

# PHOTOFACT<sup>®</sup> with

# CIRCUITRACE<sup>®</sup>

For Supplier Address See PHOTOFACT Index

## NOTE

Repair or adjustment of transmitter circuits must be under supervision of a person with first-or second-class radiotelephone license.

(Refer to FCC Rules and Regulations Part 95, Subpart C & D.)

The frequency of the transmitter should be checked periodically with a secondary frequency standard to insure proper and legal operation.

Best results will be obtained when adjusting the final RF output circuit if the antenna normally used is connected and the chassis is as nearly in the cabinet as possible.

Connect either 50-ohm dummy load or the normally used antenna system.



MIDLAND MODEL 13-830

MODEL 13-830

**HOWARD W. SAMS & CO., INC.** Indianapolis, Indiana 46206

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Printed in U. S. of America

7CY506

## ALIGNMENT INSTRUCTIONS

CAUTION: Use isolation transformer or observe polarity when connecting test equipment. Maintain line voltage at 120V AC. Allow a 15-minute warm-up period. Adjustments made with 13.8-volt DC input. Connect low sides of test equipment to ground unless specified otherwise. Connect 50-ohm dummy load or antenna before keying transmitter. Suggested Alignment Tools: GC Electronics:  
 L112,T106 thru T109.....5009  
 L106,L109,L110.....9304  
 L103,L104,T101 thru T105,T111.....9440

## SYNTHESIZER ALIGNMENT

| TEST EQUIPMENT                     | TRANSCEIVER  | ADJUST | REMARKS                           |
|------------------------------------|--------------|--------|-----------------------------------|
| Input of frequency counter to TP1. | Ch. 13       |        | Check for 10.2392MHz<br>+ 0.4kHz. |
| Input of frequency counter to TP2. | Ch. 1        |        | Check for 37.659200MHz<br>+.5kHz. |
| Input of VTVM to TP8.              | Ch. 1        | T101   | Adjust for 1.5V +0.1 volt.        |
| Input of RF VTVM to TP3.           | Ch. 13       | T111   | Adjust for maximum.               |
| Input of frequency counter to TP4. | Ch. 13, Xmit |        | Check for 10.6942MHz<br>+0.4kHz.  |

## RECEIVER ALIGNMENT

Connect an AC VTVM or AF wattmeter across speaker voice coil. Adjust volume control to obtain a suitable indication. Generator output low enough to prevent AGC limiting.

| TEST EQUIPMENT                                                                               | TRANSCEIVER | ADJUST             | REMARKS                                                      |
|----------------------------------------------------------------------------------------------|-------------|--------------------|--------------------------------------------------------------|
| Output of signal generator thru .01uF to TP5.<br>455kHz,1000Hz @ 30% modulation              | Ch. 13      | T109,T108,<br>T107 | Adjust for maximum output.                                   |
| Output of signal generator thru .01uF to TP3.<br>10.694200MHz,1000Hz @ 30% modulation.       | Ch. 13      | T106,L112          | Adjust for maximum output.                                   |
| Output of signal generator thru .01uF to antenna jack.<br>27.115MHz,1000Hz @ 30% modulation. | Ch. 13      | T105,T104          | Adjust for maximum output. Repeat above steps, if necessary. |

## RECEIVER ADJUSTMENTS

Connect an AC VTVM or AF wattmeter across speaker voice coil. Adjust volume control to obtain a suitable indication.

| TEST EQUIPMENT                                                                                             | TRANSCEIVER | ADJUST | REMARKS                                                                                             |
|------------------------------------------------------------------------------------------------------------|-------------|--------|-----------------------------------------------------------------------------------------------------|
| Output of signal generator thru .01uF to antenna jack.<br>27.115MHz,1000Hz @ 30% modulation. Output 500uV. | Ch. 13      | RV101  | SQUELCH RANGE<br>Set Squelch Control VR2 fully clockwise. Adjust RV101 so that squelch just breaks. |
| Output of signal generator thru .01uF to antenna jack.<br>27.115MHz,1000Hz @ 30% modulation. Output 100uV. | Ch. 13      | RV103  | S METER<br>Adjust for 9 on S scale of meter.                                                        |

## TRANSMITTER ALIGNMENT

Connect an RF wattmeter and 50-ohm, 25-watt dummy load to antenna connector. Be sure to check transmit frequency and power on all active channels after alignment of

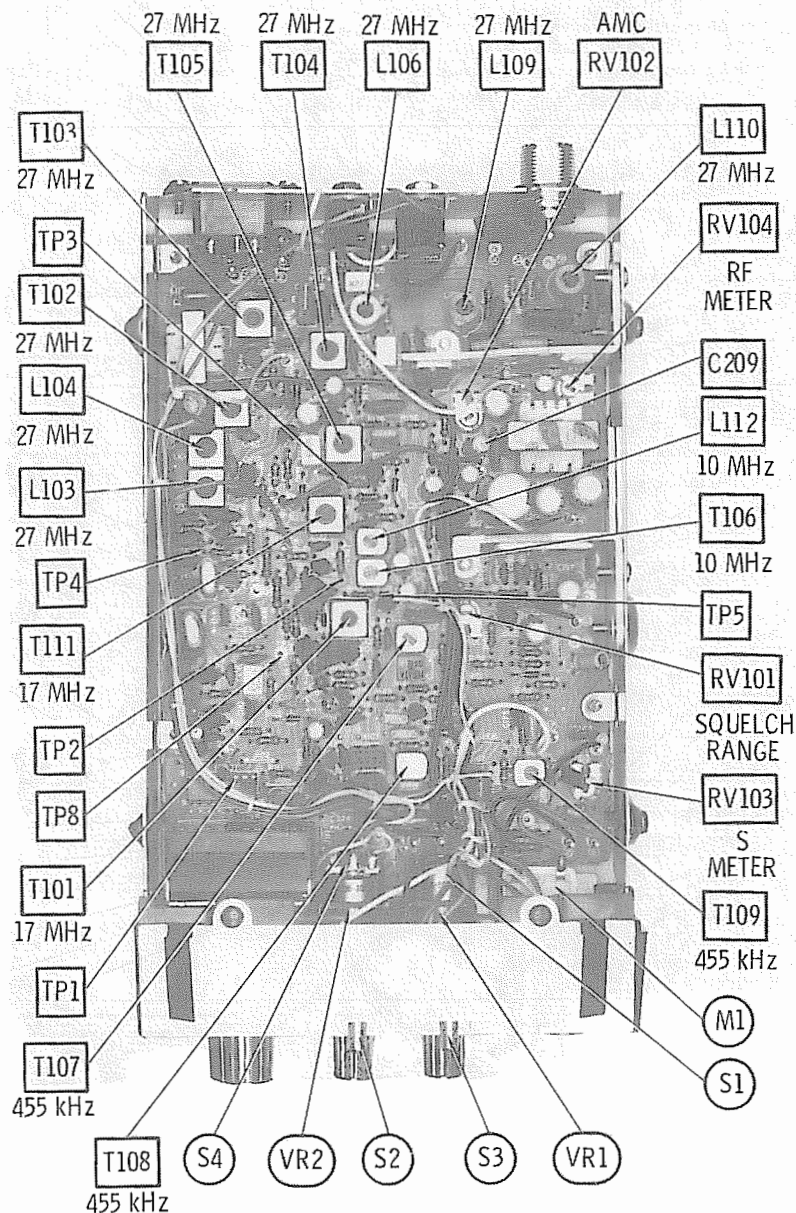
| TEST EQUIPMENT | TRANSCEIVER | ADJUST                                        | REMARKS                     |
|----------------|-------------|-----------------------------------------------|-----------------------------|
|                | Ch. 13      | L103,L104<br>T102,T103,<br>L106,L109,<br>L110 | Adjust for maximum output.  |
|                | Ch. 13      | L110,L109                                     | Adjust for 4 watts maximum. |

## TRANSMITTER ADJUSTMENTS

Connect an RF wattmeter and 50-ohm, 25-watt dummy load to antenna connector.

