ELECTRONIC TECHNICIAN

Now Including **SERVICE** Magazine

103

- 103 TV-RADIO-HI-FI Schematics
- "SHOP HINTS" Almanac
- Guide to DECIPHERING MODEL & CHASSIS Numbers

Volume 3

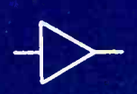
ELECTRONIC TECHNICIAN Now including SERVICE Magazine

ELECTRONIC CIRCUIT SYMBOLS

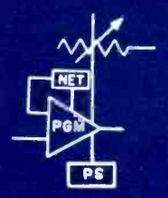
ELECTRONIC TECHNICIAN Magazine
World's Largest
Electronic Trade Circulation

Graphical representation of electronic and related components provides an efficient shortcut in conveying technical information. To establish a universal meaning for each of these symbols, a set of standards have been developed jointly by the Institute of Radio Engineers (54IRE21S1) and the American Standards Association (Y32.2—1954). Presented here are more than 175 symbols selected from the 67 major categories included in the IRE-ASA standards. These symbols represent those most frequently used in the electronic industries, and may be considered the building blocks of the complete set of standards.

AMPLIFIERS



General:
Triangle points in direction of transmission



Program Amplifier with Associated Variable Attenuator, Feed Back Path, and Power Supply

ANTENNAS

Types or Functions may be indicated by words or abbreviations adjacent to the symbol

General

Dipole

Loop

Counterpoise

ARRESTORS, Gap

For Lightning or Electric Surges

General

Carbon Block

Horn Gap

Protective Gap

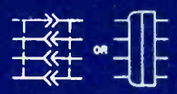
CHASSIS

Chassis Frame not necessarily at ground potential

CONNECTORS

Symbol not an arrowhead, but larger lines at 90°

Male Contact



Engaged 4-conductor connectors. Plug has 1 male & 3 female contacts

Female Contact

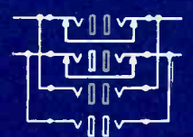
Engaged coaxial connectors. Outside conductor carried through

Two Conductor Jack

Two Conductor Plug

Jacks with circuit normalled through one way

Jacks with circuit normalled through both ways



Jacks in Multiple, one set with circuit normalled through both ways

2, 3, 4 Conductor Polarized Plugs, male/female contacts

CONTACTS, Electric

Fixed Contact

COUPLING

E, H or HE inside circle indicates type of coupling. E indicates plane at aperture is perpendicular to transverse component of major E lines. In H the plane is parallel. HE indicates coupling by all other kinds of apertures. Transmission loss may be indicated.

E-plane Coupling By Aperture to Space

E-plane Coupling 3 ends of Transmission Path Available

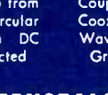
Coupling by Loop to Space

Coupling by Probe to Space

Coupling by Loop from Coaxial to Circular Waveguide with DC Grounds Connected

Coupling by Probe from Coaxial to Rectangular Waveguide with DC Grounds Connected

CRYSTALS

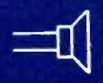


Piezoelectric Crystal

DEVICES, Audible Signal

Bell, general telephone ringer

Buzzer

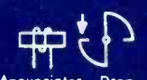


Horn, Howler, Loudspeaker, Siren

DEVICES, Visual Signal

Switchboard Type Lamp

Annunciator, general



Annunciator, Drop or Signal, Shutter or Grid Type

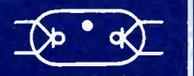
Manually Restored Drop

Electrically Restored Drop

DISCONTINUITY

LAMP

Ballast Lamp, Tube



4 terminal fluorescent lamp

2 terminal fluorescent lamp

Incandescent illuminating lamp

MACHINE, Rotating

General, Generator and Motor

Rotating Armature with Commutator and Brushes or Slip Rings

Compensating, or Commutating, Series and Shunt Fields

Generator or Motor dc, Permanent Magnetic Field

DC compound Motor with Commutating or Compensating Field Winding

1 Phase Hysteresis Motor

Reluctance Motor

Synchronous Motor with Neutral brought out

MAGNET, Permanent

METERS

A letter or letter combination from the following list shall be placed within the circle to indicate the function of the meter or instrument unless some other identification is provided in the circle and explained on the diagram.

A	Ammeter
AH	Ampere-hour meter
CMA	Contact-making (or breaking) ammeter
CMC	Contact-making (or breaking) clock
CMV	Contact-making (or breaking)

RECTIFIERS & DIODES

Solid State

RELAYS

Relay, basic

Relay coil

2-pole, double make

Polarized Relay with Transfer Contact

Relay Protective Function Balance, General

Relay Protective Function under, General

Relay Protective Functional Differential, General

RESISTORS

General

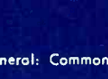
Tapped Resistor

Resistor with Adjustable Control

Adjustable or Continuously Variable Resistor

Instrument or relay shunt

RESONATORS



General: Common for coax and waveguide

SHIELDING

TERMINATIONS

Cable Termination

Short Circuit, Movable Common for Coax and Waveguide

Terminating Resistor Common for Coax and Waveguide

Path Open Path Shorted Terminating Series Capacitor

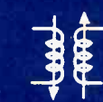
THERMISTORS

THERMOCOUPLES

Temperature Measuring Thermocouple

TRANSFORMERS

General



Double Tuned

Shielded Transformer with Magnetic Core

One Winding with Tap, one Winding Adjustable

3-phase Induction Regulator

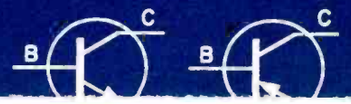
Current Transformer, Polarity Marked

Potential Transformer Polarity Marked

Delto Transformer Connections 3-phase

Wye

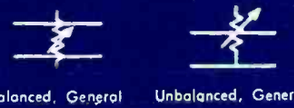
TRANSISTORS



Sphere Gap

Multigap

ATTENUATORS



Balanced, General

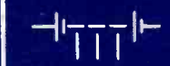
Unbalanced, General

BATTERIES

Long line always positive; polarity may be indicated in addition

dc source, General

Multicell



Multicell with 3 taps

Multicell with adjustable tap

CAPACITORS

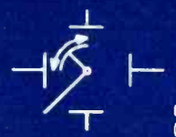
Curved Electrode represents: Outside Electrode and/or Negative Electrode and/or Moving Element in Variables and/or Low-potential in Feed-thrus

Shielded capacitor

Variable capacitor

Split stator Capacitor Both parts increase simultaneously

Variable differential capacitor



Phase-shifter capacitor

Feed thru capacitor (terminals an feed-thru element)

CELLS, Photosensitive

λ indicates Element Varies with Light

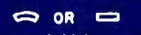
Asymmetrical Photo Conductive Transducer

Symmetrical Photo Conductive Transducer

Photovoltaic Transducer

Sleeve

Adjustable or sliding contact for resistor, inductor, etc.



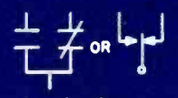
Segment: bridging contact

Vibrator Reed

Rotating Contact and brush

Closed Contact (break)

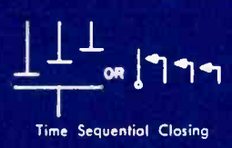
Open Contact (make)



Transfer

Make-before-break

Open Contact w/time delay closing feature



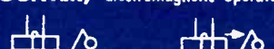
Time Sequential Closing

CORE

Magnetic Core of Inductor or Transformer

Magnetic Core of Magnet or Relay

COUNTER, Electromagnetic Operated



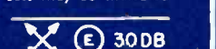
General

With Make Contact

COUPLER, Directional

Arrow Indicates Direction of Power Flow. Number of Coupling Paths, Type of Coupling, and Transmission Loss May Be Indicated

General



E-plane Aperture Coupling 30 db Transmission Loss

Loop Coupling 30 db Transmission Loss

Probe Coupling 30 db Transmission Loss

General

Capacitive Reactance

Inductive Reactance

L and C with Infinite Reactance at Resonance

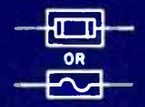
L and C with Zero Reactance at Resonance

Equivalent Shunt Element General

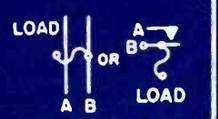
FUSES

Fusible element

High Voltage Primary Fuse Contact, Dry



High Voltage Primary Fuse Contact, Oil



With Alarm Contact (When fuse blows alarm bus B is connected to power bus A. Letters for explanation only)

GROUND

HANDSET

General

With push-to-talk switch

3 conductor handset

4 conductor handset with push-to-talk switch

KEY, Telegraph

Simple

Simple with shorting switch

Open circuit or pole changing

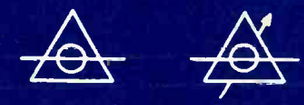
CRO	Oscilloscope or cathode-ray oscillograph
D	Demand meter
DB	DB (decibel) meter
DBM	DBM (decibels referred to 1 milliwatt) meter
DTR	Demand-totalizing relay
F	Frequency meter
G	Galvanometer
GD	Ground detector
I	Indicating
M	Integrating
μA or UA	Microammeter
MA	Milliammeter
N	Noise meter
OHM	Ohmmeter
OP	Oil pressure
OSCG	Oscillograph, string
PH	Phase meter
PI	Position indicator
PF	Power-factor meter
RD	Recording demand meter
REC	Recording
RF	Reactive-factor meter
S	Synchroscope
TLM	Telemeter
T	Temperature meter
TT	Total time
VH	Varhour meter
V	Voltmeter
VA	Volt-ammeter
VAR	Varmeter
VI	Volume indicator
VU	Standard volume Indicator
W	Wattmeter
WH	Watthour meter

MICROPHONE

NOTE: IRE-ASA standards provide two types of symbols, single line and complete. Single line symbols are intended to show essential components and functions in simplified form. Complete diagrams indicate the complete circuit and the devices used therein. In some cases, only a single or complete symbol is available for a particular component. Where a choice of single or complete is available, the complete type is used here, with the exception of amplifiers, adjustable phase shifters, and synchros, where more common usage has dictated the use of single line forms.

ing. For other shielding, note should so indicate

SHIFTER, Phase



General

Adjustable

SWITCHES

General Single Throw

2-pole double-throw switch showing terminals

3-pole double-throw knife switch with auxiliary contacts and terminals

Switch with horn gap

Pushbutton make switch spring return

Toggle
Key
Relay
Jack
Transfer Switch Non-Locking

2-position Key Switch with Locking Transfer and Break Contacts

Wafer, 3-pole, 3-circuit with 2 non-short & 1 shorting moving contacts

10-point selector switch with fixed segment

Safety Interlock Circuit Opening

SYNCHROS

Synchro, general

If identification is required, add abbreviations

CDX—Control Differential Synchro Transmitter
CT —Synchro Control Transformer
CX —Synchro Control Transmitter
TDR—Torque-Differential Synchro receiver
TDX—Torque-Differential Synchro Receiver
TR —Torque-Synchro Receiver
TX —Torque-Synchro Transmitter

NPN

PNP

TUBES, Electron

Triode, Indirectly Heated Cathode. Add grids for tetrade, pentode, etc.

Cold Cathode Gas Tube, Rectifier, regulator for dc

Photomultiplier Tube

Cathode-ray Tube with Electrostatic Deflection. Remove De for Magnetic Deflection

Thyratron

Ignitron,

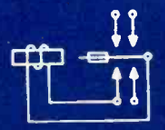
Magnetron Tunable, Loop Coupled

Reflex Klystron Integral Cavity, Aperture Coupled

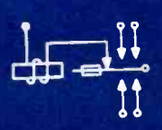
Transmit-Receive (TR) Tube. Gas filled, tunable integral cavity, aperature coupled, with starter

UHF triode (disk-seal type) with internal capacitor. Tube terminals added as shown where desired

VIBRATORS



Shunt Drive Vibrator



Series Drive Vibrator

ELECTRONIC TECHNICIAN

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103 TV-RADIO-HI-FI SCHEMATICS

Including:

- **"SHOP HINTS" Almanac**
- **"Guide to Deciphering Chassis & Model Numbers"**

Volume 3

Introduction

Many thousands of electronic service technicians have found previous "100 series" volumes of schematics to be very helpful in their troubleshooting work. Because of heavy demand, volumes 1 and 2 are out of print and no longer available. As with the earlier books, this new "103" is not for sale. It is distributed only to professional technicians who become new subscribers to Electronic Technician magazine.

This third volume—the "103"—covers sets made over the past couple of years. Circuits of 30 manufacturers are included, representing 624 different model and chassis numbers.

In addition, the "Shop Hints" in this book are a collection of time-saving service aids developed in actual practice by professional technicians.

The "Guide to Deciphering Chassis & Model Numbers" is published here in book form for the first time. It tells you how to unravel the manufacturer's code numbers, and how to interpret what they mean in terms of set type, production run, etc.

To keep you posted on new sets, every monthly issue of Electronic Technician contains the exclusive Circuit Digests section, 16 pages of the latest TV-Radio-Hi-Fi schematics and service data. A large spring binder to help you save 24 issues of Circuit Digests may be obtained postpaid from Electronic Technician for $2.95.

For more information on what Electronic Technician magazine is and does, see back cover.

Best wishes for successful servicing.

Albert J. Forman
Editor

CONTENTS

(Continued on next page)

SHOP HINTS

ADMIRAL
Chassis 17Z3D, 17Z3DC, 17Z3DT

ALL PARTS WITHIN HEAVY DASHED LINE LOCATED ON PRINTED CIRCUIT BOARD A4630-3

VHF TUNER 94D 122-1

Models T23A1, 2, 3; C23A26, 7; T23A6, 7, 11, 12, 13

CONNECT THROUGH EXTERNAL 15A RESISTOR.

JUMPER CONNECTS BETWEEN PINS 6 & 2 OR BETWEEN PINS 6 & 10, WHICHEVER PROVIDES THE BEST FOCUS.

LOCAL-DISTANCE SWITCH SHOWN IN LOCAL POSITION

CAUTION: SEE WAVEFORM DATA BEFORE MEASURING

RUN CHANGES

(10) Start of production of 17Z3D, 17Z3DT & 17Z3DC chassis.

(11) Former C505 (.01 MF 600V) AC line to ground, deleted. C505 was C506.

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

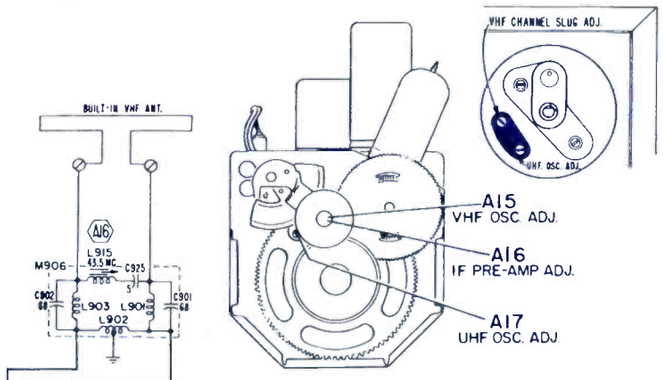
ADMIRAL
Chassis 19SZ4D; 19SZ4DF, -DT, -ES, -FS, -PS; 19Z4PRS; 19Z4RS. Runs 10 through 15

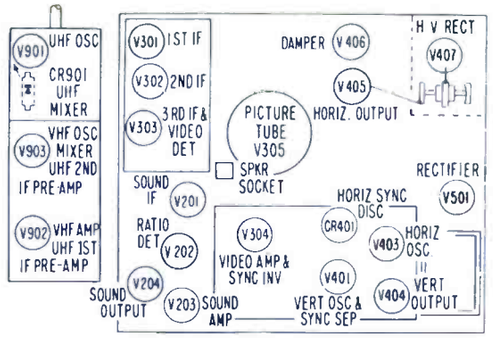
CR901-1N82A
V901-6AF4A
V902-6BZ7
V903-6U8
V201-6AU6
V202-6AL5
V203-6AV6
V204-6DG6GT
V301-6CB6

V302-6CB6
V303-6AM8
V304-6AW8
V305-21ATP4A in 19SZ4D, 19SZ4DF, 19SZ4DT, 19SZ4ES, 19SZ4PS
24DP4A in 19SZ4FS
V401-12AU7

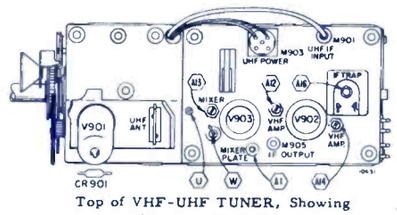
CR401-93A5-2 (Dual Selenium Diode)
V403-***
V404-6S4A
V405-6CU6 or 6DQ6
V406-6AU4GTA
V407-1B3GT
V501-5U4GA or 5U4GB

Models: TS23A1, A2, A3, A6, A7; TS323A1, A2, A2BZ, A3, A3LN; CS323A6, A7, A16, A17, A19; CS3256A, A7; T423A1, A2, A2BZ, A3, A3LN; C423A2, A3



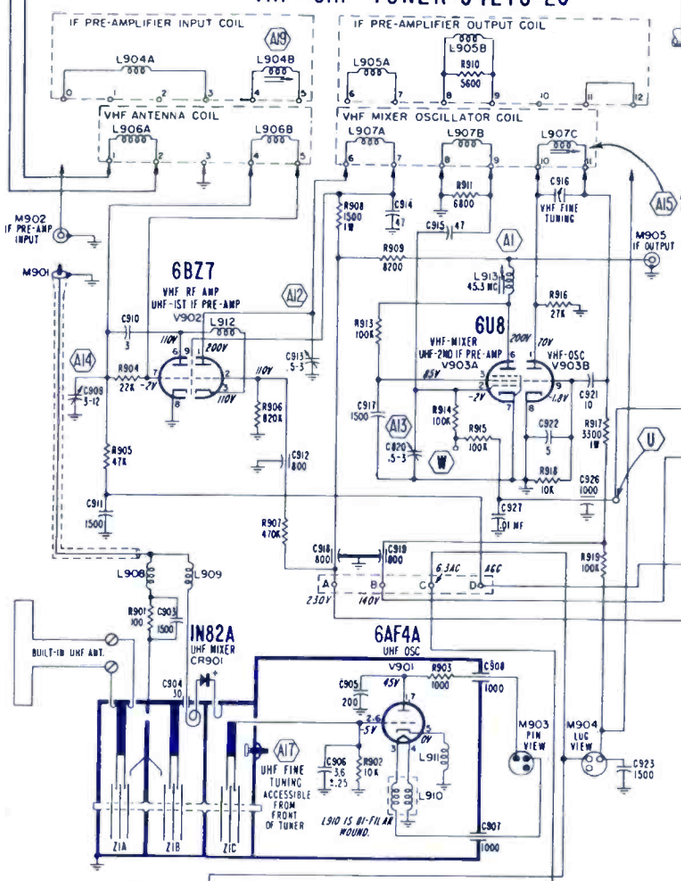


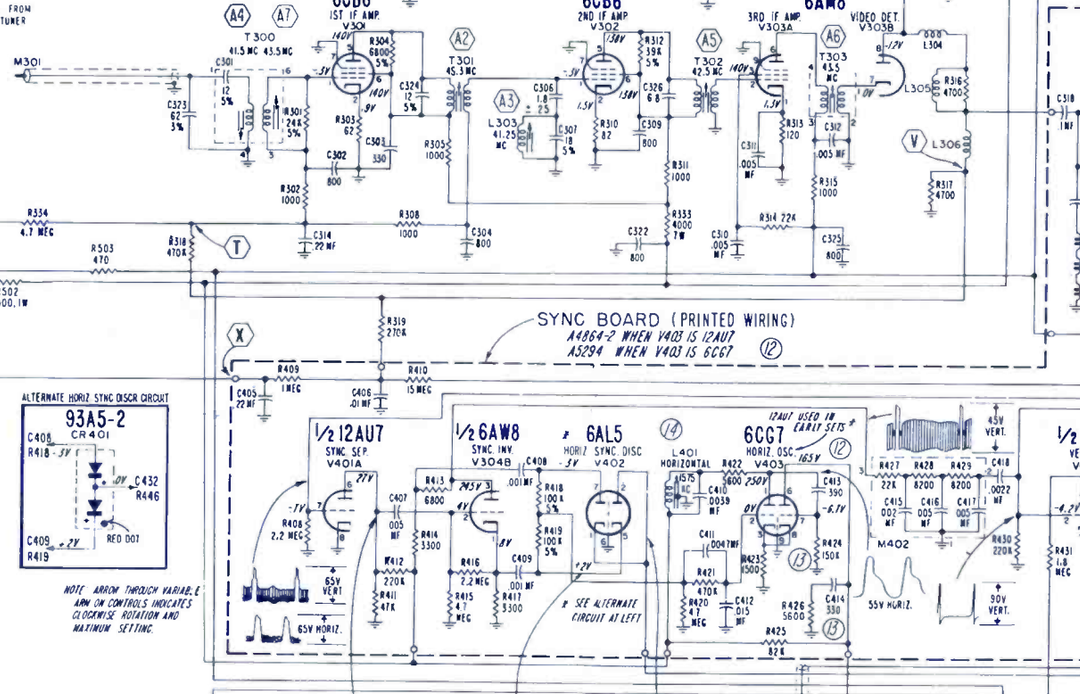
TUBE LOCATIONS

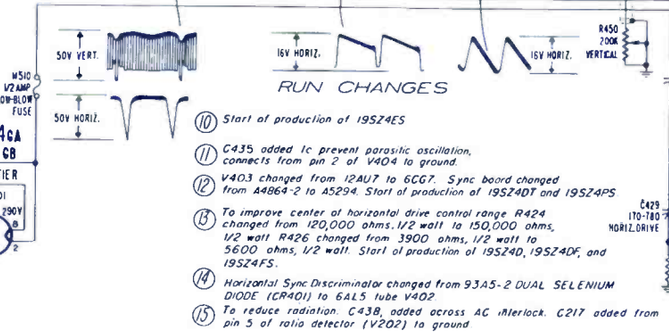


Top of VHF-UHF TUNER, Showing Adjustment Locations.

VHF-UHF TUNER 94E75-20







RUN CHANGES

(10) Start of production of 19SZ4ES

(11) C435 added to prevent parasitic oscillation, connects from pin 2 of V404 to ground.

(12) V403 changed from 12AU7 to 6CG7. Sync board changed from A4864-2 to A5294. Start of production of 19SZ4DT and 19SZ4PS.

(13) To improve center of horizontal drive control range R424 changed from 120,000 ohms, 1/2 watt to 150,000 ohms, 1/2 watt. R426 changed from 3900 ohms, 1/2 watt to 5600 ohms, 1/2 watt. Start of production of 19SZ4D, 19SZ4DF, and 19SZ4FS.

(14) Horizontal Sync Discriminator changed from 93A5-2 DUAL SELENIUM DIODE (CR401) to 6AL5 tube V402.

(15) To reduce radiation. C438 added across AC interlock. C217 added from pin 5 of ratio detector (V202) to ground.

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ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

ADMIRAL
TV Chassis 17L1, 17AL1; Hi-Fi Amplifier 4S2A

Models HF21F32, HFA21F32, HF21F33, HFA21F33, HF21F34, HFA21F34;
Hi-Fi Amplifier 4S2A;
AM-FM Tuner 8H1A

RUN CHANGES

(16) Start of production 17AL1.

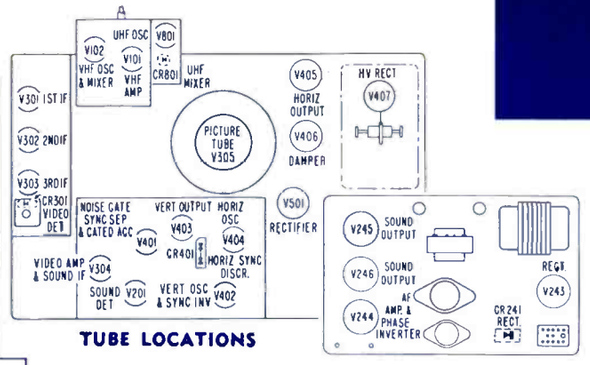
(17) Resistors R470 and R471 changed to 120K ohms to reduce focus voltage to picture tube.

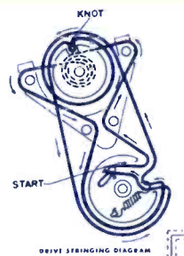
(18) R401 changed to 15meg ohms to improve AGC action in strong UHF signal areas.

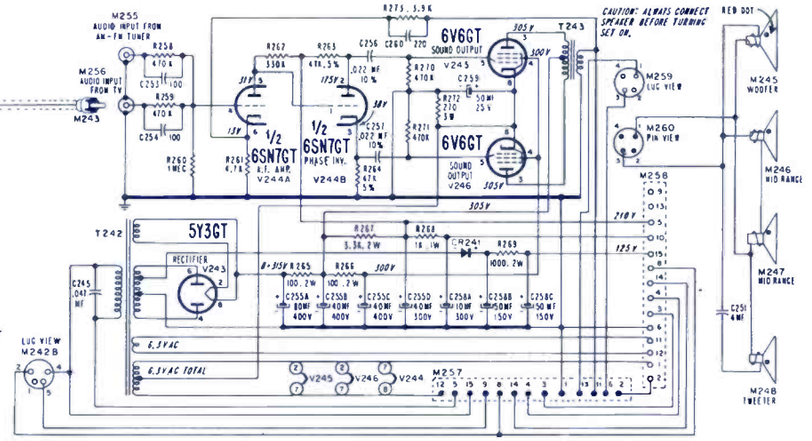
(19) Power transformer (T501) changed to reduce B+ voltage. R506 (5K ohms 15 watts) deleted. Not needed with new transformer.

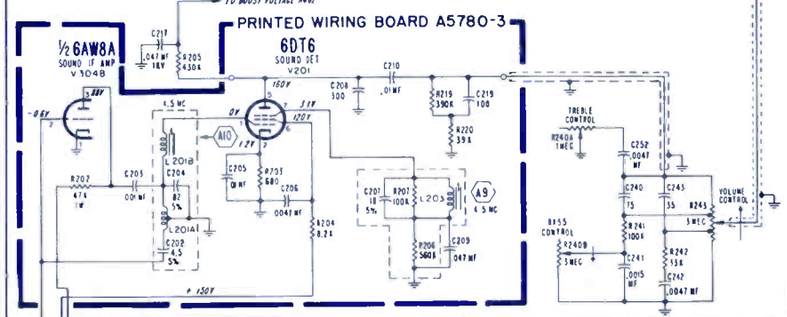
(20) For better voltage regulation to the VHF tuner R503 (2200 ohms) deleted. Resistor R509 (11K ohms, 2 watts, 5%) added in B+ circuit. R510 (15K ohms 2W) added from low B+ 150V line to chassis ground.

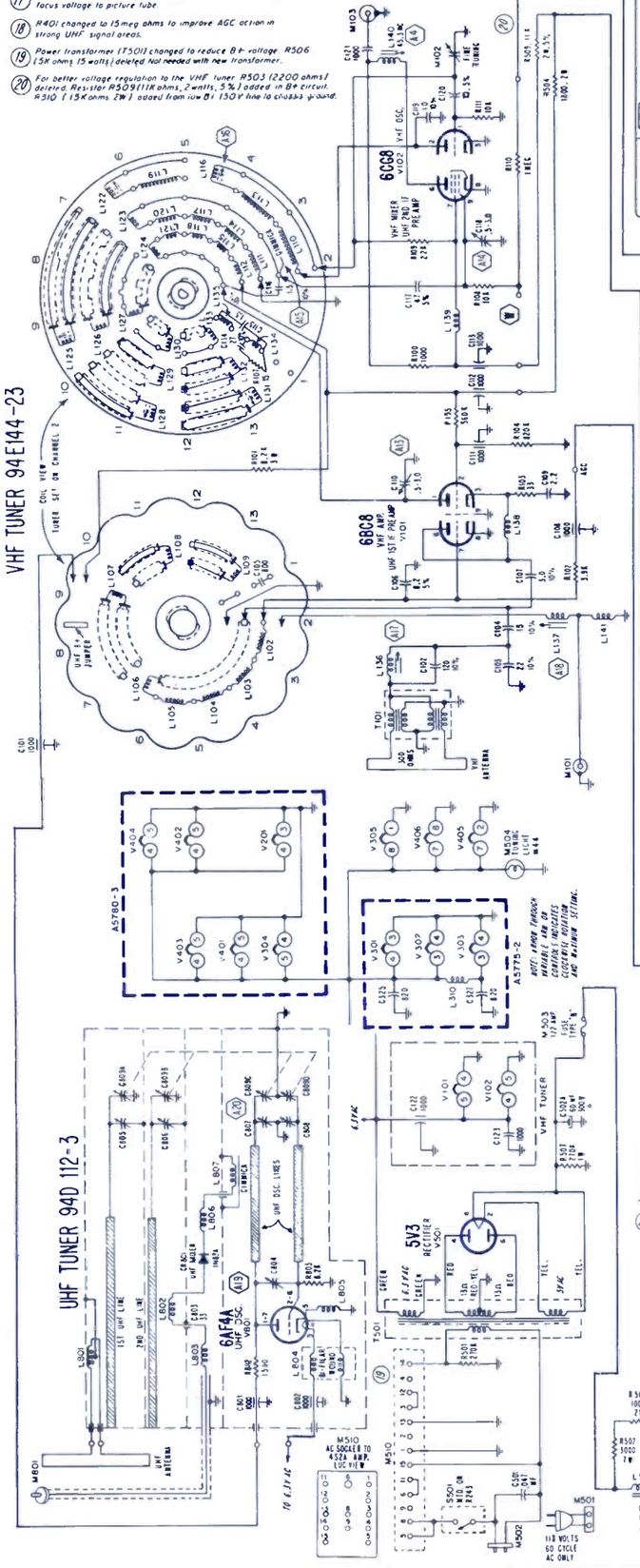
TUBE LOCATIONS

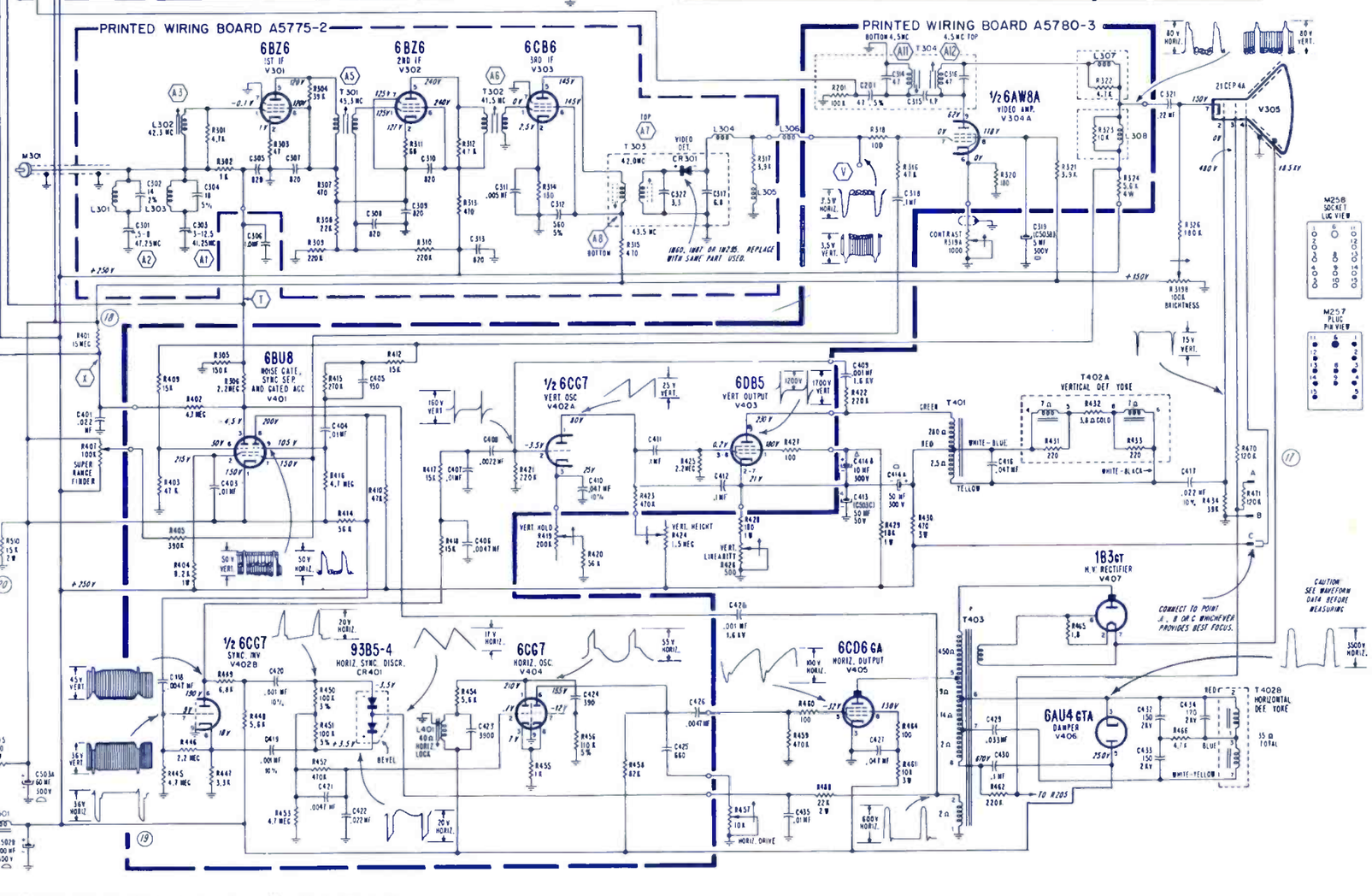




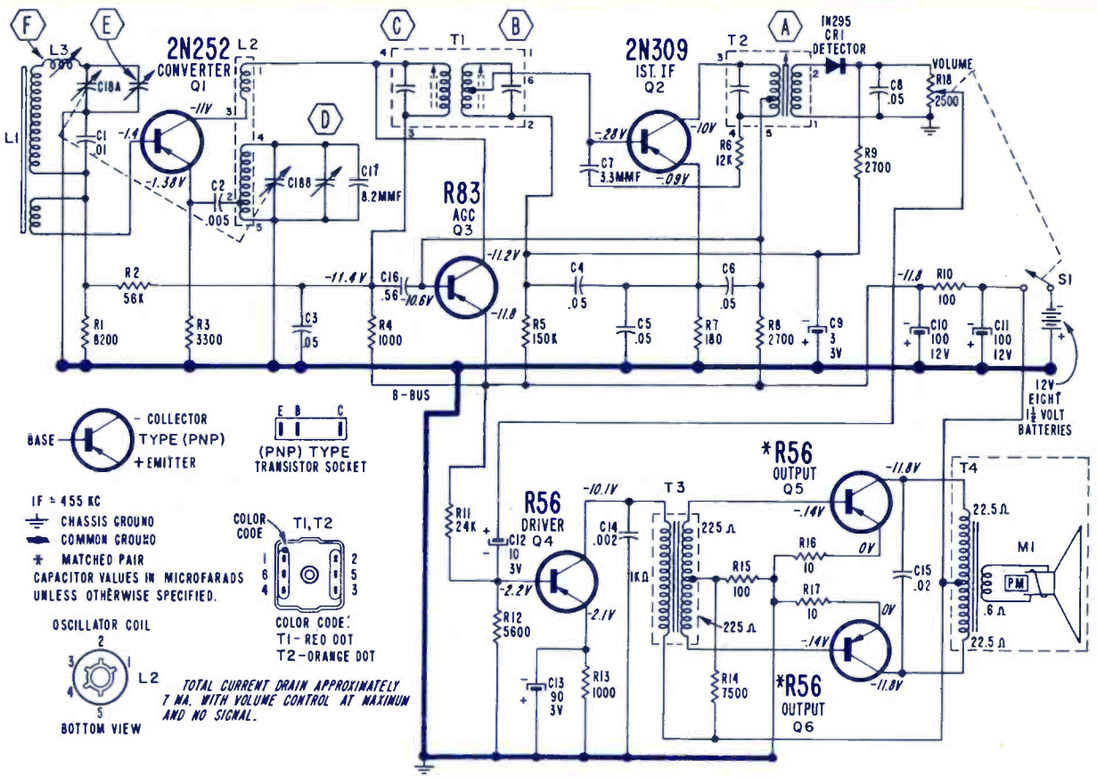


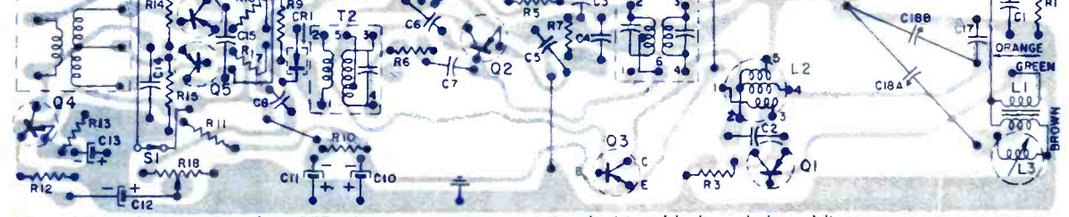




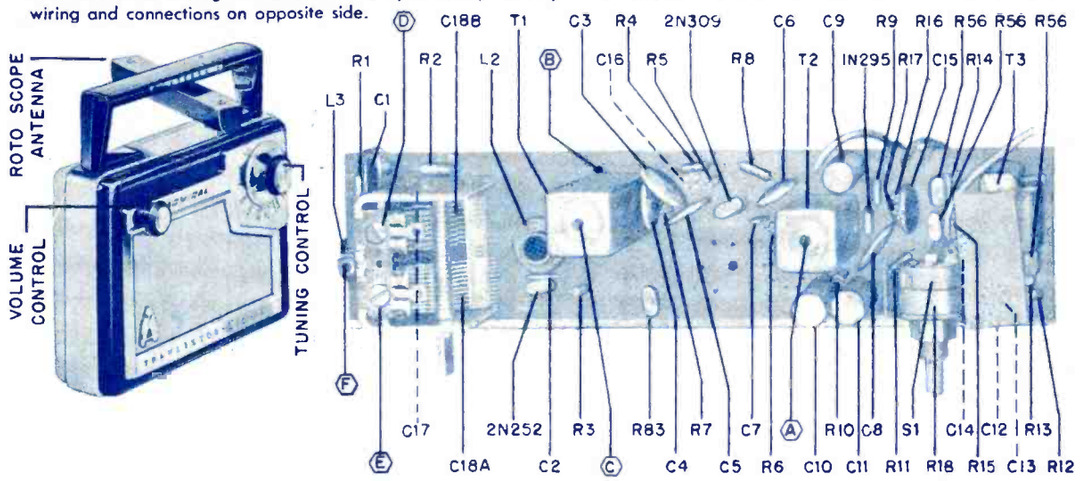


ADMIRAL
Transistor Radio Chassis 6S2



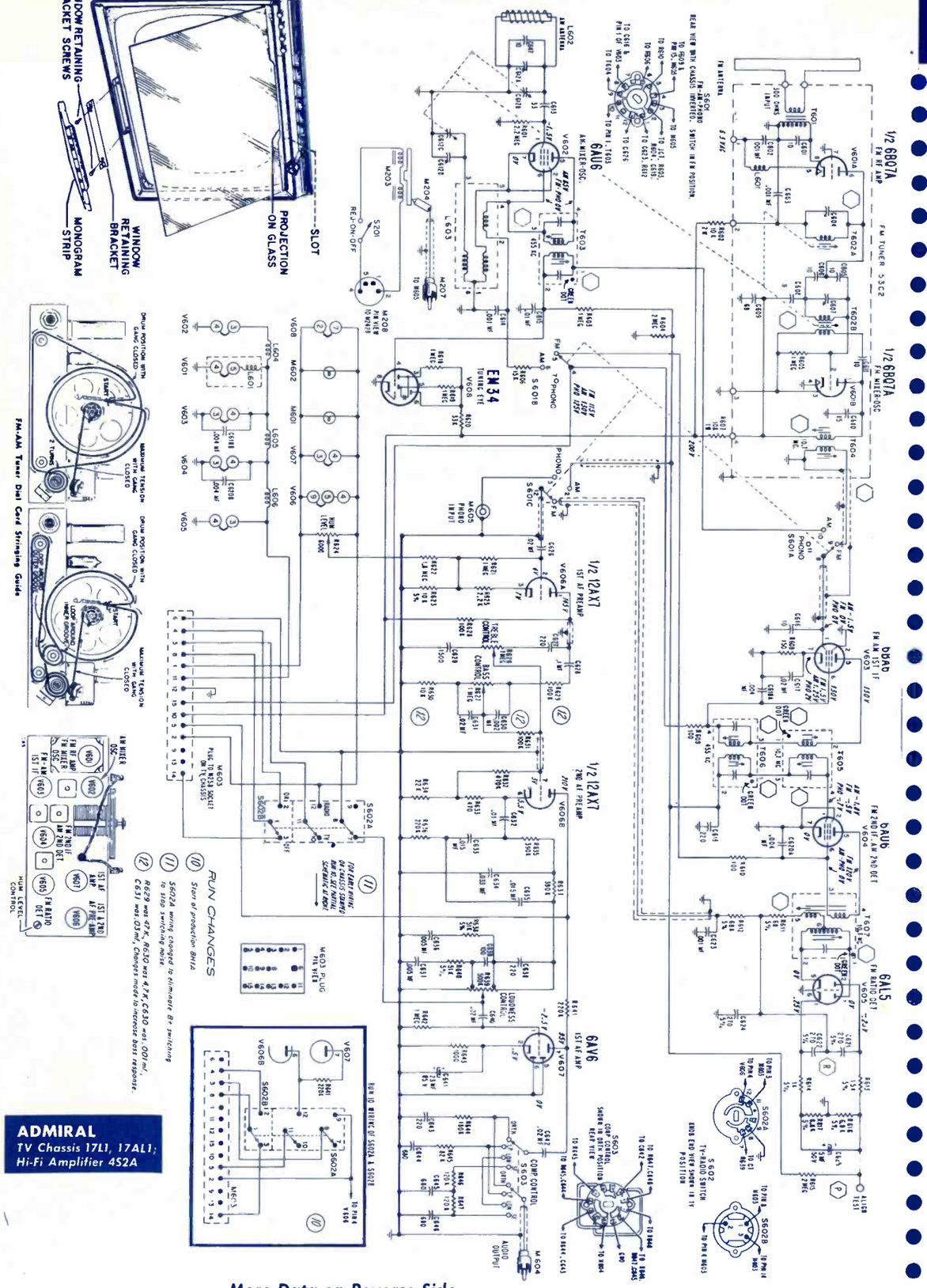


View of Printed Wiring Board. NOTE: Gray area represents printed wiring, black symbols and lines represent components, wiring and connections on opposite side.



