RCA

Broadcast Equipment

BW-95A SCA Frequency and Modulation Monitor

MI-560745

IB-8027568

EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or if evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. Report all shortages and damages to RCA, Commercial Electronic Systems Division – Camden, New Jersey 08102.

RCA will file all claims for loss and damage on this equipment so long as the inspection report is obtained. Disposition of the damaged item will be furnished by RCA.

FIELD ENGINEERING SERVICE

RCA Field Engineering Service is available at current rates. Requests for field engineering service may be addressed to your RCA Broadcast Field Representative or the RCA Service Company, Incorporated – Broadcast Service Division – Camden, New Jersey 08102. Telephone 609-963-8000.

WARRANTY ITEMS

Particular parts and/or equipment covered by warranty are specifically stated as such in the warranty or contract given to the customer at the time of sale. The warranty or contract also stipulates the conditions under which the warranty may be exercised.

To obtain a new replacement for such warranty items, contact your local RCA sales office and please supply Product Identification (including the Original Invoice Number, MI Number, Type Number, Model Number, and Serial Number) and Replacement Part Identification (including Stock Number and Description). Requests for warranty replacements may be unduly delayed if all this information is not supplied.

REPLACEMENT PARTS

When ordering replacement parts, please give Stock or Master Item (MI) Number, Description, and Symbol of each item ordered.

The part which will be supplied against an order for a replacement item may not be an exact duplicate of the original part. However, it will be a satisfactory replacement differing only in minor mechanical or electrical characteristics. Such differences will in no way impair the operation of the equipment.

Emergency Service:

For emergency service after working hours, contact RCA Parts and Accessories, Telephone 609-963-8000 or 609-848-5900.

LOCATION	ORDERING INSTRUCTIONS
Continental United States, including Alaska and Hawaii	Replacement Parts bearing a STOCK NUMBER should be ordered from RCA Parts and Accessories – 2000 Clements Bridge Road – Deptford, New Jersey 08096. Replacement Parts bearing a MASTER ITEM (MI) NUMBER should be ordered from RCA, Commercial Electronic Systems Division – Attention Commercial Service – Camden, New Jersey 08102 or your nearest RCA Regional Office. Replacement Parts with NO STOCK or MASTER ITEM (MI) NUMBER are standard components. They are not stocked by RCA and should be obtained from your local electronics distributor.
Dominion of Canada	Order from your local RCA Sales Representative or his office or from: RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec.
Outside of Continental United States, Alaska, Hawaii, and the Dominion of Canada	Order from your local RCA Sales Representative or from: RCA International Division, Clark, New Jersey – U.S.A. – Wire: RADIOINTER **Emergency:** Cable RADIOPARTS, DEPTFORD, N.J.

RETURN OF ELECTRON TUBES

If for any reason it is desired to return tubes, please return them through your local RCA tube distributor, RCA Victor Company Limited, or RCA International Division, depending on your location.

Please do not return tubes directly to RCA without authorization and shipping instructions.

It is important that complete information regarding each tube (including type, serial number, hours of service and reason for its return) be given. When tubes are returned, they should be shipped to the address specified on the Return Authorization form. A copy of the Return Authorization and also a Service Report for each tube should be packed with the tubes.

LOCATION	ORDERING INSTRUCTIONS
Continental United States, including Alaska and Hawaii	Local RCA Tube Distributor.
Dominion of Canada	Order from your local RCA Sales Representative or his office or from: RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec.
Outside of Continental United States, Alaska, Hawaii, and the Dominion of Canada	Local RCA Tube Distributor or from: RCA International Division, Clark, New Jersey, U.S.A., Wire: RADIOINTER **Emergency:** Cable RADIOPARTS, DEPTFORD, N.J.

Broadcast Equipment

Instructions

BW-95A SCA Frequency and Modulation Monitor

MI-560745

Commercial Communications Systems Division/Front and Cooper Streets/Camden, New Jersey, U.S.A., 08102

DL7110M/DL7108M

PRINTED IN U.S.A.

IB-8027568

EMERGENCY
FIRST AID INSTRUCTIONS

WARNING

VOLTAGES THAT ARE DANGEROUS TO LIFE ARE INVOLVED IN THE OPERATION OF THIS ELECTRONIC EQUIPMENT. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH VOLTAGES APPLIED. DANGEROUS CONDITIONS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION DUE TO CHARGES RETAINED BY CAPACITORS, ETC. ALWAYS DISCHARGE AND GROUND CIRCUITS PRIOR TO TOUCHING THEM TO AVOID PERSONAL INJURY OR LOSS OF LIFE.

Personnel engaged in the installation, operation, or maintenance of this equipment or similar equipment are urged to become familiar with the following rules both in theory and practice. It is the duty of all operating personnel to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

RESCUE BREATHING

GENERAL INFORMATION

A. START IMMEDIATELY, SECONDS COUNT

Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing. Warm the victim or apply stimulants. The main purpose is to GET AIR INTO THE VICTIM'S LUNGS.

B. WIPE OUT VICTIM'S MOUTH

Wipe out quickly any mucus, food, or any foreign matter in the victim's mouth using your fingers or a cloth wrapped around your fingers.

C. LOOSEN CLOTHING - KEEP WARM

Do this when the victim is breathing by himself or help is available. Keep him quiet as possible and from becoming chilled. Otherwise, treat him for shock.

D. DON'T GIVE UP

Continue emergency rescue breathing without interruption until victim is breathing without help or until all hope of reviving him as determined by a physician is gone.

E. CALL A PHYSICIAN

Have someone summon medical aid since respiratory and other disturbances may develop as a aftermath. A physician is necessary during the recovery period.

PROCEDURE

FIG. A

FIG. B

FIG. C

TILT HEAD BACK - Lift neck and point chin up to open air passage.

EXTEND JAW - Pull or push jaw into jutting out position (Fig. A).

PINCH NOSE - Close nostrils to prevent air leakage, or close mouth when using mouth-to-nose breathing.

BLOW - Seal victim's mouth or nose with your mouth. (Fig. B) Blow until chest rises.

REMOVE MOUTH - Listen for exchange of air; if none, check throat for obstruction. To remove it, place victim in position shown in Fig. C, and slap sharply between shoulder blades.

REPEAT - 12 times per minute for adults; at least 20 times per minute for children.

BURNS

SKIN REDDENED: Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Consult a physician.

SKIN BLISTERED OR FLESH CHARRED: Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to Hospital.

EXTENSIVE BURN-SKIN BROKEN: Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to hospital.

SECTION 1

GENERAL INFORMATION

1–1 GENERAL DESCRIPTION

The RCA BW-95A SCA Frequency and Modulation Monitor, Figure 1–1, (FCC Type Approval Number 3–162), is an all solid state SCA demodulator designed to operate in conjunction with the RCA BW-75A Frequency and Modulation Monitor to provide all of the SCA monitoring requirements outlined in Part 73 of the Federal Communications Commission's Rules and Regulations for FM radio stations engaged in multiplex SCA programming and remote control applications. The BW-95A has been designed to meet FCC requirements for measuring the SCA center frequency and SCA modulation characteristics of SCA multiplexed FM transmitters having an SCA center frequency range of 24 to 74 kHz. In addition, the BW-95A may be used as a low distortion and low noise SCA demodulator for driving audio monitors. The BW-95A incorporates a crystal controlled, deviation type modulation calibrator to insure the accuracy of the modulation readings at any time.

1–2 PHYSICAL DESCRIPTION

The BW-95A, Figure 1–2, is constructed on a standard 5¼ x 19 inch rack mount. Seldom used controls and test points are located under the hinged name-plate cover. Factory adjustments are located within the shielded compartment of the unit and on the back panel. The AC power input, baseband input, and monitor outputs are located at the rear of the BW-95A chassis on individual connectors and rear terminal block as shown in Figure 1–3.

The BW-95A is completely solid state utilizing all silicon transistors for long, trouble-free life. The individual circuits are constructed on two military grade, glass-epoxy, printed circuit boards. High reliability industrial and military grade components are used throughout.

1–3 ELECTRICAL DESCRIPTION

The BW-95A is a solid state crystal controlled, superheterodyne, SCA adaptor incorporating a 260 kHz IF strip and a stable, broadband frequency discriminator that measures the SCA center frequency deviation and demodulates the SCA subcarrier. Four switched crystal positions are available to measure and monitor up to four subcarriers, one at a time. Various metering and testing provisions are contained within the BW-95A to measure transmitter output characteristics. These provisions include an SCA center frequency deviation meter; a peak reading modulation meter; a peak modulation light independent of SCA modulation polarity that responds to both positive

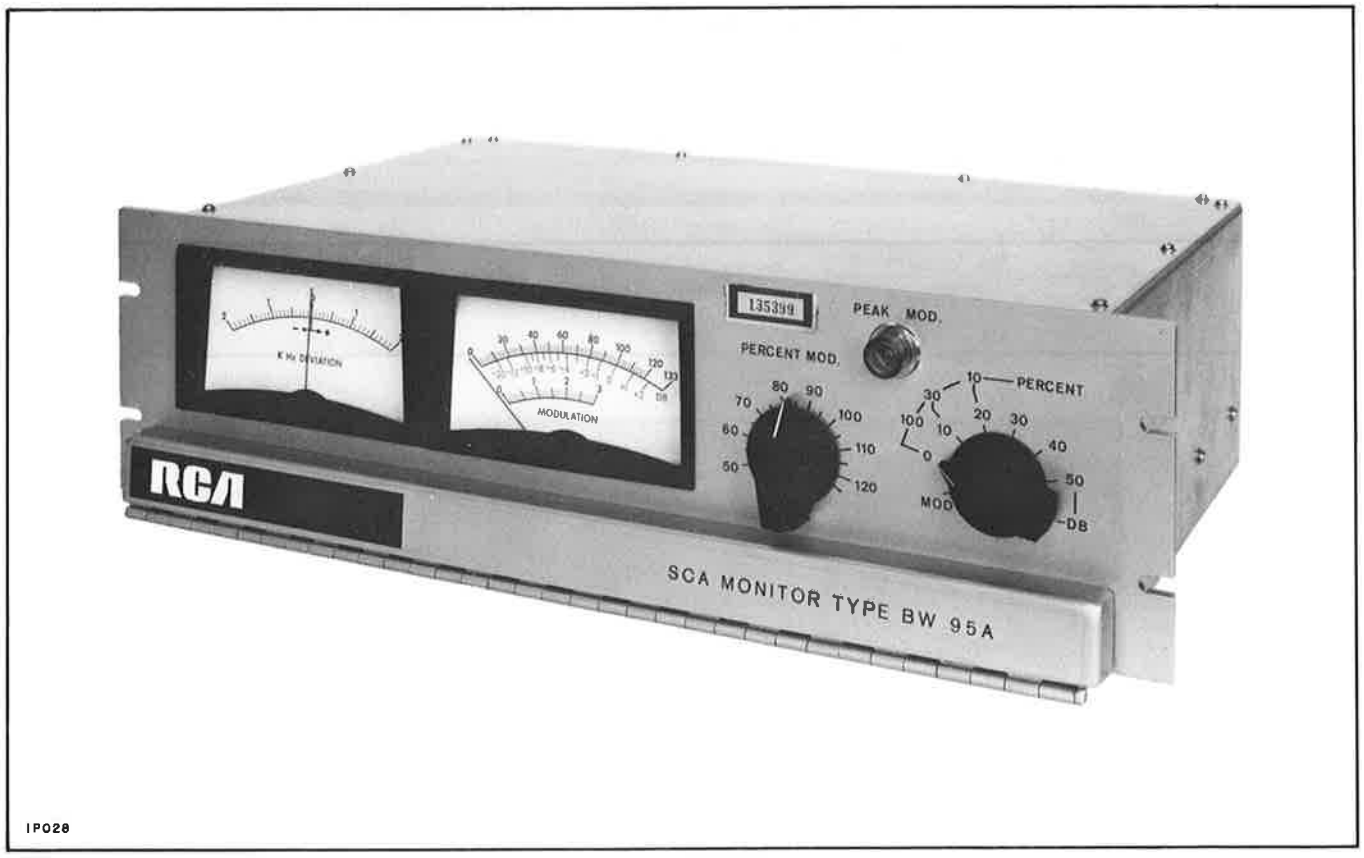

Figure 1–1

and negative peaks; a modulation calibrator to accurately set the SCA modulation meter calibration; a sensitive average voltmeter circuit for injection level, crosstalk, and noise measurements; and metering circuits to standardize the BW-95A with the BW-75A. FCC Type Approved remote monitoring of the BW-95A may be externally provided for the SCA center frequency deviation meter, modulation meter, and peak modulation light.