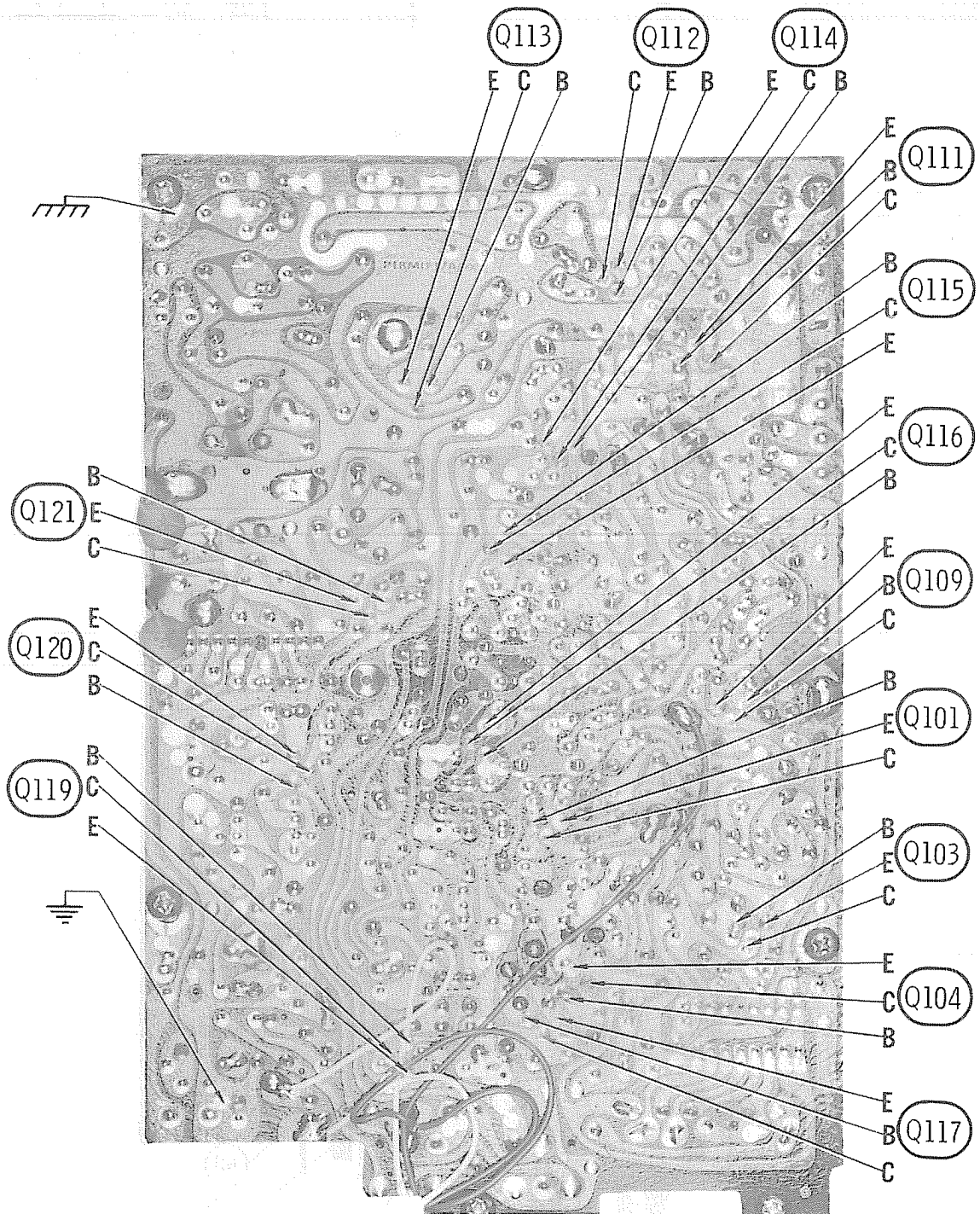
Be sure to check transmit frequency and power on all active channels after adjustments of

| TEST EQUIPMENT                                                            | TRANSCIVER | ADJUST | REMARKS                                                                                                                                   |
|---------------------------------------------------------------------------|------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Modulation meter to antenna jack.<br>Inject a 1000Hz signal at MIC input. | Ch. 13     | RV102  | AMC<br>Disconnect C209 to disable AMC. Adjust signal for overmodulation. Restore AMC operation. Adjust RV102 for 100% modulation maximum. |
|                                                                           | Ch. 13     | RV104  | RF PANEL METER<br>Adjust for 2/3 reading on power meter.                                                                                  |