Top View of Chassis Showing Parts Locations.

8H1A FM-AM Tuner Chassis



More Data on Reverse Side

ELECTRONIC TECHNICIAN CIRCUIT DIGEST

ADMIRAL
TV Chassis 16F1, 16AF1
16H1, 16AH1

TV Models P&PA14D11, P&PA14D12
P&PA14D13, P&PA14D14
P&PA17D21, P&PA14D22
P&PA17D23, P&PA14D24

Chassis 16F1 & 16H1 uses Tuner 94E144-19.
Chassis 16H1 & 16AH1 CRT 14ASP4 or 14AVP4.
REPLACE 14ASP4 with SAME TYPE.

RUN CHANGES

(13) Start of production.

(14) To prevent possible breakdown of C431 due to arc over in V305, R471 was added between pin 3 of V305 to junction of C431, R462 and R463.

(15) To prevent possible breakdown of C431 due to arc over in V305, R472 was added between pin 3 of V305 to junction of C431, R462 and R463.

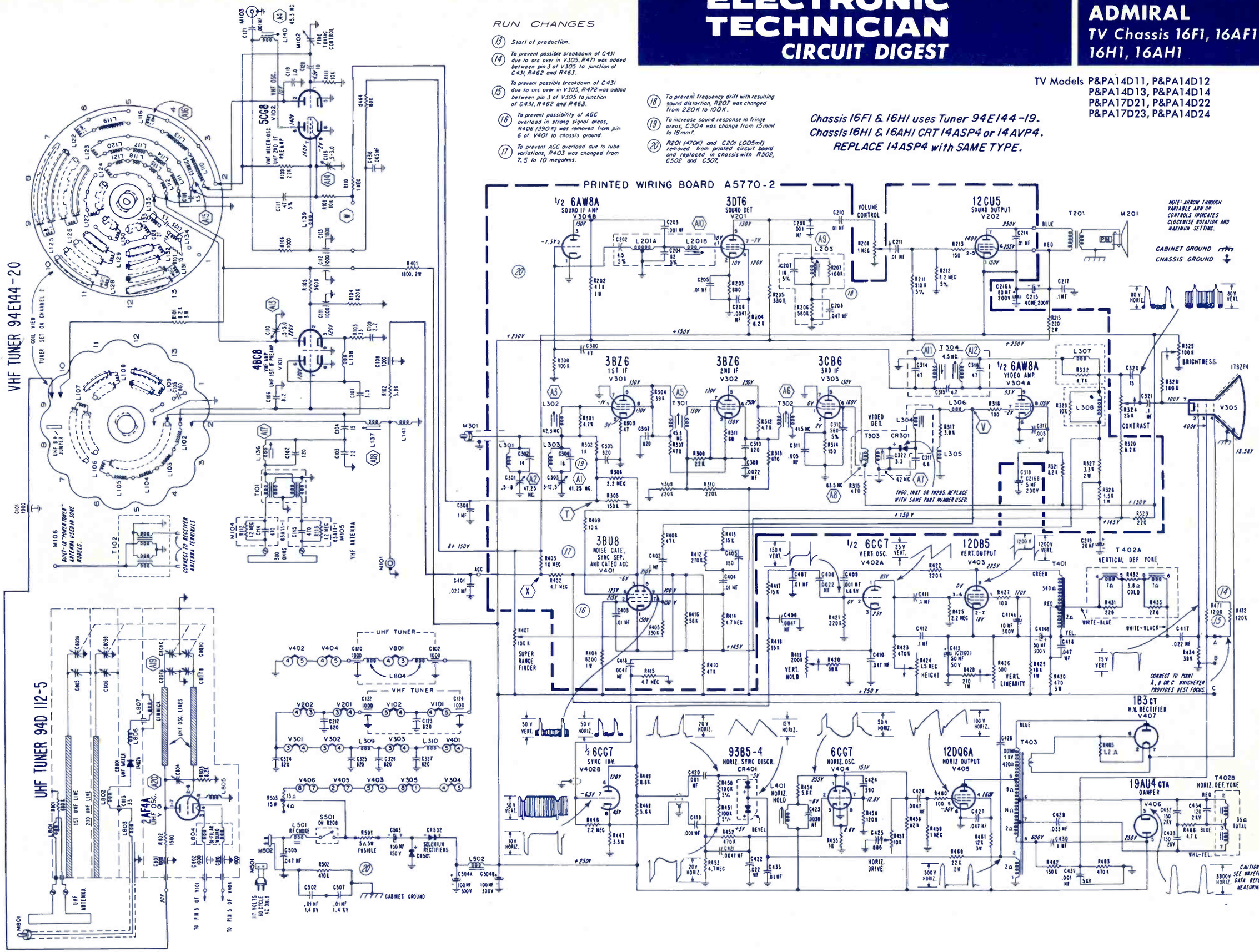
(16) To prevent possibility of AGC overload in strong signal areas, R406 (390K) was removed from pin 6 of V401 to chassis ground.

(17) To prevent AGC overload due to tube variations, R403 was changed from 7.5 to 10 megohms.

(18) To prevent frequency drift with resulting sound distortion, R207 was changed from 220K to 100K.

(19) To increase sound response in fringe areas, C304 was change from 15mmf to 18mmf.

(20) R201 (470K) and C201 (.005mf) removed from printed circuit board and replaced in chassis with R502, C502 and C507.

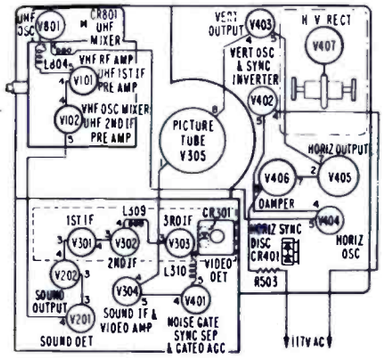


More Data on Reverse Side

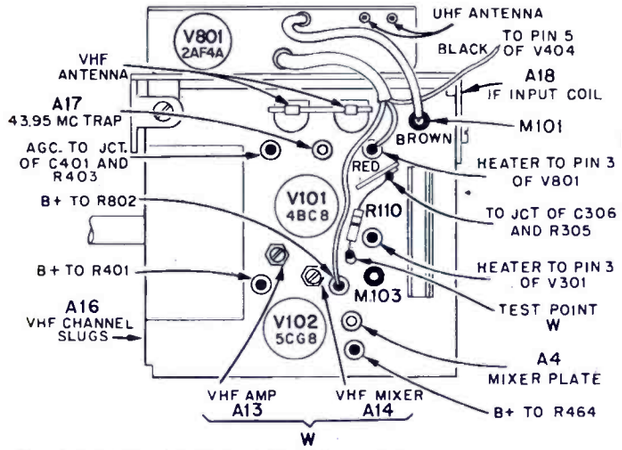
ADMIRAL
TV Chassis 16F1, 16AF1 16H1, 16AH1

More Data on Reverse Side

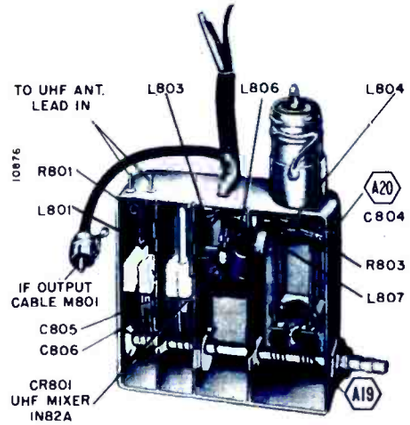
TUBE LOCATIONS AND HEATER CIRCUIT



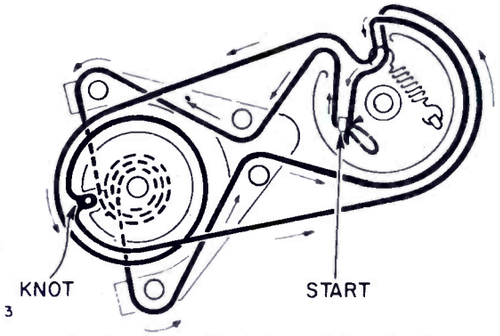
CR801—IN82A
V801—2AF4A
V101—4BC8
V102—5CG8
V201—3DT6
V202—12CU5
V301—3BZ6
V302—3BZ6
V303—3CB6
CR301—1N60, 1N87 or 1N295
V304—6AW8A
V305—17BZP4
CR401—Dual Selenium Diode 93B5-4
V401—3BU8
V402—6CG7
V403—12DB5
V404—6CG7
V405—12DQ6A
V406—19AU4GTA
V407—1B3GT



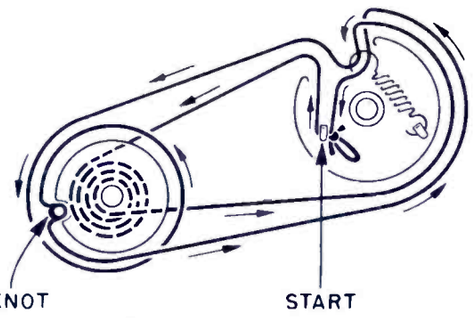
Top View of VHF Tuners 94D144-20 and UHF Tuner 94D112-5 showing Adjustment Locations.



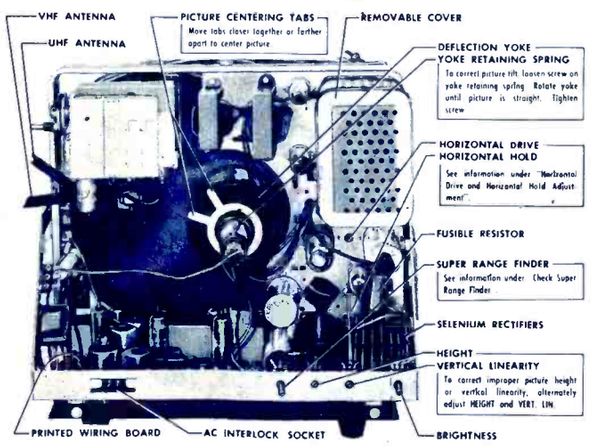
View of UHF Tuner 94D112-5, Cover Plate Removed.



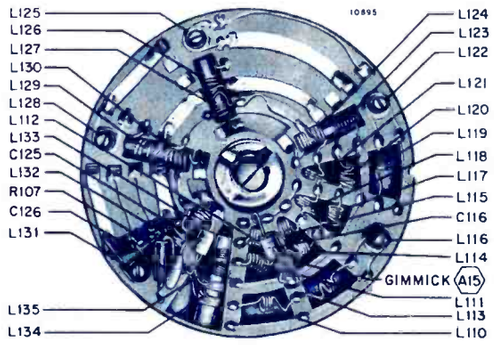
Tuning Drive Used On Early Production VHF-UHF Sets.



Tuning Drive Used On Later Production VHF-UHF Sets.

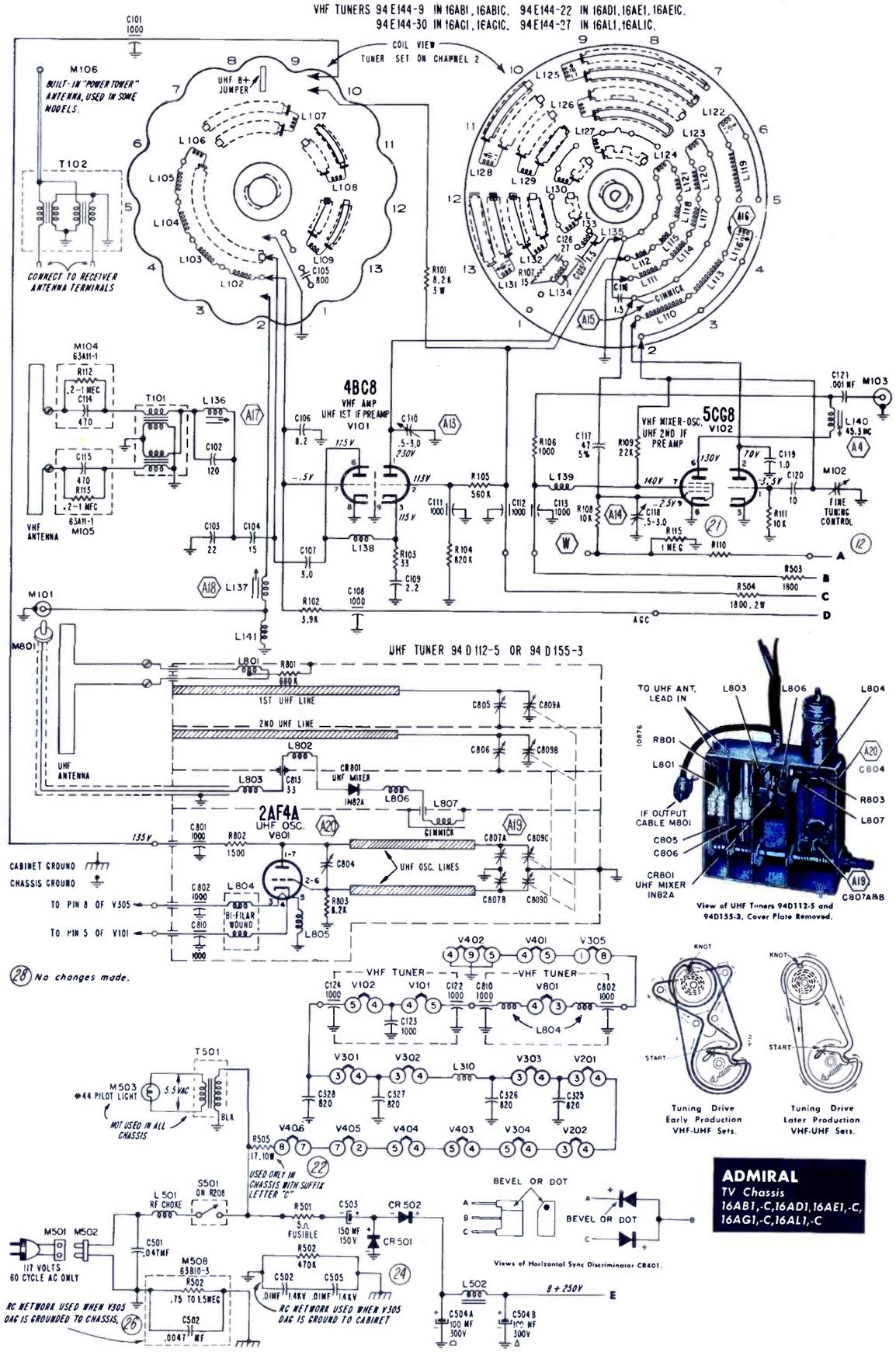


Rear View of 17" Picture Tube Sets Showing Adjustment Locations. UHF Antenna Terminals in VHF-UHF Sets Only.



View of Oscillator-Mixer Rotor Disc in VHF Tuner 94E144-20.

VHF TUNERS 94E144-9 IN 16AB1, 16ABIC. 94E144-22 IN 16AD1, 16AE1, 16AEIC.
94E144-30 IN 16AG1, 16AGIC. 94E144-27 IN 16AL1, 16ALIC.



ADMIRAL
TV Chassis
16AB1,-C,16AD1,16AE1,-C, 16AG1,-C,16AL1,-C

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ADMIRAL
TV Chassis
16AB1,-C,16AD1,16AE1,-C, 16AG1,-C,16AL1,-C

RUN CHANGES

(10) Start of production.

(11) To improve AGC action, C428 was changed from 300 mmf to .001 mf., 1.5 KV.

(12) To reduce voltage to VHF oscillator, R503 was changed from 470 to 1,800 ohms.

(13) To prevent possible breakdown of C431 due to arc over in V305, R470 was relocated from between junction of R462 and R463 and focus connection "A" to opposite side of connection "A".

(14) To improve operation of horizontal oscillator, R456 was changed from 120K to 110K, 5%.

(15) To prevent AGC overload due to tube variation, R329 was changed from 7.5 to 10 ohms.

(16) To prevent possible frequency drift with resulting sound distortion, R207 was changed from 220K to 100K.

(17) R470 was added to prevent possible breakdown of C431 due to arc over in V305.

(18) To center usable range of contrast control, R320 was changed from 470 to 220 ohms.

(19) (20) No changes made.

(21) R115 added to prevent AGC overload in very strong signal areas.

(22) To prevent possible damage to V405 due to arc-over in V406, heaters of V405 and V406 relocated in heater circuit.

(23) Start of production chassis with suffix letter "C". New horizontal output circuit used.

(24) C502 changed from .005 mf to .01 mf. C505 added in series with C502 for increased breakdown safety factor.

(25) C432 and C433 changed from 150 mmf to 210 mmf. for improving efficiency of horizontal output circuit. C416 changed from 200 to 400 volt rating for improved breakdown safety factor.

(26) V305 dag changed from cabinet to chassis ground. Couplate M508 used for RC network R502 & C502. C409 rating changed from 1.6 to 2 kv.

(27) R210 circuit changed to provide more constant sound level through range of tone control. C213 was .0047mf. R209 was 22k.

PRINTED WIRING BOARD A5780-1

PRINTED WIRING BOARD A5775-1

½ 6AW8A SOUND IF AMP. V304B

3DT6 SOUND DET. V201

12CU5 SOUND OUTPUT V202

3BZ6 1ST IF V301

3BZ6 2ND IF V302

3CB6 3RD IF V303

½ 6AW8A VIDEO AMP V304A

3BU8 NOISE GATE, SYNC SEP. AND GATED AGC V401

½ 7AU7 VERT. OSC. V402A

12DB5 VERT. OUTPUT V403

½ 7AU7 SYNC. INV. V402B

93B5-4 HORIZ. SYNC. DISCR. CR401

6CG7 HORIZ. OSC. V404

12DQ6A HORIZ. OUTPUT V405

1B3GT H.V. RECTIFIER V407

19AU4GTA DAMPER V406

21CEP4A V305

IN 16AD1 AND 16AL1C CHASSIS, TONE CONTROL NOT USED AND VOLUME CONTROL DOES NOT HAVE TAP.

CAUTION: ALWAYS CONNECT SPEAKER BEFORE TURNING VOLUME CONTROL MAXIMUM.

NOTE: ARROW THROUGH VARIABLE ARM ON CONTROLS INDICATES CLOCKWISE ROTATION AND MAXIMUM SETTING.

TWO SPEAKERS USED IN SOME MODELS

DAG GROUNDED TO CABINET IN EARLY SETS; GROUNDED TO CHASSIS IN LATER SETS.

CONNECT TO POINT A, B OR C WHICHEVER PROVIDES BEST FOCUS.

CONNECTIONS TO V40T SOCKET CHANGED IN LATER MODELS.

CAUTION: SEE WAVEFORM DATA BEFORE MEASURING

CIRCUIT SETS RUN 10 THRU RUN 26

R428 IS 180, 1W IN CHASSIS WITH SUFFIX LETTER "C"

SEE SCHEMATIC INSET FOR V405 CIRCUIT IN CHASSIS WITHOUT SUFFIX LETTER "C"

IN6D, 1N87 OR 1N295. REPLACE WITH SAME PART NUMBER USED.

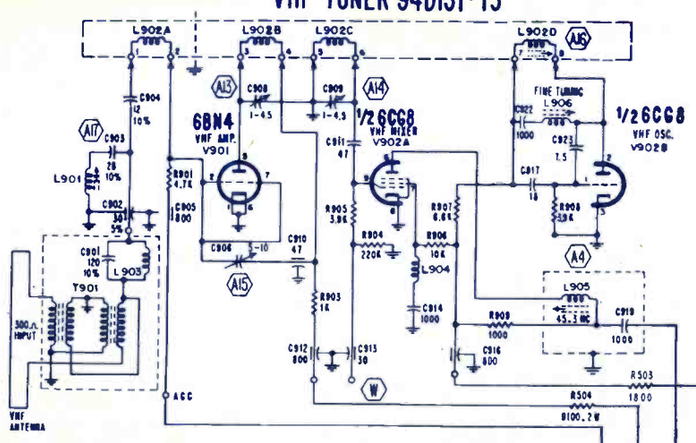
TUBE LOCATIONS AND HEATER CIRCUIT

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

ADMIRAL
TV Chassis 18C6C, 18C6T

Model CS21G62, CS21G63, CS21G64
LS21G42, LS21G43
TS21G22, TS21G23

VHF TUNER 94D151-13



RUN CHANGES

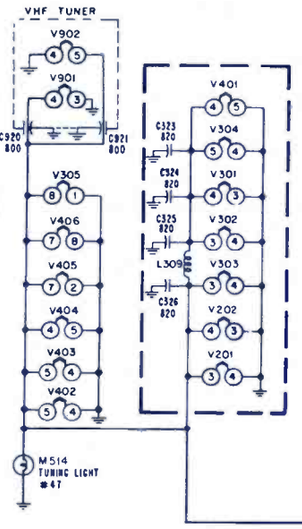
(13) Start of production

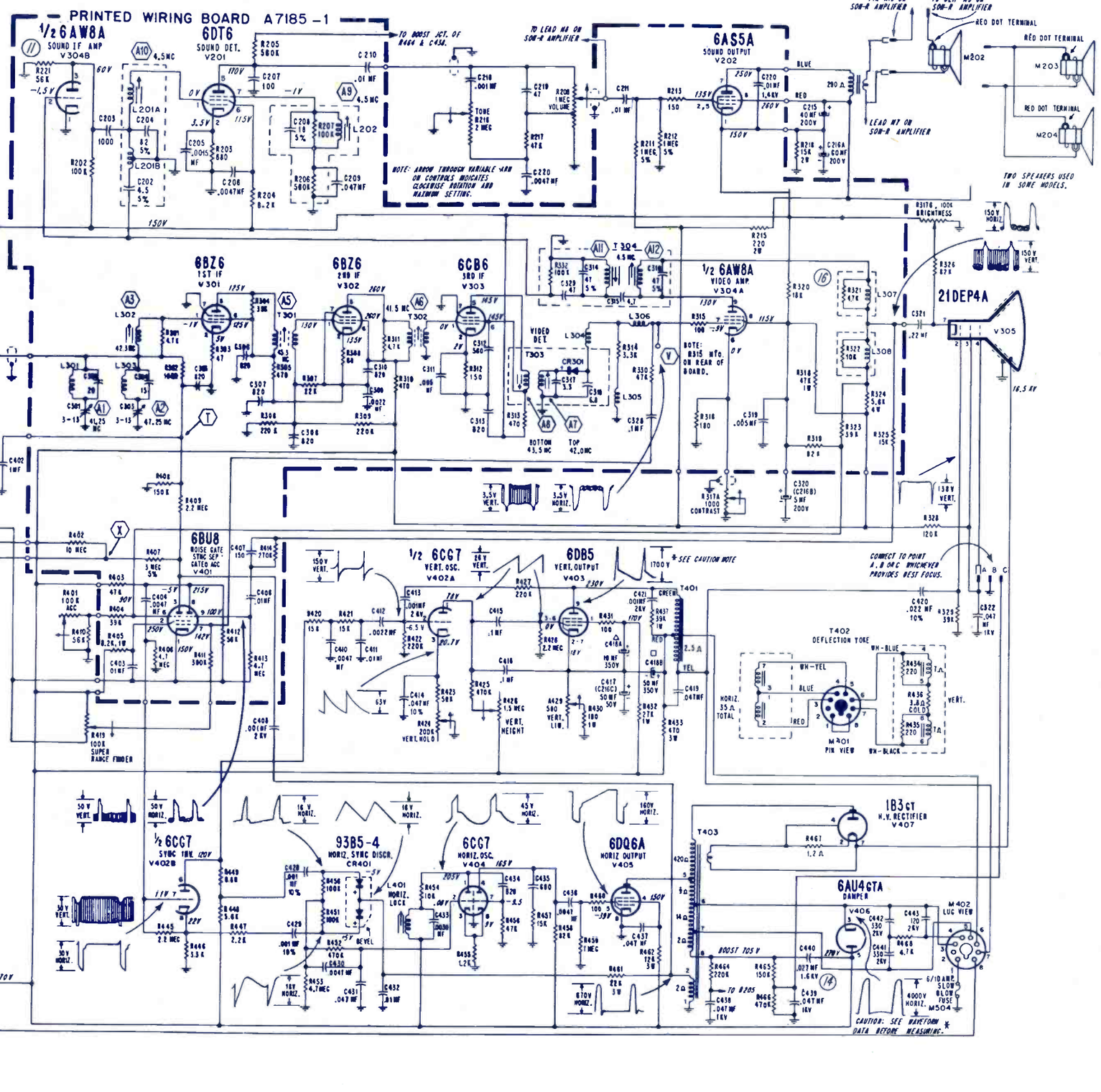
(14) C440 changed from .022MF, to .027MF, 1.6KV, 10% for improving horizontal stability at high line voltage (130 volts or higher).

(15) For standardization, R501 was changed from 270K to 470K.

(16) To simplify circuitry, L307 changed from orange and red dot coil (part number 73C5-32, wound on 18K resistor) to brown and green dot coil (part number 73C5-23, wound on 4.7K resistor). R331 (6.8K) removed from across L307 when brown and green dot coil is used.

(17) No changes made.





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ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

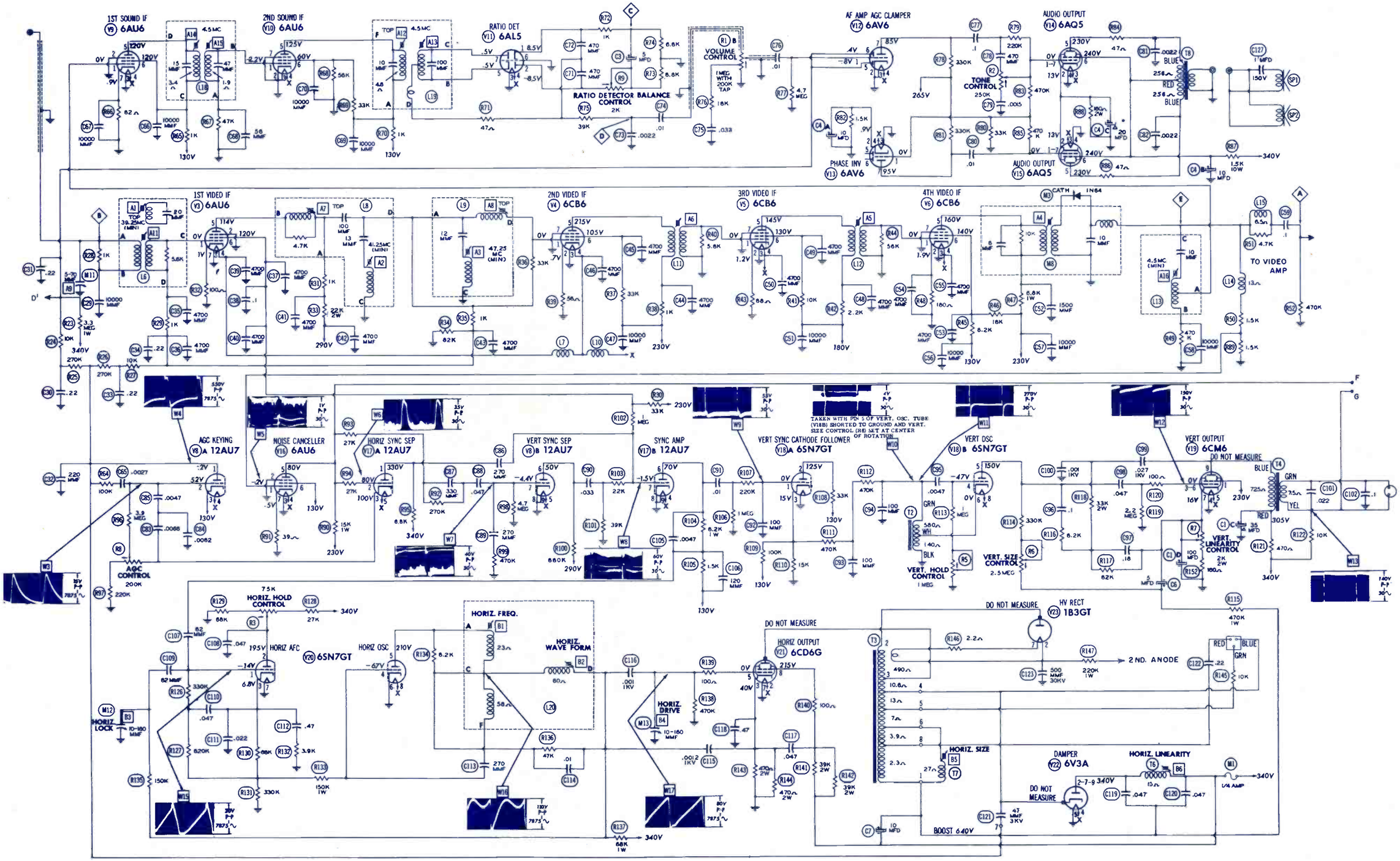
ATR
Chassis 2600

Models 26001, 2, 3, 4, 5

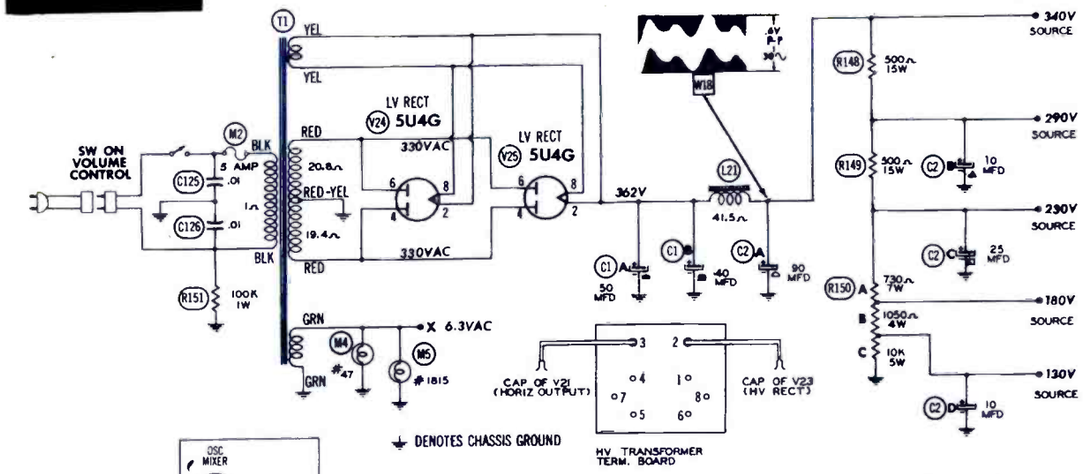
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltage measured at 1,000 ohms per volt.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings from standard commercial line with no automatic voltage regulator.
5. All controls set for normal operation; no signal applied.

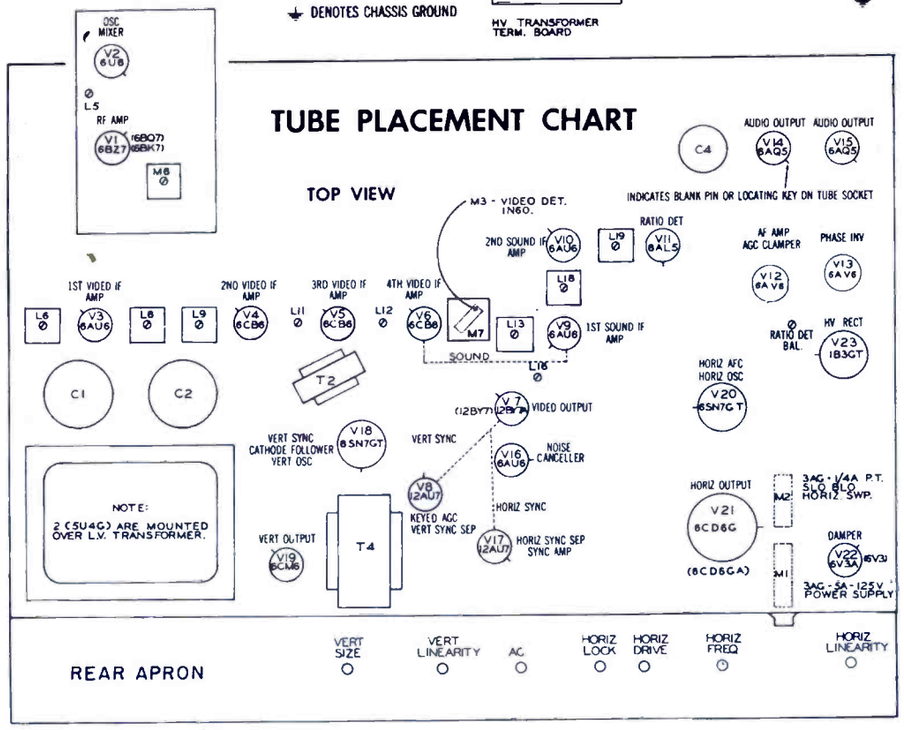
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROLS VIEWED FROM SHAFT END)

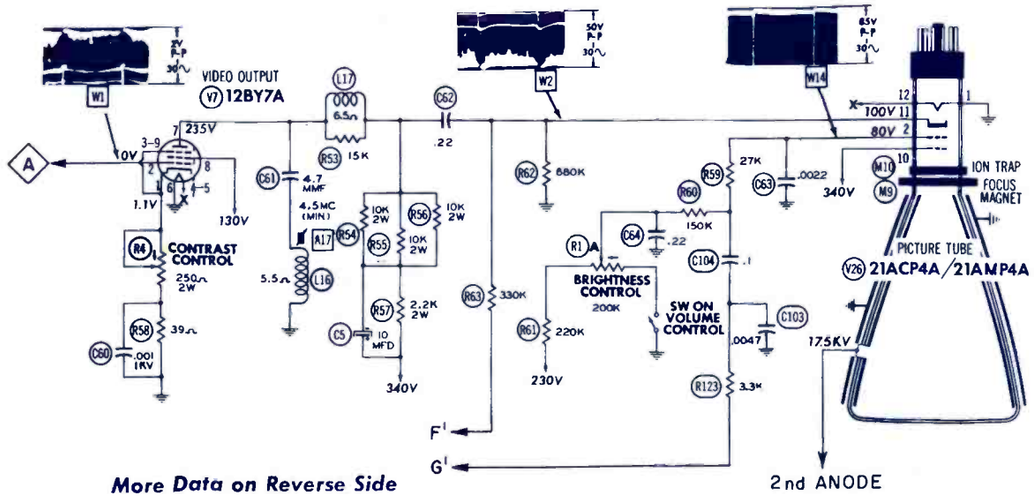
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK.

