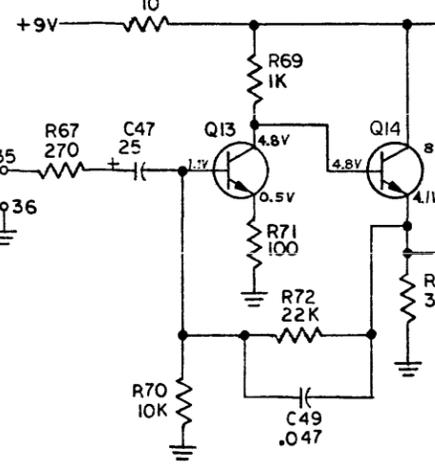
20mVp-p 1.4Vp-p 750mVp-p



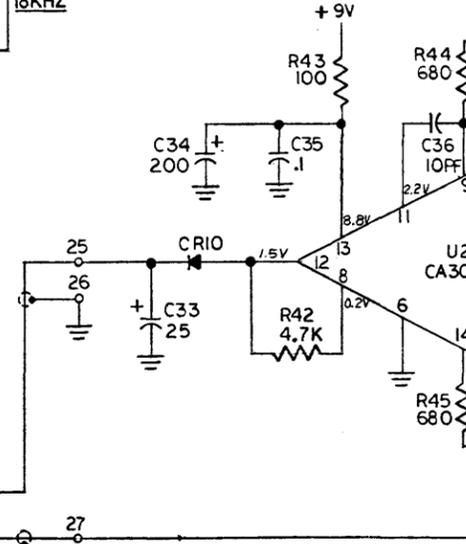
THRESHOLD AMPLIFIER



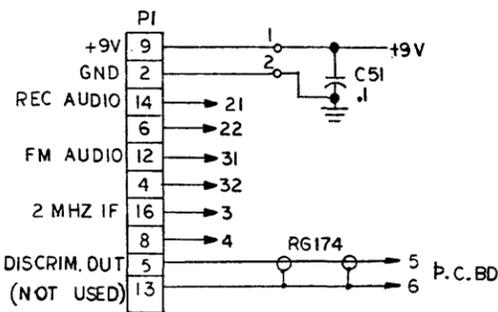
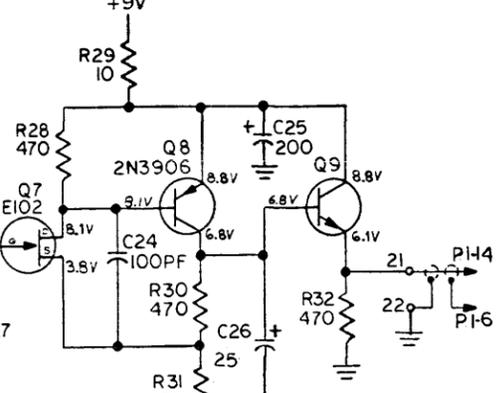
1KHz DRIVER AMPLIFIER



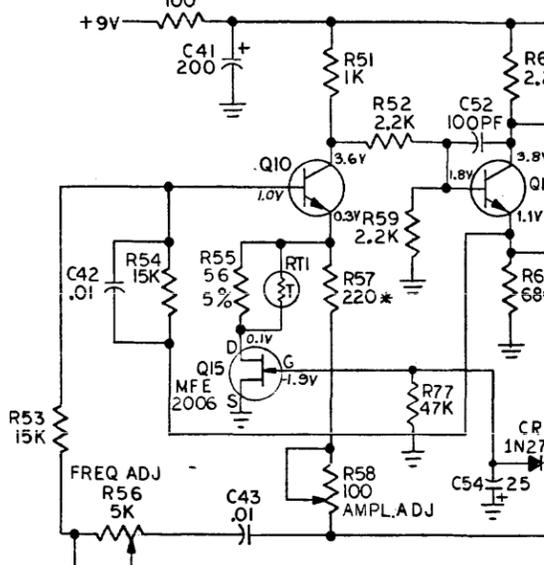
PEAK DETECTOR



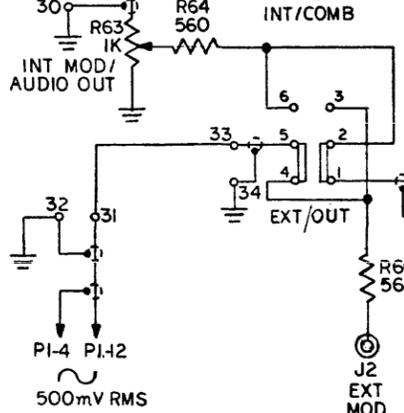
RECOVERED AUDIO AMPLIFIER



MODULATION OSCILLATOR



S4 MOD INT/COMB



LAST REF DES USED

- C54
- R78
- Q15
- S4
- CR12

- NOTES. UNLESS OTHERWISE SPECIFIED:
1. PARTIAL REF DES ARE SHOWN; FOR COMPLETE DES PREFIX WITH ASSY NO A1, EXAMPLE AIR1
 2. ALL RES ARE IN OHMS, ±10%, 1/4W.
 3. ALL CAP ARE IN MICROFARADS.
 4. ALL TRANSISTORS ARE 2N3904.
 5. ALL DIODES ARE IN4148.
 6. *INDICATES FACTORY SELECTED VALUE.
 7. VOLTAGES REFERENCED TO CHASSIS GND, WHILE MEASURING A SIGNAL DEVIATED 5KHz AT 1KHz RATE.
 8. VOLTAGES WITHOUT TOLERANCES ARE FOR REFERENCE ONLY.
 9. VOLTAGES WITHOUT WAVEFORMS ARE DC

Figure 5-31 - Schematic Diagram Model MDM-1

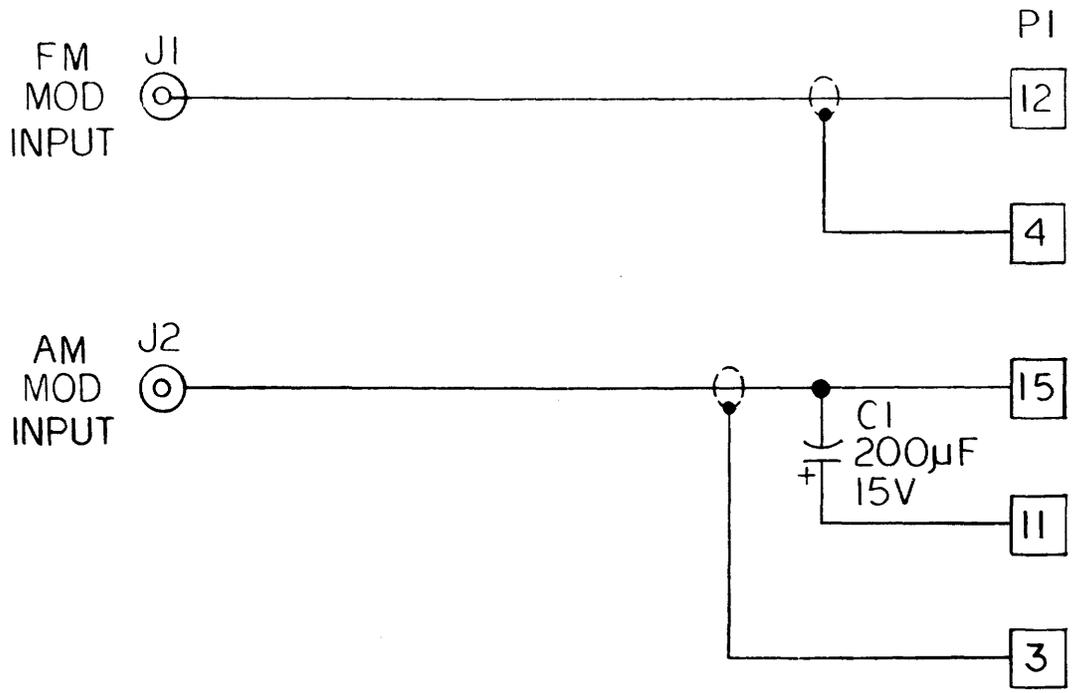


Figure 5-32 – Schematic Diagram
Model AFM-1

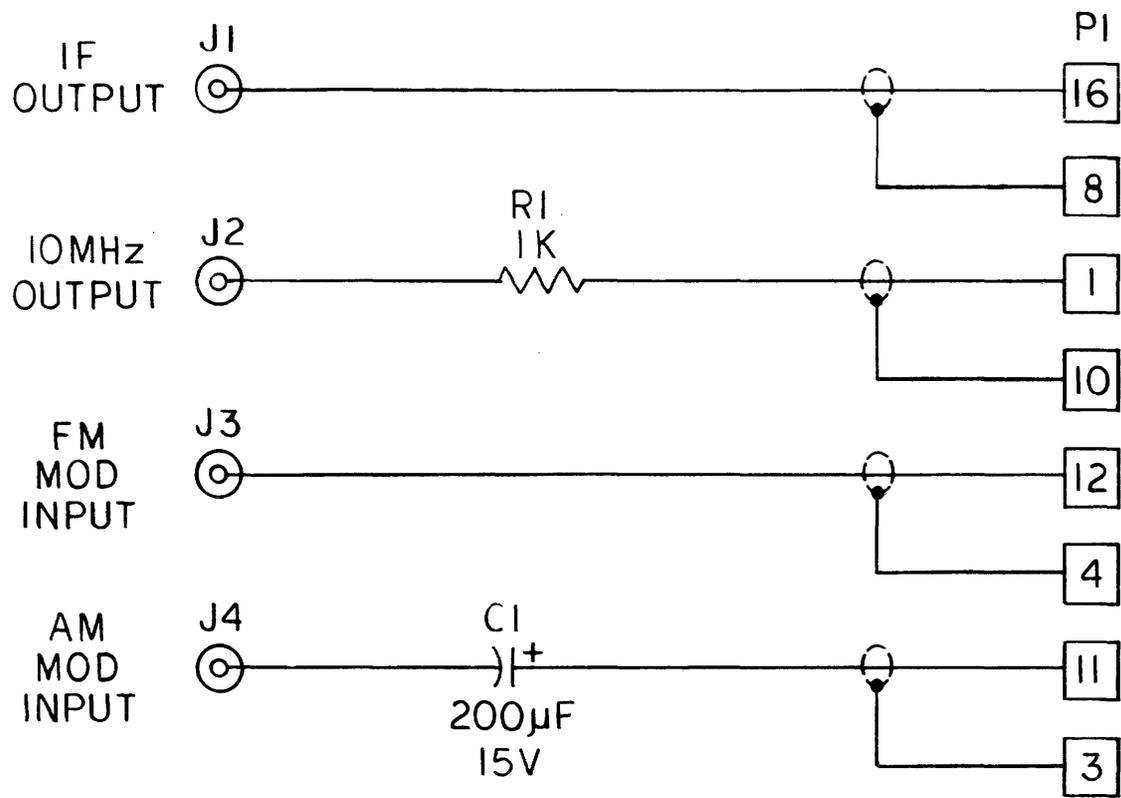
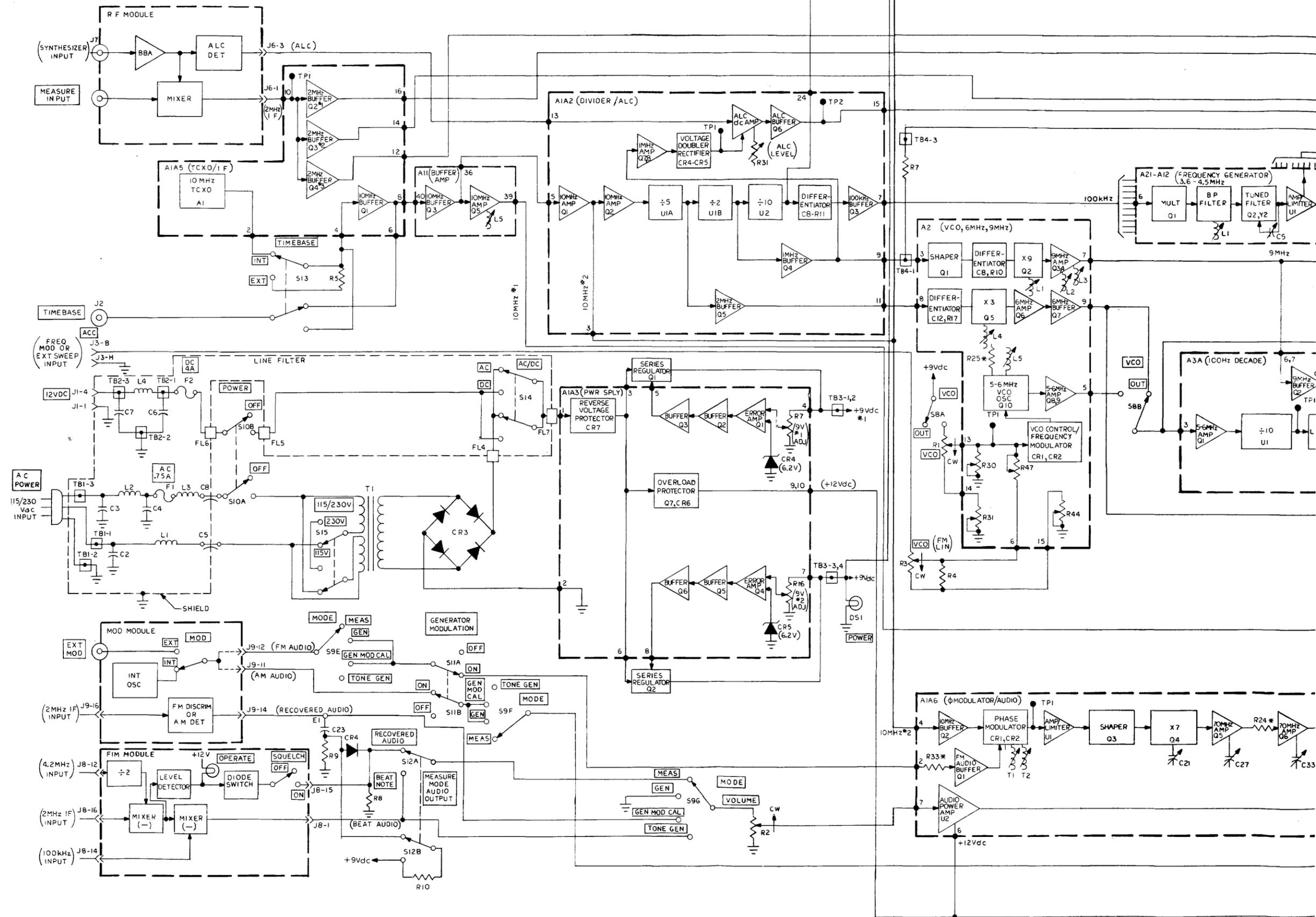
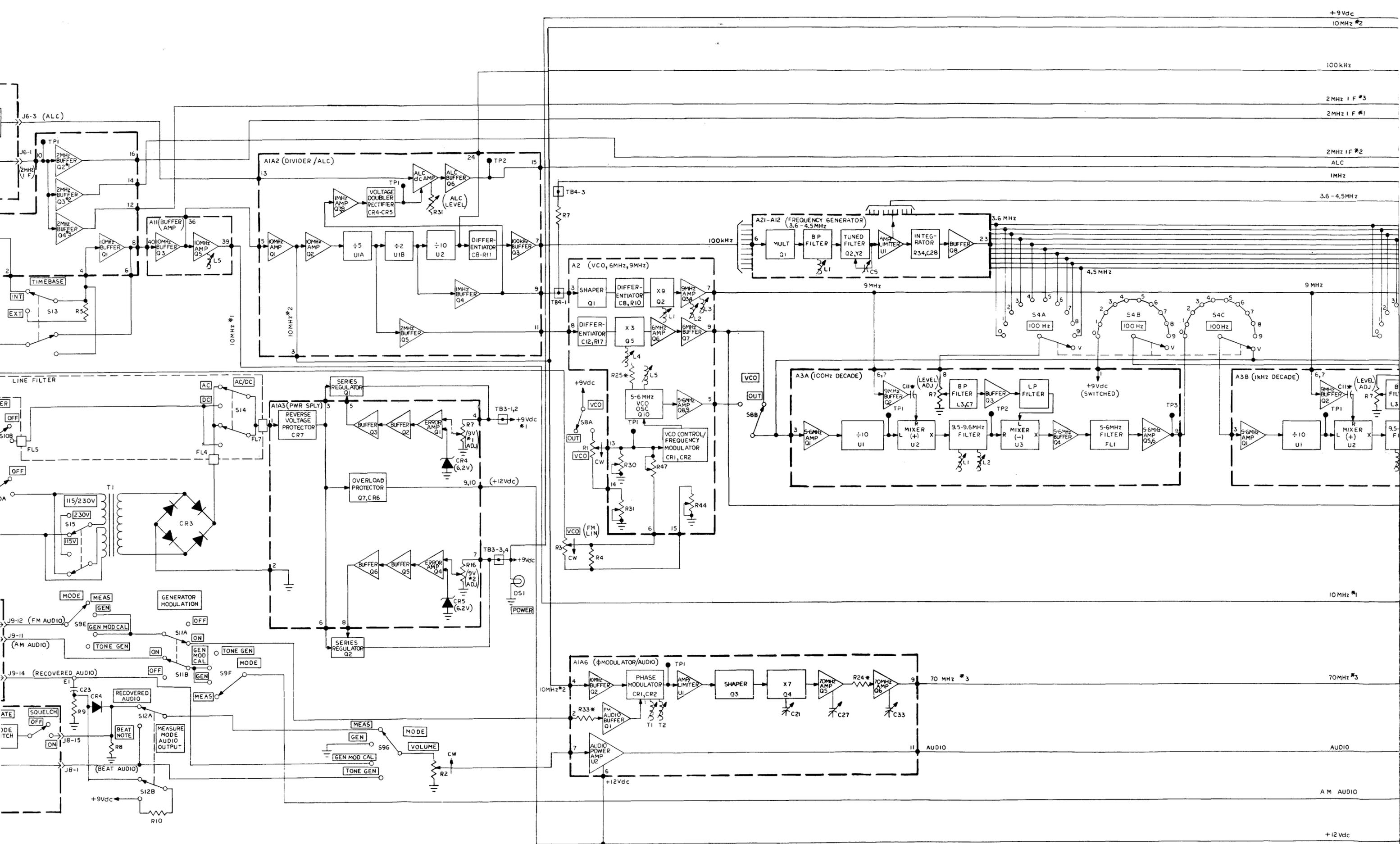


Figure 5-33 – Schematic Diagram
Model AFM-2





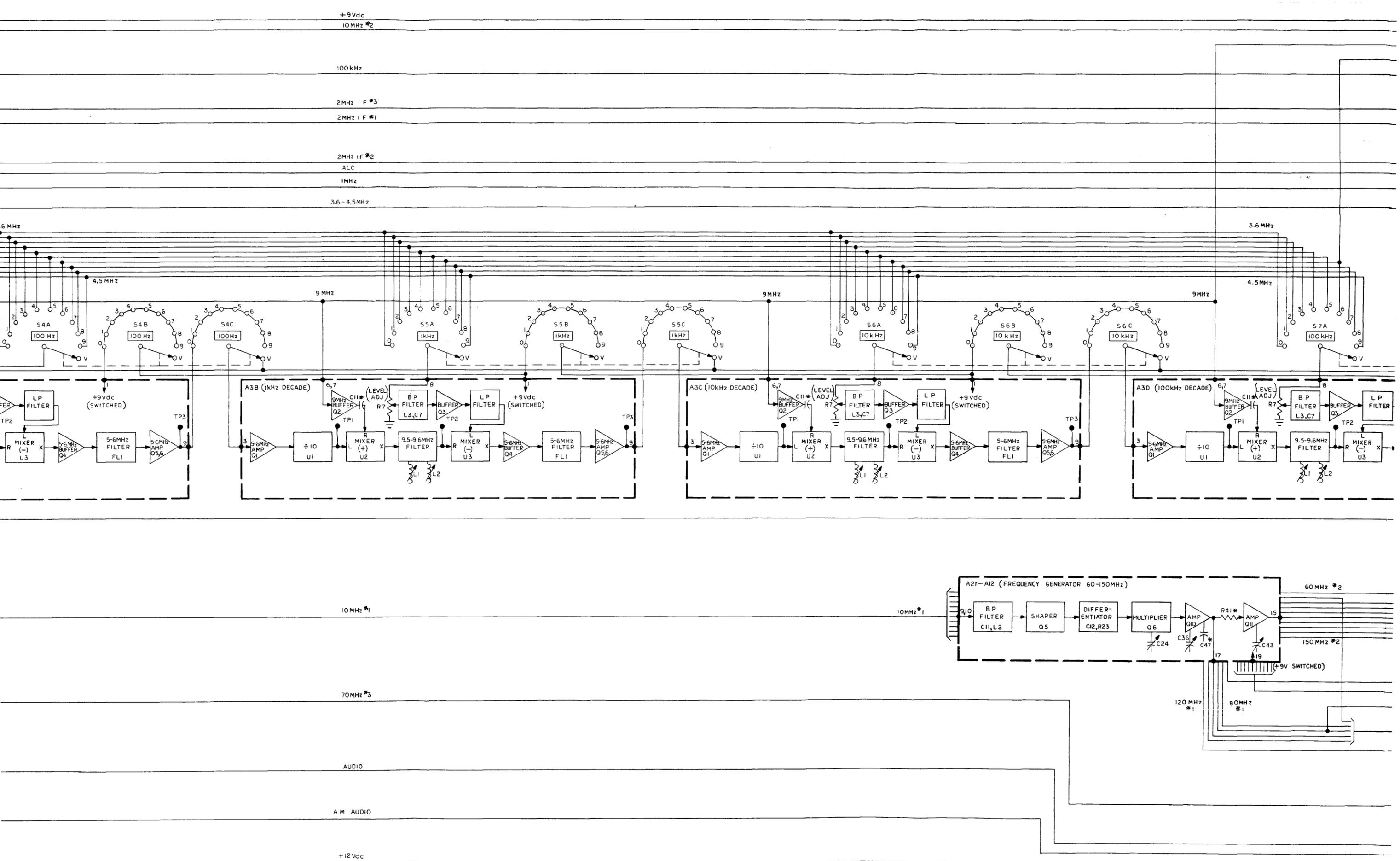
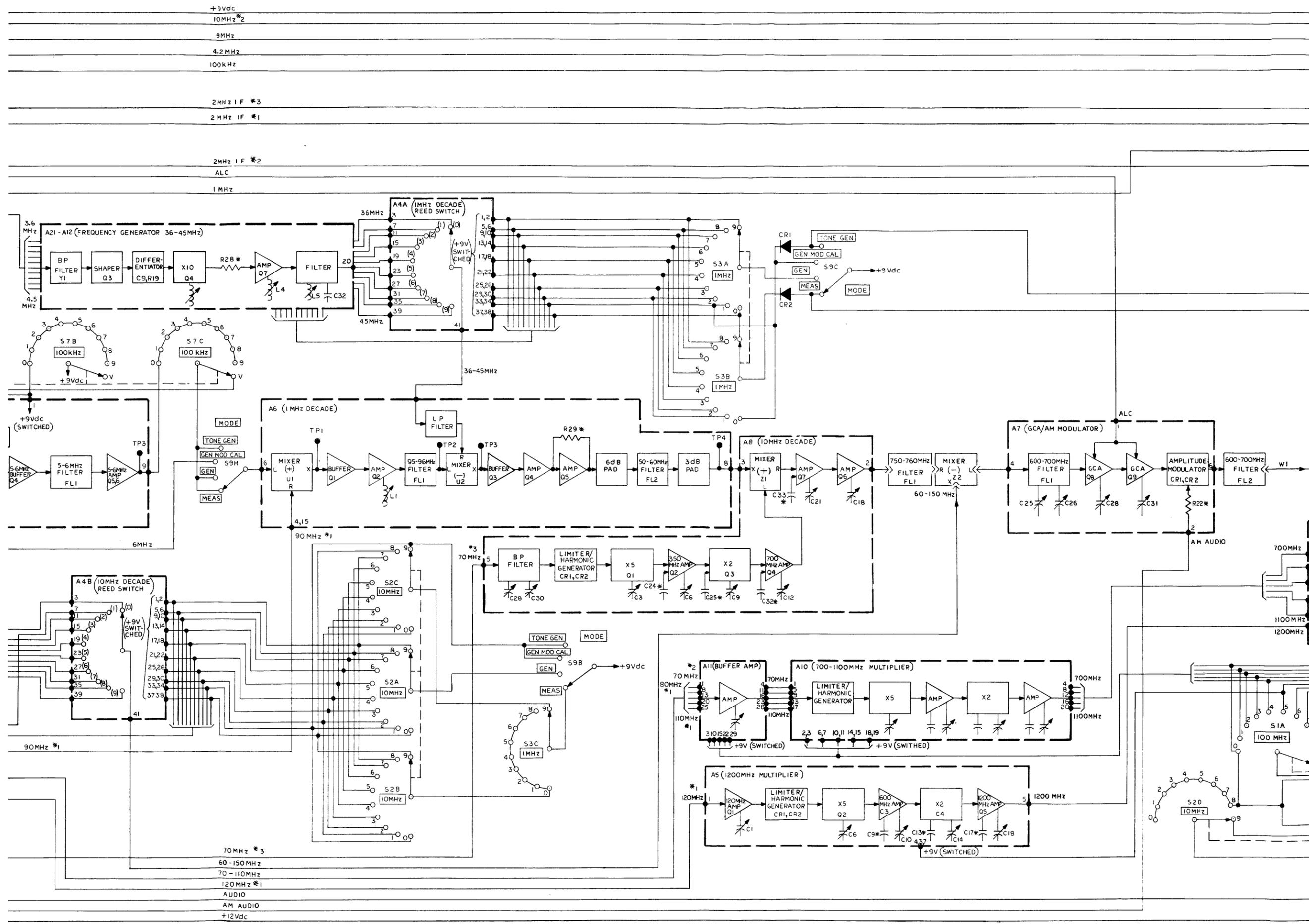


Figure 5-34 - Detailed Block Diagram Model FM-10C



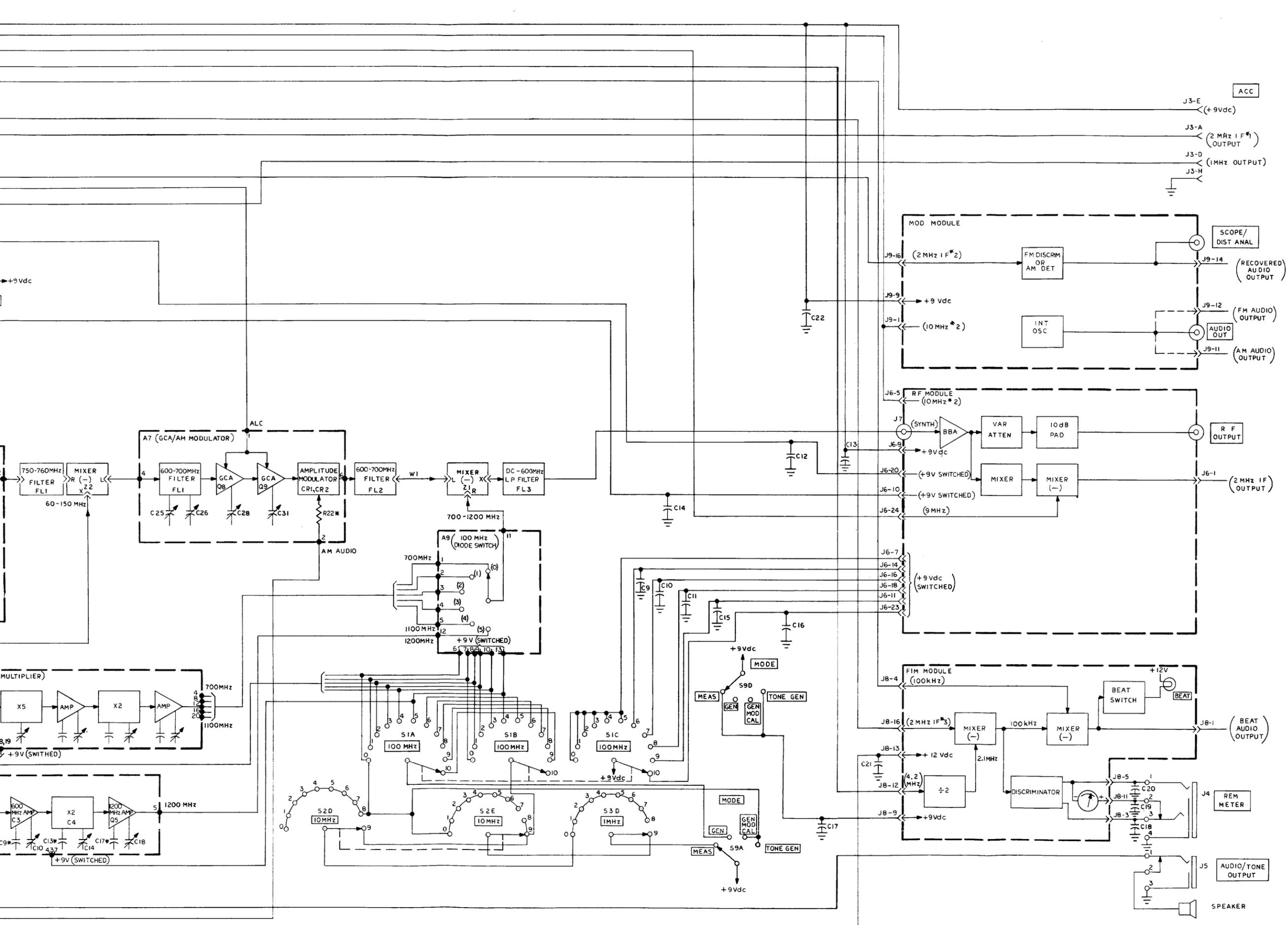
+9Vdc
 10MHz *2
 9MHz
 4.2MHz
 100kHz
 2MHz IF *3
 2MHz IF *1
 2MHz IF *2
 ALC
 1MHz

70MHz *3
 60-150MHz
 70-110MHz
 120MHz *1
 AUDIO
 AM AUDIO
 +12Vdc

700MHz
 1100MHz
 1200MHz

100MHz

100MHz



NOTE - EACH PLUG IN MODULE SIMPLIFIED BLOCK DIAGRAM IS SHOWN AT BOTH SIDES OF THE DRAWING FOR EASE IN UNDERSTANDING THE THEORY OF OPERATION.

FIG 5-34
DETAILED BLOCK DIAGRAM
MODEL FM-10C

Figure 5-34 - Detailed Block Diagram
Model FM-10C

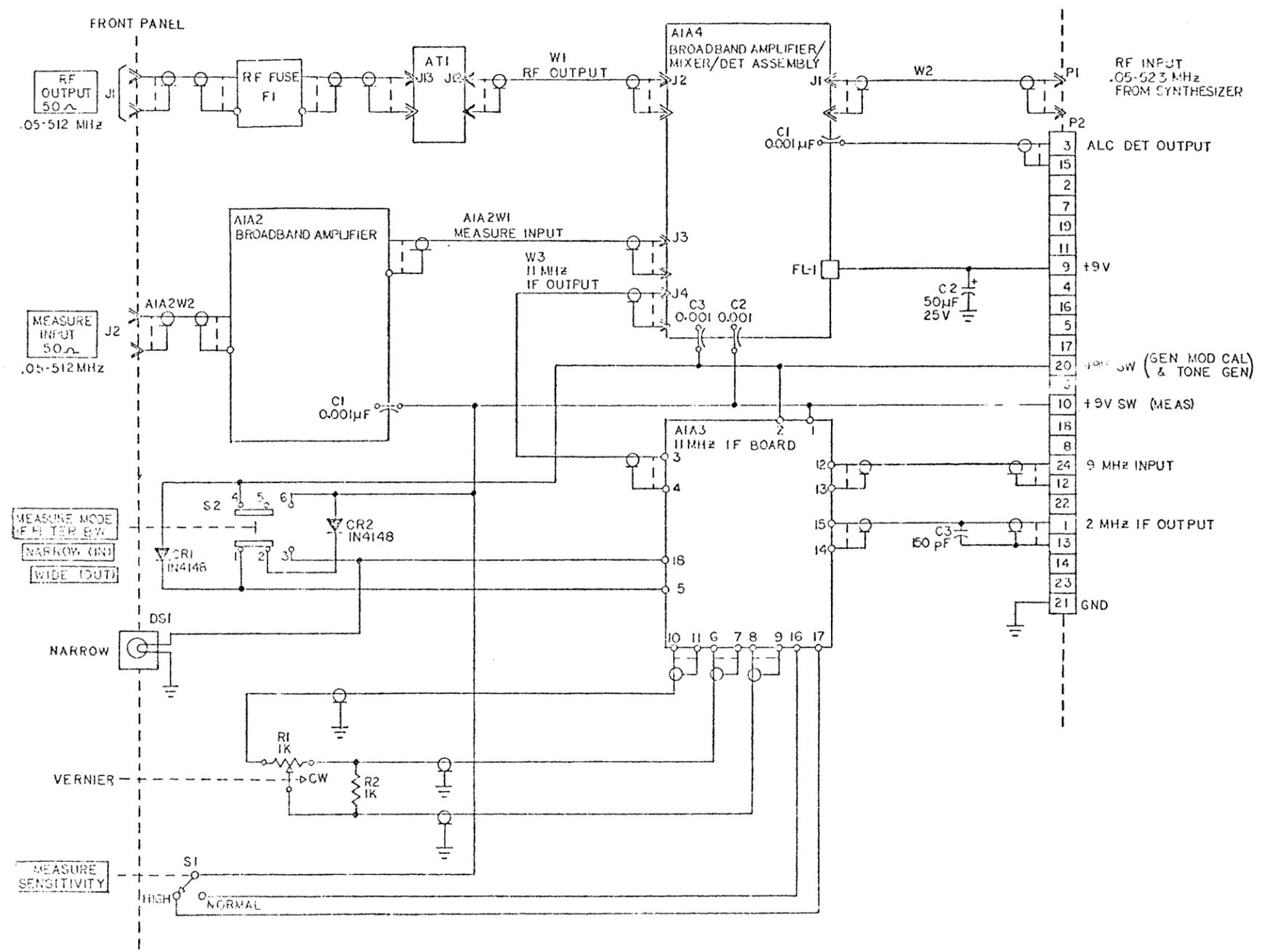
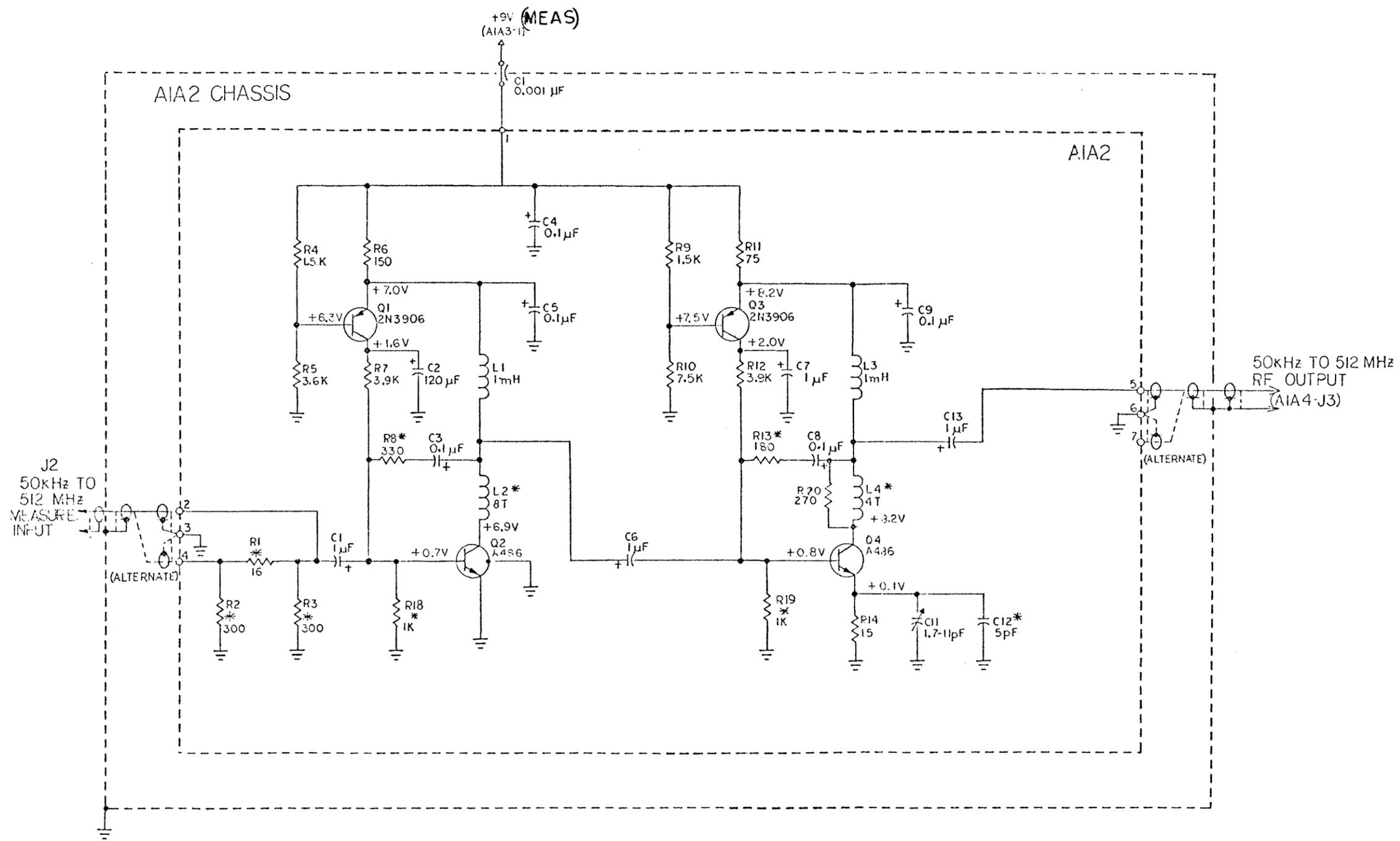


Figure 5-35. Wiring Diagram Model RFM-10D

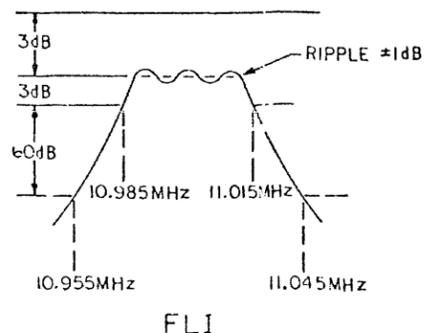
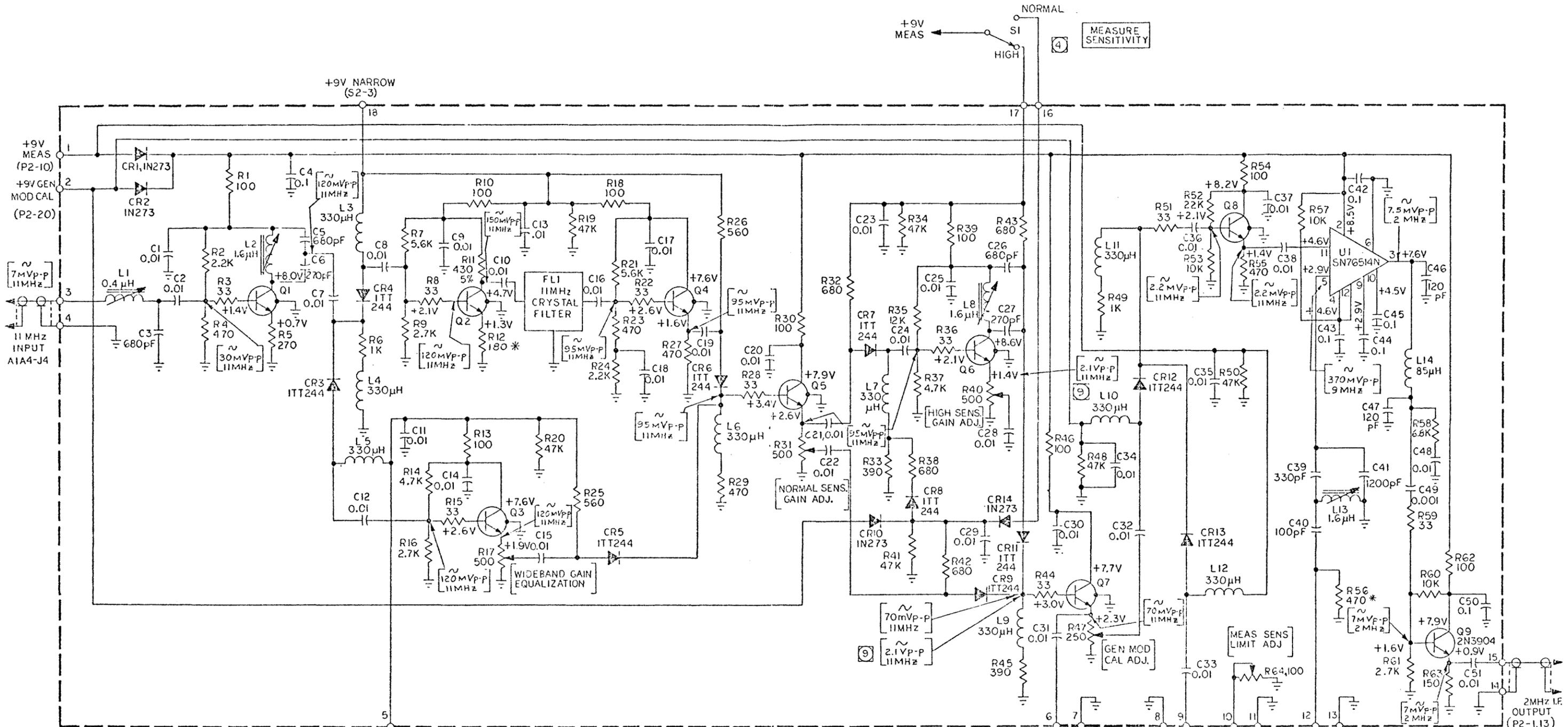


LAST REF DESIGNATION USED			
C13	L4	Q4	R20
DESIGNATIONS OMITTED			
C10			

5. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED.
 4. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 3. PARTIAL REFERENCE DESIGNATORS SHOWN (A1A2 BOARD). FOR COMPLETE DESIGNATION, PREFIX WITH ASSY NO. A1A2; EXAMPLE "A1A2C3".
 2. * DENOTES FACTORY SELECT VALUE; MAY BE OMITTED.
 1. ALL RESISTOR VALUES ARE IN OHMS, 5%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

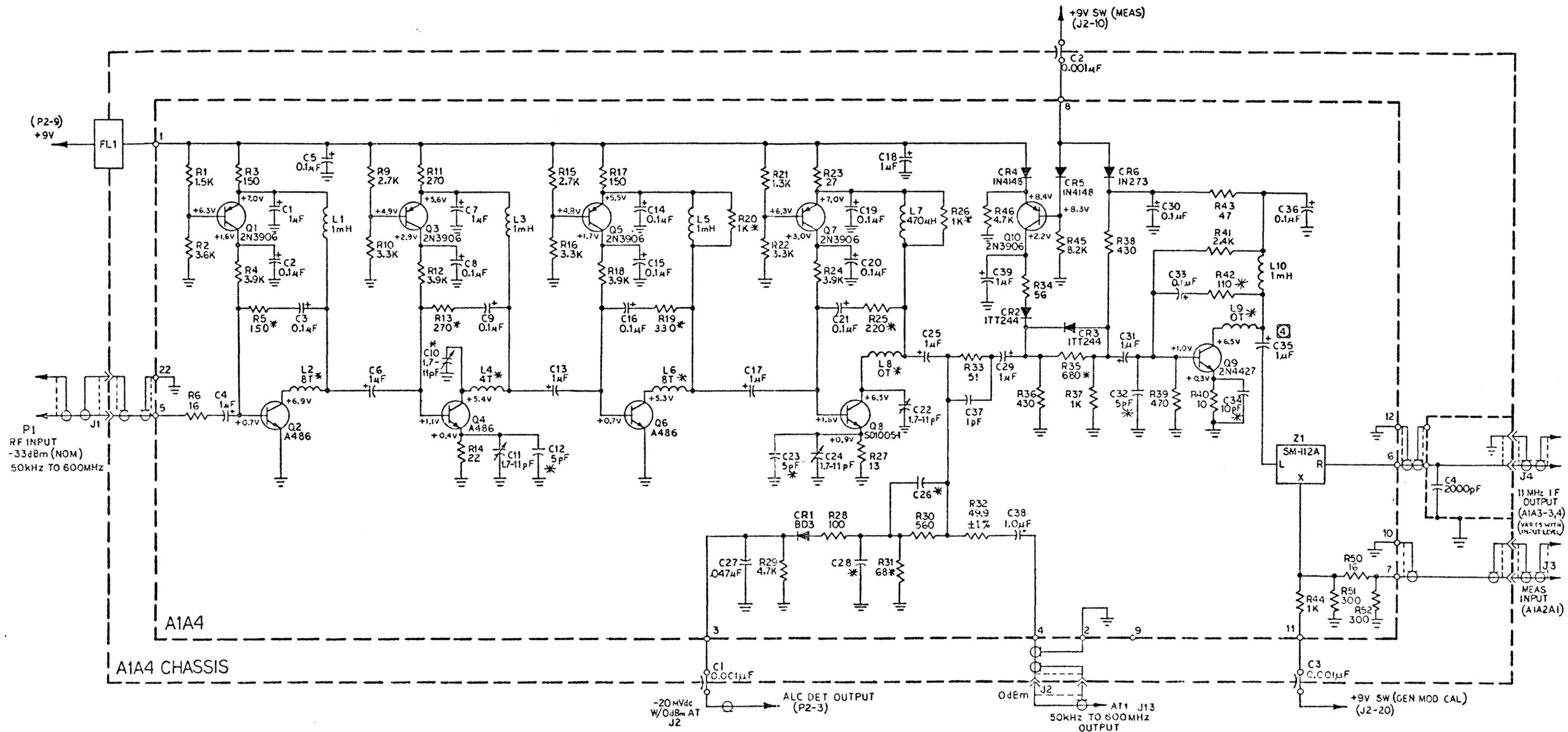
Figure 5-36. Schematic Diagram
 Broadband Amplifier, A1A2
 Model RFM-10D



- ⑨ SAME AS ⑦ EXCEPT MEASURE SENSITIVITY SWITCH SET AT HIGH.
- 8. * INDICATES FACTORY SELECTED VALUE.
- ⑦ LEVEL PRESENT WITH 20m Vrms AT MEASURE INPUT JACK J2 AND MEASURE SENSITIVITY SWITCH SET AT NORMAL AND VERNIER FULL CCW.
- 6. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND FM-10C MODE SWITCH IN EITHER MEAS, GEN MOD CAL, OR TONE GEN POSITION.
- 5. ALL VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- ④ FRONT PANEL COMPONENTS SHOWN FOR REFERENCE.
- 3. ALL TRANSISTORS ARE 2N5179.
- 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 5-37. Schematic Diagram 11 MHz and 2 MHz IF Amplifier, A1A3 Model RFM-10D



6. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INT. TIME BASE)
5. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
4. TO BE LEFT OFF AT ASSEMBLY & INSTALLED DURING TEST.
3. PARTIAL REFERENCE DESIGNATORS SHOWN (A1A4 BOARD). FOR COMPLETE DESIGNATION, PREFIX WITH ASSY NO. "A1A4." EXAMPLE: A1A4C3.
2. * DENOTES FACTORY SELECT VALUE, MAY BE OMITTED.
1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 5\%$, 1/4W.