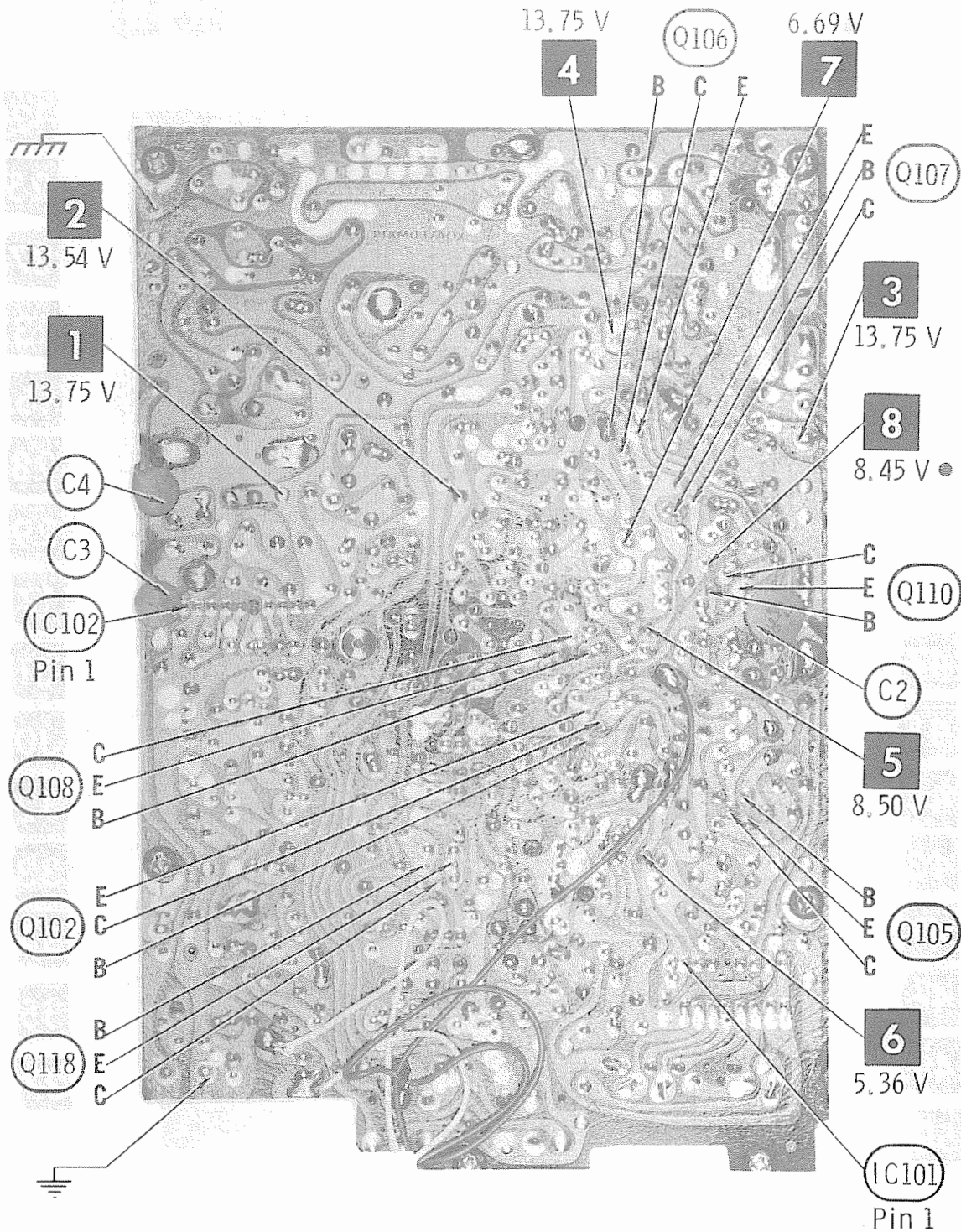


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CHASSIS-BOTTOM



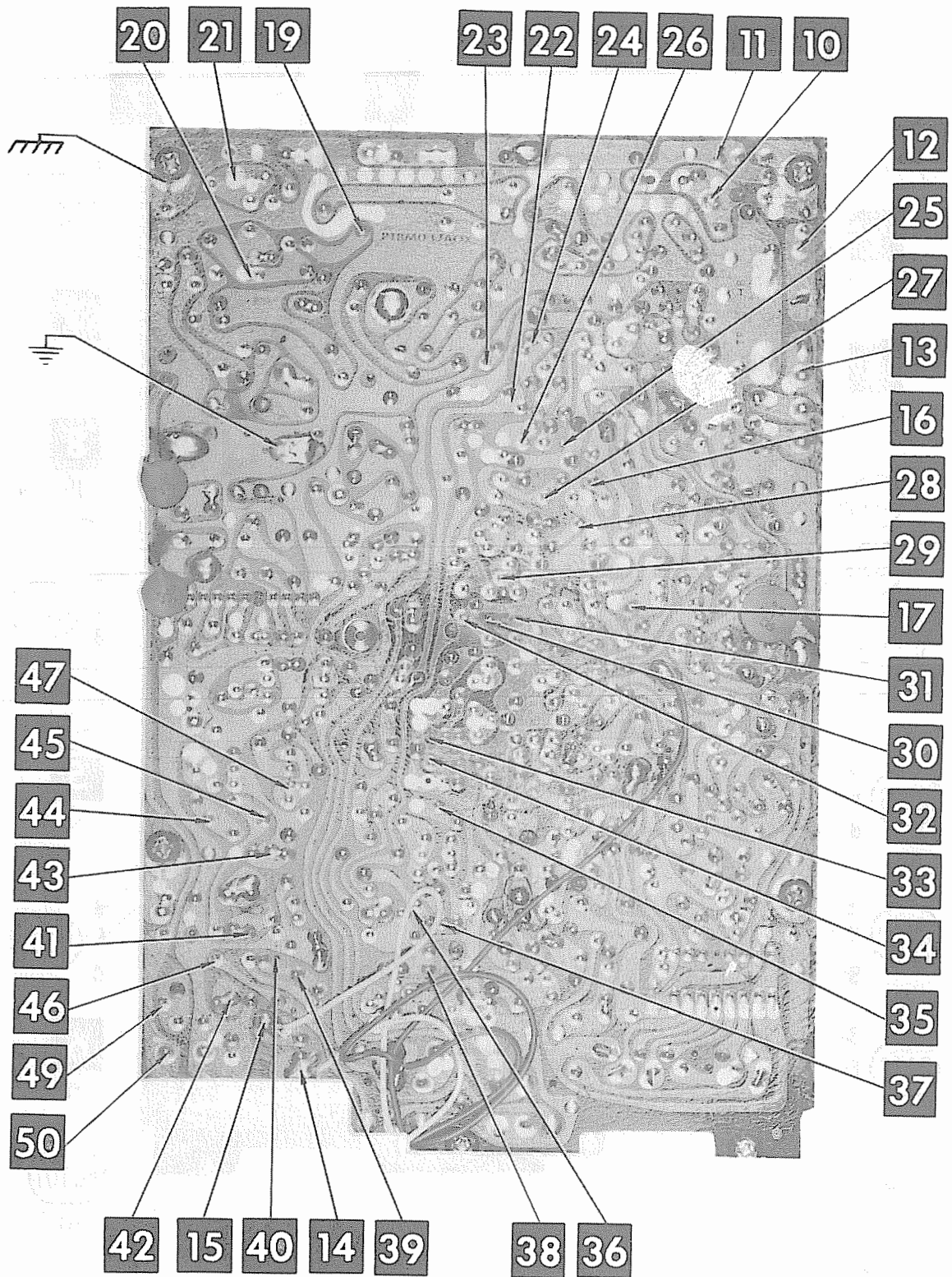
MAIN BOARD



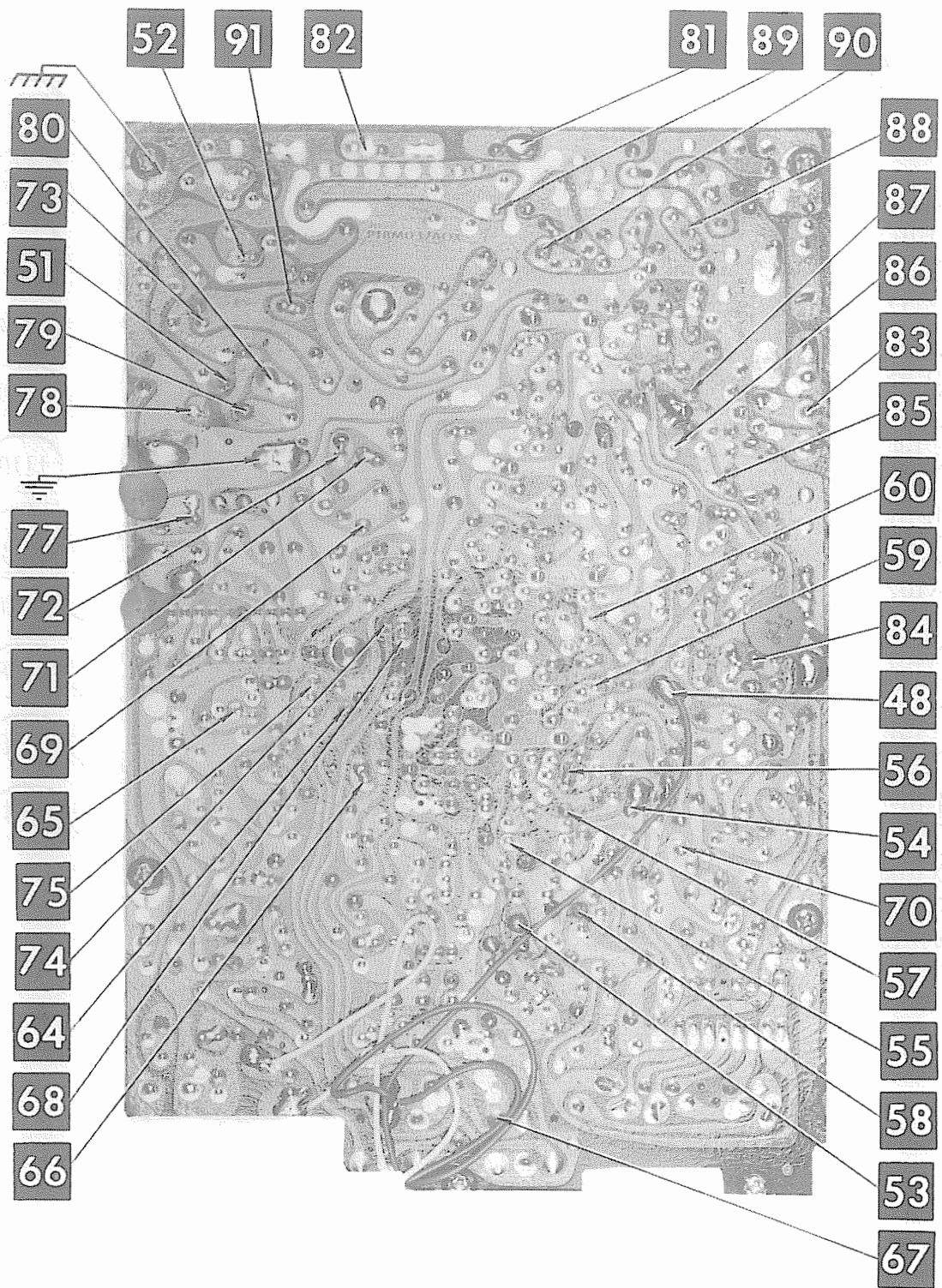
• TRANSMIT