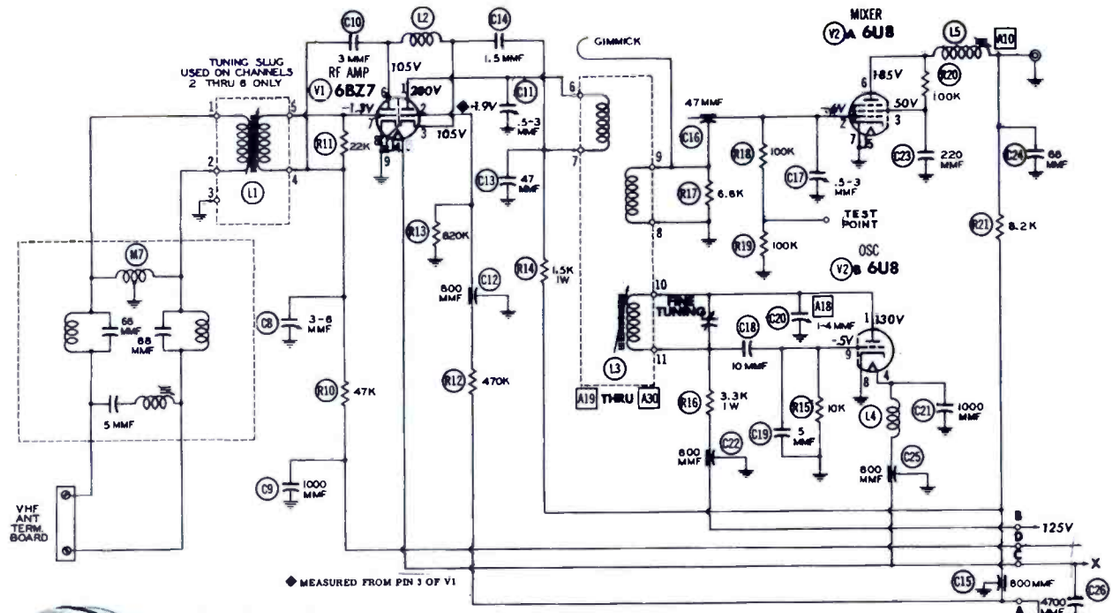


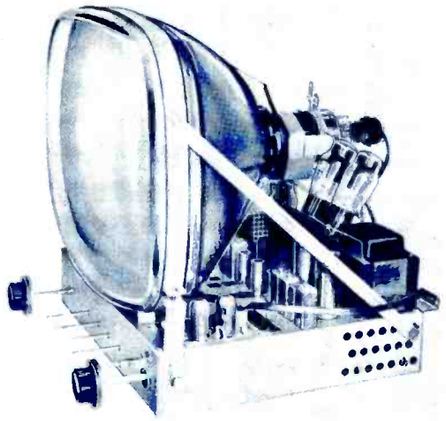
ATR
Chassis 2600

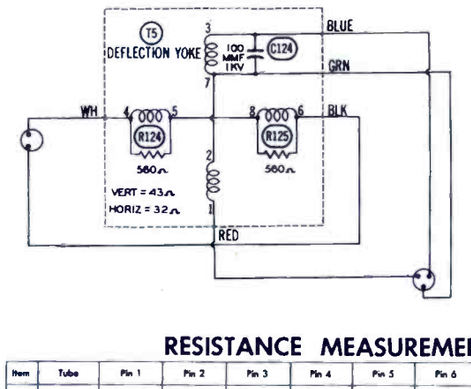


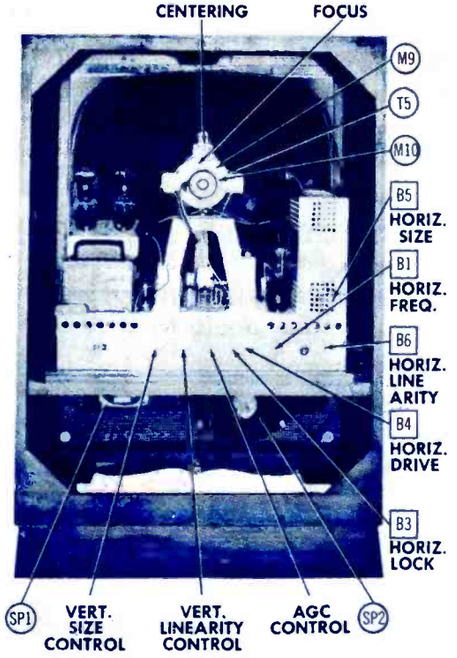












RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	†6.2KΩ	330KΩ	INF	0Ω	.1Ω	INF	600KΩ	0Ω	0Ω
V 2	6U8	†6KΩ	200KΩ	†100KΩ	.1Ω	0Ω	†13KΩ	0Ω	0Ω	10KΩ
V 3	6AU6	80KΩ	0Ω	0Ω	.1Ω	†30KΩ	†34KΩ	100Ω		
V 4	6CB6	80KΩ	56Ω	0Ω	.1Ω	†2KΩ	†34KΩ	0Ω		
V 5	6CB6	.2Ω	68Ω	0Ω	.1Ω	†4KΩ	†12KΩ	0Ω		
V 6	6CB6	.2Ω	180Ω	0Ω	.1Ω	†8KΩ	†8KΩ	0Ω		
V 7	12BY7A	80Ω	470KΩ	80Ω	.1Ω	.1Ω	0Ω	†6KΩ	†2.7KΩ	80Ω
V 8	12AU7	350KΩ	4Meg	†2.7KΩ	.1Ω	.1Ω	†680KΩ	4.7Meg	0Ω	0Ω
V 9	6AU6	470KΩ	0Ω	0Ω	.1Ω	†3.7KΩ	†3.7KΩ	82Ω		
V 10	6AU6	47KΩ	0Ω	0Ω	.1Ω	†3.7KΩ	†25KΩ	0Ω		
V 11	6AL5	8KΩ	8KΩ	0Ω	.1Ω	INF	0Ω	INF		
V 12	6AV6	4.7Meg	0Ω	0Ω	.1Ω	550KΩ	550KΩ	†330KΩ		
V 13	6AV6	33KΩ	1.5KΩ	0Ω	.1Ω	NC	NC	†330KΩ		
V 14	6AQ5	500KΩ	180Ω	.1Ω	0Ω	†1.8KΩ	†1.5KΩ	500KΩ		
V 15	6AQ5	500KΩ	180Ω	.1Ω	0Ω	†1.8KΩ	†1.5KΩ	500KΩ		
V 16	6AU6	1.5KΩ	0Ω	0Ω	.1Ω	†16KΩ	†2.7KΩ	39Ω		
V 17	12AU7	†6.8KΩ	50KΩ	420KΩ	.1Ω	.1Ω	†12KΩ	70KΩ	0Ω	0Ω
V 18	6SN7GT	1.2Meg	†37KΩ	15KΩ	1.8Meg	▲2Meg	140Ω	0Ω	.1Ω	
V 19	6CM6	†1KΩ	TP	2.2Meg	0Ω	.1Ω	2.2Meg	600Ω	NC	†1.2KΩ
V 20	6SN7GT	1.5Meg	†40KΩ	400KΩ	500KΩ	†68KΩ	0Ω	0Ω	.1Ω	
V 21	6CD6G	NC	.1Ω	235Ω	TP	470KΩ	TP	0Ω	†19KΩ	TOP CAP ▲10.6Ω
V 22	6V3A	TOP CAP 850KΩ	†80Ω	NC	.1Ω	0Ω	NC	†80Ω	NC	†80Ω
V 23	1B3GT		PINS	1 - 8	HAVE	INF	RESISTANCE			▲500Ω
V 24	5U4G	NC	10KΩ	NC	19Ω	NC	21Ω	NC	10KΩ	
V 25	5U4G	NC	10KΩ	NC	19Ω	NC	21Ω	NC	10KΩ	
V 26	21ACP4A/	0Ω	†300KΩ	PIN 10 †42Ω	PIN 11 †240KΩ	PIN 12 .1Ω				
V 27	21AMP4A									

† MEASURED FROM PIN 2 OF V24.
▲ MEASURED FROM TOP CAP OF V22.
NC- NO CONNECTION
TP - TIE POINT

More Data on Reverse Side

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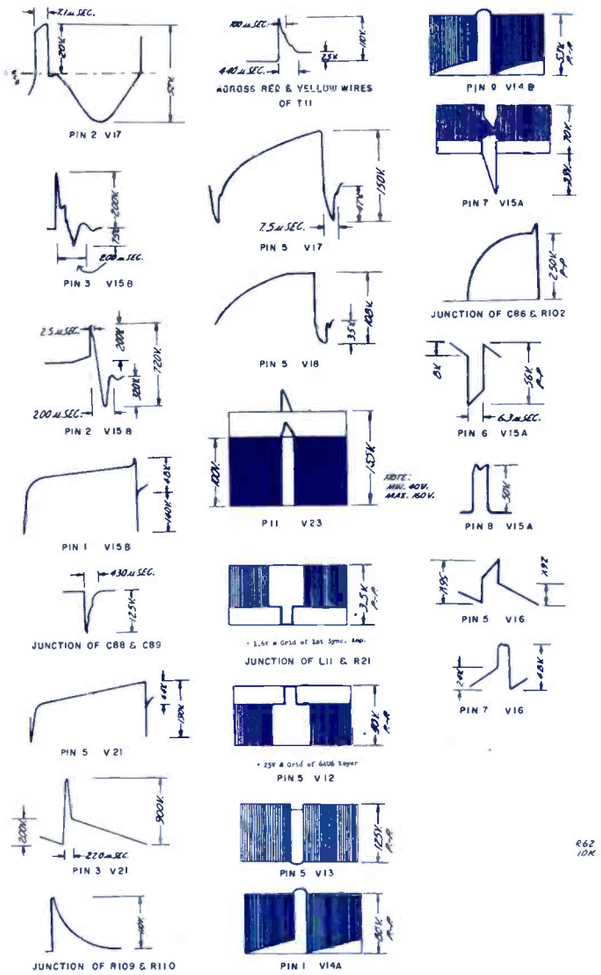
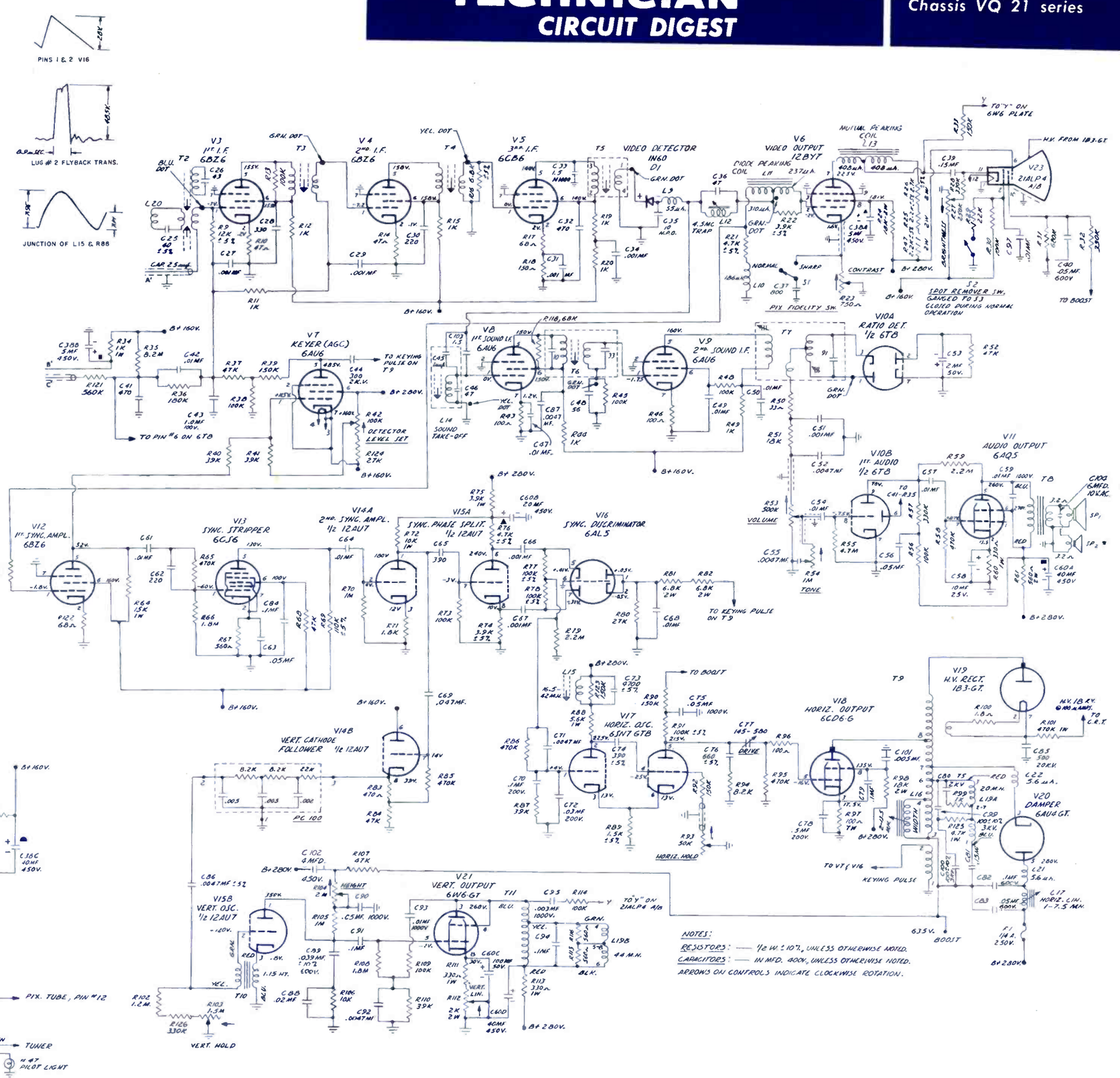
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

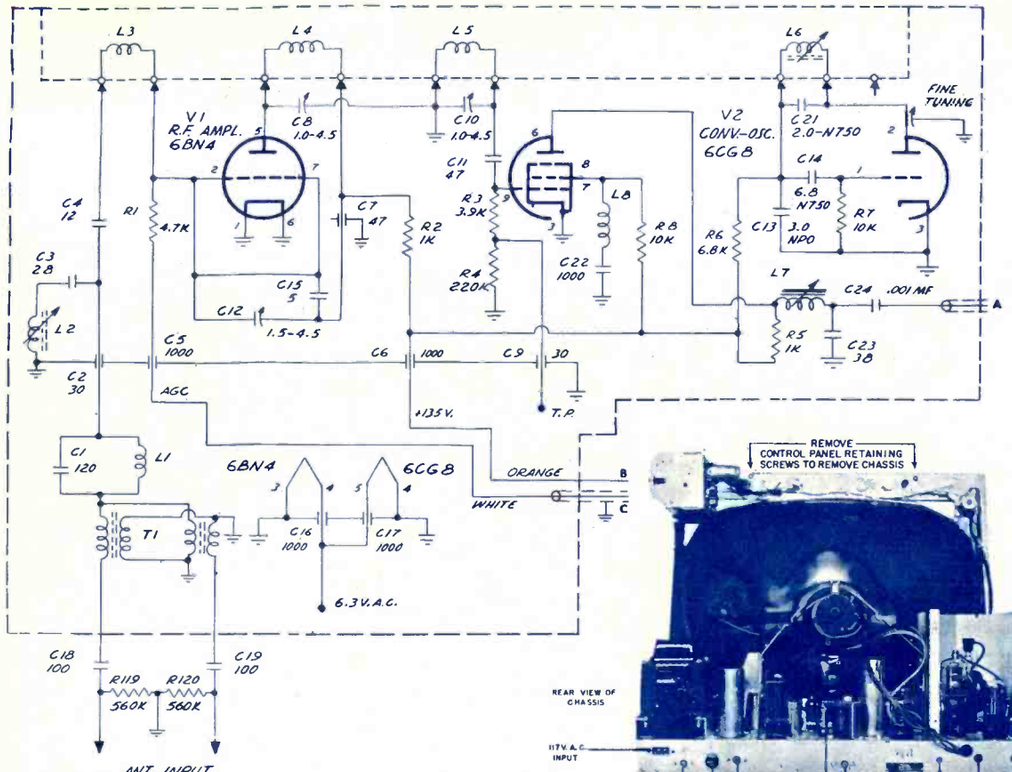
ANDREA
Chassis VQ 21 series

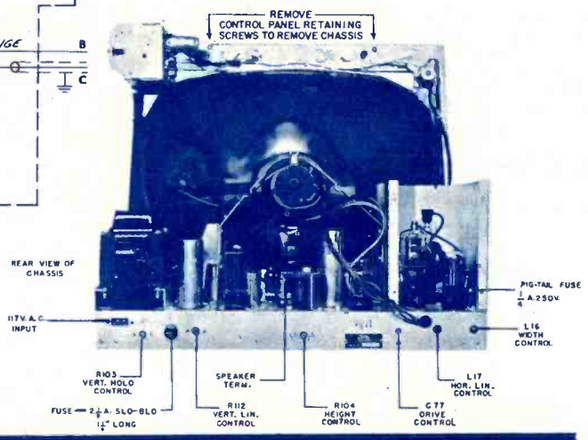




ANDREA
Hi-Fi Chassis P8W

Model: TP-8W

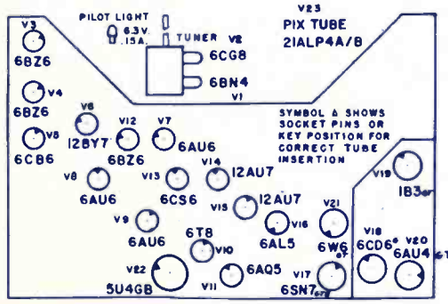




D.C. RESISTANCE OF COILS & TRANSFORMERS

1. ST-3084 Vertical Blocking Osc. Trans.
   Primary 270 Ohms
   Secondary 1450 Ohms
2. ST-3071 Audio Output Transformer
   Primary 330 Ohms
3. ST-3087 Filter Reactor
   69 Ohms
4. SA-395 Horizontal Osc. Coil
   59 Ohms
5. ST-3083 Deflection Yoke
   Horizontal Coils (1-3) 31.3 Ohms
   Vertical Coils (4-6) 41.2
6. ST-3085 Horizontal Output Trans.
   Terminals 1-2 2.9 Ohms
   3-4 1.76 Ohms
   3-5 18.60 Ohms
   3-7 23.0 Ohms
   3-8 33.2 Ohms
   8-H.V. 343. Ohms
7. ST-3086 Vertical Output Trans.
   Primary 950 Ohms
   Secondary 9.5 Ohms
8. ST-3082-1 60 Cycle Power Trans.
   Primary .8 Ohms
   H.V. Sec. 31 Ohms
   Brown 1.0 Ohm
   Yellow Less Than .1
   Green Less Than .1
9. SA-393 Width Coil
   11.6 Ohms
10. SA-394 Horizontal Lin. Coil
    8.42 Ohms

± 10%



TUBE LOCATIONS
TELEVISION
VQ21 CHASSIS

ANDREA
Chassis VQ 21 series

VQ-21 CHASSIS RESISTANCE READINGS

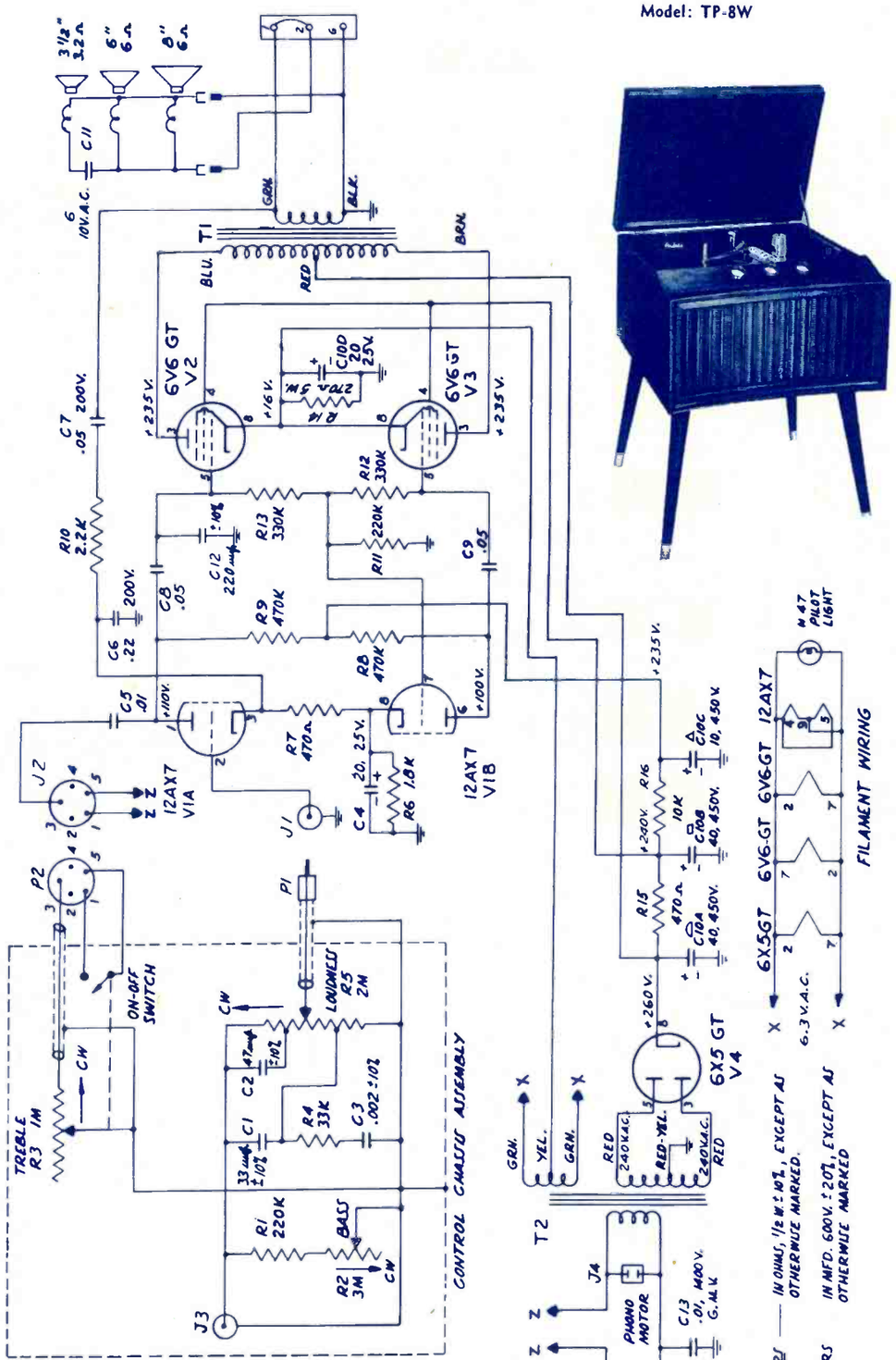
Taken from Tube Pin to Chassis
All Controls in Normal Operating Position

TUBE REF. NO.	TUBE PIN NO. 1	2	3	4	5	6	7	8	9
V1 6BN4	0	800K	0	H	200K	0	800K		
V2 6CG8	10K	200K	0	0	H	200K	220K	0	220K
V3 6BZ6	160K	47	H	0	240K	240K	0		
V4 6BZ6	150K	47	H	0	240K	240K	0		
V5 6CB6	0	220	H	0	240K	240K	0		
V6 12BY7	280*	100	0	H	H	0	220K	220K	0
V7 6AU6	190K	170K	170K	180K	260K	220K	220K		
V8 6AU6	3	0	H	0	240K	240K	100		
V9 6AU6	100K	0	H	0	220K	320K	100		
V10 6T8	600K*	47K	600K	0	H	350K	0	4.7M	450K
V11 6AQ5		330	H	0	240K	240K	470K		
V12 6BZ6	10K	68	0	H	180K	190K	0		
V13 6CS6	1.8M	560	H	0	350K	260K	560		
V14 12AU7	240K	1M	1.8K	H	H	260K	517K	48K	0
V15 12AU7	2M*	2M	240	0	0	220K	100K	3.9K	H
V16 6AL5	9K	9K	H	0	2M	0	2M		
V17 6SN7	2.2M	200K	15K	160K	1.2M	15K	H	0	
V18 6CD6		H	100	8.2K	500K		0	200K	
V19 1B3									
V20 6AU4			1M		350K		H	H	
V21 6W6	1.5K*	0	250K	250K	1.8M	1.8M	H	1.8K	
V22 5U4		200K		15		15		200K	
V23 21ALP4	0	300K				200K			
	Pin 1 = 750K				Pin 11 = 500K			Pin 12 = H	

ALL READINGS IN OHMS
K = 1000 Ohms
M = 1 Megohms

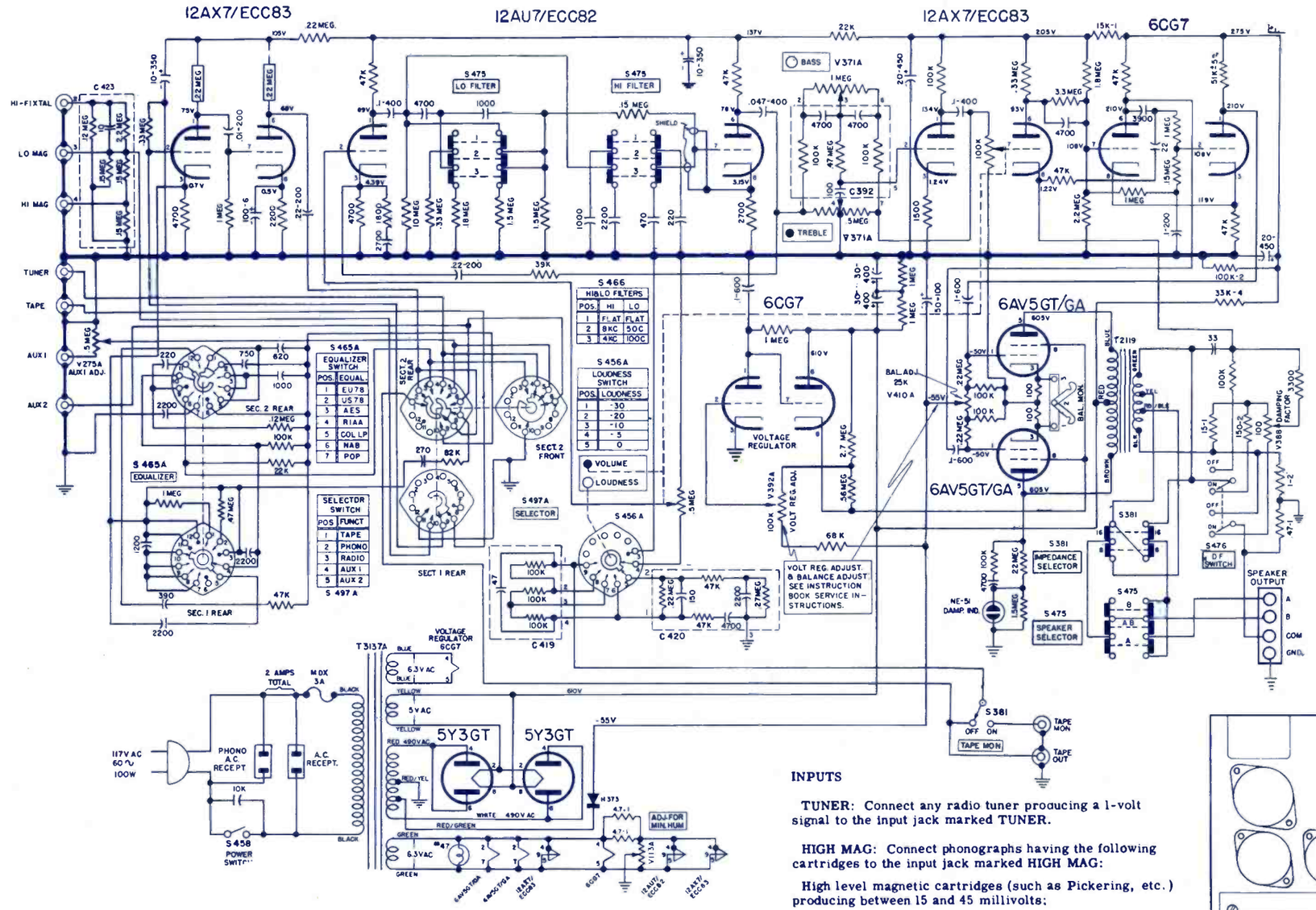
* = READING VARIES WITH CONTROL SETTING

More Data on Reverse Side



BOGEN
Hi-Fi Amplifier

Model DB130



NOTES:
1. ALL RESISTORS TO BE ½ WATT ±10% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR WITH DECIMAL VALUES ARE IN MFD, AND ARE PAPER, 400 DCWV UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITORS WITH WHOLE NUMBER VALUES ARE IN MMF, AND ARE CERAMIC ±10% UNLESS OTHERWISE SPECIFIED.
4. ALL DUMMY LUGS ON SWITCH WAFERS ARE USED AS TIE POINTS FOR COMPONENTS.
5. ——— INDICATES LOW NOISE DEPOSITED CARBON RESISTORS.
6. ALL SWITCHES ARE SHOWN AS VIEWED FROM THE SHAFT OR KNOB END.
7. ALL VOLTAGES WERE MEASURED FROM POINT TO GROUND USING A VACUUM TUBE VOLTMETER WITH AN INPUT RESISTANCE OF APPROXIMATELY 10 MEGOHMS.
8. ALL SWITCHES SHOWN IN POSITION 1.

INPUTS

TUNER: Connect any radio tuner producing a 1-volt signal to the input jack marked **TUNER.**

HIGH MAG: Connect phonographs having the following cartridges to the input jack marked **HIGH MAG:**

High level magnetic cartridges (such as Pickering, etc.) producing between 15 and 45 millivolts;

Constant amplitude cartridges (Weathers, Crystal, etc.) are to be used with Weathers Adapter Plug Model P-631;

Ceramic cartridges that equalize for RIAA curve are to be used with Electro-Voice Adapter Model 504.

LO MAG: Connect phonographs with low level magnetic cartridges with outputs between 1.5 millivolts and 15 millivolts (Fairchild, General Electric, Recoton, etc.) to the input jack marked **LO MAG.**

HI-FI XTAL: Connect phonographs having a Ronette Model. TO-284P crystal cartridge to the input jack marked **HI-FI XTAL.**

AUX 1 and AUX 2: Connect leads from a television receiver, high level tape output, etc. to the input jacks marked **AUX 1 and/or AUX 2.**

TAPE INPUT: Connect the output from the playback head of a tape playback deck to the input jack marked **TAPE INPUT.**

TAPE MON: Connect the monitor output lead from a tape recorder to the input jack (located on the chassis rear) marked **TAPE MON.**

The DAMPING FACTOR control is to be adjusted to the setting that sounds best to the listener. Room acoustics, speaker deficiencies and listener preference will dictate the correct setting, but experience has shown that with many speakers, the greatest benefits are derived from settings approaching ultimate damping. Ultimate damping is achieved when the source resistance of the amplifier is adjusted to a negative value that will almost cancel out the dc resistance of the speaker voice coil. This is the resistance that isolates the mottonal impedance (or the "business end") of the speaker from its driving source.

This revolutionary new control maintains constant negative feedback throughout its range and employs no filters to correct the response of the speaker. If a slight loss in bass response results from use of low negative settings, it may be readily brought back into proper balance by use of the BASS tone control.

The effect of the new variable damping factor control will be a revelation to the listener regardless of the speaker being used.

To adjust for ultimate damping, observe the following procedure:

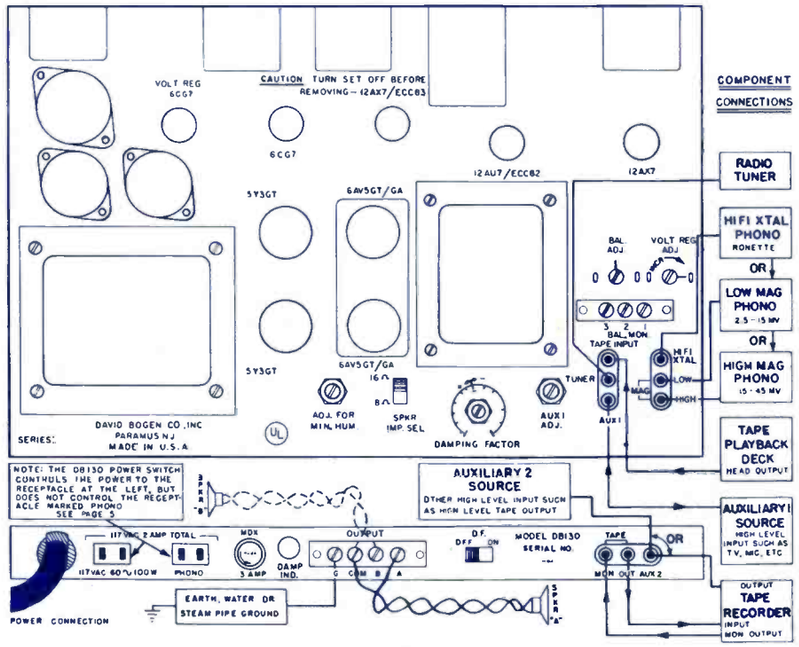
1. Set the VOLUME control for minimum gain.
2. Turn DF ON-OFF switch to ON and leave it ON.
3. Using a screwdriver slowly rotate the DAMPING FACTOR control (located on the chassis rear) in a clockwise direction until the damping indicator (DAMP. IND.) bulb flashes.

CAUTION: Allow the speaker to oscillate only momentarily. Violent vibration could be detrimental to the suspension system of the speaker.

4. Slowly rotate the DAMPING FACTOR control counterclockwise until the damping indicator bulb stops flashing.

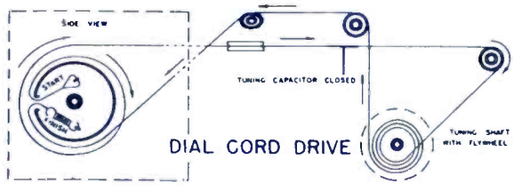
If two speakers are to be used with the DB130, make the above adjustment with the SPEAKER SELECTOR set at position AB so that speakers will be connected.

NOTE: Some speakers have higher DC voice coil resistance than others, or may produce different phase shifts. In either case no oscillation will occur. If the voice coil DC resistance is greater than about 9 ohms, the control should be adjusted to the extreme clockwise position.



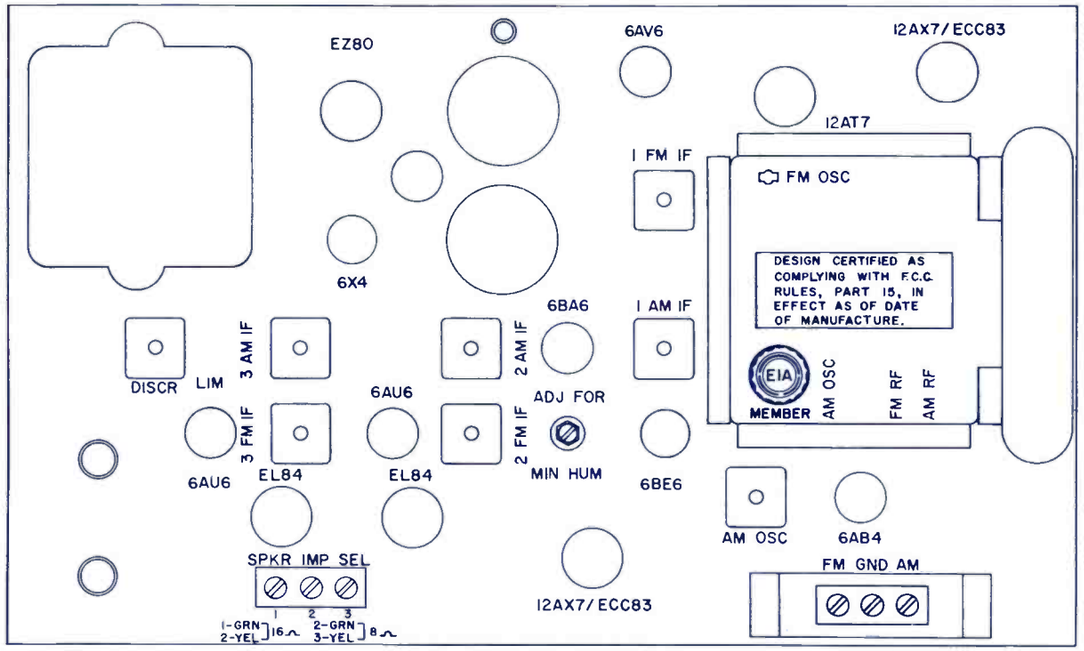
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

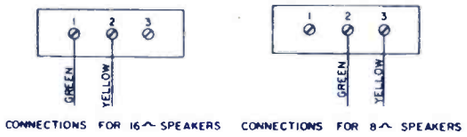
BOGEN
Hi-Fi FM/AM Receiver
Model RB115



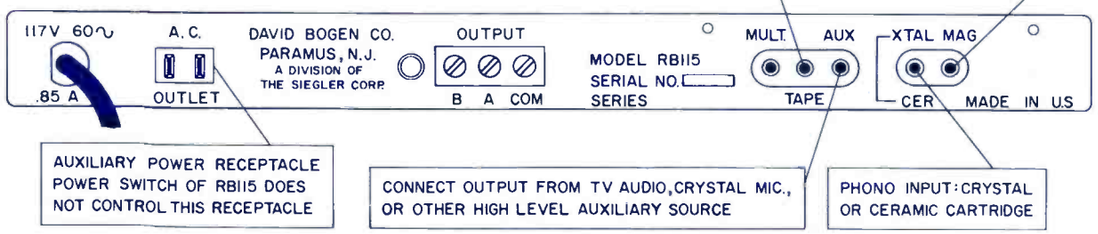
DIAL CORD RESTRINGING DIAG.

