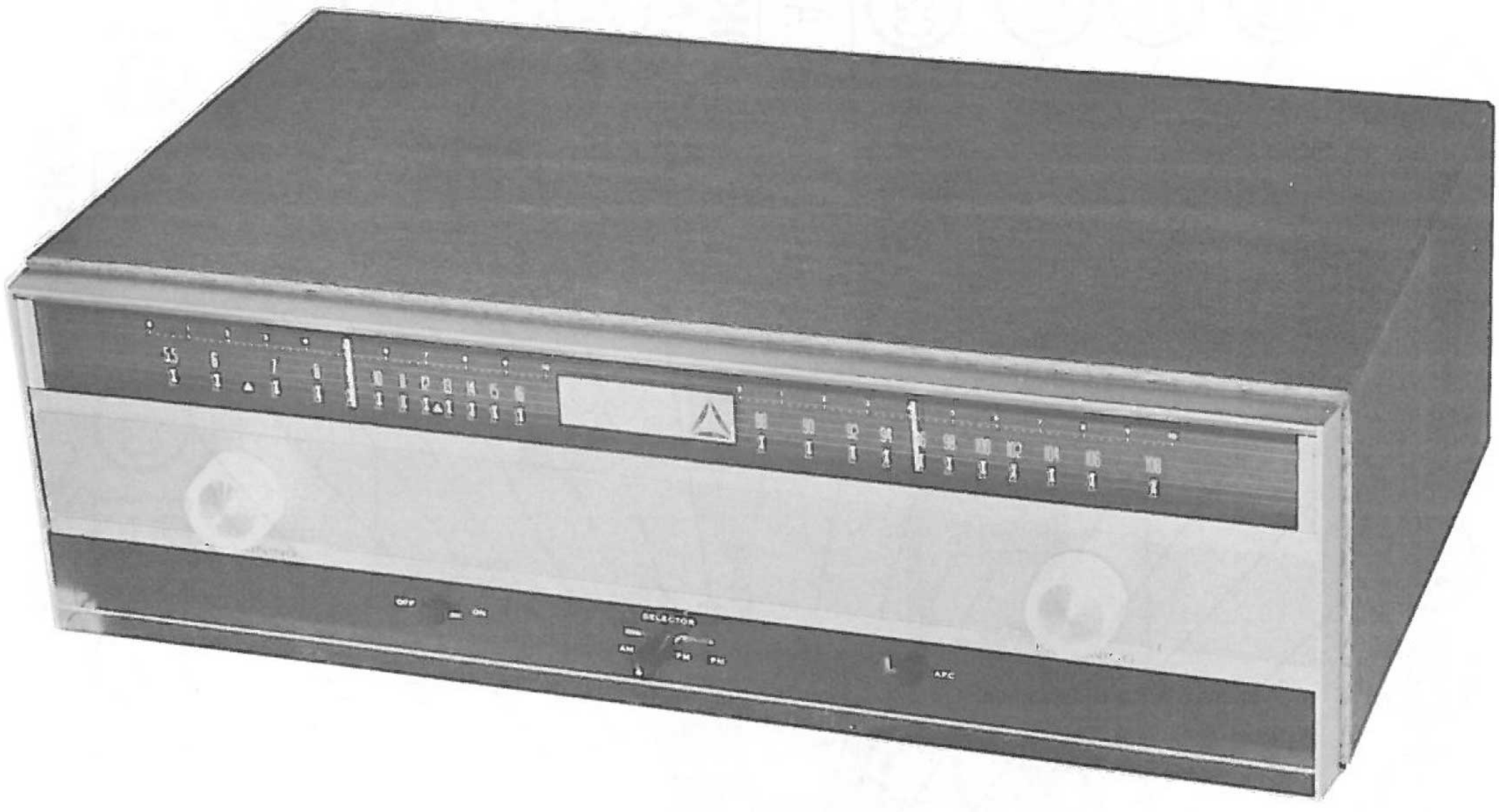
# BELL SOUND
# MODEL 2421

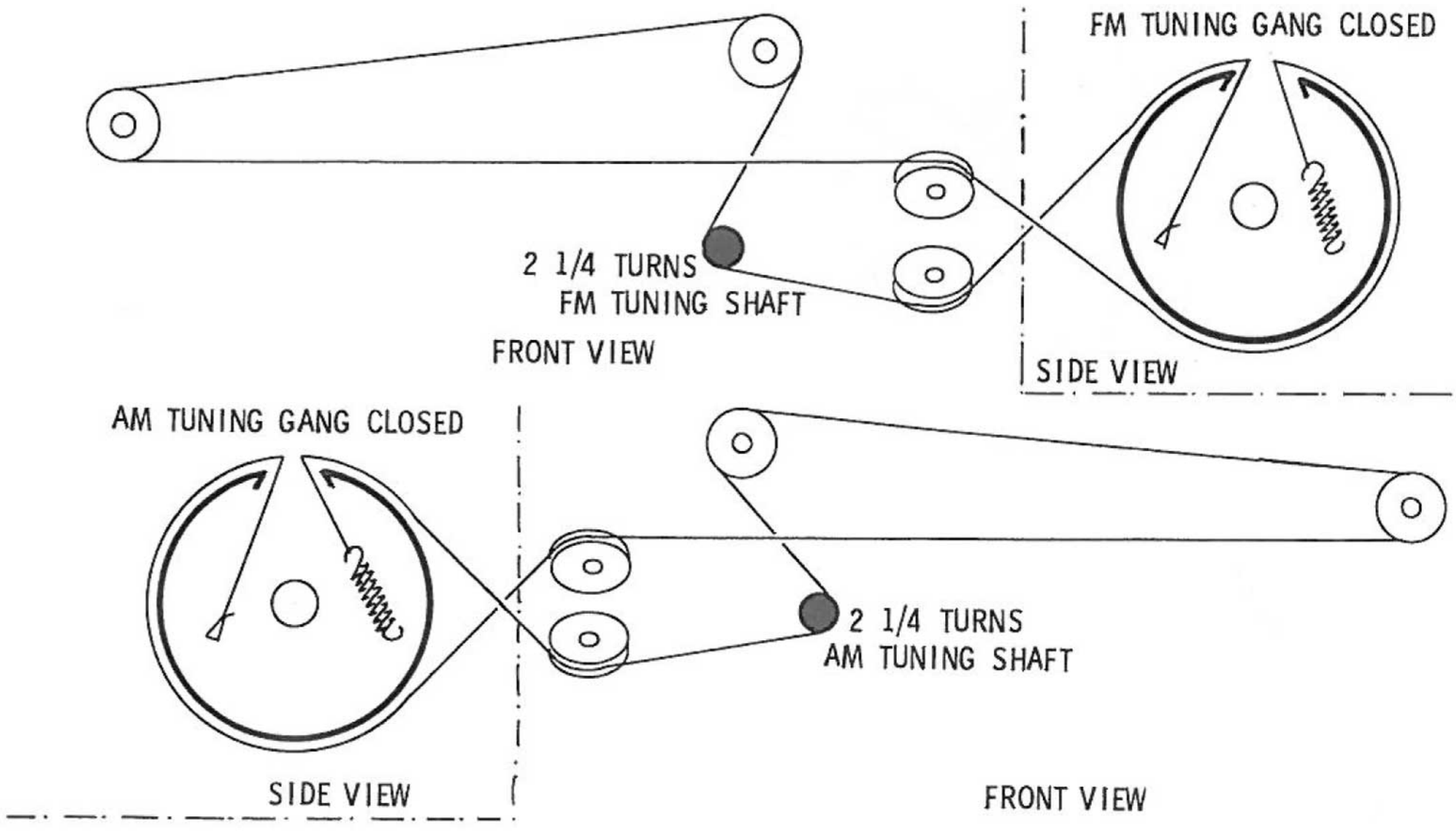



AC Operated 9 Tube FM-AM Tuner

POWER SUPPLY 110 – 120 Volts AC, 60 Cycles RATING 38 Watts, .37 Amp. @117 Volts AC

TUNING RANGE—BROADCAST 540 – 1600KC FREQ. MOD. 88 – 108MC

## DIAL CORD STRINGING




Bell Sound Div., Thompson Ramo Wooldridge Inc., 555 Marion Road, Columbus 7, Ohio

# ALIGNMENT INSTRUCTIONS

**ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

Use only enough generator output to provide a usable indication.

Suggested Alignment Tools:

| | |
|---|---|
| A1 thru A4, A8 thru A16, A19, A20.... | GENERAL CEMENT #8282, 8606, 8606-L, 9295, 9440<br>WALSCO #2526, 2543, 2544, 2545 |
| A5, A6, A17, A18..... | GENERAL CEMENT #5004, 5008, 5009<br>WALSCO #2520 |
| A7..... | GENERAL CEMENT #8721, 8722<br>WALSCO #2519 |

AM ALIGNMENT — SELECTOR IN AM POSITION

| | SIGNAL GENERATOR COUPLING | SIGNAL GENERATOR FREQUENCY | RADIO DIAL SETTING | CONNECT VTVM | ADJUST | REMARKS |
|---|---|---|---|---|---|---|
| 1. | High side thru .01mfd to pin 7 (grid) of AM Converter. Low side to chassis. | 455KC (400~ 30% AM) | (AM) Point of non-interference. | DC probe to point Ⓐ. Common to chassis. | A1, A2, A3, A4 | Adjust for maximum deflection. |
| 2. | High side thru 47mmf to AM antenna terminal. Low side to chassis. | 1400KC | 1400KC | " | A5, A6 | " |
| 3. | " | 600KC | 600KC | " | A7, A8 | Adjust for maximum deflection. Repeat Steps 2 and 3. |

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM—SELECTOR IN FM POSITION