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MAIN BOARD

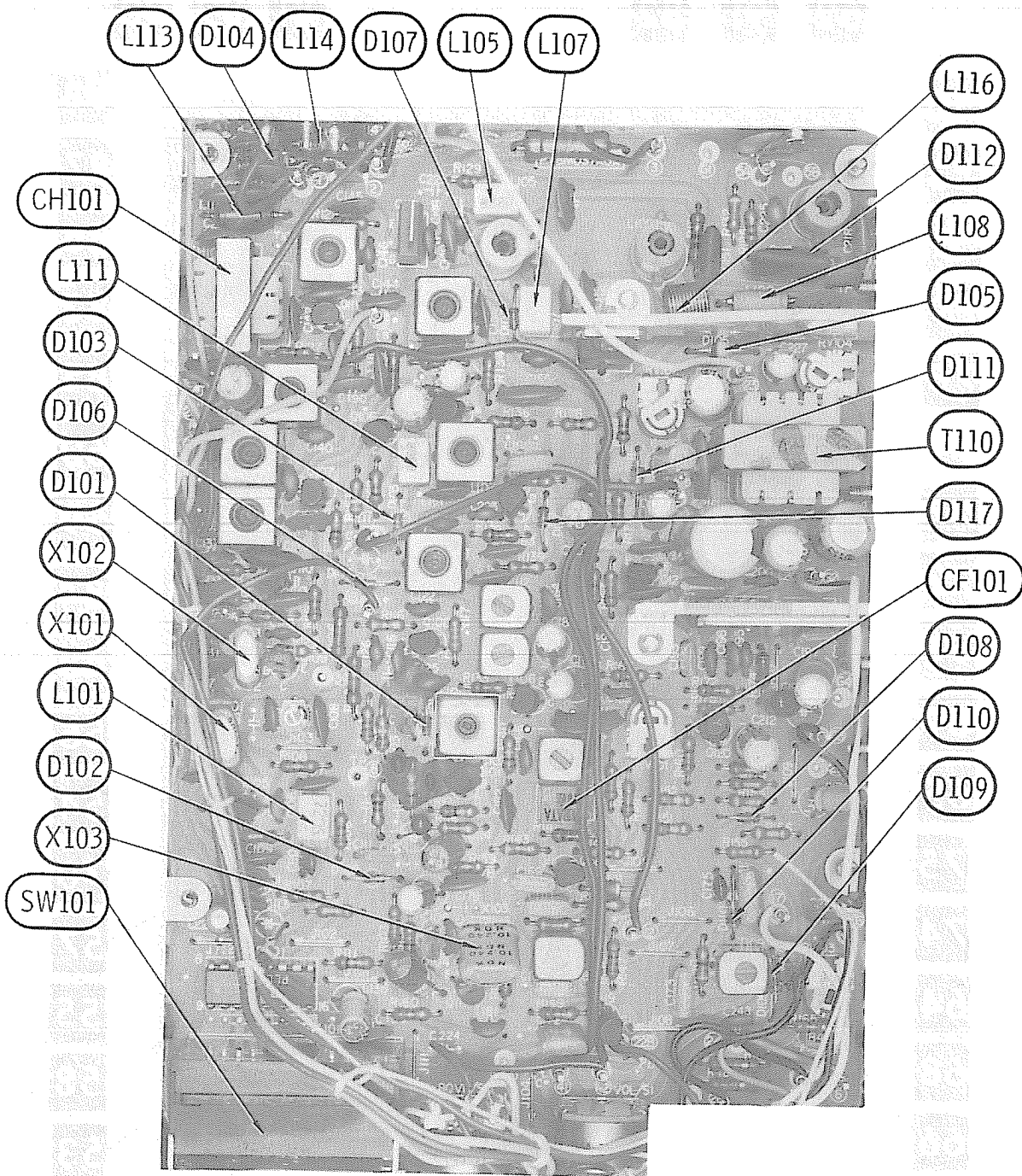


**MAIN BOARD**

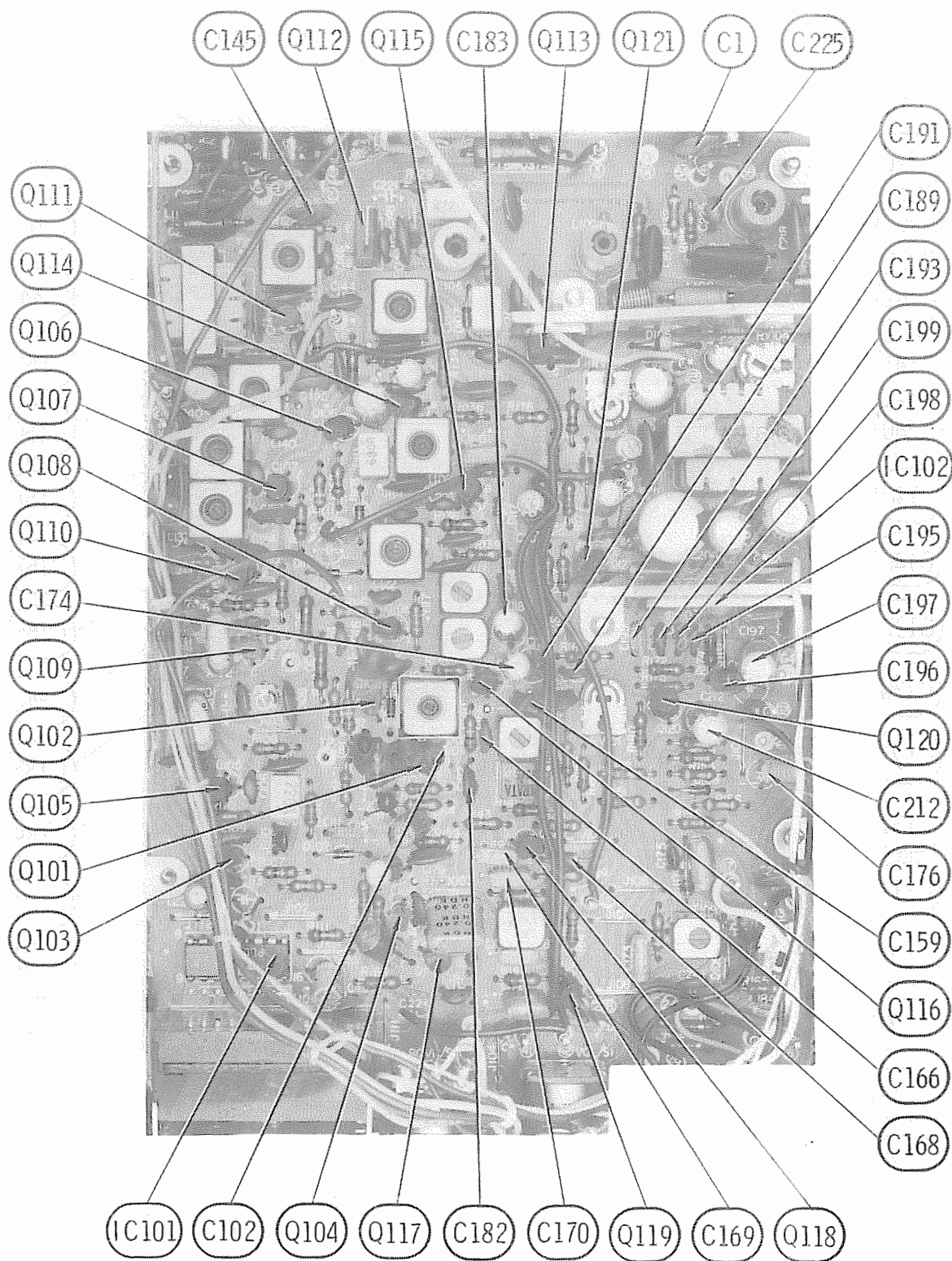


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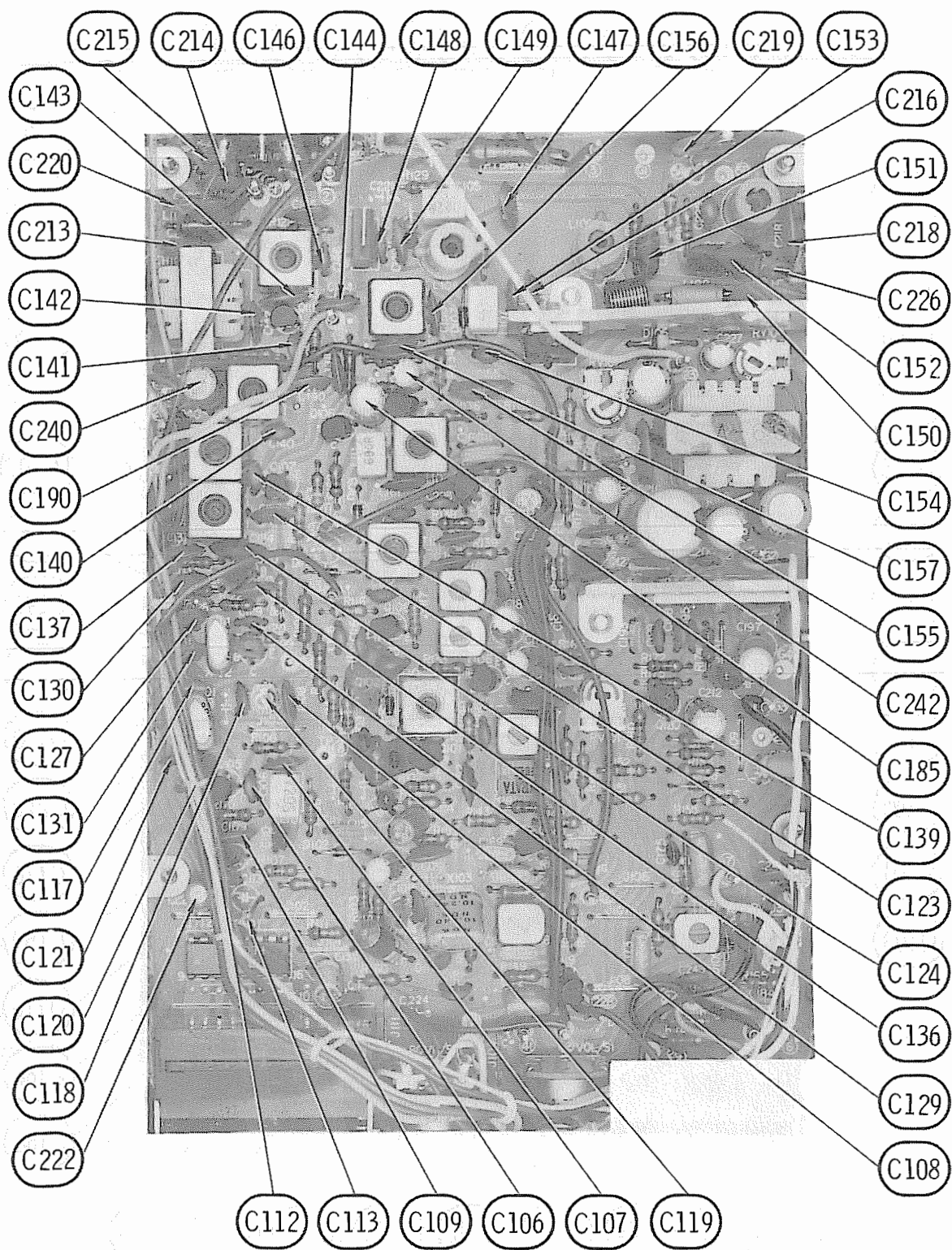
MAIN BOARD