TUBE LOCATION DIAGRAM

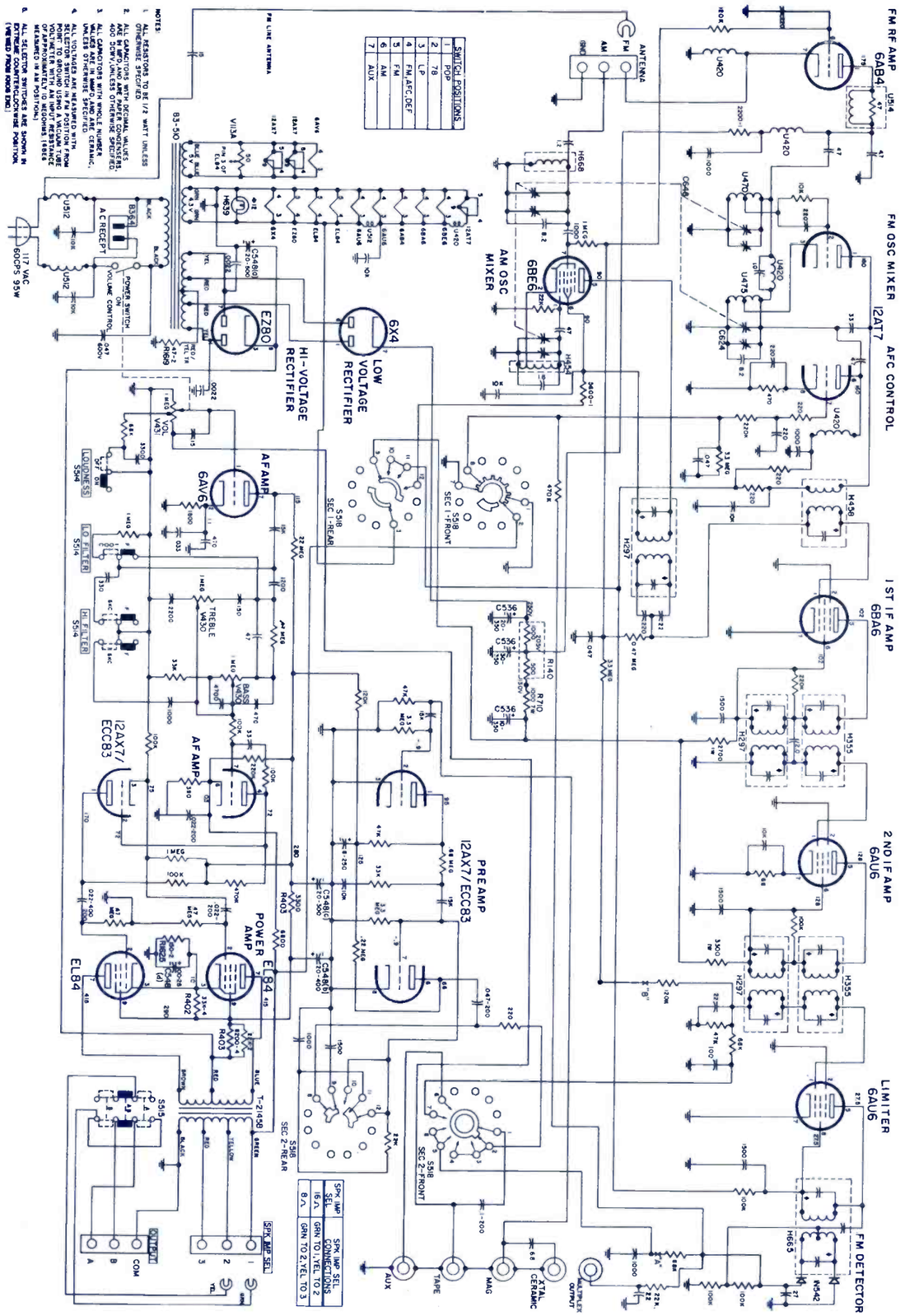




CONNECTIONS FOR 16Ω SPEAKERS CONNECTIONS FOR 8Ω SPEAKERS



REAR VIEW PICTORIAL



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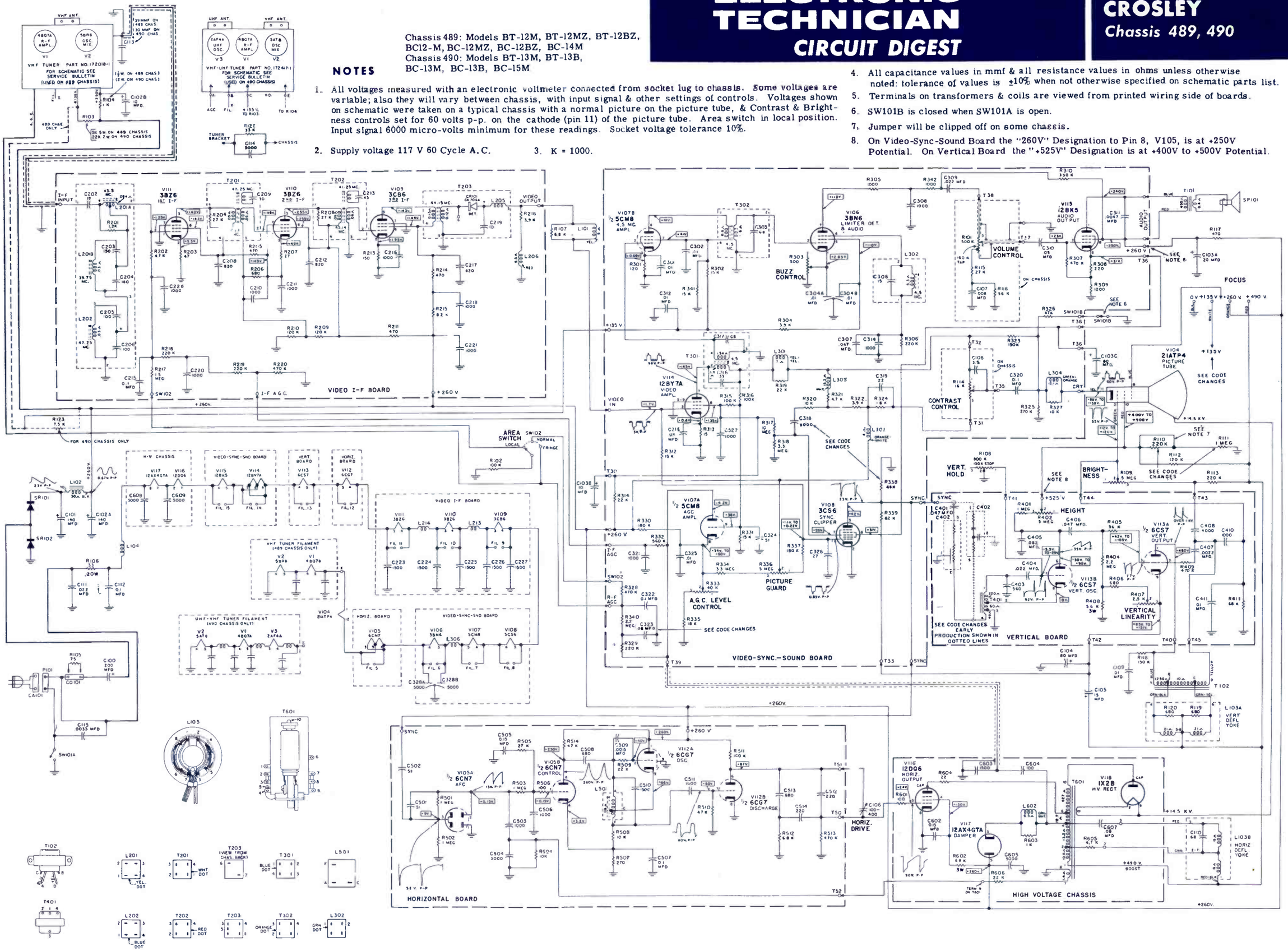
CROSLEY
Chassis 489, 490

Chassis 489: Models BT-12M, BT-12MZ, BT-12BZ, BC12-M, BC-12MZ, BC-12BZ, BC-14M
Chassis 490: Models BT-13M, BT-13B, BC-13M, BC-13B, BC-15M

NOTES

1. All voltages measured with an electronic voltmeter connected from socket lug to chassis. Some voltages are variable; also they will vary between chassis, with input signal & other settings of controls. Voltages shown on schematic were taken on a typical chassis with a normal picture on the picture tube, & Contrast & Brightness controls set for 60 volts p-p. on the cathode (pin 11) of the picture tube. Area switch in local position. Input signal 6000 micro-volts minimum for these readings. Socket voltage tolerance 10%.
2. Supply voltage 117 V 60 Cycle A.C.
3. K = 1000.
4. All capacitance values in mmf & all resistance values in ohms unless otherwise noted: tolerance of values is ±10% when not otherwise specified on schematic parts list.
5. Terminals on transformers & coils are viewed from printed wiring side of boards.
6. SW101B is closed when SW101A is open.
7. Jumper will be clipped off on some chassis.
8. On Video-Sync-Sound Board the "260V" Designation to Pin 8, V105, is at +250V Potential. On Vertical Board the "+525V" Designation is at +400V to +500V Potential.



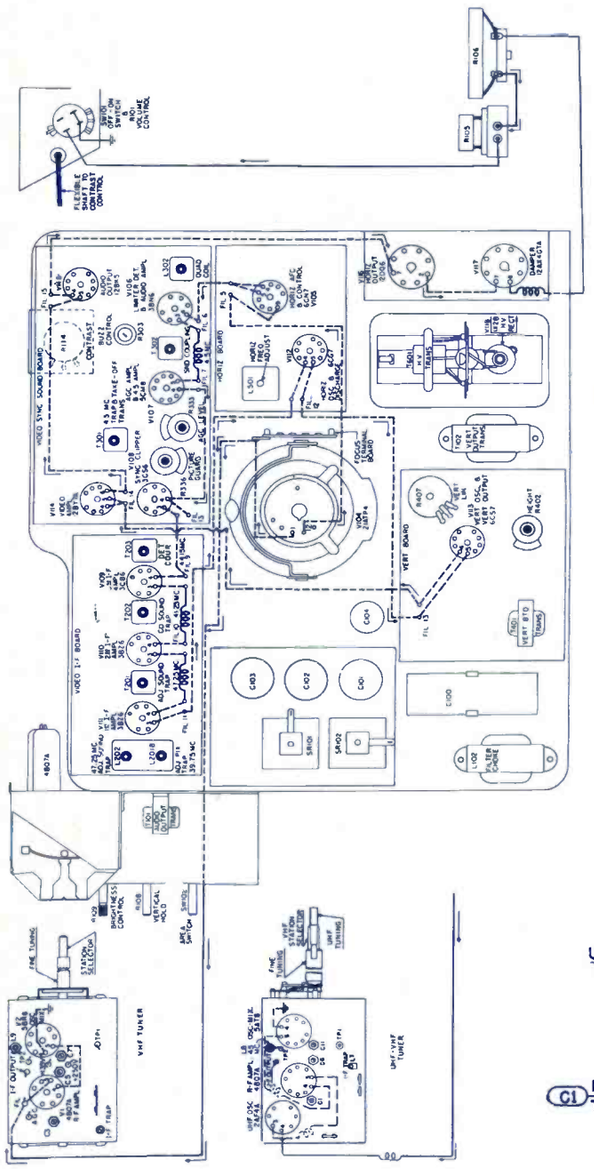
More Data on Reverse Side

CODE CHANGES

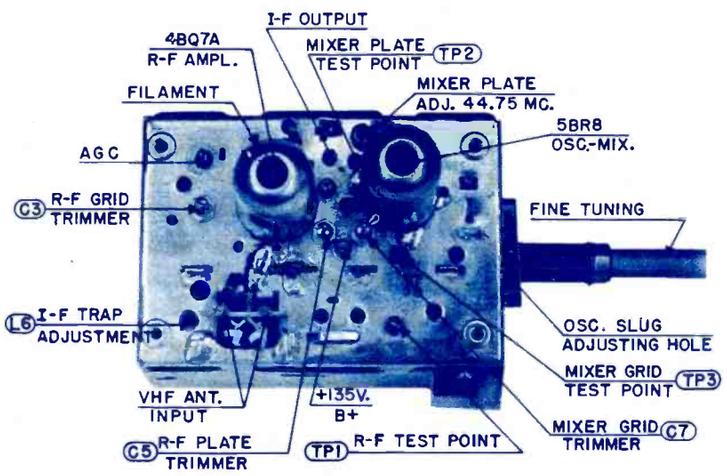
The first run of chassis are stamped with a Code letter A following the chassis number. Later code letters stamped on the chassis are used to identify certain circuit changes that are not incorporated on earlier production sets. Unless otherwise stated the circuit changes identified by an early code letter are also carried over into the chassis with later code letters. The circuits found in chassis 489 Code C and 490 Code B are shown in the schematic and schematic parts list.

CHASSIS 489 CODE B - To increase vertical stability on weak signals. C-381 was changed from 1500 mmf to .005 MFD, C-323 was changed from 1000 mmf. to .05 MFD, and R383 was changed from 47,000 ohm to 68,000 ohm.

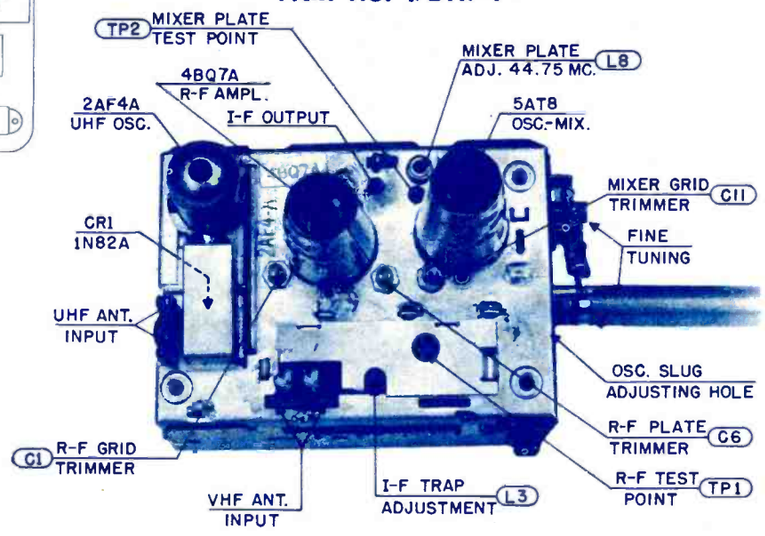
CHASSIS 489 CODE C - 490 CODE B - To improve vertical hold range. C402 Vertical Integrator was changed from 490 CODE B Part No. 157812-1 to Part No. 170203-1, and C401 .047 MFD Part No. 39478-28 was added. At the same time an additional change in the Brightness Control Circuit was made to handle slight variations between different manufacturers CRT s. R110 was changed from 680,000 ohm to 220,000 ohm; R111 was changed from 390,000 ohm to 1 megohm. On some chassis the jumper across R110 may be removed to extend the range of the brightness control at its low end. It may be necessary to add or remove this jumper upon replacement of the CRT. The lug marked +135v on the Focus Terminal Board was originally connected to the junction of R110 and R111. The voltage at this point was +150v before the values of R110 and R111 were changed.



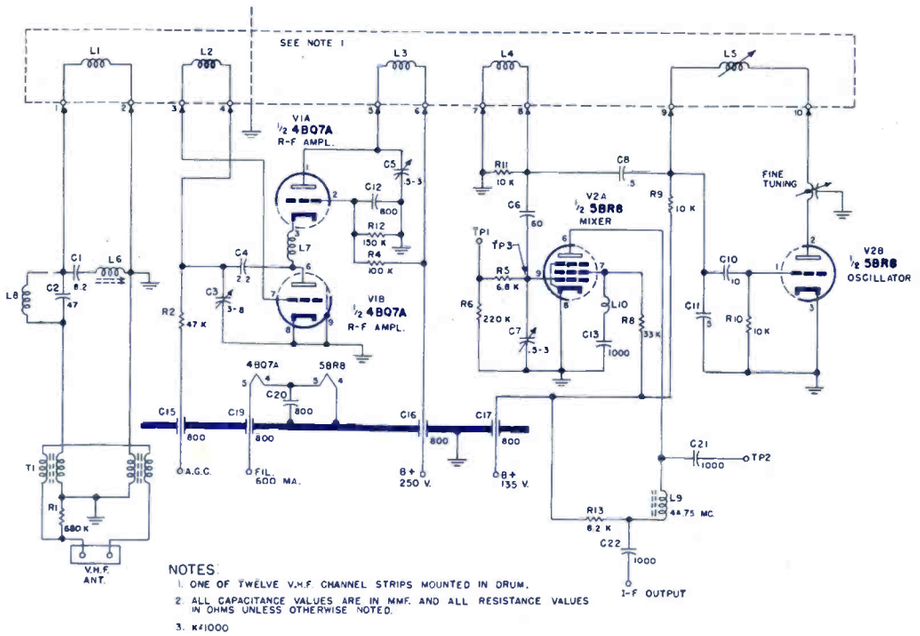
VHF TUNER, PART NO. 172018-1



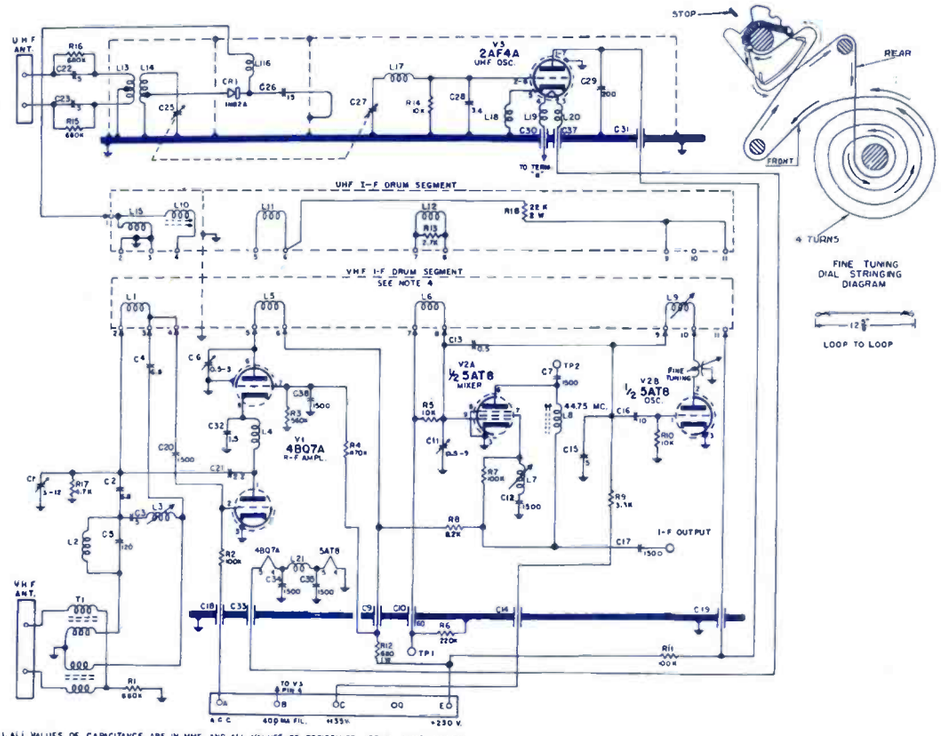
UHF - VHF TUNER, PART NO. 172417-1



VHF TUNER PART NO. 172018-1
STANDARD COIL TUNER TDS-B-110



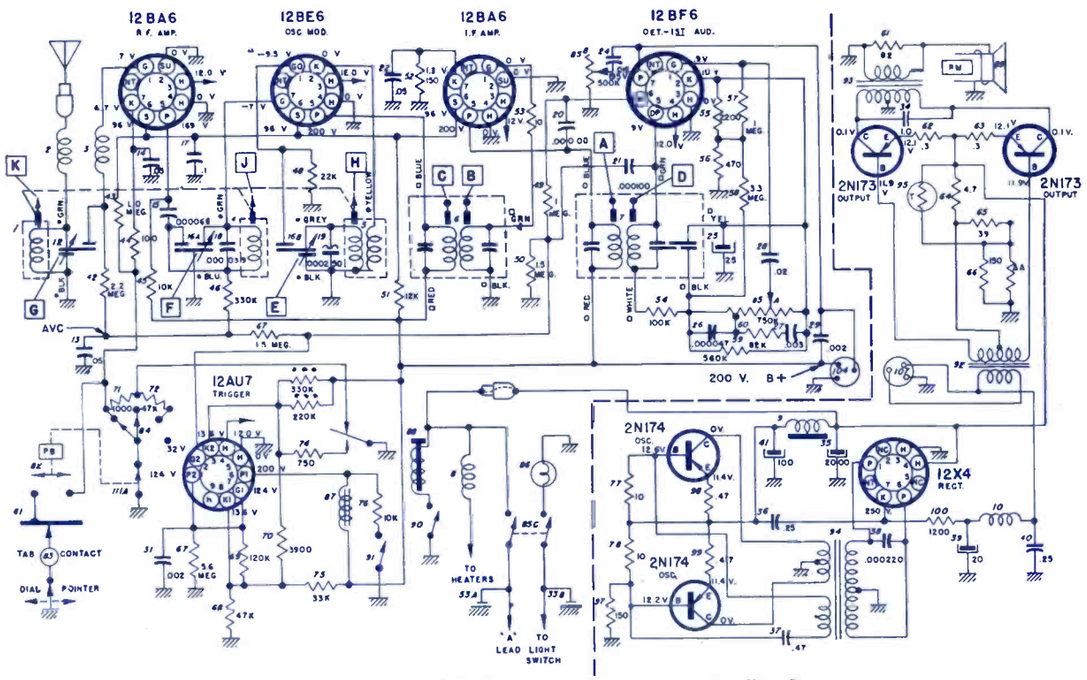
UHF - VHF TUNER, PART NO. 172417-1
STANDARD COIL TUNER TEAS-043



More Data on Reverse Side

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

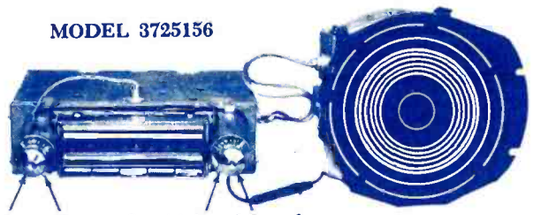
DELCO
Auto Radio Model
Chevrolet Corvette
3725156



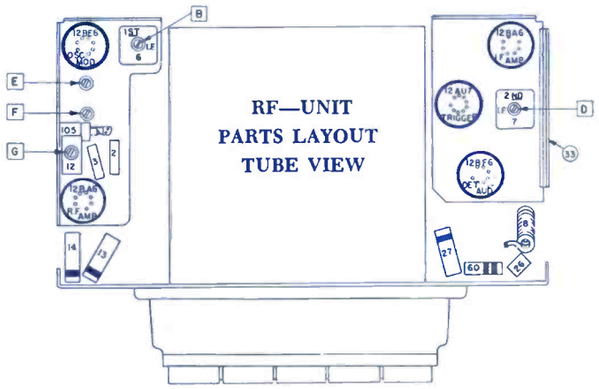
▲ Sensitivity Control in Position #2.
□ Colors of terminals on service part.
* Indicates lead colors from tuner.

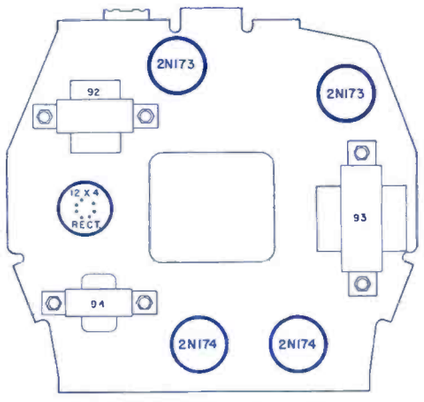
*** Resistors will not appear in all radios.
△△—When ZN173 transistors are replaced adjust value for 100 Milliamperes in the output transformer center tap. Transistors must be replaced as matched pairs.

MODEL 3725156

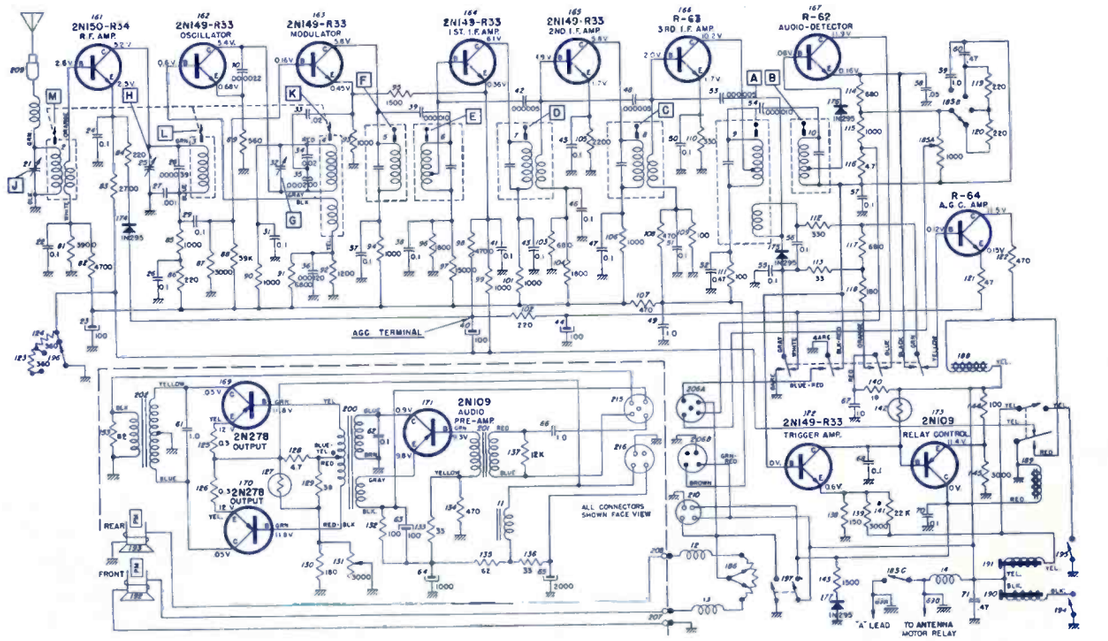


AUDIO—POWER SUPPLY UNIT

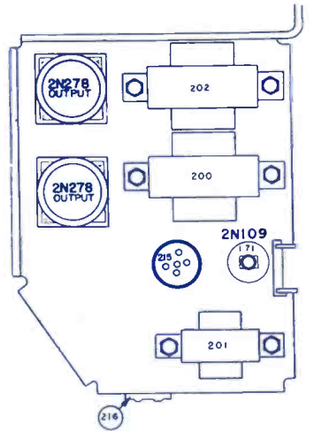




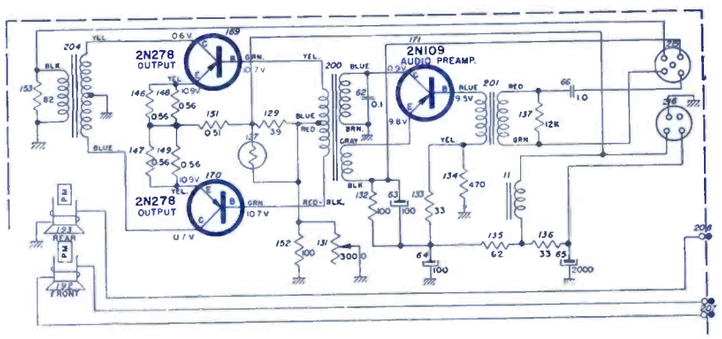
PARTS LAYOUT — TUBE VIEW



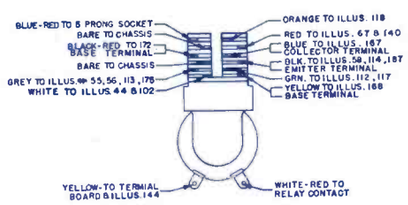
Voltages measured terminal to chassis with a VTVM—No signal and 12.0 volts at Illus. 69A—Tuner stopped.



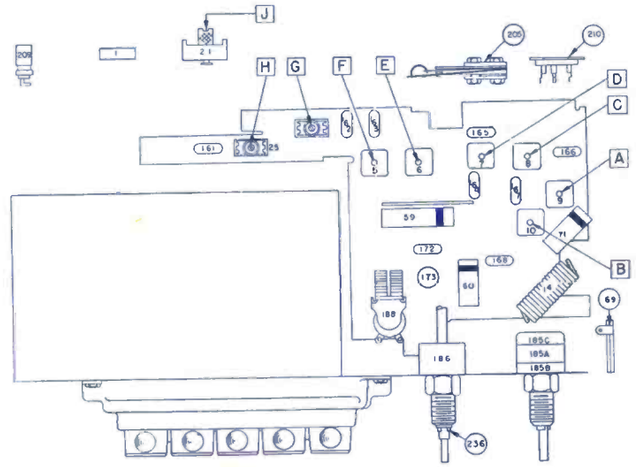
PARTS LAYOUT—TUBE VIEW



OUTPUT POWER SUPPLY AFTER SERIAL HD80



RELAY ILLUSTRATION #188

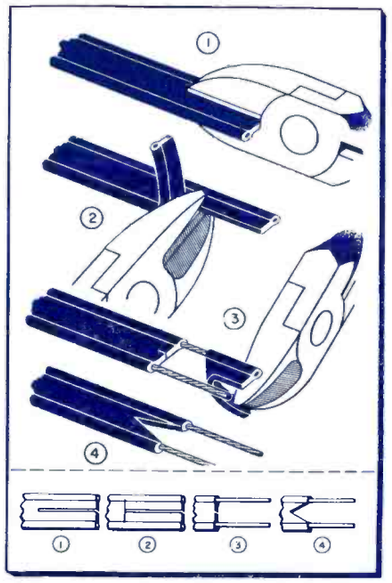


PARTS LAYOUT—TUBE VIEW

Shop Hints

Stripping Flat Transmission Line

All that is needed for a neat and efficient stripping job on flat transmission line, without nicking a few strands of wire, is a pair of side-cutters. Cut the insulation down the center. At the end of the slot thus formed cut 2 right angles, one to the right, and one to the left, as close the wires as possible, without cutting into them. Grasp the tabs, thus formed, with the cutters, one at a time, and peel back towards the open end. Trim to shape. *Lewis Lounsbery, Stone Ridge, N. Y.*



Diagonals used to strip transmission line.

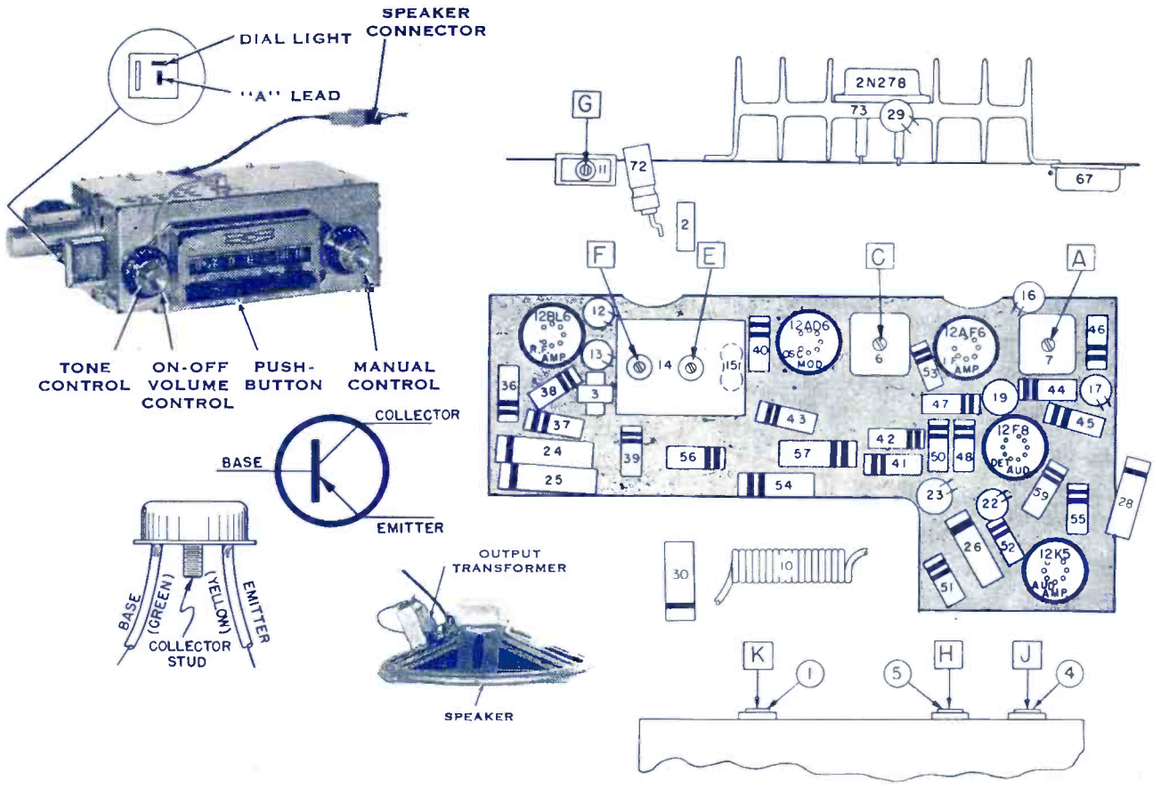
Beam Aligner

It may be noticed that on some non-ion trap tubes, another magnet, similar in appearance to the ion trap, is used. It is a beam alignment magnet and should not be confused with the ion trap. Its function is to ensure that the electron beam follows the path most conducive to highest picture quality. When replacing a non-ion trap CRT equipped with this magnet:

1. Try the new tube without the magnet.
2. If objects appear to be smeared or fuzzy, focus may be improved by using this magnet.
3. To adjust the beam magnet, place and adjust in the same manner as an ion trap. Try to eliminate smear or fuzziness especially in those areas where there is a sharp transition from black to white. RCA Victor Co., Ltd., Montreal, Canada.

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

DELCO
Chevrolet Auto
Radio Model 987727



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DELCO
Chevrolet Auto
Radio Model 987727

VOLTAGES MEASURED TERMINAL TO CHASSIS WITH A VTVM - NO SIGNAL AND 12.0 VOLTS AT ILLUS. 31.

OSCILLATOR GRID VOLTAGE TAKEN WITH SET TUNED TO 1000 KC.

TOTAL "A" DRAIN AT 12V. - 2.1 AMPS.

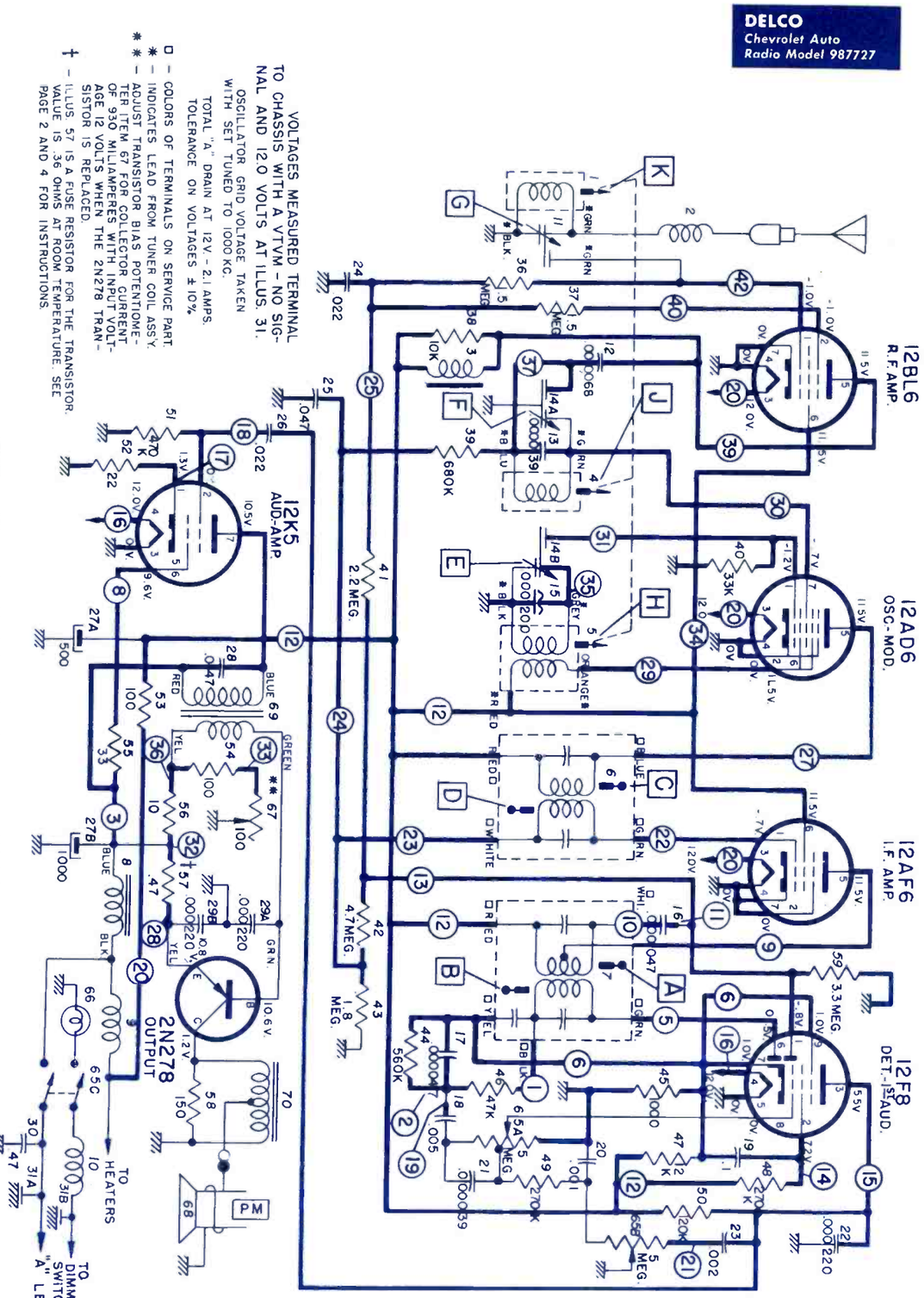
TOLERANCE ON VOLTAGES ± 10%

□ – COLORS OF TERMINALS ON SERVICE PART.

* – INDICATES LEAD FROM TUNER COIL ASS'Y.

** – ADJUST TRANSISTOR BIAS POTENTIOMETER ITEM 67 FOR COLLECTOR CURRENT OF 930 MILLIAMPERES WITH INPUT VOLTAGE 12 VOLTS WHEN THE 2N278 TRANSISTOR IS REPLACED.

+ – ILLUS. 57 IS A FUSE RESISTOR FOR THE TRANSISTOR. VALUE IS .36 OHMS AT ROOM TEMPERATURE. SEE PAGE 2 AND 4 FOR INSTRUCTIONS.