| | SIGNAL GENERATOR COUPLING | SIGNAL GENERATOR FREQUENCY | RADIO DIAL SETTING | CONNECT VTVM | ADJUST | REMARKS |
|---|---|---|---|---|---|---|
| 4. | High side thru .01mfd to pin 7 (grid) of FM Mixer. Low side to chassis. | 10.7MC (Unmod.) | (FM) Point of non-interference. | DC probe thru 100K to point Ⓑ. Common to chassis. | A9, A10, A11, A12, A13, A14 | Adjust for maximum deflection. |
| 5. | " | " | " | DC probe thru 100K to point Ⓒ. Common to chassis. | A15 | " |
| 6. | " | " | " | DC probe to point Ⓓ. Common to chassis. | A16 | Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. |

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE—SELECTOR IN FM POSITION

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

| | SIGNAL GENERATOR COUPLING | SIGNAL GENERATOR FREQUENCY | RADIO DIAL SETTING | CONNECT SCOPE | ADJUST | REMARKS |
|---|---|---|---|---|---|---|
| 4. | High side thru .01mfd to pin 7 (grid) of FM Mixer. Low side to chassis. | 10.7MC (450KC Swp) | (FM) Point of non-interference. | Vert. amp. thru 100K to point Ⓑ. Low side to chassis. | A9, A10, A11, A12, A13, A14 | Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown. |
| 5. | " | " | " | Vert. amp. thru 100K to point Ⓒ. Low side to chassis. | A15 | " |
| 6. | " | " | " | Vert. amp. to point Ⓓ. Low side to chassis. | A16 | Adjust to place marker at the center of crossover lines similar to Fig. 2. SLIGHTLY retouch A15 for maximum amplitude and straightness of crossover lines. |