Figure 5-38. Schematic Diagram
Broadband Amplifier and Doubly
Balanced Mixer, A1A4,
Model RFM-10D

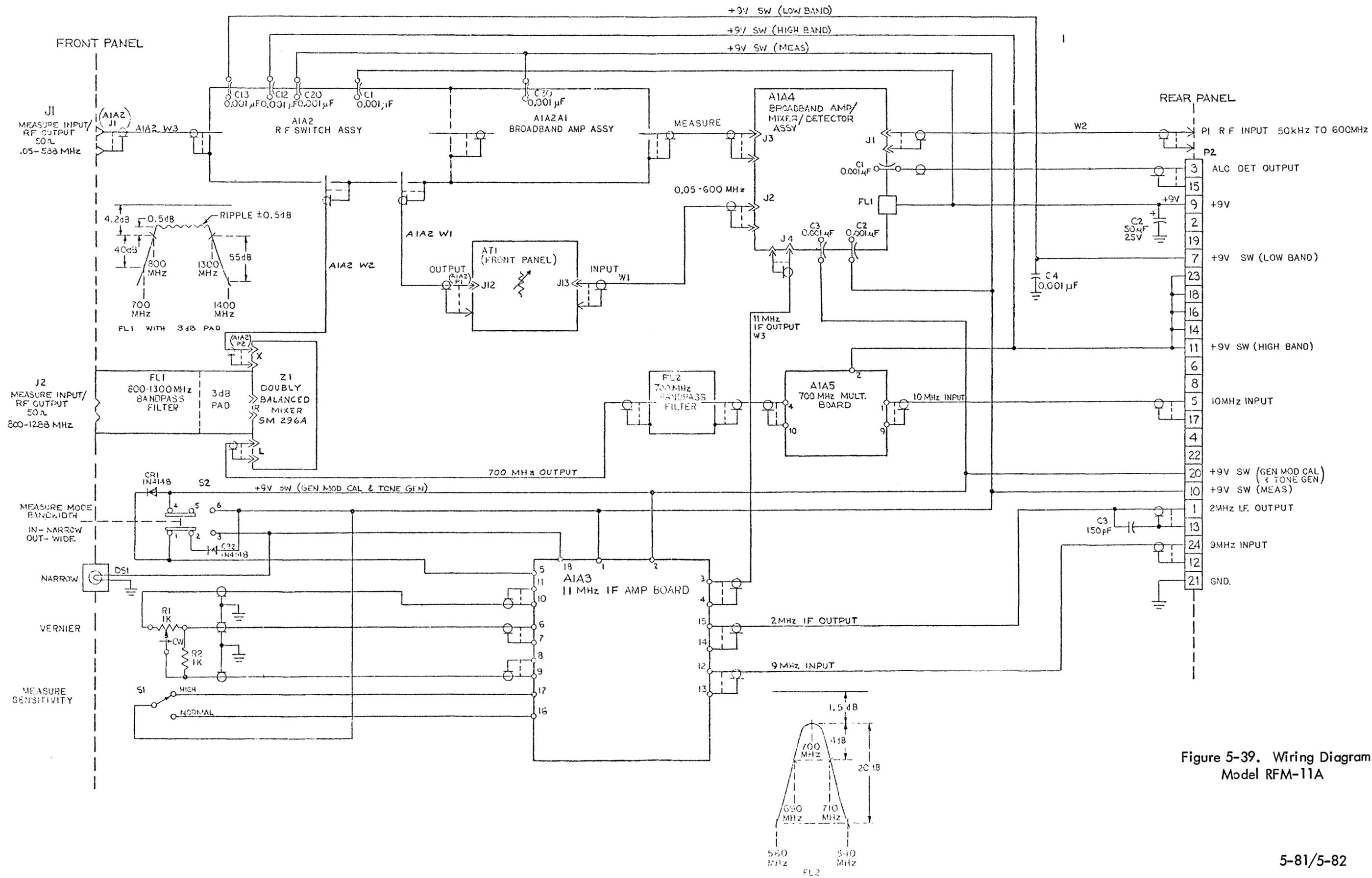
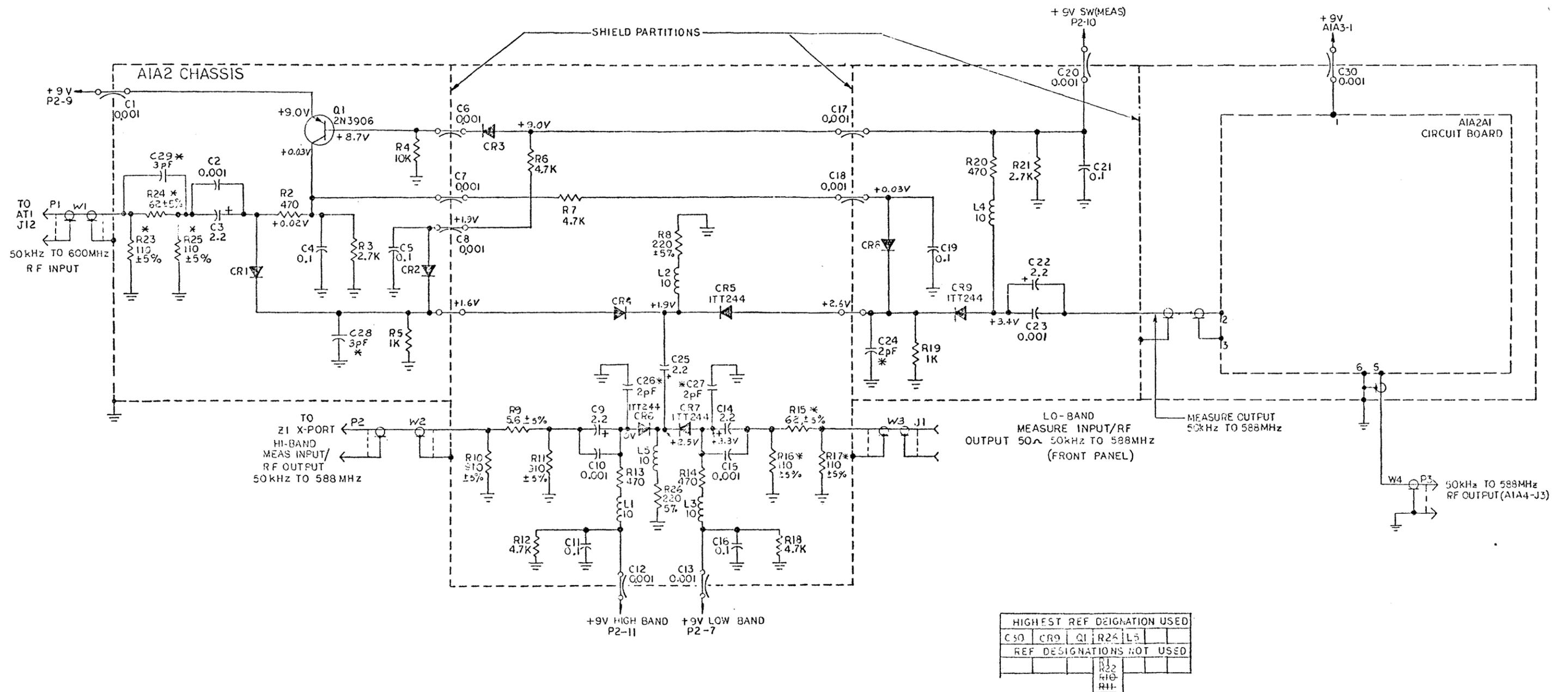
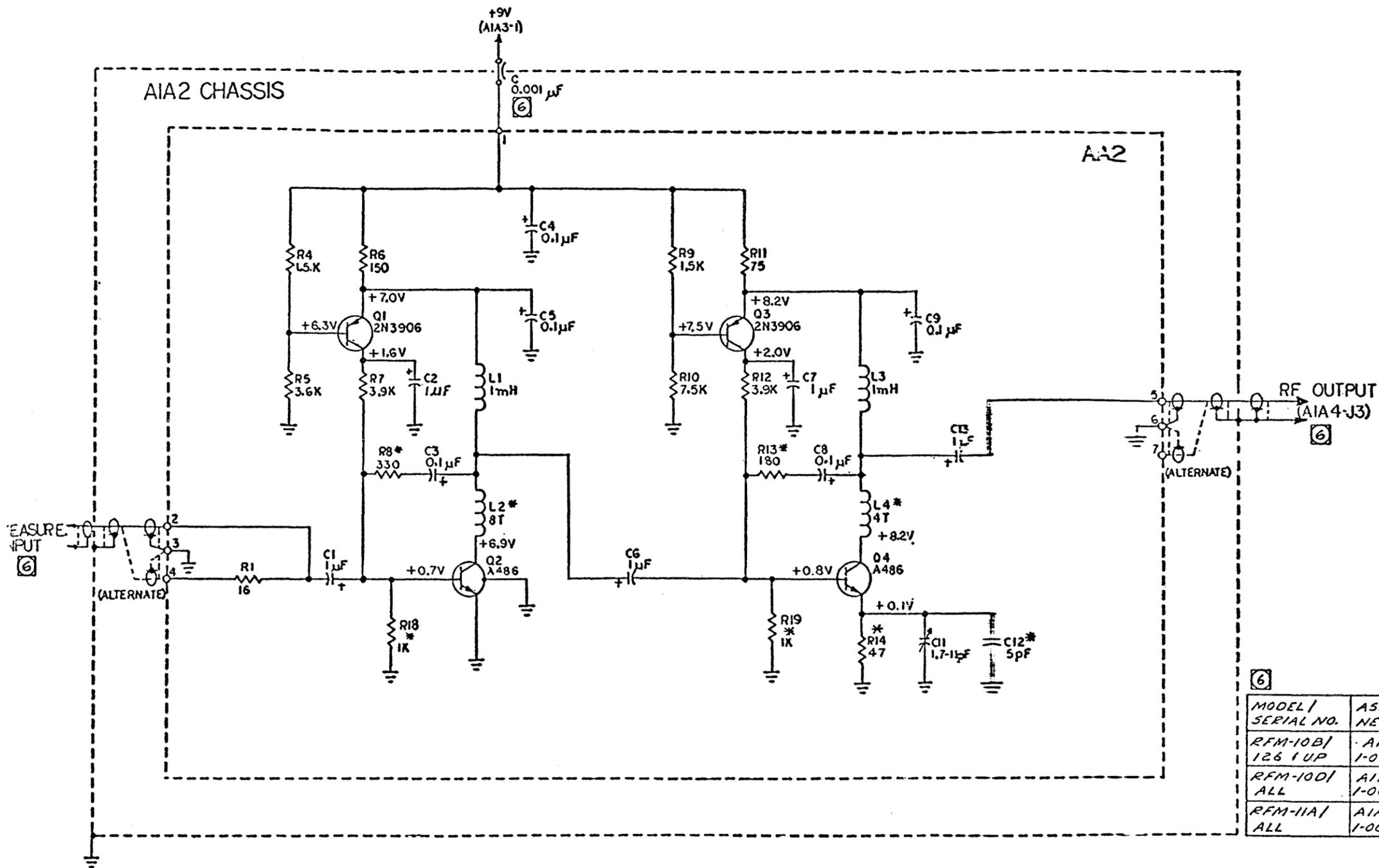


Figure 5-39. Wiring Diagram Model RFM-11A



ALL COILS ARE IN MICRohenRIES
 * INDICATES SELECTED VALUE
 ALL D.C. VOLTAGES TAKEN WITH NO SIGNALS
 A-FIELD & F-ACC MODE SWITCH IN THE MEAS
 POSITION AND TIME SWITCH IN POSITION 0 THRU 5. (DISABLE INTERNAL TIME BASE)
 VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL
 ALL DIODES ARE 1N273.
 ALL CAPACITORS ARE IN MICROFARADS.
 ALL RESISTORS ARE IN OHMS, 5% TOL. 1/4W.
 SERIAL REFERENCE DESIGNATIONS ARE SHOWN
 BY LETTERS DESIGNATION PREFIX
 AND UNIT NUMBER DESIGNATION(S).
 UNLESS OTHERWISE SPECIFIED

Figure 5-40. Schematic Diagram
 RF Switch and Broadband Amplifier,
 A1A2, Model RFM-11A

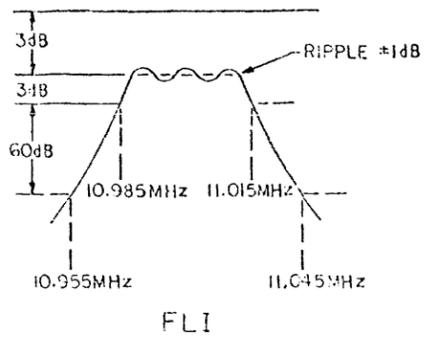
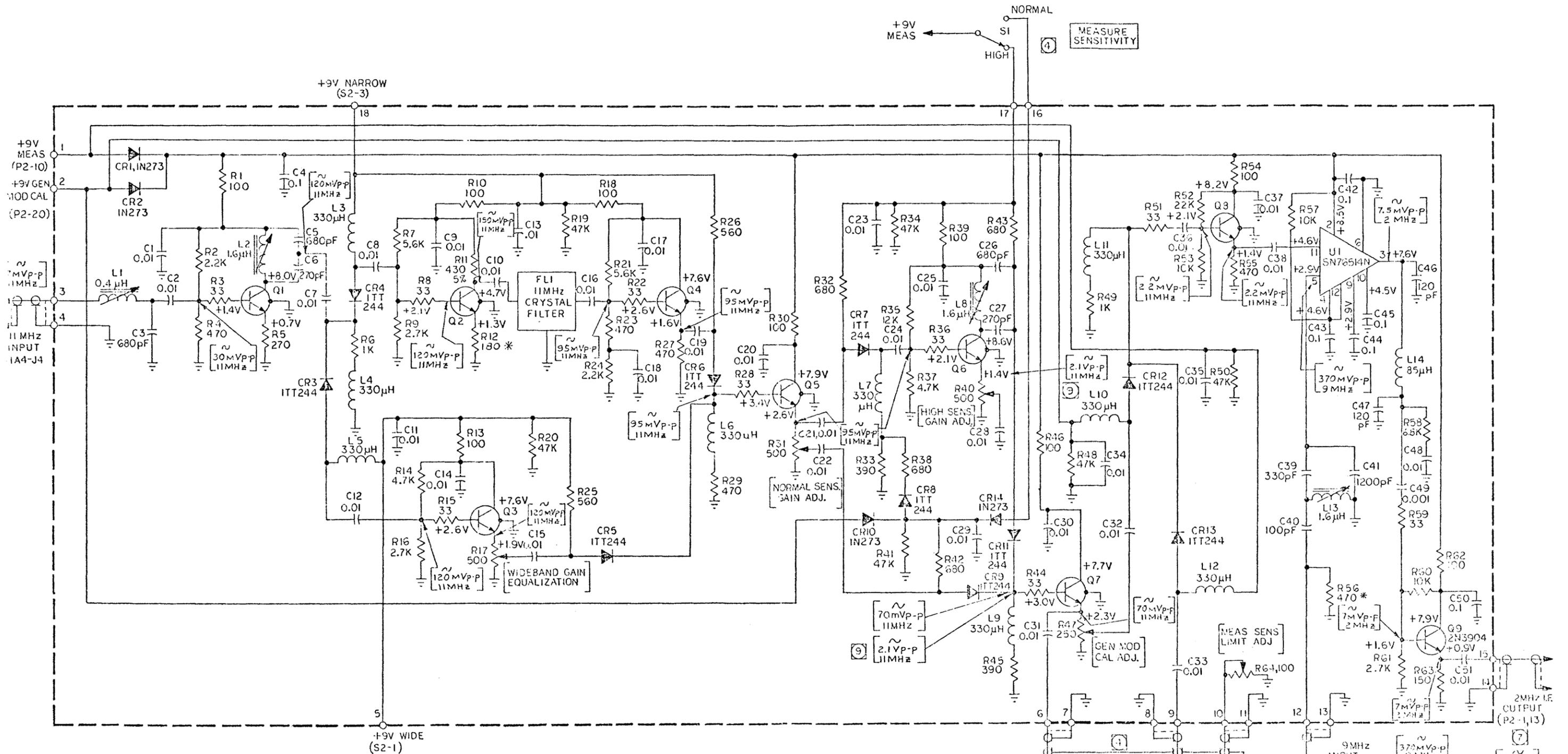


MODEL / SERIAL NO.	ASSY. NO. / NEXT ASSY.	PINS 413	PINS 516.	PIN 1
RFM-10B / 126 1UP	AIA2 / 1-004904-001	TO J2	0.05-512MHz	AIA2-C1
RFM-10D / ALL	AIA2 / 1-004891-001	TO J2	0.05-512MHz	AIA2-C1
RFM-11A / ALL	AIA2A1 / 1-004675-001	TO AIA2-C22,23	0.05-588MHz	AIA2-C30

LAST REF DESIGNATION USED			
C13	L4	Q4	R19
DESIGNATIONS OMITTED			
C10			R15,16,17

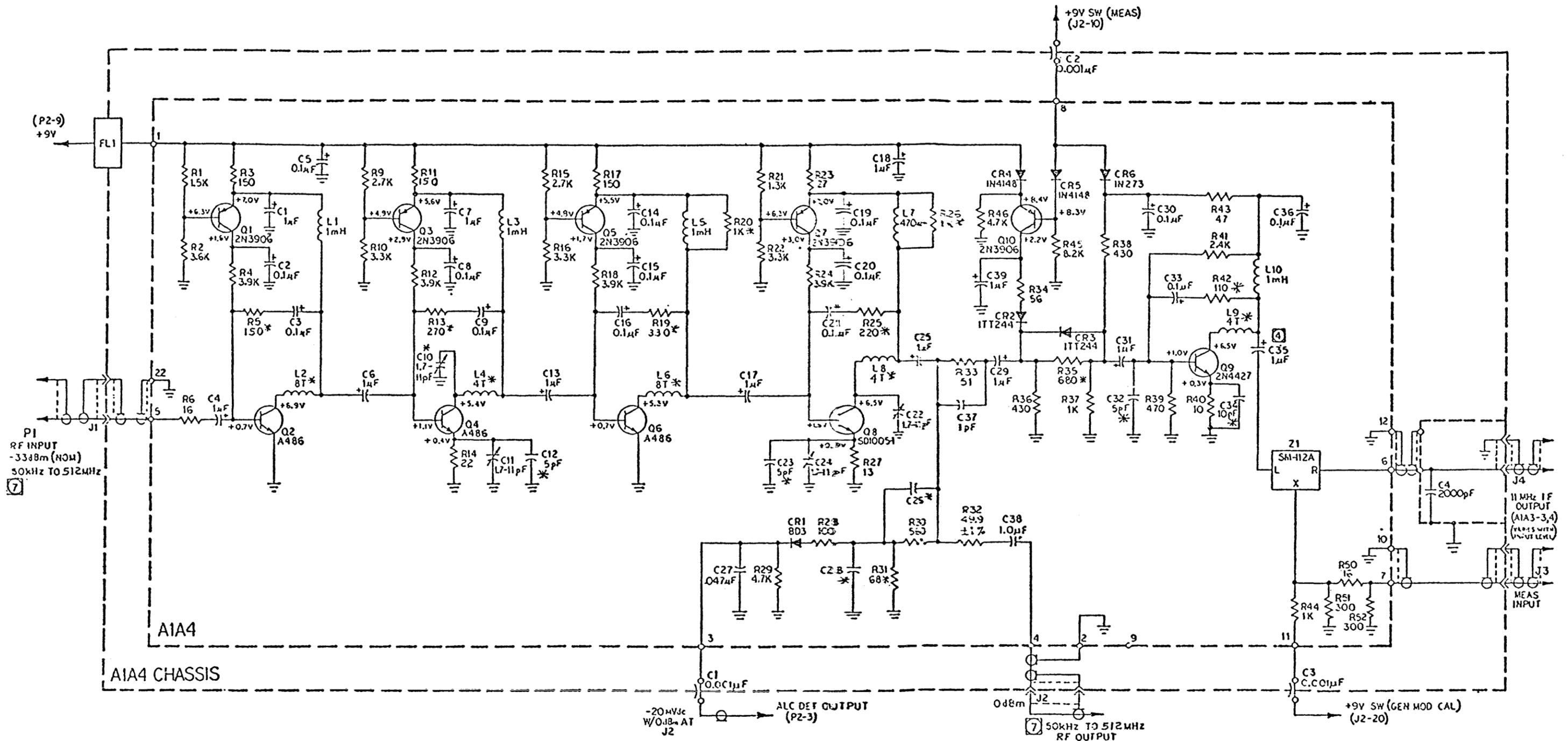
Figure 5-41. Schematic Diagram Broadband Amplifier, AIA2A1 Model RFM-11A

6 SEE TABULATION FOR ROUTING, REF. DESG. AND FREQUENCY RANGE.
 5-ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED.
 4-VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 3-PARTIAL REFERENCE DESIGNATORS SHOWN (AIA2 BOARD). FOR COMPLETE DESIGNATION, PREFIX WITH ASSY. NO. 'AIA2'; EXAMPLE 'AIA2C3'.
 2-* DENOTES FACTORY SELECT VALUE; MAY BE OMITTED.
 1-ALL RESISTOR VALUES ARE IN OHMS, 5%, 1/4W.
 NOTES: UNLESS OTHERWISE SPECIFIED



- 1) SAME AS 17) EXCEPT MEASURE SENSITIVITY SWITCH SET AT HIGH.
- 2) * INDICATES FACTORY SELECTED VALUE.
- 3) LEVEL PRESENT WITH 20m Vrms AT MEASURE INPUT JACK J2 AND MEASURE SENSITIVITY SWITCH SET AT NORMAL AND VERNIER FULL CCW.
- 4) ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND FM-10C MODE SWITCH IN EITHER MEAS, GEN MOD CAL, OR TONE GEN POSITION.
- 5) ALL VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- 6) FRONT PANEL COMPONENTS SHOWN FOR REFERENCE.
- 7) ALL TRANSISTORS ARE 2N5179.
- 8) ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 9) ALL RESISTOR VALUES ARE IN OHMS, 10K, 1/4 W.
- 10) UNLESS OTHERWISE SPECIFIED

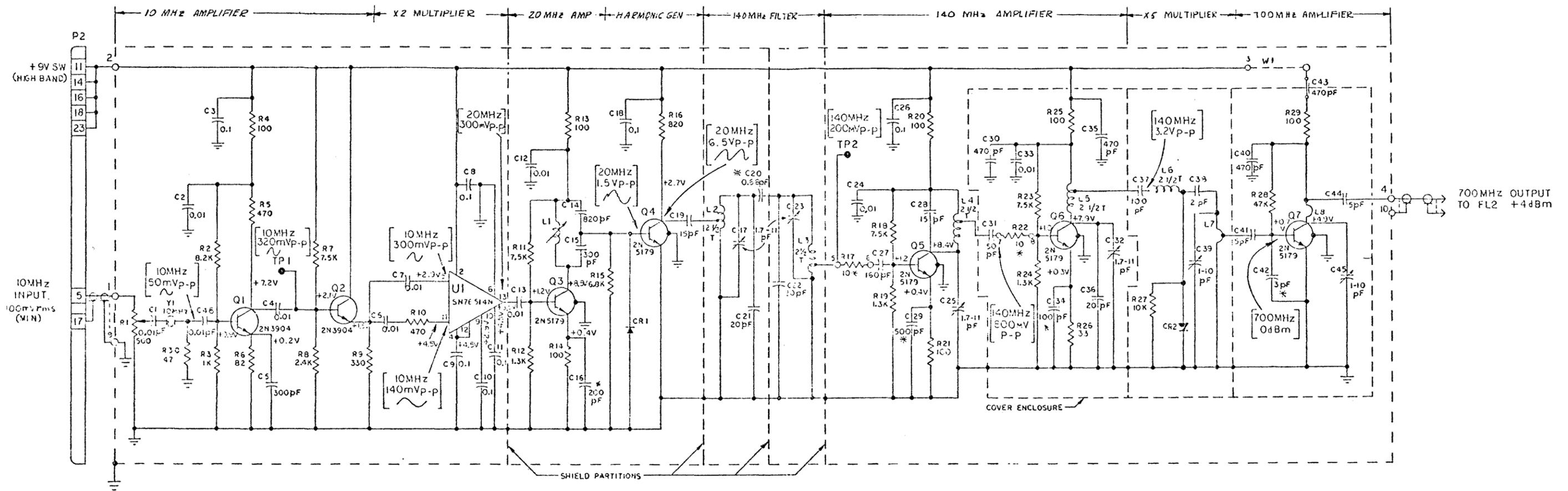
Figure 5-42. Schematic Diagram 11 MHz and 2 MHz IF Amplifier, A1A3, Model RFM-11A



- 7 RFM-11A FREQUENCY RESPONSE (50KHZ TO 600MHZ).
6. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INT. TIME BASE)
 5. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 - 4 TO BE LEFT OFF AT ASSEMBL & INSTALLED DURING TEST.
 3. PARTIAL REFERENCE DESIGNATORS SHOWN (A1A4 BOARD). FOR COMPLETE DESIGNATION, PREFIX WITH ASSY NO. "A1A4." EXAMPLE: A1A4C3.
 2. * DENOTES FACTORY SELECT VALUE, MAY BE OMITTED.
 1. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W.

TABULATION BLOCK	
MODEL NO.	SER NO.
RFM-10A	501 FUP
RFM-10B	126 FUP
RFM-10D	ALL
RFM-11A	ALL

Figure 5-43. Schematic Diagram
Broadband Amplifier and Doubly Balanced Mixer, A1A4
Model RFM-11A



HIGHEST REF DES USED					
R30	C46	Q7	L8	U1	CR2
NOT USED					

6. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN FOR COMPLETE DESIGNATION. PREFIX WITH UNIT NO. OR SUBASSEMBLY DESIGNATION(S).

5. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL (FM-100 100MHz SWITCH IN POSITIONS 8 THRU 12.)

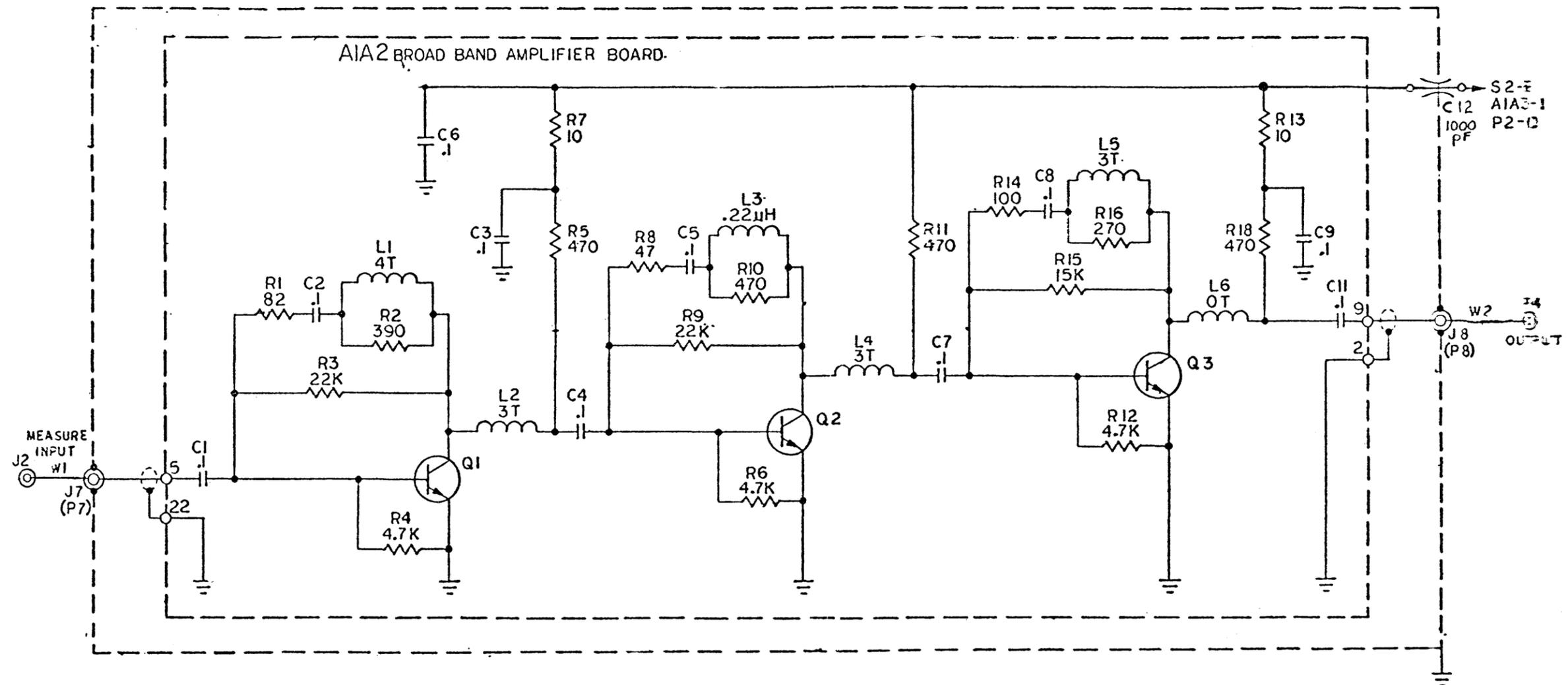
4. DIODES ARE 1TT244.

3. * INDICATES NOMINAL VALUE, EXACT VALUE DETERMINED AT TEST.

2. CAPACITOR VALUES IN MICROFARADS

1. RESISTOR VALUES IN OHMS, ±5%, ¼W

Figure 5-44. Schematic Diagram
700 MHz Multiplier, A1A5
Model RFM-11A



LAST REF DES USED

L6	R18
C11	Q3

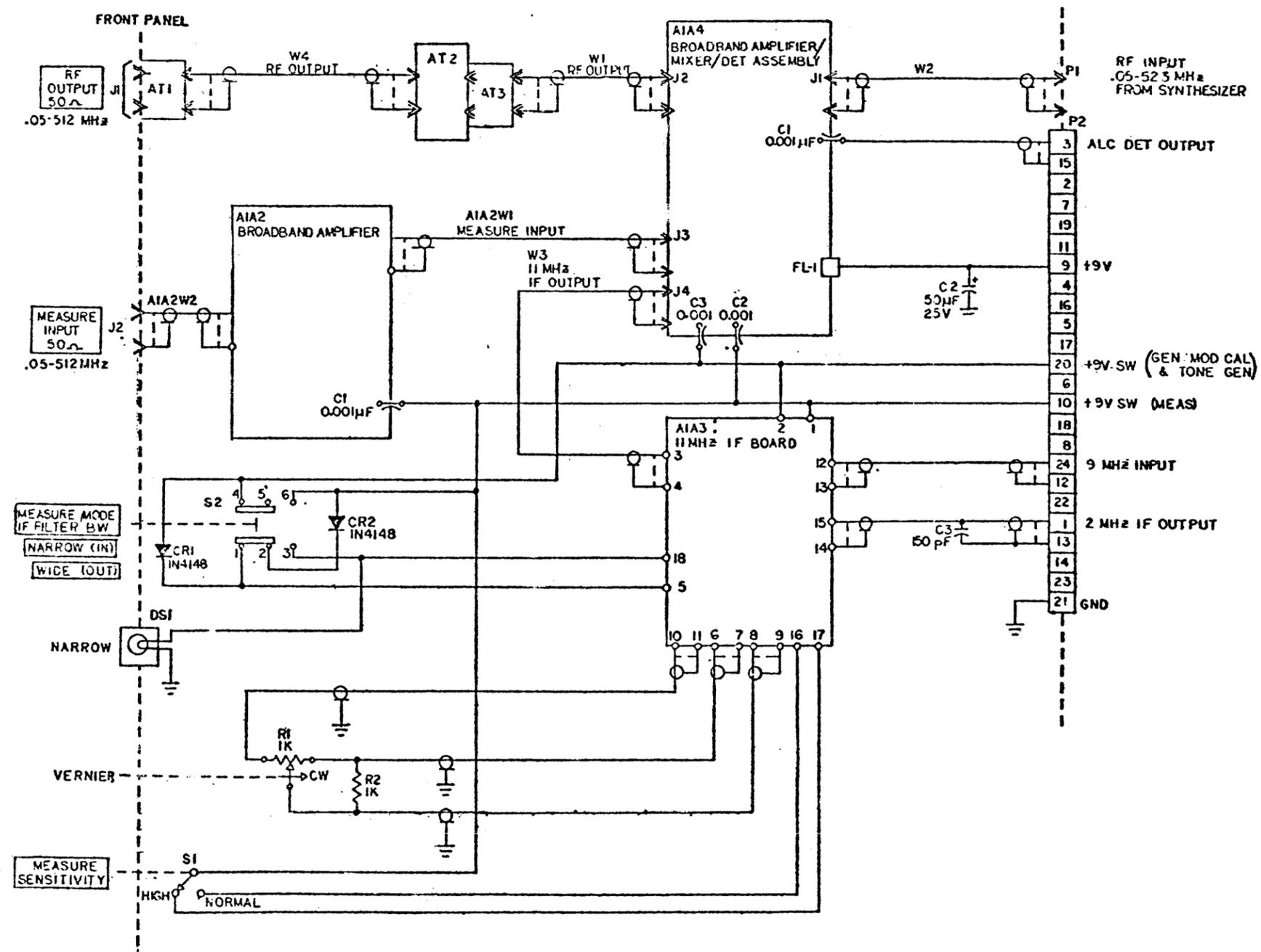
REF DES NOT USED

C10	R17
-----	-----

5. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH ASSY NO.
- 4.
3. ALL TRANSISTORS ARE 2N5179'S
2. ALL CAPACITOR VALUES ARE IN MICROFARADS, 200V
1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4W

NOTES: UNLESS OTHERWISE SPECIFIED

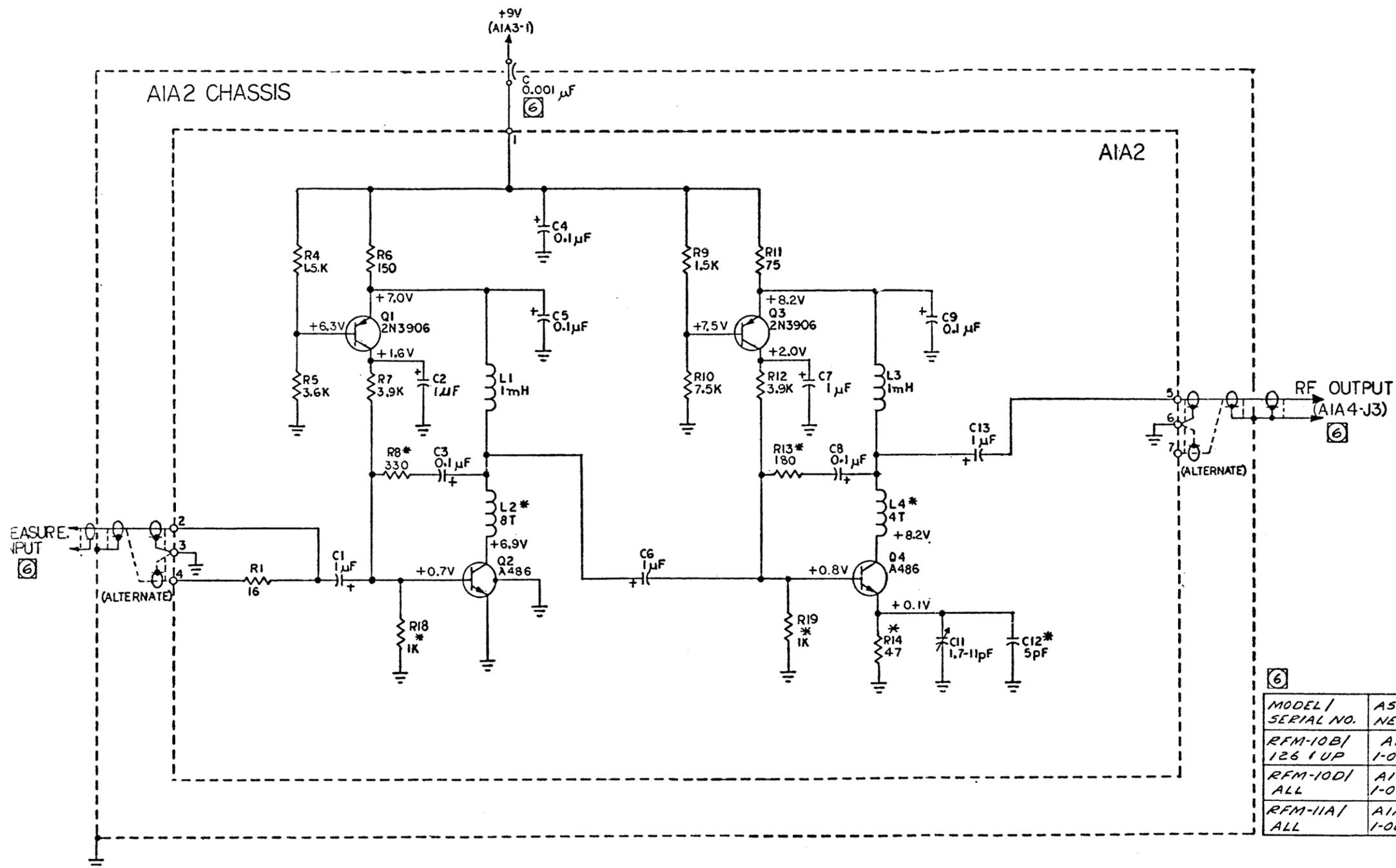
Figure 5-45. Schematic Diagram, Broadband Amplifier, AIA2 Model RFM-10B



Effective RFM-10A serial number: 501 and above.

Effective RFM-10B serial number: 126 and above.

Figure 5-46. Wiring Diagram
Model RFM-10A and RFM-10B



⑥

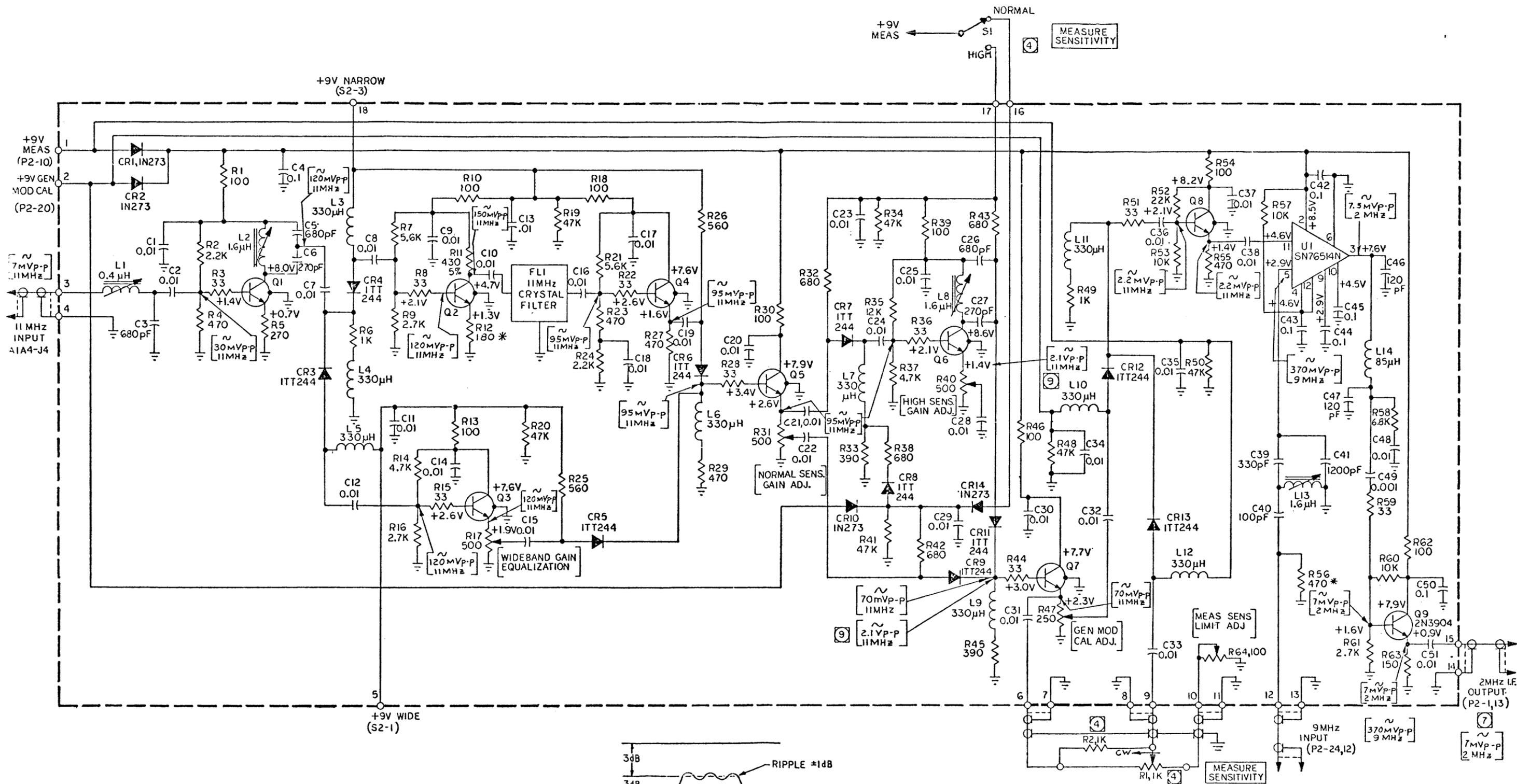
LAST REF DESIGNATION USED			
C13	L4	Q4	R19
DESIGNATIONS OMITTED			
C10			R15,16,17

NOTE: This assembly is only in the RFM-10B.

Figure 5-47. Schematic Diagram Broadband Amplifier, AIA2
Model RFM-10A/RFM-10B

- ⑥ SEE TABULATION FOR ROUTING, REF. DESG. AND FREQUENCY RANGE.
- 5. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED.
- 4. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- 3. PARTIAL REFERENCE DESIGNATORS SHOWN (AIA2 BOARD). FOR COMPLETE DESIGNATION, PREFIX WITH ASSY NO "AIA2"; EXAMPLE "AIA2C3".
- 2. * DENOTES FACTORY SELECT VALUE; MAY BE OMITTED.
- 1. ALL RESISTOR VALUES ARE IN OHMS, ± 5%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED



- ⑨ SAME AS ⑦ EXCEPT MEASURE SENSITIVITY SWITCH SET AT HIGH.
- 8. * INDICATES FACTORY SELECTED VALUE.
- ⑦ LEVEL PRESENT WITH 20m Vrms AT MEASURE INPUT JACK J2 AND MEASURE SENSITIVITY SWITCH SET AT NORMAL AND VERNIER FULL CCW
- 6. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED AND FM-10C MCDE SWITCH IN EITHER MEAS, GEN MOD CAL, OR TONE GEN POSITION.
- 5: ALL VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
- ④ FRONT PANEL COMPONENTS SHOWN FOR REFERENCE.
- 3. ALL TRANSISTORS ARE 2N5179.
- 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
- 1. ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

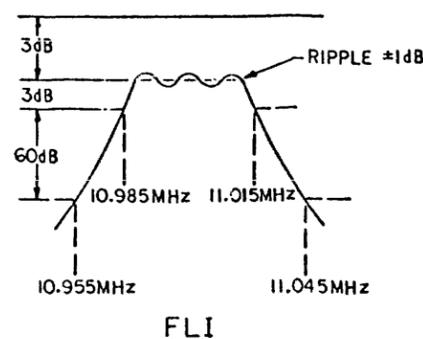
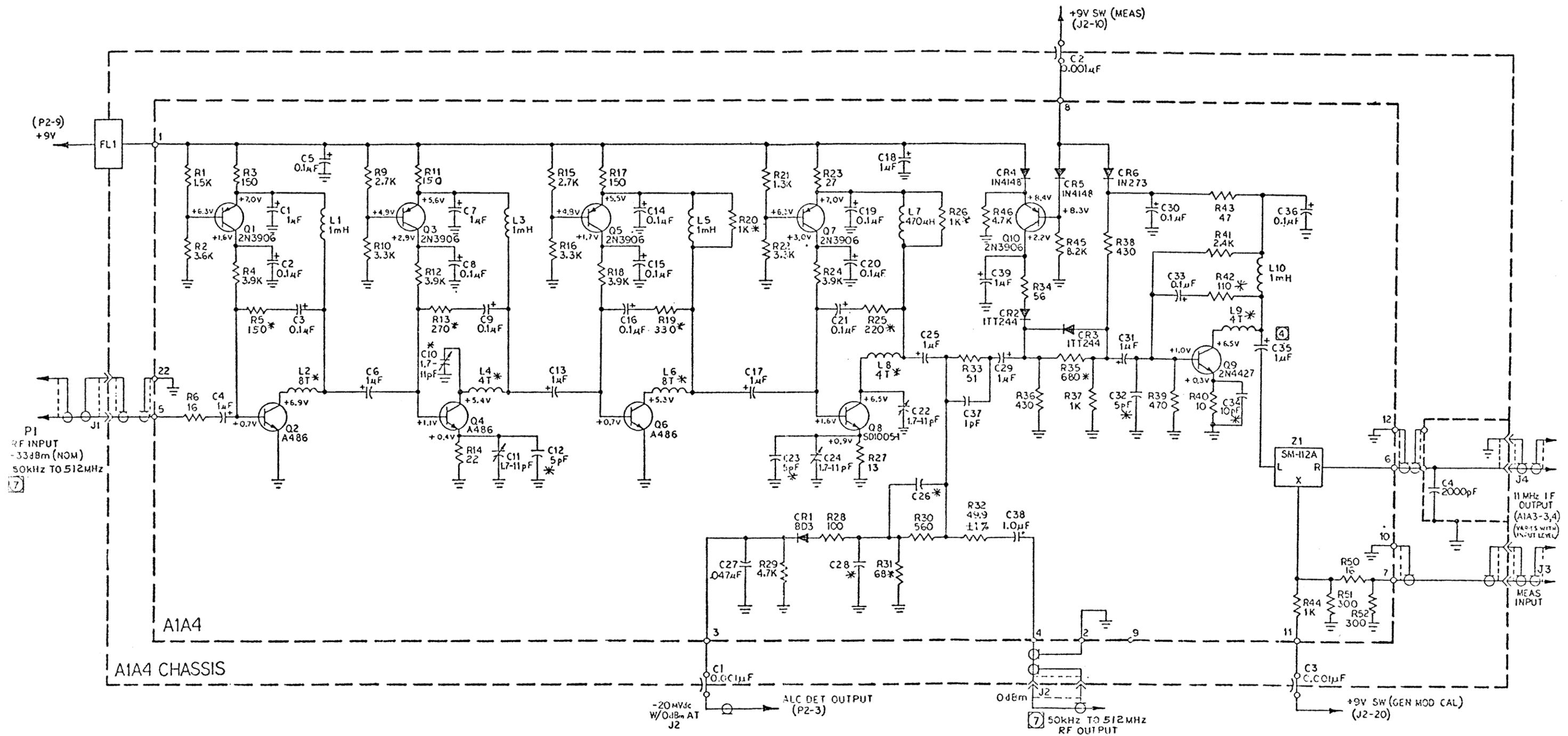


Figure 5-48. Schematic Diagram
11 MHz and 2 MHz IF Amplifier, A1A3
Model RFM-10A/RFM-10B



- ⑦ RFM-11A FREQUENCY RESPONSE (50KHZ TO 600MHZ).
6. ALL DC VOLTAGES TAKEN WITH NO SIGNALS APPLIED. (DISABLE INT. TIME BASE)
 5. VOLTAGES SHOWN WITHOUT TOLERANCES ARE TYPICAL.
 - ④ TO BE LEFT OFF AT ASSEMBLY & INSTALLED DURING TEST.
 3. PARTIAL REFERENCE DESIGNATORS SHOWN (A1A4 BOARD). FOR COMPLETE DESIGNATION, PREFIX WITH ASSY NO. 'A1A4.' EXAMPLE: A1A4C3.
 2. * DENOTES FACTORY SELECT VALUE, MAY BE OMITTED.
 1. ALL RESISTOR VALUES ARE IN OHMS, $\pm 5\%$, 1/4W.