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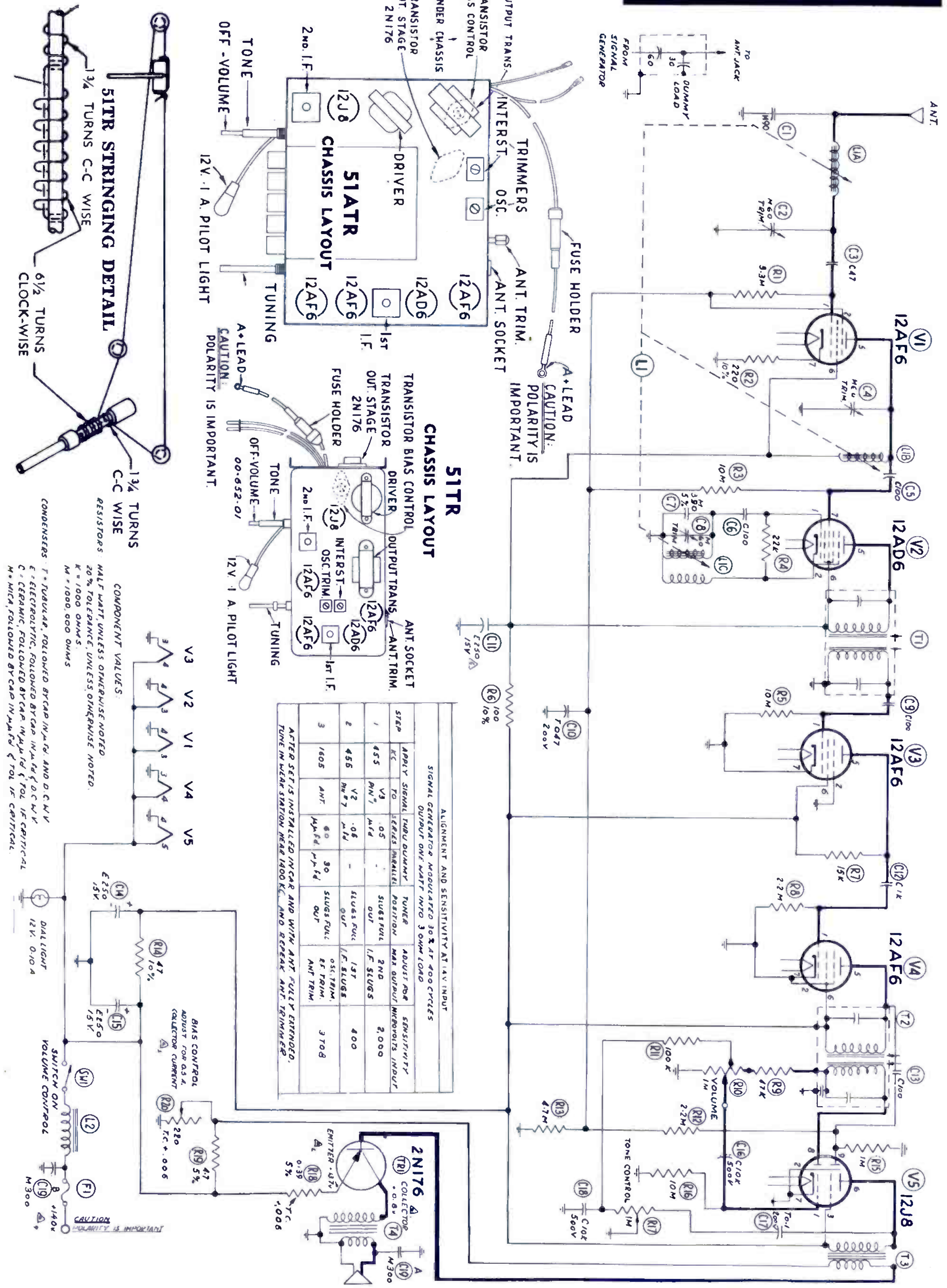
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

DOMINION ELECTROHOME (Canada)
Hybrid Auto Radio Models 51TR, 51ATR



ALIGNMENT AND SENSITIVITY AT 14V INPUT

SIGNAL GENERATOR MODULATED 30% AT 400 CYCLES OUTPUT ONE WATT INTO 3 OHM LOAD

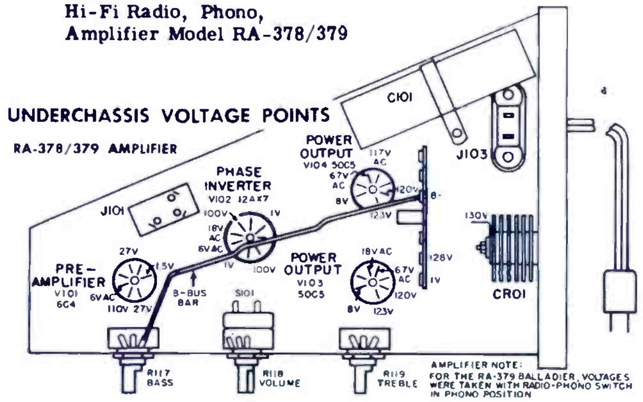
STEP	APPLY SIGNAL KC	TO	THRU DUMMY SERIES	THRU DUMMY PARALLEL	TUNER POSITION	ADJUST FOR MAX OUTPUT	SENSITIVITY MICROVOLTS INPUT
1	455	V3 PIN 1	.05 mfd	-	SLUGS FULL OUT	2ND I.F. SLUGS	2,000
2	455	V2 PIN 7	.06 mfd	-	SLUGS FULL OUT	1ST I.F. SLUGS	400
3	1605	ANT.	60 mmfd	30 mmfd	SLUGS FULL OUT	OSC. TRIM. RF TRIM. ANT TRIM.	3 TO 8

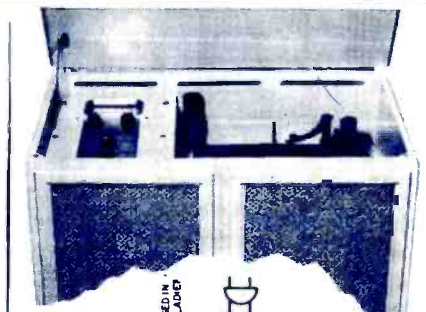
AFTER SET IS INSTALLED IN CAR AND WITH ANT. FULLY EXTENDED, TUNE IN WEAK STATION NEAR 1400 KC. AND REPEAK ANT. TRIMMER.

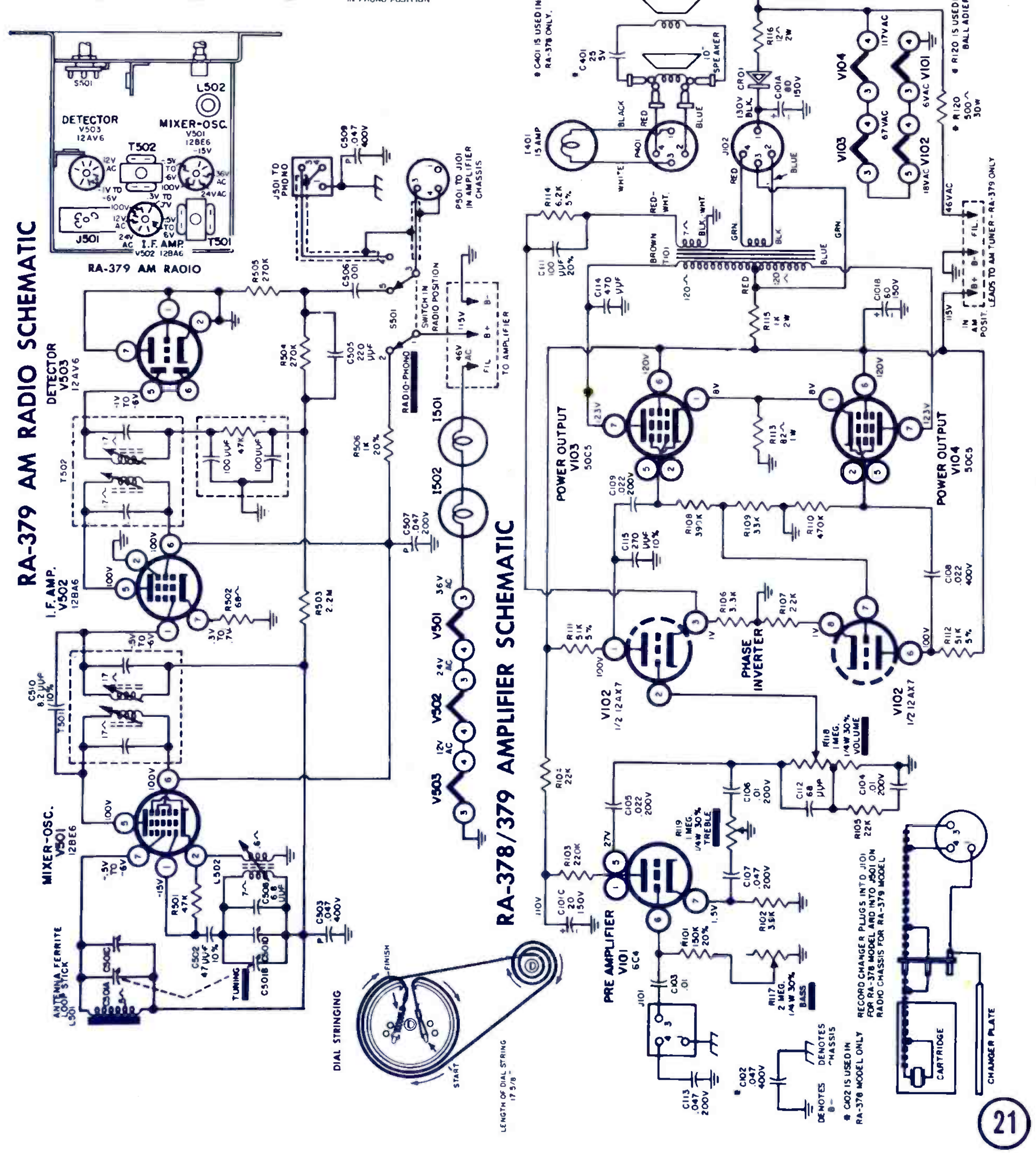
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

DUMONT
Model RA-378/379

Hi-Fi Radio, Phono, Amplifier Model RA-378/379



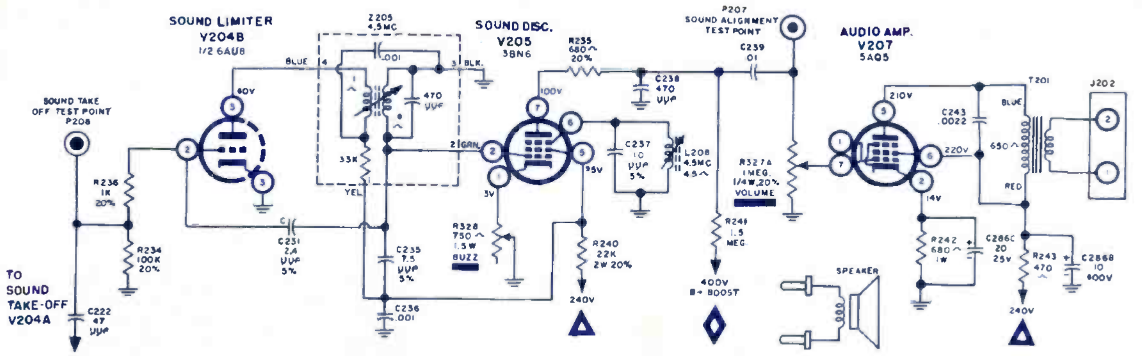




ELECTRONIC TECHNICIAN CIRCUIT DIGEST

DUMONT

Sportsman Portable TV
Chassis RA-392/393



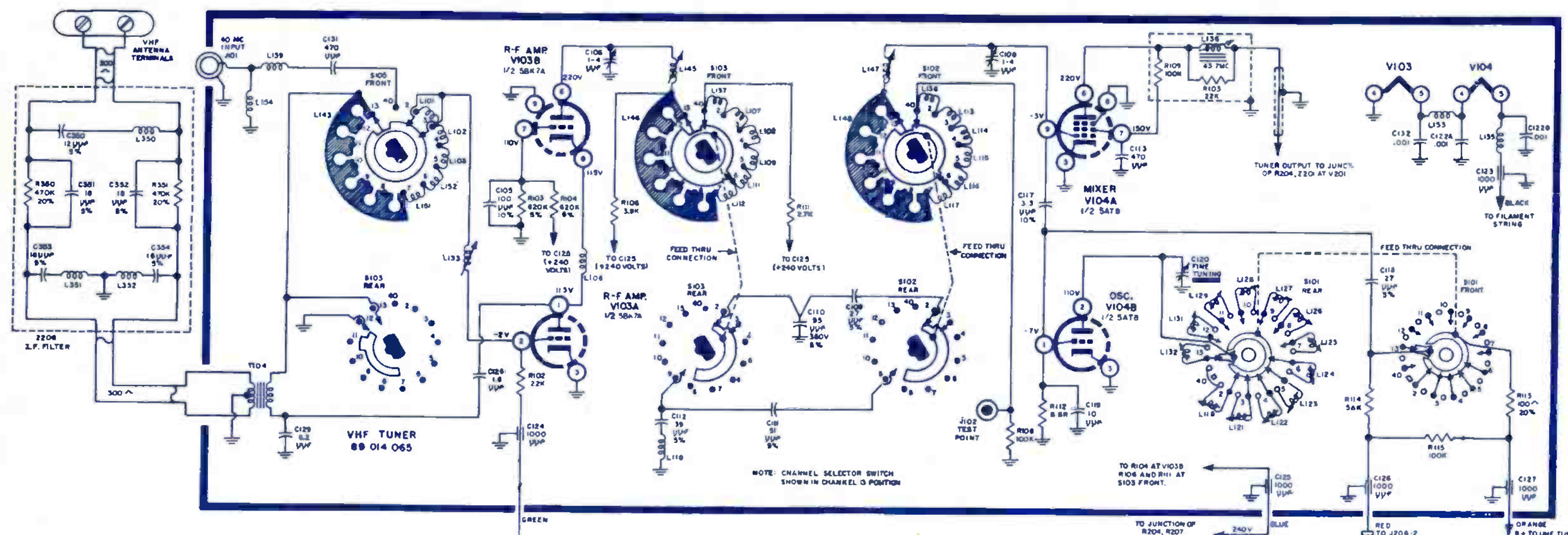
RESISTANCE MEASUREMENTS All Readings to Ground

		1	2	3	4	5	6	7	8	9
V103	5BK7A	INF	3.8M	0	0	1	25K	350K	INF	0
V104	5AT8	6.8K	25K	0	1	2	25K	120K	0	100K
V201	3CB6	750K	56	8.5	9.5	75K	75K	0		
V202	3CB6	65K	75K	9.5	10	25K	25K	75K		
V203	6AU8	0	330K-1M	1.2M-8.6M	11.5	10	82	1	30K	30K
V204	6AU8	0	100K	70K	13	11.5	68	1M	65K	30K
V205	3BN6	0-750	.4	14	15	45K	4.5	1.7M		
V207	5AQ5	0-1M	680	14	13	25K	25K	0-1M		
V208	3CS6	200K	0	15.5	15	55K	1.2K-4.7K	1.3M		
V209	12B4A	1.2K-4.7K	2.2M	15.5	17	17	NC	2.2M	NC	25K
V211	3AL5	1M	2M	17	18	1M	0	0		
V212	6SN7-GTB	180K-230K	350K	1K	2.4M	35K	1K	18	20	

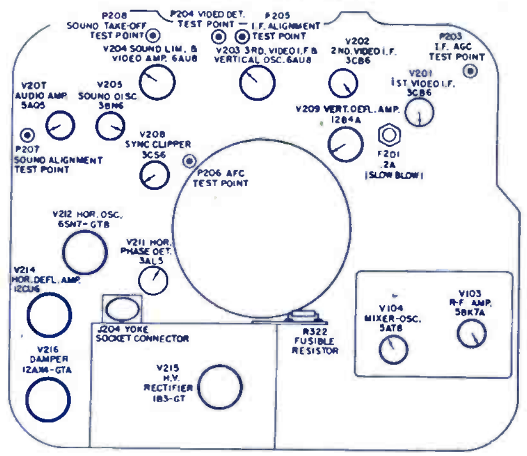
		1	2	3	4	5	6	7	8
V214	12CU6	NC	5.5	NC	35K	470K	470K	8.5	0
V215	1B3-GT	NC	INF	NC	NC	NC	NC	INF	NC
V216	12AX4-GTA	NC	NC	200K		25K		5.5	3.2
V401*	14SP4	2	100K				25K		

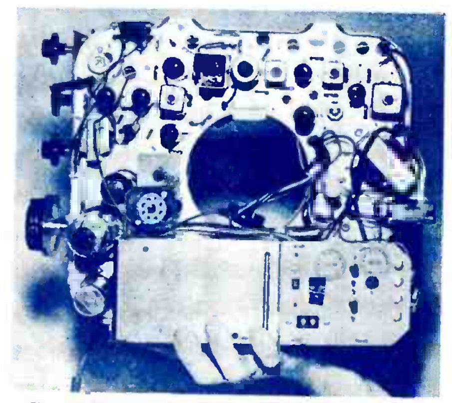
*10	11	12
25K	220K-400K	3.2

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K=1000, M=million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

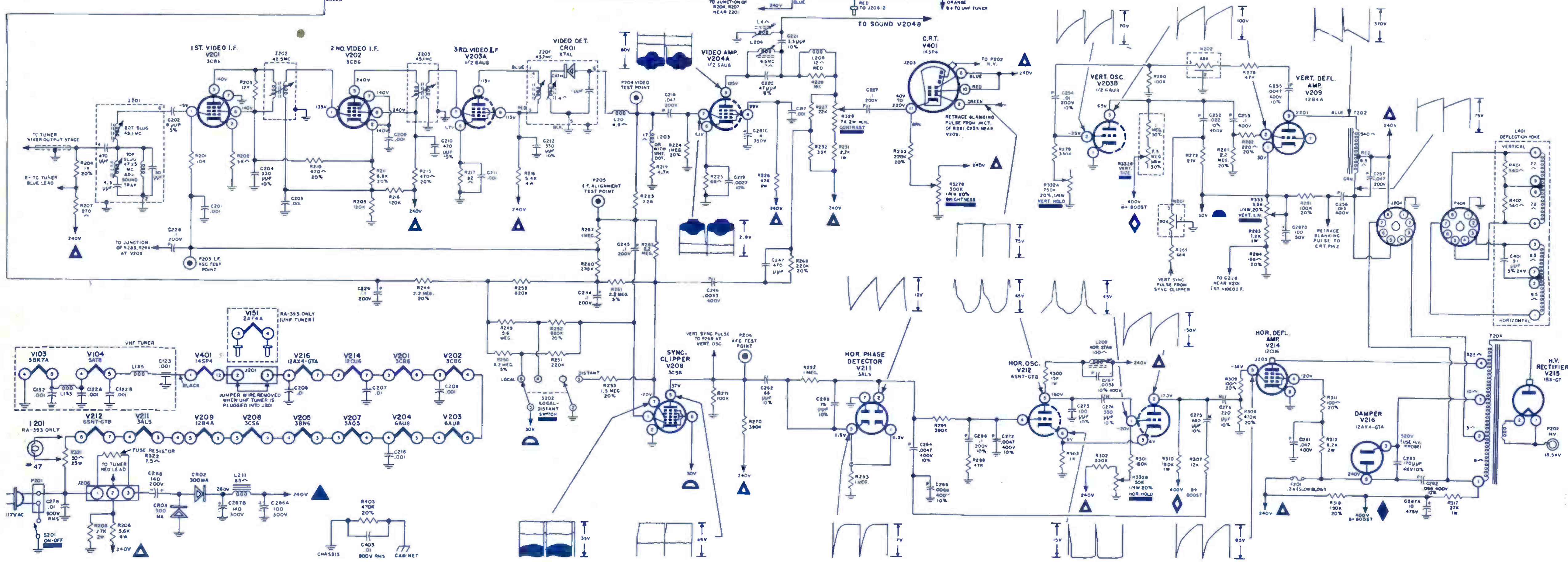


TUBE LOCATION





The RA-392/393 Sportsman portable chassis.



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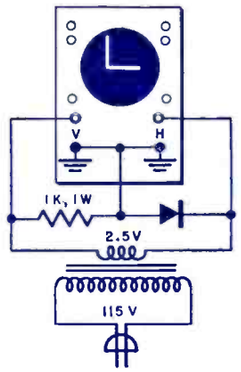
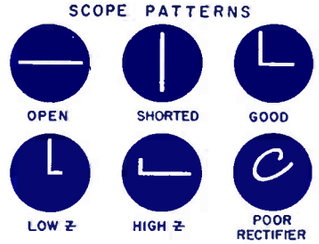
Shop Hint

Diode Checker

This simple diode checker may be used with any oscilloscope. The technique is interesting and accurate. The input signal is not critical. About 2.5-volts ac is all that is required. Any low-voltage transformer may be used. The plate side of an audio output transformer may be connected to the a-c line. The secondary winding usually develops about 2.3 volts. Because there is practically no load, the size of the transformer is not a factor. The only other parts needed are a 1,000-ohm, 1-watt resistor and some terminals. The entire unit could be built into the scope. Calibration consists of comparison with a unit known to be good. Crystal diodes may be checked for match, open, shorts, high or low impedance, and ability to rectify. Diagram shows typical waveforms and schematic.—*Ed. M. Chenoweth, Osceola, Wisconsin.*

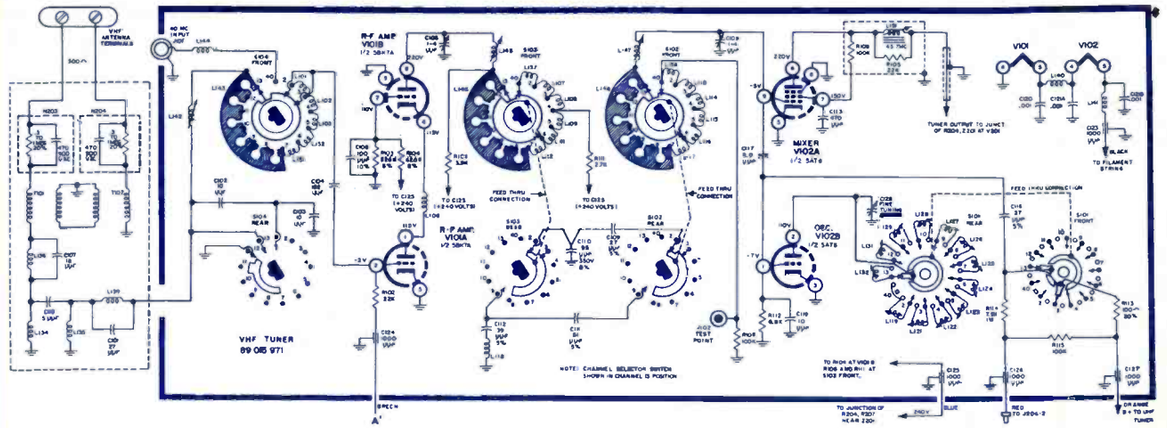


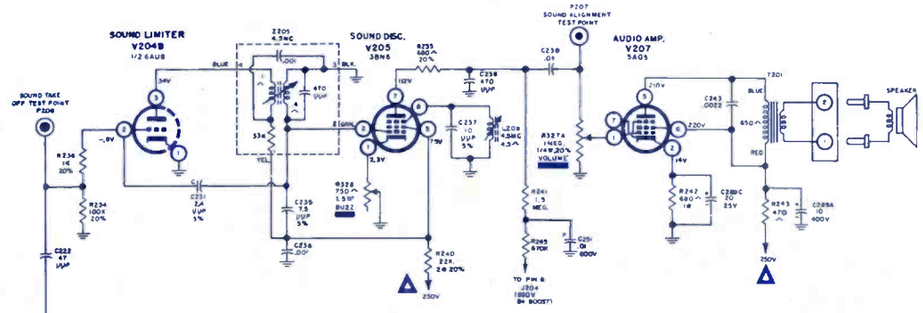


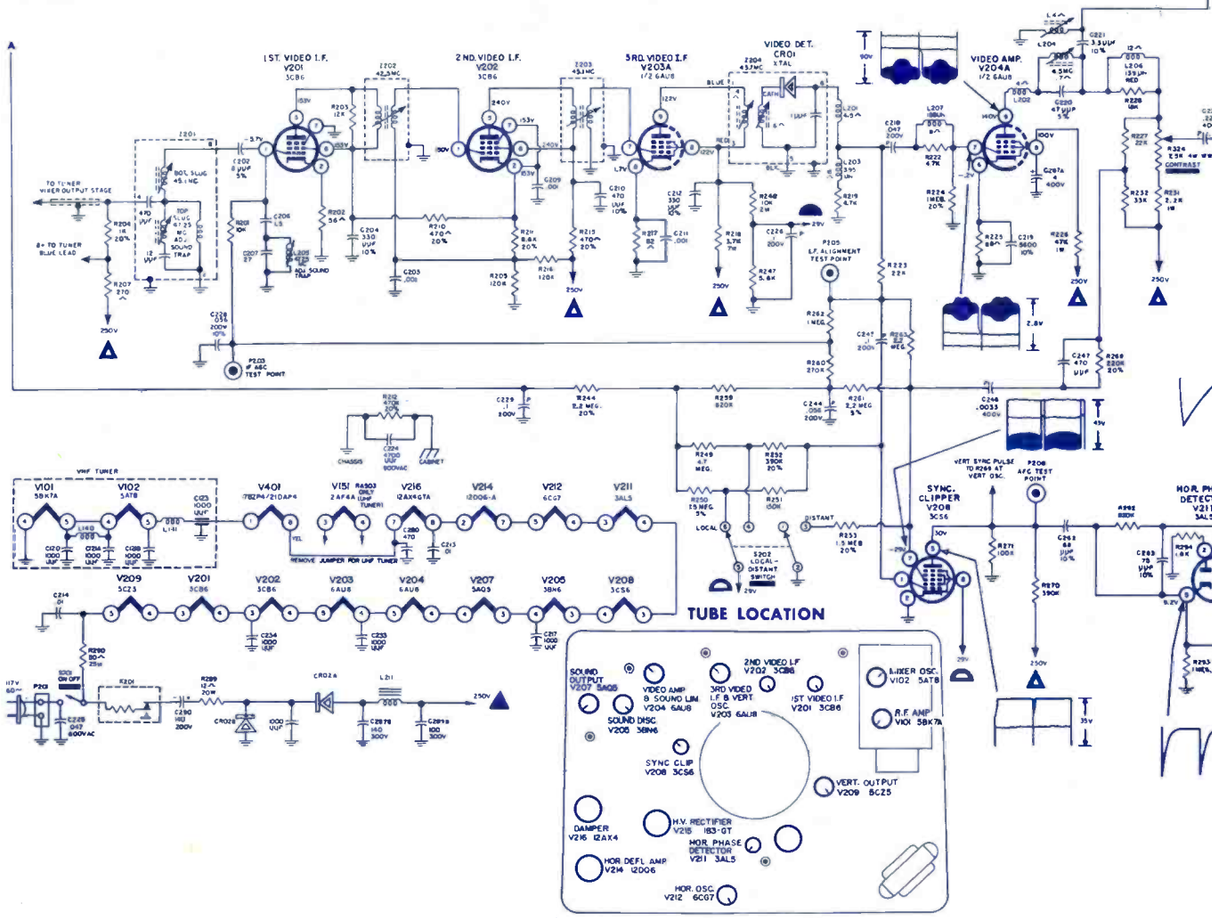
Simple diode checker and typical waveforms.

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

DU MONT
TV Chassis RA-502/503

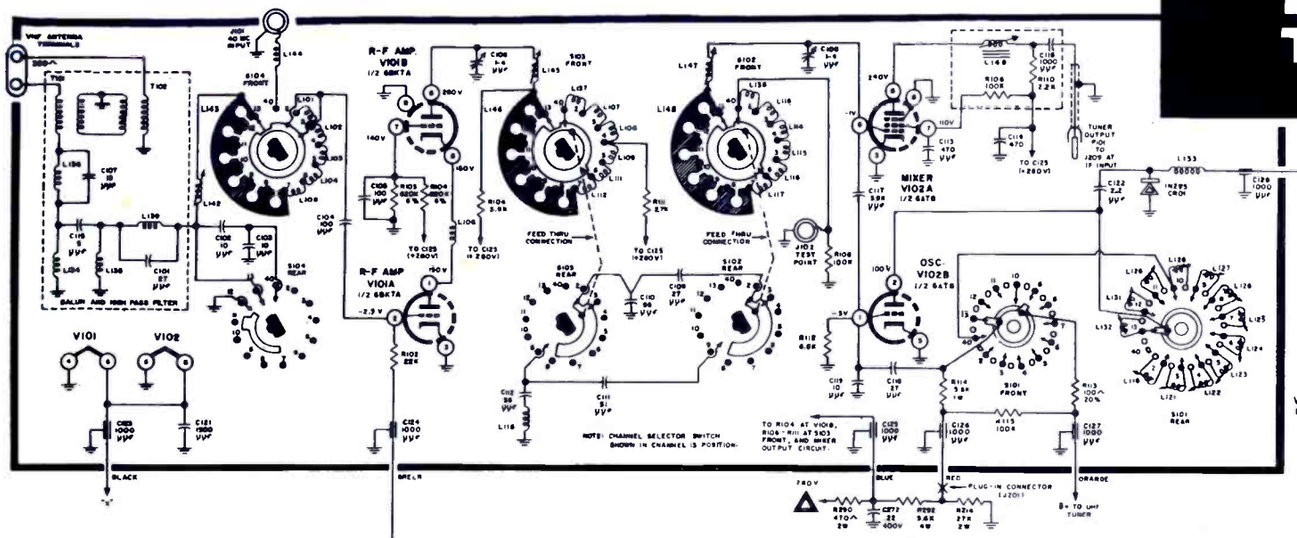


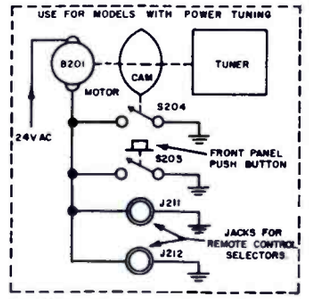


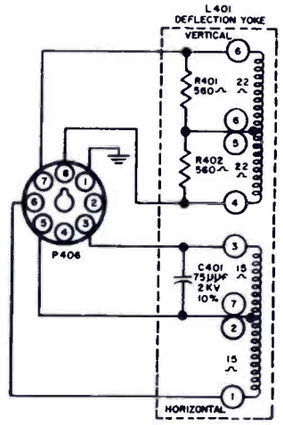


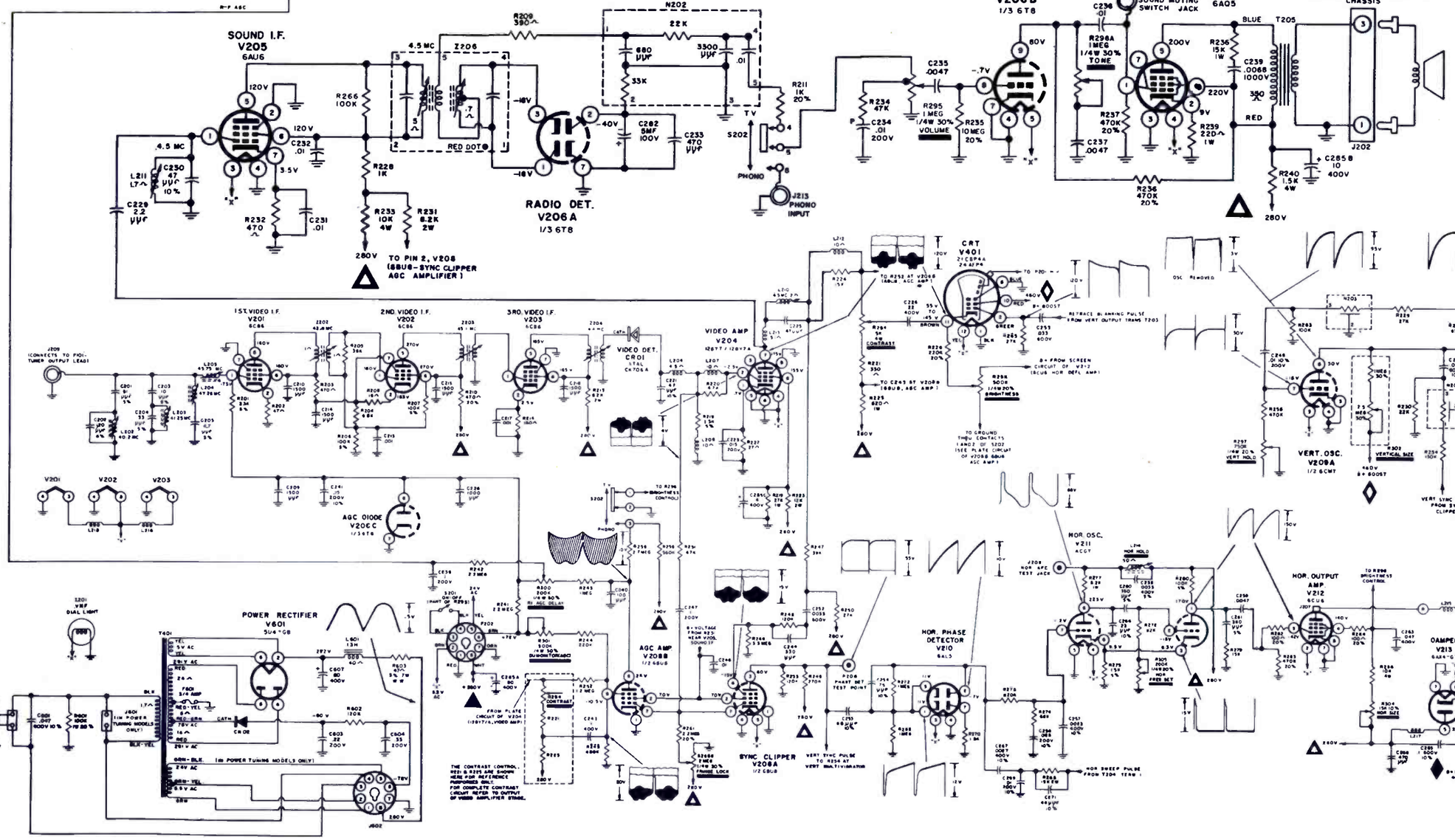
DUMONT
Chassis RA-400/401

Models Chatham 21, Beverly 21, Revere 21, Essex 21, Palm Beach 21, Riviera 21, Biscayne 21, Versailles 21, Park Lane 21, Ridgewood 24, Sherwood 24, Flanders 24, Newport 24, Westminster 21, Beaumont 21









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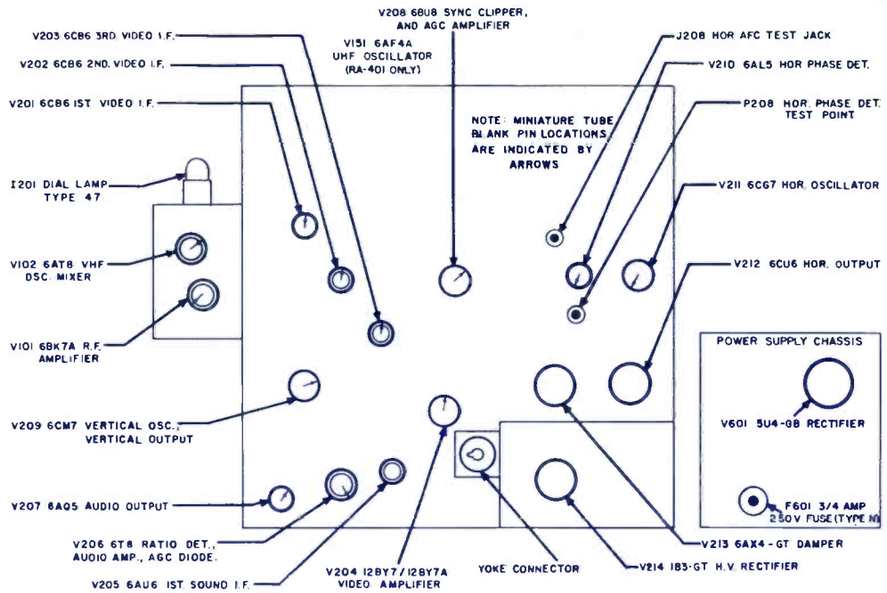
DUMONT
Chassis RA-400/401

TUBE LOCATION



RESISTANCE MEASUREMENTS

All Readings to Ground

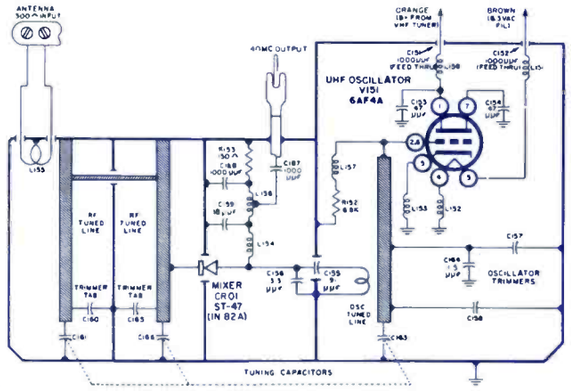
		1	2	3	4	5	6	7	8	9
V101	6BK7A	INF	3.8M	0	0	.05	15K	300K	INF	0
V102	6AT8	6.8K	18.8K	0	0	.05	16,2K	110K	0	100K
V201	6CB6	1.8M	47	.05	0	60K	60K	0		
V202	6CB6	55K	60K	.05	0	14K	14K	60K		
V203	6CB6	.1	180	.05	0	22K	22K	0		
V204	12BY7A	27	100*	0	.05	.05	0	10K	15K	0
V205	6AU6	1.8	0	.05	0	25K	25K	470		
V206	6T8	INF	33K	INF	0	.05	0	0	10M	480K
V207	6AQ5	470K	220	0	.05	15.5K	15.5K	470K		
V208	6BU8	0	32K	68K	0	.05	3.3M	2.2M	1.8M	330K
V209	6CM7	INF	NC	0	0	.05	INF	470K-1.2M	2.2M	820-2.8K
V210	6AL5	1M	2M	.05	0	1M	NC	1.8K		
V211	6CG7	110K	80K-280K	1.5K	0	.05	22K	2.8M	1.5K	NC
V212	6CU6	NC	.05	NC	25K-40K	470K	NC	0	0	
V213	6AX4GT	NC	NC	INF	NC	14K		.05	0	
V214	1B3GT	NC	INF	NC	NC	NC	INF	INF	NC	
V401†	CRT	0	27K	NC	NC	NC	0	NC	NC	NC
V601	5U4GB	NC	24	NC	14K	NC	14K	NC	24	

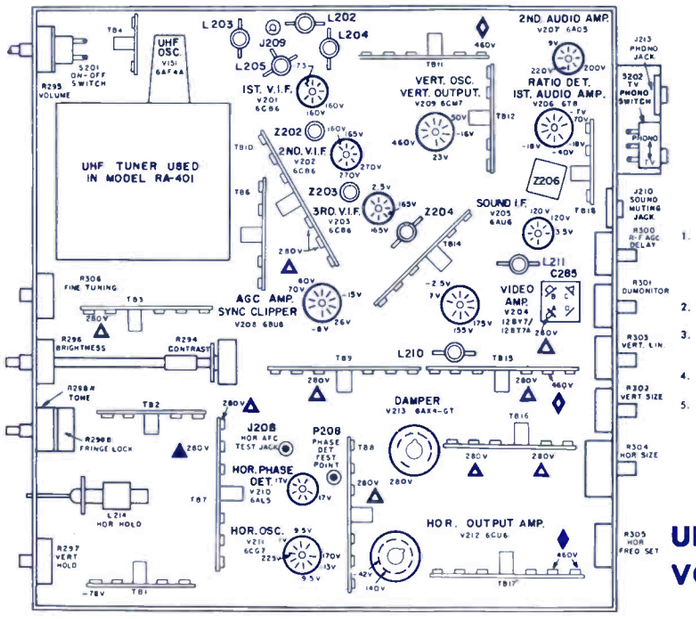
†10	11	12
INF	220K-380K	.05

*Reading depends upon crystal video detector and VTVM scale used.