FM RF ALIGNMENT — SELECTOR IN FM POSITION

| | SIGNAL GENERATOR COUPLING | SIGNAL GENERATOR FREQUENCY | RADIO DIAL SETTING | CONNECT VTVM | ADJUST | REMARKS |
|---|---|---|---|---|---|---|
| 7. | Across FM antenna terminals with 150Ω in each lead. | 106MC (Unmod.) | (FM) 106MC | DC probe thru 100K to point Ⓑ. Common to chassis. | A17, A18 | Adjust for maximum deflection. |
| 8. | " | 90MC | 90MC | " | A19, A20 | Adjust for maximum deflection. Repeat Steps 7 and 8. |

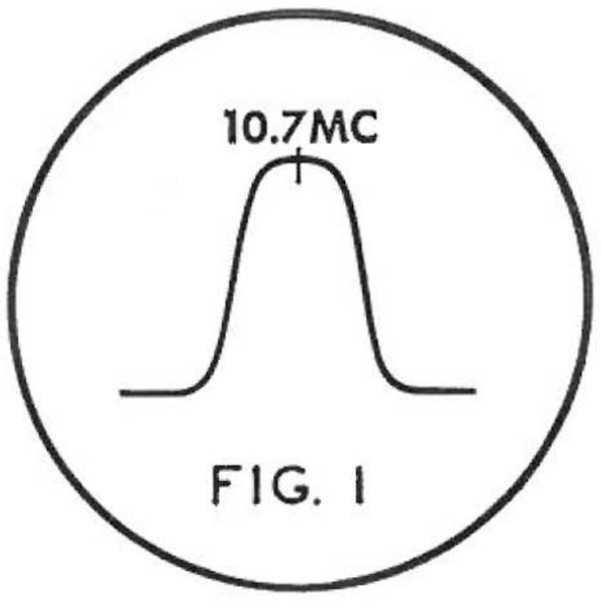


FIG. 1

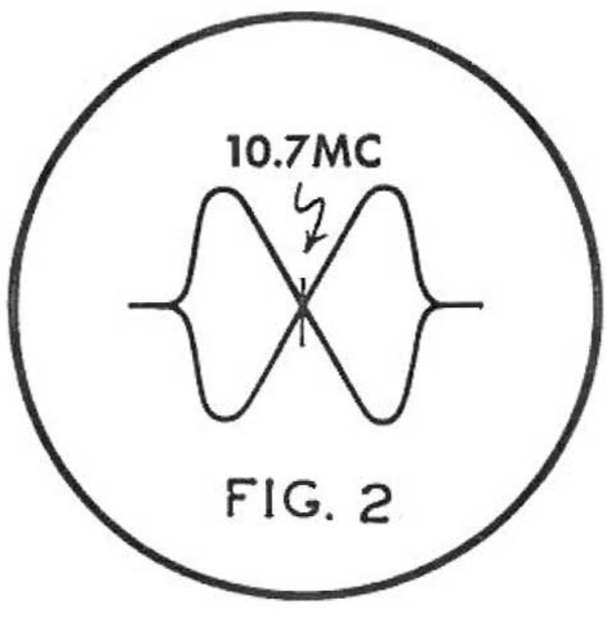


FIG. 2

# PARTS LIST AND DESCRIPTIONS

## TUBES

| ◆ GENERAL ELECTRIC ◆ | | | ◆ RAYTHEON ◆ | | ◆ SYLVANIA ◆ |
|---|---|---|---|---|---|
| ITEM No. | USE | TYPE | ITEM No. | USE | TYPE |
| V1 | FM RF Amp. -FM Mixer | ECC85/6AQ8 | V6 | Discriminator | 6AL5 |
| V2 | FM Osc. -AFC | ECC85/6AQ8 | V7 | AM Converter | 6BE6 |
| V3 | FM IF Amplifier | 6AU6 | V8 | AM IF Amplifier | 6BA6 |
| V4 | 1st FM Limiter | 6AU6 | V9 | Rectifier | EZ80/6V4 |
| V5 | 2nd FM Limiter | 6AU6 | | | |

## ELECTROLYTIC CAPACITORS

| ITEM No. | RATING | | REPLACEMENT DATA | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CAP. | VOLT. | BELL SOUND PART No. | AEROVOX PART No. | CORNELL-DUBILIER PART No. | MALLORY PART No. | PYRAMID PART No. | SPRAGUE PART No. | NOTES |
| C1A | ●40 | 200 | 23B37 | AFH4-01-60 | | FP327.89 | TMQ-4104 | TVL-2575 TVA-1511 | |
| B | ■40 | 200 | | | | | | | |
| C | ▲40 | 200 | | | | | | | |

## FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

| ITEM No. | RATING | REMARKS | REPLACEMENT DATA | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | AEROVOX PART No. | CENTRALAB PART No. | CORNELL-DUBILIER PART No. | ELMENCO PART No. | MALLORY PART No. | SPRAGUE PART No. |
| C2 | 1000 | | BPD-001 | DD-102 | BYA10D1 | CCD-102 | B-210 | 5HK-D10 |
| C3 | 1000 | | BPD-001 | DD-102 | BYA10D1 | CCD-102 | B-210 | 5HK-D10 |
| C4 | 47 N750 10% | | N750-DI 47 | DTN-47 | C10Q47U | CCTN-470 | CN7-447 | 10TCU-Q47 |
| C5 | 47 N750 10% | | N750-DI 47 | DTN-47 | C10Q47U | CCTN-470 | CN7-447 | 10TCU-Q47 |
| C6 | 2.2 NPO ± .25mmf | | NPO-DI 2.2 | DTZ-2R2 | C10V22C | CCTO-2R2 | CNO-522 | 10TCC-V22 |
| C7 | 1-7.5 | #25A17 | | 829-7 | | | | |
| C8 | 10 N220 10% | #24A132 | | | | * | | 10TCR-Q10 |
| C9 | 100 N750 10% | | N750-DI 100 | DTN-100 | C10T1U | CCTN-101 | CN7-310 | 10TCU-T10 |
| C10 | 680 | | DI-680 | DD-681 | BYA10T68 | CCD-681 | B-368 | 10TS-T68 |
| C11 | 10 N750 10% | | N750-DI 10 | DTN-10 | C10Q1U | CCTN-100 | CN7-410 | 10TCU-Q10 |
| C12 | 20000 | | BPD-02 | DD-203 | BYB6S2 | CCD-203 | B-120 | 5HK-S20 |
| C13 | 20000 | | BPD-02 | DD-203 | BYB6S2 | CCD-203 | B-120 | 5HK-S20 |
| C14 | 15 N750 10% | | N750-DI 15 | DTN-15 | C10Q15U | CCTN-150 | CN7-415 | 10TCU-Q15 |
| C15 | 1000 | | BPD-001 | DD-102 | BYA10D1 | CCD-102 | B-210 | 5HK-D10 |
| C16 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C17 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C18 | 47 N750 10% | | N750-DI 47 | DTN-47 | C10Q47U | CCTN-470 | CN7-447 | 10TCU-Q47 |
| C19 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C20 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C21 | 27 NPO 10% | | NPO-DI 25 | TCZ-27 | C10Q27C | CCTO-270 | CNO-427 | 10TCC-Q27 |
| C22 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C23 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C24 | 47 N750 10% | | N750-DI 47 | DTN-47 | C10Q47U | CCTN-47 | CN7-447 | 10TCU-Q47 |
| C25 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C26 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C27 | 100 N750 10% | | N750-DI 100 | DTN-100 | C10T1U | CCTN-101 | CN7-310 | 10TCU-T10 |
| C28 | 750 10% | | DI-750 | DD-751 | 5R5T75 | CCD-751 | GP375 | 10TS-T75 |
| C29 | .1 200V | | P288N-1 | DF-104 | CUB2P1 | 2DP-3-104 | GEM-201 | 2TM-P10 |
| C30 | 10 N470 10% | #24B71 | | | | * | | |
| C31 | 20000 | | BPD-02 | DD-203 | BYB6S2 | CCD-203 | B-120 | 5HK-S20 |
| C32 | 47 N750 10% | | N750-DI 47 | DTN-47 | C10Q47U | CCTN-470 | CN7-447 | 10TCU-Q47 |
| C33 | 20000 | | BPD-02 | DD-203 | BYB6S2 | CCD-203 | B-120 | 5HK-S20 |
| C34 | 20000 | | BPD-02 | DD-203 | BYB6S2 | CCD-203 | B-120 | 5HK-S20 |
| C35 | 20000 | | BPD-02 | DD-203 | BYB6S2 | CCD-203 | B-120 | 5HK-S20 |
| C36 | .1 200V | | P288N-1 | DF-104 | CUB2P1 | 2DP-3-104 | GEM-201 | 2TM-P10 |
| C37 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C38 | 5000 | | BPD-005 | DD-502 | BYA10D5 | CCD-502 | B-250 | 5HK-D50 |
| C39 | 10 N470 10% | #24B71 | | | | * | | |

# Bell Sound Part Number.

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

# RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

| ITEM No. | RATING | REPLACEMENT DATA | | | ITEM No. | RATING | REPLACEMENT DATA | | |
|---|---|---|---|---|---|---|---|---|---|
| | | IRC PART No. | WORKMAN TV PART No. | REMARKS | | | IRC PART No. | WORKMAN TV PART No. | REMARKS |
| R1 | 68Ω | | | | R19 | 47K | | | |
| R2 | 100Ω | | | | R20 | 68Ω | | | |
| R3 | 2.2meg | | | | R21 | 47K | | | |
| R4 | 100K | | | | R22 | 100K | | | |
| R5 | 22K | | | | R23 | 100K | | | |
| R6 | 1000Ω | | | | R24 | 100K | | | |
| R7 | 10K | | | | R25 | 1meg | | | |
| R8 | 33K | | | | R26 | 22K | | | |
| R9 | 680K | | | | R27 | 10K | | | |
| R10 | 3.3meg | | | | R28 | 3.3K | | | |
| R11 | 100K | | | | R29 | 4700Ω | | | |
| R12 | 5600Ω | | | | R30 | 68Ω | | | |
| R13 | 68Ω | | | | R31 | 270Ω | | | |
| R14 | 1meg | | | | R32 | 270Ω | | | |
| R15 | 1meg | | | | R33 | 250Ω 5W | PW5-250 | 5W-SQ-250 | |
| R16 | 100K | | | | R34 | 250Ω 5W | PW5-250 | 5W-SQ-250 | |
| R17 | 56K | | | | R35 | 330Ω | | | |
| R18 | 100K | | | | R36 | 100K | | | |