TABULATION BLOCK	
MODEL NO.	SER. NO.
RFM-10A	501 FUP
RFM-10B	126 FUP
RFM-10D	ALL
RFM-11A	ALL

Figure 5-49. Schematic Diagram
Broadband Amplifier and Doubly Balanced Mixer, A1A4
Model RFM-10A/RFM-10B

SECTION VI

PARTS LIST

TABLE 6-1. CODE LIST OF MANUFACTURERS

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbook H4-2.

CODE NO.	MANUFACTURER	ADDRESS
00656	Aerovox Corp.	New Bedford, Mass.
00853	Sangamo Electric Co.	Marion, Ill.
01121	Allen-Bradley Co.	Milwaukee, Wis.
01281	TRW Semiconductors Inc.	Lawndale, Calif.
01295	Texas Instrument, Inc., Transistors Products Div.	Dallas, Texas
02660	Amphenol-Borg Electronics Corp.	Chicago, Ill.
02735	RCA Semiconductors and Materials Div.	Sommerville, N. J.
03606	RCA Electronic Prod. Div.	Camden, N. J.
03614	Bussman Mfg.	Los Angeles, Calif.
03877	Transitron Electronic Corp.	Wakefield, Mass.
04062	Elmenco Products Co.	New York, N. Y.
04713	Motorola Inc.	Phoenix, Arizona
07109	Oaktron, Industries	Monroe, Wis.
07115	Corning Glass Works, Electronic Components Dept.	Bradford, Pa.
07263	Fairchild Semiconductor Corp.	Mountain View, Calif.
09353	C & K Components Inc.	Newton, Mass.
11636	Kings Electronics Co.	So. Pasadena, Calif.
12954	Dickson Electronics Corp.	Scottsdale, Ariz.
14655	Cornell-Dubilier Elec. Corp.	Plainfield N. J.
14752	Electro Cube	So. Pasadena, Calif.
15801	Fenwal Electronics	Farmingham, Mass.
16407	Nytronics Inc.	Lexington, Ky.
24152	SEI Mfg.	Northridge, Calif.
24446	GE Corp.	Schenectady, N. Y.
24972	Telefunken Sales Corp.	Long Island, N. Y.
56289	Sprague Electric Co.	North Adams, Mass.
71279	Cambridge Thermionic Corp.	Cambridge, Mass.

CODE NO.	MANUFACTURER	ADDRESS
71450	CTS Corp.	Elkhart, Inc.
71785	Cinch Mfg., Div. of United Carr	Chicago, Ill.
72136	Electro Motive Mfg. Co.	Willimantic, Conn.
72982	Erie Resistor Corp.	Erie, Pa.
73445	Amperex Electronics Co.	Hicksville, N. Y.
75042	International Resistance Co.	Philadelphia, Pa.
75915	Littelfuse Inc.	Desplaines, Ill.
76433	General Instrument Co.	Newark, N. J.
76493	Miller, J. W.	Los Angeles, Calif.
80294	Bourns Laboratories Inc.	Riverside, Calif.
80740	Helipot Div. of Beckman Industries	Fullerton, Calif.
80795	ITT Semiconductors	New York, N. Y.
81564	Artted Co. Inc.	Springfield, Mass.
82389	Switchcraft	Chicago, Ill.
83003	Varo Inc.	Garaland, Texas
88869	Singer Instrumentation	Los Angeles, Calif.
90201	Mallory P. R. and Co. Inc.	Detroit, Mich.
91293	Johanson Mfg. Co.	Boonton, N. J.
91737	Gremar Mfg. Co.	Wakefield, Mass.
95121	Quality Components Inc.	St Marys, Pa.
95264	Lerco, Electronics Inc.	Burbank, Calif.
95712	Dage Electric Co., Inc.	Franklin, Ind.
98291	Sealectro Corp.	New Rochelle, N. Y.
99800	Delevan Electronics, Corp.	East Aurora, N. Y.

The following vendors have no numbers assigned in the latest supplement to the Federal Supply Code for Manufacturers H4-2

CODE NO.	MANUFACTURER	ADDRESS
0000A	Siliconics	Sunnyvale, Calif.
0000B	Mura Corp.	Jericko, N. Y.
0000C	Modutec	Norwalk, Conn.
0000D	Signetics	Sunnyvale, Calif.
0000E	Power Components	Scottsdale, Pa.
0000F	Hytronics Corp.	Pinellas Park, Fla.
0000G	Electronic Application	So. El Monte, Calif.

TABLE 6-2. PARTS LIST FOR MODEL FM-10C

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1A2	Divider/ALC Circuit Board Assembly	4-003078-006		
A1A3	Power Supply Circuit Board Assembly	4-004237-006		
A1A5	TCXO/IF Circuit Board Assembly	4-004308-005		
A1A6	Phase Modulator and Audio Circuit Board Assembly	4-004309-005		
A2	VCO/6 and 9 MHz Generator Circuit Board Assembly	5-003082-006		
A3A	100 Hz Decade Circuit Board Assembly	5-003083-014		
A3B	1 kHz Decade Circuit Board Assembly	5-003083-014		
A3C	10 kHz Decade Circuit Board Assembly	5-003083-014		
A3D	100 kHz Decade Circuit Board Assembly	5-003083-014		
A4A	1 MHz Programming Circuit Board Assembly	4-004235-005		
A4B	10 MHz Programming Circuit Board Assembly	4-004235-006		
A5	1200 MHz Decade Assembly	4-004243-001		
A6	1 MHz Decade Circuit Board Assembly	4-003084-008		
A7	Gain Control Amp/Amplitude Modulator Assembly	4-003086-002		
A8	10 MHz Decade Assembly	4-003085-002		
A9	Diode Switch Assembly	4-004296-001		
A10	700 to 1100 MHz Multiplier Assembly	4-003081-002		
A11	Buffer Amplifier Circuit Board Assembly	5-003088-041		
A12	4.5, 45, & 150 MHz Generator Circuit Board Assembly	5-003088-038		
A13	4.4, 44, & 140 MHz Generator Circuit Board Assembly	5-003088-039		
A14	4.3, 43, & 130 MHz Generator Circuit Board Assembly	5-003088-040		
A15	4.2, 42, & 120 MHz Generator Circuit Board Assembly	5-003088-041		
A16	4.1, 41, & 110 MHz Generator Circuit Board Assembly	5-003088-042		
A17	4.0, 40, & 100 MHz Generator Circuit Board Assembly	5-003088-043		
A18	3.9, 39, & 90 MHz Generator Circuit Board Assembly	5-003088-044		
A19	3.8, 38, & 80 MHz Generator Circuit Board Assembly	5-003088-045		

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A20	3.7, 37, & 70 MHz Generator Circuit Board Assembly	5-003088-046		
A21	3.6, 36, & 60 MHz Generator Circuit Board Assembly	5-003088-047		
A22	Not Used			
A23	Not Used			
A24	100 Hz to 100 kHz Decade Switching Circuit Board Assembly	4-004497-005		
C1	Not Used			
C2	Capacitor, fixed, ceramic, 470 pF, $\pm 20\%$, 300 Vdc	1-900105-001	56289	30GA-T47
C3	Capacitor, fixed, ceramic, 470 pF, $\pm 20\%$, 3000 Vdc	1-900105-001	56289	30GA-T47
C4	Capacitor, fixed, ceramic, 470 pF, $\pm 20\%$, 3000 Vdc	1-900105-001	56289	30GA-T47
C5	Capacitor, fixed feedthrough, 1000 pF, $\pm 20\%$, 1500 Vdc	1-900108-001	00656	CF167AGP102K
C6	Capacitor, fixed, plastic, 0.5 uF, $\pm 20\%$, 200 Vdc	1-900006-001	24152	1143
C7	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C8	Capacitor, fixed, feedthrough, 1000 pF, $\pm 20\%$, 1500 Vdc	1-900108-001	00656	CF167AGP102K
C9	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C10	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C11	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C12	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C13	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C14	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C15	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C16	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C17	Capacitor, fixed, ceramic, 0.001 uF, +100-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C18	Capacitor, fixed, ceramic, 0.001 uF, +100-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C19	Capacitor, fixed, ceramic, 0.001 uF, +100-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C20	Capacitor, fixed, ceramic, 0.001 uF, +100-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C21	Capacitor, fixed, ceramic, 0.001 uF, +100-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C22	Capacitor, fixed, ceramic, 0.001 uF, +100-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005-001	03877	1N273
CR3	Rectifier, bridge	1-913025-001	83003	W601
CR4	Diode, silicon	1-913074-001	80795	244
DS1	Lamp, indicator, red, 10 V, 20 mA	1-925007-003	0000B	L10/20
E1	Terminal, standoff	1-941043-001	71279	2255-3
F1	Fuse, slo-blo, 3/4 Amp, 250 V	1-924000-017	03614	MDL-3/4
F2	Fuse, slo-blo, 4 Amp, 32 V	1-924000-029	03614	MDL-4
FL1	Filter, bandpass, 750-760 MHz	1-403384-001	88869	
FL2	Filter, bandpass, 600-700 MHz	1-403383-001	88869	
FL3	Filter, lowpass	2-003116-002	88869	
FL4	Filter, feedthrough, 3000 pF min at 1 kHz, 500 Vdc	1-919011-004	72982	1202-051
FL5	Filter, feedthrough, 3000 pF min at 1 kHz, 500 Vdc	1-919011-004	72982	1202-051
FL6	Filter, feedthrough, 3000 pF min at 1 kHz, 500 Vdc	1-919011-004	72982	1202-051
FL7	Filter, feedthrough, 3000 pF min at 1 kHz, 500 Vdc	1-919011-004	72982	1202-051
J1	Receptacle, jack, 4 pin	1-910179-001	71785	P304DB
J2	Receptacle, jack, BNC	1-910132-001	11636	UG-1094A

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
J3	Receptacle, jack, 7 pin	1-910157-106	02660	126-198
J4	Receptacle, jack, phone, 3 conductor	1-910152-001	82389	S13B
J5	Receptacle, jack, phone, 2 conductor	1-910077-001	82389	L112A
J6	Receptacle, jack, rectangular, 24 pins	1-910072-002	02660	26-190-24
J7	Not Used			
J8	Receptacle, jack, rectangular, 16 pins	1-910072-001	02660	26-190-16
J9	Receptacle, jack, rectangular, 16 pins	1-910072-001	02660	26-190-16
L1	Coil, fixed, 3.9 uH, $\pm 10\%$, 159 mA	1-906002-008	76493	70F396A1
L2	Coil, fixed, 3.9 uH, $\pm 10\%$, 159 mA	1-906002-008	76493	70F396A1
L3	Coil, fixed, 3.9 uH, $\pm 10\%$, 159 mA	1-906002-008	76493	70F396A1
L4	Coil, fixed, 1.8 uH min, 5A	1-906009-001	88869	
LS1	Loudspeaker, permanent magnet, 1-3/4 in. dia.	1-936004-001	07109	T2806
Q1	Transistor, silicon, NPN	1-958039-001	04713	2N3055
Q2	Transistor, silicon, NPN	1-958039-001	04713	2N3055
R1	Resistor, variable, composition, 5 k ohm, $\pm 20\%$ (part of S8)			
R2	Resistor, variable, composition, 5 k ohm, $\pm 30\%$ (part of S10)			
R3	Resistor, variable, composition, 10 k ohm, $\pm 20\%$ (part of S8)			
R4	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, 1/4 W	1-945000-043	01121	CB3331
R5	Resistor, fixed, composition, 220 ohm, $\pm 10\%$, 1/4 W	1-945000-029	01121	CB2211
R6	Resistor, fixed, composition, 620 ohm, $\pm 10\%$, 1/4 W	1-945000-157	01121	CB6215
R7	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R8	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R9	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R10	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
S1	Switch, rotary, 3 poles, 11 positions	1-403271-001	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
S2	Switch, rotary, 4 poles, 10 positions	1-403270-001	88869	
S4	Switch, rotary, 3 poles, 11 positions (part of A24)			
S5	Switch, rotary, 3 poles, 11 positions (part of A24)			
S6	Switch, rotary, 3 poles, 11 positions (part of A24)			
S7	Switch, rotary, 3 poles, 11 positions (part of A24)			
S8/R1/R3	Switch, variable resistor, assembly Switch, rotary, 2 poles, 2 positions	1-004714-001	88869	
S9	Switch, rotary, 8 poles, 4 positions	4-403267-001	88869	
S10/R2	Switch, variable resistor, assembly Switch, rotary, 2 poles, 2 positions	2-403266-001	88869	
S11	Switch, push-push, 2 poles, 2 positions	1-951024-002	88869	
S12	Switch, push-push, 2 poles, 2 positions	1-951024-002	88869	
S13	Switch, slide, 2 poles, 2 positions	1-403280-001	88869	
S14	Switch, slide, 2 poles, 2 positions	1-403280-001	88869	
S15	Switch, slide, 2 poles, 2 positions	1-951003-001	82389	46206LF
T1	Transformer, power, 115/230 V rms primary, 14 Vdc secondary	1-402835-001	88869	
TB1	Terminal strip, 3 lugs, 1 ground	1-941006-001	71785	52A
TB2	Terminal strip, 3 lugs, 1 ground	1-941006-001	71785	52A
TB3	Terminal strip, 4 lugs	1-941003-001	71785	54
TB4	Terminal strip, 3 lugs, 1 ground	1-941006-001	71785	52A
W1	Cable assembly, BNC to BNC	1-004712-001	88869	
XF1	Fuseholder, for 3 AG fuses	1-924007-001	75915	341001
XF2	Fuseholder, for 3 AG fuses	1-924007-001	75915	341001
XQ1	Socket, transistor	1-950001-002	04713	MK-15
XQ2	Socket, transistor	1-950001-002	04713	MK-15
Z1	Mixer, doubly balanced	1-403264-001	88869	
Z2	Mixer, doubly balanced	1-403264-001	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
1-used	Knob, fluted, 3/4 in. dia. (VOLUME)	1-935003-002	95264	200-1
1-used	Knob, silkscreened, (MODE)	3-301930-007	88869	
1-used	Knob, silkscreened, calibrated (0-100 Hz)	3-302109-001	88869	
4-used	Knob, silkscreened, (100 kHz, 10 kHz, 1 kHz, 100 Hz)	3-301930-003	88869	
2-used	Knob, silkscreened, (10 MHz, 1 MHz)	3-301930-002	88869	
1-used	Knob, silkscreened, (100 MHz)	3-301930-006	88869	
2-used	Handle	4-103525-001	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

ACCESSORY GROUP				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
1 incl	Repair kit, RFA-20RK	1-500992-001	88869	
1 incl	Connector, adapter, BNC to UHF	1-910117-001	11636	UG-273&U
2 incl	Attenuator assembly, RFA-20, BNC connector on each end	2-001355-001	88869	
1 incl	Connector, plug, 7 pin, Includes hood and clamp	1-910157-205	02660	126-195
1 incl	Dc power cable, 12 ft lg	2-004414-001	88869	
1 incl	RF Cable assembly, 3 ft lg	1-003159-001	88869	
1 incl	Antenna, telescoping, BNC connector on one end	2-003408-001	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A2 – DIVIDER/ALC CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C2	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.01 uF
C4	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C5	Capacitor, fixed, mica, 47 pF, ±5%, 500 Vdc	1-900001-021	72136	DM15E470J
C6	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 uF
C7	Not Used			
C8	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C9	Not Used			
C10	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C11	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C12	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C13	Capacitor, fixed, electrolytic, 1000 uF, -10 +100%, 15 Vdc	1-900040-001	76433	977-188
C14	Capacitor, fixed, ceramic, 0.005 uF, -20 +80%, 500 Vdc	1-900012-004	72982	801Z5U502Z
C15	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C16	Capacitor, fixed, plastic, 10 uF, ±20%, 100 Vdc	1-900026-040	24152	17W
C17	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C18	Not Used			
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C20	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C22	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C23	Capacitor, fixed, mica, 1000 pF, ±5%, 500 Vdc	1-900003-056	72136	DM15F102J
C24	Capacitor, fixed, mica, 1000 pF, ±5%, 500 Vdc	1-900003-056	72136	DM15F102J
C25	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C26	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C27	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A2 - DIVIDER/ALC CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
CR1	Diode, zener, 5 V, $\pm 5\%$	1-913073-001	0000E	JZ5B
CR2	Not Used			
CR3	Not Used			
CR4	Diode, silicon	1-913007-001	24446	1N4148
CR5	Diode, silicon	1-913007-001	24446	1N4148
CR6	Diode, silicon	1-913007-001	24446	1N4148
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q6	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q7	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q8	Transistor, silicon, NPN	1-958000-001	04713	2N3904
R1	Resistor, fixed, composition, 1.8 k ohm, $\pm 10\%$, 1/4 W	1-945000-040	01121	CB1821
R2	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R3	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R4	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R5	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, 1/4 W	1-945000-043	01121	CB3321
R6	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R7	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R8	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R9	Resistor, fixed, composition, 39 ohm, $\pm 10\%$, 1/2 W	1-945001-128	01121	EB-3901
R10	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB-1011
R11	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB-4711
R12	Resistor, fixed, composition, 180 k ohm, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB-1811
R13	Resistor, fixed, composition, 470 k ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB-4711
R14	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB-1021
R15	Resistor, fixed, composition, 180 ohm, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A2 - DIVIDER/ALC CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R16	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R17	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R18	Resistor, fixed, composition, 180 ohm, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R19	Resistor, fixed, film 150 ohm, $\pm .5\%$, 1/8 W	1-945088-114	07115	NA55D151
R20	Resistor, fixed, film 12.1 k ohm, $\pm 1\%$, 1/8 W	1-945016-297	07115	RN60D1212F
R21	Resistor, fixed, film 2.21 k ohm, $\pm 1\%$, 1/8 W	1-945016-226	07115	RN60D2211F
R22	Resistor, fixed, film, 2.21 k ohm, $\pm 1\%$, 1/8 W	1-945016-226	07115	RN60D2211F
R23	Resistor, fixed, film, 5.11 k ohm, $\pm 1\%$, 1/8 W	1-945016-261	07115	RN60D5111F
R24	Resistor, fixed, film 13 k ohm, $\pm 1\%$, 1/8 W	1-945016-300	07115	RN60D1302F
R25	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R26	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R27	Resistor, fixed, film, 4.32 k ohm, $\pm 1\%$, 1/8 W	1-945016-254	07115	RN60D4321F
R28	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R29	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R30	Not Used			
R31	Resistor, variable, cermet, 1 k ohm, $\pm 10\%$, 1/2 W	1-945082-002	71450	190PC102A
R32	Not Used			
R33	Resistor, fixed, composition, 22 ohm, $\pm 10\%$, 1/4 W	1-945000-017	01121	CB2201
R34	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R35	Not Used			
R36	Resistor, fixed, composition, 22 ohm, $\pm 10\%$, 1/4 W	1-945000-017	01121	CB2201
R37	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R38	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R39	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R40	Resistor, fixed, composition, 1.8 k ohm, $\pm 10\%$, 1/4 W	1-945000-040	01121	CB1821
R41	Resistor, fixed, film 5.11 k ohm, $\pm 1\%$, 1/8 W	1-945016-261	07115	RN60D5111F
R42	Resistor, fixed, film, 4.32 k ohm, $\pm 1\%$, 1/8 W	1-945016-254	07115	RN60D4321F
R43	Resistor, fixed, film, 12.1 k ohm, $\pm 1\%$, 1/8 W	1-945016-297	07115	RN60D1212F

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A2 - DIVIDER/ALC CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
U1	Integrated circuit, Decade Counter	1-926007-014	01295	SN7490
U2	Integrated circuit, Decade Counter	1-926007-014	01295	SN7490
U3	Not Used			
U4	Not Used			
U5	Integrated circuit, Differential Cascode Amplifier	1-926005-001	02735	CA3028A
U6	Integrated circuit, Differential Cascode Amplifier	1-926005-001	02735	CA3028A

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A3 - POWER SUPPLY CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, electrolytic, 25 uF, -10 +100%, 25 Vdc	1-900040-002	76433	977-206
C2	Capacitor, fixed, electrolytic, 25 uF, -10 +100%, 25 Vdc	1-900040-002	76433	977-206
C3	Not Used			
C4	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 50 Vdc	1-900039-035	76433	984-1654
C5	Not Used			
C6	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 50 Vdc	1-900039-035	76433	984-1654
C7	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.1 uF
C8	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C10	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C11	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C12	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C13	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C14	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C15	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C16	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C17	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
CR1	Not Used			
CR2	Not Used			
CR3	Not Used			
CR4	Diode, zener 6.2 V, $\pm 10\%$	1-913004-208	0000F	JZ6.2A
CR5	Diode, zener, 6.2 V, $\pm 10\%$	1-913004-208	0000F	JZ6.2A
CR6	Diode, zener, 13 V, $\pm 10\%$	1-913004-216	04713	MZ1000-16

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A3 - POWER SUPPLY CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
CR7	Diode, silicon	1-913001-001	04713	1N4001
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q3	Transistor, silicon, NPN	1-958001-002	04713	MJE520
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q5	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q6	Transistor, silicon, NPN	1-958001-002	04713	MJE520
Q7	Transistor, silicon, NPN	1-958001-002	04713	MJE520
R1	Not Used			
R2	Not Used			
R3	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R4	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R5	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/2 W	1-945001-033	01121	EB4711
R6	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R7	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, 1/4 W	1-945007-004	71450	X201
R8	Resistor, fixed, composition, 1.5 k ohm, $\pm 10\%$, 1/4 W	1-945000-039	01121	CB1521
R9	Resistor, fixed, composition, 220 ohm, $\pm 10\%$, 1/4 W	1-945000-029	01121	CB2211
R10	Not Used			
R11	Not Used			
R12	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R13	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB4721
R14	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/2 W	1-945001-033	01121	EB4711
R15	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R16	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, 1/4 W	1-945007-004	71450	X201-1000
R17	Resistor, fixed, composition, 1.5 k ohm, $\pm 10\%$, 1/4 W	1-945000-039	01121	CB1521
R18	Resistor, fixed, composition, 220 ohm, $\pm 10\%$, 1/4 W	1-945000-029	01121	CB2211
R19	Not Used			
R20	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/2 W	1-945001-033	01121	EB4711

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A5- TCXO/IF CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1	TCXO, 10 MHz	1-402838-001	88869	
C1	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C2	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C3	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C4	Capacitor, fixed, ceramic, 0.001 uF, -20 + 80%, 500 Vdc	1-900012-002	72982	801Z5U101Z
C5	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C6	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C7	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
L1	Coil, fixed, 10 uH	1-906022-005	0000F	13-10-10
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R2	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R3	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R4	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R5	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R6	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R7	Resistor, fixed, composition, 1.5 k ohm, $\pm 10\%$, 1/4 W	1-945000-039	01121	CB1521
R8	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R9	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R10	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R11	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R12	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R13	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R14	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R15	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A5- TCXO/IF CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R16	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A6- PHASE MODULATOR AND AUDIO CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C2	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C3	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C4	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C5	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C6	Capacitor, fixed, mica, 82 pF, ±5%, 500 Vdc	1-900003-028	72136	DM15E820J
C7	Capacitor, fixed, mica 2 pF, ±0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, mica, 82 pF, ±5%, 500 Vdc	1-900003-028	72136	DM15E820J
C10	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C11	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C12	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C13	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C14	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C15	Capacitor, fixed, plastic, 0.1 uF, ±5%, 500 Vdc	1-900003-013	73445	C280AE, 0.1 uF
C16	Capacitor, fixed, mica, 24 pF, ±5%, 500 Vdc	1-900003-014	72136	DM15E240J
C17	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C18	Capacitor, fixed, mica, 12 pF, ±5%, 500 Vdc	1-900003-009	72136	DM15C120J
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C20	Capacitor, fixed, mica, 5 pF, ±10%, 500 Vdc	1-900003-004	72136	DM15C050K
C21	Capacitor, Variable, ceramic, 1.7 to 11 pF, 250 Vdc	1-900113-002	91293	9301
C22	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C23	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C24	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C25	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C26	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C27	Capacitor, variable, ceramic, 1.7 to 11 pF, 250 Vdc	1-900113-002	91293	9301

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A6- PHASE MODULATOR AND AUDIO CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C28	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C29	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C30	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C31	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C32	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C33	Capacitor, variable, ceramic, 1.7 to 11 pF, 250 Vdc	1-900113-002	91293	9301
C34	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C35	Capacitor, fixed, electrolytic, 1500 uF, -10 +100%, 25 25 Vdc	1-900040-002	76433	977-206
C36	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 uF
C37	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C38	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C39	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C40	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C41	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C42	Capacitor, fixed, mica, 82 pF, ±5%, 500 Vdc	1-900003-028	72136	DM15E820J
C43	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
CR1	Diode, silicon	1-913070-001	04713	MV2115
CR2	Diode, silicon	1-913070-001	04713	MV2115
L1	Coil, fixed, 10 uH	1-906022-005	0000F	13-10-10
L2	Coil, fixed, 10 uH	1-906022-005	0000F	13-10-10
L3	Coil, fixed, 0.04 uH, 3½ turns	1-402965-003	88869	
L4	Coil, fixed, 0.04 uH, 3½ turns	1-402965-003	88869	
L5	Coil, fixed, 0.04 uH, 3½ turns	1-402965-003	88869	
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A6- PHASE MODULATOR AND AUDIO CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q5	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q6	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB-1011
R2	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R3	Resistor, fixed, composition, 6.8 k ohm, $\pm 10\%$, 1/4 W	1-945000-047	01121	CB6821
R4	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R5	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R6	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R7	Resistor, fixed, composition, 12 k ohm, $\pm 10\%$, 1/4 W	1-945000-050	01121	CB1231
R8	Resistor, fixed, composition, 12 k ohm, $\pm 10\%$, 1/4 W	1-945000-050	01121	CB1231
R9	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R10	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, 1/4 W	1-945000-036	01121	CB8211
R11	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R12	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R13	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R14	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R16	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R17	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R18	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R19	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R20	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R21	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R22	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R23	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R24	Resistor, fixed, composition, selected, 180 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R25	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R26	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A6- PHASE MODULATOR AND AUDIO CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R27	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R28	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R29	Resistor, fixed, composition, 560 ohm, $\pm .0\%$, 1/4 W	1-945000-034	01121	CB5611
R30	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R31	Resistor, fixed, composition, 22 k, $\pm .0\%$, 1/4 W	1-945000-053	01121	CB2231
R32	Resistor, fixed, composition, 1.5 k, $\pm 10\%$, 1/4 W	1-945000-039	01121	CB1521
R33	Resistor, fixed, composition, selected, 10 k ohm nominal, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
T1	Coil, variable, 1.3 to 1.8 u H	1-906006-006	81564	906006-006
T2	Coil, variable, 1.3 to 1.8 uH	1-906006-006	81564	906006-006
U1	Integrated circuit, IF Amplifier	1-926046-001	04713	MC1355P
U2	Integrated circuit, Audio Amplifier	1-926007-015	01295	SN76001N

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A2- VCO, 6 AND 9 MHz GENERATOR CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C2	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C3	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C4	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C6	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C7	Capacitor, fixed, mica, 250 pF, ±5%, 500 Vdc	1-900003-040	72136	DM15F251J
C8	Capacitor, fixed, mica 22 pF, ±5%, 500 Vdc	1-900003-013	72136	DM15E220J
C9	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C10	Capacitor, fixed, mica 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C11	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C12	Capacitor, fixed, mica, 33 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E330J
C13	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C14	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C15	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc.	1-900003-056	72136	DM15F102J
C16	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C17	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F470J
C18	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C20	Capacitor, fixed, mica, 200 pF, ±5%, 500 Vdc	1-900003-037	72136	DM15F201J
C21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C22	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C23	Capacitor, fixed, ceramic, 10 pF, N750, 1000 Vdc	1-900067-001	72982	831000U2J0100D
C24	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C25	Capacitor, fixed, plastic, 0.001 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C26	Capacitor, fixed, electrolytic, 2 uF, -10 +75%, 25 Vdc	1-900023-016	56289	TE1201
C27	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15102J

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A2-VCO, 6 AND 9 MHz GENERATOR CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C28	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
CR1	Diode, silicon	1-913029-001	04713	MV840
CR2	Diode, silicon	1-913029-011	04713	MV840
CR3	Diode, silicon	1-913007-001	03508	1N4148
L1	Coil, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L2	Coil, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L3	Coil, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L4	Coil, variable, 5 uH to 8.5 uH	1-906006-005	88869	
L5	Coil, variable, 7 uH to 14 uH	1-906006-004	88869	
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q6	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q7	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q8	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q9	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q10	Transistor, silicon, PNP	1-958046-001	04713	MPS6579
R1	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R2	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R3	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R4	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R5	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R6	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R7	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R8	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, 1/4 W	1-945000-043	01121	CB3321
R9	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A2-VCO, 6 AND 9 MHz GENERATOR CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R10	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
R11	Resistor, fixed, composition, 270 ohm $\pm 10\%$, 1/4 W	1-945000-030	01121	CB27111
R12	Resistor, fixed, composition, 270 k ohm, $\pm 10\%$, 1/4 W	1-945000-066	01121	CB2741
R13	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB27111
R14	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, 270 k ohm, $\pm 10\%$, 1/4 W	1-945000-066	01121	CB2741
R16	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R17	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R18	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R19	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R20	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R21	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R22	Resistor, fixed, composition, 100 k ohm, $\pm 10\%$, 1/4 W	1-945000-061	01121	CB1041
R23	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R24	Not Used			
R25	Resistor, fixed, composition, selected, 15 k ohm nominal, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R26	Resistor, fixed, composition, 180 ohm, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R27	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R28	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R29	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R30	Resistor, variable, composition, 2.5 k ohm, $\pm 30\%$, 1/4 W	1-945007-005	71450	X201-2500
R31	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, 1/4 W	1-945007-004	71450	X201-1000
R32	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R33	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, 1/4 W	1-945000-054	01121	CB2731
R34	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R35	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R36	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, 1/4 W	1-945000-073	01121	CB1051

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A2-VCO, 6 AND 9 MHz GENERATOR CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R37	Resistor, fixed composition, 6.8 k ohm, $\pm 10\%$, 1/4W	1-945000-047	01121	CB6821
R38	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4W	1-945000-057	01121	CB4731
R39	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4W	1-945000-057	01121	CB4731
R40	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4W	1-945000-051	01121	CB1531
R41	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4W	1-945000-053	01121	CB2231
R42	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R43	Resistor, fixed, composition, 3.3 ohm, $\pm 10\%$, 1/4 W	1-945000-043	01121	CB3321
R44	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, 1/4 W	1-945007-006	71450	X201-5000
R45	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R46	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R47	Resistor, variable, composition, 100 k ohm, $\pm 30\%$, 1/4 W	1-945007-010	71450	X201-100K
R48	Resistor, fixed, composition, 100 k ohm, $\pm 10\%$, 1/4 W	1-945000-061	01121	CB1041

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A3A, A3B, A3C, A3D – 100 Hz, 1 kHz, 10 kHz AND 100 kHz DECADE CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15F101J
C2	Capacitor, fixed, mica, 150 pF, $\pm 5\%$, 500 Vdc	1-900003-034	72136	DM15F151J
C3	Capacitor, fixed, plastic, 0.047 uF, $\pm 20\%$, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C4	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C5	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C6	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C7	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C8	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, ceramic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C10	Capacitor, fixed, ceramic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C11	Capacitor, fixed, mica, selected, 10 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100K
C12	Capacitor, fixed, mica, 180 pF, $\pm 5\%$, 500 Vdc	1-900003-036	72136	DM15F181J
C13	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C14	Capacitor, fixed, mica, 2 pF, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C15	Capacitor, fixed, mica, 180 pF, $\pm 5\%$, 500 Vdc	1-900003-036	72136	DM15F181J
C16	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C17	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15F101J
C18	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C19	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C20	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C21	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C22	Capacitor, fixed, plastic 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C23	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C24	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C25	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C26	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C27	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C28	Capacitor, fixed, plastic, 0.047 uF, $\pm 20\%$, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF

TABLE 6-2. PARTS LIST FOR MODEL FM10-C (CONT.)

A3A, A3B, A3C, A3D — 100 Hz, 1 kHz, 10 kHz AND 100 kHz DECADE CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C29	Capacitor, fixed, mica, 1500 pF, $\pm 5\%$, 500 Vdc	1-900004-015	72136	DM19F152J
C30	Capacitor, fixed, mica, 2000 pF, $\pm 5\%$, 500 Vdc	1-900004-018	72136	DM19F202J
C31	Capacitor, fixed, mica, 1500 pF, $\pm 5\%$, 500 Vdc	1-900004-015	72136	DM19F152J
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913073-001	0000E	JZ5B
FL1	Filter, bandpass, 5-6 MHz	1-004539-001	88869	
L1	Coil, variable, 1.3 uH to 1.8 uH	1-906006-006	88869	
L2	Coil, variable, 1.3 uH to 1.8 uH	1-906006-006	88869	
L3	Coil, fixed, 10 uH	1-906022-005	0000F	13-10-10
L4	Coil, fixed, 1.9 uH	1-906022-006	0000F	10-1.9-10
L5	Coil, fixed, 1.9 uH	1-906022-006	0000F	10-1.9-10
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q6	Transistor, silicon, NPN	1-958000-001	04713	2N3904
R1	Not Used			
R2	Resistor, fixed, composition, 68 ohm, $\pm 10\%$, 1/2 W	1-945001-023	01121	EB6801
R3	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R4	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R5	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R6	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R7	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/4 W	1-945010-003	71450	U201-500
R8	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R9	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A3A, A3B, A3C, A3D - 100 Hz, 1 kHz, 10 kHz AND 100 kHz DECADE CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R10	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R11	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R12	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R13	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R14	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R16	Resistor, fixed, composition, 1.8 k ohm, $\pm 10\%$, 1/4 W	1-945000-040	01121	CB1821
R17	Resistor, fixed, composition, 62 ohm, $\pm 5\%$, 1/4 W	1-945000-113	01121	CB6205
R18	Resistor, fixed, composition, 150 k ohm, $\pm 10\%$, 1/4 W	1-945000-063	01121	CB1541
R19	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R20	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
R22	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
U1	Integrated circuit, Decade Counter	1-926007-014	01295	SN7490N
U2	Integrated circuit, Balanced Mixer	1-926007-026	01295	SN76514N
U3	Integrated circuit, Balanced Mixer	1-926007-026	01295	SN76514N

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A4A, A4B - 10 MHz PROGRAMMING CIRCUIT BOARD ASSEMBLY

REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
K1	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K2	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K3	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K4	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K5	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K6	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K7	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K8	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K9	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
K10	Relay, reed, SPST, coil data: 125 ohm, 288 mW, 4.5 V	1-942014-001	0000G	1A6A
R1	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R2	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R3	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R4	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R5	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R6	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R7	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R8	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R9	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805
R10	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/2 W	1-945001-023	01121	CB6805

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A5-1200 MHz DECADE ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C2	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C3	Capacitor, fixed, mica, 24 pF, ±5%, 500 Vdc	1-900003-014	72136	DM15E240J
C4	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C5	Capacitor, fixed, mica, 22 pF, ±5%, 500 Vdc	1-900003-013	72136	DM15E220J
C6	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C7	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C8	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-008	01121	SS5D-471W
C9	Capacitor, fixed, mica, selected, 5 pF nominal, ±0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C10	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C11	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C12	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C13	Capacitor, fixed, mica, selected, 5 pF nominal, ±0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050
C14	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C15	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-4T1W
C16	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C17	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C18	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C19	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C20	Capacitor, fixed, mica, 5 pF, ±0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005-001	03877	1N273
L1	Coil, fixed, 3 turns	1-403220-001	88869	
L2	Coil, fixed, 1 turn	1-201738-001	88869	
L3	Coil, fixed, 1 turn	1-201738-001	88869	
L4	Coil, fixed, 1 turn	1-201739-001	88869	
L5	Coil, fixed, 1 turn	1-201739-001	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A5-1200 MHz DECADE ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
Q5	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R2	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R3	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R4	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R5	Resistor, fixed, composition, 300 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R6	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R7	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R8	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R9	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R10	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3315

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A6- 1 MHz DECADE CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE103
C2	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C3	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE103
C4	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE104
C5	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE104
C6	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C7	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE104
C8	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE104
C9	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C10	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C11	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C12	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C13	Capacitor, fixed, mica, 68 pF, $\pm 5\%$, 500 Vdc	1-900003-026	72136	DM15E680J
C14	Capacitor, fixed, mica, 12 pF, $\pm 5\%$, 500 Vdc	1-900003-009	72136	DM15C120J
C15	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C16	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900003-056	72136	DM15F102J
C17	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C18	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C19	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C20	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C21	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C22	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C23	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C24	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C26	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE103
C27	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 1000 Vdc	1-900003-056	72136	DM15F102J
C28	Capacitor, fixed, mica, 300 pF, $\pm 5\%$, 500 Vdc	1-900003-042	72136	DM15F301J
C29	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE103

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A6-1 MHz DECADE CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C30	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C31	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C32	Capacitor, fixed, plastic, 0.1 uF, $\pm 0\%$, 250 Vdc	1-900001-013	73445	C280AE104
C33	Capacitor, fixed, mica, 130 pF, $\pm 5\%$, 500 Vdc	1-900003-033	72136	DM15F120J
C34	Capacitor, fixed, mica, 270 pF, $\pm 5\%$, 500 Vdc	1-900003-041	72136	DM15F270J
C35	Capacitor, fixed, mica, 200 pF, $\pm 5\%$, 500 Vdc	1-900003-037	72136	DM15F201J
FL1	Filter, bandpass, 95 to 96 MHz	1-004540-001	88869	
FL2	Filter, bandpass, 50 to 60 MHz	1-004538-001	88869	
L1	Coil, variable, 0.15 uH to 0.23 uH	1-906006-008	88869	
L2	Coil, fixed, 0.47 uH $\pm 1\%$	1-906022-008	0000F	9-0.47-1
L3	Coil, fixed, 1.5 uH, $\pm 10\%$	1-906022-007	0000F	10-1.5-10
L4	Coil, fixed, 0.47 uH, $\pm 1\%$	1-906022-008	0000F	9-0.47-1
L5	Coil, fixed, 0.15 uH, $\pm 10\%$, 1750 mA	1-906003-003	16407	DD-0.15
L6	Coil, fixed, 0.15 uH $\pm 10\%$, 1750 mA	1-906003-003	16407	DD-0.15
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Transistor, silicon, NPN	1-958080-001	02735	2N4427
R1	Resistor, fixed, composition, 330 ohm, $\pm 5\%$, 1/4 W	1-945000-151	01121	CB3315
R2	Not Used			
R3	Resistor, fixed, composition, selected, 56 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-132	01121	CB5605
R4	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R5	Not Used			
R6	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, 1/4 W	1-945000-134	01121	CB6805
R7	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R8	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R9	Resistor, fixed, composition, 7.5 k ohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A6-1 MHz DECADE BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R10	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R11	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R13	Not Used			
R14	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R15	Resistor, fixed, composition, 3.9 k ohm, $\pm 0\%$, 1/4 W	1-945000-044	01121	CB3921
R16	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R17	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R18	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R19	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R20	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R21	Resistor, fixed, composition, 2 k ohm, $\pm 5\%$, 1/4 W	1-945000-169	01121	CB2025
R22	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R23	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R24	Resistor, fixed, composition, 6.8 k ohm, $\pm 10\%$, 1/4 W	1-945000-047	01121	CB6821
R25	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R26	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R27	Resistor, fixed, composition, 2.4 k ohm, $\pm 5\%$, 1/4 W	1-945000-171	01121	CB2425
R28	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, 1/4 W	1-945000-036	01121	CB8211
R29	Resistor, fixed, composition, selected, 270 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R30	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R31	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-142	01121	CB1511
R32	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1511
R33	Resistor, fixed, composition, 30 ohm, $\pm 5\%$, 1/4 W	1-945000-128	01121	CB3905
R34	Capacitor, fixed, mica, 270 pF, $\pm 5\%$, 500 Vdc	1-945000-142	01121	CB1515
R35	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
R36	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R37	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
U1	Integrated circuit, Balanced Mixer	1-926007-026	01295	SN76514N

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A6 -- 1 MHz DECADE CIRCUIT BOARD ASSEMBLY

REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
U2	Integrated circuit, Balanced Mixer	1-926007-026	01295	SN76514N

TABLE 6-2. PARTS FOR MODEL FM-10C (CONT.)