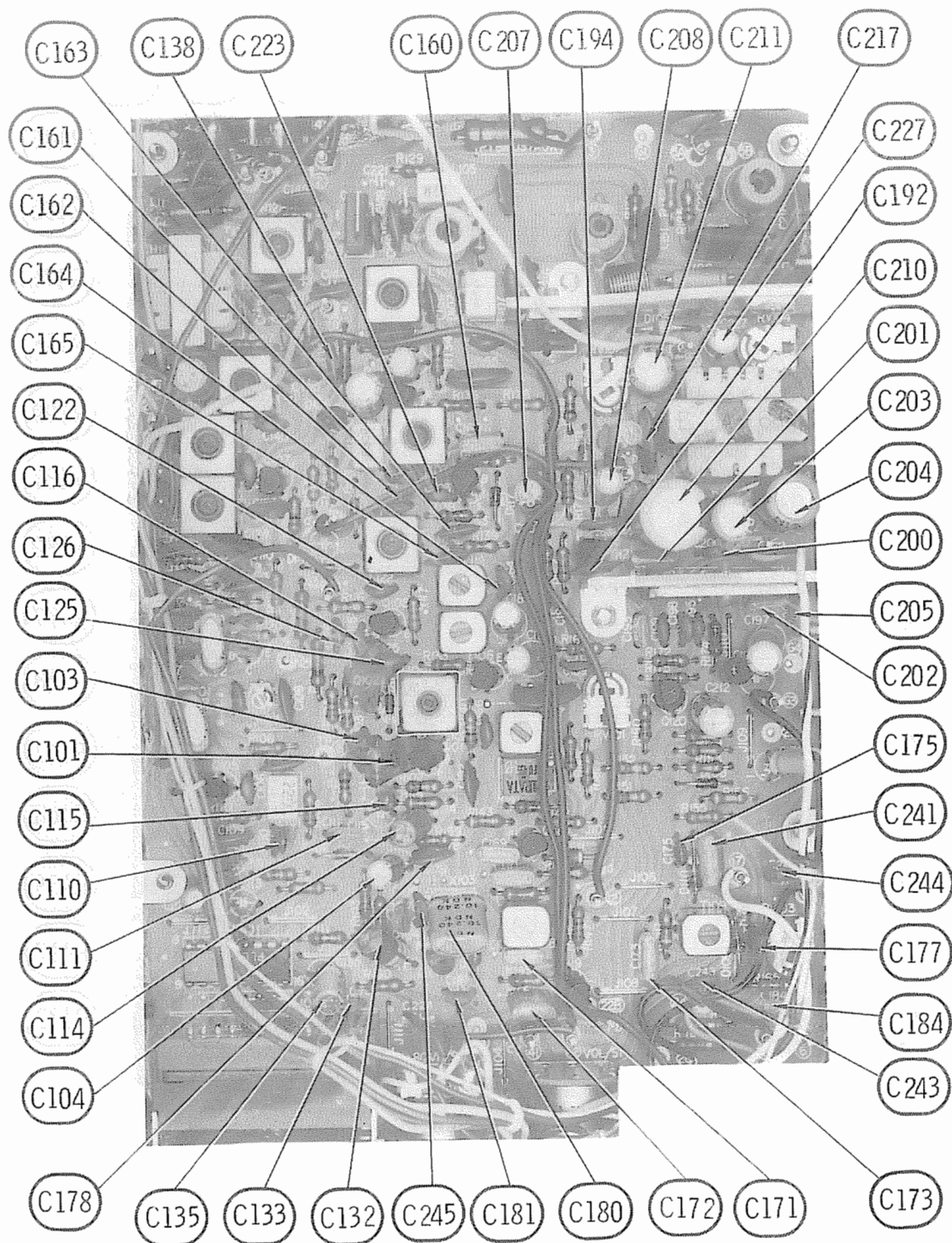
MAIN BOARD



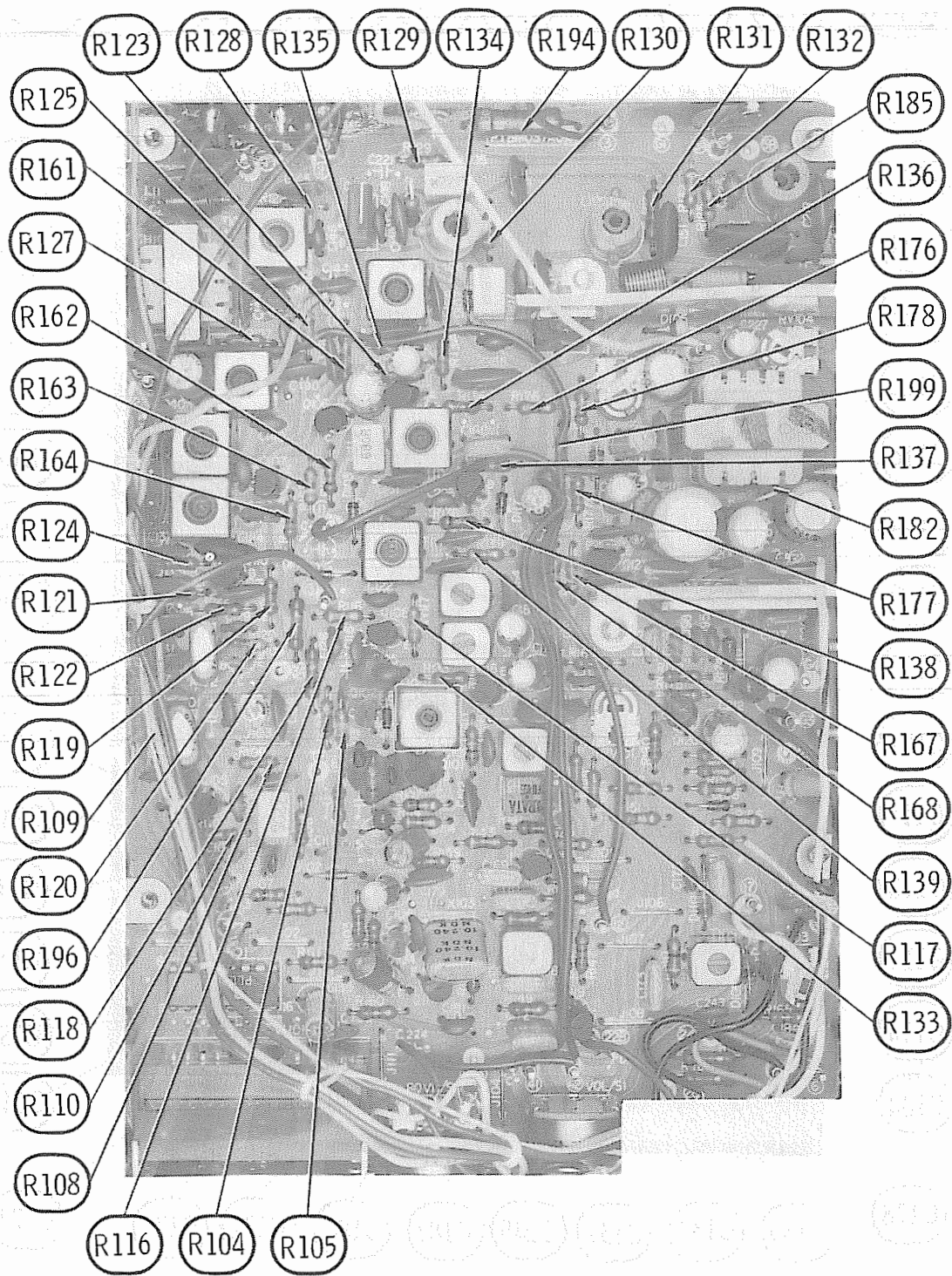
MAIN BOARD



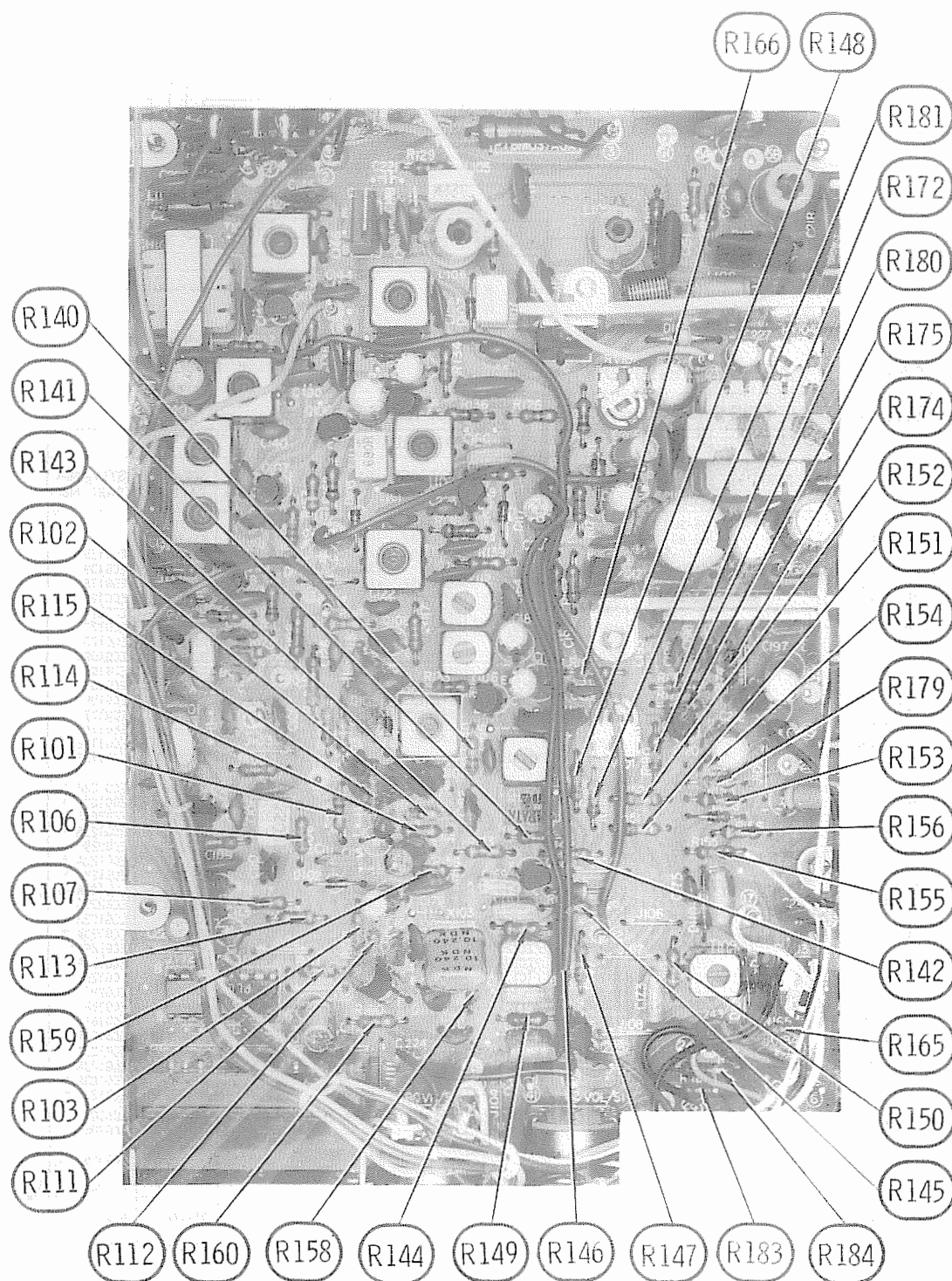
MAIN BOARD



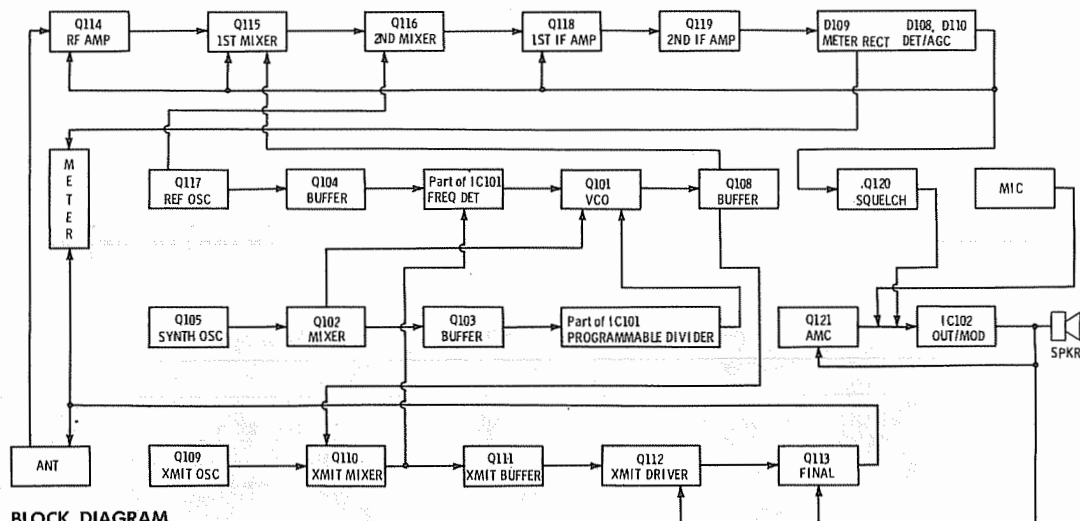
MAIN BOARD



MAIN BOARD



MAIN BOARD



BLOCK DIAGRAM

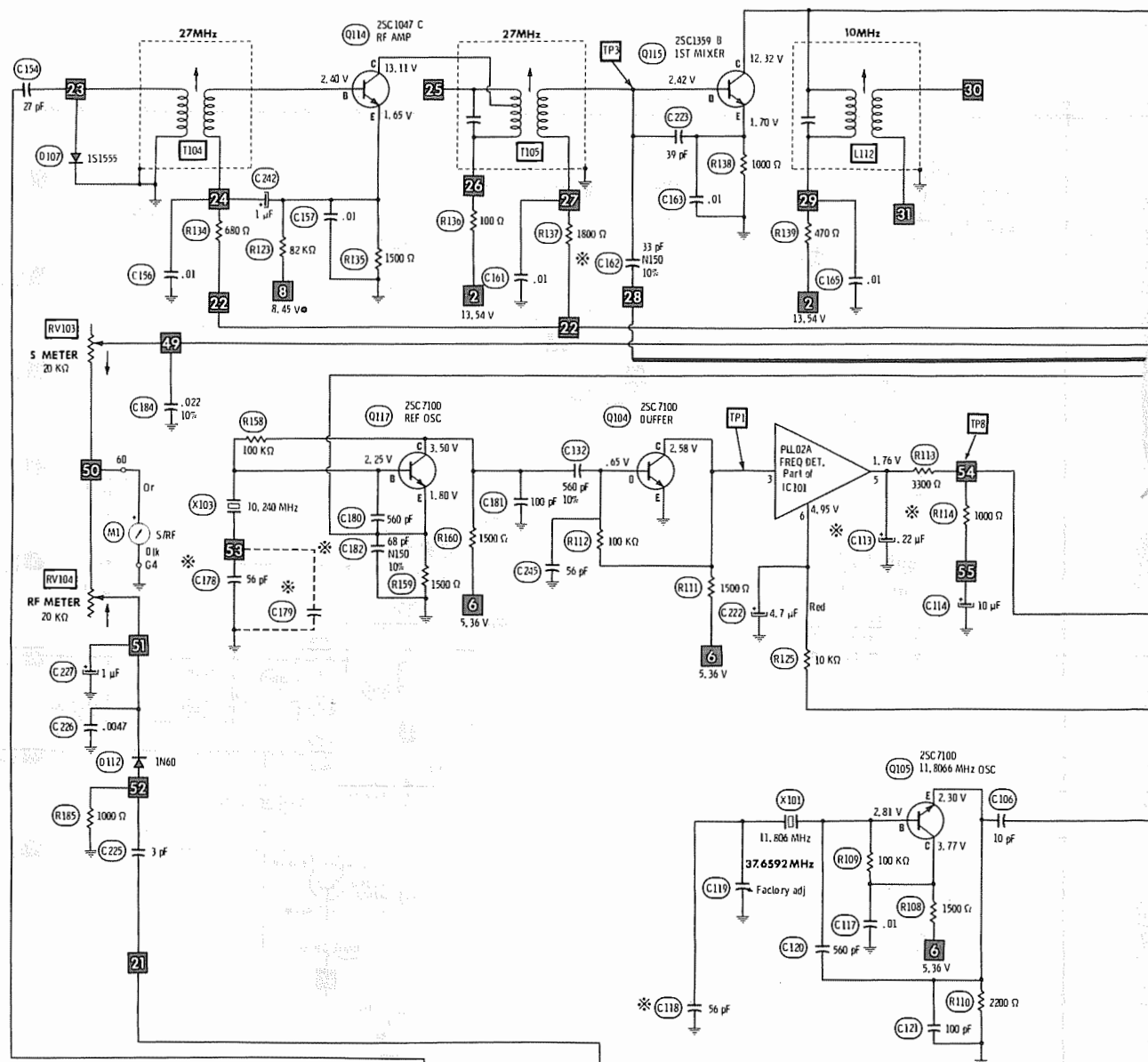
## PARTS LIST AND DESCRIPTION

(When ordering parts, state Model, Part Number, and Description.)

### SEMICONDUCTORS (Select replacement transistor for best results)

| ITEM No. | TYPE No.   | MFG. PART No. | REPLACEMENT DATA          |                     |                  |                   |                   |              |                  |                   |
|----------|------------|---------------|---------------------------|---------------------|------------------|-------------------|-------------------|--------------|------------------|-------------------|
|          |            |               | GENERAL ELECTRIC PART No. | IR WORKMAN PART No. | MALLORY PART No. | MOTOROLA PART No. | RAYTHEON PART No. | RCA PART No. | SPRAGUE PART No. | SYLVANIA PART No. |
| D101     | 1T410      |               | GE-90                     | D201                |                  | HEPR2503          | RE 195            | SK3126       | RT-262           |                   |
| D102     | 8B142(1)   |               | GE-90                     | D201                |                  | HEPR2503          | RE 195            | SK3126       | RT-262           |                   |
| D103     | M205       |               | GEZD-5,1                  | Z1203               | ZN5, 1A          | HEP20406          | RE 105            | SK3056       | RT-235           | ECG135            |
| D104     | RD9, 1E8   |               | GEZD-9,1                  |                     | ZB9, 1B          |                   | RE 114            |              | RT-240           | ECG139            |
| D105     | 1S1885     |               | GE-504A                   | 5A40                | PTC201           | HEPR0052          | RE 49             | SK3030       | RT-213           | ECG116            |
| D106     | V06C       |               | GE-509                    | 5A20                | PTC203           | HEPR0055          | RE 51             | SK3032       | RT-210           | ECG125            |
| D107     | 1S1555     |               | GE-300                    | D200                | PTC214           | HEPR0602          | RE 52             | SK3100       | RT-218           | ECG177            |
| D108     | 1S1555     |               | GE-300                    | D200                | PTC214           | HEPR0602          | RE 52             | SK3100       | RT-218           | ECG177            |
| D109     | 1N60       |               | 1N60                      | 1N60                | PTC206           | HEPR9135          | RE 47             | SK3088       | RT-263           | ECG109            |
| D110     | 1N60       |               | 1N60                      | 1N60                | PTC206           | HEPR9135          | RE 47             | SK3088       | RT-263           | ECG109            |
| D111     | 1N60       |               | 1N60                      | 1N60                | PTC206           | HEPR9135          | RE 47             | SK3088       | RT-263           | ECG109            |
| D112     | 1N60       |               | 1N60                      | 1N60                | PTC206           | HEPR9135          | RE 47             | SK3088       | RT-263           | ECG109            |
| D117     | 1S1555     |               | GE-300                    | D200                | PTC214           | HEPR0602          | RE 52             | SK3100       | RT-218           | ECG177            |
| IC101    | PLL02A     |               |                           |                     |                  |                   |                   |              |                  | ECG1167           |
| IC102    | BA521      |               |                           |                     |                  |                   |                   |              |                  | ECG1166           |