As a test instrument, the BW-95A permits the measurement of:

*1. Incidental AM
*2. AM Noise
*3. SCA Injection
4. SCA Modulation
5. Main Channel Modulation
6. Crosstalk into the Main Channel (30Hz – 15 kHz)
7. Crosstalk into the SCA Channel
8. Distortion of the SCA Channel
9. Noise of the SCA Channel
10. Response of the SCA Channel

* Main Channel

1–4 ELECTRICAL SPECIFICATIONS

Modulation Meter Range .....133% to –70 db
SCA Modulation Sensitivies ..... 100% = 6 kHz,4 kHz 2 kHz switched
Maximum Modulation Frequency .....5 kHz at 6 kHz Deviation
SCA Modulation Calibrator .....2 kHz
SCA Subcarrier ..... 24 kHz to 74 kHz, 4 switched crystal positions, SCA subcarrier and deviation maintained in the FCC allowable total frequency deviation
SCA Injection Level ..... 133% to 5%
SCA Peak Indicator ..... 100% = 6 kHz, 4 kHz, 2 kHz switched, independent of modulation polarity
SCA Frequency Meter ..... ± 2 kHz
Internal Crosstalk
  Sub to Main .....–66 db
  Main to Sub .....better than 50 db
  Stereo to Sub .....better than 50 db
Remote Metering ..... Both frequency meter and modulation meter may be remotely metered, 5000 ohms external loop

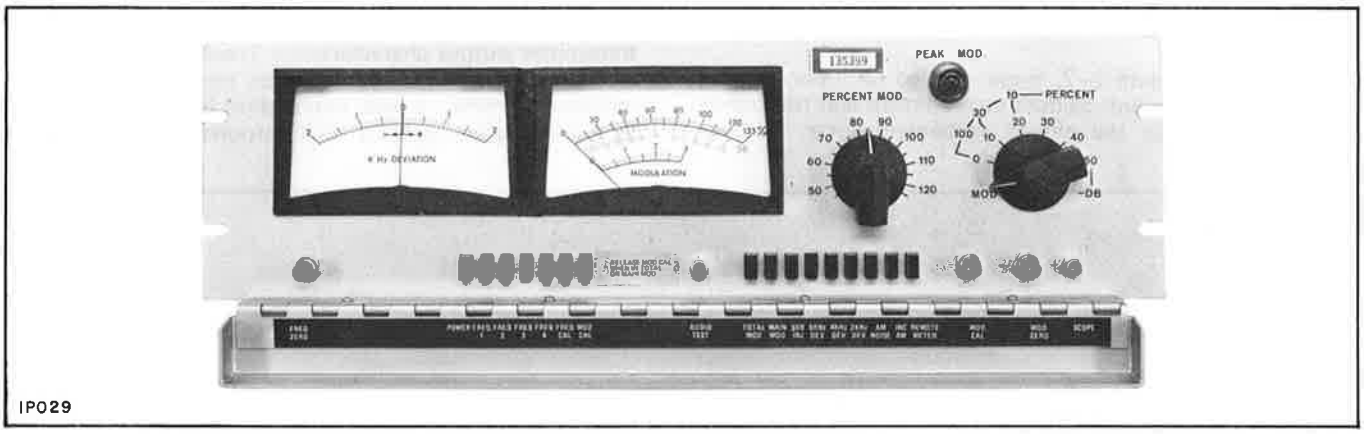

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Figure 1–2

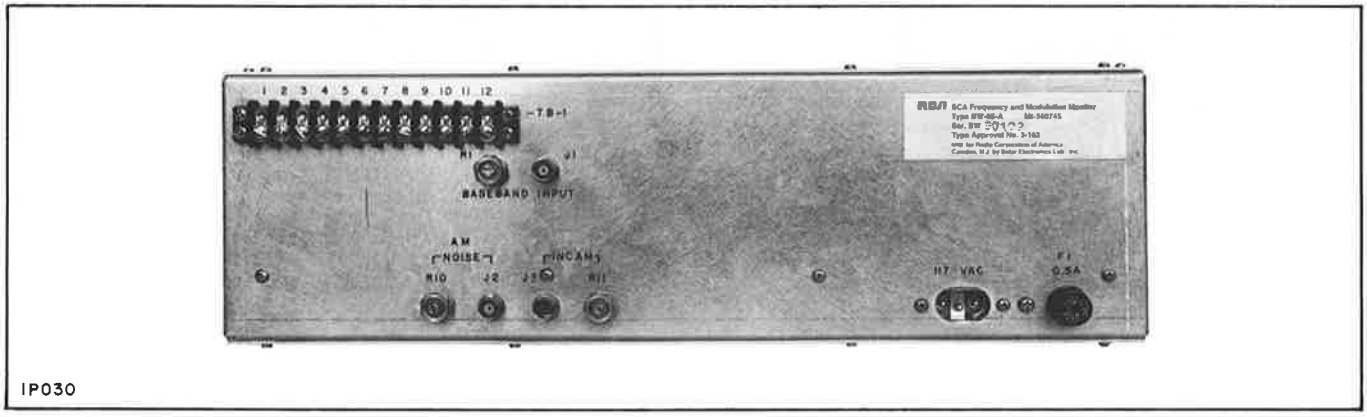

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Figure 1–3

1–5 MECHANICAL SPECIFICATIONS

Dimension ..... 5¼ x 19 x 11 7/8 inches overall
Detailed Dimensions ..... Figure 1–4
Net Weight ..... 14 pounds
Shipping Weight ..... 18 pounds

1–6 INSTRUMENT IDENTIFICATION

T he instrument is identified by the type number and a six digit serial number. The type number and serial number appear on a plate located on the rear panel, Figure 1–3. All correspondence to your RCA representative or to the factory in regard to the instrument should reference the type number and complete serial number.

1–7 ACCESSORIES

The RCA type BW-95A SCA Frequency and Modulation Monitor may be used for the remote monitoring of an SCA FM transmitter with the Remote Meter Panel, MI-560746. The meter panel contains a peak indicator lamp, an SCA frequency deviation meter and a modulation meter, both designed for 5000 ohms loop resistance.

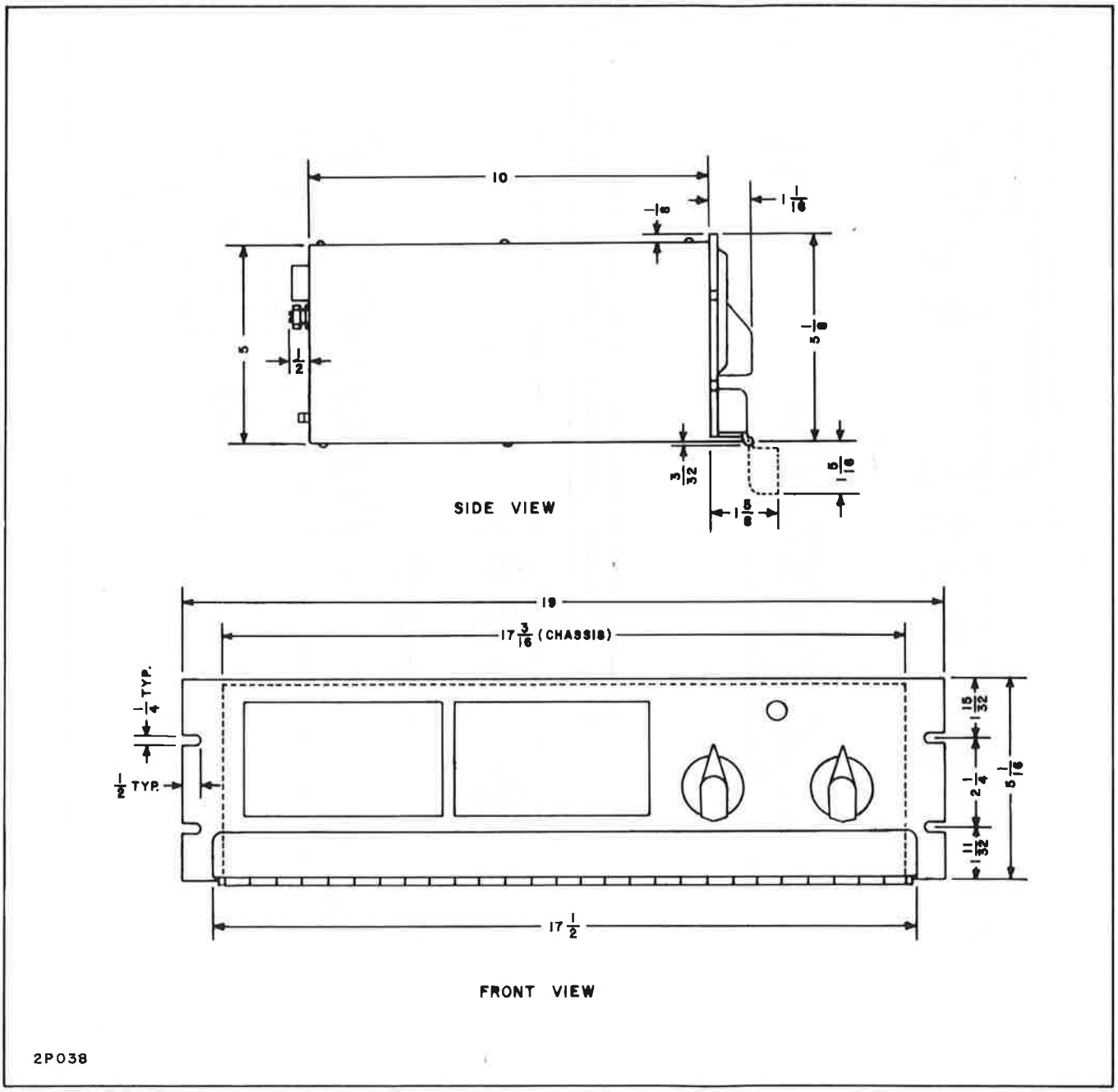


Figure 1–4

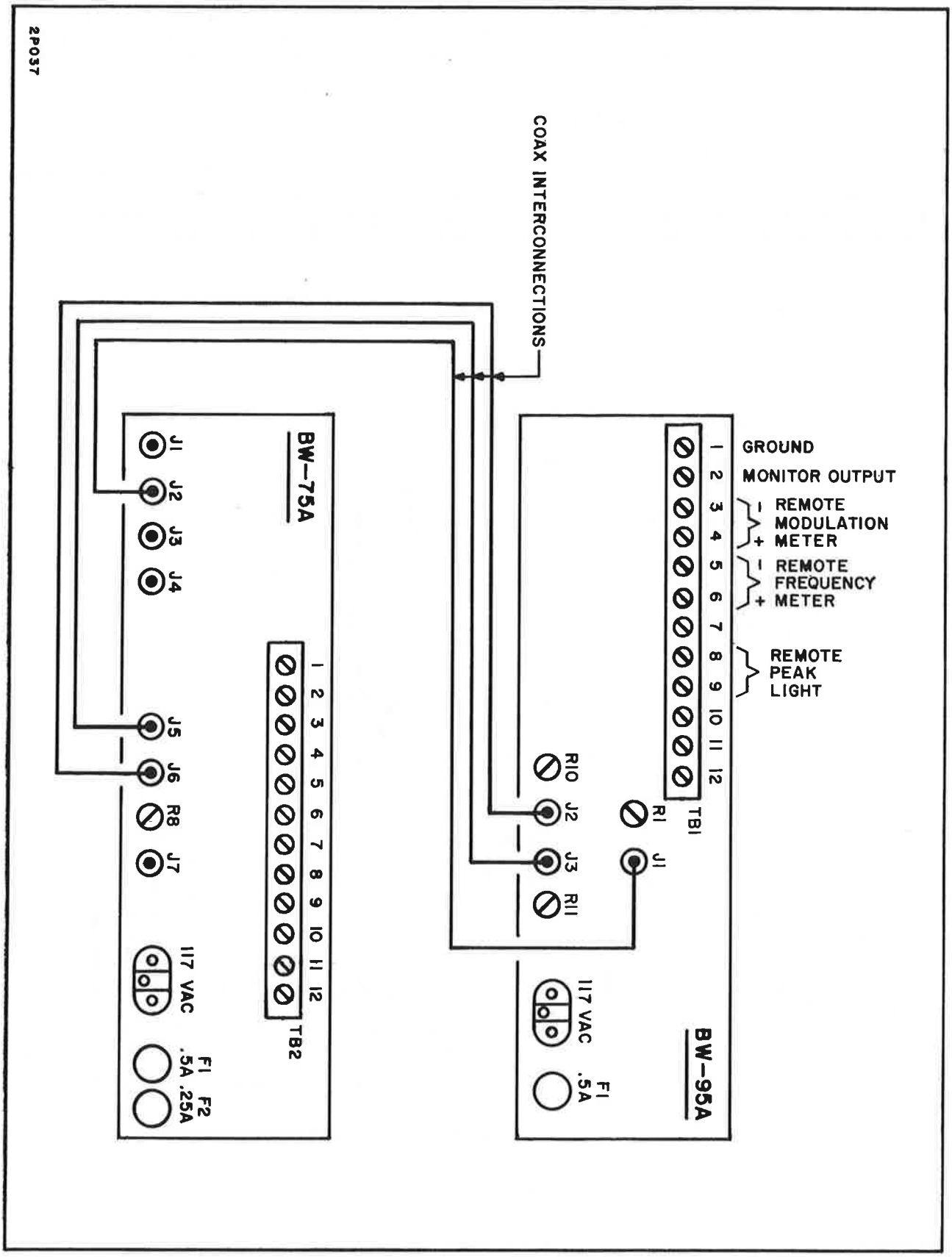

2P037
COAX INTERCONNECTIONS
BW-75A
J1
J2
J3
J4
J5
J6
R8
J7
117 VAC
F1 .5A
F2 .25A
TB2
1 2 3 4 5 6 7 8 9 10 11 12
BW-95A
R10
J2
R11
J3
R1
J1
117 VAC
F1 .5A
TB1
1 2 3 4 5 6 7 8 9 10 11 12
GROUND
MONITOR OUTPUT
- REMOTE MODULATION + METER
- REMOTE FREQUENCY + METER
REMOTE PEAK LIGHT

Figure 2–1

SECTION 2

INSTALLATION

2–1 INITIAL INSPECTION

Check the shipping carton for external damage. If the carton exhibits evidence of abuse in handling (holes, broken corners, etc.), ask the carrier's agent to be present when the unit is unpacked. Carefully unpack the unit to avoid damaging the equipment through use of careless procedures. Inspect all equipment for physical damage immediately after unpacking. Bent or broken parts, dents and scratches should be noted. If damage is found, refer to Paragraph 2–2 for the recommended claim procedure. Keep all packing material for proof of damage claim or for possible future use.

2–2 CLAIMS

If the unit has been damaged, notify the carrier immediately. File a claim with the carrier or transportation company and advise RCA of such action to arrange the repair or replacement of the unit without waiting for a claim to be settled with the carrier.

2–3 REPACKING FOR SHIPMENT

If the unit is to be returned to RCA, attach a tag to it showing owner and owner's address. A description of the service required should be included on the tag. The original shipping carton and packaging materials should be used for reshipment. If they are not available or reusable, the unit should be repackaged in the following manner:

a. Use a double-walled carton with a minimum test strength of 275 pounds.

b. Use heavy paper or sheets of cardboard to protect all surfaces.

c. Use at least 4 inches of tightly packed, industry approved, shock absorbing material such as extra firm polyurethane foam or rubberized hair. NEWSPAPER IS NOT SUFFICIENT FOR CUSHIONING MATERIAL!

d. Use heavy duty shipping tape to secure the outside of the carton.

e. Use large FRAGILE labels on each surface.

f. Return the unit, freight prepaid, via air freight. Be sure to insure the unit for full value.