# COMPONENT COMBINATIONS

| ITEM No. | USE | DESCRIPTION | BELL SOUND PART No. | REPLACEMENT DATA |
|---|---|---|---|---|
| K1 | AM Diode RF Filter | (2) 100mmf, 47K, 180K | 57A19 | |

# COILS (RF-IF)

| ITEM No. | USE | REPLACEMENT DATA | | | | | NOTES |
|---|---|---|---|---|---|---|---|
| | | BELL SOUND PART No. | Merit PART No. | Miller PART No. | Stancor PART No. | Workman TV PART No. | |
| L1 | RF Choke (1.1uh) | 31A44 | BC-561 | 4602 | RTC-8515 | T855 | ① Wound on 47Ω |
| L2 | RF Choke | 31A31 ① | | | | | |
| L3 | RF Choke (.68uh) | 31A24 | BC-560 | 4590 | RTC-8514 | T803 | |
| L4 | FM RF | 31A52 | | | | | |
| L5 | FM Osc. | 31A52 | | | | | |
| L6 | RF Choke (1.8uh) | 31A53 | BC-562 | 4604 | RTC-8516 | T856 | |
| L7 | RF Choke (2.5uh) | 31A22 | BC-563 | 4606 | RTC-8517 | T857 | |
| L8 | Fil. Choke (5.5uh) | 31A18 | SW-631 | 4609 | RTC-8519 | T859 | |
| L9 | RF Choke (5.5uh) | 31A18 | SW-631 | 4609 | RTC-8519 | T859 | |
| L10 | 1st FM IF | 32C81 | FM-254 | 1463 | RTC-8599 | T633 | |
| L11 | 2nd FM IF | 32C81 | FM-254 | 1463 | RTC-8599 | T633 | |
| L12 | 3rd FM IF | 32C81 | FM-254 | 1463 | RTC-8599 | T633 | |
| L13 | Discriminator | 32C117 | FM-253 | 1464 | RTC-8665 | T634 | |
| L14 | AM Ant. | 32A39 | BC-386 | 70-A | RTC-8731 | T500 | |
| L15 | RF Choke (1uh) | 31A61 | BC-561 | 4602 | RTC-8515 | T855 | |
| L16 | AM Osc. | 31A50 | BC-393 | 69-OSC | RTC-8646 | T503 | |
| L17 | 1st AM IF | 32C99 | BC-352 | 12-C1 | RTC-8632 | T607 | |
| L18 | 2nd AM IF | 32C99 | BC-353 | 12-C2 | RTC-8633 | T608 | |
| L19 | Fil. Choke | 31A21 | BC-564 | 4608 | RTC-8518 | T858 | |
| L20 | Fil. Choke | 31A21 | BC-564 | 4608 | RTC-8518 | T858 | |

# TRANSFORMER (POWER)

| SEC. 2 | REPLACEMENT DATA | | | | | NOTES |
|---|---|---|---|---|---|---|
| | BELL SOUND PART No. | Merit PART No. | Stancor PART No. | Thordarson PART No. | Triad PART No. | |
| 6.3V ⓐ 3.5A | 32B116 ① | | | | | ① Part #32B129 used for 50 cycle operation. |

# FUSES

| ITEM No. | TYPE | RATING | REPLACEMENT DATA | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | BELL SOUND PART No. | | LITTELFUSE PART No. | | BUSS PART No. | |
| | | | FUSE | HOLDER | FUSE | HOLDER | FUSE | HOLDER |
| M1 | 3AG | 2A 250V | 53A9 | 53A8 | 312002 (3AG 2A 250V) | 342001 | AGC 2 | HKP |

# SIGNAL DIODES

| ITEM No. | ORIG. TYPE | REPLACEMENT DATA | | | | NOTES |
|---|---|---|---|---|---|---|
| | | BELL SOUND PART No. | GENERAL ELECTRIC PART No. | RAYTHEON PART No. | SYLVANIA PART No. | |
| M2 | 1N541 | 42A14 | | 1N295 | 1N295 | AM Detector (Pigtail) |

# MISCELLANEOUS

| ITEM No. | PART NAME | BELL SOUND PART No. | NOTES |
|---|---|---|---|
| M3 | Tuning Cap | 25B18 | FM, 2 Gang |
| M4 | Tuning Cap | 25B20 | AM, 2 Gang (Ant. 16-385, Osc. 18-126mmf) |
| M5 | Switch | 43B88 | Function Selector (Lever Type) |
| M6 | Switch | 43A67 | AFC (SPDT Slide Type) |
| M7 | Switch | 43A92 | Power Off-On (SPDT Slide Type) |