|          | TA7205P    |               | GEIC-179                  |                     | PTC780           |                   |                   |              | TVMC-81          | ECG1155           |
|          | (1)        |               |                           |                     |                  |                   |                   |              |                  |                   |
| Q101     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
| Q102     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
|          | 2SC829(1)  |               | GE-20 *                   | (IR)2SC829B         | PTC121 *         | HEPS0015 *        | RE 9 *            | SK3122       | RT-308           | ECG229 *          |
|          | 2SC839(1)  |               | GE-61 *                   | (IR)2SC644          | PTC132 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-308           | ECG123A *         |
| Q103     | 2SC8290    |               | GE-20 *                   | (IR)2SC829B         | PTC121 *         | HEPS0015 *        | RE 9 *            | SK3122       | RT-308           | ECG229 *          |
|          | 2SC710(1)  |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
|          | 2SC839(1)  |               | GE-61 *                   | (IR)2SC644          | PTC132 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-308           | ECG123A *         |
| Q104     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
|          | 2SC829(1)  |               | GE-20 *                   | (IR)2SC829B         | PTC121 *         | HEPS0015 *        | RE 9 *            | SK3122       | RT-308           | ECG229 *          |
|          | 2SC839(1)  |               | GE-61 *                   | (IR)2SC644          | PTC132 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-308           | ECG123A *         |
| Q105     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
|          | 2SC829(1)  |               | GE-20 *                   | (IR)2SC829B         | PTC121 *         | HEPS0015 *        | RE 9 *            | SK3122       | RT-308           | ECG229 *          |
|          | 2SC839(1)  |               | GE-61 *                   | (IR)2SC644          | PTC132 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-308           | ECG123A *         |
| Q106     | 2SC1318Q   |               | GE-210 *                  | TR-21 *             | PTC178           | HEPS0015 *        | RE 17 *           | SK3122       | RT-302           | ECG128 *          |
| Q107     | 2SA719Q    |               | GE-21 *                   | TR-28 *             | PTC103           | HEPS0012 *        | RE 26 *           | SK3114       | RT-305           | ECG290            |
| Q108     | 2SC1359D   |               | GE-212                    | (IR)2SC380A0        | PTC121 *         | HEPS0014 *        | RE 192            | SK3038 *     | RT-308           | ECG199            |
|          | 2SC1047(1) |               | GE-60 *                   | (IR)2SC829B         | PTC132 *         | HEPS0016 *        | RE 28 *           | SK3018 *     | RT-107           | ECG161 *          |
| Q109     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
| Q110     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
|          | 2SC1687(1) |               | GE-20 *                   | TR-24 *             | PTC121 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-107A *        | ECG123A *         |
| Q111     | 2SC1687    |               | GE-20 *                   | TR-24 *             | PTC121 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-107A *        | ECG123A *         |
|          | 2SC1688(1) |               | GE-81 *                   | TR-24 *             | PTC121 *         | HEPS0027 *        | RE 13 *           | SK3137 *     | RT-172 *         | ECG123A *         |
|          | 2SC1215(1) |               | GE-61 *                   | TR-21 *             | PTC133 *         | HEPS0020 *        | RE 9 *            | SK3018 *     | RT-107A          | ECG107            |