2–4 PREPARATION FOR USE

The BW-95A SCA Frequency and Modulation Monitor is designed to be mounted in a standard 19-inch rack mount. When mounted in a rack, no cooling area need be provided above or below the unit as very little heat is generated by the monitor. When the monitor is mounted above high heat generation equipment such as vacuum-tube power supplies, consideration should be given to cooling requirements which allow a free movement of cooler air through and around the BW-95A. In no instance should the ambient chassis temperature be allowed to rise above 50 degrees C (122 degrees F). Mount the BW-95A to the rack mount panel using four No. 10 countersunk finishing washers.

Plug the line cord into a nominal 117 volts 60 Hz source. Connect an 18 inch coaxial cable (supplied) between J1 on BW-95A to J2 on BW-75A. Connect an 18 inch coaxial cable (supplied) between J2 on BW-95A to J6 on BW-75A. Connect 18 inch coaxial cable (supplied) between J3 on BW-95A to J5 on BW-75A. These last two are for AM noise and incidental AM measurements and need not be connected if a BW-75A Stereo Frequency and Modulation Monitor is connected.

If desired, connect external aural monitoring amplifier to terminals 1 and 2 on TB1. Note that this is an unbalanced output with terminal 1 grounded. A remote center frequency deviation meter and remote modulation meter may be connected to terminals, 5, 6 and 3, 4 respectively, if desired. Observe the proper polarities and note that the external loop resistance not including meters must be 5000 ohms. These meters must be obtained from RCA in order to comply with FCC regulations on remote metering. A remote peak modulation lamp may be connected to terminals 8 and 9. CAUTION: DO NOT SHORT TERMINAL 9 TO GROUND. Audio tests may be made at the audio test jack on the front panel. The remote meters and lamp are contained in the Remote Meter Panel, MI-560746.

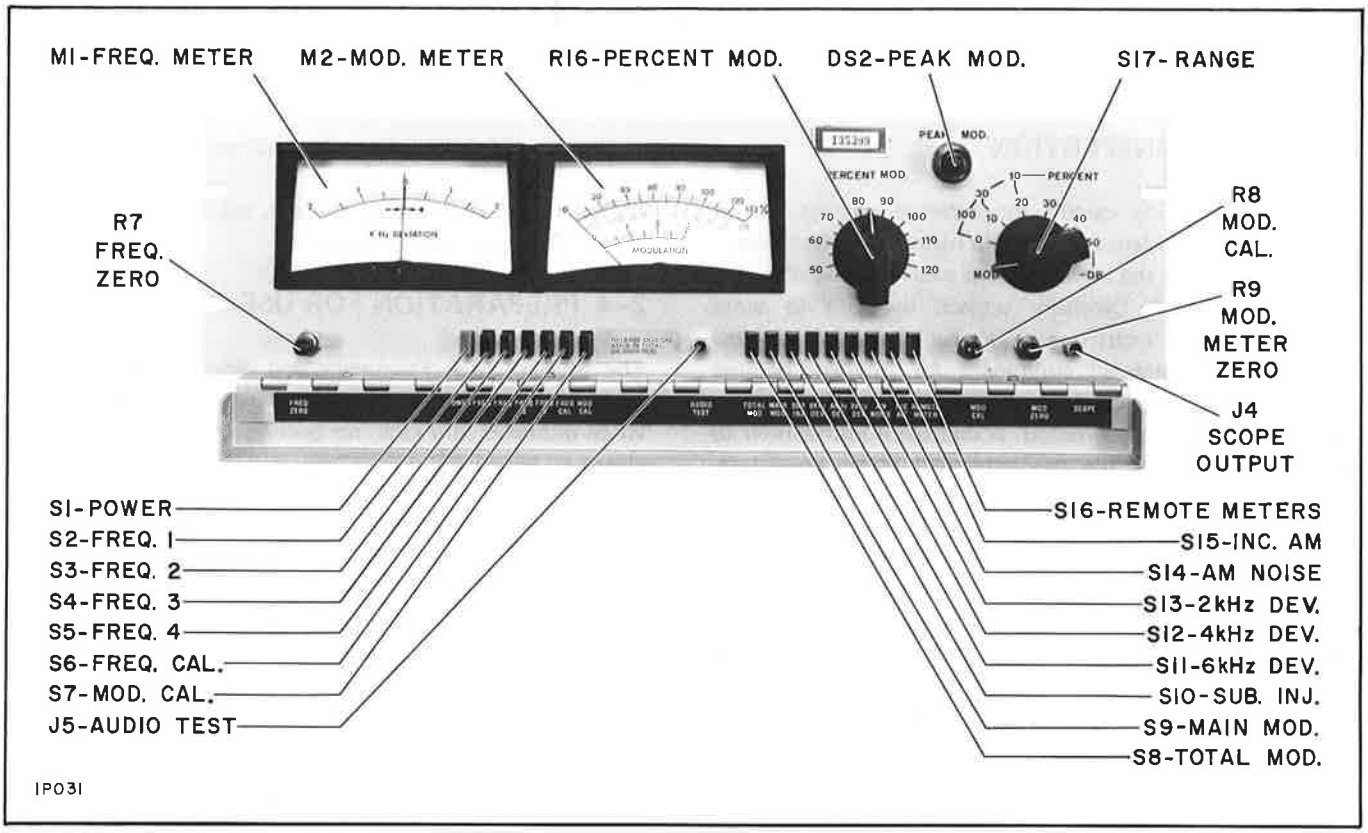


Figure 3–1

1. FREQ ZERO POTENTIOMETER—Zeroes the frequency deviation meter in the FREQ CAL position.

2. POWER SWITCH—Turns the unit on.

3. FREQUENCY 1, 2, 3, 4 SWITCH—Selects one of the four crystal positions to heterodyne the SCA subcarrier frequency up to the 260 kHz IF frequency.

4. FREQ CAL SWITCH—Selects the 260 kHz calibrating crystal for frequency calibration.

5. MOD CAL SWITCH—Activates the 258 kHz and 262 kHz calibrating oscillators and the chopper to develop the 4 kHz peak-to-peak modulation deviation. Also inserts de-emphasis in the voltmeter circuits to remove the overshoot in the calibrating waveform.

6. AUDIO TEST JACK—Test output from the monitoring amplifier. Permits linearity tests, frequency response tests, and FM noise tests to be made from the front panel, (this output is not de-emphasized).

7. TOTAL MOD SWITCH—Measures total negative modulation of baseband signal.

8. MAIN MOD SWITCH—Inserts 15 kHz low pass filter to measure main modulation.

9. SUB INJ SWITCH—Measures subcarrier injection when FREQ switch is in an active position.

10. DEVIATION, 6, 4, 2 SWITCH—Selects one of three SCA deviation ranges. Modulation meter and peak indicator lamp are normalized to this 6 kHz, 4 kHz, or 2 kHz deviation.

11. AM NOISE SWITCH—Measures AM noise of FM carrier.

12. INC AM SWITCH—Measures incidental AM noise of FM carrier.

13. REMOTE METER SWITCH—When in the off position (released) removes remote meters from the monitor circuits and substitutes their equivalent resistances.

14. MOD CAL POTENTIOMETER—Sets level into discriminator to 100% when DEV switch is in 2 kHz position.

15. MOD ZERO POTENTIOMETER—Zeroes modulation meter with no signal and RANGE switch in MOD position.

16. PERCENT MODULATION POTENTIOMETER—Pre-sets the peak modulation lamp to flash at the indicated modulation setting. This circuit is independent of modulation polarity and can be activated by either a positive or negative modulation peak.

17. RANGE SWITCH — MOD — Measures the percentage of modulation with the peak reading voltmeter.

18. RANGE SWITCH — 0 to 50 db —Measures crosstalk, noise and modulation with the average reading voltmeter.

SECTION 3

OPERATION

3–1 INITIAL OPERATION

The following procedure should be followed for placing the unit into initial operation. Refer to Figure 3–1 for location of the control functions.

1. Before turning unit on, depress FREQ CAL switch, the REMOTE METER switch to off (released) and the TOTAL MOD switch to on (depressed).

2. Place BW-75A into operation, with the AMP BAL switch depressed.

3. Depress the BW-95A POWER switch PWR to on (depressed) and allow a 15-minute warm-up. Turn RANGE switch to MOD.

4. Adjust FREQ ZERO potentiometer to zero deviation meter and adjust MOD ZERO potentiometer to zero modulation meter.

5. Depress MOD CAL switch on BW-75A and adjust R1 on the rear panel of the BW-95A chassis so that the BW-95A modulation meter reads 100%. This adjustment will be necessary only during initial set-up or installation. This adjustment standardizes the BW-95A with the BW-75A.

6. Place the BW-75A into the operate OP position.

7. Depress the BW-95A MOD CAL switch to on (depressed) and the DEV switch to 2 kHz (depressed). Adjust MOD CAL to read 100%. Note: The MOD CAL rolls off the frequency response and must not be depressed when measuring total modulation or main modulation.

8. The BW-95A is now calibrated and may be placed into normal operation by depressing the desired FREQ switch and desired DEV range. When the BW-95A is supplied with only one crystal, it will normally be on FREQ 3 position.

3–2 NORMAL OPERATION

To monitor normal SCA programming, depress the desired FREQ switch and the desired DEV switch. 4 kHz deviation is normally used when broadcasting both SCA and stereo. 6 kHz deviation is normally used when broadcasting SCA and monaural. 2 kHz deviation may be used when broadcasting remote telemetering tones used in remote control applications.

3–3 SCA MEASUREMENTS

The following operating procedures describe methods that may be used to operate each of the functions of the BW-95A SCA Monitor. Refer to Figure 3–1 for the location of the front panel controls, etc. Figure 3–1 also gives a brief explanation of the controls.

3–3–1 TOTAL MODULATION

Depress the TOTAL MOD switch and turn the RANGE switch to MOD. The BW-95A measures total negative modulation. If the BW-75A MOD POL switch is depressed (positive modulation), both positive and negative modulation polarities may be observed simultaneously to check assymmetrical program material. CAUTION: The MOD CAL switch must not be depressed when measuring total modulation for it rolls off the frequency response.

3–3–2 MAIN CHANNEL MODULATION

Depress the MAIN MOD switch and turn the RANGE switch to MOD. The BW-95A measures main channel modulation through a 15 kHz low pass filter. CAUTION: The MOD CAL switch must not be depressed when measuring total modulation for it rolls off the frequency response.

3–3–3 CROSSTALK (SUB TO MAIN)

Depress the MAIN MOD switch. Crosstalk measurements from SCA to main channel may be made with no modulation on the main channel and the RANGE switch turned to a more sensitive position (0-50 db). The crosstalk reading is the sum of the meter reading and range reading, i.e. –12 db on meter and –50 db on range yields –62 db. CAUTION: The MOD CAL switch must not be depressed when measuring total modulation for it rolls off the frequency response. Crosstalk components above 15 kHz (into the stereo subchannel) are not measured in this check.

3–3–4 SUBCARRIER INJECTION

Depress the desired FREQ switch. Depress the SUB INJ switch. The RANGE switch may be set to the desired range: 10%, 30%, or 100% and the corresponding meter scale is used. Note that the indicated injection level may change with SCA modulation. This is normal since the injection is measured through a narrow band pass filter. The injection level should be measured in the absence of SCA modulation.

3–3–5 SCA MODULATION

Depress the desired FREQ switch. Depress the DEV switch for the desired range, i.e., 6, 4, or 2 kHz deviation. The calibration is changed accordingly. With RANGE switch in MOD, the 100% meter reading corresponds to 6, 4, or 2 kHz deviation according to the above setting. When switched to the sensitive positions, say –50 db, then the range is –50 db below the 6, 4, or 2 kHz deviation. This is to say that the SCA modulation measurements are normalized to the deviation setting.

3–3–6 CROSSTALK (MAIN TO SUB)

Place the BW-95A into operation as in step 3–3–5. With SCA injection and no SCA modulation, modulate the main channel with the desired modulation. The residual reading on the modulation meter with the RANGE switch set to a more sensitive position is the crosstalk (without de-emphasis) from the main channel into the SCA channel. The crosstalk reading is the sum of the meter reading and the range reading, i.e., –12 db on meter and –40 db on range switch setting yields –52 db below the deviation used (6, 4, or 2 kHz).

De-emphasized crosstalk and noise measurements may be made with an external distortion meter and a de-emphasis capacitor as described under SCA distortion, 3–3–10 or from the de-emphasized audio output at TB1 terminals 1 and 2. Crosstalk, distortion and noise measurements are normally made with de-emphasis.

3–3–7 AM NOISE

With the main channel unmodulated (subcarrier and pilot OFF), depress the AM NOISE switch and turn the RANGE switch from 0 to a position where a reading is obtained. The algebraic sum of the meter reading and the range switch setting is the main channel AM noise reading WHEN THE RF LEVEL IS SET TO 100% on the BW-75A. For example, a meter reading of –5 db and a range switch setting of –50 db yields an AM noise measurement of –55 db.

3–3–8 INCIDENTAL AM

Depress the INC AM switch and turn the range switch from 0 to a position where a reading is obtained. The transmitter main channel is modulated for this measurement. The algebraic sum of the meter reading and the range switch setting is the incidental AM noise of the main channel. There is no FCC specification on this measurement but it may be used as an aid for proper tuning of an FM transmitter.

3–3–9 SCA FREQUENCY RESPONSE

Frequency response may be measured by using an audio oscillator to modulate the SCA generator and measuring the input signal level from the audio oscillator with an AC audio voltmeter, such as one contained in a distortion analyzer. Adjust the level at 400 Hz to indicate the desired modulation. Change the frequency of the audio oscillator to all the frequencies to be measured, adjusting the audio oscillator output to keep the SCA modulation constant. The AC voltmeter indication of the oscillator output should follow the standard de-emphasis curve (commonly 150 usec) used in the SCA generator. Standard modulating frequencies used are 50, 100, 400, 1000, and 5000 Hz.