# CABINETS & CABINET PARTS

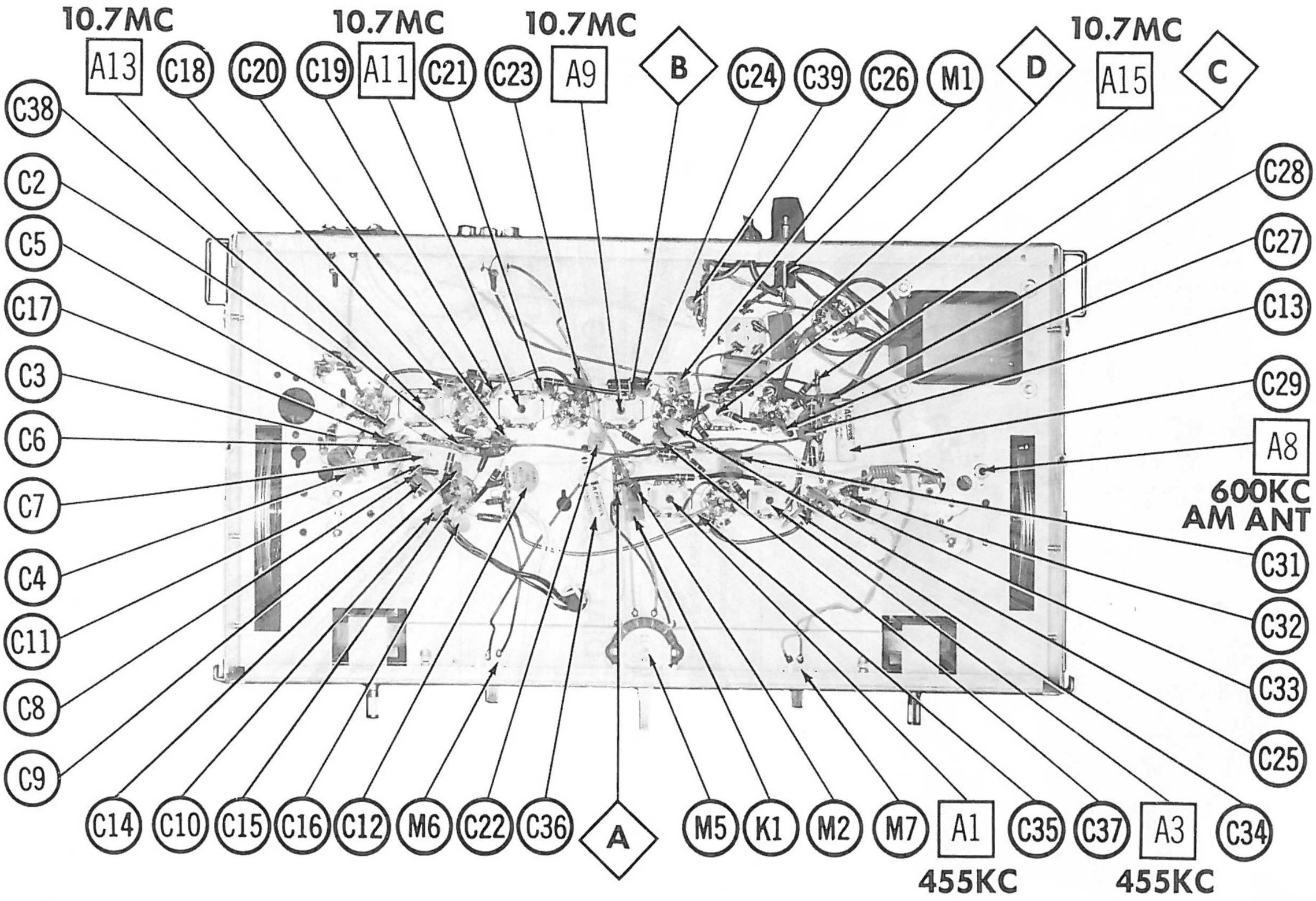
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

| NAME | PART NO. | DESCRIPTION |
|---|---|---|
| Dial Glass | 94C71 | |
| Dial Pointer | 77A72 | |
| Knob | 84A60 | Tuning |
| Knob | 84A62 | Selector |