A7 - GAIN CONTROL AMP/AMPLITUDE MODULATOR ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1 thru C23	Not Used			
C24	Capacitor, fixed, mica, 47 pF, $\pm 5\%$, 500 Vdc	1-900003-021	72136	DM15C470J
C25	Capacitor, variable, glass 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C26	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C27	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C28	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C29	Capacitor, fixed, mica, 47 pF, $\pm 5\%$, 500 Vdc	1-900003-021	72136	DM15C470J
C30	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C31	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C32	Capacitor, fixed, mica, 47 pF, $\pm 5\%$, 500 Vdc	1-900003-021	72136	DM15C470J
C33	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC-471
C34	Not Used			
C35	Not Used			
C36	Not Used			
C37	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C38	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C39	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C40	Capacitor, fixed, mica, 2 pF, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C41	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C42	Capacitor, fixed, mica, 2 pF, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005001	03877	1N273
L1 thru L8	Not Used			
L9	Coil, fixed, 2 turns	1-402953-001	88869	
L10	Coil, fixed, 4 turns	1-402953-003	88869	
L11	Coil, fixed, 3 turns	1-402953-002	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A7 - GAIN CONTROL AMP/AMPLITUDE MODULATOR ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
L12	Coil, fixed, 4 turns	1-402953-003	88869	
L13	Coil, fixed, 3 turns	1-402953-002	88869	
L14	Coil, fixed, 0.47 uH, ±15%	1-906008-002	88869	
Q1 thru Q7	Not Used			
Q8	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q9	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1 thru R14	Not Used			
R15	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R16	Resistor, fixed, composition, 39 k ohm, ±10%, 1/4 W	1-945000-056	01121	CB3931
R17	Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211
R18	Resistor, fixed, composition, 33 k ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R19	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-006	01121	CB2R71
R20	Resistor, fixed, composition, 2.7 ohm, ±10%, 1/4 W	1-945000-006	01121	CB2R71
R21	Resistor, fixed, composition, 22 k ohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R22	Resistor, fixed, composition, selected, 100 ohm nominal, ±10%, 1/4 W	1-945000-025	01121	CB1011
R23	Resistor, fixed, composition, 8.2 k ohm, ±10%, 1/4 W	1-945000-048	01121	CB8221
R24	Resistor, fixed, composition, 8.2 k ohm, ±10%, 1/4 W	1-945000-048	01121	CB8221

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A8 - 10 MHz DECADE ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, mica, 22 pF, ±5%, 500 Vdc	1-900003-013	72136	DM15E220J
C2	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900063-001	01121	SS5D-471W
C3	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C4	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C5	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C6	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C7	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C8	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C9	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C10	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C11	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C12	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	01293	7341A
C13	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C14	Not Used			
C15	Not Used			
C16	Not Used			
C17	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C18	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C19	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C20	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C21	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C22	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C23	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C24	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C25	Capacitor, fixed, mica, 5 pF, ±0.5, 500 Vdc	1-900003-004	72136	DM15C050C
C26	Not Used			
C27	Capacitor, fixed, mica, 120 pF, ±5%, 500 Vdc	1-900003-032	72136	DM15F121J
C28	Capacitor, variable, ceramic, 2.3 to 20 pF, 500 Vdc	1-900113-001	91293	9302

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A8 - 10 MHz DECADE ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C29	Capacitor, fixed, mica, 5 pF, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C30	Capacitor, variable, ceramic, 2.3 to 20 pF, 500 Vdc	1-900113-001	91293	9302
C31	Capacitor, fixed, mica, 120 pF, $\pm 5\%$, 500 Vdc	1-900003-032	72136	DM15F121J
C32	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C010C
C33	Capacitor, fixed, mica, 3 pF, ± 0.5 , 500 Vdc	1-900003-003	72136	DM15C030C
C34	Capacitor, fixed, mica, 3 pF, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C35	Capacitor, fixed, mica, selected, 3 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005-001	03877	1N273
L1	Coil, fixed, 1 turn	1-201740-001	88869	
L2	Coil, fixed, 1 turn	1-201740-001	88869	
L3	Coil, fixed, 1 turn	1-201741-001	88869	
L4	Coil, fixed, 1 turn	1-201741-001	88869	
L5	Not Used			
L6	Coil, fixed, 1 turn	1-201741-001	88869	
L7	Coil, fixed, 1 turn	1-201741-001	88869	
L8	Coil, fixed, 2 turns	1-402953-001	88869	
L9 thru L14	Not Used			
L15	Coil, fixed, 2 turns	1-403042-001	88869	
L16	Coil, fixed, 2 turns	1-403042-001	88869	
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Not Used			
Q6	Transistor, silicon, NPN	1-95801-001	02735	2N5179

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A8 - 10 MHz DECADE ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q7	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R2	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R3	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R4	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R5	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R6	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R7	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R8	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R9	Not Used			
R10	Not Used			
R11	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R12	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R13	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R14	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R15	Resistor, fixed, composition, 27 ohm, $\pm 10\%$, 1/4 W	1-945000-018	01121	CB2701

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A9 - DIODE SWITCH ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC
C2	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC
C3	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC
C4	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC
C5	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC
C6	Capacitor, fixed, mica, 5 pF, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C7	Capacitor, fixed, feedthru, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FASC
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005-001	03877	1N273
CR3	Diode, germanium	1-913005-001	03877	1N273
CR4	Diode, germanium	1-913005-001	03877	1N273
CR5	Diode, germanium	1-913005-001	03877	1N273
CR6	Diode, germanium	1-913005-001	03877	1N273
L1	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
L2	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
L3	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
L4	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
L5	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
L6	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
L7	Coil, fixed: 0.47 uH, $\pm 15\%$	1-906008-002	88869	
R1	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R2	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R3	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R4	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R5	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R6	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R7	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 -700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, mica 22 pF, $\pm 5\%$, 500 Vdc	1-900003-013	72136	DM15E220J
C2	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C3	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C4	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C5	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C6	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C7	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C8	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C9	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C10	Capacitor, fixed, mica, 3 pF, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C11	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C12	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C13	Capacitor, fixed, mica, 5 pF, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C14	Capacitor, fixed, mica, 22 pF, $\pm 5\%$, 500 Vdc	1-900003-013	72136	DM15E220J
C15	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C16	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C17	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C18	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C19	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C20	Capacitor, fixed, mica 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C21	Capacitor, fixed, mica, selected, 5 pF nominal 500 Vdc	1-900003-004	72136	DM15C050C
C22	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C23	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C24	Capacitor, fixed, mica, 3 pF, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C25	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C26	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900003-004	72136	DM15C050C
C27	Capacitor, fixed, mica, 5 pF, $\pm 5\%$, 500 Vdc	1-900003-013	72136	DM15E220J
C29	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 - 700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C30	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C31	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C32	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C33	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900003-008	72136	DM15C100J
C34	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C35	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C36	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C37	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C38	Capacitor, fixed, mica, 3 pF, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C39	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C40	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C41	Capacitor, fixed, mica, 5 pF, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C42	Capacitor, variable, glass 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C44	Capacitor, fixed, standoff, 470 pF, -0 to 100%, 500 Vdc	1-900003-008	72136	DM15C100J
C45	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C46	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C47	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900003-008	72136	DM15C100J
C48	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C49	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C50	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C51	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C52	Capacitor, fixed, mica, 3 pF, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C53	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C54	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C55	Capacitor, fixed, mica, 5 pF, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C56	Capacitor, fixed, mica, 22 pF, $\pm 5\%$, 500 Vdc	1-900003-013	72136	DM15E220J
C57	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 - 700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C58	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C59	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C60	Capacitor, variable, glass, 1 to 100 pF, 500 Vdc	1-900063-001	91293	7341A
C61	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900055-001	01121	SS5D-471W
C62	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J
C63	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF	1-900003-002	72136	DM15C020J
C64	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C65	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D0471W
C66	Capacitor, fixed, mica, 3 pF, ± 0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
C67	Capacitor, variable, glass, 1 to 10 pF, 500 Vdc	1-900063-001	91293	7341A
C68	Capacitor, fixed, standoff, 470 pF, -0 +100%, 500 Vdc	1-900044-001	01121	SS5D-471W
C69	Capacitor, fixed, mica, 5 pF, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C70	Capacitor, fixed, mica, selected, 5 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C71	Capacitor, fixed, mica, selected, 5 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C72	Capacitor, fixed, mica, selected, 5 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C73	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C74	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C75	Capacitor, fixed, mica, selected, 9 pF nominal, $\pm 5\%$, 500 Vdc	1-900087-001	00853	D155C090J0
C76	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C77	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C78	Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C79	Capacitor, fixed, mica, selected, 1 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-001	72136	DM15C010C

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 - 700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C80	Capacitor, fixed, mica, selected, 1 pF nominal, ± 0.5 pF, 500 Vdc	1-900003-001	72136	DM15C010C
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005-001	03877	1N273
CR3	Diode, germanium	10913005-001	03877	1N273
CR4	Diode, germanium	1-913005-001	03877	1N273
CR5	Diode, germanium	1-913005-001	03877	1N273
CR6	Diode, germanium	1-913005-001	03877	1N273
CR7	Diode, germanium	1-913005-001	03877	1N273
CR8	Diode, germanium	1-913005-001	03877	1N273
CR9	Diode, germanium	1-913005-001	03877	1N273
CR10	Diode, germanium	1-913005-001	03877	1N273
L1	Coil, fixed, 1 turn	1-201740-001	88869	
L2	Coil, fixed, 1 turn	1-201741-001	88869	
L3	Coil, fixed, 1 turn	1-201741-001	88869	
L4	Coil, fixed, 1 turn	1-201741-001	88869	
L5	Coil, fixed, 1 turn	1-201740-001	88869	
L6	Coil, fixed, 1 turn	1-201740-001	88869	
L7	Coil, fixed, 1 turn	1-201741-001	88869	
L8	Coil, fixed, 1 turn	1-201741-001	88869	
L9	Coil, fixed, 1 turn	1-201738-001	88869	
L10	Coil, fixed, 1 turn	1-201738-001	88869	
L11	Coil, fixed, 1 turn	1-201739-001	88869	
L12	Coil, fixed, 1 turn	1-201739-001	88869	
L13	Coil, fixed, 1 turn	1-201738-001	88869	
L14	Coil, fixed, 1 turn	1-201738-001	88869	
L15	Coil, fixed, 1 turn	1-201739-001	88869	
L16	Coil, fixed, 1 turn	1-201739-001	88869	
L17	Coil, fixed, 1 turn	1-201738-001	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 - 700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
L18	Coil, fixed, 1 turn	1-201738-001	88869	
L19	Coil, fixed, 1 turn	1-201739-001	88869	
L20	Coil, fixed, 1 turn	1-201739-001	88869	
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q6	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q7	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q8	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q9	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q10	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q11	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q12	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q13	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q14	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q15	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q16	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q17	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q18	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q19	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q20	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R2	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R3	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R4	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R5	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R6	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311

TABLE 6 2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 -- 700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R7	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R8	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R9	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R10	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R11	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R12	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R13	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R14	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R15	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R16	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R17	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R18	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R19	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R20	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R21	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R22	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R23	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R24	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R25	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R26	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R27	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R28	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R29	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R30	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R31	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R32	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R33	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R34	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A10 - 700 TO 1100 MHz MULTIPLIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R35	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R36	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R37	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R38	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R39	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R40	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R41	Resistor, fixed, composition, 27 ohm, $\pm 10\%$, 1/4 W	1-945000-018	01121	CB2701
R42	Resistor, fixed, composition, 27 ohm, $\pm 10\%$, 1/4 W	1-945000-018	01121	CB2701
R43	Resistor, fixed, composition, 27 ohm, $\pm 10\%$, 1/4 W	1-945000-018	01121	CB2701
R44	Resistor, fixed, composition, 27 ohm, $\pm 10\%$, 1/4 W	1-945000-018	01121	CB2701
R45	Resistor, fixed, composition, 27 ohm, $\pm 10\%$, 1/4 W	1-945000-018	01121	CB2701

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A11 -BUFFER AMPLIFIER CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C2	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C3	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C4	Capacitor, fixed, mica, 43 pF, ±5%, 500 Vdc	1-900003-020	72136	DM15E430J
C5	Capacitor, variable, ceramic, 1.7 to 10 pF, 500 Vdc	1-900113-002	91293	9301
C6	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C7	Not Used			
C8	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C9	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C10	Not Used			
C11	Not Used			
C12	Not Used			
C13	Not Used			
C14	Capacitor, fixed, plastic, 0.01 uF, ±10%, 150 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C15	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C16	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C17	Capacitor, fixed, plastic, 0.01 uF, ±10%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C18	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C19	Capacitor, fixed, mica 1000 pF, ±5%, 100 Vdc	1-900003-015	72136	DM15E270J
C20	Capacitor, fixed, mica 27 pF, ±5%, 500 Vdc	1-900003-015	72136	DM15E270J
C21	Capacitor, variable, ceramic, 1.7 to 10 pF, 500 Vdc	1-900113-002	91293	9301
C22	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C23	Capacitor, fixed, mica, 18 pF, ±5%, 500 Vdc	1-900003-011	72136	DM15C180J
C24	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C25	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C26	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C27	Capacitor, fixed, mica, 15 pF, ±5%, 500 Vdc	1-900003-150	72136	DM15C150J
C28	Capacitor, variable, ceramic, 1.7 to 10 pF, 500 Vdc	1-900113-002	91293	9301

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A11 - BUFFER AMPLIFIER CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C29	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C30	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C31	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C32	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C33	Capacitor, fixed, mica, 15 pF, ±5%, 500 Vdc	1-900003-010	72136	DM15C150J
C34	Capacitor, variable, ceramic, 1.7 to 10 pF, 500 Vdc	1-900113-002	9301	
C35	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C36	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C37	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C38	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C39	Capacitor, fixed, mica, 15 pF, ±5%, 500 Vdc	1-900003-010	72136	DM15C150J
C40	Capacitor, variable, ceramic, 1.7 to 10 pF, 500 Vdc	1-900113-002	91293	9301
C41	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C42	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C43	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C44	Not Used			
C45	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C46	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
L1	Coil, fixed, 0.06 uH	1-402965-002	88869	
L2	Not Used			
L3	Not Used			
L4	Coil, fixed, 0.06 uH	1-402965-002	88869	
L5	Coil, variable, 7-14 uH	1-906006-004	88869	
L6	Coil, fixed, 0.06 uH	1-402965-002	88869	
L7	Coil, fixed, 0.06 uH	1-402965-002	88869	
L8	Coil, fixed, 0.04 uH	1-402965-003	88869	
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Not Used			
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A11 - BUFFER AMPLIFIER CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q4	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q6	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q7	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q8	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R2	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R3	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R4	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R5	Not Used			
R6	Not Used			
R7	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R8	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R9	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, 1/4 W	1-945000-043	01121	CB3321
R10	Not Used			
R11	Not Used			
R12	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R13	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R14	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R15	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-038	01121	CB1221
R16	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R17	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R18	Resistor, fixed, composition, 22 ohm, $\pm 10\%$, 1/4 W	1-945000-017	01121	CB2201
R19	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R20	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R21	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R22	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R23	Resistor, fixed, composition, 39 ohm, $\pm 10\%$, 1/4 W	1-945000-020	01121	CB3901

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A11-BUFFER AMPLIFIER CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R24	Resistor, fixed, composition, 15 ohm, $\pm 10\%$, 1/4 W	1-945000-015	01121	CB1501
R25	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R26	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R27	Resistor, fixed, composition, 22 ohm, $\pm 10\%$, 1/4 W	1-945000-017	01121	CB2201
R28	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R29	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R30	Resistor, fixed, composition, 22 ohm, $\pm 10\%$, 1/4 W	1-945000-017	01121	CB2201
R31	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-038	01121	CB1221
R32	Not Used			
R33	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R34	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R35	Resistor, fixed, composition, 560 ohm, $\pm 19\%$, 1/4 W	1-945000-034	01121	CB5611
R36	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R37	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 – GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
	ON BOARDS				
C1	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C2	A12 thru A21	Capacitor, fixed, mica, 22 pF, ±5%, 500 Vdc	1-900003-013	72136	DM15C220J
C3	A12 thru A21	Capacitor, fixed, mica, 22 pF, ±5%, 500 Vdc	1-900003-013	72136	DM15C220J
C4	A12 thru A21	Capacitor, fixed, mica 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C5	A12 thru A21	Capacitor, variable, ceramic, 1.7-11 pF, 500 Vdc	1-900113-002	91293	9301
C6	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C7	A12 thru A21	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-90000-047	72136	DM15F471J
C8	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	A12 thru A21	Capacitor, fixed, mica, 43 pF, ±5%, 500 Vdc	1-900003-020	72136	DM15C430J
C10	A12 thru A21	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900001-056	72136	DM15F102J
C11	A12 thru A21	Capacitor, fixed, mica, 24 pF, ±5%, 500 Vdc	1-900003-014	72136	DM15C240J
C12	A12 thru A21	Capacitor, fixed, mica, 12 pF, ±5%, 500 Vdc	1-900003-009	72136	DM15C120J
C13	A12 thru A21	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C14	A12 thru A21	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C15	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C16	A12 thru A15	Capacitor, fixed, mica, 2 pF, ±0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
	A16 thru A21	Capacitor, fixed, mica, 5 pF, ±0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
C17	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C18	A12 thru A14	Capacitor, fixed, mica, 82 pF, ±5%, 500 Vdc	1-900003-028	72136	DM15F820J
	A15	Capacitor, fixed, mica, 91 pF, ±5%, 500 Vdc	1-900003-029	72136	DM15F910J
	A16 thru A21	Capacitor, fixed, mica, 68 pF, ±5%, 500 Vdc	1-900003-026	72136	DM15F680J
C19	A12 thru A19	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-056	72136	DM15F471J
	A20 and A21	Capacitor, fixed, mica, 680 pF, ±5%, 500 Vdc	1-900003-052	72136	DM15F681J
C20	A12 thru A21	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C21	A12	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
	A13 and A16	Capacitor, fixed, mica, 15 pF, ±5%, 500 Vdc	1-900003-010	72136	DM15C150J
	A14	Capacitor, fixed, mica, 18 pF, ±5%, 500 Vdc	1-900003-011	72136	DM15C180J

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 – GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
	ON BOARDS				
C21 Cont.	A15 thru A17	Capacitor, fixed, mica, 25 pF, $\pm 5\%$, 500 Vdc	1-900003-014	72136	DM15E240J
	A18	Capacitor, fixed, mica, 33 pF, $\pm 5\%$, 500 Vdc	1-900003-017	72136	DM15E330J
	A19	Capacitor, fixed, mica, 43 pF, $\pm 5\%$, 500 Vdc	1-90000-020	72136	DM15E430J
	A20 and A21	Capacitor, fixed, mica, 56 pF, $\pm 5\%$, 500 Vdc	1-900003-024	72136	DM15E560J
C22	A12 thru A21	Capacitor, fixed, mica, 1000 pF, $\pm 5\%$, 100 Vdc	1-900003-056	72136	DM15F102J
C23	A12 thru A21	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C24	A12 thru A21	Capacitor, variable, ceramic, 1.7–11 pF, 500 Vdc	900113-001	91293	9301
C25	A12 thru A14	Capacitor, fixed, mica, 82 pF, $\pm 5\%$, 500 Vdc	1-900003-028	72136	DM15F820J
	A15	Capacitor, fixed, mica, 91 pF, $\pm 5\%$, 500 Vdc	1-900003-029	72136	DM15F910J
	A16 thru A21	Capacitor, fixed, mica, 68 pF, $\pm 5\%$, 500 Vdc	1-900003-026	72136	DM15F680J
C26	A12 thru A18	Capacitor, fixed, mica 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
	A19 thru A21	Capacitor, fixed, mica, 680 pF, $\pm 5\%$, 300 Vdc	1-900003-052	72136	DM15F681J
C27	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C28	A12 thru A21	Capacitor, fixed, mica, 15 pF, $\pm 5\%$, 500 Vdc	1-900003-010	72136	DM15C150J
C29	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C30	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C31	A12 thru A21	Capacitor, fixed, mica, 2 pF, ± 0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020C
C32	A12 thru A14	Capacitor, fixed, mica, selected, 91 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-029	72136	DM15F910J
	A15	Capacitor, fixed, mica, selected, 100 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15F101J
	A16 thru A21	Capacitor, fixed, mica, selected, 82 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-028	72136	DM15F820J
C33	A12 thru A21	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C34	A12 thru A20	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15F471J
C35	A12	Capacitor, fixed, mica, 10 pF, \pm , 500 Vdc	1-900003-008	72136	DM15C100J
	A13 and A16	Capacitor, fixed, mica, 15 pF, $\pm 5\%$, 500 Vdc	1-900003-010	72136	DM15C150J
	A14	Capacitor, fixed, mica, 18 pF, $\pm 5\%$, 500 Vdc	1-900003-011	72136	DM15C180J

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 – GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C35 Cont.	ON BOARDS				
	A15 and A17	Capacitor, fixed, mica, 24 pF, ±5%, 500 Vdc	1-900003-014	72136	DM15E240J
	A18	Capacitor, fixed, mica, 33 pF, ±5%, 500 Vdc	1-900003-017	72136	DM15E330J
	A19	Capacitor, fixed, mica, 43 pF, ±5%, 500 Vdc	1-90000-020	72136	DM15E430J
	A20 and A21	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C36	A12 thru A21	Capacitor, variable, ceramic 1.7–11 pF, 500 Vdc	1-900113-002	91293	9301
C37	A12 thru A20	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C38	A12 thru A21	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C39	A12 thru A21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900002-001	73445	C280AE, 0.01 uF
C40	A15 thru A21	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C41	A15 thru A20	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C42	A12	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
	A13 and A16	Capacitor, fixed, mica, 15 pF, ±5%, 500 Vdc	1-900003-010	72136	DM15C150J
	A14	Capacitor, fixed, mica, 18 pF, ±5%, 500 Vdc	1-900003-011	72136	DM15C180J
	A15 and A17	Capacitor, fixed, mica, 24 pF, ±5%, 500 Vdc	1-900003-014	72136	DM15E240J
	A18	Capacitor, fixed, mica, 33 pF, ±5%, 500 Vdc	1-900003-017	72136	DM15E330J
	A19	Capacitor, fixed, mica, 43 pF, ±5%, 500 Vdc	1-900003-020	72136	DM15E430J
	A20	Capacitor, fixed, mica, 56 pF, ±5%, 500 Vdc	1-900003-024	72136	DM15E560J
C43	A12 thru A20	Capacitor, variable, 1.7–11 pF, 500 Vdc	1-900113-002	91293	9301
C44	A12 thru A21	Capacitor, fixed, mica, 1000 pF	1-900003-056	72136	DM15F102J
C45	A12 thru A20	Capacitor, 1000 pF	1-900003-056	72136	DM15F102J
C46		Not Used			
C47	A14	Capacitor, fixed, mica, selected, 3 pF nominal, ±0.5 pF, 500 Vdc	1-900003-003	72136	DM15C030C
	A15 and A16	Capacitor, fixed, mica, selected, 5 pF nominal, ±0.5 pF, 500 Vdc	1-900003-004	72136	DM15C050C
	A17	Capacitor, fixed, mica, selected, 10 pF nominal, ±5%, 500 Vdc	1-90003-008	72136	DM15C100J
	A18 and A19	Capacitor, fixed, mica, selected, 12 pF nominal, ±5%, 500 Vdc	1-900003-009	72136	DM15C120J

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 – GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
	ON BOARDS				
C47 Cont.	A20	Capacitor, fixed, mica, selected, 15 pF nominal, ±5%, 500 Vdc	1-900003-010	72136	DM15C150J
	A21	Capacitor, fixed, mica, selected, 27 pF nominal, ±5%, 500 Vdc	1-900003-015	72136	DM15C270J
C48		Not Used			
C49	A12 thru A21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
L1	A12 thru A21	Coil, variable, 30–60 uH	1-906006-003	88869	
L2	A12 thru A21	Coil, 10 uH, 75 mA	1-906002-015	76493	70F105A1
L3	A12 thru A15	Coil, variable, 0.16–0.23 uH	1-906006-008	88869	
	A16 thru A21	Coil, variable, 0.22–0.34 uH	1-906006-009	88869	
L4	A12 thru A15	Coil, variable, 0.16–0.23 uH	1-906006-008	88869	
	A16 thru A21	Coil, variable, 0.22–0.34 uH	1-906006-009	88869	
L5	A12 thru A15	Coil, variable, 0.16–0.23 uH	1-906006-008	88869	
	A16 thru A21	Coil, variable, 0.22–0.34 uH	1-906006-009	88869	
L6	A12 thru A15	Coil, fixed, 2½ turns	1-402965-001	88869	
	A16 thru A20	Coil, fixed, 3½ turns	1-402965-003	88869	
	A21	Coil, fixed, 4½ turns	1-402965-002	88869	
L7	A12 thru A15	Coil, fixed, 2½ turns	1-402965-001	88869	
	A16 thru A20	Coil, fixed, 3½ turns	1-402965-003	88869	
	A21	Coil, fixed, 4½ turns	1-402965-002	88869	
L8	A12 thru A15	Coil, fixed, 2½ turns	1-402965-001	88869	
	A15 thru A20	Coil, fixed, 3½ turns	1-402965-003	88869	
Q1	A12 thru A21	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q2	A12 thru A21	Transistor, silicon, NPN	1-958000-001	04713	2N3904
Q3	A12 thru A21	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q4	A12 thru A21	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q5	A12 thru A21	Transistor, silicon, PNP	1-958000-002	04713	2N3906
Q6	A12 thru A21	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q7	A12 thru A21	Transistor, silicon, NPN	1-958018-001	02735	2N5179

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 – GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
	ON BOARDS				
Q8	A12 thru A21	Transistor, silicon, NPN	1-958-000-001	04713	2N3904
Q9		Not Used			
Q10	A12 thru A21	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q11	A12 thru A20	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	A12 thru A21	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R2	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R3	A12 thru A21	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R4	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R5	A12 thru A21	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R6	A12 thru A21	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
R7	A12 thru A21	Resistor, fixed, composition, 56 k ohm, $\pm 10\%$, 1/4 W	1-945000-058	01121	CB5631
R8	A12 thru A21	Resistor, composition, 1.5 k ohm, $\pm 10\%$, 1/4 W	1-945000-039	01121	CB1521
R9	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R10	A12 thru A21	Resistor, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R11	A12 thru A21	Resistor, composition, 47 k ohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R12	A12 thru A21	Resistor, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R13	A12 thru A21	Resistor, fixed, composition, 150 k ohm, $\pm 10\%$, 1/4 W	1-945000-063	01121	CB4711
R14	A12 thru A21	Resistor, composition, 220 ohm, $\pm 10\%$, 1/4 W	1-945000-029	01121	CB2211
R15	A12 thru A21	Resistor, composition, 220 ohm, $\pm 10\%$, 1/4 W	1-945000-029	01121	CB2211
R16	A12 thru A21	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
R17	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R18	A12 thru A21	Resistor, fixed, composition, 1.5 k ohm, $\pm 10\%$, 1/4 W	1-945000-039	01121	CB1521
R19	A12 thru A21	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, 1/4 W	1-945000-038	01121	CB1221
R20	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
	ON BOARDS				
R21	A12 thru A21	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R22	A12 thru A21	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R23	A12 thru A21	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R24	A12 thru A21	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R25	A12 thru A21	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R26	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R27	A12 thru A21	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R28	A12 thru A21	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R29	A12 thru A21	Resistor, fixed, composition, selected, 100 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R30	A12 thru A20	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
	A21	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R31	A12 thru A21	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R32	A12 thru A21	Resistor, fixed, composition, 220 ohm, $\pm 10\%$, 1/4 W	1-945000-029	01121	CB2211
R33	A12 thru A21	Resistor, fixed, composition, 15 ohm, $\pm 10\%$, 1/4 W	1-945000-015	01121	CB1501
R34	A12 thru A21	Resistor, composition, 10 k ohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R35	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R36		Not Used			
R37		Not Used			
R38		Not Used			
R39	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R40	A12 thru A21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R41	A12 thru A21	Resistor, fixed, composition, selected, 180 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R42	A12 thru A20	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, 1/4 W	1-945000-044	01121	CB3921
R43	A12 thru A20	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 – GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
	ON BOARDS				
R44	A12 thru A20	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R45		Not Used			
R46	A12 thru A21	Resistor, fixed, composition, 1.2 k ohm, ±10%, 1/4 W	1-945000-038	01121	CB1221
R47		Not Used			
R48		Not Used			
R49	A12 thru A20	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R50	A12 thru A20	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R51	A21	Resistor, fixed, composition, 56 ohm, ±10%, 1/4 W	1-945000-022	01121	CB5601
U1	A12 thru A21	Integrated circuit, Quad 2-Input NOR Gate	1-926018-001	0000D	LU380A
Y1	A12	Xtl, Freq: 4.5 MHz	1-912001-010	88869	
	A13	Xtl, Freq: 4.4 MHz	1-912001-009	88869	
	A14	Xtl, Freq: 4.3 MHz	1-912001-008	88869	
	A15	Xtl, Freq: 4.2 MHz	1-912001-007	88869	
	A16	Xtl, Freq: 4.1 MHz	1-912001-006	88869	
	A17	Xtl, Freq: 4.0 MHz	1-912001-005	88869	
	A18	Xtl, Freq: 3.9 MHz	1-912001-004	88869	
	A19	Xtl, Freq: 3.8 MHz	1-912001-003	88869	
	A20	Xtl, Freq: 3.7 MHz	1-912001-002	88869	
	A21	Xtl, Freq: 3.6 MHz	1-912001-001	88869	
Y2	A12	Xtl, Freq: 4.5 MHz	1-912001-010	88869	
	A13	Xtl, Freq: 4.4 MHz	1-912001-009	88869	
	A14	Xtl, Freq: 4.3 MHz	1-912001-008	88869	
	A15	Xtl, Freq: 4.2 MHz	1-912001-007	88869	
	A16	Xtl, Freq: 4.1 MHz	1-912001-006	88869	
	A17	Xtl, Freq: 4.0 MHz	1-912001-005	88869	
	A18	Xtl, Freq: 3.9 MHz	1-912001-004	88869	
	A19	Xtl, Freq: 3.8 MHz	1-912001-003	88869	

TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES					
REF. DESIG.		DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Y2 Cont.	ON BOARDS				
	A20	Xtl, Freq: 3.7 MHz	1-912002-002	88869	
	A21	Xtl, Freq: 3.6 MHz	1-912001-001	88869	

TABLE 6-3. PARTS LIST FOR MODEL RFM-10

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1A1	Not Used			
A1A2	RF. Switch Assembly	1-004451-001	88869	
A1A3	11 MHz IF Board Assembly	4-004307-005	88869	
A1A4	Broadband Amplifier Assembly	1-004452-001	88869	
AT1	Attenuator, 10 dB	2-001355-005	88869	
AT2	Attenuator, variable	1-103576-001	88869	
C1	Capacitor, fixed, electrolytic 50 uF, -10% +75, 25 Vdc	1-900039-005	76433	984-1654
CR1	Diode, silicon	1-913007-001	24446	1N4148
CR2	Diode, silicon	1-913007-001	24446	1N4148
DS1	Lamp, indicator, red, 10 V, 20 mA	1-925007-003	0000B	L10/20
P1	Part of A1A4			
P2	Receptacle, plug, male, 24 PIN	1-910071-002	02660	26-159-24
P3	Part of W2			
P4	Part of A1A2			
P5	Receptacle, plug, phono	1-910018-001	71785	13A
P6	Receptacle, plug, phono	1-910018-001	71785	13A
R1	Resistor, variable, composition, 1 k ohm, ±10%			
S1	Not Used			
S2	Switch, push-push 2 poles, 2 positions	1-951024-002	82389	65017-206
W1	Cable, BNC to BNC	2-004461-001	88869	
W2	Cable, BNC to BNC	1-003159-002	88869	

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A2 - RF SWITCH ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, feedthru, 470 pF, ±20%, 500 Vdc	1-900045-001	01121	FA5C-4712
C2	Capacitor, fixed, standoff, 470 pF, +100 -0%, 500 Vdc	1-900044-001	01121	SS5D-471W
J1	Not Used			
J2	Receptacle, jack, push-on	1-910005-001	11636	UG-911/u
K1	Relay, magnetic reed, SPST	1-942014-001	0000G	1A6A
K2	Relay, magnetic reed, SPST	1-942014-001	0000G	1A6A
P1	Not Used			
P2	Not Used			
P3	Not Used			
P4	Connector, phono plug	1-910018-001	71785	13A
R1	Resistor, fixed, composition, 300 ohm, ±5%, 1/4 W	1-945000-149	01121	CB3015

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A3 -11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C2	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C3	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C5	Not Used			
C6	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C7	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
C8	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
C9	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C10	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C11	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C12	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C13	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C14	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C15	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C16	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73446	C280AE, 0.022 uF
C17	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C18	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-90003-057	72136	DM15F122J
C19	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73446	C280AE, 0.022 uF

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C20	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
C21	Capacitor, fixed, mica, 330 pF, ±5%, 500 Vdc	1-900003-043	72136	DM15F331J
C22	Not Used			
C23	Capacitor, fixed, plastic 0.022 uF, ±20%, 250 Vdc	1-900001-005	73446	C280AE, 0.022 uF
C24	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C25	Capacitor, fixed, mica, 820 pF, ±5%, 300 Vdc	1-900003-054	72136	DM15F821J
C26	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C27	Capacitor, fixed, ceramic, 0.001 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C28	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C29	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
CR1	Diode, silicon	1-913007-002	24446	1N4148
CR2	Diode, silicon	1-913007-002	24446	1N4148
CR3	Diode, silicon	1-913007-002	24446	1N4148
CR4	Diode, silicon	1-913007-002	24446	1N4148
L1	Coil, variable, 1.3-1.8 uH	1-906006-006	88869	
L2	Coil, variable, 1.3-1.8 uH	1-906006-006	88869	
L3	Coil, variable, 1.3-1.8 uH	1-906006-006	88869	
L4	Coil, variable, 1.3-1.8 uH	1-906006-006	88869	
L5	Coil, fixed, 39 uH, 75 mA	1-906002-023	76493	70F395A1
L6	Coil, variable, 30-60 uH	1-906006-003	88869	
O1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R1	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-038	01121	CB1221
R2	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R3	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R4	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R5	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R6	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R7	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R8	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-038	01121	CB1221
R9	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R10	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R11	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R12	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R13	Resistor, fixed, composition, 56 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-022	01121	CB5601
R14	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R15	Resistor, fixed, composition, 6.8 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-047	01121	CB6821
R16	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-038	01121	CB1221
R17	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R18	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R19	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R20	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R21	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-004	71450	X201
R22	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1021
R23	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R24	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R25	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-004	71450	X201
Y1	Crystal filter, 11 MHz	1-403279-001	88869	
Z1	Mixer, singly-balanced	1-403262-001	88869	

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A4 - BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C2	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C6	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C7	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C10	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C11	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C12	Capacitor, fixed, mica, 27 pF, ±5%, 500 Vdc	1-900002-015	72136	DM15E270J
C13	Capacitor, fixed, mica, selected, 2 pF nominal, ±0.5 pF, 500 Vdc	1-900003-002	72136	DM15C020K
C14	Not Used			
C15	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
CR1	Diode, back, germanium	1-913026-003	24446	BD3
CR2	Diode, back, germanium	1-913026-003	24446	BD3
CR3	Diode, silicon	1-913007-002	24446	1N4148
FL1	Filter, feedthru	1-919011-004	72982	1202-052
FL2	Filter, feedthru	1-919011-004	72982	1202-052

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A4—BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
J1	Not Used			
J2	Not Used			
J3	Receptacle, jack, BNC	1-910017-007	95712	UG909/U
J4	Receptacle, jack,phono	1-910026-001	82389	3C1054A
J5	Receptacle, jack,phono	1-910026-001	82389	3C1054A
J6	Receptacle, jack,phono	1-910026-001	82389	2C1054A
L1	Coil, fixed, 4 turns	1-402869-003	88869	
L2	Coil, fixed, 3 turns	1-402869-001	88869	
L3	Coil, fixed, 0.24 uH ±15%	1-402869-001	88869	
L5	Coil, fixed, 3 turns	1-402869-002	88869	
L6	Coil, fixed, "0" turns		88869	
P1	Receptacle, plug, push-on	1-910174-001	91737	8205A
Q1	Transistor, silicon, NPN	1-958018-001	2N5179	
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-950818-001	02735	2N5179
R1	Resistor, fixed, composition, selected, 82 ohm nominal ±10%, ¼W	1-945000-024	01121	CB8201
R2	Resistor, fixed, composition, 390 ohm, ±10%, ¼W	1-945000-032	01121	CB3911
R3	Resistor, fixed, composition, 22 k ohm, ±10%, ¼W	1-945000-053	01121	CB2231
R4	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R5	Resistor, fixed, composition, 470 ohm, ±10%, ¼W	1-945000-033	01121	CB4711
R6	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R7	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R8	Resistor, fixed, composition, selected, 47 ohm nominal, ±10%, ¼W	1-945000-021	01121	CB4701
R9	Resistor, fixed, composition, 22 k ohm, ±10%, ¼W	1-945000-053	01121	CB2231

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A4 - BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R10	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R11	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R12	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R13	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R14	Resistor, fixed, composition, 100 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R15	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R16	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R17	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-021	01121	CB4701
R18	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R19	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-027	01121	CB1511
R20	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R21	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-027	01121	CB1511
R22	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-027	01121	CB1511
R23	Resistor, fixed, composition, selected, 270 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R24	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R25	Resistor, fixed, composition, selected, 390 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-032	01121	CB3911
R26	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R27	Resistor, fixed, composition, 68 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-023	01121	CB6801

TABLE 6-3. PARTS LIST FOR MODEL RFM-10 (CONT.)

A1A4 - BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R28	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1A1	Not Used			
A1A2	R.F. Switch Assembly	1-004451-002	88869	
A1A3	11 MHz IF Board Assembly	4-004558-001	88869	
A1A4	Broad Band Amplifier Assembly	1-004588-001	88869	
AT1	Attenuator, 10 dB	2-001355-005	88869	
AT2	Attenuator, variable	1-1035760--1	88869	
C1	Capacitor, fixed, plastic, 0.022 uF, $\pm 20\%$, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C2	Capacitor, fixed, electrolytic, 50 uF, +75 -10%, 25 Vdc	1-900039-005	76433	984-1654
C3	Capacitor, fixed, mica, 150 pF, $\pm 5\%$, 500 Vdc	1-900003-034	72136	DM15F151J
CR1	Diode, silicon	1-913007-001	24446	1N4148
CR2	Diode, silicon	1-913007-001	24446	1N4148
DS1	Light, indicator, red, 10V, 20 mA	1-925007-003	0000B	L10/20
P2	Receptacle, plug, rectangular, 24 PIN	1-910071-002	02660	26-159-24
R1	Resistor, variable, composition, 1 k ohm, $\pm 10\%$, (part of S1)			
S1/R1	Switch, resistor assembly, S1: Switch, rotary, 1 pole, 2 positions	1-403365-001	88869	
S2	Switch, push-push, 2 poles, 2 positions	1-951024-002	82389	65017-206
W1	Cable BNC to BNC	2-004461-001	88869	
W2	Cable BNC to BNC	1-003159-002	88869	

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A2 - RF SWITCH ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, feedthru, 470 pF, ±20%, 500 Vdc	1-900045-001	01121	FA5C-4712
C2	Capacitor, fixed, standoff, 470 pF, +100 -0%, 500 Vdc	1-900044-001	01121	SS5D-471W
J1	Not Used			
J2	Receptacle, jack, BNC	1-910005-001	11636	UG-911/U
K1	Relay, magnetic reed, SPST	1-942014-001	0000G	1A6A
K2	Relay, magnetic reed, SPST	1-942014-001	0000G	1A6A
R1	Resistor, fixed, comp, 300 ohm, ±5%, ¼W	1-945000-149	01121	CB3015

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C2	Capacitor, fixed, mica, 180 pF, ±5%, 500 Vdc	1-900003-036	72136	DM15F181J
C3	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C4	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C5	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C6	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
C7	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
C8	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C9	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C10	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C11	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15F271J
C12	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C13	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C14	Capacitor, fixed, mica, 220 pF, ±5%, 500 Vdc	1-900003-038	72136	DM15F221J
C15	Capacitor, fixed, mica, 680 pF, ±5%, 300 Vdc	1-900003-052	72136	DM15F681J
C16	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C17	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C18	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
C19	Capacitor, fixed, mica, 330 pF, ±5%, 500 Vdc	1-900003-043	72136	DM15F331J

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C20	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C21	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900001-013	73445	DM15F101J
C22	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C23	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C24	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C25	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C26	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C27	Capacitor, fixed, mica, 47 pF, ±5%, 500 Vdc	1-900003-021	72136	DM15E470J
C28	Capacitor, fixed, mica, 470 pF, ±5%, 500 Vdc	1-900003-047	72136	DM15F471J
C29	Capacitor, fixed, mica, 390 pF, ±5%, 500 Vdc	1-900003-045	72136	DM15F391J
C30	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C31	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102F
CR1	Diode, germanium	1-913005-001	03877	1N273
CR2	Diode, germanium	1-913005-001	03877	1N273
CR3	Diode, silicon	1-913007-002	24446	1N4148
CR4	Diode, silicon	1-913007-002	24446	1N4148
CR5	Diode, silicon	1-913007-002	24446	1N4148
CR6	Diode, silicon	1-913007-002	24446	1N4148
L1	Coil, variable, 1.3- 1.8 uH	1-906006-006	88869	
L2	Coil, variable, 1.3-1.8 uH	1-906006-006	88869	
L3	Coil, variable, 1.3- 1.8 uH	1-906006-006	88869	
L4	Coil, variable, 1.3-1.8 uH	1-906006-006	88869	

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
L5	Coil, variable, 30-60 uH	1-906006-003	88869	
L6	Coil, fixed, 39 uH, 75 mA	1-906002-023	76493	70F395A1
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-038	01121	CB1221
R2	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-004	71450	X201
R3	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R4	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R5	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R6	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R7	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R8	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R9	Resistor, fixed, composition, 1.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-038	01121	CB1221
R10	Resistor, fixed, composition, 10 ohm $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R11	Resistor, fixed, composition, 10 ohm $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R12	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R13	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R14	Resistor, variable, composition, 2.5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-005	71450	X201
R15	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R16	Resistor, fixed, composition, 6.8 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-047	01121	CB6821
R17	Resistor, variable, composition, 2.5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-005	71450	X201

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R18	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB4721
R19	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R20	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-032	01121	CB3911
R21	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-032	01121	CB3911
R22	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R23	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R24	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R25	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R26	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-019	01121	CB3301
U1	Integrated circuit, IF Amplifier	1-926054-001	04713	MC1350P
U2	Integrated circuit, Balanced Mixer	1-926007-026	01295	SN76514N
Y1	Crystal filter, 11 MHz	1-403279-001	88869	

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A4 - BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C2	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C3	Capacitor, fixed, mica, selected, 6 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-005	72136	DM15C060K
C4	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C5	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C6	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C7	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C8	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, variable, ceramic, 1.7-10 pF	1-900113-002	91293	9301
C10	Capacitor, fixed, mica, 15 pF, $\pm 5\%$, 500 Vdc	1-900003-010	72136	DM15C150J
C11	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C12	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C13	Capacitor, variable, ceramic, 1.7-10 pF	1-900113-002	91293	9301
C14	Capacitor, fixed, plastic, 0.047 uF, $\pm 20\%$, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C15	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C16	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C17	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C18	Capacitor, fixed, mica, 10 pF, $\pm 5\%$, 500 Vdc	1-900003-008	72136	DM15C100J

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A4-ROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C19	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C20	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C21	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C22	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C23	Capacitor, variable, ceramic, 1.7-10 pF	1-900113-002	91293	9301
C24	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
C25	Capacitor, variable, ceramic, 1.7-10 pF	1-900113-002	91293	9301
C26	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C27	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C28	Capacitor, fixed, mica, selected,	1-900003-()	72136	DM15type
C29	Capacitor, fixed, mica, selected	1-900003-()	72136	DM15type
C30	Capacitor, fixed, mica, 10 pF, , ±5%, 500 Vdc	1-900003-008	72136	DM15C100J
CR1	Diode, back, germanium	1-913026-003	24446	BD3
FL1	Filter, feedthru	1-919011-004	72982	1202-052
FL2	Filter, feedthru	1-919011-004	72982	1202-052
FL3	Filter, feedthru	1-919011-004	72982	1202-052
J1	Not Used			
J2	Not Used			
J3	Receptacle, jack, BNC	1-910132-002	11636	UG1094/U
L1	Coil, fixed, 6 turns	1-403283-006	88869	
L2	Coil, 1 mH, 40 mA	1-906003-049	16407	DD-1000
L3	Coil, fixed, 6 turns	1-403283-005	88869	
L4	Coil, 1 mH, 40 mA	1-906003-049	16407	DD-1000

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A4—BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
L5	Coil, fixed, 4 turns	1-403283-001	88869	
L6	Coil, 1 mH, 40 mA	1-906003-049	16407	DD-1000
L7	Coil, fixed, 3 turns	1-403283-003	88869	
L8	Coil, 1 mH, 40 mA	1-906003-049	16407	DD-1000
P1	Receptacle, plug, push-on	1-910174-001	91737	8205A
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
Q5	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q6	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q7	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q8	Transistor, silicon, NPN	1-958064-001	73445	A486
R1	Resistor, fixed, composition, 1.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-165	01121	CB1325
R2	Resistor, fixed, composition, 3.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-174	01121	CB3325
R3	Resistor, fixed, composition, 10 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-114	01121	CB1005
R4	Resistor, fixed, composition, 100 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-210	01121	CB1045
R5	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-142	01121	CB1515
R6	Resistor, fixed, composition, 3.9 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-176	01121	CB3925
R7	Resistor, fixed, composition, selected 390 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-152	01121	CB3915
R8	Resistor, fixed, composition, 390 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-152	01121	CB3915
R9	Resistor, fixed, composition, 1.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-165	01121	CB1325
R10	Resistor, fixed, composition, 3.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-174	01121	CB3325
R11	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-142	01121	CB1515

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A4-BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R12	Resistor, fixed, composition, 3.9 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected 270 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-148	01121	CB2715
R14	Resistor, fixed, composition, 13 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-117	01121	CB1305
R15	Resistor, fixed, composition, 4.7 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-178	01121	CB4725
R16	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-153	01121	CB4315
R17	Resistor, fixed, composition, selected, 100 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-138	01121	CB1015
R18	Resistor, fixed, composition, 68 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-134	01121	CB6805
R19	Resistor, fixed, composition, 100 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-138	01121	CB1015
R20	Resistor, fixed, composition, 100 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-138	01121	CB1015
R21	Resistor, fixed, composition, 1.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-165	01121	CB1325
R22	Resistor, fixed, composition, 3.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-174	01121	CB3325
R23	Resistor, fixed, composition, 56 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-132	01121	CB5605
R24	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-142	01121	CB1515
R25	Resistor, fixed, composition, 3.9 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-176	01121	CB3925
R26	Resistor, fixed, composition, selected, 680 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-158	01121	CB6815
R27	Resistor, fixed, composition, 10 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-114	01121	CB1005
R28	Resistor, fixed, composition, 390 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-152	01121	CB3915
R29	Resistor, fixed, composition, 1.8 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-168	01121	CB1825
R30	Resistor, fixed, composition, 3.3 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-174	01121	CB3325

TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A4-BROAD BAND AMPLIFIER ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R31	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-142	01121	CB1515
R32	Resistor, fixed, composition, 3.9 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-176	01121	CB3925
R33	Resistor, fixed, composition, selected, 680 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-158	01121	CB6815
R34	Resistor, fixed, composition, 15 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-118	01121	CB1505
R35	Resistor, fixed, composition, 430 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-153	01121	CB4315
R36	Not Used			
R37	Not Used			
R38	Not Used			
R39	Resistor, fixed, composition, selected, 10 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-186	01121	CB1035
R40	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-119	01121	CB1605
R41	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-149	01121	CB3015
R42	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-119	01121	CB1605
R43	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-149	01121	CB3015
R44	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-149	01121	CB3015
Z1	Mixer, doubly balanced	1-403441-001	88869	

TABLE 6-5. PARTS LIST FOR MODEL FIM-1

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1	Circuit Board Assembly	4-004279-005	88869	
C1	Capacitor, fixed, ceramic, 150 pF, ±10%, 500 Vdc	1-900069-017	72982	CK60BX151M
DS1	Light, indicator, green 10V, 10 mA	1-925007-002	0000B	L-10/20
DS2	Light, indicator, amber 10V, 20 mA	1-925007-001	0000B	L-10/20
P1	Receptacle, plug, rectangular, 16 PIN	1-910071-001	02660	26-159-16
M1	Meter, 100-0-100 uA	1-937011-001	0000C	2S-DUA-1H1
R1	Resistor, variable, composition, 100 ohm, ±30%, ½W	1-403268-001	71450	5VA-45
S1	Switch, rotary, 2 pole, 4 position	1-003214-004	71450	223

TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, ceramic, 0.001 uF, +100, -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C2	Capacitor, fixed, electrolytic 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C4	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C5	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C6	Capacitor, fixed, mica, 360 pF, ±5%, 500 Vdc	1-900003-044	72136	DM15F361J
C7	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C10	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C11	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C12	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C13	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C14	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C15	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C16	Capacitor, fixed, mica, 910 pF, ±5%, 100 Vdc	1-900003-055	72136	DM15F911J
C17	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C18	Capacitor, fixed, mica, 910 pF, ±5%, 100 Vdc	1-900003-055	72136	DM15F911J
C19	Capacitor, fixed, mica, 82 pF, ±5%, 500 Vdc	1-900003-028	72136	DM15E820J

TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C20	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C21	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C22	Capacitor, fixed, electrolytic 1 uF, ±20%, 50 Vdc	1-900115-003	12954	D1R0GSA50M
C23	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C24	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-90012-002	72982	861Z5U102P
C25	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C26	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C27	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C28	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C29	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C30	Capacitor, fixed, ceramic, 0.005 uF, +80 -20%, 500 Vdc	1-900012-004	72982	801Z5U502Z
C31	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C32	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C27	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C28	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C29	Capacitor, fixed, electrolytic 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C30	Capacitor, fixed, ceramic, 0.005 uF, +80 -20%, 500 Vdc	1-900012-004	72982	801Z5U502Z
C31	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C32	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-90001-001	73445	C280AE, 0.01 uF

TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C33	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-90001-001	73445	C280AE, 0.01 uF
CR1	Diode, silicon	1-913007-001	03508	1N4148
L1	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L2	Coil, fixed, 2.5 uH, ±10%, 50 mA	1-906002-054	76493	70F253A1
L3	Coil, fixed, 2.5 uH, ±10%, 50 mA	1-906002-054	76493	70F253A1
L4	Coil, variable 30 to 60 uH	1-906006-003	88869	
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 120 k ohm, ±10%, ¼W	1-945000-062	01121	CB1241
R2	Resistor, fixed, composition, 1 k ohm, ±10%, ¼W	1-945000-037	01121	CB1021
R3	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R4	Resistor, variable, composition, 1 k ohm, ±30%, ¼W	1-945007-004	71450	X201
R5	Resistor, fixed, composition, 1 k ohm, ±10%, ¼W	1-945000-037	01121	CB1021
R6	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R7	Resistor, fixed, film, 18.2 k ohm, ±1%, ¼W	1-945016-314	72982	RN60D1822F
R8	Resistor, variable, composition, 5 k ohm, ±30%, ¼W	1-945007-006	71450	X201
R9	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R10	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R11	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R12	Resistor, fixed, composition, 1 k ohm, ±10%, ¼W	1-945000-037	01121	CB1021

TABLE 6-5. PARTS LIST FOR MODEL FIM-1

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R13	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R14	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R15	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R16	Resistor, fixed, composition, 56 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-022	01121	CB5601
R17	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R18	Resistor, variable, composition, 500 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-003	71450	X201
R19	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R20	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R21	Resistor, variable, composition, 2.5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-005	71450	X201
R22	Resistor, fixed, composition, 8.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-048	01121	CB8221
R23	Resistor, variable, composition 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-006	71450	X201
R24	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB2721
R25	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R26	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R27	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R28	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R29	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R30	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R31	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-006	71450	X201

TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R32	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R33	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R34	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R35	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R36	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R37	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R38	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-023	01121	CB6801
R39	Resistor, fixed, composition, 68 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-023	01121	CB6801
R40	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R41	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R42	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R43	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R44	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-046	01121	CB5621
R45	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R46	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R47	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-043	01121	CB3321
R48	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-046	01121	CB5621
R49	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-046	01121	CB5621
R50	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-046	01121	CB5621

TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R51	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-044	01121	CB3921
R52	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R53	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-044	01121	CB3921
R54	Resistor, fixed, composition, 27 k ohm,	1-945000-054	01121	CB2731
R55	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R56	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R57	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R58	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R59	Resistor, fixed, composition, 150 ohm, ±10%, ½W	1-945001-027	01121	EB1511
R60	Resistor, fixed, composition, 150 ohm, ±10%, ½W	1-945001-027	01121	EB1511
R61	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R62	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R63	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R64	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R65	Resistor, fixed, composition, 33 k ohm, ±10%, ¼W	1-945000-055	01121	CB3331
R66	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
U1	Integrated circuit, Dual JK Binary	1-926021-002	0000A	SP322B
U2	Integrated circuit, Voltage Regulator	1-926045-001	04713	MFC4060
U3	Integrated circuit, Monostable Multivibrator	1-926044-001	02735	CA3046
U4	Integrated circuit, General Purpose Transistor Array	1-926018-001	0000A	LU380A

TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
U5	Integrated circuit, Quad 2-input Nor Gate	1-926018-001	0000A	LU380A
U6	Integrated circuit, General Purpose Transistor Array	1-926044-001	02735	CA3046
U7	Integrated circuit, Quad 2-input Nor Gate	1-926018-001	0000A	LU380A

TABLE 6-6. PARTS LIST FOR MODEL FIM-3

MAIN ASSEMBLIES AND CHASSIS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1	Circuit Board Assembly	4-004279-006	88869	
C1	Capacitor, fixed, ceramic, 150 pF, $\pm 10\%$, 500 Vdc	1-900069-017	72982	CK60BX151M
DS1	Light, indicator, green 10 V, 20 mA	1-925007-002	0000B	L-10/20
DS2	Light, indicator, amber, 10 V, 20 mA	1-925007-001	0000B	L-10/20
P1	Receptacle, plug, rectangular, 16 PIN	1-910071-001	02660	26-159-16
M1	Meter, 100-0-100 μ A	1-937011-001	0000C	2S-DUA-1HI
R1	Resistor, variable, composition, 100 ohm, $\pm 30\%$, $\frac{1}{2}W$	1-403268-001	71450	5Va-45
S1	Switch, rotary, 2 pole, 4 position	1-003214-004	71450	223
S2	Switch, toggle, SPDT	1-951036-001	09353	7101

TABLE 6-6. PARTS LIST FOR MODEL FIM-3

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, ceramic, 0.001 uF, ±100%, -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C2	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C4	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C5	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C6	Capacitor, fixed, mica, 360 pF, ±5%, 500 Vdc	1-900003-044	72136	DM15F361J
C7	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C9	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C10	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C11	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C12	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C13	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C14	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C15	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C16	Capacitor, fixed, mica, 910 pF, ±5%, 100 Vdc	1-900003-055	72136	DM15F911J
C17	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C18	Capacitor, fixed, mica, 910 pF, ±5%, 100 Vdc	1-900003-055	72136	DM15F911J
C19	Capacitor, fixed, mica, 82 pF, ±5%, 500 Vdc	1-900003-028	72136	DM15E820J

TABLE 6-6. PARTS LIST FOR MODEL FIM-3 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C20	Capacitor, fixed, mica, 160 pF, ±5%, 500 Vdc	1-900003-035	72136	DM15F161J
C21	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C22	Capacitor, fixed, electrolytic, 1 uF, ±20%, 50 Vdc	1-900115-003	12954	D1ROGSA50M
C23	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C24	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C25	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C26	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C27	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C28	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U102P
C29	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	983-2203
C30	Capacitor, fixed, ceramic, 0.005 uF, +80 -20%, 500 Vdc	1-900012-004	72982	801Z5U502Z
C31	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C32	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C33	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C34	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
CR1	Diode, silicon	1-913007-001	03508	1N4148
CR2	Diode, silicon	1-913074-001	80795	1TT244
L1	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L2	Coil, fixed, 2.5 uH, ±10%, 50 mA	1-906002-054	76493	70F253A1
L3	Coil, fixed, 2.5 uH, ±10%, 50 mA	1-906002-054	76493	70F253A1
L4	Coil, variable, 30 to 60 uH	1-906006-003	88869	

TABLE 6-6. PARTS LIST FOR MODEL FIM-3 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q1	Transistor, silicon, NPN	958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	958000-001	04713	2N3904-5
Q3	Transistor, silicon, NPN	958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 120 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-062	01121	CB1241
R2	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R3	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R4	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-004	71450	X201
R5	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R6	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R7	Resistor, fixed, film 18.2 k ohm, $\pm 1\%$, $\frac{1}{4}W$	1-945016-314	72982	RN60D1822F
R8	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-006	71450	X201
R9	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R10	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R11	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R12	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R13	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R14	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R15	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R16	Resistor, fixed, composition, 56 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-022	01121	CB5601
R17	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611

TABLE 6-6. PARTS LIST FOR MODEL FIM-3 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R18	Resistor, variable, composition, 500 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-003	71450	X201
R19	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R20	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R21	Resistor, variable, composition, 2.5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-005	71450	X201
R22	Resistor, fixed, composition, 8.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-048	01121	CB8221
R23	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-006	71450	X201
R24	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R25	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R26	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R27	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R28	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R29	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R30	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R31	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-006	71450	X201
R32	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R33	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R34	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R35	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R36	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021

TABLE 6-6. PARTS LIST FOR MODEL FIM-3 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R37	Resistor, fixed, composition, 470 ohm, ±10%, ¼W	1-945000-033	01121	CB4711
R38	Resistor, fixed, composition, 3.3 k ohm, ±10%, ¼W	1-945000-043	01121	CB3321
R39	Resistor, fixed, composition, 68 ohm, ±10%, ¼W	1-945000-023	01121	CB6802
R40	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R41	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R42	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R43	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R44	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R45	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R46	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R47	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-043	01121	CB3321
R48	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R49	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R50	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R51	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-044	01121	CB3921
R52	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R53	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-044	01121	CB3921
R54	Resistor, fixed, composition, 27 k ohm, ±10%, ¼W	1-945000-054	01121	CB2731
R55	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-044	01121	CB3921

TABLE 6-6. PARTS LIST FOR MODEL FIM-3 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R56	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R57	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R58	Resistor, fixed, composition, 10 k ohm ±10%, ¼W	1-945000-049	01121	CB1031
R59	Resistor, fixed, composition, 150 ohm, ±10%, ½W	1-945001-027	01121	EB1511
R60	Resistor, fixed, composition, 150 ohm, ±10%, ½W	1-945001-027	01121	EB1511
R61	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R62	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R63	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R64	Resistor, fixed, composition, 4.7 k ohm, ±10%, ¼W	1-945000-045	01121	CB4721
R65	Resistor, fixed, composition, 33 k ohm, ±10%, ¼W	1-945000-055	01121	CB3331
R66	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R67	Not Used			
R68	Resistor, fixed, composition, 330 ohm, ±10%, ¼W	1-945000-031	01121	CB3311
U1	Integrated circuit, Dual JK Binary	1-926021-002	0000A	SP322B
U2	Integrated circuit, Voltage Regulator	1-926045-001	04713	MFC4060
U3	Integrated circuit, Monostable Multivibrator	1-926007-023	01295	SN74121
U4	Integrated circuit, General Purpose Transistor Array	1-926044-001	02735	CA3046
U5	Integrated circuit, Quad 2-input Nor Gate	1-926018-001	0000A	LU380A
U6	Integrated circuit, General Purpose Transistor Array	1-926044-001	02735	CA3046
U7	Integrated circuit, Quad 2-input Nor Gate	1-926018-001	0000A	LU380A

TABLE 6-7. PARTS LIST FOR MODEL OAM-1

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1	AM Detector Board Assembly	4-004369-005	88869	
A2	High Voltage Power Supply Board Assembly	4-003202-005	88869	
A3	Vertical Amplifier Board Assembly	4-003204-009	88869	
A4	Horizontal Amplifier Board Assembly	5-003217-005	88869	
C1	Capacitor, fixed, plastic, 0.47 μ F, \pm 20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 μ F
C2	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 μ F
C3	Capacitor, fixed, electrolytic, 2 μ F, +75 -10%, 25 Vdc	1-900023-016	56289	TE-1201
C4	Capacitor, fixed, ceramic, 0.02 μ F, \pm 20%, 1000 Vdc	1-900012-012	56289	5QA-S20
DS1	Lamp, indicator, neon	1-925008-011	24446	NE-86
J1	Receptacle, jack, BNC	1-910132-001	91737	UG-1094A/U
J2	Receptacle, jack, phone	1-910132-001	82389	S-13B
J3	Receptacle, jack, BNC	1-910132-001	01737	UG-1094A/U
J4	Receptacle, jack, BNC	1-910132-001	91737	UG-1094A/U
P1	Receptacle, plug, rectangular, -16 pins	1-910071-001	02660	26-159-16
Q1	Transistor, NPN, silicon	1-958001-004	04713	MJE521
Q2	Transistor, NPN, silicon	1-958001-004	04713	MJE521
R1	Resistor, variable, composition, 1 k ohm, \pm 30% (part of S3)			
R2	Resistor, variable, composition, 1 k ohm, \pm 30% (part of S1)			
R3	Resistor, variable, composition, 100 k ohm, \pm 30%, (part of S2)			
R4	Resistor, fixed, composition, 1 k ohm \pm 10%, $\frac{1}{4}$ W	1-945000-037	01121	CB1021
R5	Resistor, variable, composition, 500 k ohm, \pm 30%, (part of S4)			
R6/R13	Resistor, variable, composition assembly (R6) 1 k ohm, \pm 30%	1-003215-002	88869	
R7	Resistor, fixed, composition, 2.2 k ohm, \pm 10%, $\frac{1}{4}$ W	1-945000-041	01121	CB2221

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R8/R11	Resistor, variable, composition assembly (R8) 5 k ohm, $\pm 30\%$	1-003215-001	88869	
R9	Resistor, fixed, composition 470 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-069	01121	CB4741
R10	Resistor, fixed, composition, 4.7 M ohm, $\pm 10\%$, 2 W	1-945003-081	01121	HB4751
R11	Resistor, variable, composition, 500 Vdc, $\pm 30\%$ (part of R8/R11)			
R12	Resistor, fixed, composition, 560 k ohm, $\pm 5\%$, $\frac{1}{2}W$	1-945001-228	01121	EB5645
R13	Resistor, variable, composition, 1 M ohm, $\pm 30\%$ (part of R6/R13)			
R14	Resistor, fixed, composition, selected, 68 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-059	01121	CB6831
S1/S6/R2	Switch/ variable resistor assembly (S1) switch, rotary 1 pole, 1 position	1-003407-003	88869	
S2/R3	Switch/ variable resistor assembly (S2) switch, rotary, 4 poles, 4 positions	1-003407-001	88869	
S3/R1	Switch/ variable resistor assembly (S3) switch, rotary, 2 poles, 3 positions	1-003210-003	88869	
S4/R5	Switch/ resistor variable (S4) switch, rotary, 1 pole, 2 positions	1-003210-002	88869	
S5	Switch, rotary, 3 poles, 2 positions	1-003214-003	88869	
S6	Switch, rotary, 2 poles, 3 positions (part of S1/S6/R2)			
V1	Electron Tube, cathode ray	1-917000-001	24972	D7-166J
XV1	Socket, CRT	1-950003-001	24972	30232

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C601	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C602	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C603	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900002-057	72136	DM15F122J
C604	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C605	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C606	Capacitor, fixed, mica, 3 pF, ±0.5 pF, 500 Vdc	1-90003-003	72136	DM15C030
C607	Not Used			
C608	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-90003-034	72136	DM15F151J
C609	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C610	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C611	Not Used			
C612	Not Used			
C613	Not Used			
C614	Not Used			
C615	Not Used			
C616	Not Used			
C617	Not Used			
C618	Not Used			
C619	Not Used			
C620	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C621	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C622	Capacitor, fixed, electrolytic, 10 uF, +75 -10%, 25 Vdc	1-900023-017	56289	TE-1204

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C623	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C624	Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C625	Not Used			
C626	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C627	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C628	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C629	Capacitor, fixed, electrolytic, 25 uF, +75 - 10%, 25 Vdc	1-900039-001	76433	984-2203
C630	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C631	Capacitor, fixed, plastic, 0.022 uF, ±20%, 250 Vdc	1-900001-005	73445	C280AE, 0.022 uF
C632	Capacitor, fixed, electrolytic, 2 uF, +75 -10%, 25 Vdc	1-900023-016	56289	TE-1201
C633	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C634	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C635	Not Used			
C636	Capacitor, fixed, electrolytic, 200 uF, +75, -10%, 15 Vdc	1-900039-002	76433	984-1733
C637	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C638	Capacitor, fixed, electrolytic, 2 uF, +75 -10%, 25 Vdc	1-900023-016	56289	TE-1201
C639	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C640	Capacitor, fixed, electrolytic, 2 uF, +75 -10%, 25 Vdc	1-900023-016	56289	TE-1201
C641	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C642	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C643	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C644	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C645	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C646	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C647	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C648	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C649	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C650	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C651	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C652	Capacitor, fixed, electrolytic, 200 uF, +75 -10%, 15 Vdc	1-900039-002	76433	984-1733
CR601	Diode, silicon, zener, 4.7 V	1-913004-005	04713	JZ4.7B
CR602	Diode, germanium	1-913005-001	03877	1N273
CR603	Diode, germanium	1-913005-001	03877	1N273
CR604	Diode, silicon	1-913007-002	24446	1N4148
L601	Coil, variable, 30--60 uH	1-906006-003	88869	
L602	Coil, variable, 30--60 uH	1-906006-003	88869	
L603	Coil, variable, 30 -60 uH	1-906006-003	88869	
L604	Not Used			
L605	Not Used			
L606	Coil, variable, 30--60 uH	1-906006-003	88869	
Q601	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q602	Not Used			

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q603	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q604	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q605	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q606	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q607	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q608	FET, silicon, N-channel	1-958031-003	0000A	E102
Q609	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q610	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q611	FET, silicon, N-channel	1-958044-003	04713	MFE2006
Q612	Transistor, silicon, NPN	1-958000-001	04713	2N3906-5
Q613	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q614	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q615	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q616	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q617	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
R601	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R602	Resistor, fixed, composition, 6.8 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-047	01121	CB6821
R603	Resistor, fixed, composition, 56 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-022	01121	CB5601
R604	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R605	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R606	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R607	Not Used			
R608	Not Used			
R609	Not Used			
R610	Not Used			
R611	Not Used			

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R612	Not Used			
R613	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R614	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R615	Not Used			
R616	Not Used			
R617	Not Used			
R618	Not Used			
R619	Not Used			
R620	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R621	Resistor, variable, composition, 500 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-003	71450	X201
R622	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R623	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R624	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R625	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R626	Resistor, variable, composition, 500 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-003	71450	X201
R627	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R628	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R629	Resistor, fixed, composition, 12 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-050	01121	CB1231
R630	Resistor, fixed, composition, 18 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-016	01121	CB1801
R631	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	XB1031
R632	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R633	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R634	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R635	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R636	Resistor, fixed, composition, 2.7 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-078	01121	CB2751
R637	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R638	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
R639	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R640	Not Used			
R641	Resistor, variable, composition, 100 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-001	71450	X201
R642	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R643	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R644	Resistor, fixed, composition, selected, 100 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R645	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-043	01121	CB3321
R646	Thermistor, 300 ohm, $\pm 2\%$	1-945070-001	07115	C20
R647	Resistor, fixed, composition, 56 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-022	01121	CB5601
R648	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R649	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R650	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R651	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-057	01121	CB4731

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R652	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R653	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R654	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-057	01121	CB4731
R655	Not Used			
R656	Resistor, fixed, film, 4.02 k ohm, $\pm 1\%$, $\frac{1}{4}W$	1-945016-251	72982	RN60D4021F
R657	Resistor, fixed, composition, 56 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-058	01121	CB5631
R658	Resistor, fixed, film, 3.01 k ohm, $\pm 1\%$, $\frac{1}{4}W$	1-945016-239	72982	RN60D3011F
R659	Resistor, fixed, film, 3.01 k ohm, $\pm 1\%$, $\frac{1}{4}W$	1-945016-239	72982	RN60D3011F
R660	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-039	01121	CB8211
R661	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R662	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R663	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R664	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R665	Resistor, fixed, composition, 18 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-053	01121	CB1831
R666	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
R667	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R668	Resistor, fixed, composition, 6.8 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-047	01121	CB6821
R669	Resistor, fixed, composition, 27 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R670	Resistor, fixed, composition, selected, 10 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R671	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-006	71450	X201
R672	Resistor, fixed, composition, selected, 27 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-054	01121	CB2731
R673	Resistor, variable, composition, 10 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-007	71450	X201
R674	Resistor, variable, composition, 100 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-001	71450	X201
R675	Resistor, variable, composition, 100 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-001	71450	X201
R676	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R677	Resistor, fixed, composition, selected 39 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-056	01121	CB3931
R678	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-053	01121	CB2231
R679	Not Used			
R680	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R681	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
U601	Not Used			
U602	Integrated circuit, Differential/Cascade Amplifier	1-926005-001	02735	CA3028A

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A2 - HIGH VOLTAGE POWER SUPPLY BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C401	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C402	Capacitor, fixed, electrolytic, 200 uF, +75 -10%, 15 Vdc	1-900039-002	76433	984-1733
C403	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 uF
C404	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-012	56289	5GA-520
C405	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-012	56289	5GA-520
C406	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-012	56289	5GA-520
C407	Capacitor, fixed, electrolytic, 4 uF, +100 -10%, 350 Vdc	1-900011-001	14665	BR-350
C408	Capacitor, fixed, electrolytic, 4 uF, +100 -10%, 350 Vdc	1-900011-001	14665	BR4-350
C409	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C410	Capacitor, fixed, electrolytic, 100 uF, +75 -10%, 25 Vdc	1-900039-004	76433	984-1653
C411	Capacitor, fixed, ceramic, 0.1 uF, +80 -20%, 500 Vdc	1-900012-005	56289	41C92
C412	Capacitor, fixed, ceramic, 0.02 uF, ±20% 1000 Vdc	1-900012-012	56289	5GA-520
CR401	Diode, silicon	1-913043-002	04713	MR991A
CR402	Diode, silicon	1-913043-002	04713	MR991A
CR403	Diode, silicon	1-913001-004	04713	1N4004
CR404	Diode, silicon	1-913001-004	04713	1N4004
CR405	Diode, silicon	1-913001-002	04713	1N4002
CR406	Diode, silicon	1-913001-002	04713	1N4002
CR407	Diode, silicon, zener, 15 V, 10%, 1W	1-913004-017	04713	MZ-100-17
L401	Coil, fixed, 27 uH	1-003213-001	88869	
R401	Resistor, fixed, composition, 68 ohm, ±10%, ¼W	1-945000-023	01121	CB6801
R402	Resistor, fixed, composition, 680 ohm, ±10%, ¼W	1-945000-035	01121	CB6811

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A2 - HIGH VOLTAGE POWER SUPPLY BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R403	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R404	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011
T401	Transformer, power	1-003206-001	88869	

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C101	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C102	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C103	Capacitor, fixed, electrolytic, 15 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C104	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z50102P
C105	Capacitor, fixed, plastic, 0.1 uF, ±10%, 400 Vdc	1-900005-115	90201	PVC401
C106	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z50102P
C107	Not Used			
C108	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
CR101	Not Used			
CR102	Diode, silicon	1-913007-001	24446	1N4148
CR103	Diode, silicon	1-913007-001	24446	1N4148
Q101	FET silicon N-channel	1-958003-003	04713	2N5458
Q102	FET silicon N-channel	1-958002-002	04713	2N5458
Q103	Transistor, silicon, NPN	1-958004-001	02735	40327
Q104	Transistor, silicon, NPN	1-958004-001	02735	40327
Q105	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R101	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R102	Resistor, fixed, composition, 10 M ohm, ±10%, ¼W	1-945000-085	01121	CB1061
R103	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011
R104	Resistor, fixed, composition, 1 M ohm, ±10%, ¼W	1-945000-073	01121	CB1051
R105	Resistor, variable, composition, 100 k ohm, ±30%, ¼W	1-945010-010	71450	U201
R106	Resistor, fixed, composition, 560 ohm, ±10%, ¼W	1-945000-034	01121	CB5611

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R107	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R108	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R109	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R110	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R111	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R112	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-006	71450	U201
R113	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1 W	1-945002-057	01121	GB4731
R114	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R115	Resistor, fixed, composition, 47 k ohm, $\pm 0\%$, 1 W	1-945000-057	01121	GB4731
R116	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R117	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-036	01121	CB8211
R118	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R119	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R120	Resistor, fixed, composition, 6.8 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-182	01121	CB6825
R121	Resistor, fixed, composition, 1 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-162	01121	CB1025
R122	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-142	01121	CB1515
R123	Not Used			
R124	Resistor, fixed, composition, selected, 91 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-137	CB9105	
R125	Not Used			

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R126	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R127	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R128	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-053	01121	CB2231
U101	Integrated circuit, Differential/Cascade Amplifier	1-926005-001	02735	CA3028A

TABLE 6-7. PARTS LIST FOR MODEL OAM-1

A4 - HORIZONTAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C200	Capacitor, fixed, plastic, 0.0022 uF, ±10%, 600 Vdc	1-900005-101	90201	PVC6222
C201	Capacitor, fixed, plastic, 0.022 uF, ±10%, 200 Vdc	1-90005-004	90201	PVC2122
C202	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C203	Not Used			
C204	Capacitor, fixed, electrolytic +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C205	Capacitor, fixed, electrolytic 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
Q200	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q201	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q202	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q203	FET silicon N-channel	1-958002-002	04713	2N5458
Q204	Transistor, silicon, NPN	1-958004-001	02735	40327
Q205	Transistor, silicon, NPN	1-958004-001	02735	40327
R200	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R201	Resistor, fixed, composition, 15 k ohm, ±10%, ¼W	1-945000-051	01121	CB1531
R202	Resistor, variable, composition, 100 k ohm, ±30%, ¼W	1-945010-010	71450	U201
R203	Resistor, fixed, composition, 1.2 k ohm, ±10%, ¼W	1-945000-038	01121	CB1221
R204	Resistor, variable, composition, 10 k ohm, ±30%, ¼W	1-945010-007	71450	U201
R205	Resistor, fixed, composition, 10 M ohm, ±10%, ¼W	1-945000-085	01121	CB1061
R206	Not Used			
R207	Not Used			
R208	Resistor, fixed, composition, 22 k ohm, ±10%, ¼W	1-945000-053	01121	CB2231
R209	Resistor, fixed, composition, 1 k ohm, ±10%, ¼W	1-945000-037	01121	CB1021

TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A4 - HORIZONTAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R210	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1 W	1-945002-057	01121	GB4731
R211	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-046	01121	CB5621
R212	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R213	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-004	71450	U201
R214	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1 W	1-945002-057	01121	GB4731
R215	Resistor, fixed, composition, 5.6 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-046	01121	CB5621
R216	Resistor, fixed, composition, 3.9 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-044	01121	CB3921
R217	Resistor, variable, composition, 1 M ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-013	71450	U201

TABLE 6-8. PARTS LIST FOR MODEL ODM-1

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1	IF Board Assembly	5-003178-005	88869	
A2	High Voltage Power Supply Board Assembly	4-003202-005	88869	
A3	Vertical Amplifier Board Assembly	4-003204-008	88869	
A4	Horizontal Amplifier Board Assembly	5-003217-005	88869	
C1	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 uF
C2	Capacitor, fixed, plastic, 0.37 uF, ±20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 uF
C3	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 250 Vdc	1-900012-012	56289	5GA-S20
C4	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
DS1	Lamp, indicator, 10V, 20 mA	1-925007-005	0000B	L10/20
DS2	Lamp, indicator, 10V, 20 mA	1-925007-005	0000B	L10/20
DS3	Lamp, indicator, neon	1-925008-011	24446	NE-86
J1	Receptacle, jack phone	1-910043-001	11636	KC-19-68
J2	Receptacle, jack phone	1-910152-001	82389	S-13B
J3	Receptacle, jack BNC	1-910043-001	11636	KC-19-68
J4	Receptacle, jack BNC	1-910043-001	11636	KC-19-68
P1	Receptacle, plug, rectangular - 16 pins	1-910071-001	02660	26-159-16
Q1	Transistor, silicon, NPN	1-958001-004	04713	MJE521
Q2	Transistor, silicon, NPN	1-958001-004	04713	MJE521
R1	Not Used			
R2	Resistor, fixed, film 70 k ohm, ±1%, 1/8 W	1-945001-580		RN60D7002F
R3	Resistor, fixed, film 20 k ohm, ±1%, 1/8 W	1-945001-318		RN60D2002F
R4	Resistor, fixed, film 10 k ohm, ±1%, 1/8 W	1-945001-289		RN60D1002F
R5	Not Used			
R6	Resistor, fixed, composition, 220 ohm, ±10%, ¼W	1-945000-029	01121	CB2211
R7	Resistor, variable, composition, 25 k ohm, ±20% (part of S1)			

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R8	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R9/R18	Resistor, variable, assembly (R9) 1 k ohm, $\pm 30\%$	1-003215-002	88869	
R10	Not Used			
R11	Resistor, variable, composition, 500 k ohm, $\pm 30\%$ (part of S3)			
R12/R21	Resistor, variable, composition, 1 k ohm, $\pm 30\%$ (part of S5)			
R14	Resistor, fixed, composition, 1.8 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-040	01121	CB1821
R15	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R16	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R17	Not Used			
R18	Resistor, variable, composition, 1 M ohm, $\pm 30\%$ (part of R9/R18)			
R19	Resistor, fixed, composition, 470 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-069	01121	CB4741
R20	Resistor, fixed, composition, 560 k ohm, $\pm 5\%$, $\frac{1}{2}W$	1-945001-228	01121	EB5645
R21	Resistor, variable, composition, 500 k ohm, $\pm 30\%$ (part of R12/R21)			
R22	Resistor, fixed, composition, 4.7 M ohm, $\pm 5\%$, 2W	1-945003-081	01121	HB4755
S1/R7	Switch/Variable resistor assembly (S1) switch, rotary, 2 poles, 2 positions	1-003210-001	88869	
S2	Switch, rotary, 1 pole, 3 positions	1-003214-001	88869	
S3/R11	Switch/Variable resistor assembly (S3) switch, rotary, 1 pole, 2 positions	1-003210-002	88869	
S4	Switch, rotary, 3 poles, 3 positions	1-003214-002	88869	
S5/R13	Switch/Variable resistor assembly (S5) switch, rotary, SPDT	1-402816-001	88869	
V1	Electron tube, cathode ray	1-917000-001	24972	D7-166J
XV1	Socket, CRT	1-950003-001	24972	30232

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C501	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C502	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900002-057	72136	DM15F122J
C503	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C504	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C505	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C506	Not Used			
C507	Capacitor, fixed, mica, 5 pF, ±10%, 500 Vdc	1-900003-004	72136	DM15C050K
C508	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C509	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	72136	DM15F122J
C510	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C511	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C512	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
C513	Capacitor, fixed, mica, 47 pF, ±5%, 500 Vdc	1-900002-021	72136	DM15E470J
C514	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C515	Capacitor, fixed, plastic, 0.1 uF, ±20%, 150 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C516	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C517	Capacitor, fixed, ceramic, 0.005 uF, +80 -20%, 500 Vdc	1-900012-004	72982	801Z5U5-02Z
C518	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z5U-102P
C519	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C520	Not Used			
C521	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C522	Capacitor, fixed, mica, 150 pF, $\pm 5\%$, 500 Vdc	1-900002-034	72136	DM15F151J
C523	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C524	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C525	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C526	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C527	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C528 THRU C550	Not Used			
C551	Capacitor, fixed, plastic, 0.1 uF, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C552	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900002-030	72136	DM15F101J
C553	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C554	Not Used			
C555	Not Used			
C556	Not Used			
C557	Not Used			
C558	Not Used			
C559	Not Used			
C560	Not Used			
C561	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C562	Capacitor, fixed, plastic, 0.01 uF, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C563	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	72136	DM15F101J
C564	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C565	Capacitor, fixed, electrolytic, 200 uF, +75 -10%, 15 Vdc	1-900039-002	76433	984-1733
C566	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C567	Capacitor, fixed, electrolytic, 2 uF, +75 -10%, 25Vdc	1-900023-016	56289	TE-1201
C568	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C569	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C570	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C571	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C572	Not Used			
C573	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
CR501	Diode, silicon, zener, 4.7 V	1-913004-005	04713	JZ4.7B
CR502	Diode, silicon	1-913007-001	24446	1N4148
CR503	Diode, silicon	1-913007-001	24446	1N4148
CR504	Diode, germanium	1-913005-001	03877	1N273
CR505	Diode, germanium	1-913005-001	03877	1N273
L501	Coil, variable, 30 - 60 uH	1-906006-003	88869	
L502	Coil, variable, 30 - 60 uH	1-906006-003	88869	
L503	Coil, variable, 30 - 60 uH	1-906006-003	88869	
L504	Coil, variable, 30 - 60 uH	1-906006-003	88869	
L505	Not Used			
L506	Coil, variable, 30 - 60 uH	1-906006-003	88869	
Q501	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q502	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q503	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q504	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q505	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q506	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q507	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q508	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q509	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q510	Transistor, silicon, NPN	1-958001-001	04713	2N3904-5
Q511	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q512	FET, silicon, N-channel	1-958031-003	0000A	E102
Q513	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q514	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q515	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q516	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q517	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q518	FET, silicon, N-channel	1-958044-003	04713	MFE2006
Q519	Transistor, silicon, NPN ^a	1-958000-001	04713	2N3904-5
Q520	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R501	Resistor, fixed, composition, 56 ohm, ±10%, ¼W	1-945000-022	01121	CB5601
R502	Resistor, fixed, composition, 6.8 k ohm, ±10%, ¼W	1-945000-047	01121	CB6831
R503	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R504	Resistor, fixed, composition, 470 ohm, ±10%, ¼W	1-945000-033	01121	CB4711
R505	Resistor, fixed, composition, 100 k ohm, ±10%, ¼W	1-945000-061	01121	CB1041
R506	Resistor, fixed, composition, 470 ohm, ±10%, ¼W	1-945000-033	01121	CB4711

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R507	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R508	Resistor, fixed, composition, 100 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-061	01121	CB1041
R509	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R510	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R511	Resistor, fixed, composition, selected, 9.1 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-185	01121	CB9125
R512	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R513	Resistor, fixed, composition, 12 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-050	01121	CB1231
R514	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R515	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R516	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945007-004	71450	X201-white
R517	Resistor, fixed, composition, selected, 4.7 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R518	Not Used			
R519	Not Used			
R520	Not Used			
R521	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R522	Resistor, fixed, composition, 120 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-026	01121	CB1211
R523	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R524	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-043	01121	CB3321
R525	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R526	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R527	Resistor, variable, wire wound, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945056-007	80294	3257W1-102
R528	Resistor, variable, wire wound, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945056-007	80294	3257W1-102
R529	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R530	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R531	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
R532	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
R533	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R534	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R535	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R536	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R547	Not Used			
R548	Not Used			
R549	Not Used			
R550	Not Used			
R551	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R552	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R553	Resistor, fixed, composition, 10 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-045000-085	01121	CB1061
R554	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R555	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R556	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R557	Resistor, fixed, composition, 470 ohm, ±10%, ¼W	1-945000-033	01121	CB4711
R558	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R559	Not Used			
R560	Not Used			
R561	Resistor, fixed, composition, 15 k ohm, ±10%, ¼W	1-945000-051	01121	CB1531
R562	Resistor, variable, composition, 5 k ohm, ±30%, ¼W	1-945007-006	71450	X201-green
R563	Resistor, fixed, composition, selected, 15 k ohm nominal, ±10%, ¼W	1-945000-051	01121	CB1531
R564	Resistor, fixed, composition, 1 k ohm, ±10%, ¼W	1-945000-037	01121	CB1021
R565	Resistor, fixed, composition, selected, 150 ohm nominal, ±10%, ¼W	1-945000-027	01121	CB1511
R566	Resistor, variable, composition, 100 ohm, ±30%, ¼W	1-945007-001	71450	X201-black
R567	Resistor, fixed, composition, 56 ohm, ±10%, ¼W	1-945000-022	01121	CB5601
R568	Thermistor, 300 ohm, ±2%	1-945070-001	07115	C20
R569	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R570	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R571	Resistor, fixed, composition, 47 k ohm, ±10%, ¼W	1-945000-057	01121	CB4721
R572	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011
R573	Resistor, fixed, composition, 2.2 k ohm, ±10%, ¼W	1-945000-041	01121	CB2221
R574	Resistor, fixed, composition, 680 ohm, ±10%, ¼W	1-945000-035	01121	CB6811
R575	Resistor, fixed, composition, 270 ohm, ±10%, ¼W	1-945000-030	01121	CB2711
R576	Not Used			

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R577	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-036	01121	CB8211
R578	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R579	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R580	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R581	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R582	Resistor, fixed, composition, 12 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-050	01121	CB1231
R583	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
R584	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R585	Not Used			
R586	Not Used			
R587	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-019	01121	CB3301
U501	Integrated circuit, FM Detector and Limiter	1-926031-001	56289	ULN2111A

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A2 - HIGH VOLTAGE POWER SUPPLY BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C401	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C402	Capacitor, fixed, electrolytic, 200 uF, +75 -10%, 15 Vdc	1-900039-002	76433	984-1733
C403	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 Vdc	1-900001-021	73445	C280AE, 0.47 uF
C404	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-013	56289	5GA-520
C405	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-012	56289	5GA-510
C406	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-012	56289	5GA-520
C407	Capacitor, fixed, electrolytic, 4 uF, +100 -10%, 350 Vdc	1-900011-001	14665	BR4-350
C408	Capacitor, fixed, electrolytic, 4 uF, +100 -10%, 350 Vdc	1-900011-001	14665	BR4-350
C409	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-004	76433	984-1653
C410	Capacitor, fixed, electrolytic, 100 uF, +75 -10%, 25 Vdc	1-900039-004	76433	984-1653
C411	Capacitor, fixed, ceramic, 0.1 uF, +80 -20%, 500 Vdc	1-900012-005	56289	41C92
C412	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 Vdc	1-900012-012	56189	5GA-520
CR401	Diode, silicon	1-913043-002	04713	MR991A
CR402	Diode, silicon	1-913043-002	04713	MR991A
CR403	Diode, silicon	1-913001-004	04713	1N4004
CR404	Diode, silicon	1-913001-004	04713	1N4004
CR405	Diode, silicon	1-913001-002	04713	1N4002
CR407	Diode, silicon, zener, 15 V, ±10%, 1 W	1-913004-017	04713	MZ-1000-17
L401	Coil, fixed, 27 uH	1-003213-001	01121	CB6801
R401	Resistor, fixed, composition, 68 ohm, ±10%, ¼W	1-945000-023	01121	CB6801
R402	Resistor, fixed, composition, 680 ohm, ±10%, ¼W	1-945000-035	01121	CB6811

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A2 - HIGH VOLTAGE POWER SUPPLY BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R403	Resistor, fixed, composition, 10 k ohm, ±10%, ¼W	1-945000-049	01121	CB1031
R404	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011
T401	Transformer, Power	1-003206-001	88869	

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R123	Resistor, fixed, composition, 150 ohm, ±5%, ¼W	1-945000-142	01121	CB1515
R124	Resistor, fixed, composition, 1 k ohm, ±5%, ¼W	1-945000-162	01121	CB1025
R125	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-013	01121	CB1001
R126	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011
R127	Resistor, fixed, composition, 1 M ohm, ±10%, ¼W	1-945000-073	01121	CB1051
R128	Resistor, fixed, composition, 22 k ohm, ±10%, ¼W	1-945000-053	01121	CB2231
R129	Resistor, variable, composition, 10 k ohm, ±30%, ¼W	1-945010-007	71450	U201
U101	Integrated circuit, Differential/Cascode Amplifier	1-926005-001	02735	CA3028A
U102	Integrated circuit, Amplifier	1-004763-001	88869	

TABLE 6-8. PARTS LIST FOR MODEL ODM-2 (CONT.)

A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C101	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C102	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C103	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C104	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z50102P
C105	Capacitor, fixed, plastic, 0.1 uF, ±10%, 400 Vdc	1-900005-115	90201	PVC401
C106	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	72982	861Z50102P
C107	Capacitor, fixed, electrolytic, 100 uF, +75 -10%, 25 Vdc	1-900039-004	76433	984-1653
C108	Not Used			
C109	Capacitor, fixed, electrolytic, 1 uF, 50 Vdc	1-900115-003	12954	D1ROGSA50M
C110	Not Used			
C111	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
CR101	Diode, silicon	1-913007-001	24446	1N4148
CR102	Diode, silicon	1-913007-001	24446	1N4148
CR103	Diode, silicon	1-913007-001	24446	1N4148
Q101	FET, silicon, N-channel	1-958002-002	04713	2N5458
Q102	FET, silicon, N-channel	1-958002-002	04713	2N5458
Q103	Transistor, silicon, NPN	1-958004-001	02735	40327
Q104	Transistor, silicon, NPN	1-958004-001	02735	40327
Q105	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R101	Resistor, fixed, composition, 10 ohm, ±10%, ¼W	1-945000-085	01121	CB1061
R102	Resistor, fixed, composition, 10 M ohm, ±10%, ¼W	1-945000-085	01121	CB1061
R103	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R104	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R105	Resistor, variable, composition, 100 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-010	71450	U201
R106	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R107	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R108	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R109	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R110	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R111	Resistor, fixed, composition, selected, 10 ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R112	Resistor, variable, composition, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-006	71450	U201
R113	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1 W	1-945002-057	01121	GB4731
R114	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-038	01121	CB1021
R115	Resistor, fixed, composition, 47 k ohm, $\pm 10\%$, 1 W	1-945000-057	01121	GB4731
R116	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-073	01121	CB1051
R117	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-036	01121	CB8211
R118	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R119	Resistor, fixed, composition, selected, 1.5 k ohm nominal, $\pm 10\%$, $\frac{1}{4}W$	1-945000-039	01121	CB1521
R120	Resistor, fixed, composition, 6.8 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-182	01121	CB6825
R121	Resistor, fixed, composition, 1 k ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-162	01121	CB1025
R122	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-142	01121	CB1515

TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A4 - HORIZONTAL AMPLIFIER BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C200	Capacitor, fixed, plastic, 0.0022 uF, ±10%, 500 Vdc	1-900005-101	90201	PVC6222
C201	Capacitor, fixed, plastic, 0.022 uF, ±10%, 200 Vdc	1-900005-004	90201	PVC2122
C202	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C203	Not Used			
C204	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
C205	Capacitor, fixed, electrolytic, 25 uF, +75 -10%, 25 Vdc	1-900039-001	76433	984-2203
Q200	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q201	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q202	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q203	FET, silicon, N-channel	1-958003-003	04713	2N5458
Q204	Transistor, silicon, NPN	1-958004-001	02735	40327
Q205	Transistor, silicon, NPN	1-958004-001	02735	40327
R212	Resistor, fixed, composition, 100 ohm, ±10%, ¼W	1-945000-025	01121	CB1011
R213	Resistor, variable, composition, 1 k ohm, ±30%, ¼W	1-945010-004	71450	U201
R214	Resistor, fixed, composition, 47 k ohm, ±10%, 1W	1-945002-057	01121	GB4731
R215	Resistor, fixed, composition, 5.6 k ohm, ±10%, ¼W	1-945000-046	01121	CB5621
R216	Resistor, fixed, composition, 3.9 k ohm, ±10%, ¼W	1-945000-044	01121	CB3921
R217	Resistor, variable, composition, 1 M ohm, ±30%, ¼W	1-945010-013	71450	U201

TABLE 5-9. PARTS LIST FOR MODEL MDM-1

MAIN ASSEMBLIES AND CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
A1	Printed Circuit Board Assembly	5-003043	88869	
CR8	Diode, silicon	1-913007-001	03508	1N4148
CR9	Diode, silicon	1-913007-001	03508	1N4148
J1	Receptacle, jack, phone	1-910152-001	82389	S13B
J2	Receptacle, jack, BNC	1-910043-002	11636	KC93TR5
J3	Receptacle, jack, BNC	1-910043-002	11636	KC93TR5
M1	Meter, marked: PEAK DEVIATION, LIM CUR KILOHERTZ, 0-6, 0-18 scale	1-937008-001	88869	
P1	Receptacle, plug, rectangular, 16 pin	1-910071-001	02660	26-159-16
R63	Resistor, variable, composition, 1 k ohm, $\pm 20\%$, $\frac{1}{2}W$	1-945009-002	71450	45-1K
R64	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R65	Not Used			
R66	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R78	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
S1	Switch, push-push, DPDT, 3 station-interlock	1-951023-001	88869	
S2	Switch, push-push, DPDT, 3 stations	1-951025-001	88869	
S3	Part of S2			
S4	Part of S2			

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY

REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	04062	DM15F151J
C2	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	04062	DM15F122J
C3	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	04062	DM15F122J
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C5	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	04062	DM15F151J
C6	Capacitor, fixed, mica, 5 pF, ±10%, 500 Vdc	1-900003-004	04062	DM15F050C
C7	Not Used			
C8	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	04062	DM15F151J
C9	Capacitor, fixed, mica, 1200 pF, ±5%, 100 Vdc	1-900003-057	04062	DM15F122J
C10	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C11	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-9000001-009	73445	C280AE, 0.04 uF
C12	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C13	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	04062	DM15F151J
C14	Capacitor, fixed, mica, 47 pF, ±5%, 500 Vdc	1-900003-021	04062	DM15F470J
C15	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C16	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C17	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	56289	5GA-S50
C18	Capacitor, fixed, ceramic, 0.001 uF, +100 -0%, 500 Vdc	1-900012-002	56289	5GA-S50
C19	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C20	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C21	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	9842203
C22	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C23	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C24	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	04062	DM15-101J
C25	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C26	Capacitor, fixed, electrolytic, 25 uF, -10 +25%, 25 Vdc	1-900039-001	76433	984-2203
C27	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C28	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-90003-034	04062	DM15F151J
C29	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C30	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C31	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C32	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C33	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C34	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 25 Vdc	1-900039-002	76433	984-1733
C35	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C36	Capacitor, fixed, mica, 10 pF, ±5%, 500 Vdc	1-900003-008	04062	DM15F100J
C37	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	04062	DM15F101J

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C38	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	04062	DM15F101J
C39	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C40	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C41	Capacitor, fixed, electrolytic, 200 uF, -10 +75%, 15 Vdc	1-900039-002	76433	984-1733
C42	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C43	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE, 0.01 uF
C44	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 15 Vdc	1-900039-001	73445	C280AE, 0.01 uF
C45	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 15 Vdc	1-900039-001	73445	C280AE, 0.01 uF
C46	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C47	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C48	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C49	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE, 0.047 uF
C50	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
C51	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, 0.1 uF
C52	Capacitor, fixed, mica, 100 pF, ±5%, 500 Vdc	1-900003-030	04062	DM15F101J
C53	Capacitor, fixed, electrolytic, 2 uF, -10 +75%, 25 Vdc	1-900023-016	56289	TE1201
C54	Capacitor, fixed, electrolytic, 25 uF, -10 +75%, 25 Vdc	1-900039-001	76433	984-2203
CR1	Diode, silicon	1-913007-001	24446	1N4148
CR2	Diode, silicon	1-913007-001	24446	1N4148

TABLE 6-9. PARTS LIST FOR MODEL MDM-1(CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
CR3	Diode, silicon	1-913007-001	24446	1N4148
CR4	Diode, silicon	1-913007-001	24446	1N4148
CR5	Diode, silicon	1-913007-001	24446	1N4148
CR6	Diode, silicon	1-913007-001	24446	1N4148
CR7	Diode, silicon	1-913007-001	24446	1N4148
CR8	Not Used			
CR9	Not Used			
CR10	Diode, silicon	1-913007-001	24446	1N4148
CR11	Diode, germanium	1-913005-001	03877	1N273
CR12	Diode, germanium	1-913005-001	03877	1N273
L1	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L2	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L3	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L4	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L5	Coil, variable, 30 to 60 uH	1-906006-003	88869	
L6	Coil, fixed, 2.5 uH, $\pm 10\%$, 50 mA	1-906002-054	76493	70F253A1
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q3	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q4	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q5	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q6	FET, silicon, N-channel	1-958031-003	0000A	E102
Q7	FET, silicon, N-channel	1-958031-003	0000A	E102
Q8	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q9	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q10	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q11	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q12	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
Q13	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q14	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q15	FET, silicon, N-channel	1-958044-003	04713	MFE2006
R1	Resistor, fixed, composition, 56 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-022	01121	CB5601
R2	Resistor, fixed, composition, 6.8 k ohm, $+10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB6821
R3	Resistor, fixed, composition, 2.2 k ohm, $+10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2231
R4	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R5	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R6	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R7	Resistor, fixed, composition, 100 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-061	01121	CB1041
R8	Resistor, fixed, composition, 100 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-061	01121	CB1041
R9	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R10	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R11	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R12	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R13	Resistor, fixed, composition, 12 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-050	01121	CB1235
R14	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R15	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R16	Resistor, fixed, composition, $\pm 1\%$, $\frac{1}{8}W$	1-945016-260	75042	RN60D4990F
R17	Resistor, fixed, film, 2 k ohm, $\pm 1\%$, $\frac{1}{8}W$	1-945016-222	75042	RN60D2001F