3–3–10 SCA DISTORTION

Distortion measurements may be made by connecting a distortion analyzer to the AUDIO TEST jack on the front panel and applying a modulating signal to the SCA channel of the transmitter. The measurements may be made with de-emphasis by connecting an external capacitor across the AUDIO TEST jack output. 7500 pF yields a 75 usec de-emphasis curve, 0.015 uF yields a 150 usec de-emphasis curve.

Distortion measurements may be made from the aural monitor output (TB1 terminals 1 and 2). This output is de-emphasized by A2C21. 0.047 uF yields 75 usec de-emphasis and 0.1 uF yields 150 usec de-emphasis. A2C21 is plugged in and is normally supplied for 75 usec unless otherwise specified. Distortion measurements will be higher than actual due to the narrow bandwidth of the SCA channel filter normally supplied in the BW-95A. A narrow-band filter is used in order to make possible accurate crosstalk measurements.

3–3–11 SCA NOISE

Place the BW-95A into operation as in step 3–3–5. Apply SCA injection but no SCA modulation or main channel modulation. The residual reading on the modulation meter with the RANGE switch set to a more sensitive position is the SCA noise (without de-emphasis). The SCA noise reading is the sum of the meter reading and the range switch setting, i.e., –12 db on the meter and –40 db on the range switch setting yields –52 db below the deviation used (6, 4, or 2 kHz).

De-emphasized crosstalk and noise measurements may be obtained with an external distortion meter, and a de-emphasis capacitor as described under SCA distortion, 3–3–10 or from the de-emphasized audio output at TB1 terminals 1 and 2. Crosstalk, distortion and noise measurements are normally made with de-emphasis.

SECTION 4

PRINCIPLES OF OPERATION

4–1 CIRCUIT DESCRIPTION

Figure 7–3 is the chassis schematic of the BW-95A and may be referred to for operation along with the individual card schematics, Figures 7–1 and 7–2. The incoming multiplex composite input is applied to the BASEBAND INPUT J1. Buffer amplifier A2Q1 and Q2 on CARD A2 applies the signal to both the mixer, on CARD A1, and the TOTAL MOD and MAIN MOD switches, S8 and S9.

The Oscillator, Mixer, and IF CARD A1 selects the particular SCA channel to be monitored and filters out the main channel and stereo subchannel or other SCA channels. The particular SCA channel is amplified and limited by A1Q1, Q2, and Q3 and demodulated by the balanced discriminator. The output of the discriminator is applied to the voltmeter circuits on CARD A2 through the low pass filters FL2 and FL3.

CARD A2 contains the peak voltmeter, average voltmeter, peak lamp, and audio amplifier circuits to measure and monitor the various SCA functions. The peak voltmeter and peak lamp circuits are the same as used in the BW-75A.

Switches S2 through S6 select the subchannel or calibrating frequency to be measured. Switches S7 through S15 select the particular function to be measured.

4–1–1 OSCILLATOR, MIXER AND IF CARD A1

The baseband signal containing the multiplex composite signal is applied to pin 2 of the Oscillator, Mixer and IF CARD A1 where it is then applied to the balanced mixer along with the local oscillator frequency to form an intermediate frequency (IF) of 260 kHz. This signal contains the main channel and all the subcarriers. The local oscillator operates 260 kHz above the desired subcarrier frequency so that the desired subcarrier with its sidebands is centered around 260 kHz; for example, a 67 kHz subcarrier requires a 327 kHz local oscillator frequency. The main channel and all other subcarriers are removed by the 260 kHz bandpass filter FL1 located on the main chassis. The desired subcarrier and its sidebands are passed by the filter and applied to the limiters A1Q2 and Q3 which removes any AM component that may be present. The SCA signal is further amplified by A2Q4 and demodulated by the balanced discriminator A1T3, T4, A1CR7, CR8.

The output of the discriminator is applied to the buffer amplifier A1Q5 and split by A1Q6 and Q7. A1Q6 drives the low pass filters FL2 and FL3 to remove the IF components. The output of the filter FL3 is applied to CARD A2 through the switches S9, S11, S12, and S13.

The DC signal from the discriminator is amplified by A1Q7 to drive the frequency deviation meter M1 and remote meter if used. The DC signal is proportional to the frequency deviation.

The local oscillator is a crystal controlled oscillator whose crystals are located on the push button switches S2 through S6. The frequency of the local oscillator is determined by the crystal selected. When the unit is supplied for more than one subcarrier, the crystals are placed on switches S2 through S5 in increasing order, a 260 kHz crystal is placed on S6 for frequency calibration.

Frequency calibration is accomplished by operating the local oscillator at 260 kHz. When the FREQ CAL push button is depressed, a 260 kHz crystal is applied to the local oscillator. A DC voltage is also applied to the mixer through S6 and terminal 4 on CARD A1. This DC voltage unbalances the mixer to allow an output of 260 kHz to be applied to the IF amplifier and discriminator. The frequency meter M1 is zeroed with this signal.

Modulation calibration is accomplished by applying the modulation calibrating oscillators A1Q10, Q11 to the IF amplifier and discriminator. When the MOD CAL push button is depressed, the 25V DC is applied to terminal 25 to turn on the calibrating oscillators. A1Q10 operates 2 kHz above 260 kHz and A1Q11 operates 2 kHz below 260 kHz. 60 Hertz AC is applied to terminals 26 and 27 which turns the diodes A1CR9 and CR10 on and off alternately at a 60 Hertz rate to form a 4 kHz peak-to-peak square wave FM signal centered at 260 kHz. This deviation is an accurate deviation since it is controlled by the 262 kHz and 258 kHz crystals. The MOD CAL switch S7 also shorts terminal 40 to 41 to connect the 0.22 uF capacitor A2C32 to ground on CARD A2 to remove the spike from the square wave calibrating signal.

The output of the mixer is also applied to a 260 kHz narrow bandpass filter A1FL1 and amplified by A1Q12 to measure the subcarrier injection. A1FL1 removes most of the sidebands from the SCA signal so that when subcarrier injection is measured with SCA modulation, the subcarrier varies with this modulation. The subcarrier injection should be measured with no SCA modulation.

4–1–2 AUDIO AMPLIFIER, VOLTMETER, METERING AND FLASHER CARD A2

The incoming baseband signal is amplified by transistor A2Q1. Potentiometer R1 (INPUT LEVEL) adjusts the gain slightly to allow the BW-95A to be normalized with the BW-75A. Transistor A2Q2 provides a low impedance to drive the A1 CARD and also the TOTAL and MAIN CHANNEL switches S8 and S9. The particular function to be measured is applied to the input of the wideband feedback amplifier A2Q3, Q4, and Q5 which drives the peak voltmeter circuit. Section 4–2–3 in the BW-75A manual may be referred to for its operation since the circuits are the same.

The output of the feedback amplifier also drives the RANGE switch S17 which provides attenuation steps for the sensitive average voltmeter. The output of the RANGE switch S17 is applied to the average voltmeter amplifier A2Q9 and Q10. Diode bridge A2CR3 through CR6 rectifies the output to drive the modulation meter. A sample of the output is applied to the emitter of A2Q9 to provide feedback to stabilize the gain and linearize the meter reading. The gain is adjusted by A2R41. An output is also taken from the amplifier to provide an oscilloscope output (SCOPE) that follows the sensitivity setting of the RANGE switch.

When the RANGE switch is on MOD, the modulation meter M2 is switched to the peak reading voltmeter circuit on terminals 19 and 20. When the RANGE switch is on 0-50 db positions, the modulation meter M2 is switched to the diode bridge on terminals 26 and 27. Note that if a remote modulation meter is used it always remains on the peak voltmeter circuit.

The peak lamp circuit consists of a phase splitter, Schmitt voltage comparator, and monostable multivibrator. This circuit is the same as used in the BW-75A and Section 4–2–3 may be referred to for its operation. Note that the peak lamp circuit is independent of modulation polarity so that upper and lower sideband peaks may be monitored simultaneously. Also note that the peak lamp circuit only monitors the SCA modulation.

The monitoring amplifier is a three stage feedback amplifier to provide a low distortion signal for aural monitoring. The signal is applied to the input stage A2Q11 which both amplifies the signal and sums the feedback voltage in the emitter. Transistor A2Q12 provides additional amplification to drive the output transistor A2Q13. Feedback is taken from the output and applied to the emitter of the input stage through A2R54 and A2C21 to de-emphasize the signal. Note that 0.047 is used for 75 usec de-emphasis and 0.1 is for 150 usec de-emphasis.

4–1–3 MAIN CHASSIS

The main chassis contains the power supply and 25 volt pre-regulator to supply the cards. It also contains the 260 kHz wide bandpass filter FL1, 9 kHz lowpass filter FL2, and 15 kHz lowpass filter FL3.

Depressing one of the FREQ switches S2 through S5 applies the particular local oscillator crystal for the subcarrier used. Depressing the FREQ CAL switch S6 or SUB INJ switch S10 applies the 260 kHz crystal to the local oscillator. The SUB INJ switch also applies the output of the subchannel injection amplifier to the input of the voltmeter through the normalizing potentiometer R13.

Depressing one of the SCA deviation switches S11 through S13 applies the output of the discriminator to the deviation attenuator, R20, R21, and R22, through the two low pass filters FL2 and FL3. The output of the attenuator is applied to the input of the voltmeter on CARD A2. Note that the deviation attenuator normalizes the modulation meter to read 100% for 6, 4, or 2 kHz deviations.

Depressing the TOTAL MOD switch S8 applies the baseband signal to the voltmeter through the normalizing potentiometer R 14. Depressing the MAIN MOD channel switch S9 applies the baseband signal to the voltmeter through the 15 kHz lowpass filter FL3 and normalizing potentiometer R15.

SECTION 5

MAINTENANCE

5–1 INTRODUCTION

This section contains maintenance and service information for the BW-95A SCA Frequency and Modulation Monitor. Included are Performance Checks, Adjustments, and Calibration Procedures.

5–2 PERFORMANCE CHECKS

Before performing any checks on the BW-95A, it is suggested that the BW-75A performance be verified. See Section 5–2 in the instruction manual for the BW-75A (IB-8027548).

5–2–1 FREQUENCY DEVIATION METER CHECK

Depress FREQ CAL switch. Verify that by rotating the FREQ ZERO control from maximum clockwise to maximum counterclockwise the kHz DEVIATION meter pointer will go up scale in the positive and negative directions respectively. Return the pointer to zero. Depress the particular FREQ switch corresponding to the subchannel to be measured and read the frequency deviation.

5–2–2 MODULATION MOD ZERO METER CHECK

Depress FREQ CAL and 6 kHz DEV switches. Verify that by rotating the MOD ZERO control from maximum clockwise to maximum counterclockwise the modulation meter pointer will move in a positive to negative direction about zero. Return the pointer to zero after check.

5–2–3 MODULATION CALIBRATOR CHECK

Depress MOD CAL and 2 kHz DEV switches. Verify that by rotating the MOD CAL control from maximum clock wise to maximum counterclockwise the modulation meter pointer will move in a positive to negative direction about 100%. Return the pointer to 100% after check.

5–2–4 PEAK LAMP CHECK

With the monitor placed in operation as in step 5–2–3, rotate the PERCENT MOD control from maximum clockwise to the point at which the PEAK MOD lamp just lights. The reading of the PERCENT MOD should be approximately 110%. This is normal since the modulation calibrating signal is a 60 Hertz square wave and the restricted low frequency response of the peak lamp circuit causes a droop in the square wave signal which increases its peak value to 110%. The peak lamp is accurate for sinewave or program modulation.

5–3 ADJUSTMENTS AND CALIBRATIONS

Place the BW-75A in normal operation. Before performing any adjustments on the BW-95A, verify that the BW-75A is operating normally as outlined in the instruction manual for the BW-75A, IB-8027548, under Section 5–2.

Before proceeding with the BW-95A alignment, depress the BW-75A AMP BAL switch to verify that the BW-75A modulation meter reads zero; reset to zero if necessary, using the MOD ZERO control on the BW-75A. Adjust the BW-95A MOD ZERO control for zero indication on the BW-95A modulation meter as in step 5–2–2.

5–3–1 PRELIMINARY

Connect an RF sample from a properly operating multiplex exciter to the RF input jack of the BW-75A FM monitor. Set BW-75A input level potentiometer R7 for an indication of 100% on the BW-75A modulation meter with the RF LEVEL switch depressed.

5–3–2 DISCRIMINATOR ADJUSTMENT

Depress the MOD CAL switch and 2 kHz DEV switches and rotate the MOD CAL control maximum counterclockwise on the BW-95A for a minimum reading. The minimum reading should be approximately 92%. If this reading is not below 100% or cannot be set to 100%, the discriminator must be aligned and proceed as follows. With a clip lead, short the cold end of the discriminator output (junction of A1R23, R24, R25, and C9) to ground. Bypass the discriminator output (junction of A1R21, R22, R23, and gate of A1Q5) to ground with a 0.01 uF capacitor. Observe the square wave calibrating signal on the output of the discriminator with a calibrated oscilloscope. The amplitude of the square wave should be 2 volts peak-to-peak.

Adjust the slugs in A1T3 and T4 until this amplitude is 2 volts peak-to-peak. Check the discriminator zero by depressing the FREQ CAL switch and measure the DC output. If not 0 volts DC, turn the slug in either A1T3 or T4 and readjust the slug on the other for the 2 volts peak-to-peak amplitude as in above. Adjust the slugs in A1T3 and T4 for 2 volts peak-to-peak on MOD CAL and 0 volts DC on FREQ CAL. Remove the bypass capacitor and short from the A1 Card.