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K=1000, M=million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

UHF TUNER 89 014 451





USE OF SYMBOLS

Solid symbol indicates source of voltage.

Open symbol indicates point to which voltage is supplied.

Solid bar indicates an adjustable control.

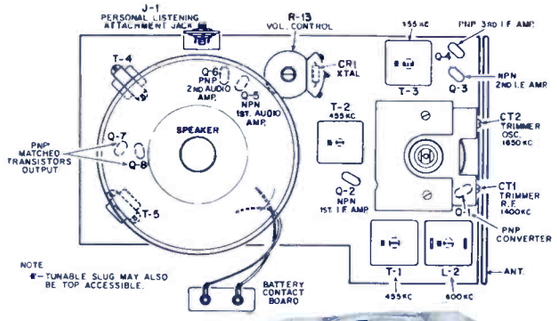
CHASSIS NOTES

1. All waveforms were taken under operating conditions. The receiver was tuned to an average strength TV signal, and the R-F AGC Delay and the Dumonitor controls were adjusted for optimum reception.
2. Voltages 20% of those shown are normal.
3. All resistors are 10%, one-half watt unless otherwise indicated. W.W. indicates wire wound resistor.
4. All capacitors are 20%, 500 volts, unless otherwise indicated.
5. R603, the 47 ohm 5% wire wound resistor in the power supply chassis, is not used on all sets. This resistor is used only in chassis below serial number 40009200.

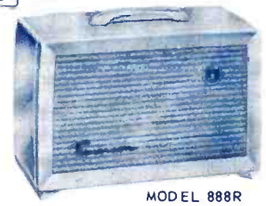
UNDERCHASSIS VOLTAGE POINTS

ELECTRONIC TECHNICIAN CIRCUIT DIGEST

EMERSON
Transistor Radio
Chassis 12374



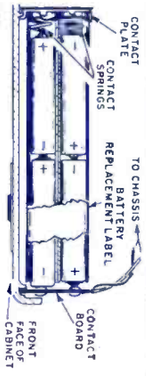
MODEL 888 (PIONEER)



MODEL 888R

VANGUARD

SATELLITE



NOTE
BATTERY PACK LAYOUT SHOWN WITH POLARITIES FOR PENLIGHT AND RECHARGEABLE (NICKEL-CADMIUM) CELLS.
MERCURY CELLS ARE PHYSICALLY REVERSED FROM ABOVE DRAWING BUT POLARITY REMAINS THE SAME.

FIG. 1 – BATTERY POLARITY

TRANSISTOR SUBSTITUTES		
FOR	USE	TRANSISTOR NOS.
815024B	815024D	Q2/Q3
815026A	No Subst.	Q2/Q3
815026C	815026E	Q2/Q3

TRANSISTOR SUBSTITUTES		
FOR	USE	TRANSISTOR NOS.
815026F	815031	Q2/Q3
815028	No. Subst.	Q5
815031	815032	Q5

TRANSISTOR SUBSTITUTES		
FOR	USE	TRANSISTOR NOS.
815033	815032	Q5
815034	815032	Q5
815035	815032	Q5

TRANSISTOR PAIRS		ASSOCIATED R12
Q2	Q3	
815026A	815026A	680
815026B	815026B	680
815026D	815026D	680

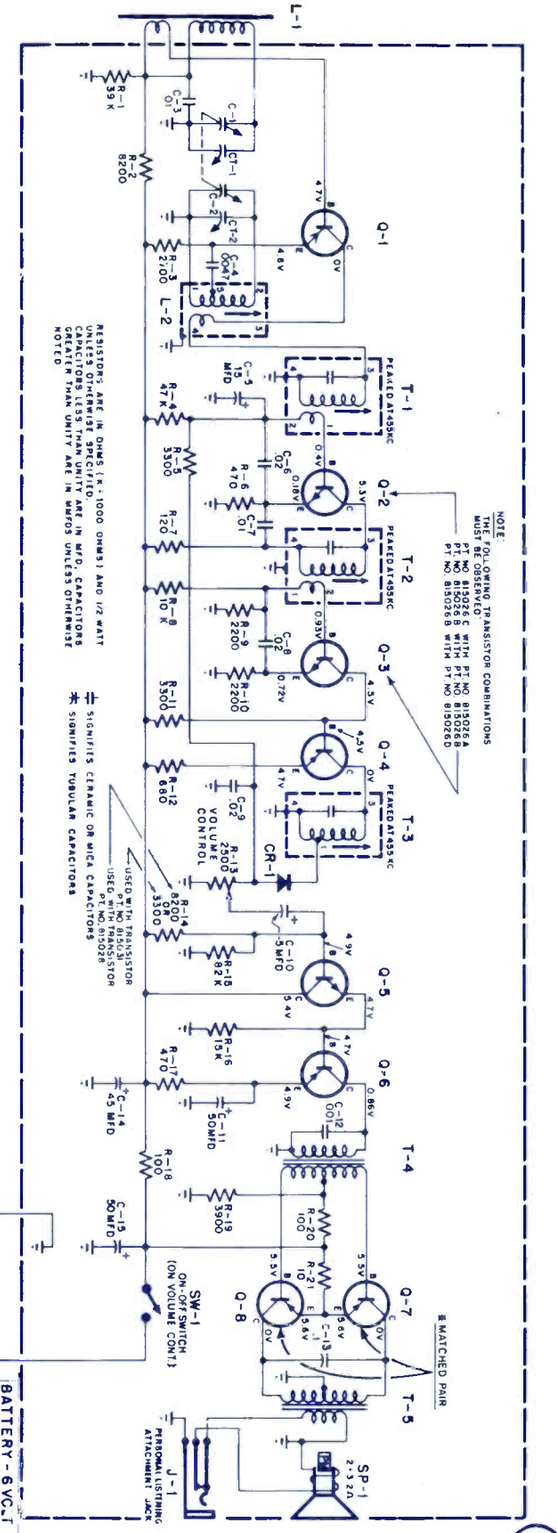
TRANSISTOR PAIRS		ASSOCIATED R12
Q2	Q3	
815026C	815026E	680
815026D	815026D	680
815026F	815026F	330

TRANSISTOR	ASSOCIATED R14
Q5	
815031	3300
815028	8200
815032	4700

TRANSISTOR	ASSOCIATED R14
Q5	
815033	6800
815034	8200
815035	10,000

NOTES: 1—Because of the small physical size of the transistors, the 1st three digits, "815", have been replaced by the letter, "E" for Emerson.

2—To improve the operation of Q1, at the high end, a resistor 680K, ±10%, ½W, is added across pins 1 and 2 of L-2.

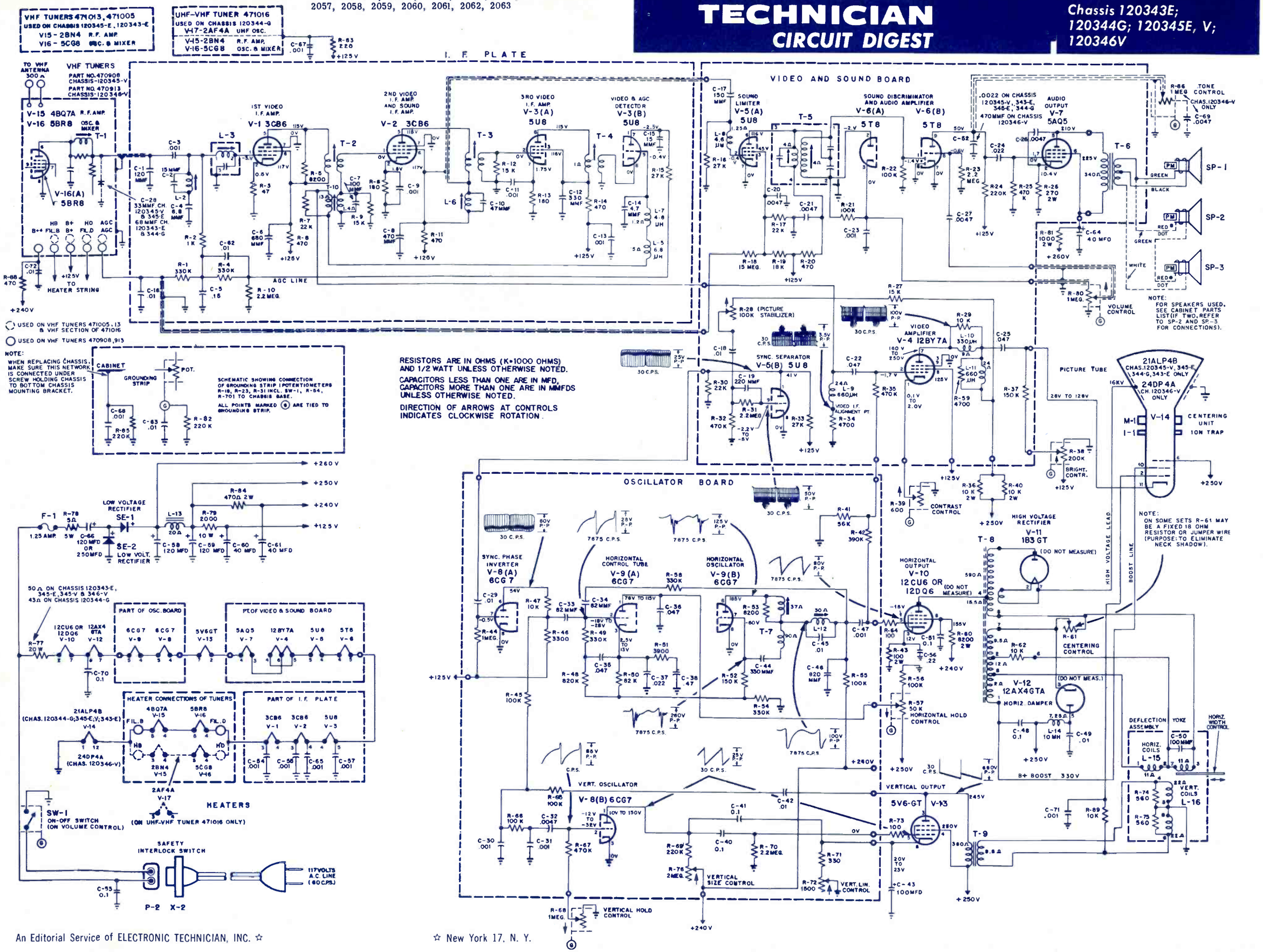


ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

EMERSON

Chassis 120343E; 120344G; 120345E, V; 120346V

Models: 2034S, 2038S, 2040S, 2042S, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063



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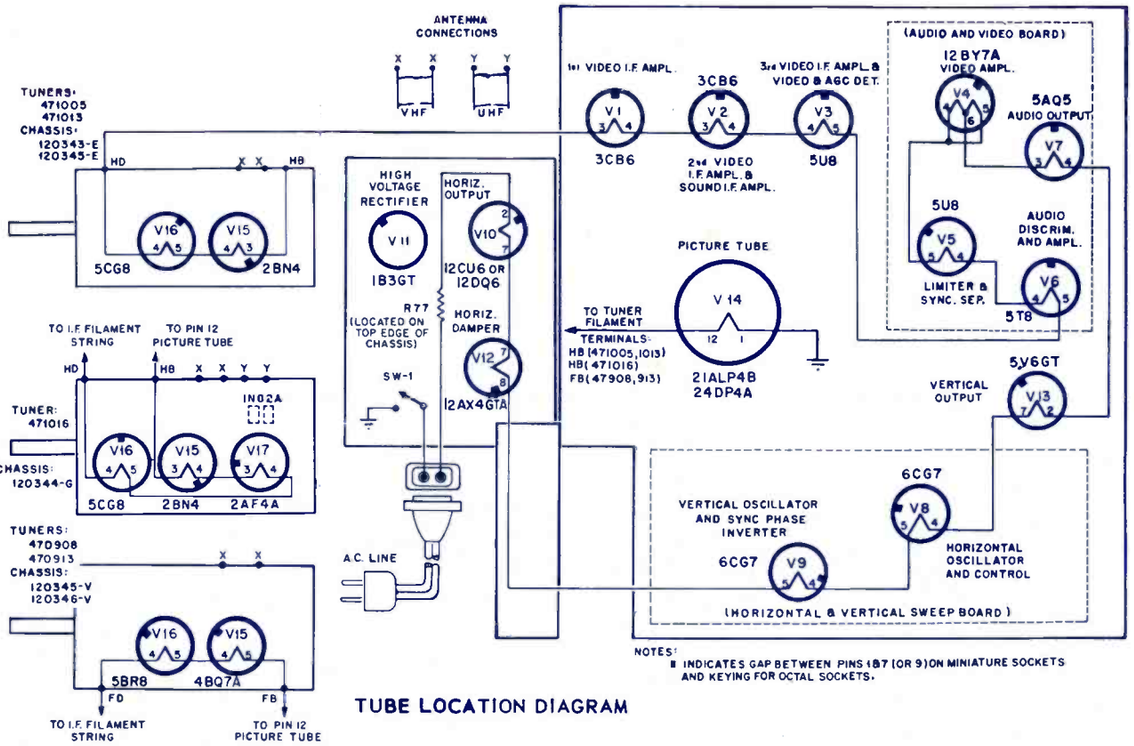
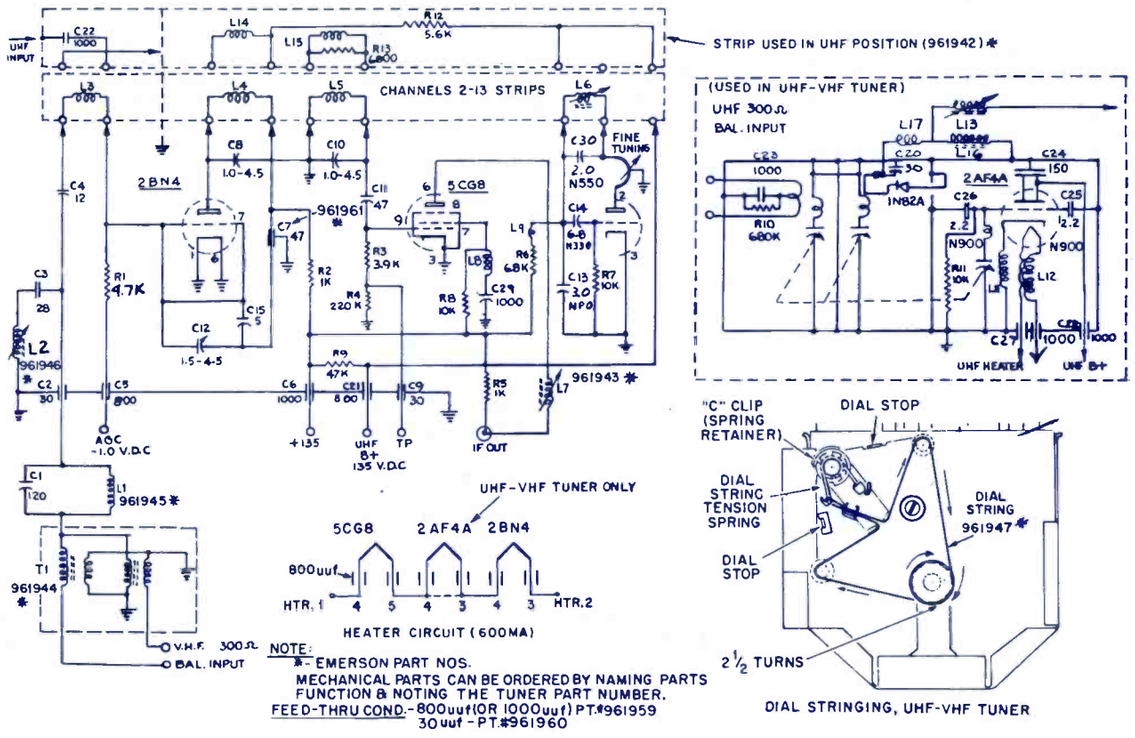
EMERSON

Chassis 120343E; 120344G; 120345E, V; 120346V



NOTES:
* INDICATES GAP BETWEEN PINS 1&7 (OR 9) ON MINIATURE SOCKETS AND KEYING FOR OCTAL SOCKETS.

TUBE LOCATION DIAGRAM



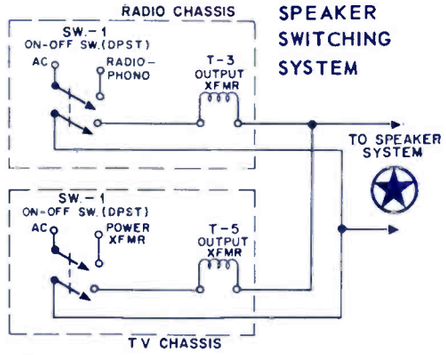
NOTE:
* - EMERSON PART NOS.
MECHANICAL PARTS CAN BE ORDERED BY NAMING PARTS FUNCTION & NOTING THE TUNER PART NUMBER.
FEED-THRU COND.- 800uuf (OR 1000uuf) PT. #961959
30uuf - PT. #961960

DIAL STRINGING, UHF-VHF TUNER

UHF-VHF TUNER PT. #471016, VHF TUNERS 471013, 471005

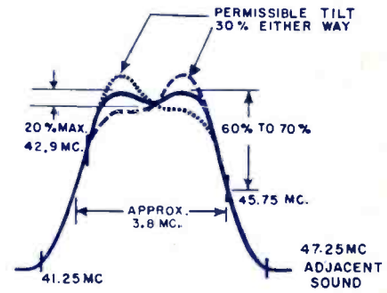
EMERSON

TV Chassis 120407S, 417S, 420S, 422S, 408U 418U, 421U, 423U

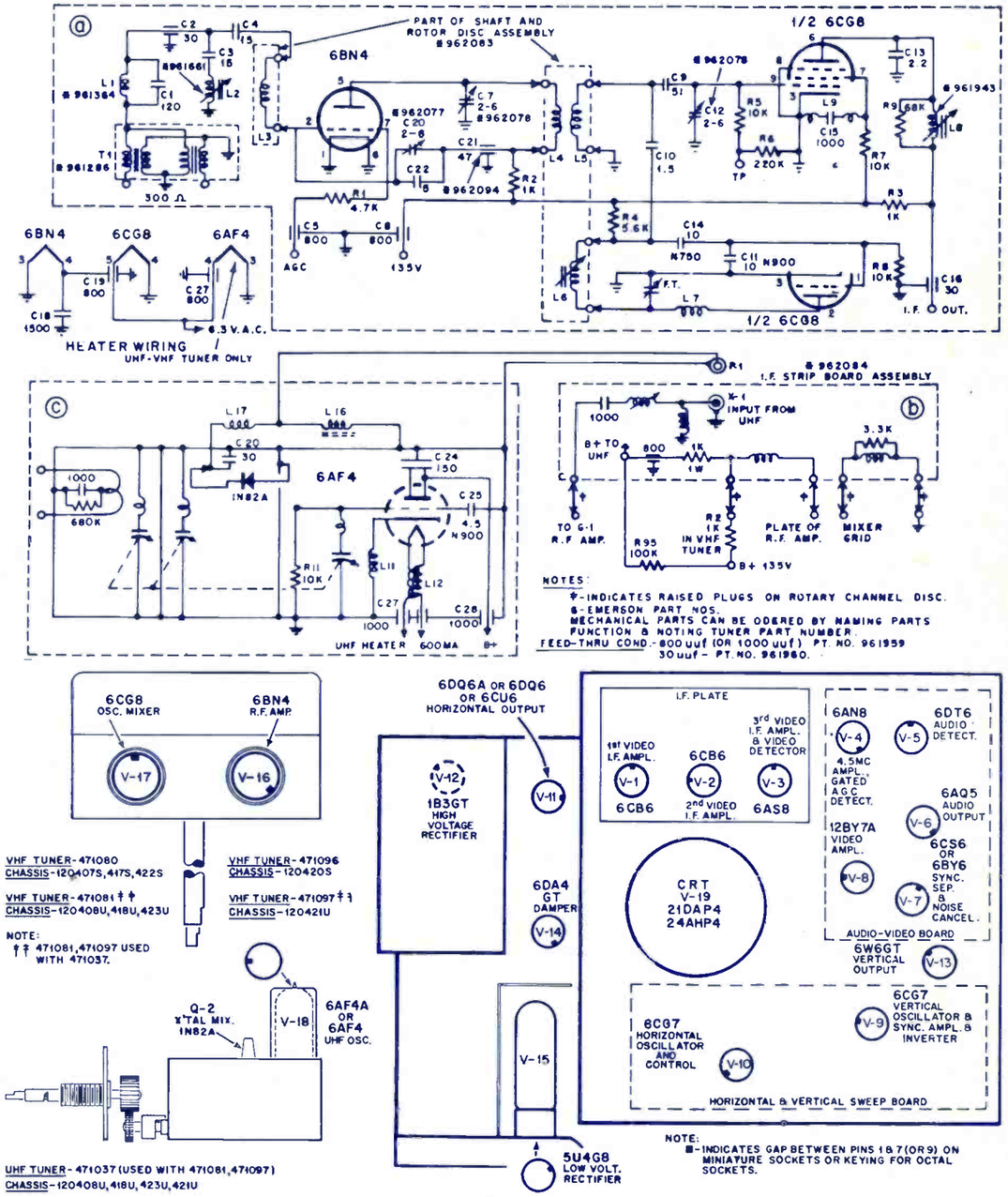


SPEAKER SWITCHING SYSTEM

TUNERS: 471080, 1081, 1096, 1097, 1037



OVERALL I.F. RESPONSE CURVE



NOTES:
* - INDICATES RAISED PLUGS ON ROTARY CHANNEL DISC.
& - EMERSON PART NOS.
MECHANICAL PARTS CAN BE ORDERED BY NAMING PARTS FUNCTION & NOTING TUNER PART NUMBER.
FEED-THRU COND.- 800 uuf (OR 1000 uuf) PT. NO. 961959
30 uuf - PT. NO. 961960.

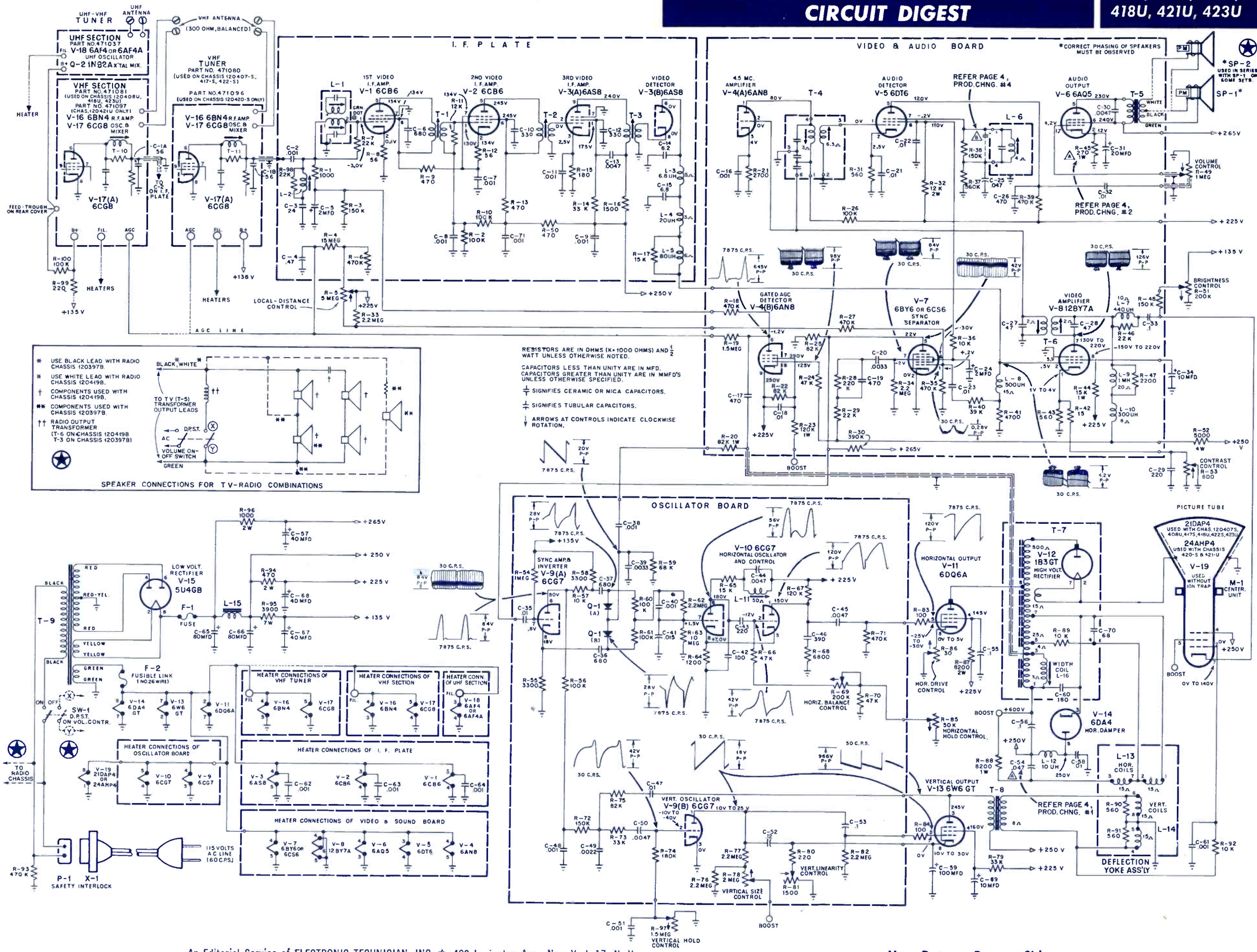
NOTE:
■ - INDICATES GAP BETWEEN PINS 1 & 7 (OR 9) ON MINIATURE SOCKETS OR KEYING FOR OCTAL SOCKETS.

TUBE LOCATION DIAGRAM

More Data on Reverse Side

EMERSON

TV Chassis 120407S, 417S, 420S, 422S, 408U 418U, 421U, 423U



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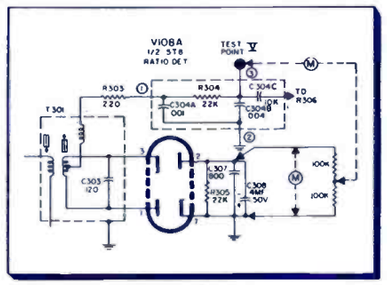
More Data on Reverse Side

Shop Hint

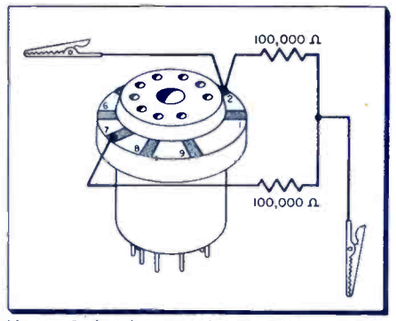
Alignment Jig

When aligning the ratio detector in the audio section of a TV set as found on GE Model M3 and many other sets using a 5T8, it is necessary to obtain zero output at the electrical center between pins 2 and 7. Normally it would be necessary to temporarily solder in a pair of matched resistors across these two points. The zero output indication would then be taken from the junction of these two resistors and test point V. The top of T301 (secondary) is the adjustment for this purpose. Tune for a dip between two peaks. Other adjustments call for a maximum from pin 2 to ground. Top of T154 (secondary) and bottom of T301 (primary) are used for these adjustments.



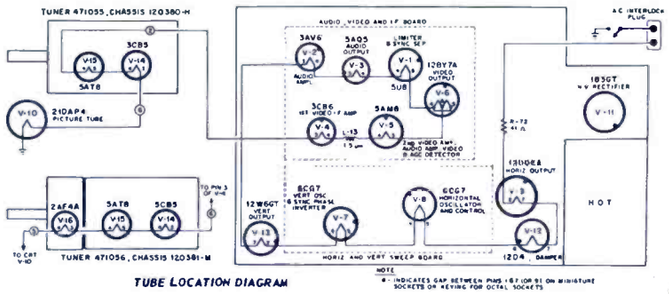
Typical ratio detector showing meter and resistor connections for sound alignment.

To avoid soldering and unsoldering to the printed wiring board, and to speed up alignment procedure, two matched 100,000 ohm resistors are tied together at one end and the other ends soldered to the external portion of pins 2 and 7 respectively of a q-pin miniature vector socket. One aligator clip with a short lead may be soldered to pin 2 and another to the junction point of the two resistors. Insert socket between tube and chassis, tune in a station and hook up a VTVM.—*Richard Prestia, Pittsburgh, Pa.*

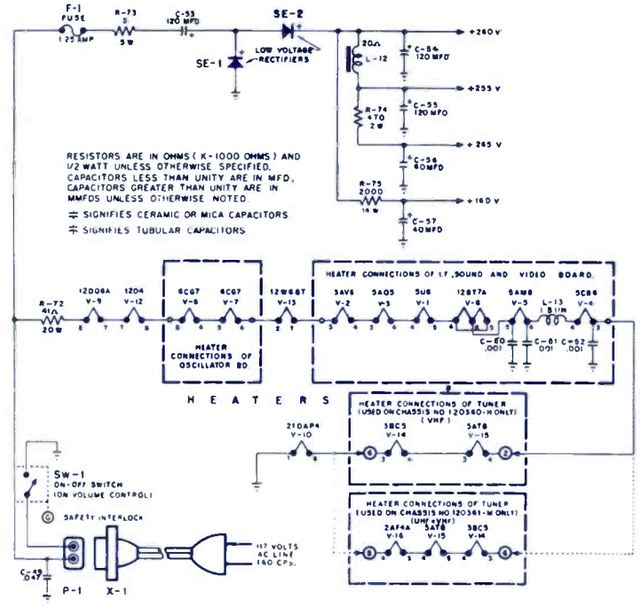


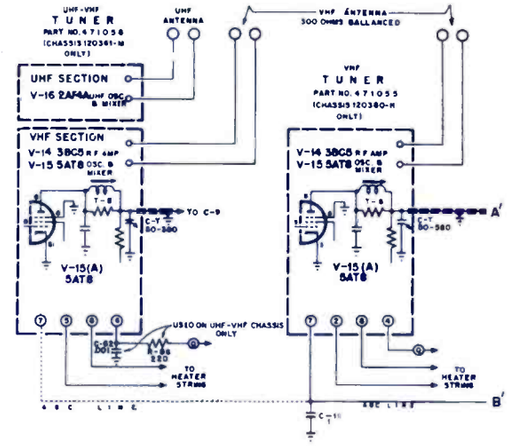
Vector Socket becomes handy alignment jig.

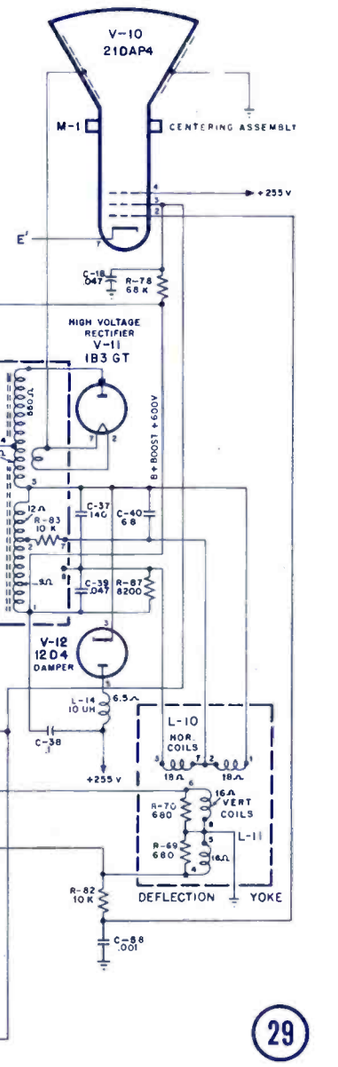
EMERSON
Chassis 120380H, 120388H, 120381M, 120389M

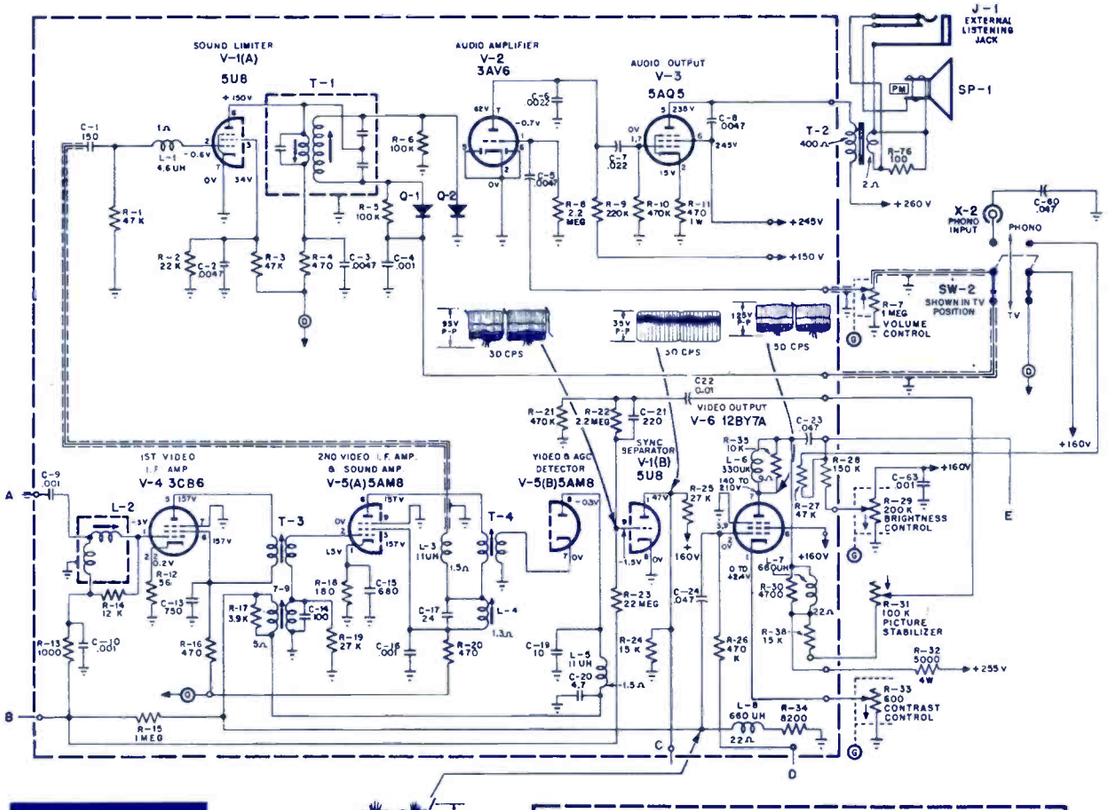


TUBE LOCATION DIAGRAM



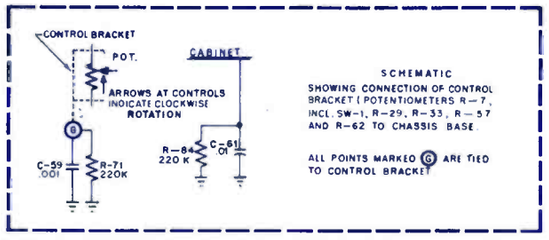






EMERSON
Chassis 120380H, 120388H, 120381M, 120389M

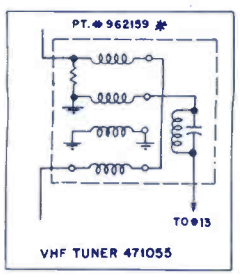
More Data on Reverse Side

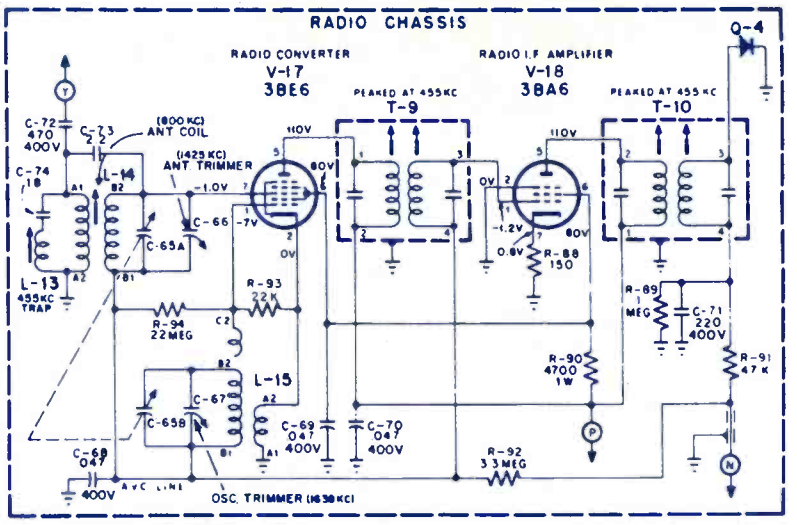


ADDITIONAL CHASSIS PARTS LIST, CHASSIS 120388H, 120389M

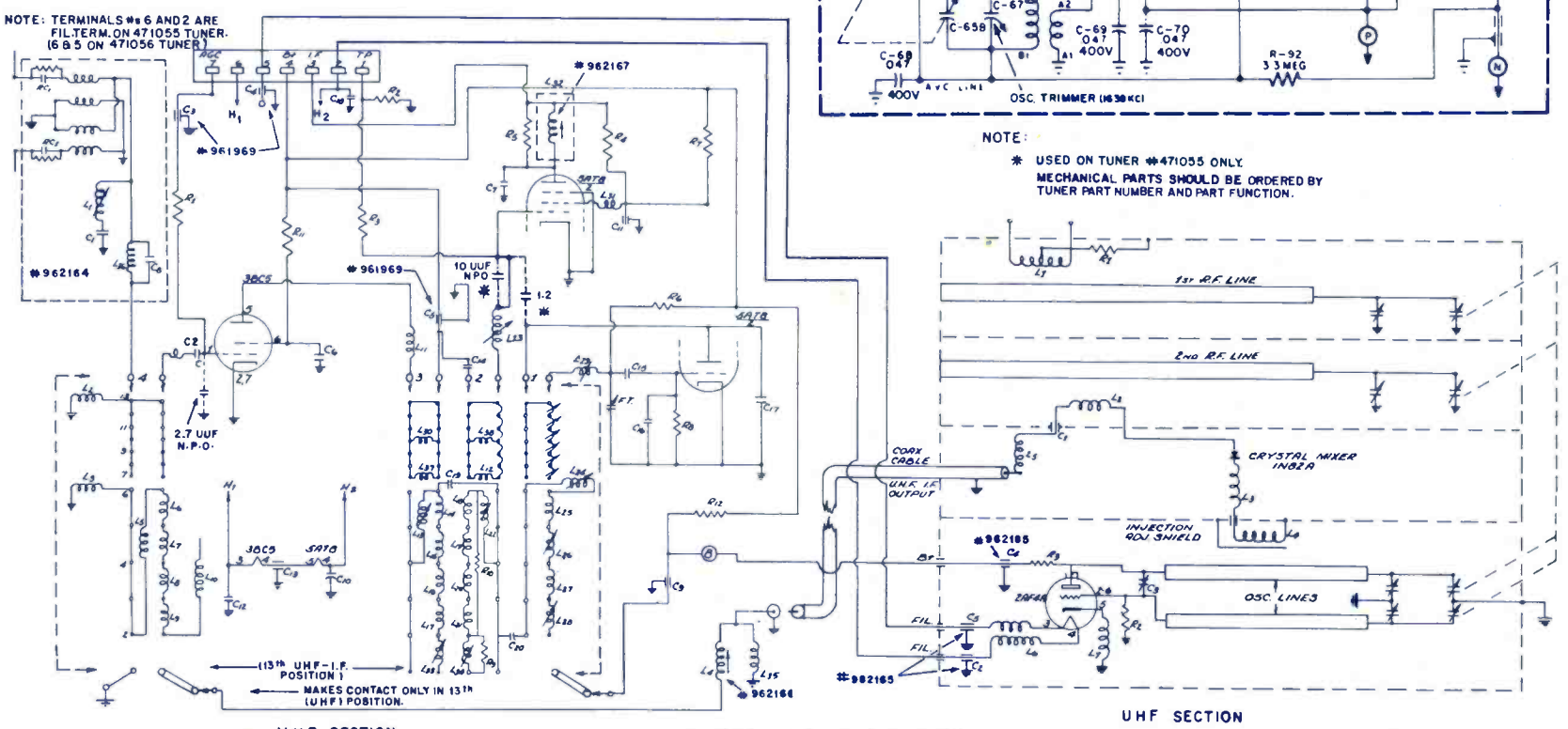
SYMB.	PART NO.	DESCRIPTION
{Q-3 Q-4	817061	Crystal Diode — UHF Tuner Only) Crystal Diode — Radio Chassis
T-9, T-10	720075	1st & 2nd Radio I.F. Transformer
T-11	720305	Sound Take-Off Transformer
L-13	708291	Wave Trap — 455 KC.)
L-14	710032	Antenna Coil)
L-15	716111	Oscillator Coil)
SW-2	510126	Switch—"Radio-Phono-TV" {Chas. 120388-H Only
SW-2	510125	Switch—"Radio-Phono-TV" {Chas. 120389-M Only
R-14	394204	12,000 Ohm — Carbon ± 10% 4 W
R-97	370932	68,000 Ohm — Carbon ± 10% 1 W
C-62	928919 (Ch. 120389-M only)	.001 MFD — Ceramic ± 20% 500 V
{V-17 V-18	800179 800181	Vacuum Tube — 3BE6) Vacuum Tube — 3BA6) Radio Chassis

Note—All other radio parts are noted directly on Radio Schematic.