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R18	Resistor, fixed, film, 2 k ohm, $\pm 1\%$, 1/8 W	1-945016-222	75042	RN60D2001F
R19	Resistor, fixed, film 1 k ohm, 1%, 1/8 W	1-945016-193	75042	RN60D1001F
R20	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4W	1-945000-033	01121	CB4711
R21	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, 1/4W	1-945000-073	01121	CB1051
R22	Resistor, fixed, composition, 150 k ohm, $\pm 10\%$, 1/4W	1-945000-063	01121	CB1054
R23	Resistor, fixed, composition, 4.99 k ohm, $\pm 1\%$, 1/8 W	1-945016-260	75042	RN60D4991F
R24	Resistor, fixed, composition, 4.99 k ohm, $\pm 1\%$, 1/8 W	1-945016-260	75042	RN60D4991F
R25	Resistor, fixed, composition, 470 k ohm, $\pm 10\%$, 1/4W	1-945000-069	01121	CB4740
R26	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, 1/4W	1-945000-069	01121	CB4740
R27	Resistor, fixed, composition, 1 M ohm, $\pm 10\%$, 1/4W	1-945000-073	01121	CB1051
R28	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4W	1-945000-033	01121	CB4700
R29	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4W	1-945000-013	01121	CB1001
R30	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4W	1-945000-033	01121	CB4711
R31	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4W	1-945000-033	01121	CB4711
R32	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4W	1-945000-033	01121	CB4711
R33	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4W	1-945000-033	01121	CB4711
R34	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, 1/4W	1-945000-049	01121	CB1031
R35	Resistor, fixed, composition, 3.3 k ohm, $\pm 10\%$, 1/4W	1-945000-043	01121	CB3321
R36	Resistor, fixed, composition, 120 ohm, $\pm 10\%$, 1/4W	1-945000-026	01121	CB1211

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R37	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R38	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R39	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R40	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-004	71450	U201
R41	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R42	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-045	01121	CB4721
R43	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R44	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R45	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R46	Resistor, fixed, composition, 2.7 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-042	01121	CB2721
R47	Resistor, variable, composition, 1 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-004	71450	U201
R48	Resistor, fixed, composition, 470 ohm, $\pm 1\%$, $\frac{1}{4}W$	1-945000-033	01121	CB4711
R49	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R50	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R51	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R52	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R53	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R54	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-051	01121	CB1531
R55	Resistor, fixed, composition, 56 ohm, $\pm 5\%$, $\frac{1}{4}W$	1-945000-132	01121	CB5605

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R56	Resistor, variable, composition, 5 k ohm, 5 k ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-006	71450	U201
R57	Resistor, fixed, composition, selected 150 ohm nominal $\pm 10\%$, $\frac{1}{4}W$	1-945000-027	01121	CB1511
R58	Resistor, variable, composition, 100 ohm, $\pm 30\%$, $\frac{1}{4}W$	1-945010-001	71450	U201
R59	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R60	Resistor, fixed, composition, 2.2 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-041	01121	CB2221
R61	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-035	01121	CB6811
R62	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R63	Not Used			
R64	Not Used			
R65	Not Used			
R66	Not Used			
R67	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-030	01121	CB2711
R68	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-013	01121	CB1001
R69	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021
R70	Resistor, fixed, composition, 10 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-049	01121	CB1031
R71	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-025	01121	CB1011
R72	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-053	01121	CB2231
R73	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-031	01121	CB3311
R74	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-034	01121	CB5611
R75	Resistor, fixed, composition, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021

TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
R76	Resistor, fixed, composition, ±10%, ¼W	1-945000-037	01121	CB1021
R77	Resistor, fixed, composition, 47 k ohm, ±10%, ¼W	1-945000-057	01121	CB4731
RT1	Thermistor, disc, 300 ohm, ±10%	1-945070-001	15801	KB23J
U1	Integrated circuit, FM Detector and Limiter	1-926031-001	56289	ULN-2111A
U2	Integrated circuit, Operational Amplifier	1-926033-001	03606	CA3037A

TABLE 6-10. PARTS LIST FOR MODEL AFM-1

CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, electrolytic, 200 uF, +75 -10%, 15 Vdc	1-900039-002	76433	984-1733
J1	Receptacle, jack, BNC	1-900043-001	11636	K19-68
J2	Receptacle, jack, BNC	1-900043-001	11636	K19-68
P1	Receptacle, plug, rectangular, 16 pin	1-910071-001	02660	26-259-16

TABLE 6-11. PARTS LIST FOR MODEL AFM-2

CHASSIS PARTS				
REF. DESIG.	DESCRIPTION	SINGER PART NO.	MFR. CODE	MFR. PART NO.
C1	Capacitor, fixed, electrolytic, 200 uF, +75 -10%, 15 Vdc	1-900039-002	76433	984-1733
J1	Receptacle, jack, BNC	1-910043-001	11636	K19-68
J2	Receptacle, jack, BNC	1-910043-001	11636	UG-1094A/U
J3	Receptacle, jack, BNC	1-910043-001	11636	K19-68
J4	Receptacle, jack, BNC	1-910132-001	11636	UG-1094A/U
P1	Receptacle, plug, rectangular, 16 pin	1-910071-001	02660	26-159-16
R1	Resistor, fixed, composition, 1 k ohm, $\pm 10\%$, $\frac{1}{4}W$	1-945000-037	01121	CB1021

Table 6-12. Parts List for Model RFM-10D

Main Assemblies and Chassis Parts				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1A2	Broadband amplifier assembly	1-004892-001	88869	
A1A3	11 MHz and 2 MHz IF amplifier assembly	4-004836-001	88869	
A1A4	Broadband amplifier, mixer detector assembly	1-004820-001	88869	
AT1	Attenuator, step, assembly, dual concentric, 1 dB and 10 dB steps	4-403416-001	88869	
C1	Not Used			
C2	Capacitor, fixed, electrolytic, 50 uF, -10% +75%, 25 Vdc	1-900039-005	76433	984-1654
C3	Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15
CR1	Diode, silicon, $V_r = 75$ V, $I_f = 10$ mA	1-913007-001	03508	1N4148
CR2	Diode, silicon, $V_r = 75$ V, $I_f = 10$ mA	1-913007-001	03508	1N4148
DS1	Lamp, indicator, red, 10 V, 20 mA	1-925007-003	0000B	L-10/20
F1	Fuse, RF assembly, +10 dBm	3-403417-001	88869	
J1	Part of F1			
J2	Part of A1A2W2			
P1	Part of W2			

Table 6-12. Parts List for Model RFM-10D

Main Assemblies and Chassis Parts (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
P2	Connector, plug, rectangular, 24 pin	1-910071-002	13511	26-159-24
R1	Resistor, variable, composition, 1 kilohm, $\pm 30\%$, 1/2 W (Part of S1)			
R2	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
S1/R1	Switch/variable resistor assembly (S1) Switch, rotary, 1 pole, 2 position	1-403576-001	88869	
S2	Switch, push-push, 2 pole, 2 position	1-951024-002	82389	65017-206
W1	Cable assembly, 7 in., BNC to rt. angle BNC	1-004890-001	88869	
W2	Cable assembly, 6 1/2 in., BNC to push-on	1-004818-001	88869	
W3	Cable assembly, 9 1/2 in., phono plug one end	1-004819-001	88869	
	Knob, black (MEASURE SENSITIVITY)	1-935003-101	0000K	RS5-50L-1
	Knob, black, concentric (HIGH-NORMAL)	1-935007-002	0000K	SSN70CL-2
	Pawl, adjustable (2 req.)	1-964183-001	08730	SS6121

Table 6-12. Parts List for Model RFM-10D

A1A2 - Broadband Amplifier Assembly				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C2	Capacitor, fixed, electrolytic, 120 uF, ±20%, 15 Vdc	1-900115-001	12954	D120GSD15M
C3	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C4	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C5	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C6	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C7	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C8	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C9	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C10	Not Used			
C11	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C12	Capacitor, fixed, mica, selected, 5 pF nominal, ±10 %, 500 Vdc	1-900003-004	72136	DM15
C13	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
L1	Inductor, fixed, 1 mH, ±10%, 139 mA	1-906016-049	0000J	DR-1000

Table 6-12. Parts List for Model RFM-10D

A1A2 - Broadband Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L2	Inductor, fixed, selected, 8 turns nominal	1-403283-007	88869	
L3	Inductor, fixed, 1 mH, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR-1000
L4	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q2	Transistor, silicon, NPN	1-958064-001	73445	A486
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
R1	Resistor, fixed, composition, 160 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R2	Resistor, fixed, composition, selected, 300 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
R3	Resistor, fixed, composition, selected, 300 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
R4	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R5	Resistor, fixed, composition, 3.6 kilohm, $\pm 5\%$, 1/4 W	1-945000-175	01121	CB3625
R6	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R7	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925

Table 6-12. Parts List for Model RFM-10D

A1A2 - Broadband Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R8	Resistor, fixed, composition, selected, 330 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-150	01121	CB3315
R9	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R10	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R11	Resistor, fixed, composition, 75 ohm, $\pm 5\%$, 1/4 W	1-945000-135	01121	CB7505
R12	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected, 180 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-144	01121	CB1815
R14	Resistor, fixed, composition, 15 ohm, $\pm 5\%$, 1/4 W	1-945000-118	01121	CB1505
R15	Not Used			
R16	Not Used			
R17	Not Used			
R18	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R19	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R20	Resistor, fixed, composition, selected, 270 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-148	01121	CB2715
W1	Cable assembly, 10 in., BNC at one end	1-004888-001	88869	

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C2	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C3	Capacitor, fixed, mica, 680 pF, $\pm 5\%$, 300 Vdc	1-900003-052	72136	DM15
C4	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C5	Capacitor, fixed, mica, 680 pF, $\pm 5\%$, 300 Vdc	1-900003-052	72136	DM15
C6	Capacitor, fixed, mica, 270 pF, $\pm 5\%$, 500 Vdc	1-900003-041	72136	DM15
C7	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C8	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C9	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C10	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C11	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C12	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C13	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C14	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C15	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C16	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C17	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C18	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C19	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C20	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C21	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C22	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C23	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C24	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C25	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C26	Capacitor, fixed, mica, 680 pF, ±5%, 300 Vdc	1-900003-052	72136	DM15
C27	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15
C28	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C29	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C30	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C31	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C32	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C33	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C34	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C35	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C36	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C37	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C38	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C39	Capacitor, fixed, mica, 330 pF, $\pm 5\%$, 500 Vdc	1-900003-043	72136	DM15
C40	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15
C41	Capacitor, fixed, mica, 1200 pF, $\pm 5\%$	1-900003-057	72136	DM15
C42	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C43	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C44	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C45	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C46	Capacitor, fixed, mica, 120 pF, $\pm 5\%$, 500 Vdc	1-900003-032	72136	DM15
C47	Capacitor, fixed, mica, 120 pF, $\pm 5\%$, 500 Vdc	1-900003-032	72136	DM15
C48	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C49	Capacitor, fixed, plastic, 0.001 μ F, $\pm 20\%$, 250 Vdc	1-900001-030	73445	C280AE
C50	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C51	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
CR1	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR2	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR3	Diode, silicon, switching	1-913074-001	80795	ITT244
CR4	Diode, silicon, switching	1-913074-001	80795	ITT244
CR5	Diode, silicon, switching	1-913074-001	80795	ITT244

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
CR6	Diode, silicon, switching	1-913074-001	80795	ITT244
CR7	Diode, silicon, switching	1-913074-001	80795	ITT244
CR8	Diode, silicon, switching	1-913074-001	80795	ITT244
CR9	Diode, silicon, switching	1-913074-001	80795	ITT244
CR10	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR11	Diode, silicon, switching	1-913074-001	80795	ITT244
CR12	Diode, silicon, switching	1-913074-001	80795	ITT244
CR13	Diode, silicon, switching	1-913074-001	80795	ITT244
CR14	Diode, germanium, 1N273	1-913005-001	03877	1N273
FL1	Filter, crystal, 11 MHz	1-403279-001	88869	
L1	Inductor, variable, 0.3 μ H to 0.5 μ H	1-403586-001	88869	
L2	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L3	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L4	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L5	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L6	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L7	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L8	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L9	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L10	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L11	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L12	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L13	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L14	Inductor, fixed, 85 μ H, $\pm 5\%$	1-906022-009	0000F	13-85-5
Q1	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q2	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q3	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q4	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q5	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q6	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q7	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q8	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q9	Transistor, silicon, NPN, 2N3904	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R2	Resistor, fixed, composition, 2.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R3	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R4	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R5	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R6	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R7	Resistor, fixed, composition, 5.6 kilohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R8	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R9	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R10	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R11	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R12	Resistor, fixed, composition, 180 ohm, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R13	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R14	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R15	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R16	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R17	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R18	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R19	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R20	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R21	Resistor, fixed, composition, 5.6 kilohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R22	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R23	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R24	Resistor, fixed, composition, 2.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R25	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R26	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R27	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R28	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R29	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R30	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R31	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R32	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R33	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R34	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R35	Resistor, fixed, composition, 12 kilohm, $\pm 10\%$, 1/4 W	1-945000-050	01121	CB1231
R36	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R37	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R38	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R39	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R40	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R41	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R42	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R43	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R44	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R45	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R46	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R47	Resistor, variable, composition, 250 ohm, $\pm 30\%$, 1/5 W	1-945007-002	71450	X201
R48	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R49	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R50	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R51	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301

Table 6-12. Parts List for Model RFM-10D

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R52	Resistor, fixed, composition, 22 kilohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R53	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R54	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R55	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R56	Resistor, fixed, composition, selected, 470 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R57	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R58	Resistor, fixed, composition, 6.8 kilohm, $\pm 10\%$, 1/4 W	1-945000-047	01121	CB6821
R59	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R60	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R61	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R62	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R63	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
U1	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C2	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C3	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C4	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C5	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C6	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C7	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C8	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C9	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C10	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C11	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C12	Capacitor, fixed, mica, selected, 5 pF nominal, $\pm 10\%$, 500 Vdc	1-900003-004	72136	DM15
C13	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C14	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M

Table 6-12 Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C15	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C16	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C17	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C18	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C19	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C20	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C21	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C22	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C23	Capacitor, fixed, mica, selected, 15 pF nominal, ±10%, 500 Vdc	1-900003-010	72136	DM15
C24	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C25	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C26	Capacitor, fixed, mica, selected, (may be omitted)	1-900003-000	72136	DM15
C27	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE
C28	Capacitor, fixed, ceramic, selected, (may be omitted)	1-900066-000	95121	MC

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C29	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C30	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C31	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C32	Capacitor, fixed, mica, selected, 15 pF nominal, $\pm 10\%$, 500 Vdc	1-900003-010	72136	DM15
C33	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-400115-002	12954	DRIOGSA50M
C34	Capacitor, fixed, mica, selected, 10 pF nominal, $\pm 10\%$, 500 Vdc	1-900003-008	72136	DM15
C35	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C36	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C37	Capacitor, fixed, mica, 1.0 pF, ± 0.5 pF, 500 Vdc	1-900003-001	72136	DM15
C38	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C39	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
CR1	Diode, back, silicon	1-913026-003	03508	BD-3
CR2	Diode, switching, silicon	1-913074-001	80795	ITT244
CR3	Diode, switching, silicon	1-913074-001	80795	ITT244

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
CR4	Diode, silicon	1-913007-001	03508	1N4148
CR5	Diode, silicon	1-913007-001	03508	1N4148
CR6	Diode, germanium	1-913005-001	03877	1N273
L1	Inductor, fixed, 1000 μ H, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR1000
L2	Inductor, fixed, selected, 8 turns nominal	1-403283-007	88869	
L3	Inductor, fixed, 1000 μ H, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR1000
L4	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L5	Inductor, fixed, 1000 μ H, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR1000
L6	Inductor, fixed, selected, 8 turns nominal	1-903283-007	88869	
L7	Inductor, fixed, 470 μ H, $\pm 5\%$, 180 mA	1-906032-045	16407	WEE470
L8	Inductor, fixed, 1 turn	1-403598-001	88869	
L9	Inductor, fixed, 1 turn	1-403597-001	88869	
L10	Inductor, fixed, 1000 μ H, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR1000
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q2	Transistor, silicon, NPN	1-958064-001	73445	A486
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-011	73445	A486
Q5	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q6	Transistor, silicon, NPN	1-958064-001	73445	A486
Q7	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q8	Transistor, silicon, NPN	1-958080-001	04713	2N4427
Q9	Transistor, silicon, NPN	1-958081-001	0000H	SD1005-1
Q10	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
R1	Resistor, fixed, composition, 2.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-170	01121	CB2225
R2	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R3	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R4	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R5	Resistor, fixed, composition, selected, 150 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R6	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R7	Not used			
R8	Not used			
R9	Resistor, fixed, composition, 2.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-170	01121	CB2225
R10	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R11	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R12	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected, 270 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-148	01121	CB2715
R14	Resistor, fixed, composition, 22 ohm, $\pm 5\%$, 1/4 W	1-945000-122	01121	CB2205
R15	Resistor, fixed, composition, 2.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-172	01121	CB2725
R16	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-174	01121	CB3325
R17	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R18	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R19	Resistor, fixed, composition, selected, 330 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-150	01121	CB3315

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R20	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R21	Resistor, fixed, composition, 1.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-165	01121	CB1325
R22	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-174	01121	CB3325
R23	Resistor, fixed, composition, 27 ohm, $\pm 5\%$, 1/4 W	1-945000-124	01121	CB2705
R24	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R25	Resistor, fixed, composition, selected, 220 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-146	01121	CB2215
R26	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R27	Resistor, fixed, composition, 13 ohms, $\pm 5\%$, 1/4 W	1-945000-117	01121	CB1305
R28	Resistor, fixed, composition, 100 ohm, $\pm 5\%$, 1/4 W	1-945000-138	01121	CB1015
R29	Resistor, fixed, composition, 4.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-178	01121	CB4725
R30	Resistor, fixed, composition, 560 ohm, $\pm 5\%$, 1/4 W	1-945000-156	01121	CB5615
R31	Resistor, fixed, composition, selected, 68 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-134	01121	CB6805
R32	Resistor, fixed, film, 49.9 ohm, $\pm 1\%$, 1/4 W	1-945016-068	72982	RN60D4990F
R33	Resistor, fixed, composition, 51 ohm, $\pm 5\%$, 1/4 W	1-945000-131	01121	CB5105

Table 6-12. Parts List for Model RFM-10D

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R34	Resistor, fixed, composition, 56 ohm, $\pm 5\%$, 1/4 W	1-945000-132	01121	CB5605
R35	Resistor, fixed, composition, selected, 680 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-158	01121	CB6815
R36	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R37	Resistor, fixed, composition, 1 kilohm, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R38	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R39	Resistor, fixed, composition, 470 ohm, $\pm 5\%$, 1/4 W	1-945000-154	01121	CB4715
R40	Resistor, fixed, composition, 10 ohm, $\pm 5\%$, 1/4 W	1-945000-114	01121	CB1005
R41	Resistor, fixed, composition, 2.4 kilohm, $\pm 5\%$, 1/4 W	1-945000-171	01121	CB2425
R42	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115
R43	Resistor, fixed, composition, 47 ohm, $\pm 5\%$, 1/4 W	1-945000-130	01121	CB4705
R44	Resistor, fixed, composition, 1 kilohm, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R45	Resistor, fixed, composition, 8.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-184	01121	CB8225
R46	Resistor, fixed, composition, 4.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-178	01121	CB4725
R47	Not Used			

Table 6-13. Parts List for Model RFM-11A

Main Assemblies and Chassis Parts				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1A2	RF switch assembly	1-004777-001	88869	
A1A3	11 MHz and 2 MHz IF amplifier assembly	4-004836-001	88869	
A1A4	Broadband amplifier, mixer, detector assembly	1-004820-001	88869	
A1A5	700 MHz multiplier assembly	4-004726-001	88869	
AT1	Attenuator, step, assembly, dual concentric, 1 dB and 10 dB steps	3-403590-002	88869	
C1	Not Used			
C2	Capacitor, fixed, electrolytic, 50 μ F, -10% +75%, 25 Vdc	1-900039-005	76433	984-1654
C3	Capacitor, fixed, mica, 150 pF, \pm 5%, 500 Vdc	1-900003-034	72136	DM15
C4	Capacitor, fixed, ceramic, 0.001 μ F, +100%-0%, 500 Vdc	1-900012-002	72982	861Z5U102P
CR1	Diode, silicon, $V_r=75$ V, $I_f=10$ mA	1-913007-001	03508	1N4148
CR2	Diode, silicon, $V_r=75$ V, $I_f=10$ mA	1-913007-001	03508	1N4148
DS1	Lamp, indicator, red, 10 V, 20 mA	1-925007-003	0000B	L-10/20
FL1	Filter, bandpass, 800 MHz to 1300 MHz	1-403545-001	88869	
FL2	Filter, bandpass, 700 MHz	1-004784-001	88869	

Table 6-13. Parts List for Model RFM-11A

Main Assemblies and Chassis Parts				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
J1	Part of A1A2W3			
J2	Part of FL1			
P1	Part of W2			
P2	Connector, plug, rectangular, 24 pin	1-910071-002	13511	26-159-24
R1	Resistor, variable, composition, 1 kilohm, $\pm 30\%$, 1/2 W (Part of S1)			
R2	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W (Part of S1)			
S1/R1, R2	Switch/Variable resistor assembly (S1) Switch, rotary, 1 pole, 2 position	1-403576-001	88869	
S2	Switch, push-push, 2 pole, 2 position	1-951024-002	82389	65017-206
W1	Cable assembly, 8 in., BNC to BNC	1-004817-001	88869	
W2	Cable assembly, 6 1/2 in., BNC to push-on	1-004818-001	88869	
W3	Cable assembly, 9 1/2 in., phono plug at one end	1-004819-001	88869	
Z1	Mixer, doubly balanced	1-403587-001	88869	
	Knob, black (MEASURE SENSITIVITY)	1-935003-101	0000K	RSS-50L-1
	Knob, black, concentric (HIGH-NORMAL)	1-935007-002	0000K	SSN70CL-2

Table 6-13 Parts List for Model RFM-11A

A1A2 - RF SWITCH ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1A2A1	Broadband amplifier, circuit board assembly	1-004840-001	88869	
C1	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C2	Capacitor, fixed, ceramic, 0.001 μ F -0+100%, 500 Vdc	1-900012-002	72982	861Z5U102P
C3	Capacitor, fixed, electrolytic, 2.2 μ F, \pm 20%, 15 Vdc	1-900115-005	12954	D2R2GSA15M
C4	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C5	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C6	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C7	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C8	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C9	Capacitor, fixed, electrolytic, 2.2 μ F, \pm 20%, 15 Vdc	1-900115-005	12954	D2R2GSA15M
C10	Capacitor, fixed, ceramic, 0.001 μ F, -0% +100%, 500 Vdc	1-900012-002	72982	861Z5U102P
C11	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C12	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C13	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W

Table 6-13. Parts List for Model RFM-11A

A1A2 - RF SWITCH ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C14	Capacitor, fixed, electrolytic, 2.2 μ F, \pm 20%, 15 Vdc	1-900115-005	12954	D2R2GSA15M
C15	Capacitor, fixed, ceramic, 0.001 μ F, -0% +100%, 500 Vdc	1-900012-002	72982	861Z5U102P
C16	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C17	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C18	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C19	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C20	Capacitor, fixed, feed through, 0.001 μ F, \pm 20%, 500 Vdc	1-900045-002	01121	FA5C-102W
C21	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C22	Capacitor, fixed, electrolytic, 2.2 μ F, \pm 20%, 15 Vdc	1-900115-005	12954	D2R2GSA15M
C23	Capacitor, fixed, ceramic, 0.001 μ F, -0% +100%, 500 Vdc	1-900012-002	72982	861Z5U102P
C24	Capacitor, fixed, mica, selected, 2 pF nominal, \pm 0.05 pF, 500 Vdc	1-900003-002	72136	DM15
C25	Capacitor, fixed, electrolytic, 2.2 μ F \pm 20%, 15 Vdc	1-900115-005	12954	D2R2GSA15M
C26	Capacitor, fixed, mica, selected, 2 pF nominal, \pm .5 pF, 500 Vdc	1-900003-002	72136	DM15
C27	Capacitor, fixed, mica, selected, 2 pF nominal, \pm .5 pF, 500 Vdc	1-900003-002	72136	DM15

Table 6-13. Parts List for Model RFM-11A

A1A2 - RF SWITCH ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C28	Capacitor, fixed, mica, selected 3 pF nominal, $\pm .5$ pF, 500 Vdc	1-900003-003	72136	DM15
C29	Capacitor, fixed, mica, selected, 3 pF nominal, $\pm .5$ pF, 500 Vdc	1-900003-003	72136	DM15
C30	Capacitor, fixed, feed through, 0.001 μ F, $-0\% \pm 100\%$, 500 Vdc	1-900038-001	01121	FB2B-102W
CR1	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR2	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR3	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR4	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR5	Diode, silicon, switching	1-913074-001	80795	ITT244
CR6	Diode, silicon, switching	1-913074-001	80795	ITT244
CR7	Diode, silicon, switching	1-913074-001	80795	ITT244
CR8	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR9	Diode, silicon, switching	1-913074-001	80795	ITT244
J1	Part of W3 assembly			
L1	Inductor, fixed, 10 μ H	1-906022-005	0000F	13-10-10

Table 6-13 Parts List for Model RFM-11A

A1A2 - RF SWITCH ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L2	Inductor, fixed, 10 μ H	1-906022-005	0000F	13-10-10
L3	Inductor, fixed, 10 μ H	1-906022-005	0000F	13-10-10
L4	Inductor, fixed, 10 μ H	1-906022-005	0000F	13-10-10
L5	Inductor, fixed, 10 μ H	1-906022-005	0000F	13-10-10
P1	Part of W1 assembly			
P2	Part of W2 assembly			
P3	Part of W4 assembly			
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
R1	Not Used			
R2	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R3	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R4	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R5	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R6	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721

Table 6-13. Parts List for Model RFM-11A

A1A2 - RF SWITCH ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R7	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R8	Resistor, fixed, composition, 220 ohm, $\pm 5\%$, 1/4 W	1-945000-146	01121	CB2215
R9	Resistor, fixed, composition, 5.6 kilohm, $\pm 5\%$, 1/4 W	1-945000-108	01121	CB5625
R10	Resistor, fixed, composition, 910 ohm, $\pm 5\%$, 1/4 W	1-945000-161	01121	CB9115
R11	Resistor, fixed, composition, 910 ohm, $\pm 5\%$, 1/4 W	1-945000-161	01121	CB9115
R12	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4720
R13	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R14	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R15	Resistor, fixed, composition, selected, 62 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-133	01121	CB6205
R16	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115
R17	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115
R18	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R19	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R20	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711

Table 6-13. Parts List for Model RFM-11A

A1A2 - RF SWITCH ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R21	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R22	Not Used			
R23	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115
R24	Resistor, fixed, composition, selected, 62 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-133	01121	CB6205
R25	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115
R26	Resistor, fixed, composition, 220 ohm, $\pm 5\%$, 1/4 W	1-945000-146	01121	CB2215
W1	Cable assembly, 4 7/8 in., BNC to termination	1-004849-001	88869	
W2	Cable assembly, 9 in., BNC to termination	1-004851-001	88869	
W3	Cable assembly, 9 3/8 in., BNC to termination	1-004850-001	88869	
W4	Cable assembly, 12 in., BNC at one end	1-004900-001	88869	

Table 6-13. Parts List for Model RFM-11A

AIA2A1 - BROADBAND AMPLIFIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C2	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 15 Vdc	1-900115-003	12954	DIROGSA50M
C3	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C4	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C5	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C6	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C7	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C8	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C9	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C10	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C11	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C12	Capacitor, fixed, mica, selected, 5 pF nominal, \pm 10%, 500 Vdc	1-900003-004	72136	DM15
C13	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
L1	Inductor, fixed, 1 mH, \pm 10%, 139 mA	1-906016-049	0000J	DR-1000

Table 6-13 Parts List for Model RFM-11A

A1A2A1 - BROADBAND AMPLIFIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L2	Inductor, fixed, selected 8 turns nominal	1-403283-007	88869	
L3	Inductor, fixed, 1 mH, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR-1000
L4	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
R1	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R2	Not used			
R3	Not used			
R4	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R5	Resistor, fixed, composition, 3.6 kilohm, $\pm 5\%$, 1/4 W	1-945000-175	01121	CB3625
R6	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R7	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925

Table 6-13 Parts List for Model RFM-11A

ATA2A1 - BROADBAND AMPLIFIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R8	Resistor, fixed, composition, selected, 330 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-150	01121	CB3315
R9	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R10	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R11	Resistor, fixed, composition, 75 ohm, $\pm 5\%$, 1/4 W	1-945000-135	01121	CB7505
R12	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected, 180 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-144	01121	CB1815
R14	Resistor, fixed, composition, selected, 47 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-130	01121	CB4705
R15	Not Used			
R16	Not Used			
R17	Not Used			
R18	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R19	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025

Table 6-13. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C2	Capacitor, fixed, plastic 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C3	Capacitor, fixed, mica, 680 pF, \pm 5%, 300 Vdc	1-900003-052	72136	DM15
C4	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C5	Capacitor, fixed, mica, 680 pF, \pm 5%, 300 Vdc	1-900003-052	72136	DM15
C6	Capacitor, fixed, mica, 270 pF, \pm 5%, 500 Vdc	1-900003-041	72136	DM15
C7	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C8	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C9	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C10	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C11	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C12	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C13	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C14	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE

Table 6-13 Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C15	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C16	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C17	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C18	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C19	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C20	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C21	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C22	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C23	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C24	Capacitor, fixed, plastic, 0.01 μ F, \pm 20 %, 250 Vdc	1-900001-001	73445	C280AE
C25	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C26	Capacitor, fixed, mica, 680 pF, \pm 5%, 300 Vdc	1-900003-52	72136	DM15
C27	Capacitor, fixed, mica, 270 pF, \pm 5%, 500 Vdc	1-900003-041	72136	DM15
C28	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE

Table 6-13. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C29	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C30	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C31	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C32	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C33	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C34	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C35	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C36	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C37	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C38	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C39	Capacitor, fixed, mica, 330 pF, \pm 5%, 500 Vdc	1-900003-043	72136	DM15
C40	Capacitor, fixed, mica, 100 pF, \pm 5%, 500 Vdc	1-900003-030	72136	DM15
C41	Capacitor, fixed, mica, 1200 pF, \pm 5%	1-900003-057	72136	DM15
C42	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE

Table 6-13. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C43	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C44	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C45	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C46	Capacitor, fixed, mica, 120 pF, \pm 5%, 500 Vdc	1-900003-032	72136	DM15
C47	Capacitor, fixed, mica, 120 pF, \pm 5%, 500 Vdc	1-900003-032	72136	DM15
C48	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C49	Capacitor, fixed, plastic, 0.001 μ F, \pm 20%, 250 Vdc	1-900001-030	73445	C280AE
C50	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C51	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
CR1	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR2	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR3	Diode, silicon, switching	1-913074-001	80795	ITT244
CR4	Diode, silicon, switching	1-913074-001	80795	ITT244
CR5	Diode, silicon, switching	1-913074-001	80795	ITT244

Table 61-3. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
CR6	Diode, silicon, switching	1-913074-001	80795	ITT244
CR7	Diode, silicon, switching	1-913074-001	80795	ITT244
CR8	Diode, silicon, switching	1-913074-001	80795	ITT244
CR9	Diode, silicon, switching	1-913074-001	80795	ITT244
CR10	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR11	Diode, silicon, switching	1-913074-001	80795	ITT244
CR12	Diode, silicon, switching	1-913074-001	80795	ITT244
CR13	Diode, silicon, switching	1-913074-001	80795	ITT244
CR14	Diode, germanium, 1N273	1-913005-001	03877	1N273
FL1	Filter, crystal, 11 MHz	1-403279-001	88869	
L1	Inductor, variable, 0.3 μ H to 0.5 μ H	1-403586-001	88869	
L2	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L3	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L4	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47

Table 6-13 Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L5	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L6	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L7	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L8	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L9	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L10	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L11	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L12	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L13	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L14	Inductor, fixed, 85 μ H, \pm 5%	1-906022-009	0000F	13-85-5
Q1	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q2	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q3	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q4	Transistor silicon, NPN, 2N5179	1-958018-001	03606	2N5179

Table 6-13 . Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q5	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q6	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q7	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q8	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q9	Transistor, silicon, NPN, 2N3904	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R2	Resistor, fixed, composition, 2.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R3	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R4	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R5	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R6	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R7	Resistor, fixed, composition, 5.6 kilohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R8	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R9	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721

Table 6-13. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R10	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R11	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R12	Resistor, fixed, composition, selected, 180 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R13	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R14	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R15	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R16	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R17	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R18	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB101
R19	Resistor, fixed composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R20	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R21	Resistor, fixed, composition, 5.6 kilohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R22	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R23	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711

Table 6-13 Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP. ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R24	Resistor, fixed, composition, 2.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R25	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R26	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R27	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R28	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R29	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R30	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R31	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R32	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R33	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R34	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R35	Resistor, fixed, composition, 12 kilohm, $\pm 10\%$, 1/4 W	1-945000-050	01121	CB1231
R36	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R37	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721

Table 6-13. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R38	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R39	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R40	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R41	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R42	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R43	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R44	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R45	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R46	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R47	Resistor, variable, composition, 250 ohm, $\pm 30\%$, 1/5 W	1-945007-002	71450	X201
R48	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R49	Resistor, fixed, composition, 1 kohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R50	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R51	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301

Table 6-13. Parts List for Model RFM-11A

A1A3 - 11.0/2.0 MHz IF AMP ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R52	Resistor, fixed, composition, 22 kilohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R53	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R54	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R55	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R56	Resistor, fixed, composition, selected, 470 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R57	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R58	Resistor, fixed, composition, 6.8 kilohm, $\pm 10\%$, 1/4 W	1-945000-047	01121	CB6821
R59	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R60	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R61	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R62	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R63	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
U1	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N

Table 6-13. Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C2	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C3	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C4	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C5	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C6	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C7	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C8	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C9	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C10	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C11	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C12	Capacitor, fixed, mica, selected, 5 pF nominal, \pm 10%, 500 Vdc	1-900003-004	72136	DM15
C13	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C14	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M

Table 6-13. Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C15	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C16	Capacitor, fixed electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C17	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C18	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C19	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C20	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C21	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C22	Capacitor, variable, ceramic, 1.7 pF, to 10 pF, 500 Vdc	1-900113-002	91293	9301
C23	Capacitor, fixed, mica, selected, 5 pF nominal, \pm 10%, 500 Vdc	1-900003-004	72136	DM15
C24	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C25	Capacitor, fixed, electrolytic 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C26	Capacitor, fixed, mica, selected, (may be omitted)	1-900003-000	72136	DM15
C27	Capacitor, fixed, plastic, 0.047 μ F, \pm 20%, 250 Vdc	1-900001-009	73445	C280AE
C28	Capacitor, fixed, ceramic, selected, (may be omitted)	1-900066-000	95121	MC

Table 6-13 Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C29	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C30	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C31	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C32	Capacitor, fixed, mica, selected, 5 pF nominal, \pm 10%, 500 Vdc	1-900003-004	72136	DM15
C33	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C34	Capacitor, fixed, mica, selected, 10 pF nominal, \pm 10%, 500 Vdc	1-900003-008	72136	DM15
C35	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C36	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C37	Capacitor, fixed, mica, 1.0 pF, \pm 0.5 pF, 500 Vdc	1-900003-001	72136	DM15
C38	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C39	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
CR1	Diode, back, silicon	1-913026-003	03508	BD-3
CR2	Diode, switching, silicon	1-913074-001	80795	ITT244
CR3	Diode, switching, silicon	1-913074-001	80795	ITT244

Table 6-13. Parts List for Model RFM=11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
CR4	Diode, silicon	1-913007-001	03508	1N4148
CR5	Diode, silicon	1-913007-001	03508	1N4148
CR6	Diode, germanium	1-913005-001	03877	1N273
L1	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
L2	Inductor, fixed, selected, 8 turns nominal	1-403283-007	88869	
L3	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
L4	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L5	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
L6	Inductor, fixed, selected, 8 turns nominal	1-903283-007	88869	
L7	Inductor, fixed, 470 μ H, \pm 5%, 180 mA	1-906032-045	16407	WEE470
L8	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L9	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L10	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5

Table 6-13. Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q2	Transistor, silicon, NPN	1-958064-001	73445	A486
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
Q5	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q6	Transistor, silicon, NPN	1-958064-001	73445	A486
Q7	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q8	Transistor, silicon, NPN	1-958080-001	04713	2N4427
Q9	Transistor, silicon, NPN	1-958081-001	0000H	SD1005-1
Q10	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
R1	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R2	Resistor, fixed, composition, 3.6 kilohm, $\pm 5\%$, 1/4 W	1-945000-175	01121	CB3625
R3	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R4	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R5	Resistor, fixed, composition, selected, 150 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515

Table 6-13. Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R6	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4W	1-945000-119	01121	CB1605
R7	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-956000-149	01121	CB3015
R8	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
R9	Resistor, fixed, composition, 2.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-172	01121	CB2725
R10	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-174	01121	CB3325
R11	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R12	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected, 270 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-148	01121	CB2715
R14	Resistor, fixed, composition, 15 ohm, $\pm 5\%$, 1/4 W	1-945000-118	01121	CB1505
R15	Resistor, fixed, composition, 2.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-172	01121	CB2725
R16	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-174	01121	CB3325
R17	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R18	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R19	Resistor, fixed, composition, 200 ohm, $\pm 5\%$, 1/4 W	1-945000-145	01121	CB2015

Table 6-13. Parts List for Model RFM-11A

A1A4 BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R20	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R21	Resistor, fixed, composition, 1.3 kilohm, $\pm 5\%$, 1/4W	1-945000-165	01121	CB1325
R22	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4W	1-945000-174	01121	CB3325
R23	Resistor, fixed, composition, 27 ohm, $\pm 5\%$, 1/4W	1-945000-124	01121	CB2705
R24	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R25	Resistor, fixed, composition, selected, 220 ohm nominal, $\pm 5\%$, 1/4W	1-945000-146	01121	CB2215
R26	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R27	Resistor, fixed, composition, 13 ohms, $\pm 5\%$, 1/4 W	1-945000-117	01121	CB1305
R28	Resistor, fixed, composition, 100 ohm, $\pm 5\%$, 1/4 W	1-945000-138	01121	CB1015
R29	Resistor, fixed, composition, 4.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-178	01121	CB4725
R30	Resistor, fixed, composition, 560 ohm, $\pm 5\%$, 1/4 W	1-945000-156	01121	CB5615
R31	Resistor, fixed, composition, selected, 68 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-134	01121	CB6805
R32	Resistor, fixed, film, 49.9 ohm, $\pm 1\%$, 1/4 W	1-945016-068	72982	RN60D4990F
R33	Resistor, fixed, composition, 51 ohms, $\pm 5\%$, 1/4 W	1-945000-131	01121	CB5105

Table 6-13 Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R34	Resistor, fixed, composition, 56 ohms, $\pm 5\%$, 1/4 W	1-945000-132	01121	CB5605
R35	Resistor, fixed, composition, selected, 680 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-158	01121	CB6815
R36	Resistor, fixed, composition, 430 ohms, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R37	Resistor, fixed, composition, 1 kilohm, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R38	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R39	Resistor, fixed, composition, 470 ohm, $\pm 5\%$, 1/4 W	1-945000-154	01121	CB4715
R40	Resistor, fixed, composition, 10 ohm, $\pm 5\%$, 1/4 W	1-945000-114	01121	CB1005
R41	Resistor, fixed, composition, 2.4 kilohm, $\pm 5\%$, 1/4 W	1-945000-171	01121	CB2425
R42	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115
R43	Resistor, fixed, composition, 47 ohm, $\pm 5\%$, 1/4 W	1-945000-130	01121	CB4705
R44	Resistor, fixed, composition, 1 kilohm, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R45	Resistor, fixed, composition, 8.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-184	01121	CB8225
R46	Resistor, fixed, composition, 4.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-178	01121	CB4725
R47	Not used			

Table 6-13 Parts List for Model RFM-11A

A1A4 - BROADBAND AMPLIFIER AND DOUBLY BALANCED MIXER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R48	Not Used			
R49	Not Used			
R50	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R51	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
R52	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
Z1	Mixer, doubly balanced	1-403411-001	88869	
C1 Chassis	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B102W
C2 Chassis	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB28102W
C3 Chassis	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B102W
C4 Chassis	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B102W
FL1 Chassis	Filter, feedthru, 100 MHz - 10 GHz	1-919011-004	72982	1202052

Table 6-13 Parts List for Model RFM-11A

A1A5 - 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C2	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-90000-001	73445	C280AE
C3	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C4	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C5	Capacitor, fixed, mica, 300 pF, \pm 5%, 500 Vdc	1-900003-042	72136	DM15
C6	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C7	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C8	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C9	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C10	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C11	Capacitor, fixed, plastic, 0.1 μ F, \pm 20%, 250 Vdc	1-900001-013	73445	C280AE
C12	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250 Vdc	1-900001-001	73445	C280AE
C13	Capacitor, fixed, plastic, 0.01 μ F, \pm 20%, 250Vdc	1-900001-001	73445	C280AE
C14	Capacitor, fixed, mica, 820 pF, \pm 5%, 300 Vdc	1-900003-054	72136	DM15

Table 6-13 . Parts List for Model RFM-11A

A1A5 - 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C15	Capacitor, fixed, mica, 300 pF, $\pm 5\%$, 500 Vdc	1-900003-042	72136	DM15
C16	Capacitor, fixed, mica, selected, 200 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-037	72136	DM15
C17	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 Vdc	1-900113-002	91293	9301
C18	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C19	Capacitor, fixed, mica, 15 pF, $\pm 5\%$, 500 Vdc	1-900003-010	72136	DM15
C20	Capacitor, fixed, ceramic, selected, 0.68 pF nominal, $\pm 10\%$, 500 Vdc	1-900066-019	95121	MC
C21	Capacitor, fixed, mica, 20 pF, $\pm 5\%$, 500 Vdc	1-900003-012	72136	DM15
C22	Capacitor, fixed, mica, 20 pF, $\pm 5\%$, 500 Vdc	1-900003-012	72136	DM15
C23	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 Vdc	1-900113-002	91293	9301
C24	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C25	Capacitor, variable, ceramic, 1.7 pF to 11 pF, 500 Vdc	1-900113-002	91293	9301
C26	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE
C27	Capacitor, fixed, mica, 160 pF, $\pm 5\%$, 500 Vdc	1-900003-035	72136	DM15
C28	Capacitor, fixed, mica, 15 pF, $\pm 5\%$, 500 Vdc	1-900003-010	72136	DM15

Table 6-13. Parts List for Model RFM-11A

A1A5 - 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C29	Capacitor, fixed, mica, selected, 500 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-048	72136	DM15
C30	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15
C31	Capacitor, fixed, mica, 50 pF, $\pm 5\%$, 500 Vdc	1-900003-022	72136	DM15
C32	Capacitor, variable, ceramic 1.7 pF to 11 pF, 500 Vdc	1-900113-002	91293	9301
C33	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C34	Capacitor, fixed, mica, selected, 100 pF nominal, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15
C35	Capacitor, fixed, mica, 470 pF, $\pm 5\%$, 500 Vdc	1-900003-047	72136	DM15
C36	Capacitor, fixed mica, 20 pF, $\pm 5\%$, 500 Vdc	1-900003-012	72136	DM15
C37	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15
C38	Capacitor, fixed, mica, 2pF, $\pm .5$ pF, 500 Vdc	1-900003-002	72136	DM15
C39	Capacitor, variable, glass, 1.0 pF to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C40	Capacitor, fixed, stand off, 470 pF, -0% +100%, 500 Vdc	1-900044-001	01121	SS5D-47/W
C41	Capacitor, fixed, mica, 5pF, $\pm 10\%$, 500 Vdc	1-900003-004	72136	DM15
C42	Capacitor, fixed, mica, selected, 3 pF nominal, $\pm 10\%$, 500 Vdc	1-900098-003	04062	DM5-030K

Table 6-13. Parts List for Model RFM-11A

A1A5 = 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C43	Capacitor, fixed, feedthrough, 470 pF, $\pm 20\%$, 500 Vdc	1-900045-001	01121	FA5C-4712
C44	Capacitor, fixed, mica, 5 pF, $\pm 10\%$, 500 Vdc	1-900098-005	04062	DM5-050K
C45	Capacitor, variable, glass 1.0 pF to 10 pF, 500 Vdc	1-900063-001	91293	7341-A
C46	Capacitor, fixed, plastic, 0.0 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
CR1	Diode, silicon, switching, $V_r=20V$, $I_f=100mA$	1-913074-001	80795	ITT244
CR2	Diode, silicon, switching, $V_r=20V$, $I_f=100mA$	1-913074-001	80795	ITT244
L1	Inductor, variable, 0.22 μ H to 0.34 μ H	1-906006-009	88869	
L2	Inductor, fixed, 2 1/2 turns 0.02 μ H	1-402965-001	88869	
L3	Inductor, fixed, 2 1/2 turns, 0.02 μ H	1-402965-001	88869	
L4	Inductor, fixed, 2 1/2 turns, 0.02 μ H	1-402965-001	88869	
L5	Inductor, fixed, 2 1/2 turns	1-403499-001	88869	
L6	Inductor, fixed, 2 1/2 turns	1-403500-001	88869	
L7	Inductor, fixed, 1 turn	1-201741-002	88869	
L8	Inductor, fixed, 1 turn	1-201741-001	88869	

Table 6-13. Parts List for Model RFM-11A

A1A5 - 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q1	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q3	Transistor, silicon, NPN	1-958018-001	03606	2N5179
Q4	Transistor silicon, NPN	1-958018-001	03606	2N5179
Q5	Transistor, silicon, NPN	1-958018-001	03606	2N5179
Q6	Transistor, silicon, NPN	1-958018-001	03606	2N5179
Q7	Transistor, silicon, NPN	1-958018-001	03606	2N5179
R1	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R2	Resistor, fixed, composition, 8.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-048	01121	CB8221
R3	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R4	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R5	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R6	Resistor, fixed, composition, 82 ohm, $\pm 10\%$, 1/4 W	1-945000-024	01121	CB8201
R7	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525

Table 6-13 Parts List for Model RFM-11A

A1A5 - 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R8	Resistor, fixed, composition, 2.4 kilohm, $\pm 5\%$, 1/4 W	1-945000-171	01121	CB2425
R9	Resistor, fixed, composition, 330 ohm, $\pm 10\%$, 1/4 W	1-945000-031	01121	CB3311
R10	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R11	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R12	Resistor, fixed, composition, 1.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-165	01121	CB1325
R13	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R14	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R15	Resistor, fixed, composition, 6.8 kilohm, $\pm 10\%$, 1/4 W	1-945000-047	01121	CB6821
R16	Resistor, fixed, composition, 820 ohm, $\pm 10\%$, 1/4 W	1-945000-036	01121	CB8211
R17	Resistor, fixed, composition, selected, 10 ohm nominal, 10%, 1/4 W	1-945000-013	01121	CB1001
R18	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R19	Resistor, fixed, composition, 1.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-165	01121	CB1325
R20	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R21	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011

Table 6-13. Parts List for Model RFM-11A

A1A5 - 700 MHz MULTIPLIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R22	Resistor, fixed, composition, selected, 10 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R23	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R24	Resistor, fixed, composition, 1/3 kilohm, $\pm 5\%$, 1/4 W	1-945000-165	01121	CB1325
R25	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R26	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R27	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R28	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R29	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R30	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
U1	Integrated circuit, Balanced Mixer	1-926007-026	01295	SN76514N
W1	Wire, stranded, red, 24 gage	1-999000-102	04946	1WT-221934
Y1	Crystal, 10 MHz	2-403562-001	88869	

TABLE 6-14. PARTS LIST FOR MODEL RFM-10B

The parts list for the Model RFM-10B is the same as that for the Model RFM-10A with the following exceptions (refer to Table 6-4):

a) The MAIN ASSEMBLIES AND CHASSIS PARTS should be:

1) A1A2 Broadband Amplifier 1-004761-001 88869

b) The A1A2 - RF SWITCH ASSEMBLY should be replaced with the accompanying A1A2 - BROADBAND ASSEMBLY parts list.