5–3–3 A2R15 Adjustment

With the MOD CAL control still maximum counterclockwise and the MOD CAL and 2 kHz switches depressed, adjust potentiometer A2R15 for an indication of 92% on the modulation meter. Check control as in step 5–2–3 and return the pointer to 100%.

5–3–4 R12 ADJUSTMENT

Depress FREQ CAL switch and zero the frequency deviation meter. Depress the particular FREQ switch corresponding to the subchannel being measured and adjust the subcarrier frequency to +1 kHz and –1 kHz deviation while measuring its frequency with a frequency counter.

Adjust R12 on main chassis to correspond with the + and −1 kHz deviation.

5–3–5 R14 ADJUSTMENT

Apply a 1 kHz 100% modulating tone to the exciter input as read on the BW-75A. No other modulation should be present. On the BW-95A, depress the FREQ CAL switch and the TOTAL MOD switch and adjust R14 on the main chassis to read 100% on the BW-95A. The RANGE switch should be on MOD.

5–3–6 R15 ADJUSTMENT

Apply a 1 kHz 100% modulating tone to the exciter input as read on the BW-75A. No other modulation should be present. On the BW-95A, depress the FREQ CAL switch and the MAIN MOD switch, rotate the RANGE switch to MOD and adjust R15 on the main chassis to read 100% on the BW-95A.

5–3–7 A2R41 ADJUSTMENT

Apply a 1 kHz modulating tone to the exciter input as in step 5–3–5. Rotate the RANGE switch to 0 db and adjust A2R41 to read exactly that value as read in the MOD position.

5–3–8 A2R55 ADJUSTMENT

Apply a 400 Hz modulating tone to the SCA generator. Depress the particular FREQ switch corresponding to the subchannel being measured and depress the 2 kHz DEV switch. Adjust the modulation to read exactly 100% as read on the BW-95A. Rotate the PERCENT MOD control from maximum clockwise to the point at which the PEAK MOD lamp just lights and note the reading. Rotate the PERCENT MOD control to 50 percentage points below the above reading and adjust the modulation level until the PEAK MOD light just lights and note the reading on the modulation meter. Adjust A2R55 so that the percentage difference on the PERCENT MOD CONTROL is 50% when the modulation level is changed from 100% to 50%. Slip the PERCENT MOD knob by loosening the two set screws and retightening after adjusting to correct the reading of the PERCENT MOD at 100% after the span has been adjusted.

5–3–9 R13 ADJUSTMENT

Apply the SCA subcarrier to the transmitter. Depress TOTAL MOD switch and rotate the RANGE switch to 10%(−20 db). No other modulation should be present. Adjust subcarrier level to read 100% on modulation meter (10% injection). Depress the particular FREQ switch corresponding to the subchannel being measured and depress the SUB INJ switch. Adjust R13 on main chassis so that 100% is indicated on the modulation meter.

5–3–10 R10 ADJUSTMENT

Apply a 400 Hertz audio signal to the AM NOISE jack J2 on the back panel of the BW-95A. Adjust the level to 0.78 volts RMS. Depress the AM NOISE switch and rotate the RANGE switch to 0 db. Adjust R10 on main chassis to indicate 100% on the modulation meter.

5–3–11 R11 ADJUSTMENT

Apply a 400 Hertz audio signal to the INC AM jack J3 on the back panel of the BW-95A. Adjust the level to 0.9 volts RMS. Depress the INC AM switch and rotate the RANGE switch to 0 db. Adjust R11 on the main Chassis to indicate 100% on the modulation meter.

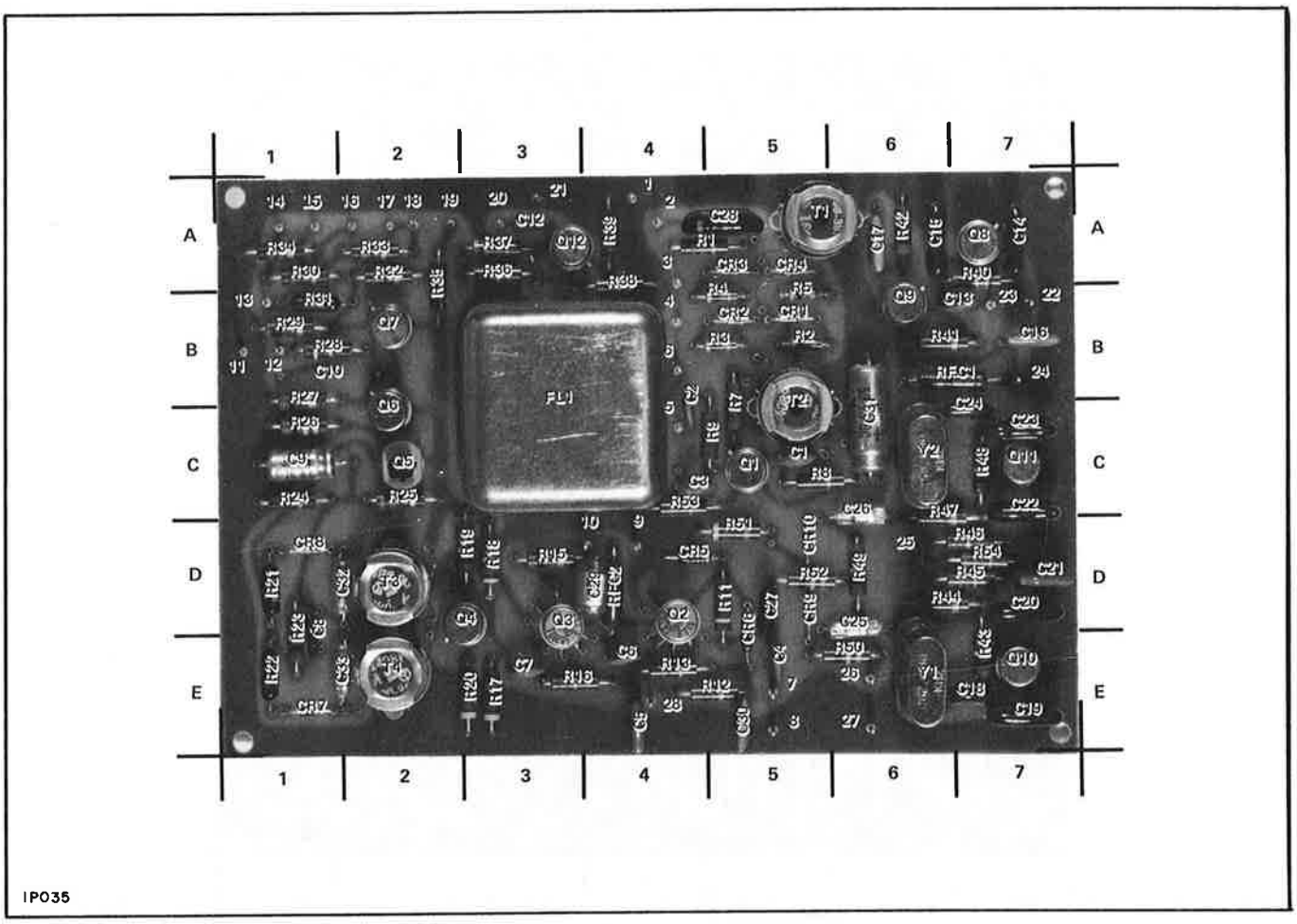


Figure 5–1. A1 Card

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
R1	A4	R24	C1	R46	D7	C2	C4	C24	C7	FL1	B3	15	A1
R2	B5	R25	C2	R47	D6	C3	C4	C25	E6	T1	A5	16	A2
R3	B5	R26	C1	R48	C7	C4	E5	C26	C6	T2	C5	17	A2
R4	B5	R27	B1	R49	D6	C5	E4	C27	D5	T3	D2	18	A2
R5	B5	R28	B1	R50	E6	C6	E4	C28	A5	T4	E2	19	A2
R6	B5*	R29	B1	R51	D5	C7	E3	C29	D4	Y1	E6	20	A3
R7	C5	R30	A1	R52	D5	C8	E1	C30	E5	Y2	C6	21	A3
R8	C5	R31	B1	R53	C4	C9	C1	C31	C6	PINS		22	B7
R9	C5	R32	A2	R54	D7	C10	B1	C32	D1	1	A4	23	B7
R10	C4*	R33	A2	Q1	C5	C11	B3*	C33	E1	2	A4	24	B7
R11	D5	R34	A1	Q2	D4	C12	A3	CR1	B5	3	B4	25	D6
R12	E5	R35	A2	Q3	D3	C13	B7	CR2	B5	4	B4	26	E6
R13	E4	R36	A3	Q4	D2	C14	A7	CR3	A5	5	C4	27	E6
R15	D3	R37	A3	Q5	C2	C15	A6	CR4	A5	6	B4	28	E4
R16	E3	R38	A4	Q6	C2	C16	B7	CR5	D4	7	E5		
R17	E3	R39	A4	Q7	B2	C17	A6	CR6	E5	8	E5	*Bottom of Board	
R18	D3	R40	A7	Q8	A7	C18	E7	CR7	E1	9	D4		
R19	D3	R41	B7	Q9	B6	C19	E7	CR8	D1	10	D4		
R20	E3	R42	A6	Q10	E7	C20	D7	CR9	D5	11	B1		
R21	D1	R43	E7	Q11	C7	C21	D7	CR10	D5	12	B1		
R22	E1	R44	D7	Q12	A3	C22	C7	RFC1	B7	13	B1		
R23	D1	R45	D7	C1	C5	C23	C7	RFC2	D4	14	A1		

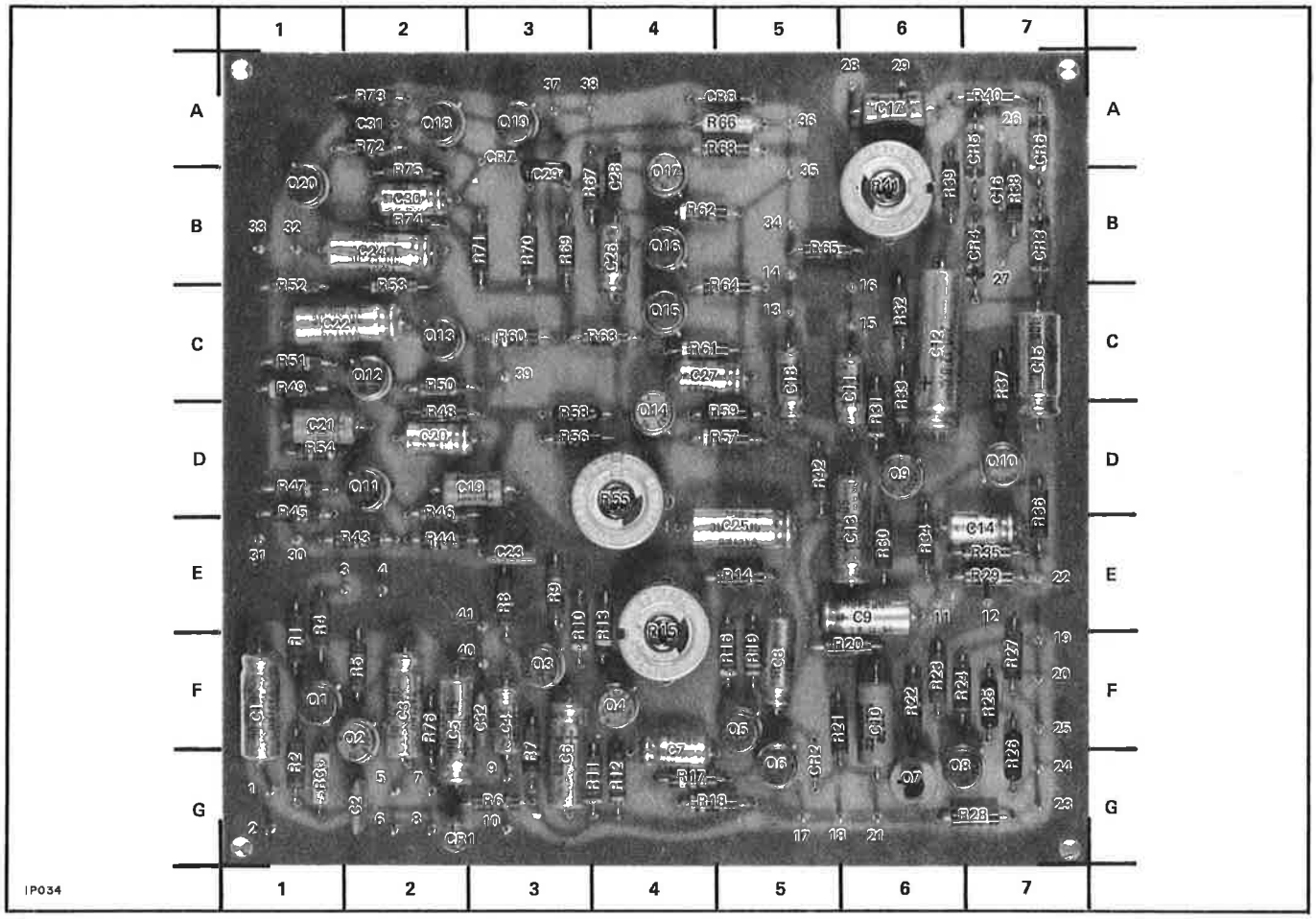


Figure 5–2. A2 Card

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
R1	F1	R27	F7	R53	C2	Q3	F3	C9	E6	CR4	B7	21	G6
R2	G1	R28	G7	R54	D1	Q4	F4	C10	F6	CR5	A7	22	E7
R3	G1	R29	E7	R55	D4	Q5	F5	C11	C5	CR6	A7	23	G7
R4	E1	R30	E6	R56	D3	Q6	F5	C12	C6	CR7	A3	24	G7
R5	F2	R31	D6	R57	D5	Q7	F6	C13	E6	CR8	A5	25	F7
R6	G3	R32	C6	R58	D3	Q8	F7	C14	E7	PINS		26	A7
R7	G3	R33	D6	R59	D5	Q9	D6	C15	C7	1	G1	27	B7
R8	E3	R34	E6	R60	C3	Q10	D7	C16	B7	2	G1	28	A6
R9	E3	R35	E7	R61	C4	Q11	D2	C17	A6	3	E2	29	A6
R10	F3	R36	D7	R62	B4	Q12	C2	C18	C5	4	E2	30	E1
R11	G3	R37	C7	R63	C4	Q13	C2	C19	D3	5	G2	31	E1
R12	G4	R38	B7	R64	C5	Q14	D4	C20	D2	6	G2	32	B1
R13	F4	R39	B6	R65	B5	Q15	C4	C21	D1	7	G2	33	B1
R14	E5	R40	A7	R66	A4	Q16	B4	C22	C1	8	G2	34	B5
R15	F4	R41	B6	R67	B3	Q17	B4	C23	E3	9	G3	35	B5
R16	F5	R42	D5	R68	A4	Q18	A2	C24	B2	10	G3	36	A5
R17	G4	R43	E2	R69	B3	Q19	A3	C25	E5	11	E6	37	A3
R18	G4	R44	E2	R70	B3	Q20	B1	C26	B4	12	E7	38	A3
R19	F5	R45	D1	R71	B3	C1	F1	C27	C4	13	C5	39	C3
R20	F6	R46	D2	R72	A2	C2	G2	C28	B4	14	B5	40	F3
R21	F5	R47	D1	R73	A2	C3	F2	C29	B3	15	C6	41	F3
R22	F6	R48	D2	R74	B2	C4	F3	C30	B2	16	B6		
R23	F6	R49	C1	R75	B2	C5	F2	C31	A2	17	G5		
R24	F6	R50	C2	R76	F2	C6	F3	CR1	G2	18	G5		
R25	F7	R51	C1	Q1	F1	C7	F4	CR2	G5	19	F7		
R26	G7	R52	C1	Q2	F2	C8	F5	CR3	B7	20	F7		