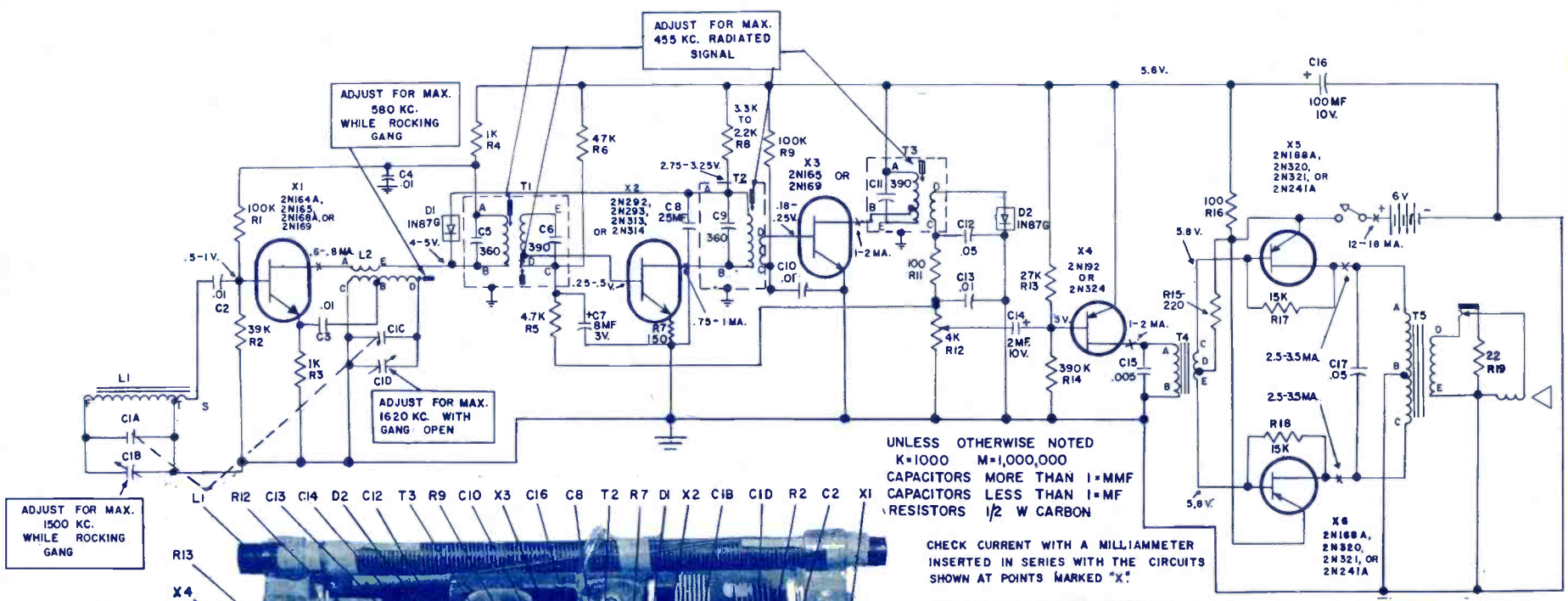


NOTE:
* USED ON TUNER #471055 ONLY.
MECHANICAL PARTS SHOULD BE ORDERED BY TUNER PART NUMBER AND PART FUNCTION.



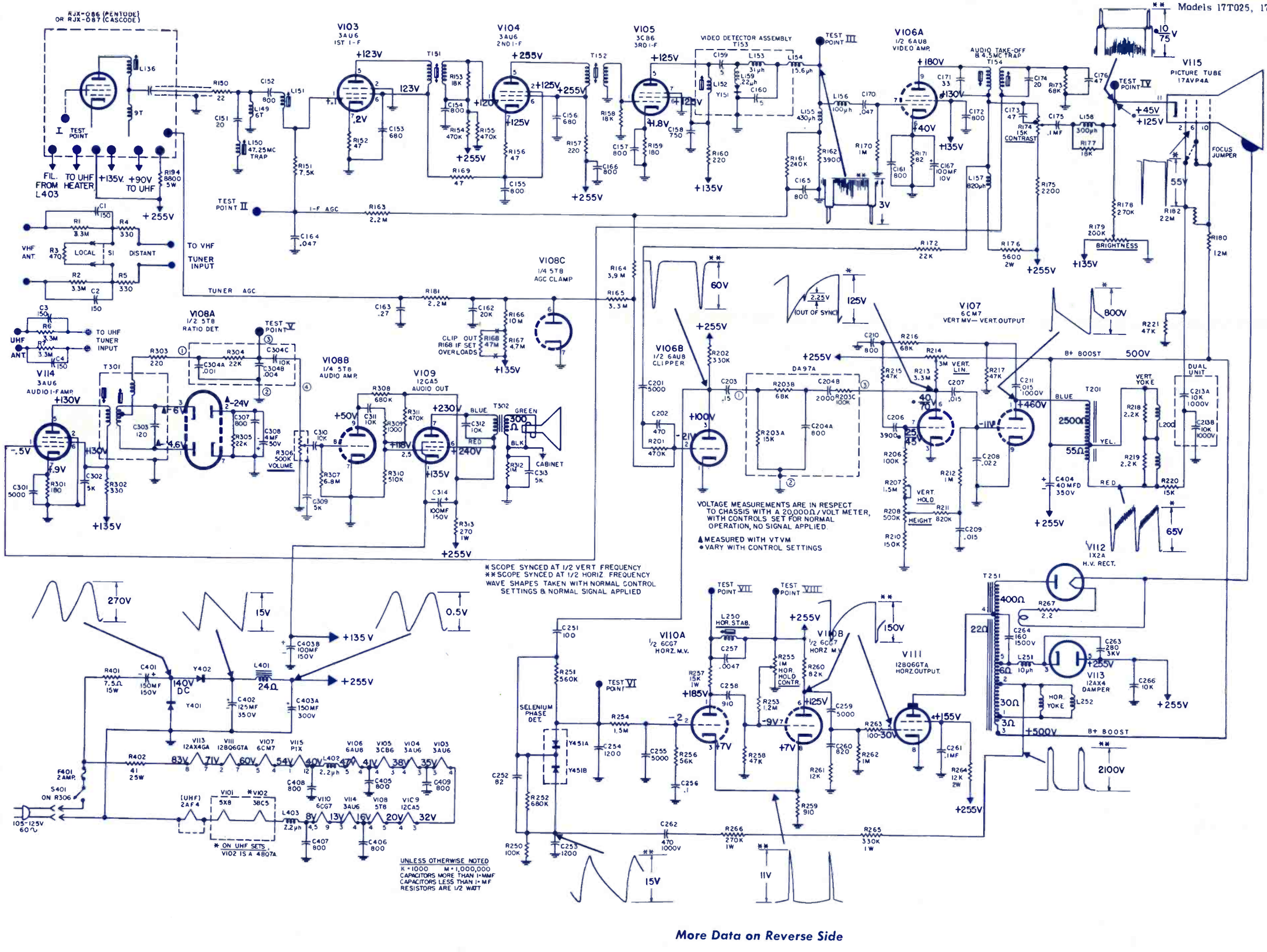
UHF-VHF TUNER 471056

Models VHF 1282, 1284, 1286; UHF-VHF 1283, 1285, 1287



GENERAL ELECTRIC
Portable TV
Chassis "MM" series

Models 17T025, 17T026

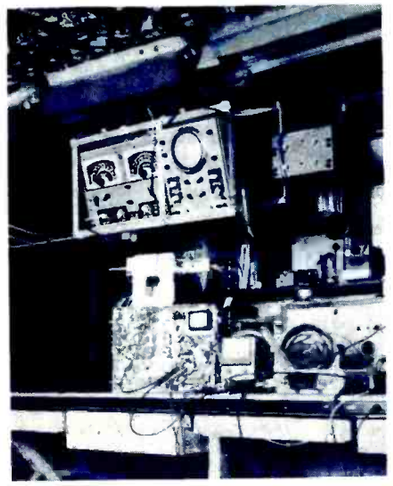


More Data on Reverse Side

Shop Hint

Sliding Rack For Test Equipment

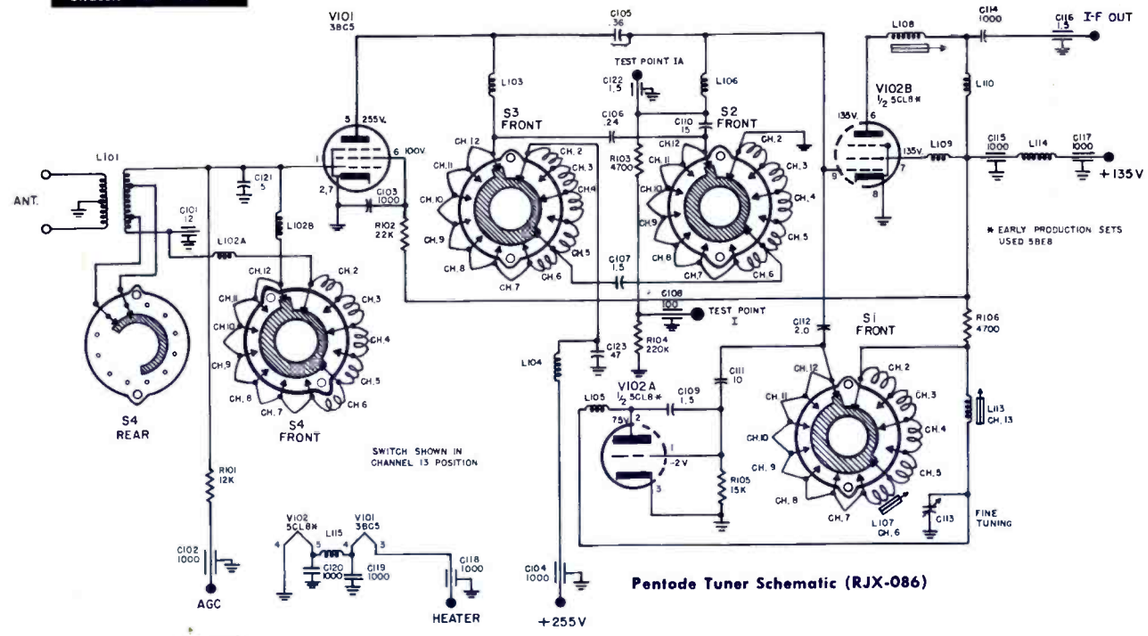
Special trucks, racks, stands and tables for test equipment have been on the market for some time now. I find they leave much to be desired. The main trouble is that the test leads are usually in the way and when trying to get around one end of the set or the other, one has to be a contortionist to avoid shorts, broken tubes and leads. I have struggled and tried many devices and ideas in an effort to get a decent set-up, which would eliminate moving either the set to be serviced or the test equipment. I designed an equipment carrier which holds my scope, signal generator and electronic switch. The carrier is a cage-like framework made up of 1" angle iron, and some 1" flat stock. An old bedspring and parts of a large wall-mount antenna bracket set may also be used to build the carrier. After the cage is assembled, it can be mounted on a track installed over the bench. Track and roller kits designed for roll-away doors were used. Since these kits are usually only 6 feet long, two of them were obtained and placed end-to-end. This permitted the cage to slide over a 12 foot length of the bench. The test equipment was mounted at an angle to facilitate viewing from either a standing or sitting position. When in use, the test leads drop almost straight down, thus assuring maximum freedom of motion and minimum damage. When the equipment is not in use, the leads can be conveniently hung on a couple of hooks installed at the top of the frame, as shown in the photograph. Total cost of the carrier is approximately $27.00—*C. R. Williams, Baltimore, Md.*



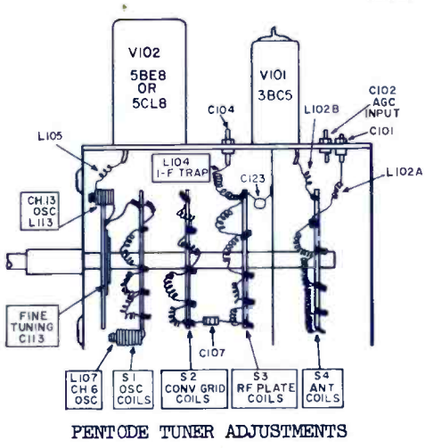
Overhead sliding equipment rack provides more room on the bench, and speeds servicing.

GENERAL ELECTRIC
Portable TV
Chassis "MM" series

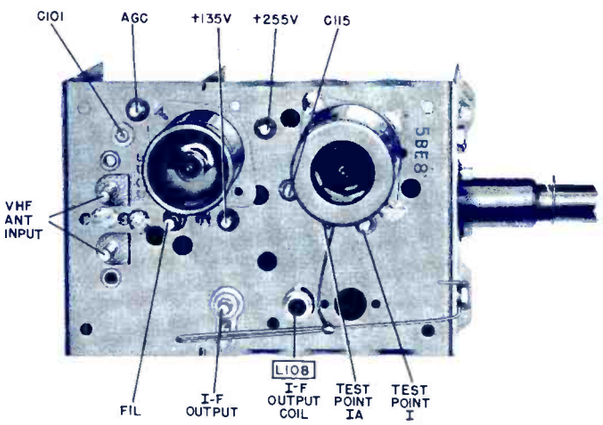
More Data on Reverse Side



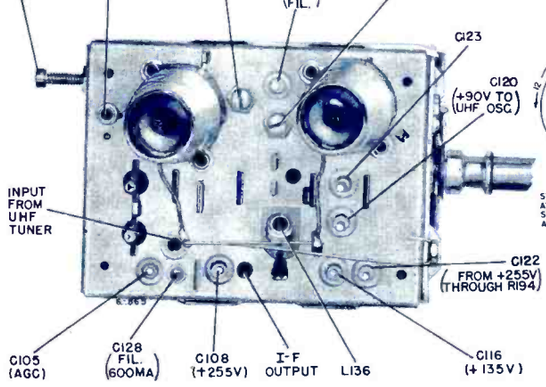
Pentode Tuner Schematic (RJX-086)

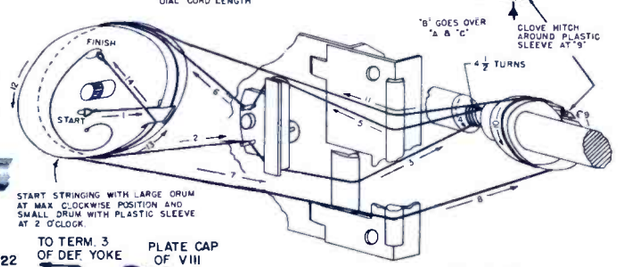


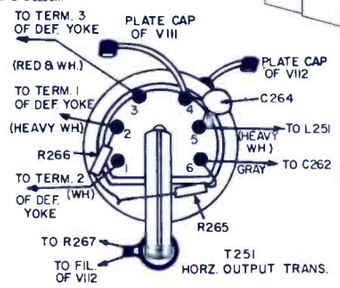
PENTODE TUNER ADJUSTMENTS

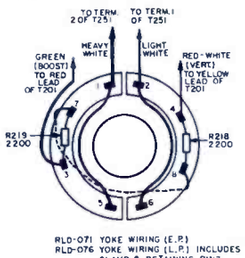


RJX-086 Top View

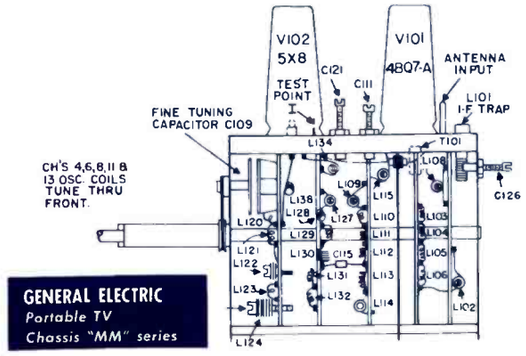






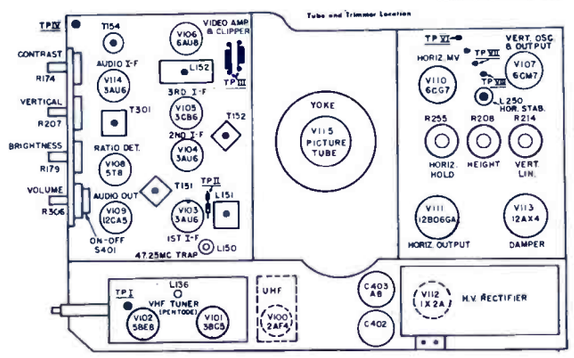


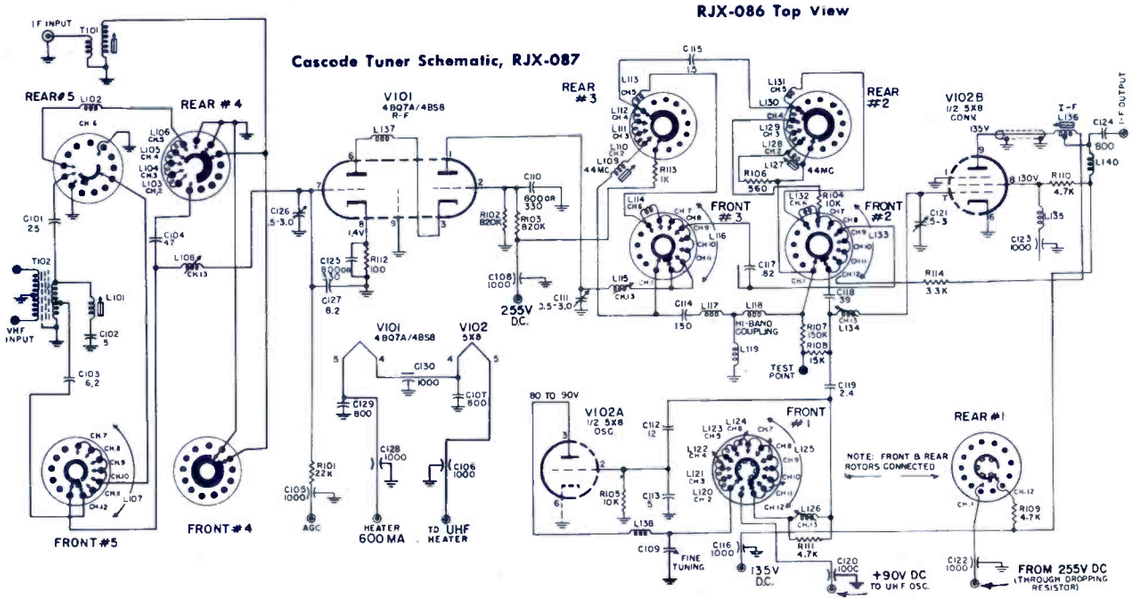
RLD-071 YOKE WIRING (E.P.)
RLD-076 YOKE WIRING (L.P.) INCLUDES CLAMP & RETAINING RING



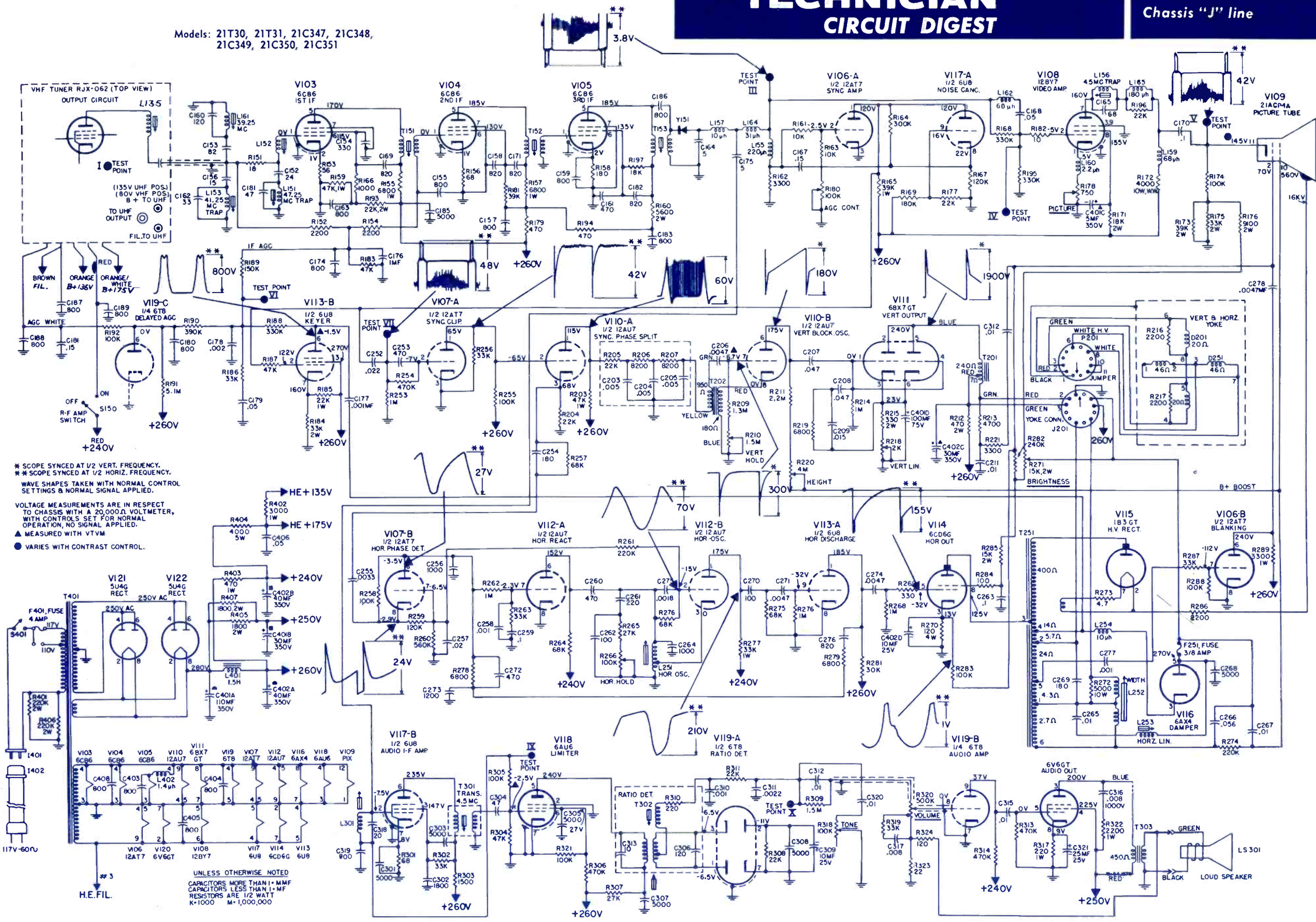
GENERAL ELECTRIC
Portable TV
Chassis "MM" series

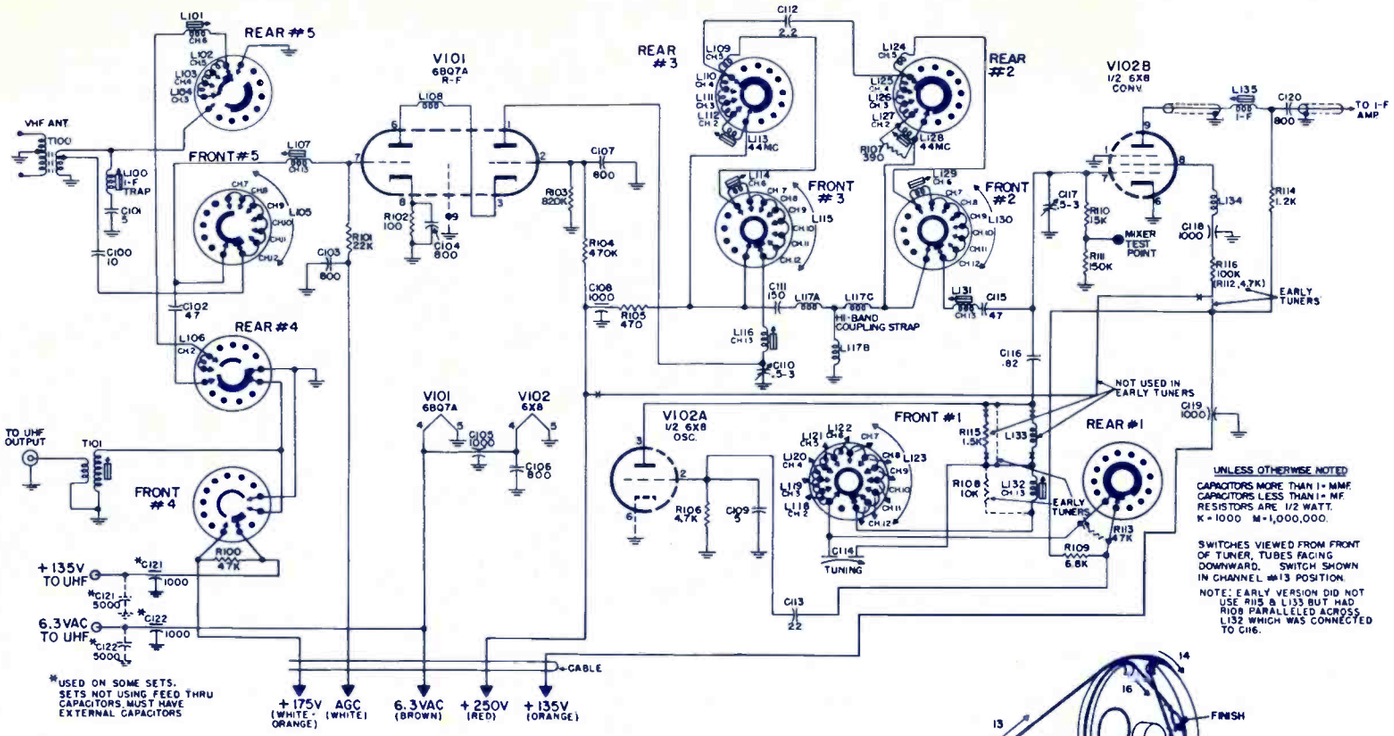
RJX-087 TUNER





Models: 21T30, 21T31, 21C347, 21C348, 21C349, 21C350, 21C351





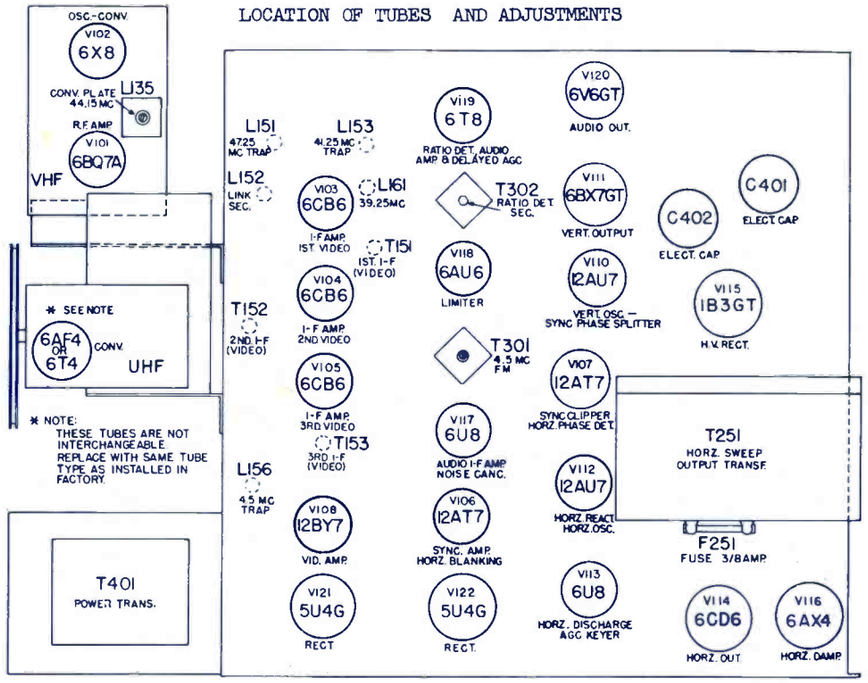
SCHEMATIC DIAGRAM FOR VHF TUNER (HEAD-END)

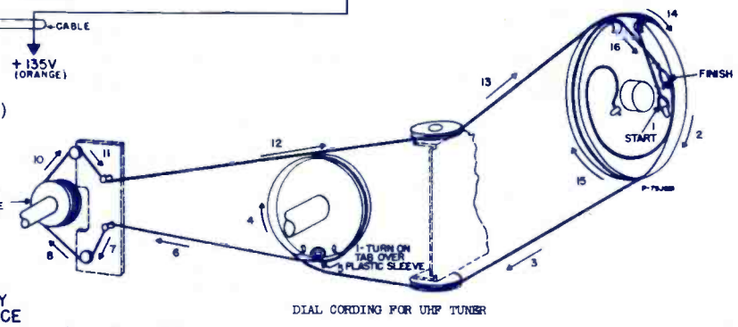
UNLESS OTHERWISE NOTED
CAPACITORS MORE THAN 1- MMF. CAPACITORS LESS THAN 1+ MF. RESISTORS ARE 1/2 WATT. K = 1000 M = 1,000,000.

SWITCHES VIEWED FROM FRONT OF TUNER, TUBES FACING DOWNWARD. SWITCH SHOWN IN CHANNEL #13 POSITION.

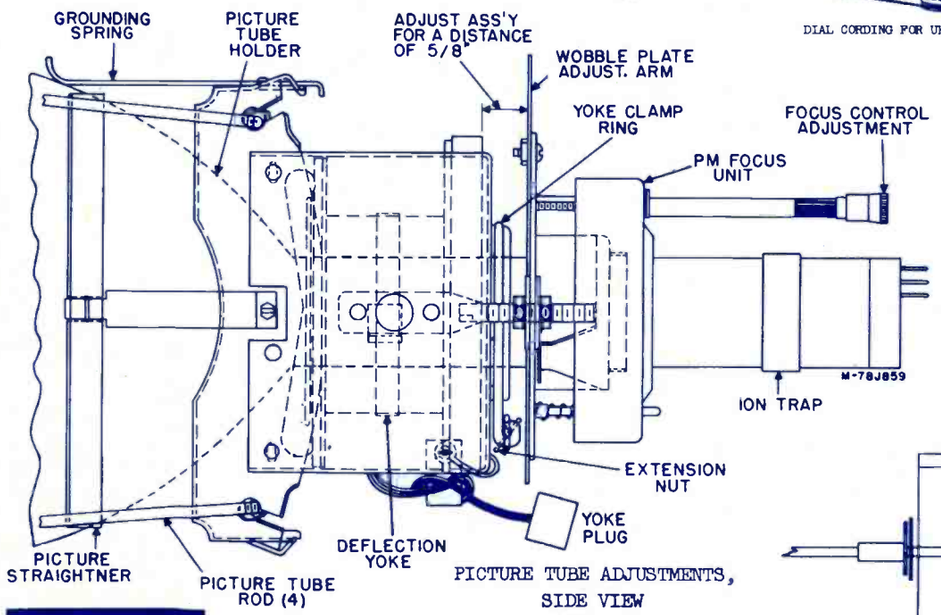
NOTE: EARLY VERSION DID NOT USE R115 & L133 BUT HAD R108 PARALLELED ACROSS L132 WHICH WAS CONNECTED TO C116.