Table 6-14. Parts List for Model RFM-10B

A1A2 - BROADBAND AMPLIFIER ASSEMBLY				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C2	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C3	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C5	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C6	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C7	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C8	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C9	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C10	Not Used			
C11	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE, .1 uF
C12	Capacitor, fixed, feedthru, 1000 pF, ±20%, 500 Vdc	1-900045-002	01121	FA5C-102W
L1	Inductor, fixed, 4 turns	1-402869-003	88869	
L2	Inductor, fixed, 3 turns	1-402869-001	88869	

Table 6-14. Parts List for Model RFM-10B

A1A2 - BROADBAND AMPLIFIER ASSEMBLY (Cont.)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L3	Inductor, fixed, 0.24 μ H, $\pm 15\%$	1-906008-001	99848	200-11
L4	Inductor, fixed, 3 turns	1-402869-001	88869	
L5	Inductor, fixed, 3 turns	1-402869-001	88869	
L6	Inductor, fixed, 0 turns	1-999001-008	88869	
Q1	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q2	Transistor, silicon, NPN	1-958018-001	02735	2N5179
Q3	Transistor, silicon, NPN	1-958018-001	02735	2N5179
R1	Resistor, fixed, composition, 82 ohm, $\pm 10\%$, 1/4 W	1-945000-024	01121	CB8201
R2	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R3	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R4	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R5	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R6	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R7	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001

Table 6-14. Parts List for Model RFM-10B

A1A2 - BROADBAND AMPLIFIER ASSEMBLY (Cont.)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R8	Resistor, fixed, composition, 47 ohm, $\pm 10\%$, 1/4 W	1-945000-021	01121	CB4701
R9	Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R10	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R11	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R12	Resistor, fixed, composition, 4.7 k ohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R13	Resistor, fixed, composition, 10 ohm, $\pm 10\%$, 1/4 W	1-945000-013	01121	CB1001
R14	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R15	Resistor, fixed, composition, 15 k ohm, $\pm 10\%$, 1/4 W	1-945000-051	01121	CB1531
R16	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R17	Not Used			
R18	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711

Table 6-15. Parts List for Model RFM-10A and RFM-10B

Main Assemblies and Chassis Parts				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1A2	Broadband amplifier assembly(RFM-10B only)	1-004840-001	88869	
A1A3	11 MHz and 2 MHz IF amplifier assembly	4-004836-001	88869	
A1A4	Broadband amplifier, mixer detector assembly	1-004820-001	88869	
AT1	Attenuator, step, assembly, dual concentric, 1 dB and 10 dB steps	4-403416-001	88869	
C1	Not Used			
C2	Capacitor, fixed, electrolytic, 50 μ F, -10% +75%, 25 Vdc	1-900039-005	76433	984-1654
C3	Capacitor, fixed, mica, 150 pF, \pm 5%, 500 Vdc	1-900003-034	72136	DM15
CR1	Diode, silicon, $V_r = 75$ V, $I_f = 10$ mA	1-913007-001	03508	1N4148
CR2	Diode, silicon, $V_r = 75$ V, $I_f = 10$ mA	1-913007-001	03508	1N4148
DS1	Lamp, indicator, red, 10 V, 20 mA	1-925007-003	0000B	L-10/20
F1	Fuse, RF assembly, +10 dBm	3-403417-001	88869	
J1	Part of F1			
J2	Part of A1A2W2			
P1	Part of W2			

Table 6-15. Parts List for Model RFM-10A and RFM-10B

Main Assemblies and Chassis Parts (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
P2	Connector, plug, rectangular, 24 pin	1-910071-002	13511	26-159-24
R1	Resistor, variable, composition, 1 kilohm, $\pm 30\%$, 1/2 W (Part of S1)			
R2	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W (part of S1)			
S1/R1, R2	Switch/variable resistor assembly (S1) Switch, rotary, 1 pole, 2 position	1-004938-001	88869	
S2	Switch, push-push, 2 pole, 2 position	1-951024-002	82389	65017-206
W1	Cable assembly, 7 in., BNC to rt. angle BNC	1-004890-001	88869	
W2	Cable assembly, 6 1/2 in., BNC to push-on	1-004818-001	88869	
W3	Cable assembly, 9 1/2 in., phono plug one end	1-004819-001	88869	
	Knob, black (MEASURE SENSITIVITY)	1-935003-101	0000K	RSS-50L-1
	Knob, black, concentric (HIGH-NORMAL)	1-935007-002	0000K	SSN70CL-2
	Pawl, adjustable (2 req.)	1-964183-001	08730	SS6121

Table 6-15. Parts List for Model RFM-10B only

A1A2 - Broadband Amplifier Assembly				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1 (Chassis)	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B-102W
C1	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C2	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C3	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C4	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C5	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C6	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C7	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C8	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C9	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DR10GSA50M
C10	Not Used			
C11	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C12	Capacitor, fixed, mica, selected, 5 pF nominal, \pm 10%, 500 Vdc	1-900003-004	72136	DM15
C13	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
L1	Inductor, fixed, 1 mH, \pm 10%, 139 mA	1-906016-049	0000J	DR-1000

Table 6-15. Parts List for Model RFM-10B only

A1A2 - Broadband Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L2	Inductor, fixed, selected, 8 turns nominal	1-403283-007	88869	
L3	Inductor, fixed, 1 mH, $\pm 10\%$, 139 mA	1-906016-049	0000J	DR-1000
L4	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q2	Transistor, silicon, NPN	1-958064-001	73445	A486
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-001	73445	A486
R1	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R2	Not used			
R3	Not used			
R4	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R5	Resistor, fixed, composition, 3.6 kilohm, $\pm 5\%$, 1/4 W	1-945000-175	01121	CB3625
R6	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R7	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925

Table 6-15. Parts List for Model RFM-10B only

A1A2 - Broadband Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R8	Resistor, fixed, composition, selected, 330 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-150	01121	CB3315
R9	Resistor, fixed, composition, 1.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-166	01121	CB1525
R10	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R11	Resistor, fixed, composition, 75 ohm, $\pm 5\%$, 1/4 W	1-945000-135	01121	CB7505
R12	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected, 180 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-144	01121	CB1815
R14	Resistor, fixed, composition, selected, 47 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-130	01121	CB4705
R15	Not Used			
R16	Not Used			
R17	Not Used			
R18	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R19	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R20	Not used			
W1	Cable assembly, 10 in., BNC at one end	1-004888-001	88869	

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C2	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C3	Capacitor, fixed, mica, 680 pF, ±5%, 300 Vdc	1-900003-052	72136	DM15
C4	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE
C5	Capacitor, fixed, mica, 680 pF, ±5%, 300 Vdc	1-900003-052	72136	DM15
C6	Capacitor, fixed, mica, 270 pF, ±5%, 500 Vdc	1-900003-041	72136	DM15
C7	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C8	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C9	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C10	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C11	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C12	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C13	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C14	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE

Table 6-15. Parts List for Model RFM-10A and RFM 10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C15	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C16	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C17	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C18	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C19	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C20	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C21	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C22	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C23	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C24	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C25	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C26	Capacitor, fixed, mica, .680 pF, $\pm 5\%$, 300 Vdc	1-900003-052	72136	DM15
C27	Capacitor, fixed, mica, 270 pF, $\pm 5\%$, 500 Vdc	1-900003-041	72136	DM15
C28	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C29	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C30	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C31	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C32	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C33	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C34	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C35	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C36	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C37	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C38	Capacitor, fixed, plastic, 0.01 μ F, $\pm 20\%$, 250 Vdc	1-900001-001	73445	C280AE
C39	Capacitor, fixed, mica, 330 pF, $\pm 5\%$, 500 Vdc	1-900003-043	72136	DM15
C40	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900003-030	72136	DM15
C41	Capacitor, fixed, mica, 1200 pF, $\pm 5\%$	1-900003-057	72136	DM15
C42	Capacitor, fixed, plastic, 0.1 μ F, $\pm 20\%$, 250 Vdc	1-900001-013	73445	C280AE

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C43	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE
C44	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE
C45	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE
C46	Capacitor, fixed, mica, 120 pF, ±5%, 500 Vdc	1-900003-032	72136	DM15
C47	Capacitor, fixed, mica, 120 pF, ±5%, 500 Vdc	1-900003-032	72136	DM15
C48	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
C49	Capacitor, fixed, plastic, 0.001 uF, ±20%, 250 Vdc	1-900001-030	73445	C280AE
C50	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 Vdc	1-900001-013	73445	C280AE
C51	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
CR1	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR2	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR3	Diode, silicon, switching	1-913074-001	80795	ITT244
CR4	Diode, silicon, switching	1-913074-001	80795	ITT244
CR5	Diode, silicon, switching	1-913074-001	80795	ITT244

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
CR6	Diode, silicon, switching	1-913074-001	80795	ITT244
CR7	Diode, silicon, switching	1-913074-001	80795	ITT244
CR8	Diode, silicon, switching	1-913074-001	80795	ITT244
CR9	Diode, silicon, switching	1-913074-001	80795	ITT244
CR10	Diode, germanium, 1N273	1-913005-001	03877	1N273
CR11	Diode, silicon, switching	1-913074-001	80795	ITT244
CR12	Diode, silicon, switching	1-913074-001	80795	ITT244
CR13	Diode, silicon, switching	1-913074-001	80795	ITT244
CR14	Diode, germanium, 1N273	1-913005-001	03877	1N273
FL1	Filter, crystal, 11 MHz	1-403279-001	88869	
L1	Inductor, variable, 0.3 μ H to 0.5 μ H	1-403586-001	88869	
L2	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L3	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47
L4	Inductor, fixed, 330 μ H, \pm 10%	1-906038-001	0000F	C-1017-47

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L5	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L6	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L7	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L8	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L9	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L10	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L11	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L12	Inductor, fixed, 330 μ H, $\pm 10\%$	1-906038-001	0000F	C-1017-47
L13	Inductor, variable, 1.3 μ H to 1.8 μ H	1-906006-006	88869	
L14	Inductor, fixed, 85 μ H, $\pm 5\%$	1-906022-009	0000F	13-85-5
Q1	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q2	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q3	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q4	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q5	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q6	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q7	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q8	Transistor, silicon, NPN, 2N5179	1-958018-001	03606	2N5179
Q9	Transistor, silicon, NPN, 2N3904	1-958000-001	04713	2N3904-5
R1	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R2	Resistor, fixed, composition, 2.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R3	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R4	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R5	Resistor, fixed, composition, 270 ohm, $\pm 10\%$, 1/4 W	1-945000-030	01121	CB2711
R6	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R7	Resistor, fixed, composition, 5.6 kilohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R8	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R9	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R10	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R11	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R12	Resistor, fixed, composition, 180 ohm, $\pm 10\%$, 1/4 W	1-945000-028	01121	CB1811
R13	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R14	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721
R15	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R16	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R17	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R18	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R19	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R20	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R21	Resistor, fixed, composition, 5.6 kilohm, $\pm 10\%$, 1/4 W	1-945000-046	01121	CB5621
R22	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R23	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R24	Resistor, fixed, composition, 2.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-041	01121	CB2221
R25	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R26	Resistor, fixed, composition, 560 ohm, $\pm 10\%$, 1/4 W	1-945000-034	01121	CB5611
R27	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R28	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R29	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R30	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R31	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R32	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R33	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R34	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R35	Resistor, fixed, composition, 12 kilohm, $\pm 10\%$, 1/4 W	1-945000-050	01121	CB1231
R36	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R37	Resistor, fixed, composition, 4.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-045	01121	CB4721

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R38	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R39	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R40	Resistor, variable, composition, 500 ohm, $\pm 30\%$, 1/5 W	1-945007-003	71450	X201
R41	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R42	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R43	Resistor, fixed, composition, 680 ohm, $\pm 10\%$, 1/4 W	1-945000-035	01121	CB6811
R44	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R45	Resistor, fixed, composition, 390 ohm, $\pm 10\%$, 1/4 W	1-945000-032	01121	CB3911
R46	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R47	Resistor, variable, composition, 250 ohm, $\pm 30\%$, 1/5 W	1-945007-002	71450	X201
R48	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R49	Resistor, fixed, composition, 1 kilohm, $\pm 10\%$, 1/4 W	1-945000-037	01121	CB1021
R50	Resistor, fixed, composition, 47 kilohm, $\pm 10\%$, 1/4 W	1-945000-057	01121	CB4731
R51	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R52	Resistor, fixed, composition, 22 kilohm, $\pm 10\%$, 1/4 W	1-945000-053	01121	CB2231
R53	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R54	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R55	Resistor, fixed, composition, 470 ohm, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R56	Resistor, fixed, composition, selected, 470 ohm nominal, $\pm 10\%$, 1/4 W	1-945000-033	01121	CB4711
R57	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R58	Resistor, fixed, composition, 6.8 kilohm, $\pm 10\%$, 1/4 W	1-945000-047	01121	CB6821
R59	Resistor, fixed, composition, 33 ohm, $\pm 10\%$, 1/4 W	1-945000-019	01121	CB3301
R60	Resistor, fixed, composition, 10 kilohm, $\pm 10\%$, 1/4 W	1-945000-049	01121	CB1031
R61	Resistor, fixed, composition, 2.7 kilohm, $\pm 10\%$, 1/4 W	1-945000-042	01121	CB2721
R62	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R63	Resistor, fixed, composition, 150 ohm, $\pm 10\%$, 1/4 W	1-945000-027	01121	CB1511
U1	Integrated circuit, balanced mixer	1-926007-026	01295	SN76514N

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C1 (Chassis)	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B-102W
C2 (Chassis)	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B-102W
C3 (Chassis)	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B-102W
C4 (Chassis)	Capacitor, fixed, feedthru, 0.001 μ F, -0 +100%, 500 Vdc	1-900038-001	01121	FB2B-102W
FL1 (Chassis)	Filter, feedthru, 100 MHz - 10 GHz	1-919011-004	72982	1202-052
C1	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C2	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C3	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C4	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C5	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C6	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C7	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C8	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C9	Capacitor, fixed, electrolytic, 0.1 μ F, \pm 20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C10	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C11	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C12	Capacitor, fixed, mica, selected, 5 pF nominal, $\pm 10\%$, 500 Vdc	1-900003-004	72136	DM15
C13	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C14	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C15	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C16	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C17	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C18	Capacitor, fixed, electrolytic, 1.0 μ F, $\pm 20\%$, 50 Vdc	1-900115-003	12954	DIROGSA50M
C19	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C20	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C21	Capacitor, fixed, electrolytic, 0.1 μ F, $\pm 20\%$, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C22	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C23	Capacitor, fixed, mica, selected, 15 pF nominal, $\pm 10\%$, 500 Vdc	1-900003-010	72136	DM15

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C24	Capacitor, variable, ceramic, 1.7 pF to 10 pF, 500 Vdc	1-900113-002	91293	9301
C25	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C26	Capacitor, fixed, mica, selected, (may be omitted)	1-900003-000	72136	DM15
C27	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 Vdc	1-900001-009	73445	C280AE
C28	Capacitor, fixed, ceramic, selected, (may be omitted)	1-900066-000	95121	MC
C29	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C30	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C31	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C32	Capacitor, fixed, mica, selected, 15 pF nominal, ±10%, 500 Vdc	1-900003-010	72136	DM15
C33	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-400115-002	12954	DRIOGSA50M
C34	Capacitor, fixed, mica, selected, 10 pF nominal, ±10%, 500 Vdc	1-900003-008	72136	DM15
C35	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C36	Capacitor, fixed, electrolytic, 0.1 uF, ±20%, 50 Vdc	1-900115-002	12954	DRIOGSA50M
C37	Capacitor, fixed, mica, 1.0 pF, ±0.5 pF, 500 Vdc	1-900003-001	72136	DM15

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C38	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
C39	Capacitor, fixed, electrolytic, 1.0 μ F, \pm 20%, 50 Vdc	1-900115-003	12954	DIROGSA50M
CR1	Diode, back, silicon	1-913026-003	03508	BD-3
CR2	Diode, switching, silicon	1-913074-001	80795	ITT244
CR3	Diode, switching, silicon	1-913074-001	80795	ITT244
CR4	Diode, silicon	1-913007-001	03508	1N4148
CR5	Diode, silicon	1-913007-001	03508	1N4148
CR6	Diode, germanium	1-913005-001	03877	1N273
L1	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
L2	Inductor, fixed, selected, 8 turns nominal	1-403283-007	88869	
L3	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
L4	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L5	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
L6	Inductor, fixed, selected, 8 turns nominal	1-903283-007	88869	

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
L7	Inductor, fixed, 470 μ H, \pm 5%, 180 mA	1-906032-045	16407	WEE470
L8	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L9	Inductor, fixed, selected, 4 turns nominal	1-403283-001	88869	
L10	Inductor, fixed, 1000 μ H, \pm 10%, 139 mA	1-906016-049	0000J	DR1000
Q1	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q2	Transistor, silicon, NPN	1-958064-001	73445	A486
Q3	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q4	Transistor, silicon, NPN	1-958064-011	73445	A486
Q5	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q6	Transistor, silicon, NPN	1-958064-001	73445	A486
Q7	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q8	Transistor, silicon, NPN	1-958080-001	04713	2N4427
Q9	Transistor, silicon, NPN	1-958081-001	0000H	SD1005-1
Q10	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R1	Resistor, fixed, composition, 2.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-170	01121	CB2225
R2	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R3	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R4	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R5	Resistor, fixed, composition, selected, 150 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R6	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R7	Not used			
R8	Not used			
R9	Resistor, fixed, composition, 2.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-170	01121	CB2225
R10	Resistor, fixed, composition, 7.5 kilohm, $\pm 5\%$, 1/4 W	1-945000-183	01121	CB7525
R11	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R12	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R13	Resistor, fixed, composition, selected, 270 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-148	01121	CB2715
R14	Resistor, fixed, composition, 22 ohm, $\pm 5\%$, 1/4 W	1-945000-122	01121	CB2205

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R15	Resistor, fixed, composition, 2.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-172	01121	CB2725
R16	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-174	01121	CB3325
R17	Resistor, fixed, composition, 150 ohm, $\pm 5\%$, 1/4 W	1-945000-142	01121	CB1515
R18	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R19	Resistor, fixed, composition, selected, 330 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-150	01121	CB3315
R20	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R21	Resistor, fixed, composition, 1.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-165	01121	CB1325
R22	Resistor, fixed, composition, 3.3 kilohm, $\pm 5\%$, 1/4 W	1-945000-174	01121	CB3325
R23	Resistor, fixed, composition, 27 ohm, $\pm 5\%$, 1/4 W	1-945000-124	01121	CB2705
R24	Resistor, fixed, composition, 3.9 kilohm, $\pm 5\%$, 1/4 W	1-945000-176	01121	CB3925
R25	Resistor, fixed, composition, selected, 220 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-146	01121	CB2215
R26	Resistor, fixed, composition, selected, 1 kilohm nominal, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R27	Resistor, fixed, composition, 13 ohms, $\pm 5\%$, 1/4 W	1-945000-117	01121	CB1305
R28	Resistor, fixed, composition, 100 ohm, $\pm 5\%$, 1/4 W	1-945000-138	01121	CB1015

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R29	Resistor, fixed, composition, 4.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-178	01121	CB4725
R30	Resistor, fixed, composition, 560 ohm, $\pm 5\%$, 1/4 W	1-945000-156	01121	CB5615
R31	Resistor, fixed, composition, selected, 68 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-134	01121	CB6805
R32	Resistor, fixed, film, 49.9 ohm, $\pm 1\%$, 1/4 W	1-945016-068	72982	RN60D4990F
R33	Resistor, fixed, composition, 51 ohm, $\pm 5\%$, 1/4 W	1-945000-131	01121	CB5105
R34	Resistor, fixed, composition, 56 ohm, $\pm 5\%$, 1/4 W	1-945000-132	01121	CB5605
R35	Resistor, fixed, composition, selected, 680 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-158	01121	CB6815
R36	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R37	Resistor, fixed, composition, 1 kilohm, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R38	Resistor, fixed, composition, 430 ohm, $\pm 5\%$, 1/4 W	1-945000-153	01121	CB4315
R39	Resistor, fixed, composition, 470 ohm, $\pm 5\%$, 1/4 W	1-945000-154	01121	CB4715
R40	Resistor, fixed, composition, 10 ohm, $\pm 5\%$, 1/4 W	1-945000-114	01121	CB1005
R41	Resistor, fixed, composition, 2.4 kilohm, $\pm 5\%$, 1/4 W	1-945000-171	01121	CB2425
R42	Resistor, fixed, composition, selected, 110 ohm nominal, $\pm 5\%$, 1/4 W	1-945000-139	01121	CB1115

Table 6-15. Parts List for Model RFM-10A and RFM-10B

A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)				
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R43	Resistor, fixed, composition, 47 ohm, $\pm 5\%$, 1/4 W	1-945000-130	01121	CB4705
R44	Resistor, fixed, composition, 1 kilohm, $\pm 5\%$, 1/4 W	1-945000-162	01121	CB1025
R45	Resistor, fixed, composition, 8.2 kilohm, $\pm 5\%$, 1/4 W	1-945000-184	01121	CB8225
R46	Resistor, fixed, composition, 4.7 kilohm, $\pm 5\%$, 1/4 W	1-945000-178	01121	CB4725
R47	Not Used			
R48	Not Used			
R49	Not Used			
R50	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4 W	1-945000-119	01121	CB1605
R51	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
R52	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4 W	1-945000-149	01121	CB3015
Z1	Mixer, doubly balanced	1-403411-001	88869	

ADDENDUM
FOR
MANUAL NO. 1-500783-260 (Rev. A)
MODEL FM-10C

ERRATA

Perform the following changes to the above manual:

Page 3-2: 1 MHz Decade - last paragraph, last sentence

Was: The difference frequency is applied to mixer A8Z1-L

Is: The difference frequency is applied to mixer A8Z1-X

Page 4-34: First paragraph - delete first line: "connected to L on A8Z1."

Page 4-68: FIGURE 4-35. AM DETECTOR BOARD ASSEMBLY, A1 (OAM-1)

Was: R671, R674 (400 Hz LEVEL ADJ); R673, R675 (1 kHz LEVEL ADJ)

Is: R671, R674 (1 kHz LEVEL ADJ); R673, R675 (400 Hz LEVEL ADJ)

Page 5-7/5-8: Figure 5-3. "Schematic Diagram TCXO/IF BOARD (A1A5)...."

Replace with the attached schematic No. 4-501166-001(G)

Page 5-21/5-22: Figure 5-10. Schematic Diagram 1 MHz Decade Board (A6)

R₃, Was: * Is: 56*

Page 5-45/5-46: Figure 5-22. Schematic Diagram 11 MHz Decade Board (A1A6)

Response curve, Y1, Was: 6 dB Is: 60 dB

Page 5-51/5-52: Figure 5-25. Schematic Diagram 11 MHz Decade Board (A1A3)

Response curve, Y1, Was: 6 dB Is: 60 dB

Page 5-69/5-70: Figure 5-34. Detailed Block Diagram Model FM-10C

A1A2 (DIVIDER/ALC), the ALC dc AMP references are U5 and U6

Page 6-7: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS

R5, Was: Resistor, fixed, composition, 1-945000-029 01121 CB2211
220 ohms, +10%, 1/4W

Is: Resistor, fixed, composition, 1-945000-030 01121 CB2711
270 ohm, +10%, 1/4W

Page 6-62: TABLE 6-3. PARTS LIST FOR MODEL RFM-10

MAIN ASSEMBLIES AND CHASSIS PARTS

R1, Was: Resistor, variable, composition, 1 Kohm, +10%

Is: Not Used

Page 6-79: TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A4 Was: "ROAD BAND" Is: "BROAD BAND"

Below C30, add: C31 Capacitor, fixed, elect., 1-900115-003 12954 DIROGSA50M
1 uF, +20%, 50 V dc

Z	
Y	
X	
W	
V	
U	
T	
S	
R	
Q	
P	
O	
N	
M	
L	
K	
J	
I	
H	
G	
F	
E	
D	
C	
B	
A	
Approved	
Revision	
Date	9-20-73
Initials	

SINGER INSTRUMENTATION	TITLE ADDENDUM MODEL FM-10C	DWG NO. 1- 500783-260(A)
---------------------------	-----------------------------------	-----------------------------

ERRATA (Continued)

Page 6-88: TABLE 6-5. PARTS LIST FOR MODEL FIM-1 (CONT.)

A1-PRINTED CIRCUIT BOARD ASSEMBLY

R34, Was: Resistor, fixed, composition, 1-945000-033 01121 CB4711
470 ohm, $\pm 10\%$, 1/4W

Is: Resistor, fixed, composition, 1-945007-005 71450 X201
2.5 kilohm, $\pm 30\%$, 1/4W

Page 6-99: TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS

R11, Was: Resistor, variable, composition, 500Vdc, $\pm 30\%$ (part of R8/R11)

Is: Resistor, variable, composition, 500kilohm, $\pm 30\%$ (part of R8/R11)

Page 3-13/3-14: Figure 3-1 - Simplified Synthesis Block Diagram Model
FM-10C Mainframe

Ø Mod output, Was: x70, 700 MHz Is: x7, 70 MHz

Page 3-25/3-26: Figure 3-7 - Detailed Block Diagram Model ODM-1

S1A, should be in the INT position.

Page 4-35: Paragraph 4.4.34-e

line 4, Was: ... (24% to 36% modulation)... Is: ... (27% to 33% modulation)

Page 4-47: Paragraph 4.11.2-c

Was: 1000,000 MHz Is: 100.0000 MHz

Page 6-23: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

C25, Was: 0.001 uF Is: 0.01 uF

Page 6-116: TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

Delete: REF. DESIG. R12/R21 and replace with R13

Between R11 and R13, Add: R12/R21 Resistor, variable 1-003215-001 88869
assembly (R12)
resistor, variable,
5 kilohm

Page 4-114: Steps t and u:

Was: Repeat step 4 Is: Repeat step r

Page 5-75/5-76: Figure 5-36. Schematic Diagram Broadband Amplifier,
A1A2 Model RFM-10D

R1, Was: *16 Is: 16

Page 5-77/5-78: Figure 5-37. Schematic Diagram 11 MHz and 2 MHz I. F.
Amplifier, A1A3 Model RFM-10B

MEASURE SENSITIVITY switch, S1, Was: displayed in the HIGH position

Is: displayed in the NORMAL position

ERRATA (Continued)

Page 5-79/5-80: Figure 5-38. Schematic Diagram Broadband Amplifier and Doubly Balanced Mixer, A1A4, Model RFM-10D

RF INPUT Was: 50 kHz - 600 MHz Is: 50 kHz - 512 MHz
R11, Was: 270 Is: 150
L8, Was: OT* Is: 4T*
L9, Was: OT* Is: 4T*

Page 6-145: A1A2 - Broadband Amplifier Assembly

Before C1, Add: C1 (Chassis) Capacitor, fixed, 1-900038-001 01121 FB2B102W
feedthru, 0.001 uF,
-0 +100%, 500 Vdc

Page 6-146: A1A2 - Broadband Amplifier Assembly (Continued)

R1, Was: Resistor, fixed, composition, 160 ohm, $\pm 5\%$, 1/4W
Is: Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4W

Page 6-160: A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly

Before C1, Add: C1 (Chassis) Capacitor, fixed, 1-900038-001 01121 FB2B102W
feedthru, 0.001 uF,
-0 +100%, 500 Vdc
C2 (Chassis) Capacitor, fixed, 1-900038-001 01121 FB2B102W
feedthru, 0.001 uF,
-0 +100%, 500 Vdc
C3 (Chassis) Capacitor, fixed, 1-900038-001 01121 FB2B102W
feedthru, 0.001 uF,
-0 +100%, 500 Vdc
C4 (Chassis) Capacitor, fixed, 1-900116-010 73445 2222424-
polystyrene, 2000pF, 22002
 $\pm 5\%$, 63 Vdc
FL1 (Chassis) Filter, feedthru, 1-919011-004 72982 1202-052
100 MHz-10 GHz

Page 6-163: A1A4 - Broadband Amplifier and Doubly Balanced Mixer Assembly (Continued)

L8, Was: Inductor, fixed, 1 turn 1-403598-001 88869
Is: Inductor, fixed, selected, 1-403283-001 88869
4 turns nominal
L9, Was: Inductor, fixed, 1 turn 1-403597-001 88869
Is: Inductor, fixed, selected, 1-403283-001 88869
4 turns nominal

Page 4-102: TABLE 4-13. TEST EQUIPMENT REQUIREMENTS FOR MODEL RFM-10D

Sweep Generator, RECOMMENDED MODEL, Add: and Singer Model FM-2748
Signal Generator, Level, Was: -81 dBm to 0 dBm Is: -101 dBm to 0 dBm

Page 4-108: Step r, line 4,

Was: Rotate the sweep generator center frequency control from 50kHz to 512MHz
Is: Rotate the sweep generator center frequency control from 50kHz to 512MHz

At bottom of page, Add: *Use the Singer Model FM-2748 to check the flatness from 50 kHz to 200kHz

ERRATA (Continued)

Page 5-79/5-80, 5-89/5-90, 5-101/5-102:

Figure 5-38. Schematic Diagram Broadband Amplifier and Doubly Balanced Mixer, A1A4

C2, C8, Was: 0.1 μ F Is: 1 μ F

Page 6-160, 6-192, 6-229: A1A4-Broadband Amplifier and Doubly Balanced Mixer Assembly

C2, C8, Was: Capacitor, fixed, 1-900115-002 12954 DR10GSA50M
electrolytic, 0.1 μ F,
 \pm 20%, 50 Vdc

Is: Capacitor, fixed, 1-900115-003 12954 D1ROGSA50M
electrolytic, 1 μ F,
 \pm 20%, 50 Vdc

Page 6-163, 6-195, 6-232: A1A4-Broadband Amplifier and Doubly Balanced Mixer Assembly

L2, Singer Part No., Was: 1-403283-007 Is: 1-403690-001

Page 5-87/5-88: Figure 5-42. Schematic Diagram 11 MHz and 2 MHz IF Amplifier, A1A3,, Model RFM-11A

Delete: C7 0.01 and replace with a straight line.

MEASURE SENSITIVITY switch, S1, Was: Displayed in the HIGH position.

Is: Displayed in the NORMAL position.

Page 6-181: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly

C2, C8 thru C14, Was: Capacitor, fixed, plastic 1-900001-001 73445 C280AE
0.01 μ F, \pm 20 %, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 μ F, \pm 20 %, 100 Vdc

C6, Was: Capacitor, fixed, mica 1-900003-041 72136 DM15
270 pF, \pm 5 %, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-027 04062 SCDM-10
270 pF, \pm 5%, 500 Vdc

C7 Was: Capacitor, fixed, plastic 1-900001-001 73445 C280AE
0.01 μ F, \pm 20%, 250 Vdc

Is: Not Used

Page 6-182: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)

C15 thru C24 Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 μ F, \pm 20 %, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 μ F, \pm 20%, 100 Vdc

C27 Was: Capacitor, fixed, mica 1-900003-041 72136 DM15
270 pF, \pm 5%, 500 Vdc

Is: Capacitor, fixed, mica 1-900072-027 04062 SCDM-10
270 pF, \pm 5%. 500 Vdc

ERRATA (Continued)

Page 6-183: A1A3 - 11.0 MHz and 2 MHz IF Amplifier Assembly (Continued)

- C29 thru C38, Was: Capacitor, fixed, 1-900001-001 73445 C280AE
 plastic, 0.01 μ F, \pm 20%, 250 Vdc
 Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
 0.01 μ F, \pm 20%, 100 Vdc
 C39, Was: Capacitor, fixed, mica 1-900003-043 72136 DM15
 330 pF, \pm 5%, 500 Vdc
 Is: Capacitor, fixed, mica, 1-900072-029 04062 SCDM-10
 330 pF, \pm 5%, 500 Vdc
 C40, Was: Capacitor, fixed, mica, 1-900003-030 72136 DM15
 100 pF, \pm 5%, 500 Vdc
 Is: Capacitor, fixed, mica, 1-900072-020 04062 SCDM-10
 100 pF, \pm 5%, 500 Vdc

Page 6-184: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)

- C46, C47, Was: Capacitor, fixed, mica, 1-900003-032 72136 DM15
 120 pF, \pm 5%, 500 Vdc
 Is: Capacitor, fixed, mica, 1-900072-021 04062 SCDM-10
 120 pF, \pm 5%, 500 Vdc
 C48, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
 0.01 μ F, \pm 20%, 250 Vdc
 Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
 0.01 μ F, \pm 20%, 100 Vdc
 C49, Was: Capacitor, fixed, plastic, 1-900001-030 73445 C280AE
 0.001 μ F, \pm 20%, 250 Vdc
 Is: Capacitor, fixed, mica 1-900003-056 72136 DM15
 1000 pF, \pm 5%, 100 Vdc
 C51, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280 AE
 0.01 μ F, \pm 20%, 250 Vdc
 Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
 0.01 μ F, \pm 20%, 100 Vdc

Page 6-72: MAIN ASSEMBLIES AND CHASSIS PARTS

AT2, Singer P/N, Was: 1-1035160-1 Is: 1-103576-001

Page 5-75/5-76 and 5-85/5-86: Schematic Diagram Broadband Amplifier

- L4, Was: *4T Is: 8T
 R14, Was: *47 Is: *22

Page 6-178: A1A2A1 BROADBAND AMPLIFIER ASSEMBLY

- C10, Was: Capacitor, variable, ceramic, 1-900113-002 91293 9301
 1.7 pF to 10 pF, 500 Vdc
 Is: Not used

Page 6-146 and 6-179: BROADBAND AMPLIFIER ASSEMBLY

- L4, Was: Inductor, fixed, selected, 1-403283-001 88869
 4 turns nominal
 Is: Inductor, fixed, 8 turns 1-403690-001 88869

Page 6-147 and 6-180: BROADBAND AMPLIFIER ASSEMBLY

- R14, Was: Resistor, fixed, composition 1-945000-130 01121 CB4705
 selected, 47 ohm nominal, \pm 5%, 1/4 W

ERRATA (Continued)

Is: Resistor, fixed, composition, 1-945000-122 01121 CB2205
 selected, 22 ohm nominal, $\pm 5\%$, 1/4 W

Page 5-83/5-84: Figure 5-40. Schematic Diagram RF Switch and Broadband Amplifier, A1 A2, Model RFM-11A

Delete: L1 thru L5 and replace with straight lines.

Page 5-95/5-96: Figure 5-46. Wiring Diagram Model RFM-10A and RFM-10B

Add: NOTE: A1 A2, A1 A2W1 and A1 A2W2 are used on Model RFM-10B only.
 For Model RFM-10A, add a coaxial cable, W5, from J2 to A1A4J3.

Pages 6-174/6-175: Table 6-13. Parts List for Model RFM-11A

Delete: L1 thru L5 Inductor, fixed, 10 μ H 1-906022-005 0000F 13-10-10

Page 6-179: Table 6-13. Parts List for Model RFM-11A

Q2, Was: Transistor, silicon, NPN	1-958018-001	02735	2N5179
Is: Transistor, silicon, NPN	1-958064-001	73445	A486

Page 6-212: Table 6-12. Parts List for Model RFM-10A and RFM-10B

AT1, Was: Attenuator, step, assembly,
 dual concentric, 1 dB and
 10 dB steps

4-403416-001 88869

Is: Attenuator, fixed, 10 dB

2-001355-005 88869

Below AT1, Add: AT2 Attenuator, variable,

40 dB

1-103576-001 88869

AT3 Attenuator, fixed,

23 dB

2-001355-006 88869

Delete: F1 Fuse, RF assembly, +10 dBm

3-403417-001 88869

J1, Was: Part of F1

Is: Part of AT1

J2, Add: (RFM-10B only)(Part of W5 on Model RFM-10A)

Page 6-213: Table 6-12. Parts List for Model RFM-10A and RFM-10B

W1, Was: Cable assembly, 7 in., BNC
 to rt. angle BNC

1-004890-001 88869

Is: Cable assembly, 7 in. BNC to BNC 1-004907-001 88869

Below W3, Add: W4 Cable assembly, 7-1/2

in., BNC male to BNC

female

2-004461-001 88869

W5 Cable assembly, 9 in.,

BNC to BNC bulkhead

(RFM-10 A only)

1-004906-001 88869

Page 5-87/5-88: Figure 5-42. Schematic Diagram 11 MHz and 2 MHz IF Amplifier,
 A1A3, Model RFM-11A

C40, Was: 100 pF Is: 47 pF

C41, Was: 1200 pF Is: 820 pF

ERRATA (Continued)

Page 6-183: Table 6-13. Parts List for Model RFM-11A

C40, Was:	Capacitor, fixed, mica, 100 pF, $\pm 5\%$, 500 Vdc	1-900072-020	04062	SCDM-10
Is:	Capacitor, fixed, mica, 47 p F, $\pm 5\%$, 500 Vdc	1-900072-014	04062	SCDM-470J
C41, Was:	Capacitor, fixed, mica, 1200 pF, $\pm 5\%$	1-900003-057	72136	DM15
Is:	Capacitor, fixed, mica, 820 pF, $\pm 5\%$, 300 Vdc	1-900003-054	72136	DM15

REVISED

APPROVED

MAINFRAME RUNNING CHANGES

Effective Date: February 14, 1973 (Effective serial number: 501 and above)

Page 5-33/5-34: Figure 5-16. Schematic Diagram Frequency Generator (A12-21)
C10, C20, C22, C37, ~~C44, C45~~ Was: 1000 pF Is: 0.01 uF

Page 6-54 through 6-56: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)
A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES

C10, C20, C22, Was: Capacitor, fixed, mica, 1-900003-056 71236 DM15F102J
C37, C44, C45 1000 pF, +5%, 100V dc
Is: Capacitor, fixed, ceramic, 1-900077-002 56289 IGA-510
0.01 uF, +20%, 100V dc

Effective date: March 23, 1973 (Effective serial number: 501 and above)

Page 5-33/5-34: Figure 5-16. Schematic Diagram Frequency Generator (A12-21)

NOTES **3**, Was: To be added to A21 board only at final assembly
Is: To be added to A21 board between terminals 9 and 11

Effective date: April 5, 1973 (Effective serial number: 430 and above)

Page 5-9/5-10: Figure 5-4. Schematic Diagram ϕ Modulator/Audio (A1A6)
R10, Was: 820 Is: 270

Page 6-21: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A1A6 - PHASE MODULATOR AND AUDIO CIRCUIT BOARD ASSEMBLY

R10, Was: Resistor, fixed, composition, 1-945000-036 01121 CB8211
820 ohm, +10%, 1/4W

Is: Resistor, fixed, composition, 1-945000-030 01121 CB2711
270 ohm, +10%, 1/4W

Effective date: May 8, 1973 (Effective serial number: 501 and above)

Page 5-33/5-34: Figure 5-16. Schematic Diagram Frequency Generator (A12-21)
Component Values chart, A16 board only; C32, Was: 82 pF Is: 68 pF

MAINFRAME RUNNING CHANGES (Continued)

Page 6-55: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES

C32, Was: A16 thru A21 Capacitor, fixed, mica, 1-900003-028 72136 DM15F820J
selected, 82 pF nominal,
+5%, 500V dc

Is: A16 Capacitor, fixed, mica, 1-900003-026 72136 DM15F680J
68 pF, +5%, 500V dc

A17 thru A21 Capacitor, fixed, mica, 1-900003-028 72136 DM15F820J
selected, 82 pF nominal,
+5%, 500V dc

Effective date: June 8, 1973 (Effective serial number: 601 and above)

Page 6-50/6-51: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A11 - BUFFER AMPLIFIER CIRCUIT BOARD ASSMEBLY

C5, C21, C28, Was: Capacitor, variable, ceramic, 1-900113-002 91293 9301
C34, C40 1.7-10 pF, 500V dc

Is: Capacitor, variable, ceramic, 1-900065-001 E. F. Johnson 187-106-5
1.7 pF-11 pF, 500V dc

Page 6-55 and 6-56: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES

C24, C36, C43, Was: A12 thru A21 Capacitor, variable, 1-900113-002 91293 9301
ceramic, 1.7-11 pF,
500V dc

Is: A12 thru A21 Capacitor, variable, 1-900065-001 EF Johnson
ceramic, 1.7 pF-11 pF, 187-106-5
500V dc

C43 is not used on A21 board

Effective date: June 13, 1973

Page 5-25/5-26: Figure 5-12. Schematic Diagram 10 MHz Decade Assembly (A8)

C34, Was: 3 pF Is: 5 pF

Page 6-40: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

A8 - 10 MHz DECADE ASSEMBLY

C34, Was: Capacitor, fixed, mica, 1-900003-003 72136 DM15C030C
3 pF, +0.5 pF, 500V dc

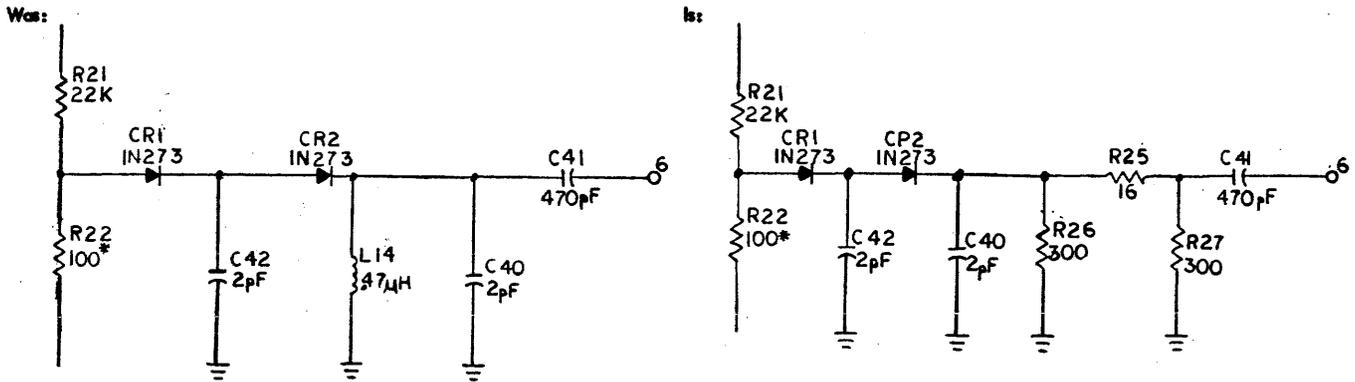
Is: Capacitor, fixed, mica, 1-900003-004 72136 DM15C050C
5 pF, +0.5 pF, 500V. dc

Effective Date: June 15, 1973 (Effective serial number: 501 and above)

Page 5-23/5-24: Figure 5-11. Schematic Diagram Gain Control Amp/Amplitude
Modulator

Change the schematic as follows:

MAINFRAME RUNNING CHANGES (Continued)



Page 6-38: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)
 A7 - GAIN CONTROL AMP/AMPLITUDE MODULATOR ASSEMBLY
 L14, Was: Coil, fixed, 0.47 uH, $\pm 15\%$ 1-906008-002 88869

Is: Not Used

Below R24, add: R25 Resistor, fixed, composition, 1-945000-119 01121 CB1605
 16 ohm, $\pm 5\%$, 1/4W
 R26, R27 Resistor, fixed, composition, 1-945000-149 01121 CB3015
 300 ohm, $\pm 5\%$, 1/4W

Effective date: June 22, 1973

Page 5-21/5-22: Figure 5-10. Schematic Diagram 1 MHz Decade Board (A6)
 R16, Was: 33 Is: 10*

Page 6-35: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)
 A6 - 1 MHz DECADE BOARD ASSEMBLY

R16, Was: Resistor, fixed, composition, 1-945000-019 01121 CB3301
 33 ohm, $\pm 10\%$, 1/4W

Is: Resistor, fixed, composition, 1-945000-013 01121 CB1001
 selected, 10 ohm nominal,
 $\pm 10\%$, 1/4W

Effective date: August 3, 1973

Page 5-3/5-4: Figure 5-1 - Schematic Diagram Divider/ALC Board (A1A2)
 R19, Was: 150, $\pm 0.5\%$, 1/8W Is: 150, $\pm 1\%$, 1/8W

Page 6-13: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

R19, Was: Resistor, fixed, film, 1-945088-114 07115 NA55D151
 150 ohm, $\pm .5\%$, 1/8W

Is: Resistor, fixed, film, 1-945027-114 07115 NA55D151
 150 ohm, $\pm 1\%$, 1/8W

MAINFRAME RUNNING CHANGES (Continued)

Page 6-21: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (Cont.)