| Q112     | 2SC1760    |               | GE-276                    |                     |                  |                   |                   |              | RT-310           | ECG306            |
|          | (11)       |               |                           |                     |                  |                   |                   |              |                  |                   |
|          | 2SC1846    |               | GE-336                    |                     |                  |                   | RE 209            |              |                  | ECG306            |
|          | (1) (12)   |               |                           |                     | PTC180           |                   | RE 209            |              |                  | ECG295            |
|          | 2SC1957(1) |               |                           |                     |                  |                   |                   |              |                  |                   |
|          | 2SC2074(1) |               |                           |                     |                  |                   |                   |              |                  |                   |
| Q113     | 2SC16780   |               | GE-322                    |                     | PTC186           |                   | RE 203            | SK3197       | RT-146           | ECG235            |
|          | (13)       |               |                           |                     |                  |                   |                   |              |                  |                   |
|          | 2SC1306    |               | GE-215                    |                     | PTC186           |                   | RE 203            | SK3197       | RT-146           | ECG235            |
|          | (1) (14)   |               |                           |                     |                  |                   |                   |              |                  |                   |
| Q114     | 2SC2075(1) |               |                           |                     |                  |                   |                   |              |                  |                   |
|          | 2SC1047C   |               | GE-60 *                   | (IR)2SC829B         | PTC132 *         | HEPS0016 *        | RE 28 *           | SK3018 *     | RT-107           | ECG161 *          |
|          | 2SC784(1)  |               | GE-60 *                   | (IR)2SC380A0        | PTC132 *         | HEPS0008 *        | RE 28 *           | SK3018 *     | RT-187           | ECG229 *          |
|          | 2SC1359(1) |               | GE-212                    | (IR)2SC380A0        | PTC121 *         | HEPS0014 *        | RE 192            | SK3038 *     | RT-308           | ECG199            |
| Q115     | 2SC1359B   |               | GE-212                    | (IR)2SC380A0        | PTC121 *         | HEPS0014 *        | RE 192            | SK3038 *     | RT-308           | ECG199            |
|          | 2SC710(1)  |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
| Q116     | 2SC829C    |               | GE-20 *                   | (IR)2SC829B         | PTC121 *         | HEPS0015 *        | RE 9 *            | SK3122       | RT-308           | ECG229 *          |
|          | 2SC710(1)  |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
| Q117     | 2SC7100    |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
| Q118     | 2SC829C    |               | GE-20 *                   | (IR)2SC829B         | PTC121 *         | HEPS0015 *        | RE 9 *            | SK3122       | RT-308           | ECG229 *          |
|          | 2SC710(1)  |               | GE-211 *                  | (IR)2SC710          | PTC115           | HEPS0016 *        | RE 13 *           | SK3018 *     | RT-308 *         | ECG123A *         |
|          | 2SC839(1)  |               | GE-61 *                   | (IR)2SC644          | PTC132 *         | HEPS0015 *        | RE 13 *           | SK3018 *     | RT-308           | ECG123A *         |