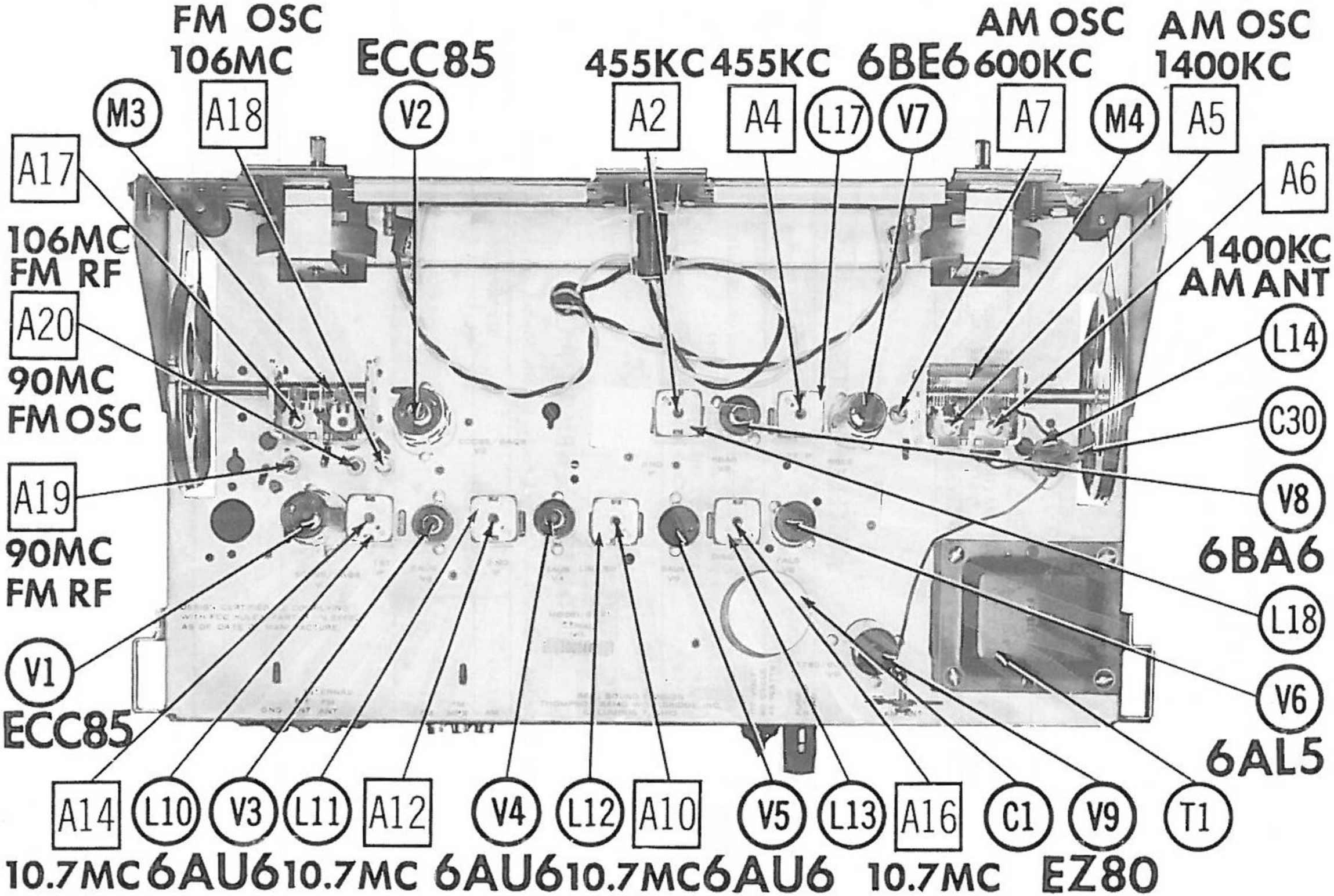
# WIRING DATA

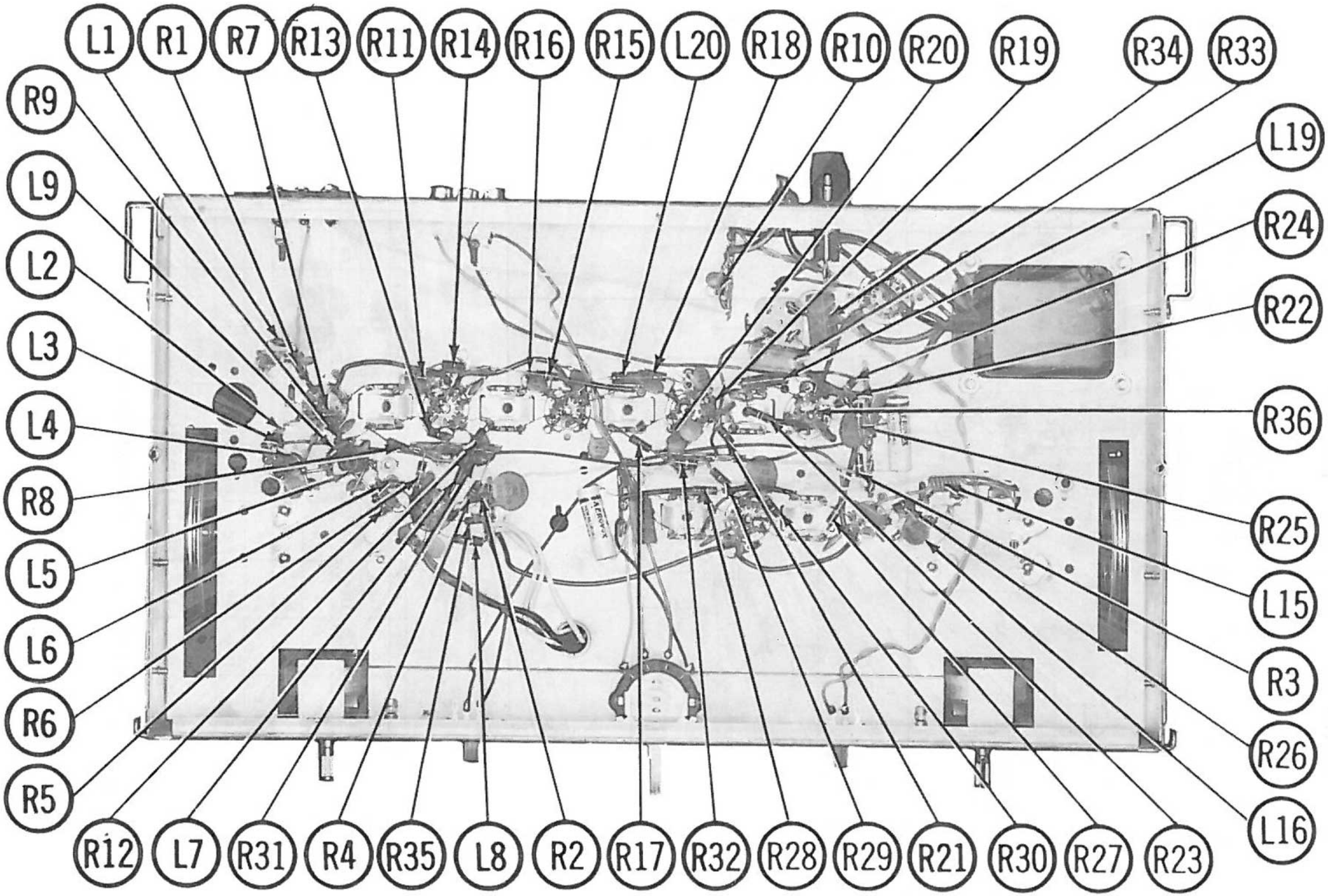
General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K ($7\frac{1}{2}$ Ft. Length)