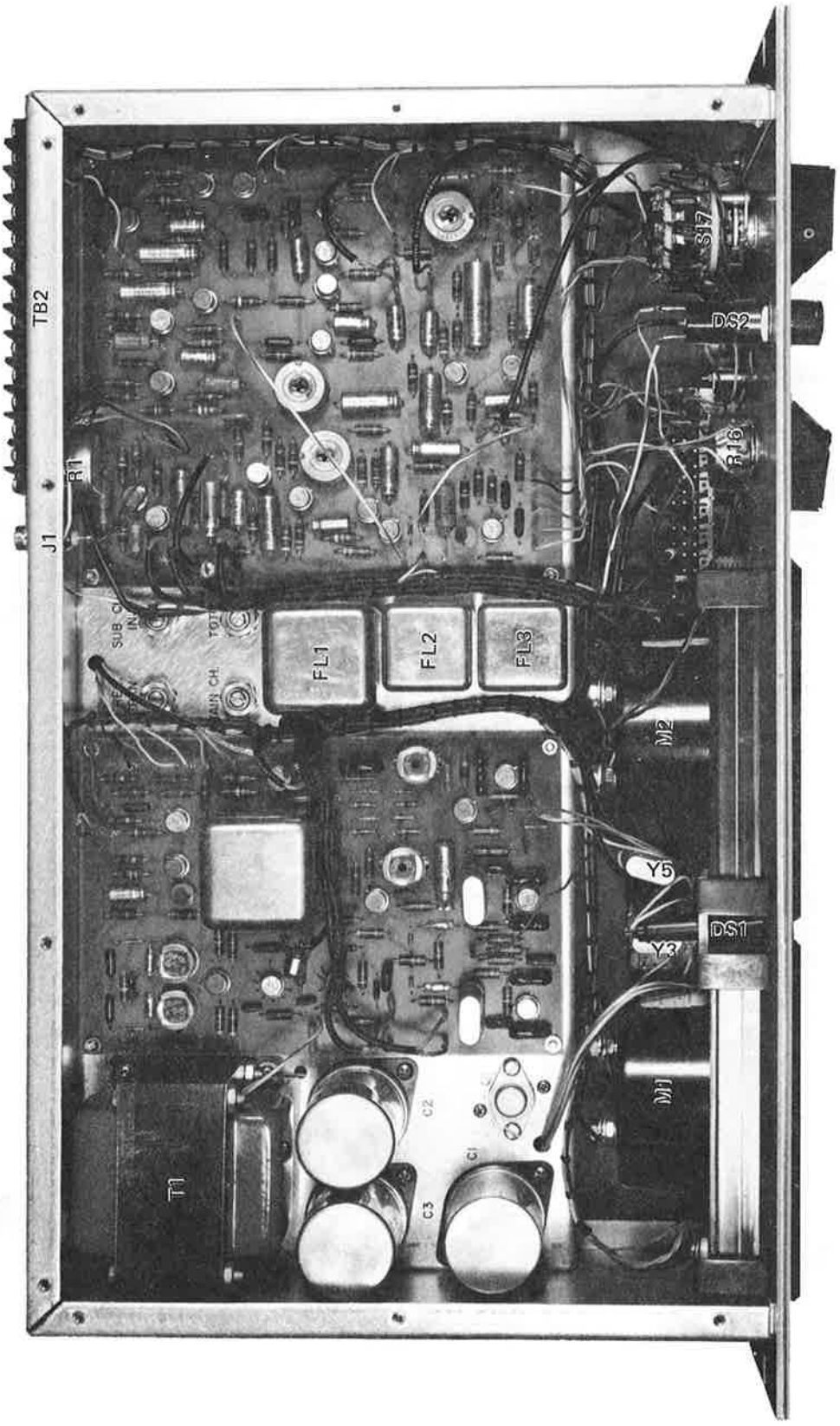


Figure 5–3. Chassis, Top View

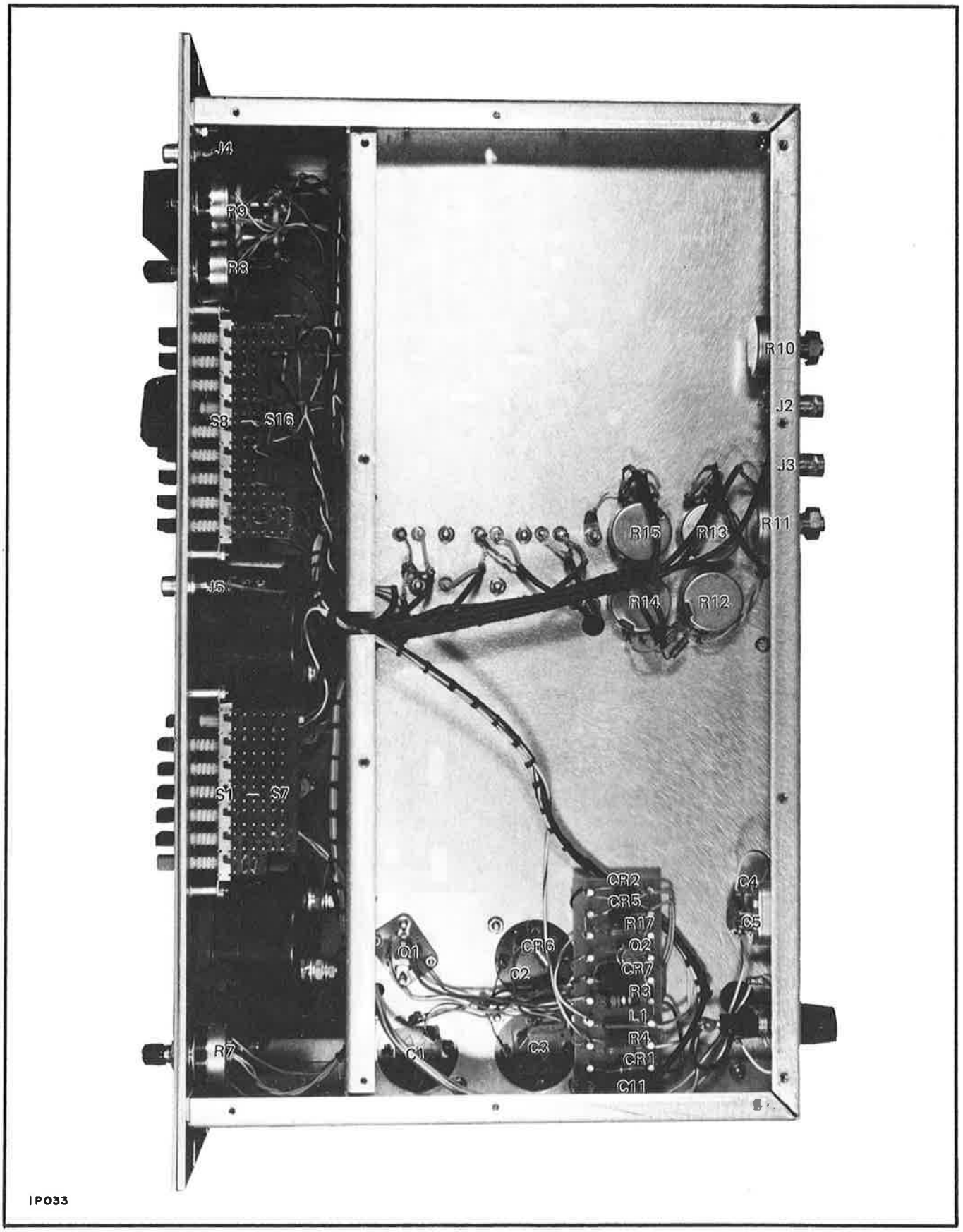


Figure 5–4. Chassis, Bottom View

SECTION 6
REPLACEABLE PARTS

6–1 INTRODUCTION

This section contains information for ordering replaceable parts for the monitor. The table lists the parts in alpha-numerical order of their reference designations and provides a description of the part and the RCA stock number.

6–2 ORDERING INFORMATION

To order a replacement part from RCA, address the order according to the information on the inside cover of this instruction book and supply the following information:

a. Type number and serial number of unit.

b. Description of part including the reference designation and location.

c. RCA Stock or Master Item (MI) Number.

REFERENCE DESIGNATORS

A	= assembly	J	= jack	S	= switch
C	= capacitor	L	= inductor	T	= transformer
CR	= diode	M	= meter	TB	= terminal board
DS	= device signaling(lamp)	P	= plug	W	= cable
F	= fuse	Q	= transistor	X	= oven
FL	= filter	R	= resistor	Y	= crystal

ABBREVIATIONS

CER	= ceramic	MEG	= 1,000,000	POT	= potentiometer
COMP	= composition	METFLM	= metal film	SEMICON	= semiconductor
CONN	= connector	MY	= mylar	SI	= silicon
ELECT	= electrolytic	PC	= printed circuits	U	= micro
F	= farads	PIV	= peak inverse voltage	VDCW	= dc working volts
FXD	= fixed	POLY	= polystyrene	W	= watts
GE	= germanium	PORC	= porcelain	WW	= wirewound
K	= kilo = 1000				