--- Circuitry not used in some versions

--- Circuitry used in some versions

⊙ See parts list

\* Nominal value

⊕ Ground

Chassis

Measurements with switching as shown unless noted:

⊞ Squelch fully clockwise ⊠ 100% modulation

⊙ Transmit

Supply voltage maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Arrow at control indicates direction of advance.

Terminal identification may not be found on unit.

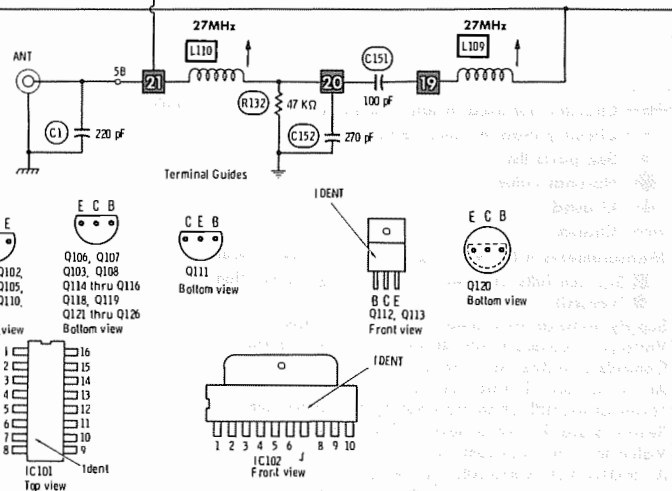
Resistors are 1/2W or less, 5% unless noted.

Value in ( ) used in some versions.

A PHOTOFAC STANDARD NOTATION SCHEMATIC

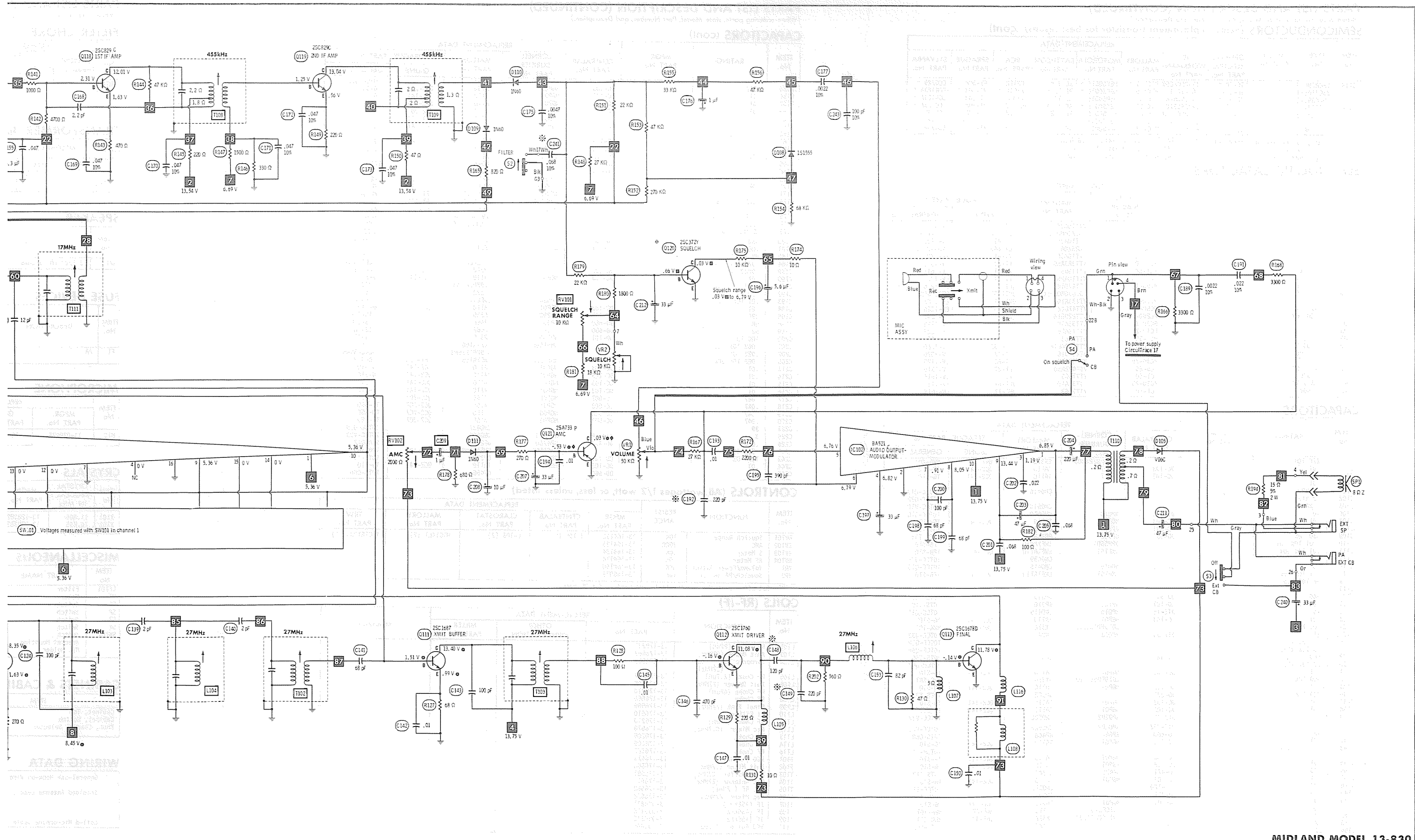
WITH **CIRCUITRACE**

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