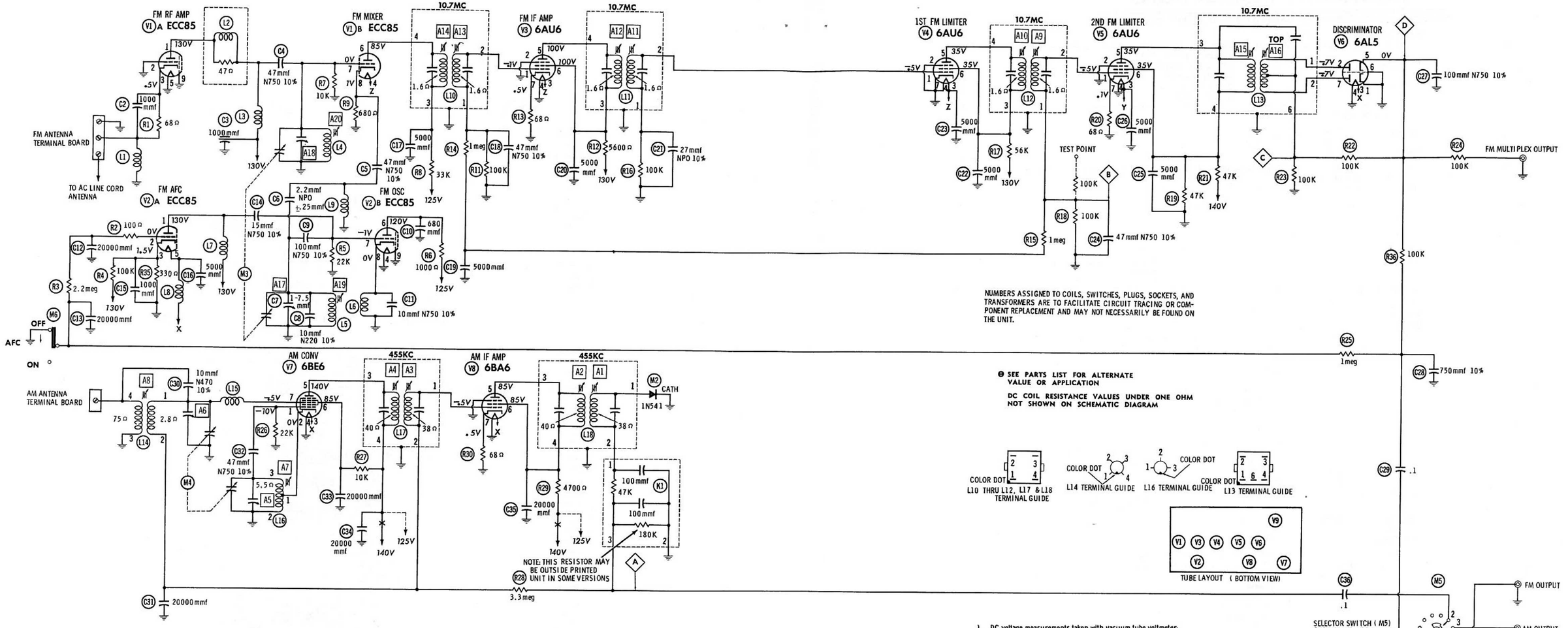



CHASSIS BOTTOM VIEW-ALIGNMENT. CAPACITOR & MISC. IDENT.


FM OSC
106MC
ECC85
455KC
455KC
6BE6
AM OSC
600KC
AM OSC
1400KC
M3
A18
V2
A2
A4
L17
V7
A7
M4
A5
A17
A6
106MC
FM RF
1400KC
AM ANT
A20
L14
90MC
FM OSC
C30
A19
V8
6BA6
90MC
FM RF
L18
V1
V6
ECC85
6AL5
A14
L10
V3
L11
A12
V4
L12
A10
V5
L13
A16
C1
V9
T1
10.7MC
6AU6
10.7MC
6AU6
10.7MC
6AU6
10.7MC
EZ80




CHASSIS BOTTOM VIEW-RESISTOR & INDUCTOR IDENT.




NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM




RESISTANCE READINGS

| ITEM | TUBE | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 | Pin 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| V1 | ECC85 6AQ8 | †800Ω | 0Ω | 68Ω | 0Ω | .1Ω | †34K | 0Ω | 680Ω | 0Ω |
| V2 | ECC85 6AQ8 | †800Ω | 3.5meg ■2.2meg | 330Ω | .1Ω | 0Ω | †2000Ω | 22K | 0Ω | 0Ω |
| V3 | 6AU6 | 100K | 0Ω | 0Ω | .1Ω | †6400Ω | †6400Ω | 68Ω | | |
| V4 | 6AU6 | 100K | 0Ω | 0Ω | .1Ω | †56K | †56K | 0Ω | | |
| V5 | 6AU6 | 100K | 0Ω | 0Ω | .1Ω | †30K | †30K | 68Ω | | |
| V6 | 6AL5 | 0Ω | 100K | .1Ω | 0Ω | 200K | 0Ω | 100K | | |
| V7 | 6BE6 | 22K | .3Ω | 0Ω | .1Ω | †500Ω | †10K | 3.5meg | | |
| V8 | 6BA6 | 3.5meg | 0Ω | .1Ω | 0Ω | †5200Ω | †5200Ω | 68Ω | | |
| V9 | EZ80 6V4 | 82Ω | NC | ¶45K | .1Ω | 0Ω | NC | 89Ω | NC | NC |

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
■ MEASURED WITH "AFC" OFF.
† MEASURED FROM PIN 3 OF V9.
NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured with 1000 ohm per volt voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common ground.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. no signal applied for voltage measurements.