REPLACEMENT PARTS

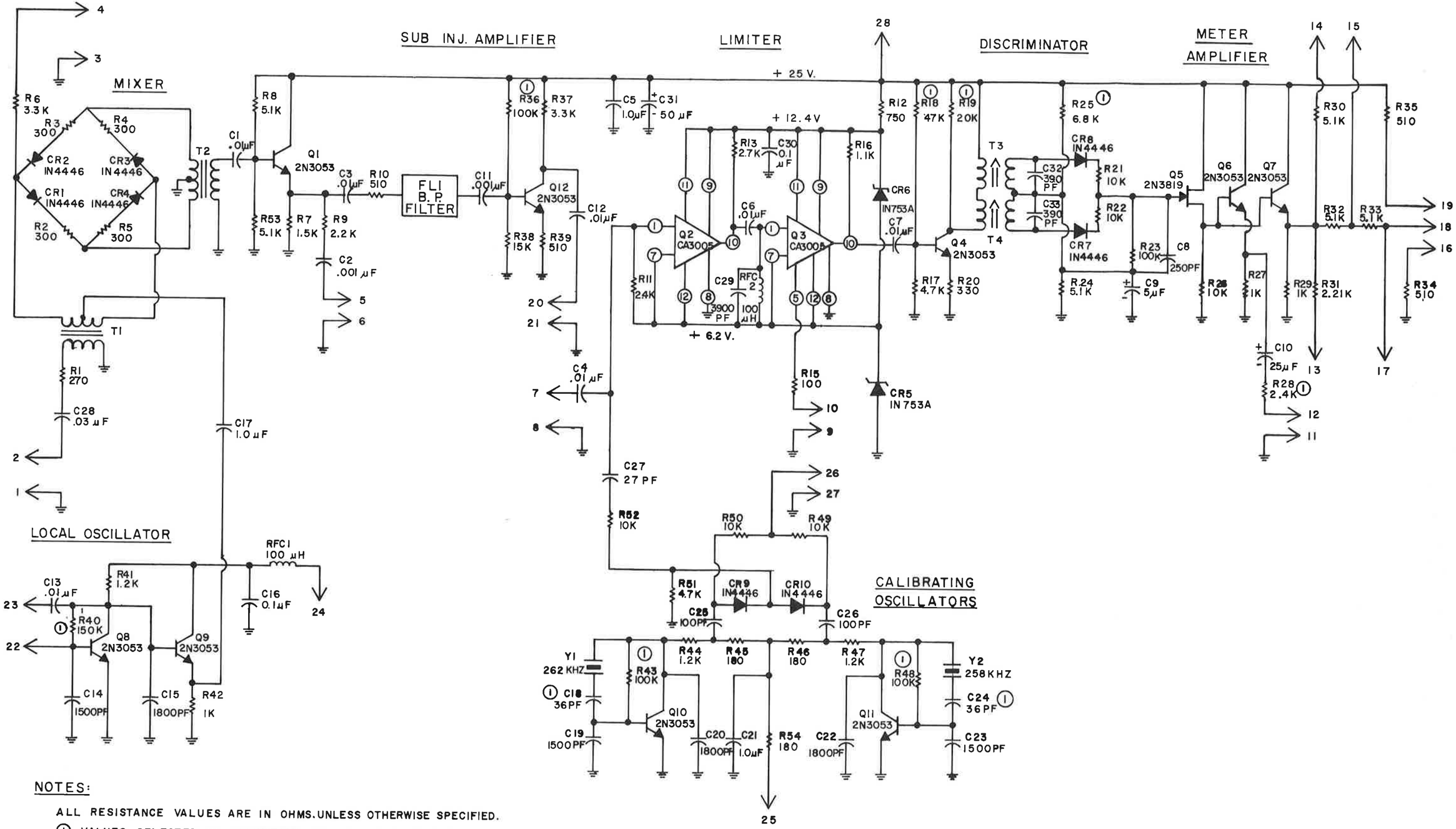
Symbol	Stock No.	Drawing No.	Description
			BW-95A SCA FREQUENCY AND MODULATION MONITOR MI-560745
			MAIN CHASSIS
			CAPACITORS
C1	227721		ELECTROLYTIC, 500 MF 50 V DC
C2	246926		ELECTROLYTIC, 1000 MF 50 V DC
C3	246926		ELECTROLYTIC, 1000 MF 50 V DC
C4	267478		CERAMIC, .01 MF 1 KV
C5	267478		CERAMIC, .01 MF 1 KV
C6 TO C10	220259		MICA, 36 PF 5% 500 V DC
C11	238046		FILM, 0.22 MF 10% 80 V DC
CR1 TO CR5	921608		DIODE - SILICON, TYPE 1N2070
CR6	232946		DIODE - ZENER, TYPE 1N30308
CR7	248418		DIODE - SELAR
DS1	248420		LAMP - INDICATOR ASSEMBLY, AMBER
DS2	212721		LAMP - INCANDESCENT, 28 V 0.07A
F1	003748		FUSE - CARTRIDGE, 1/2 AMP, 250 V
FL1	419867		FILTER - 260 KHZ, BAND PASS
FL2	419868		FILTER - 9 KHZ, LOW PASS
FL3	248442		FILTER - 15 KHZ, LOW PASS
M1	419869		METER - FREQUENCY, 2 KHZ
M2	419870		METER - MODULATION, 0 TO 133% MOD
Q1	262116		TRANSISTOR - SILICON, TYPE 2N3054
Q2	232841		TRANSISTOR - SILICON, TYPE 2N3053
			RESISTORS - FIXED COMPOSITION, UNLESS NOTED
R1	300035		VARIABLE, 100 OHMS 10% 2 W
R2	502210		1000 OHMS 5% 1/2 W
R3	238135		WIREWOUND, 0.33 OHMS 5% 1 W
R4	217145		WIREWOUND, 100 OHMS 5% 3 W
R5	502262		6200 OHMS 5% 1/2 W
R6	502251		5100 OHMS 5% 1/2 W
R7	248399		VARIABLE WIREWOUND, 100 OHMS 10% 2 W
R8	248401		VARIABLE WIREWOUND, 500 OHMS 10% 2 W
R9	248399		VARIABLE WIREWOUND, 100 OHMS 10% 2 W
R10	300031		VARIABLE, 100,000 OHMS 10% 2 W
R11	300031		VARIABLE, 100,000 OHMS 10% 2 W
R12	098077		VARIABLE, 50,000 OHMS 10% 2 W
R13	057221		VARIABLE, 5000 OHMS 10% 2 W
R14	300054		VARIABLE, 1000 OHMS 10% 2 W
R15	300054		VARIABLE, 1000 OHMS 10% 2 W
R16	248401		VARIABLE WIREWOUND, 500 OHMS 10% 2 W
R17	260951		WIREWOUND, 1.5 OHMS 5% 3 W
R18	502212		1200 OHMS 5% 1/2 W
R19	502212		1200 OHMS 5% 1/2 W
R20	263972		FILM, 1000 OHMS 1% 1/8 W
R21	245280		FILM, 499 OHMS 1% 1/8 W
R22	236177		FILM, 1500 OHMS 1% 1/8 W
R23 TO R27	502582		8.2 MEGOHM 5% 1/2 W
R28	238498		FILM, 200 OHMS 1% 1/8 W
R29	236797		FILM, 442 OHMS 1% 1/8 W
R30	239707		FILM, 221 OHMS 1% 1/8 W
R31	239707		FILM, 221 OHMS 1% 1/8 W
R32	248449		FILM, 1370 OHMS 1% 1/8 W
R33	236797		FILM, 442 OHMS 1% 1/8 W
R34	248449		FILM, 1370 OHMS 1% 1/8 W
R35	236797		FILM, 442 OHMS 1% 1/8 W
R36	248449		FILM, 1370 OHMS 1% 1/8 W
R37	502224		2400 OHMS 5% 1/2 W
Y1	419871		CRYSTAL, 301 kHz (FOR 41 kHz SUBCARRIER FREQUENCY)
Y2	420148		CRYSTAL, 302 kHz (FOR 42 kHz SUBCARRIER FREQUENCY)
Y3	420149		CRYSTAL, 327 kHz (FOR 67 kHz SUBCARRIER FREQUENCY)

Symbol	*Stock No.*	*Drawing No.*	*Description*
Y4	SPECIAL	ORDER	CRYSTAL, OTHER THAN ABOVE (SPECIFY FREQUENCY)
Y5	240150		CRYSTAL, 260 kHz
			A1 CARD-OSCILLATOR, IF AND MIXER
			CAPACITORS
A1C1	261542		CERAMIC, .01 MF 100 V DC
A1C2	240846		CERAMIC, .001 MF 1000 V
A1C3	261542		CERAMIC, .01 MF 100 V DC
A1C4	261542		CERAMIC, .01 MF 100 V DC
A1C5	248409		CERAMIC, 1.0 MF 25 V DC
A1C6	261542		CERAMIC, .01 MF 100 V DC
A1C7	261542		CERAMIC, .01 MF 100 V DC
A1C8	242252		MICA, 250 PF 5% 500 V DC
A1C9	231493		ELECTROLYTIC, 5 MF 25 V DC
A1C10	260552		ELECTROLYTIC, 25 MF 12 V DC
A1C11	240846		CERAMIC, .001 MF 1000 V
A1C12	261542		CERAMIC, .01 MF 100 V DC
A1C13	261542		CERAMIC, .01 MF 100 V DC
A1C14	218777		MICA, 1500 PF 5% 300 V DC
A1C15	215380		MICA, 1800 PF 5% 300 V DC
A1C16	239051		CERAMIC, 0.1 MF 50 V DC
A1C17	248409		CERAMIC, 1.0 MF 25 V DC
A1C18	220259		MICA, 36 PF 5% 500 V DC
A1C19	218777		MICA, 1500 PF 5% 300 V DC
A1C20	215380		MICA, 1800 PF 5% 300 V DC
A1C21	248409		CERAMIC, 1.0 MF 25 V DC
A1C22	215380		MICA, 1800 PF 5% 300 V DC
A1C23	218777		MICA, 1500 PF 5% 300 V DC
A1C24	220259		MICA, 36 PF 5% 500 V DC
A1C25	419872		FILM, 100 PF 2 1/2% 125 V DC
A1C26	419872		FILM, 100 PF 2 1/2% 125 V DC
A1C27	218098		MICA, 27 PF 5% 500 V DC
A1C28	419864		MICA, .03 MF 10% 100 V DC
A1C29	419873		FILM, 3900 PF 2 1/2% 125 V DC
A1C30	239051		CERAMIC, 0.1 MF 50 V DC
A1C31	300092		ELECTROLYTIC, 50 MF 25 V DC
A1C32	419874		FILM, 390 PF 2 1/2% 125 V DC
A1C33	419874		FILM, 390 PF 2 1/2% 125 V DC
A1CR1 TO A1CR4	248403		DIODE - SILICON, TYPE 1N4446
A1CR5	236201		DIODE - ZENER, TYPE 1N753A
A1CR6	236201		DIODE - ZENER, TYPE 1N753A
A1CR7 TO A1CR10	248403		DIODE - SILICON, TYPE 1N4446
A1FL1	419875		FILTER - INJECTION
A1Q1	232841		TRANSISTOR - SILICON, TYPE 2N3053
A1Q2	419865		INTEGRATED CIRCUIT, TYPE CA3005
A1Q3	419865		INTEGRATED CIRCUIT, TYPE CA3005
A1Q4	232841		TRANSISTOR - SILICON, TYPE 2N3053
A1Q5	248417		TRANSISTOR - SILICON, FET TYPE 2N3819
A1Q6 TO A1Q12	232841		TRANSISTOR - SILICON, TYPE 2N3053
			RESISTORS - FIXED COMPOSITION, UNLESS NOTED
A1R1	502127		270 OHMS 5% 1/2 W
A1R2 TO A1R5	502130		300 OHMS 5% 1/4 W
A1R6	502233		3300 OHMS 5% 1/2 W
A1R7	502215		1500 OHMS 5% 1/2 W
A1R8	502251		5100 OHMS 5% 1/2 W
A1R9	502222		2200 OHMS 5% 1/2 W

Symbol	*Stock No.*	*Drawing No.*	*Description*
A1R10	502151		510 OHMS 5% 1/2 W
A1R11	502224		2400 OHMS 5% 1/2 W
A1R12	502175		750 OHMS 5% 1/2 W
A1R13	502227		2700 OHMS 5% 1/2 W
A1R15	502110		100 OHMS 5% 1/2 W
A1R16	502211		1100 OHMS 5% 1/2 W
A1R17	502247		4700 OHMS 5% 1/2 W
A1R18	502347		47,000 OHMS 5% 1/2 W
A1R19	502320		20,000 OHMS 5% 1/2 W
A1R20	502133		330 OHMS 5% 1/2 W
A1R21	264844		FILM, 10,000 OHMS 1% 1/8 W
A1R22	264844		FILM, 10,000 OHMS 1% 1/8 W
A1R23	502411		100,000 OHMS 5% 1/2 W
A1R24	502251		5100 OHMS 5% 1/2 W
A1R25	502268		6800 OHMS 5% 1/2 W
A1R26	502310		10,000 OHMS 5% 1/2 W
A1R27	502210		1000 OHMS 5% 1/2 W
A1R28	502224		2400 OHMS 5% 1/2 W
A1R29	502210		1000 OHMS 5% 1/2 W
A1R30	502251		5100 OHMS 5% 1/2 W
A1R31	238522		2210 OHMS 1% 1/8 W
A1R32	502251		5100 OHMS 5% 1/2 W
A1R33	502251		5100 OHMS 5% 1/2 W
A1R34	502151		510 OHMS 5% 1/2 W
A1R35	502151		510 OHMS 5% 1/2 W
A1R36	502411		100,000 OHMS 5% 1/2 W
A1R37	502233		3300 OHMS 5% 1/2 W
A1R38	502315		15,000 OHMS 5% 1/2 W
A1R39	502151		510 OHMS 5% 1/2 W
A1R40	502415		150,000 OHMS 5% 1/2 W
A1R41	502212		1200 OHMS 5% 1/2 W
A1R42	502210		1000 OHMS 5% 1/2 W
A1R43	502411		100,000 OHMS 5% 1/2 W
A1R44	502212		1200 OHMS 5% 1/2 W
A1R45	502118		180 OHMS 5% 1/2 W
A1R46	502118		180 OHMS 5% 1/2 W
A1R47	502212		1200 OHMS 5% 1/2 W
A1R48	502411		100,000 OHMS 5% 1/2 W
A1R49	502310		10,000 OHMS 5% 1/2 W
A1R50	502310		10,000 OHMS 5% 1/2 W
A1R51	502247		4700 OHMS 5% 1/2 W
A1R52	502310		10,000 OHMS 5% 1/2 W
A1R53	502251		5100 OHMS 5% 1/2 W
A1R54	502118		180 OHMS 5% 1/2 W
A1RFC1	419876		CHOKE - RF, 100 UH
A1RFC2	419876		CHOKE - RF, 100 UH
A1T1	419877		TRANSFORMER - MIXER, INPUT
A1T2	419878		TRANSFORMER - MIXER, OUTPUT
A1T3	419879		TRANSFORMER - DISCRIMINATOR
A1T4	419880		TRANSFORMER - DISCRIMINATOR
A1Y1	419881		CRYSTAL - 262 KHZ
A1Y2	419882		CRYSTAL - 258 KHZ
			A2 CARD-AMPLIFIER, METERING AND FLASHER
			CAPACITORS
A2C1	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C2	239051		CERAMIC, 0.1 MF 50 V DC
A2C3	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C4	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C5	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C6	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C7	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C8	260552		ELECTROLYTIC, 25 MF 12 V DC
A2C9	260552		ELECTROLYTIC, 25 MF 12 V DC
A2C10	238046		FILM, 0.22 MF 10% 80 V DC
A2C11	231493		ELECTROLYTIC, 5 MF 25 V DC