Was: R9, Resistor, fixed, composition,	1-945000-041	01121	CB2221
2.2 K ohm, $\pm 10\%$, 1/4 W			
Is: Resistor, fixed, composition,	1-945000-030	01121	CB2711
270 ohm, $\pm 10\%$, 1/4 W			

Effective date: October 5, 1973 (Effective serial number: 630 and above)

Page 5-21/5-22: Figure 5-10. Schematic Diagram 1 MHz Decade Board (A6)
Add: A line between A6-10 and GND

Effective date: October 10, 1973 (Effective serial) number: 801 and above)

Page 4-35, Paragraph 4.4.34. Amplitude Modulation Adjustment.

Delete steps a. through e. and replace with the following:

- a. Set the mainframe MODE switch to the GEN MOD CAL position.
- b. Remove the ODM-1 and replace it with the OAM-1. Turn the OAM-1 on and adjust INTENSITY and FOCUS for normal trace.
- c. Set the OAM-1 RANGE switch to the GEN 30% position.
- d. Set the OAM-1 VERT MODE switch to the VERT SET position. Rotate the VERT POS control so that the trace is positioned exactly on the VERTICAL SET line.
- e. Set the OAM-1 VERT MODE switch to the CARR SET position. Adjust the CARRIER LEVEL control so that the trace is exactly on the CARRIER SET line.
- f. Set the OAM-1 VERT MODE switch to the MEAS AM position. The OAM-1 is now calibrated to measure 30% AM.
- g. Set the GENERATOR MODULATION switch on the mainframe to the IN-ON position.
- h. Set the MOD/AUDIO OUT FREQ switch on the OAM-1 to the kHz position and MOD MODE switch to the INT position.
- i. Set the VTVM range switch on the distortion analyzer to 0.1 volts and monitor the voltage at A27-2 and A27-3.
- k. Adjust the INT MOD/AUDIO OUT control on the OAM-1 for 75 mV rms.
- l. Unsolder the 60 MHz to 150 MHz input cable at A27-4 and connect it to the RF voltmeter with the 50 ohm load. The power level should be $-1 \text{ dBm} \pm 1 \text{ dB}$. Rotate the 10 MHz frequency switch from 0 through 9. If the output level varies greater than $\pm 1 \text{ dB}$, refer to 60-150 alignment procedures paragraphs 4.4.20 thru 4.4.30 and readjust as necessary.

MAINFRAME RUNNING CHANGES (Continued)

- m. Resolder the input cable to A27-4. Disconnect the BNC connector at Z2-X and connect the RF voltmeter with 50 ohm load to the cable.
- n. Adjust A27R9 for an output level of -15 dBm. Disconnect the RF voltmeter and reconnect the cable to Z2-X.
- p. Adjust A27R1 for 30% AM as monitored on the previously calibrated OAM-1
- r. Measure the distortion at the OAM-1 DIST ANAL receptacle.
- s. Adjust A27R4 for minimum distortion. The distortion must be less than 3%.
- t. Repeat steps (n) through (s) as there is interaction between the two adjustments.
- u. Set the MODE switch on the mainframe to the GEN position. Set the RF OUTPUT level to -20 dBm. Set the frequency switches to 3 MHz and connect one end of a 50 ohm RF cable to the RF OUTPUT receptacle.
- v. Connect the other end of the RF cable to the input receptacle of the AM meter (FM-2748 with OAM-1).
- w. Set the frequency of the AM meter to 5 MHz (2 MHz offset from generator frequency).
- x. Set the AM meter 10 MHz switch to the "out" position. Set the audio switch to the modulate position.
- y. Calibrate the OAM-1 as in steps b through f.
- z. Measure and record the percent of AM.
- aa. Change the 10 MHz Frequency switches on the mainframe and AM meter in steps from 0 through 9 as in Table 4-13.

TABLE 4-13. EXAMPLE OF AM TEST RESULTS

FM-10C MHz	AM Meter MHz	% MOD Test Results
03	05	29
13	15	29
23	25	30
33	35	28
43	45	30
53	55	31
63	65	30
73	75	29
83	85	29
93	95	27

High 31
 Low 27

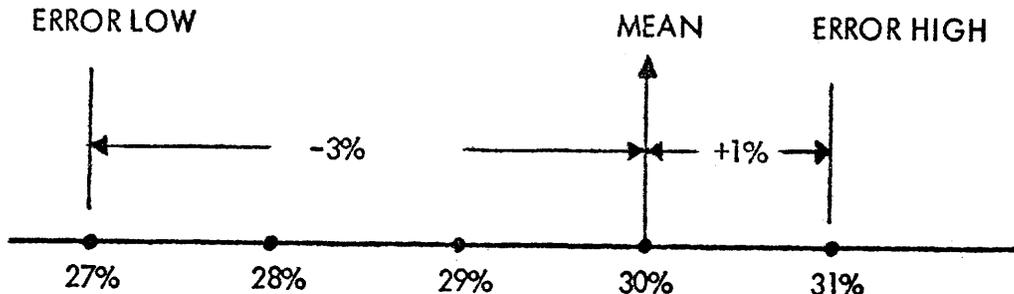
 Error 4%

REVISED
 APPROVED

MAINFRAME RUNNING CHANGES (Continued)

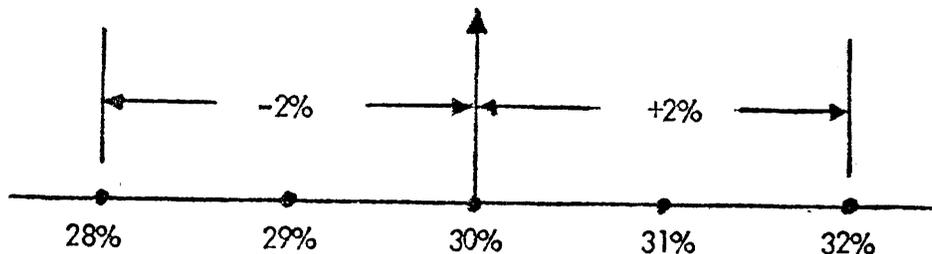
- ab. At each step recalibrate the OAM-1 in the AM meter as in steps d thru f.
- ac. In the example in Table 4-13, the percent of error from a mean of 30% is -3% and +1%. See Figure 4-49.

FIGURE 4-49. GRAPHIC REPRESENTATION OF EXAMPLE IN TABLE 4-13



- ad. Adjust A27R1 to set the error at the mean or middle.
- ae. In this example adjust A27R1 up +1% to set the error in the middle of 30% mean. As displayed graphically in Figure 4-50.

FIGURE 4-50. GRAPHIC REPRESENTATION OF ADJUSTMENT IN STEP ae



The error is now centered +20% and -2% after adjusting A27R1, up +1%.

Effective date: October 12, 1973 (Effective serial number: 800 and below)

Page 5-23/5-24: Figure 5-11, Schematic Diagram Gain Control Amp/Amplitude Modulator.

Add: For S/N's up to 800, use schematic diagram 4-501181-001.

For S/N's 801 and above, use schematic diagram 4-501181-002

MAINFRAME RUNNING CHANGES (Continued)

Page 6-38: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (Cont)

R15, Was:	Resistor, fixed, composition 47 ohm, $\pm 10\%$, 1/4W	1-945000-021	01121	CB4701
Is:	Not Used			
R21, Was:	Resistor, fixed, composition 22 K ohm, $\pm 10\%$, 1/4W	1-945000-053	01121	CB2231
Is:	Not Used			
R22, Was:	Resistor, fixed, composition, Selected, 100 ohm nominal, $\pm 10\%$, 1/4W	1-945000-025	01121	CB1011
Is:	Not Used			
R25, Was:	Resistor, fixed, composition, 16 ohm, $\pm 5\%$, 1/4W	1-945000-119	01121	CB1605
Is:	Not Used			
R26, R27, Was:	Resistor, fixed, composition, 300 ohm, $\pm 5\%$, 1/4W	1-945000-149	01121	CB3015
Is:	Not Used			
Below R27, Add:	R28 Resistor, fixed, com- position, 300 ohm, $\pm 5\%$, 1/4W	1-945000-149	01121	CB3015
Add:	R29 Resistor, fixed, compo- sition, 18 ohm, $\pm 5\%$, 1/4W	1-945000-120	01121	CB1805
Add:	R30 Resistor, fixed, compo- sition, 300 ohm, $\pm 5\%$, 1/4W	1-945000-149	01121	CB3015

Effective date: October 30, 1973 (Effective serial number: 601 and above)

Page 5-7/5-8: Figure 5-3 Schematic Diagram TCXO/IF Board (A1A5) and J2, J3, J4 and S13.

Was: A1A5-4 connected to S13-5 Is: Connected to S13-4

Page 5-69/5-70: Figure 5-34 Detailed Block Diagram Model FM-10C, Sheet 1 of 2

Effective serial number: 801 and above

Between Pages 5-33/5-34 and 5-35/5-36, Add: The attached Figure 5-16A.

Page 6-61: Add the following table:

Table 6-2, Parts List for Model FM-10C, Continued

A27 - AM Modulator Assembly

Ref Design	Description	Singer Part No.	Mfg. Code No.	Mfg. Part No.
A1	Modulator, AM	1-403623-001	05375	SS-43
C1	Capacitor, fixed, electrolytic, 120 uF, $\pm 20\%$, 15 Vdc	1-900115-001	12954	D120GSD15M
C2	Capacitor, fixed, electrolytic, 120 uF, $\pm 20\%$, 15 Vdc	1-900115-001	12954	D120GSD15M
C3	Capacitor, fixed, ceramic, 0.001 uF, $-0\% \pm 100\%$, 500 Vdc	1-900012-002	72982	861Z5U102P
Q1	Transistor, silicon, NPN, 2N3906	1-958000-001	04713	2N3904-5
Q2	Transistor, silicon, PNP, 2N3904	1-958000-002	04713	2N3906-5
R1	Resistor, variable, composition, 1 k Ω , $\pm 30\%$, 1/5 W	1-945007-004	71450	X201
R2	Resistor, fixed, composition, 2 k Ω , $\pm 5\%$, 1/4 W	1-945000-169	01121	CB2025
R3	Resistor, fixed, composition, 100 ohm, $\pm 10\%$, 1/4 W	1-945000-025	01121	CB1011
R4	Resistor, fixed, composition, 8.2 kilohm, $\pm 10\%$, 1/4 W	1-945000-048	01121	CB8221
R5	Resistor, fixed, composition, 1.2 k Ω , $\pm 10\%$, 1/4 W	1-945000-038	01121	CB1221
R6	Resistor, fixed, composition, 27 Ω , $\pm 10\%$, 1/4 W	1-945000-022	01121	CB2701
R7	Resistor, fixed, composition, 56 Ω , $\pm 10\%$, 1/4 W	1-945000-022	01121	CB5601
R8	Resistor, variable, film, 294 Ω , $\pm 1\%$, 1/8 W	1-945027-142	07115	NA55P
R9	Resistor, variable, ceramic, 10 k Ω , $\pm 1\%$, 3/4 W	1-945081-011	80294	3009P-1-203

MAINFRAME RUNNING CHANGES (Continued)

Effective date: August 24, 1973

Page 5-23/5-24: Figure 5-11. Schematic Diagram Gain Control Amp/
Amplitude Modulator Assembly (A7) and FL2 (Main Frame)

C24, Was: 47 pF Is: 10 pF
C40, C42, Was: 2 pF Is: *2 pF
R21, Was: 22K Is: *22K
Delete: R15 47

Add: L15, a 5 turn coil between R22 and the uncurved side of C39
Add: L16, a 5 turn coil between R21 and the junction of C32 and CR1

Page 6-37: A7 - GAIN CONTROL AMP/AMPLITUDE MODULATOR ASSEMBLY

C24, Was: Capacitor, fixed, mica, 1-900003-021 72136 DM15C470J
47 pF, $\pm 5\%$, 500 Vdc
Is: Capacitor, fixed, mica, 1-900003-008 72136 DM15C100J
10 pF, $\pm 5\%$, 500 Vdc

C40, C42, Was: Capacitor, fixed, mica, 2 pF, ± 0.5 pF, 500 Vdc
Is: Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF,
500 Vdc

Page 6-38: A7 - GAIN CONTROL AMP/AMPLITUDE MODULATOR ASSEMBLY

Below L14, Add: L15 Coil, fixed, 5 turns 1-945000-025 88869
L16 Coil, fixed, 5 turns 1-945000-053 88869

R15, Was: Resistor, fixed, 1-945000-021 01121 CB4701
composition, 47 ohm,
 $\pm 10\%$, 1/4W

Is: Not Used

R21, Was: Resistor, fixed, composition, 22 k ohm, $\pm 10\%$, 1/4W
Is: Resistor, fixed, composition, selected, 22 k ohm nominal,
 $\pm 10\%$, 1/4W

Effective serial number: 701 and above

Page 6-50 and 6-51: A11 - BUFFER AMPLIFIER CIRCUIT BOARD ASSEMBLY

C5, C21,
C28, C34,

C40, Was: Capacitor, variable, 1-900065-001 E. F. Johnson 187-106-5
ceramic, 1.7 to 11 pF,
500 Vdc

Is: Capacitor, variable, 1-900113-002 91293 9301
ceramic, 1.7 to 11 pF,
500 Vdc

Effective serial numbers: Serial numbers suffixed with 03353 and above

Page 5-33/5-34: Figure 5-16. Schematic Diagram Frequency Generator (A12-21)

C31, Was: 2 pF Is: *2 pF

Page 6-55: A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES

C31, Was: Capacitor, fixed, mica, 2 pF, ± 0.5 pF, 500 Vdc
Is: Capacitor, fixed, mica, selected, 2 pF nominal, ± 0.5 pF, 500 Vdc

MAINFRAME RUNNING CHANGES (Continued)

Effective serial number: Serial numbers prefixed with 701 and above

Page 5-19/5-20: Figure 5-9. Schematic Diagram 1200 MHz Multiplier (A5)
Between A8-1 and ground, Add: C21*, a 10 pF capacitor with the curved side to ground.

Page 5-25/5-26: Figure 5-12. Schematic Diagram 10 MHz Decade Assembly (A8) and FL1 and Z2.

Between Z1-R and ground, Add: C36*, a 3 pF capacitor with the curved side to ground.

Page 5-33/5-34: Figure 5-16. Schematic Diagram Frequency Generator (A12-21)

Was: C18 Is: C18*

Was: C25 Is: C25*

COMPONENT VALUES Chart, A16C18, A16C25, A17C18 and A17C25, Was: 68 pF
Is: 56 pF.

Page 6-31: A5-1200 MHz DECADE ASSEMBLY

Below C20, Add: C21 Capacitor, fixed, mica, 1-900003-008 72136 DM15C100J
selected, 10 pF nominal,
±5%, 500 Vdc

Page 6-40: A8-10 MHz DECADE ASSEMBLY

Below C35, Add: C36 Capacitor, fixed, mica, 1-900003-003 72136 DM15C030C
selected, 3 pF nominal,
±0.5 pF, 500 Vdc

Page 6-54 and 6-55: A12 THRU A21 - GENERATOR CIRCUIT BOARD ASSEMBLIES

C18 and C25, Was: A16 thru A21 Capacitor, 1-900003-026 72136 DM15F680J
fixed, mica, 68 pF, ±5%,
500 Vdc

Is: A16 and A17 Capacitor, 1-900003-024 72136 DM15 E560J
fixed, mica, selected,
56 pF nominal, ±5%,
500 Vdc

Is: A18 thru A21 Capacitor, 1-900003-026 72136 DM15F560J
fixed, mica, 68 pF, ±5%,
500 Vdc

Effective serial number: Serial numbers suffixed with 04049 and above.

Page 5-69/5-70: Figure 5-34. Detailed Block Diagram Model FM-10C

F1, Was: AC .75 Is: 115 Vac 1A SB, 230 Vac 0.5 A SB

Page 6-6: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

F1, Was: Fuse, slo-blo, 3/4 Amp, 250 V 1-924000-017 03614 MDL-3/4

Is: Fuse, slo-blo, 1 Amp, 250 V 1-924000-019 03614 MDL-1

Effective serial number: Serial numbers prefixed with 801 and above.

Page 5-13/5-14: Figure 5-6. Schematic Diagram .1, 1, 10, 100 kHz Decades
(A3A, A3B, A3C, A3D)(Mainframe)

C2, Was: 150 pF Is: 1000 pF

C11, Was: *10 pF Is: *20 pF

C12, C15, Was: 180 pF Is: *220 pF

Delete: L6, 220 μH, and add a resistor, R24, 470, in its place.

REVISED

APPROVED

MAINFRAME RUNNING CHANGES (Continued)

Page 6-27: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

C2, Was: Capacitor, fixed, mica, 150 pF, ±5%, 500 Vdc	1-900003-034	72136	DM15F151J
Is: Capacitor, fixed, mica, 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15F102J
C11, Was: Capacitor, fixed, mica, selected, 10 pF nominal, ±5%, 500 Vdc	1-900003-008	72136	DM15C100K
Is: Capacitor, fixed, mica, selected, 20 pF nominal, ±5%, 500 Vdc	1-900003-012	72136	DM15E200K
C12 and C15, Was: Capacitor, fixed, mica, 180 pF, ±5%, 500 Vdc	1-900003-036	72136	DM15F181J
Is: Capacitor, fixed, mica, selected, 220 pF nominal, ±5%, 500 Vdc	1-900003-038	72136	DM15F221J

Page 6-29: TABLE 6-2. PARTS LIST FOR MODEL FM-10C (CONT.)

Below R22, Add:

R23 Not Used

R24 Resistor, fixed,
Composition, 470 ohm,
±10%, 1/4 W

1-945000-033 01121 CB4711

CLASS CODE

SINGER
INSTRUMENTATION

TITLE

ADDENDUM
MODEL FM-10C

DWG NO.
I-500783-260(A)
SHEET 2.1.17

APPROVED REVISED

RFM-10A RUNNING CHANGES

Effective date: April 2, 1973 (Effective RFM-10A serial number: 355 and above)

Page 5-51/5-52: Figure 5-25. Schematic Diagram 11 MHz IF Board (A1A3)

Delete: R10, a 10 ohm resistor, connecting the left side of C13 to the junction of C10 and C11

Add: a wire connecting the left side of C13 to the junction of L2 and C10 and R27, a 1.5k resistor, from the junction of C7 and Y1 to ground

Page 6-76 and 6-77: TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

A1A3 - 11 MHz IF BOARD ASSEMBLY

R10, Was: Resistor, fixed, composition, 1-945000-013 01121 CB1001
10 ohm, +10%, 1/4W

Is: Not Used

Below R26, add: R27 Resistor, fixed, composition, 1-945000-039 01121 CB1521
1.5 kilohm, +10%, 1/4W

Effective date: August 20, 1973

Page 5-51/5-52: Figure 5-25 - Schematic Diagram 11 MHz IF Board (A1A3)

R15, R18, Was: 4.7K Is: 4.7K*

Page 6-76 and 6-77: TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

R15 and R18, Was: Resistor, fixed, composition, 4.7 k ohm, +10%, 1/4W

Is: Resistor, fixed, composition, selected, 4.7 k ohm
nominal, +10%, 1/4W

Effective date: August 28, 1973 (Effective RFM-10A serial number: 501 and above)

Page 5-53/5-54: Figure 5-26 - Schematic Diagram Broadband Amplifier and Mixer (A1A4)

Insert: C32, 0.1 uF, in the line connecting the junction of C29 and R17 to the junction of R19 and R18 with the curved side to R19 and R18.

Add: R45, 1k, from the positive side of C29 to ground.

Page 6-79: TABLE 6-4. PARTS LIST FOR MODEL RFM-10A (CONT.)

Below C31, Add: C32 Capacitor, fixed plastic, 1-900001-013 73445 C280Ae, 0.1uF
0.1uF, +20%, 250 Vdc

Below R44, Add: R45 Capacitor, fixed composition 1-945000-037 01121 CB1021
1 kilohm, +10%, 1/4W

REVISED

APPROVED

FIM-3 RUNNING CHANGES

Effective date: January 22, 1973 (Effective FIM-3 serial number: 401 and above)

Page 5-57/5-58: Figure 5-28. Schematic Diagram Model FIM-3

R32, Was: 4.7 k Is: 2.7 k
R34, Was: 470 Is: 2.5 k variable

Page 6-95: TABLE 6-6. PARTS LIST FOR MODEL FIM-3 (CONT.)

A1 - PRINTED CIRCUIT BOARD ASSEMBLY

R32, Was: Resistor, fixed, composition, 1-945000-045 01121 CB4721
4.7k ohm, +10%, 1/4W

Is: Resistor, fixed, composition, 1-945000-042 01121 CB2721
2.7 kilohm, +10%, 1/4W

R34, Was: Resistor, fixed, composition, 1-945000-033 01121 CB4711
470 ohm, +10%, 1/4W

Is: Resistor, variable, composition, 1-945007-005 71450 X201
2.5 kilohm, +30%, 1/4W

OAM-1 RUNNING CHANGES

Effective date: August 2, 1972 (Effective OAM-1 serial number: 151 and above)

Page 6-102: TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

A1 - AM DETECTOR BOARD ASSEMBLY

CR604, Was: Diode, silicon 1-913007-002 24446 1N4148

Is: Diode, silicon 1-913007-001 24446 1N4148

Effective date: February 15, 1973 (Effective OAM-1 serial number: 365 and above)

Page 5-59/5-60: Figure 5-29. Schematic Diagram OAM-1

R14, Was: *68k Is: *47k

Page 6-99: TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

MAIN ASSEMBLIES AND CHASSIS PARTS

R14, Was: Resistor, fixed, composition, 1-945000-059 01121 CB6831
selected, 68k ohms nominal,
+10%, 1/4W

Is: Resistor, fixed, composition, 1-945000-057 01121 CB4731
selected, **47** kilohm nominal,
+10%, 1/4W

Effective date: August 14, 1973 (Effective OAM-1 serial number: 466 and above)

Page 6-108: TABLE 6-7. PARTS LIST FOR MODEL OAM-1 (CONT.)

C411, Was: Capacitor, fixed, ceramic, 1-900012-005 56289 41C92
0.1uF, +80-20%, 500 Vdc

Is: Capacitor, fixed, plastic, 1-900001-113 73345 C280AE, 0.1uF
0.1uF, +10%, 250 Vdc

Effective date: October 1, 1973

Page 5-59/5-60: Figure 5-29 - Schematic Diagram Model OAM-1

Delete: C2, 0.1uF, and replace it with a straight line.

Page 6-98: TABLE 6-7. PARTS LIST FOR MODEL OAM-1

C2, Delete: All information and replace with "Not Used."

Effective OAM-1 Serial Numbers: Serial numbers suffixed with 03337 and above.

Page 3-23/3-24: Figure 3-6. Detailed Block Diagram Model OAM-1

Delete: The line from S2C-common to E606 and add a line from E606 to
S3A - "30%".

Delete: R14* and replace with a straight line

Add: A line connecting S3B - "100%" to S3B - "GEN 30%"

REVISED
APPROVED

OAM RUNNING CHANGES (Continued)

Page 5-59/5-60: Figure 5-29. Schematic Diagram Model OAM-1
E606, Was: Connected to S2C-common Is: Connected to S3A-2
R120, Was: 6.8 k $\pm 5\%$ Is: 10 k $\pm 5\%$
Delete: R14 *47 k and replace with a straight line
Add: A line connecting S3B-1 to S3B-3

Page 6-99: MAIN ASSEMBLIES AND CHASSIS PARTS

R14, Was: Resistor, fixed, composition, 1-945000-057 01121 CB4731
selected, 47 k ohm nominal, $\pm 10\%$, 1/4 W
Is: Not used.

Page 6-111: A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY

R120, Was: Resistor, fixed, composition, 1-945000-182 01121 CB6825
6.8 k ohm, $\pm 5\%$, 1/4 W
Is: Resistor, fixed, composition, 1-945000-186 01121 CB1035
10 kilohm, $\pm 5\%$, 1/4 W

Effective serial numbers: OAM-1 serial numbers prefixed with 566 and above.

Page 3-9: Paragraph 3.7.5 Internal Modulator Circuitry

Last sentence, Was: "... , S3, is in the GEN 30% position. "

Is: "... , S3, is in either the GEN 30% or the 100% position. "

Page 3-23/3-24: Figure 3-6. Detailed Block Diagram Model OAM-1

RANGE, Was: GEN 30%, 30%, 100% Is: GEN 30%, MEAS 30%, MEAS/GEN
100%

Page 4-65: Paragraph 3.23.9 Modulation Measurement Accuracy Check

m., Was: 8 divisions (80% modulation) Is: 9.5 division (95% modulation)

f., Was: between 0.70 and 0.21 cm (70% to 90% modulation)

Is: approximately 0.1 cm (95% modulation)

Paragraph 4.23.10 Mainframe (Internal) Modulation Capability and Recovered
Audio Distortion Check

f., delete the period and Add: for up to 30% modulation or set it to MEAS/GEN
100% for greater than 30% modulation.

Page 4-66: Paragraph 4.23.10

a., delete the period and Add: or less than 10% at 95% modulation.

Paragraph 4.23.11 External Modulation Capability, Frequency Response,
and Recovered Audio Distortion Check

c., delete the period and Add: and set RANGE switch to GEN 30%.

d., Add: Switch RANGE switch to MEAS/GEN 100%. Verify that increasing
audio oscillator input (to approximately 1.7 V rms) will product full-
scale deflection (100% modulation).

ODM-1 RUNNING CHANGES

Effective date: January 29, 1973

Page 5-61/5-62: Figure 5-30. Schematic Diagram Model ODM-1

A2 board - C409, Was: 25 35V Is: 25 25V

A4 board - C204, Was: 25 35V Is: 25 25V

Effective date: February 6, 1973

Page 5-61/5-62: Figure 5-30. Schematic Diagram Model ODM-1

A1 board - R561, Was: 15k Is: 15k*

Page 6-123: TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

A1 - IF BOARD ASSEMBLY

R561, Was: Resistor, fixed, composition, 1-945000-051 01121 CB1531
15k ohm, +10%, 1/4W

Is: Resistor, fixed, composition, 1-945000-051 01121 CB1531
selected, 15k ohm nominal,
+10%, 1/4W

Effective date: May 14, 1973 (Effective ODM-1 serial number: 1001 and above)

Page 5-61/5-62: Figure 5-30. Schematic Diagram Model ODM-1

Add: C5, a 100 pF capacitor, between pin 9 and pin 10 of the CRT,
(V1, D7-16GJ), such that the curved side of the capacitor is
connected to the line from pin 9

Page 6-115: TABLE 6-8. PARTS LIST FOR MODEL ODM-1

MAIN ASSEMBLIES AND CHASSIS PARTS

Below C4, add: C5 Capacitor, mica, 1-900003-030 72136 DM15
100 pF, +5%, 100V dc

Effective date: August 14, 1973 (Effective ODM-1 serial number: 1136 and above)

Page 6-125: TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

C411, Was: Capacitor, fixed, ceramic, 1-900012-005 56289 41C92
0.1uF, +80-20%, 500 Vdc

Is: Capacitor, fixed, plastic, 1-900001-113 73445 C280AE, 0.1uF
0.1uF, +10%, 250 Vdc

Effective date: October 4, 1973

Page 4-86: Paragraph 4.28.6-a

Between "EXT" and "and", Add: ", VERT COUPLING switch to DC"

Page 4-87: Paragraph 4.28.7-a

Add: VERT COUPLING Check in both AC and DC positions

REVISED
APPROVED

ODM-1 RUNNING CHANGES (Continued)

Page 6-128: TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

C109, Was: Capacitor, fixed, 1-900115-003 12954 D1R0GSA50M
electrolytic, 1 uF,
50 Vdc

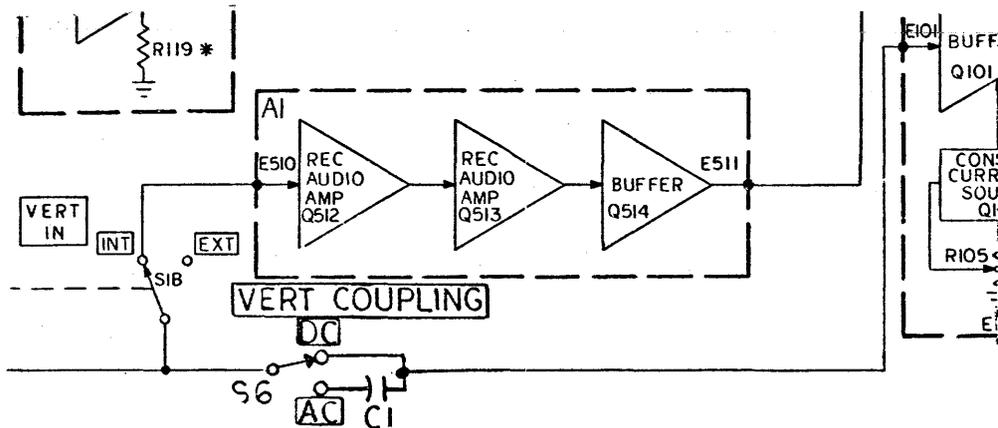
Is: Capacitor, fixed, 1-900057-146 56289 150D105X0035A2
electrolytic, 1 uF,
+20%, 35 Vdc

Effective ODM-1 Serial Number: Serial numbers suffixed with 04058 and above

Page 3-25/3-26: Detailed Block Diagram, Model ODM-1

Delete C4 and replace with a straight line.

Add: S6, VERT COUPLING, as illustrated below



Page 5-61/5-62: Figure 5-30. Schematic Diagram Model ODM-1

Delete: Diode, CR501, JZ4.7B, 4.7 V and replace with a resistor, R588, 1.5 k, 5%

Delete: C5, 100 pF

Delete: C519, 0.1, and TB2

Delete: C4, 0.1, and replace with a straight line

Delete: C1, .47, and replace with resistor R30, 6.8 k, 5%

Add: Resistor R31, 68 K, 5%, from the junction of R30 and R7 to ground.

Delete: CR101, 1N4148, and replace with a resistor, R130, 180 ohms

Delete: CR102, 1N4148, and replace with a straight line.

R104, Was: 1 MEG Is: 2.2 M

R106, Was: 560 Is: 1.5 k

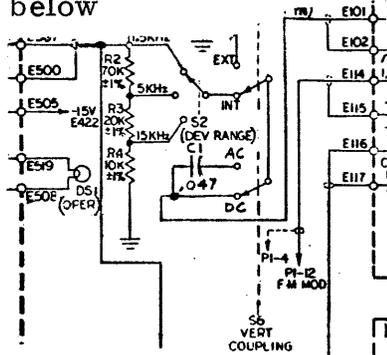
ODM-1 RUNNING CHANGES (Continued)

E507, Was: +0.15 V Is: 0 V

E507, Was: 260 mV p-p ±10% Is: 175 mV P-P ±10 %

Remove the line from E510, E500 at S1 INT and connect it to the junction of E507 and R2.

Add: S6, VERT COUPLING, as illustrated below



Page 6-115: TABLE 6-8. PARTS LIST FOR MODEL ODM-1

C1, Was: Capacitor, fixed, plastic, 1-900001-021 73445 C280AE, 0.47 μF, ±20%, 250 Vdc
 Is: Capacitor, fixed, plastic, 1-900001-009 73445 C280AE, 0.047 μF, ±20%, 250 Vdc

C4, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE, 0.01 μF, ±20%, 250 Vdc
 Is: Not used

Delete: C5 and all information.

Page 6-116: MAIN ASSEMBLIES AND CHASSIS PARTS

Below R22, Add:

R30 Resistor, fixed, composition, 1-945000-182 01121 CB6825
 6.8 k ohm, ±5%, 1/4 W
 R31 Resistor, fixed, composition, 1-945000-206 01121 CB6835
 68. k ohm, ±5%, 1/4 W
 S2, Was: Switch, rotary, 1 pole, 1-003214-001 88869
 3 position
 Is: S2/S6 Switch, Concentric assembly 1-403529-001 88869
 (S2) switch, rotary, 1 pole, 3 position

Below S5/R13, Add: S6 Switch, rotary, 1 pole, 2 position (part of S2/S6)

Page 6-117: A1-IF BOARD ASSEMBLY

C519, Was: Capacitor, fixed, plastic, 1-900001-013 73445 C280AE, 0.1 μF, ±20%, 250 Vdc
 Is: Not used

Page 6-119: A1-IF BOARD ASSEMBLY

CR501, Was: Diode, silicon, zener, 1-913004-005 04713 JZ4.7B
 4.7 V
 Is: Not used

Page 6-124: A1-IF BOARD ASSEMBLY

Below R587, Add: R588 Resistor, fixed, 1-945000-166 01121 CB1525
 composition, 1.5 k ohm, ±5%, 1/4 W

APPROVED REVISED

ODM-1 RUNNING CHANGES (Continued)

Page 6-127: A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY
 Below R129, Add: R130 Resistor, fixed, 1-945000-028 01121 CB1811
 composition, 180 ohm,
 ±10 %, 1/4 W

Page 6-128: A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY
 CR101, CR102, Was: Diode, silicon 1-913007-001 24446 1N4148
 Is: Not Used

Page 6-129: A3 - VERTICAL AMPLIFIER BOARD ASSEMBLY
 R104, Was: Resistor, fixed, composition, 1-945000-073 01121 CB1051
 1 M ohm, ±10 %, 1/4 W
 Is: Resistor, fixed, composition, 1-945000-077 01121 CB2251
 2.2 M ohm, ±10 %, 1/4 W
 R106, Was: Resistor, fixed, composition, 1-945000-034 01121 CB5611
 560 ohm, ±10 %, 1/4 W
 Is: Resistor, fixed, composition, 1-945000-039 01121 CB1521
 1.5 k ohm, ±10 %, 1/4 W

Effective ODM-1 Serial Number: Serial numbers prefixed with 1336 and above.

Page 3-10: Paragraph 3.8.5. Vertical Deflection Circuitry
 Delete the period at the end of the first sentence and add: and the DC BAL control, R32.

Page 3-25/3-26: Figure 3-7. Detailed Block Diagram Model ODM-1
 Delete: The line connecting E507 and R2.
 Add: A variable resistor, R32, DC BAL, with one end connected to E507, the wiper connected to the top R2, and the remaining end connected to +9 V.

Page 5-61/5-62: Figure 5-30 - Schematic Diagram Model ODM-1
 Replace with the attached Figure 5-30.

Page 6-116: MAIN ASSEMBLIES AND CHASSIS PARTS

Below R31, Add: R32 Resistor, variable, composition, 200 ohm, ±10%
 (part of S4/R32)

R33 Resistor, fixed, composition, 1-945000-049 01121 CB1031
 10 k ohm, ±10%, 1/4 W

Was: S4, Switch, rotary, 3 poles, 1-003214-002 88869
 3 positions

Is: S4/R32 Switch/Variable resistor 1-403707-001 88869
 assembly (S4) switch, rotary. 3 poles, 3 positions

Page 6-116: TABLE 6-8. PARTS LIST FOR MODEL ODM-1 (CONT.)

R32, Was: Resistor, variable, composition, 200 ohm, ±30% (part of S4/R32)
 Is: Resistor, variable, composition, 200 ohm, ±10% (part of S4/R32)

CLASS CODE				
SINGER INSTRUMENTATION LOS ANGELES, CALIF.		TITLE ADDENDUM MODEL FM-10C	DWG NO. I-500783-260(A) SHEET 274	

REVISED
APPROVED

ODM-1 RUNNING CHANGES, Continued

Effective serial number: Serial numbers prefixed with 1236 and above.

Page 4-79: Paragraph 4.27.7 5 kHz Range Gain Check

b., Delete the period and Add: and the VERT COUPLING switch to DC.

Paragraph 4.27.8 15 kHz Range Gain Check

b., Delete the period and Add: and the VERT COUPLING switch to DC.

Page 4-87: Paragraph 4.28.7. External Vertical Gain Adjustment

Delete Steps a thru f and replace with the following:

- a. Set the VERT IN switch to EXT, VERT COUPLING switch to DC and adjust the VERT CENTER and DC BAL controls to their mid-range positions.
- b. Set the DEV RANGE switch to 5 kHz. Adjust A3R105 (vertical position) to position the trace on the 0 center line.
- c. Set the frequency source frequency controls to 002.000 MHz, 0-1 kHz control to out, 10 MHz switch to out, audio switch to the modulation position and output level to 2.5 mV rms.
- d. Set the VERT IN switch to INT and adjust A1R516 (offset adjust) to position the trace on the 0 center line. If unable to position the trace on the 0 center line, select the value of A1R517.
- e. Connect the DVM to pin A1E507 and verify the presence of 0 Vdc \pm 0.1 Vdc.
- f. Set the frequency source frequency controls to 002.005 MHz and note the reading on the DVM.
- g. Set the frequency source frequency controls to 001.995 MHz and note the reading on the DVM.
- h. The voltage deviations obtained in Steps f and g should be equal above and below the voltage measured in Step e. If they are unequal, adjust A1L504 to add or subtract 1/2 the inequality and repeat Steps e thru g until this condition is met.
- j. Set the VERT IN switch to EXT and adjust A3R105 to position the trace on the 0 center line.
- k. Set the frequency source frequency controls to 002.005 MHz.
- l. Set the VERT IN switch to INT and adjust A3R112 (vertical gain) to position the trace on the +5 kHz line.

CLASS CODE

SINGER
INSTRUMENTATION
LOS ANGELES, CALIF.

TITLE

ADDENDUM
MODEL FM-10C

DWG NO.
I-500783(A)
SHEET 2.7.6

REVISED
APPROVED

ODM-1 RUNNING CHANGES, Continued

- m. Repeat Step j.
- n. A3R105 and R112 interact with one another, so repeat Steps j, l and m until the conditions are met.
- p. Set the frequency source frequency controls to 001.995 MHz.
- q. Set the VERT IN switch to INT. The trace should be on the -5 kHz line of the graticule. If it is not, repeat Steps d thru p until the conditions are met.
- r. Set the frequency source frequency controls to 002.000 MHz.
- s. Set the DEV RANGE switch to the 1.5 kHz and 15 kHz positions. Verify that the trace remains on the 0 center line $\pm 1/2$ division.

Page 4-87: Paragraph 4.28.9 Modulation Oscillator Adjustment

d., Was: 1.15 mV rms Is: 1.15 V rms

Effective serial number: Serial numbers prefixed with 1336 and above.

Page 5-61/5-62: Figure 5-30, Schematic Diagram Model ODM-1.

At the junction of E507 and R32, Add: C6, a 0.01 μ F capacitor, with the curved side to ground.

Page 6-115: TABLE 6-8. PARTS LIST FOR MODEL ODM-1

Below C4, Add:

C6 Capacitor, fixed, plastic, 1-900001-001 73445 C280AE, 0.01 μ F
0.01 μ F, ± 20 %, 250 Vdc

CLASS CODE

SINGER
INSTRUMENTATION
LOS ANGELES, CALIF.

TITLE ADDENDUM
MODEL FM-10C

DWG NO.
1-500783-260(A)
SHEET 2.7.7

REVISED
APPROVED

MDM-1 RUNNING CHANGES

Effective date: March 23, 1973 (Effective MDM-1 serial number: 451 and above)

Page 5-63/5-64: Figure 5-31. Schematic Diagram Model MDM-1
R12, Was: 10 Is: 56*

Page 6-136: TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)
A1 - PRINTED CIRCUIT BOARD

R12, Was:	Resistor, fixed, composition,	1-945000-013	01121	CB1001
	10 ohm, <u>+10%</u> , 1/4W			
Is:	Resistor, fixed, composition,	1-945000-022	01121	CB5601
	selected, 56 ohm nominal,			
	<u>+10%</u> , 1/4W			

Effective date: August 14, 1973

Page 5-63/5-64: Figure 5-31 - Schematic Diagram Model MDM-1
R53, Was: 15K Is: 15K*

Page 6-138: TABLE 6-9. PARTS LIST FOR MODEL MDM-1 (CONT.)

R53, Was:	Resistor, fixed, composition, 15 k ohm, <u>+10%</u> , 1/4W
Is:	Resistor, fixed, composition, selected, 15 k ohm nominal, <u>+10%</u> , 1/4W

RFM-10D RUNNING CHANGES

Effective date: November 6, 1973 (Effective RFM-10D serial number: 101 and above)

Page 5-75/5-76: Figure 5-36. Schematic Diagram Broadband Amplifier,
A1A2 Model RFM-10D.

R14, Was: 15 Is: *47

Delete: R2*300, R3*300 and R20 270

Last ref. des. used, Was: R20 Is: R19

C2, Was: 120 uF Is: 1 uF

Designations Omitted, Add: R15, R16, R17

Page 6-143: Main Assemblies and Chassis Parts

A1A2 - P/N, Was: 1-004892-001 Is: 1-004840-001

Page 6-145: A1A2 - Broadband Amplifier Assembly

C2, Was: Capacitor, fixed, 1-900115-001 12954 D120GSD15M
electrolytic, 120 uF,
+20%, 15 Vdc

Is: Capacitor, fixed, 1-900115-003 12954 D1R0GSA50M
electrolytic, 1 uF,
+20%, 50 Vdc

Page 6-146: A1A2 - Broadband Amplifier Assembly (Continued)

R2, Was: Resistor, fixed, 1-945000-149 01121 CB3015
composition, selected,
300 ohm nominal, +5%,
1/4W

Is: Not Used

R3, Was: Resistor, fixed, 1-945000-149 01121 CB3015
composition, selected,
300 ohm nominal, +5%,
1/4W

Is: Not Used

Page 6-147: A1A2 Broadband Amplifier Assembly (Continued)

R14, Was: Resistor, fixed, 1-945000-118 01121 CB1505
composition, 15 ohm,
+5%, 1/4W

Is: Resistor, fixed, 1-945000-130 01121 CB4705
composition, selected,
47 ohm nominal, +5%,
1/4W

R20, Was: Resistor, fixed, 1-945000-148 01121 CB2715
composition, selected,
270 ohm nominal, +5%,
1/4W

Is: Not Used

REVISED

APPROVED

RFM-10D RUNNING CHANGES (Continued)

Effective RFM-10D serial number: serial numbers prefixed with 131 and above

Page 5-77/5-78: Figure 5-37. Schematic Diagram 11 MHz and 2 MHz IF Amplifier, A1A3 Model RFM-10D

Delete: C7 0.01 and replace with a straight line.

Page 6-149: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly

C2, C8 thru C14, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 uF, ±20%, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 uF, ±20%, 100 Vdc

C6, Was: Capacitor, fixed, mica 1-900003-041 72136 DM15
270 pF, ±5%, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-027 04062 SCDM-10
270 pF, ±5%, 500 Vdc

C7, Was: Capacitor, fixed, plastic 1-900001-001 73445 C280AE
0.01 uF, ±20%, 250 Vdc

Is: Not Used.

Page 6-150: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)

C15 thru C24, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 uF, ±20%, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 uF, ±20%, 100 Vdc

C27, Was: Capacitor, fixed, mica, 1-900003-041 72136 DM15
270 pF, ±5%, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-027 04062 SCDM-10
270 pF, ±5%, 500 Vdc

Page 6-151: A1A3 - 11.0 MHz and 2 MHz IF Amplifier Assembly (Continued)

C29 thru C38, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 uF, ±20%, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 uF, ±20%, 100 Vdc

C39, Was: Capacitor, fixed, mica, 1-900003-043 72136 DM15
330 pF, ±5%, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-029 04062 SCDM-10
330 pF, ±5%, 500 Vdc

C40, Was: Capacitor, fixed, mica, 1-900003-030 72136 DM15
100 pF, ±5%, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-020 04062 SCDM-10
100 pF, ±5%, 500 Vdc

Page 6-152: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)

C46, C47, Was: Capacitor, fixed, mica, 1-900003-032 72136 DM15
120 pF, ±5%, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-021 04062 SCDM-10
120 pF, ±5%, 500 Vdc

C48, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 uF, ±20%, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 uF, ±20%, 100 Vdc

RFM-10D RUNNING CHANGES (Continued)

C49, Was:	Capacitor, fixed, plastic, 0.001 uF, ±20%, 250 Vdc	1-900001-030	73445	C280AE
Is:	Capacitor, fixed, mica 1000 pF, ±5%, 100 Vdc	1-900003-056	72136	DM15
C51, Was:	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 Vdc	1-900001-001	73445	C280AE
Is:	Capacitor, fixed, ceramic, 0.01 uF, ±20%, 100 Vdc	1-900077-002	56289	TG-S10

APPROVED REVISED

RFM-10A AND RFM-10B RUNNING CHANGES

Effective RFM-10A and RFM-10B Serial Numbers: RFM-10A serial numbers prefixed with 601 and above, and RFM-10B serial numbers prefixed with 176 and above.

Page 5-99/5-100: Schematic Diagram 11 MHz and 2 MHz IF Amplifier, A1A3 Model RFM-10A/RFM-10B

Delete: C7 0.01 and replace with a straight line

Page 6-218: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly

C2, C8 thru C14, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 μ F, $\pm 20\%$, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 μ F, $\pm 20\%$, 100 Vdc

C6, Was: Capacitor, fixed, mica, 1-900003-041 72136 DM15
270 pF, $\pm 5\%$, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-027 04062 SCDM-10
270 pF, $\pm 5\%$, 500 Vdc

C7, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 μ F, $\pm 20\%$, 250 Vdc

Is: Not used.

Page 6-219: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)

C15 thru C24, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 μ F, $\pm 20\%$, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 μ F, $\pm 20\%$, 100 Vdc

C27, Was: Capacitor, fixed, mica, 1-900003-041 72136 DM15
270 pF, $\pm 5\%$, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-027 04062 SCDM-10
270 pF, $\pm 5\%$, 500 Vdc

Page 6-220: A1A3 - 11.0 MHz and 2 MHz IF Amplifier Assembly (Continued)

C29 thru C38, Was: Capacitor, fixed, plastic, 1-900001-001 73445 C280AE
0.01 μ F, $\pm 20\%$, 250 Vdc

Is: Capacitor, fixed, ceramic, 1-900077-002 56289 TG-S10
0.01 μ F, $\pm 20\%$, 100 Vdc

C39, Was: Capacitor, fixed, mica, 1-900003-043 72136 DM15
330 pF, $\pm 5\%$, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-029 04062 SCDM-10
330 pF, $\pm 5\%$, 500 Vdc

C40, Was: Capacitor, fixed, mica, 1-900003-030 72136 DM15
100 pF, $\pm 5\%$, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-020 04062 SCDM-10
100 pF, $\pm 5\%$, 500 Vdc

Page 6-221: A1A3 - 11.0 MHz and 2.0 MHz IF Amplifier Assembly (Continued)

C46, C47, Was: Capacitor, fixed, mica, 1-900003-032 72136 DM15
120 pF, $\pm 5\%$, 500 Vdc

Is: Capacitor, fixed, mica, 1-900072-021 04062 SCDM-10
120 pF, $\pm 5\%$, 500 Vdc