Symbol	Stock No.	Drawing No.	Description
A2C12	231920		ELECTROLYTIC, 200 MF 12 V DC
A2C13	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C14	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C15	227419		ELECTROLYTIC, 100 MF 15 V DC
A2C16	261542		CERAMIC, .01 MF 100 V DC
A2C17	247949		FILM, 0.1 MF 10% 80 V DC
A2C18	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C19	247949		FILM, 0.1 MF 10% 80 V DC
A2C20	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C21	259471		FILM, 0.047 MF 10% 200 V DC
A2C22	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C23	239051		CERAMIC, 0.1 MF 50 V DC
A2C24	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C25	300092		ELECTROLYTIC, 50 MF 25 V DC
A2C26	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C27	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C28	241252		MICA, 250 PF 5% 500 V DC
A2C29	300184		MICA, 120 PF 5% 500 V DC
A2C30	231493		ELECTROLYTIC, 5 MF 25 V DC
A2C31	241252		MICA, 250 PF 5% 500 V DC
A2C32	419595		CERAMIC, 0.22 MF 50 V DC
A2CR1	248454		DIODE - ZENER, TYPE 1N1514
A2CR2	248403		DIODE - SILICON, TYPE 1N4446
A2CR3			
TO			
A2CR6	248402		DIODE - GERMANIUM, TYPE 1N541
A2CR7	248403		DIODE - SILICON, TYPE 1N4446
A2CR8	225315		DIODE - ZENER, TYPE 1N965B
A2Q1			
TO			
A2Q6	232841		TRANSISTOR - SILICON, TYPE 2N3053
A2Q7	248417		TRANSISTOR - SILICON, FET TYPE 2N3819
A2Q8	232841		TRANSISTOR - SILICON, TYPE 2N3053
A2Q9	232841		TRANSISTOR - SILICON, TYPE 2N3053
A2Q10	241012		TRANSISTOR - SILICON, TYPE 2N4037
A2Q11			
TO			
A2Q14	232841		TRANSISTOR - SILICON, TYPE 2N3053
A2Q15	419866		TRANSISTOR - SILICON, TYPE 2N3053 } MATCHED PAIR
A2Q16	419866		TRANSISTOR - SILICON, TYPE 2N3053 }
A2Q17			
TO			
A2Q20	232841		TRANSISTOR - SILICON, TYPE 2N3053
			RESISTORS - FIXED COMPOSITION, UNLESS NOTED
A2R1	502322		22,000 OHMS 5% 1/2 W
A2R2	502375		75,000 OHMS 5% 1/2 W
A2R3	238522		FILM, 2210 OHMS 1% 1/8 W
A2R4	502175		750 OHMS 5% 1/2 W
A2R5	502212		1200 OHMS 5% 1/2 W
A2R6	502182		820 OHMS 5% 1/2 W
A2R7	502410		100,000 OHMS 5% 1/2 W
A2R8	502412		120,000 OHMS 5% 1/2 W
A2R9	502310		10,000 OHMS 5% 1/2 W
A2R10	502247		4700 OHMS 5% 1/2 W
A2R11	502347		47,000 OHMS 5% 1/2 W
A2R12	502233		3300 OHMS 5% 1/2 W
A2R13	502124		240 OHMS 5% 1/2 W
A2R14	502218		1800 OHMS 5% 1/2 W
A2R15	226912		WIREWOUND, 3000 OHMS
A2R16	502247		4700 OHMS 5% 1/2 W
A2R17	502324		24,000 OHMS 5% 1/2 W
A2R18	502233		3300 OHMS 5% 1/2 W
A2R19	502133		330 OHMS 5% 1/2 W
A2R20	502182		820 OHMS 5% 1/2 W
A2R21	502482		8.2 MEGOHMS 5% 1/2 W
A2R22	502310		10,000 OHMS 5% 1/2 W
A2R23	502215		1500 OHMS 5% 1/2 W

Symbol	Stock No.	Drawing No.	Description
A2R24	502262		6200 OHMS 5% 1/2 W
A2R25	263972		FILM, 1000 OHMS 1% 1/8 W
A2R26	263972		FILM, 1000 OHMS 1% 1/8 W
A2R27	502151		510 OHMS 5% 1/2 W
A2R28	502151		510 OHMS 5% 1/2 W
A2R29	502210		1000 OHMS 5% 1/2 W
A2R30	502422		220,000 OHMS 5% 1/2 W
A2R31	502347		47,000 OHMS 5% 1/2 W
A2R32	502110		100 OHMS 5% 1/2 W
A2R33	502262		6200 OHMS 5% 1/2 W
A2R34	502312		12,000 OHMS 5% 1/2 W
A2R35	502262		6200 OHMS 5% 1/2 W
A2R36	502110		100 OHMS 5% 1/2 W
A2R37	502312		12,000 OHMS 5% 1/2 W
A2R38	502310		10,000 OHMS 5% 1/2 W
A2R39	502118		180 OHMS 5% 1/2 W
A2R40	502310		10,000 OHMS 5% 1/2 W
A2R41	261960		VARIABLE WIREWOUND, 100 OHMS
A2R42	502310		10,000 OHMS 5% 1/2 W
A2R43	502312		12,000 OHMS 5% 1/2 W
A2R44	502324		24,000 OHMS 5% 1/2 W
A2R45	502222		2200 OHMS 5% 1/2 W
A2R46	502215		1500 OHMS 5% 1/2 W
A2R47	502110		100 OHMS 5% 1/2 W
A2R48	502327		27,000 OHMS 5% 1/2 W
A2R49	502230		3000 OHMS 5% 1/2 W
A2R50	502182		820 OHMS 5% 1/2 W
A2R51	502110		100 OHMS 5% 1/2 W
A2R52	502215		1500 OHMS 5% 1/2 W
A2R53	502162		620 OHMS 5% 1/2 W
A2R54	502216		1600 OHMS 5% 1/2 W
A2R55	226912		WIREWOUND, 3000 OHMS
A2R56	502310		10,000 OHMS 5% 1/2 W
A2R57	502243		4300 OHMS 5% 1/2 W
A2R58	263972		FILM, 1000 OHMS 1% 1/8 W
A2R59	263972		FILM, 1000 OHMS 1% 1/8 W
A2R60	502139		390 OHMS 5% 1/2 W
A2R61	502247		4700 OHMS 5% 1/2 W
A2R62	502247		4700 OHMS 5% 1/2 W
A2R63	502210		1000 OHMS 5% 1/2 W
A2R64	502156		560 OHMS 5% 1/2 W
A2R65	502051		51 OHMS 5% 1/2 W
A2R66	238522		FILM, 2210 OHMS 1% 1/8 W
A2R67	502315		15,000 OHMS 5% 1/2 W
A2R68	502275		7500 OHMS 5% 1/2 W
A2R69	502210		1000 OHMS 5% 1/2 W
A2R70	502222		2200 OHMS 5% 1/2 W
A2R71	502222		2200 OHMS 5% 1/2 W
A2R72	502310		10,000 OHMS 5% 1/2 W
A2R73	502222		2200 OHMS 5% 1/2 W
A2R74	502382		82,000 OHMS 5% 1/2 W
A2R75	502222		2200 OHMS 5% 1/2 W
A2R76	263972		FILM, 1000 OHMS 1% 1/8 W



NOTES:

ALL RESISTANCE VALUES ARE IN OHMS. UNLESS OTHERWISE SPECIFIED.

① VALUES SELECTED IN PRODUCTION, NOMINAL VALUES SHOWN.

2P039

Figure 7–1. A1 Card, Schematic

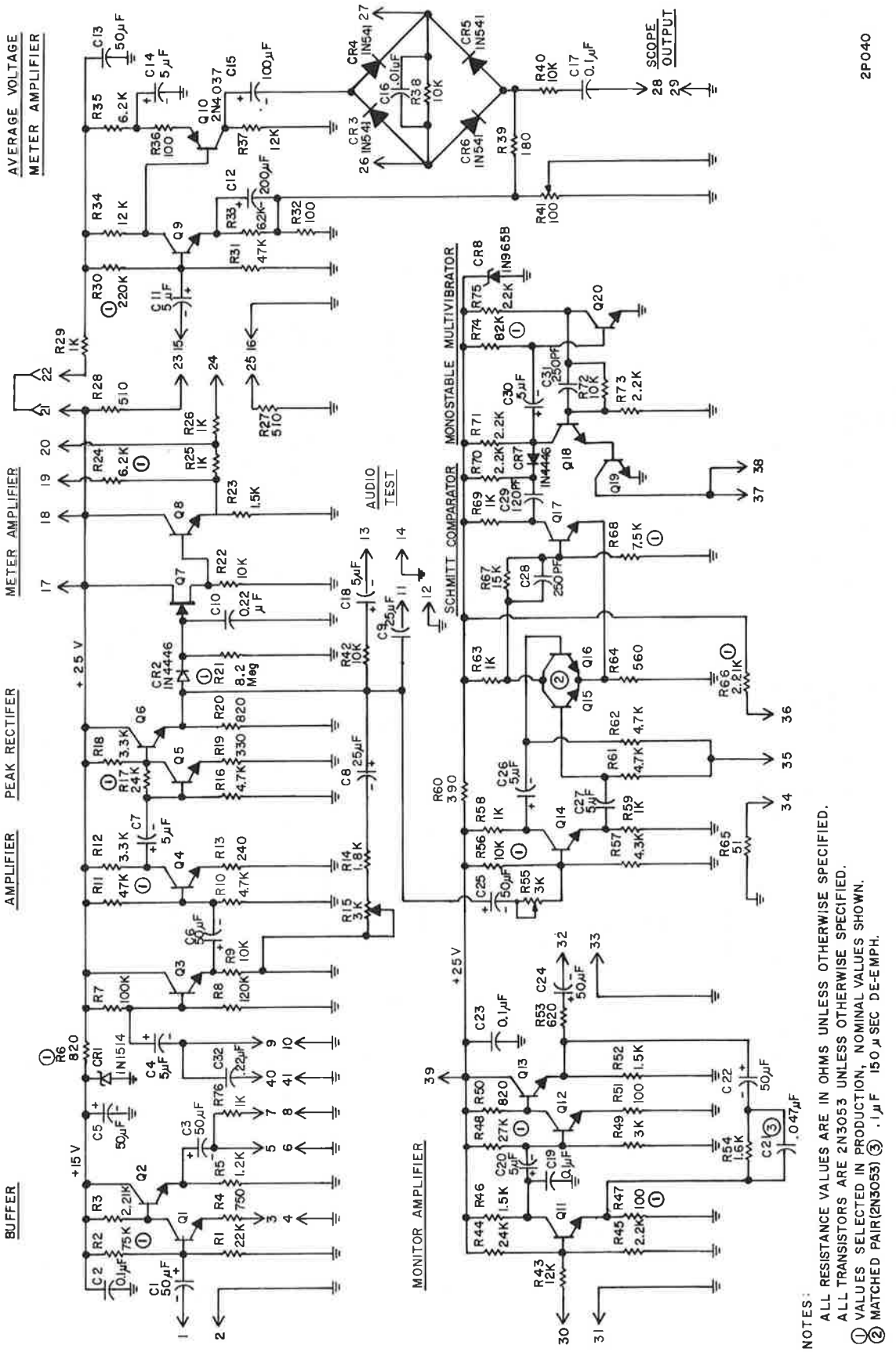


Figure 7–2. A2 Card, Schematic

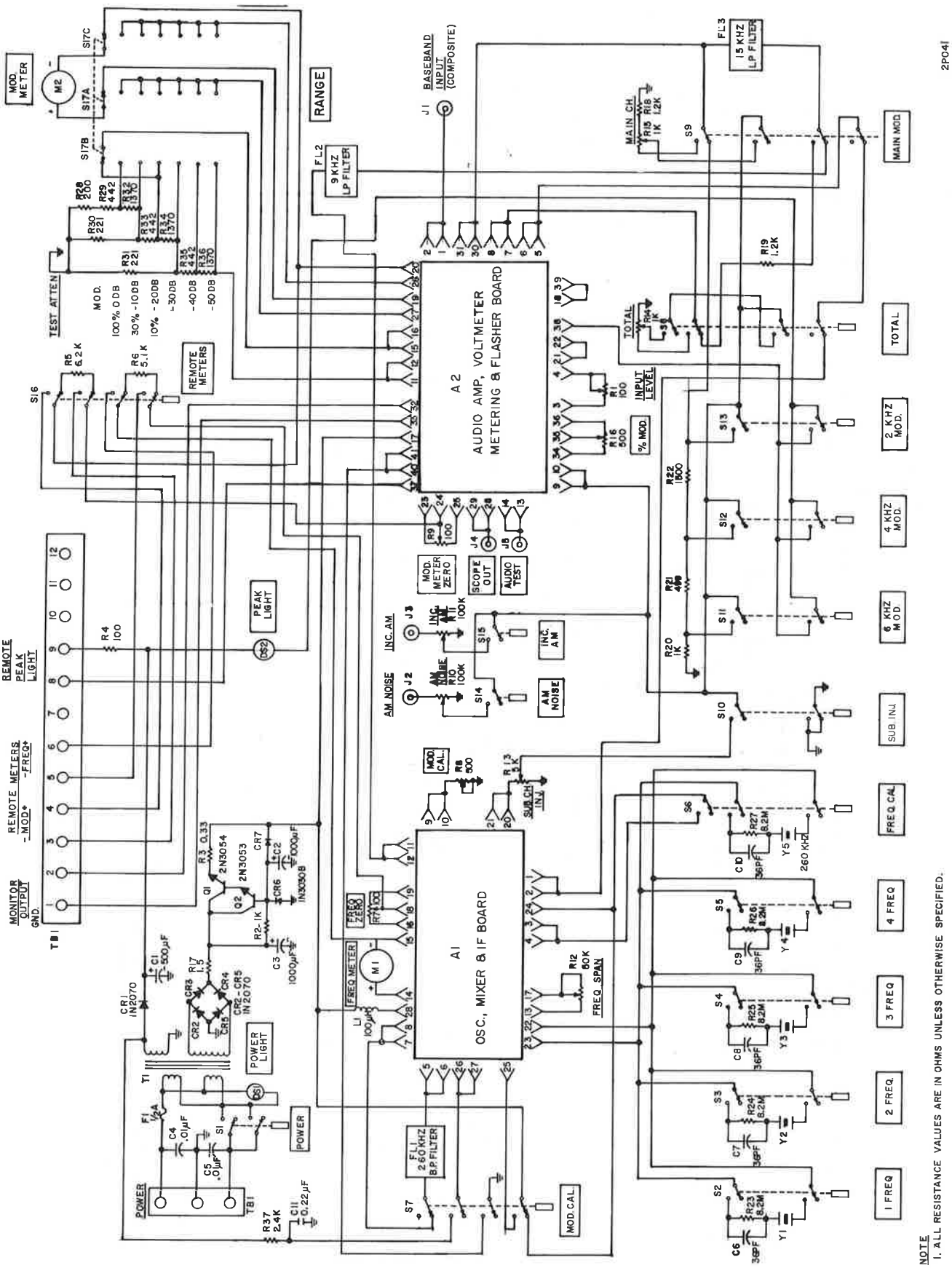


Figure 7–3. Main Chassis, Schematic

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