LOCATION OF TUBES AND ADJUSTMENTS

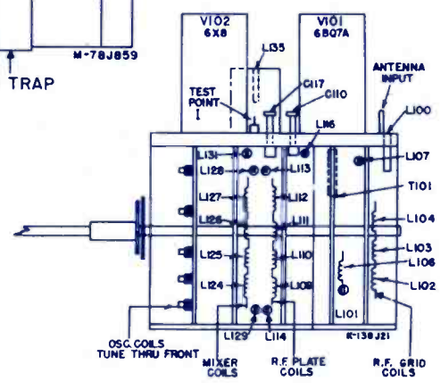




DIAL CORDING FOR UHF TUNER

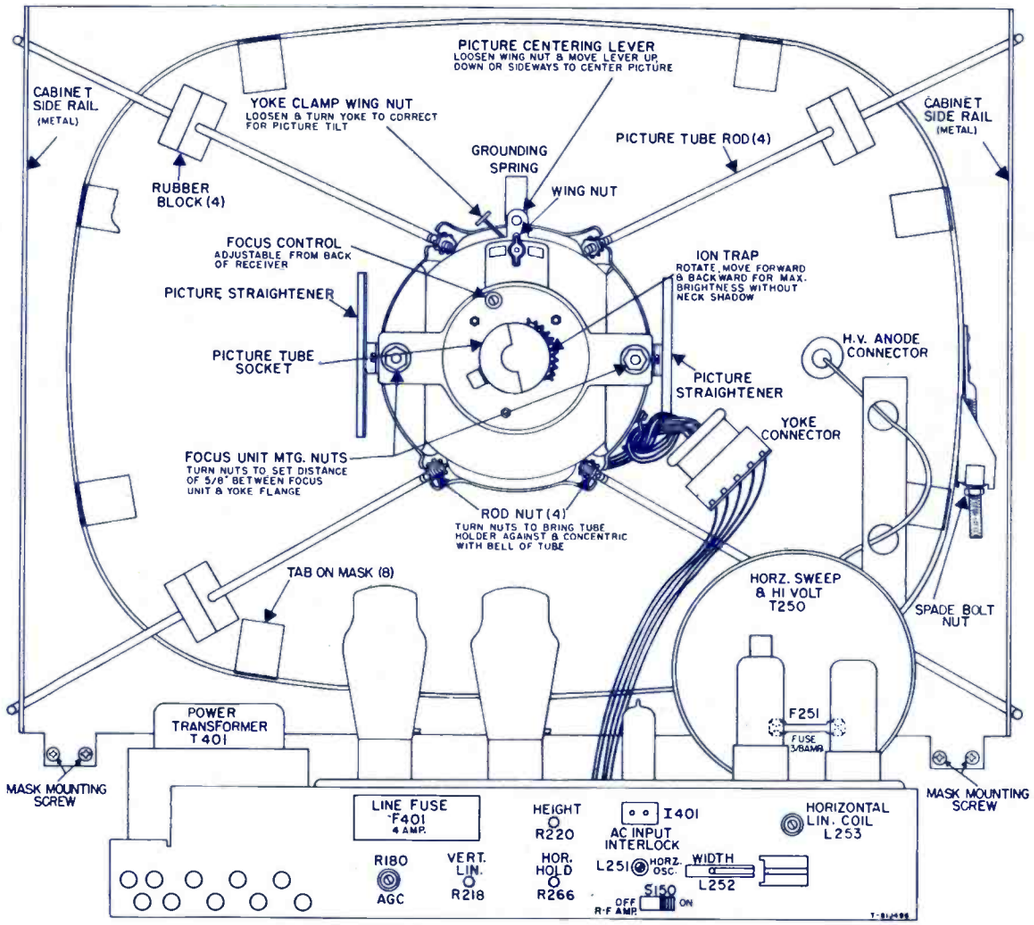


PICTURE TUBE ADJUSTMENTS, SIDE VIEW



VHF TUNER ADJUSTMENT

PICTURE TUBE ADJUSTMENTS (REAR VIEW)



GENERAL ELECTRIC
Chassis "J" line

More Data on Reverse Side

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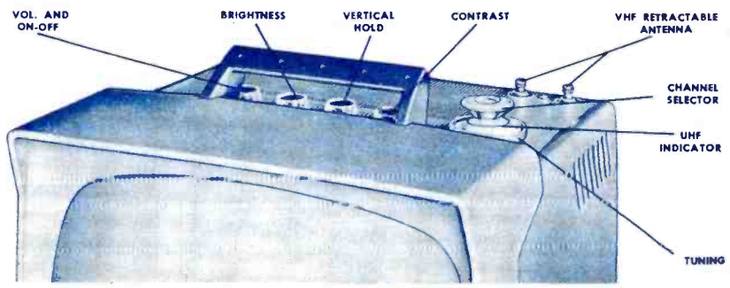
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

March • 1958

GENERAL ELECTRIC
TV Chassis Q2



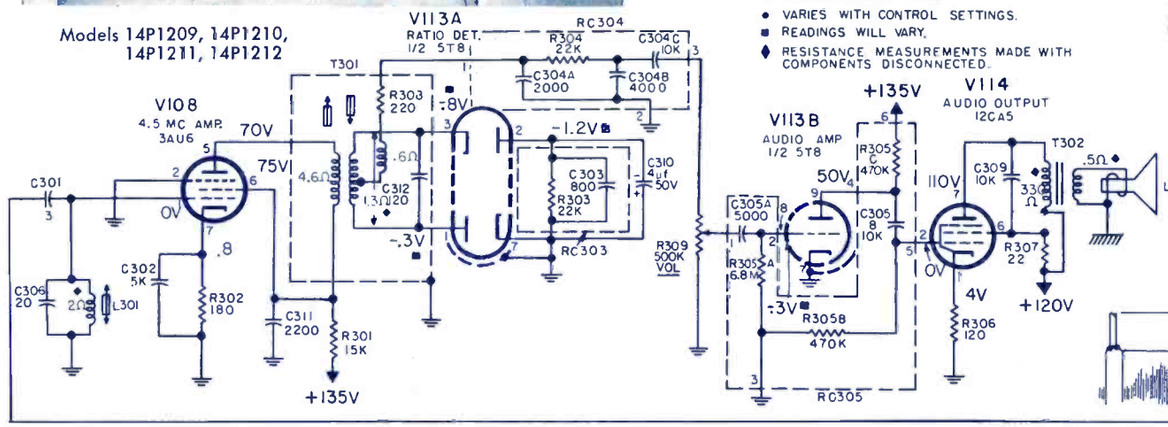
Models 14P1209, 14P1210, 14P1211, 14P1212

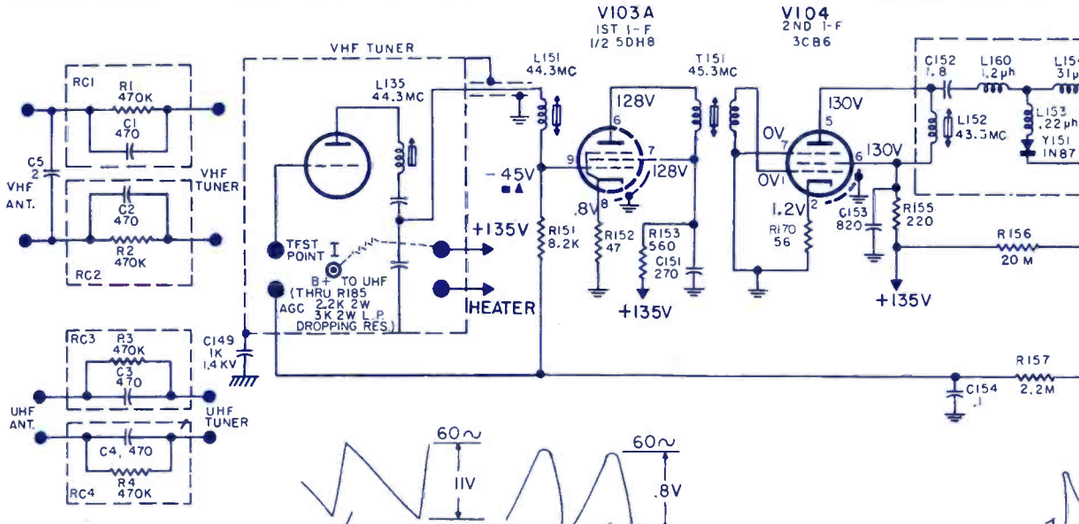
UNLESS OTHERWISE NOTED
K=1,000 M=1,000,000
CAPACITORS MORE THAN 1 = μμf
CAPACITORS LESS THAN 1 = μf
RESISTORS ARE 1/2 WATT
▨ DENOTES CABINET
* SEE PRODUCTION CHANGES
L.P. DENOTES LATE PRODUCTION

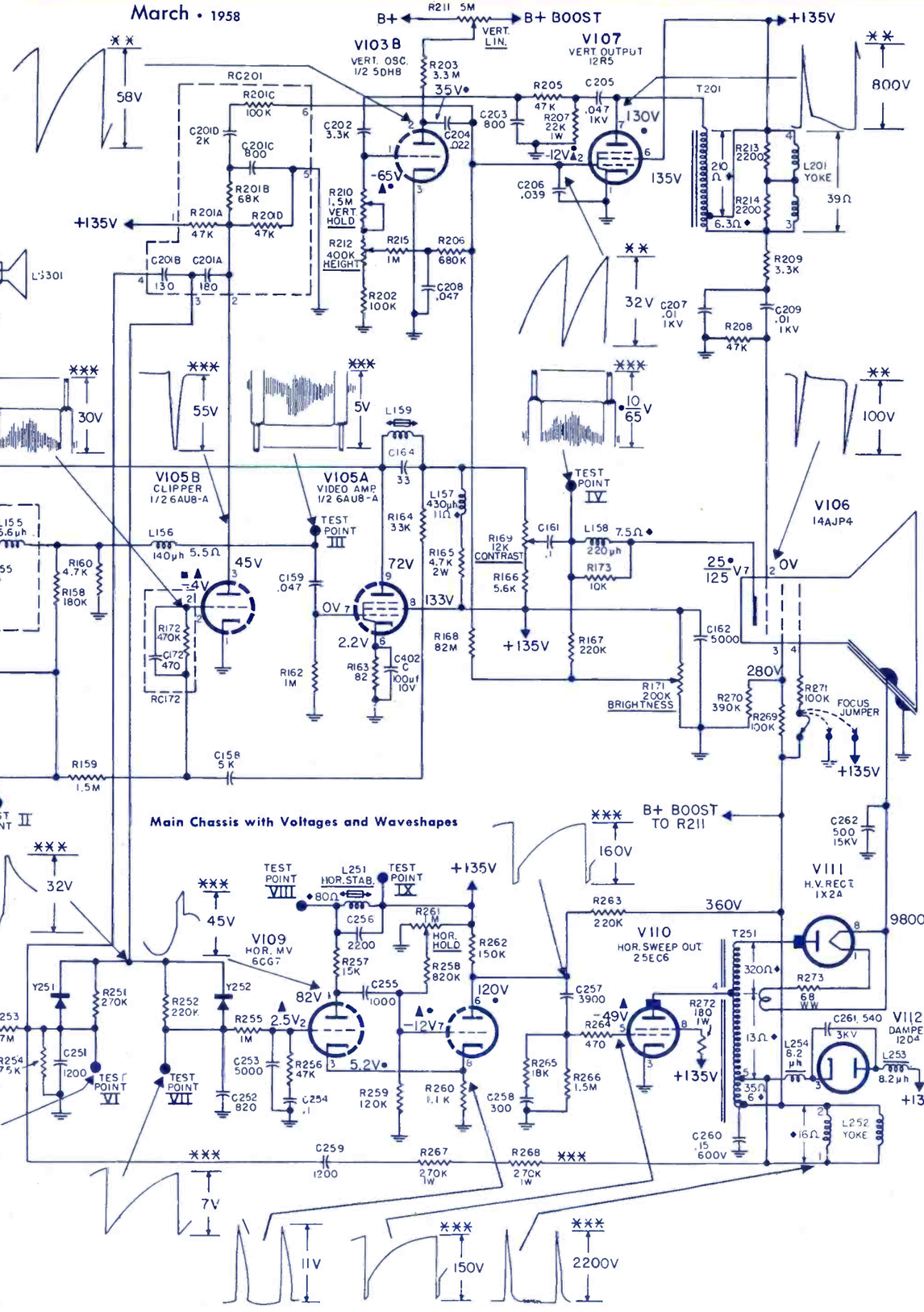
** SCOPE SYNCED AT 1/2 VERT. FREQUENCY.
*** SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY.
WAVE SHAPES TAKEN WITH NORMAL CONTROL SETTINGS & NORMAL SIGNAL APPLIED.

VOLTAGE MEASUREMENTS ARE IN RESPECT TO CHASSIS WITH A 20,000Ω VOLT METER, WITH CONTROLS SET FOR NORMAL OPERATION, NO SIGNAL APPLIED

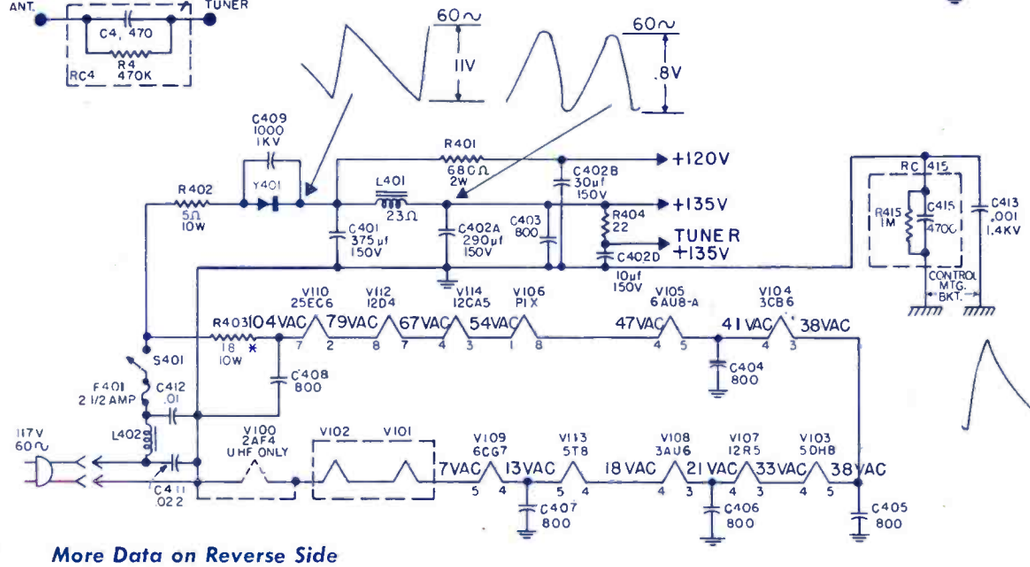
▲ MEASURED WITH VTVM.
● VARIES WITH CONTROL SETTINGS.
■ READINGS WILL VARY.
◆ RESISTANCE MEASUREMENTS MADE WITH COMPONENTS DISCONNECTED.





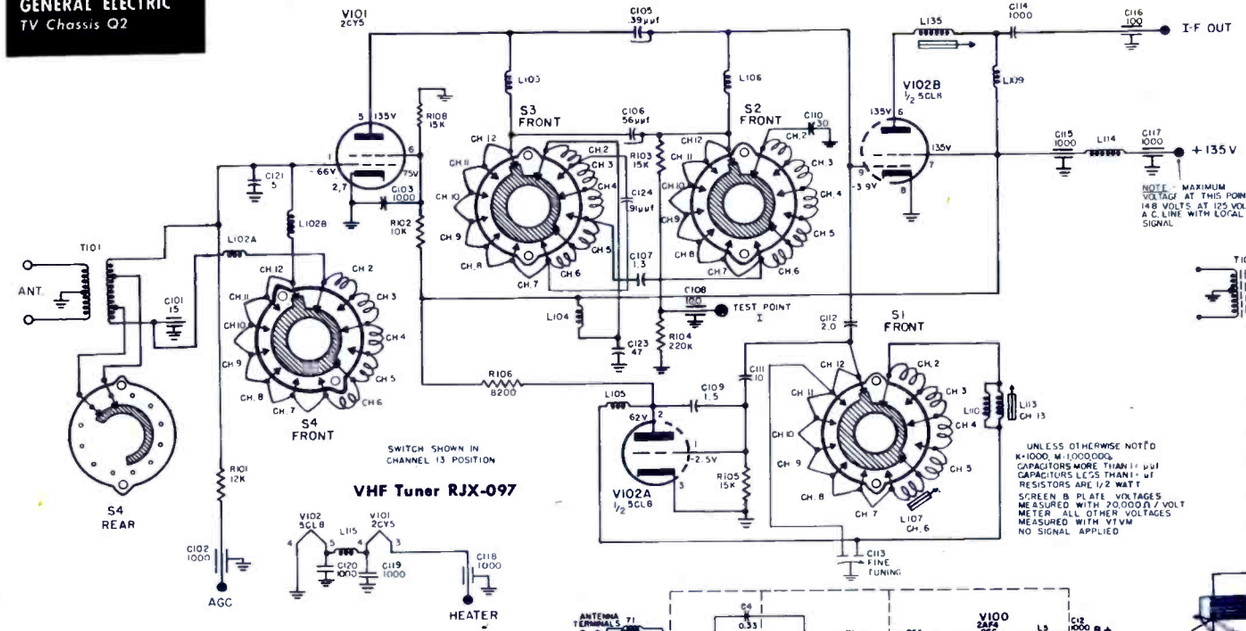


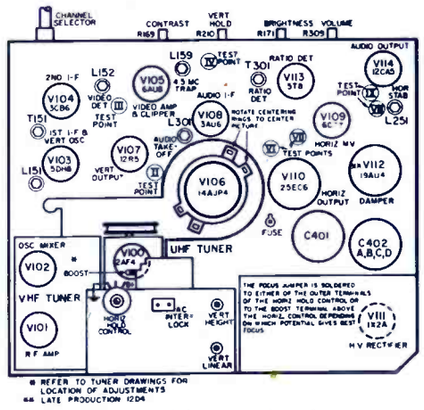
Main Chassis with Voltages and Waveshapes



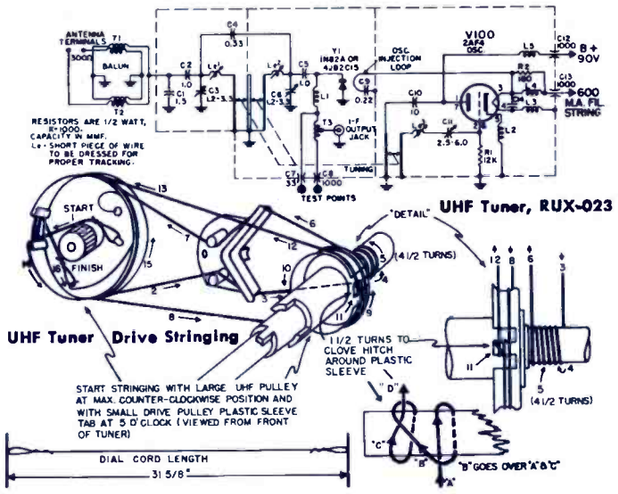
More Data on Reverse Side

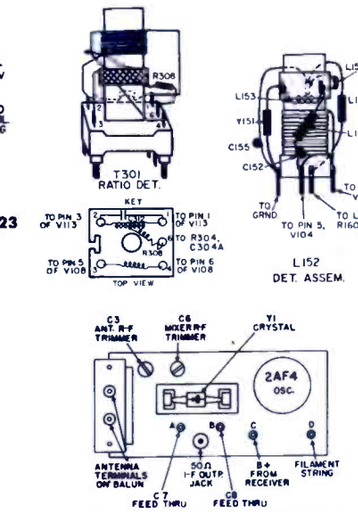
GENERAL ELECTRIC
TV Chassis Q2

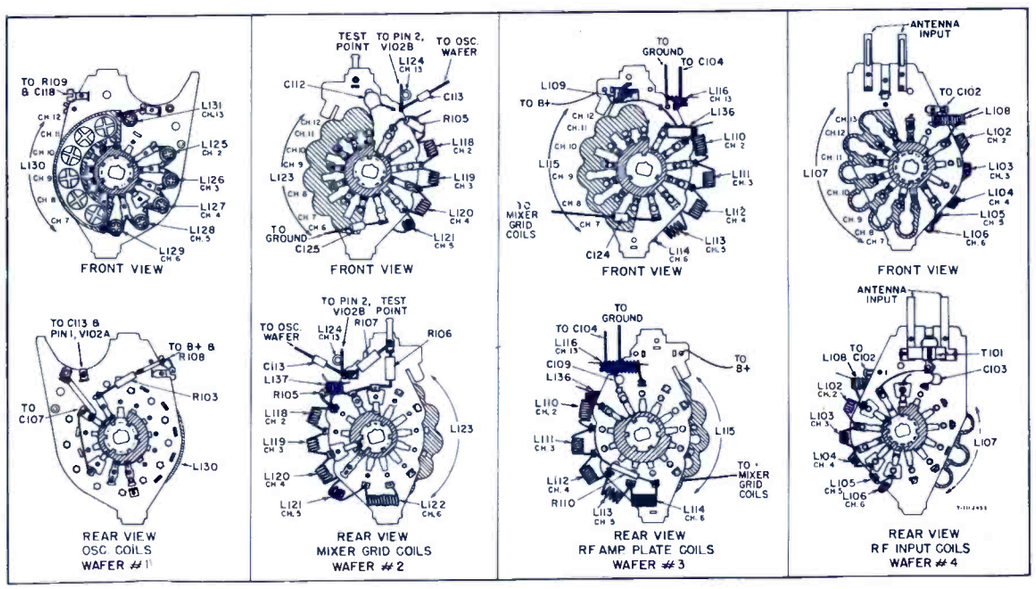




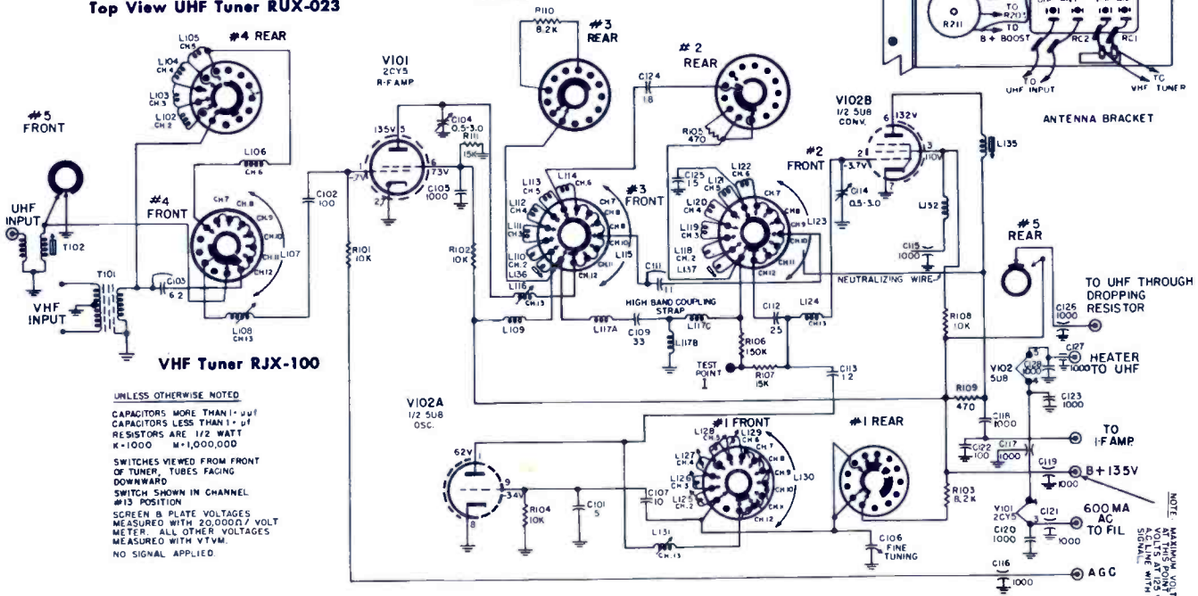
Tube and Adjustment Locations

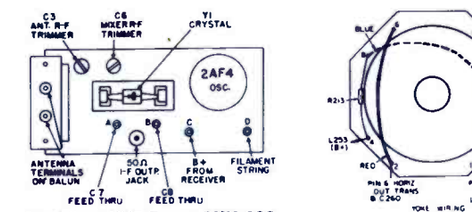


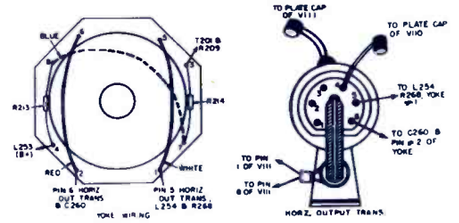


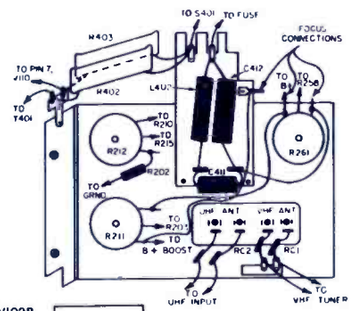


RJX-100 VHF Tuner Switch Wafer Diagram









More Data on Reverse Side

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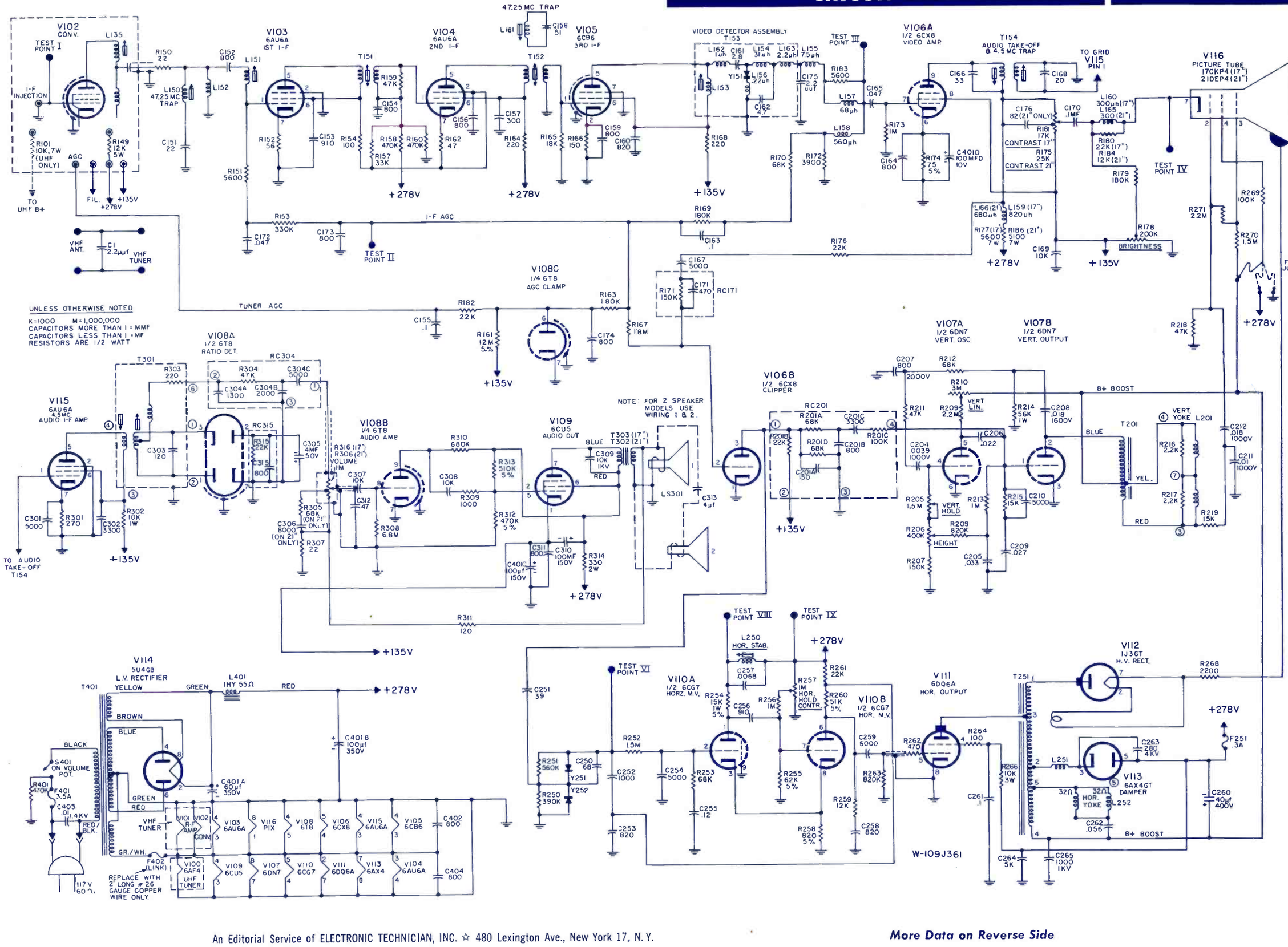
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

GENERAL ELECTRIC
TV Chassis M4
Model 21T2425, 21T2426 & UHF



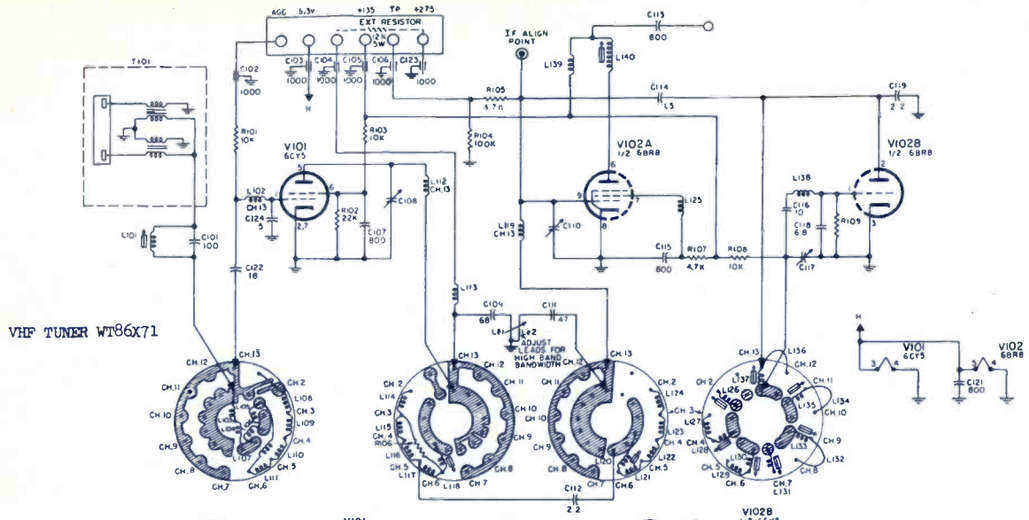
More Data on Reverse Side

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

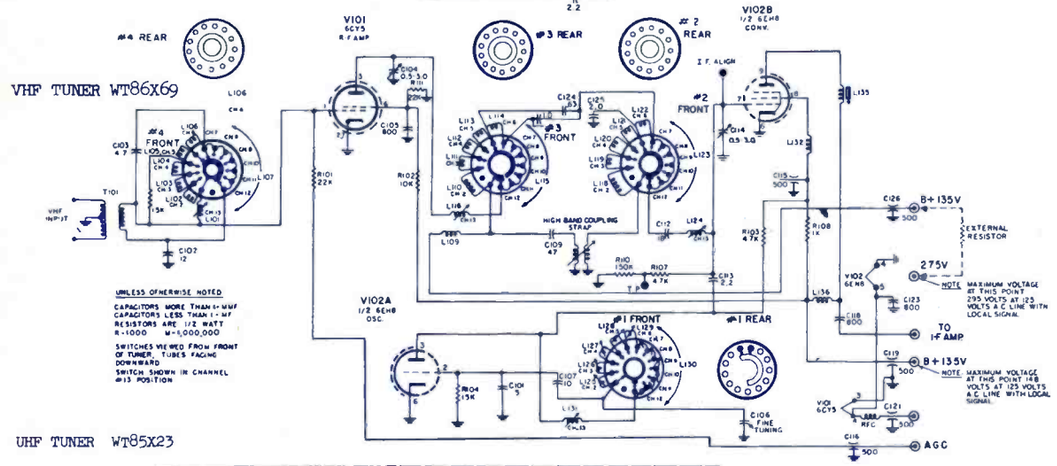
GENERAL ELECTRIC (Canada)
Transistor Radio P750A

Transistor Radio P750A

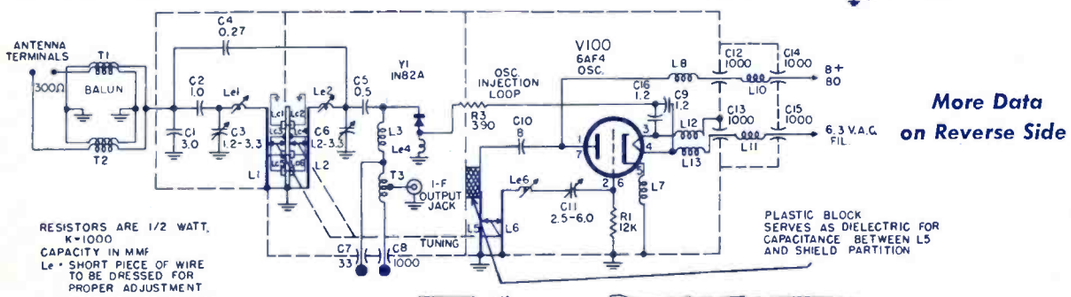
VHF TUNER WT86X71



VHF TUNER WT86X69



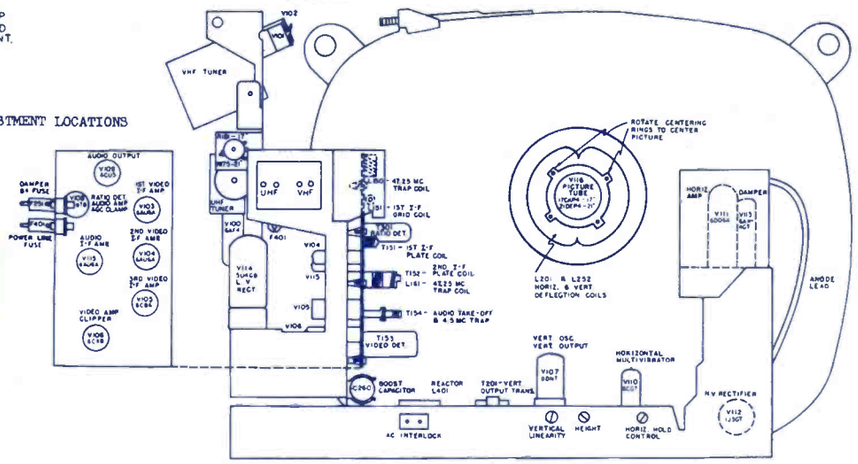
UHF TUNER WT85X23



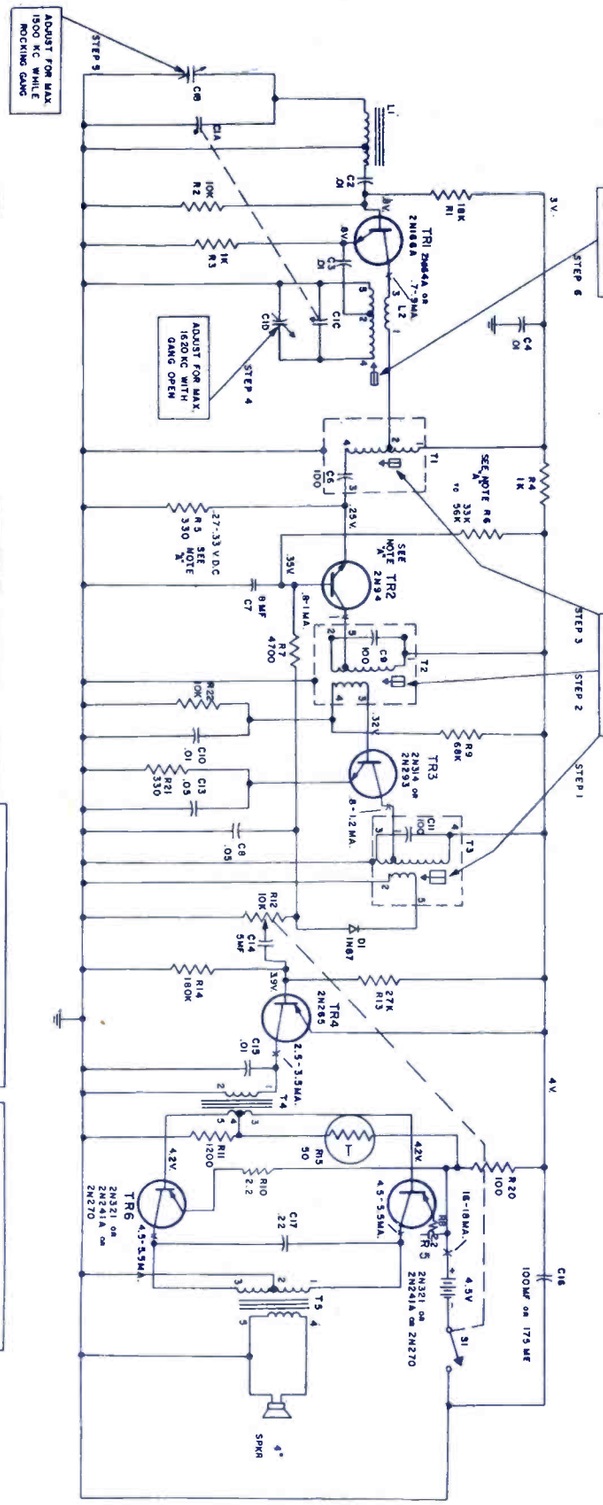
RESISTORS ARE 1/2 WATT.
K=1000
CAPACITY IN MMF
Le = SHORT PIECE OF WIRE TO BE DRESSED FOR PROPER ADJUSTMENT
Lc = PIECE OF WIRE OR LOOP OF WIRE TO BE DRESSED FOR PROPER ADJUSTMENT.

More Data on Reverse Side

TUBE AND ADJUSTMENT LOCATIONS



GENERAL ELECTRIC
TV Chassis M4



I.F. TRANSFORMER T1, T2, T3

OSCILLATOR TRANSFORMER T4

BOTTOM VIEWS

TRANSISTOR MOUNTING PATTERN B

ALIGNMENT

SET VOLUME CONTROL AT MAXIMUM.
CONNECT OUTPUT METER OR SCOPE ACROSS VOICE COIL.
INDUCTIVELY COUPLE SIGNAL GENERATOR TO RECEIVER.
STEP 1, 2 & 3 - SET SIG. GEN AT 455 KC, WITH RECEIVER TUNING GANG OPEN
STEP 4 - SET SIG. GEN. AT 1620 KC., WITH RECEIVER TUNING GANG OPEN
STEP 5 - SET SIG. GEN AT 1500 KC. TUNE RECEIVER TO 1500 KC.
STEP 6 - SET SIG. GEN AT 580 KC. TUNE RECEIVER TO 580 KC

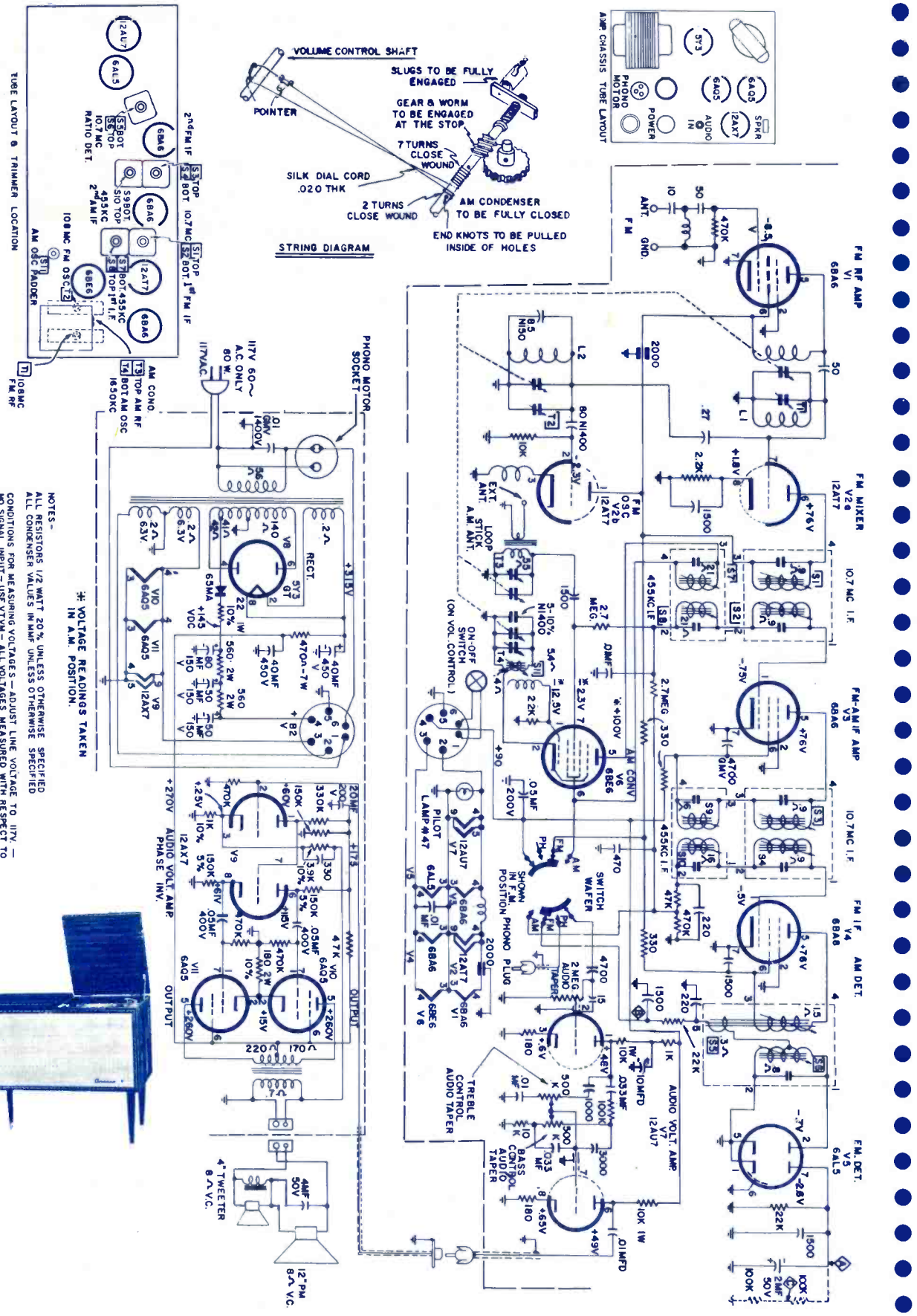
NOTE "X"
AFTER REPLACING TR2, CHECK VOLTAGE ACROSS R5. IF NOT WITHIN RANGE, CHANGE VALUE OF R6 UNTIL VOLTAGE ACROSS R5 IS WITHIN VOLTAGE RANGE SHOWN.

MEASURE COLLECTOR CURRENTS WITH A MILLIAMMETER INSERTED IN SERIES WITH THE CIRCUITS MARKED "X" AND ALSO BATTERY CURRENT AT POINT MARKED "X" IN BATTERY CIRCUIT.

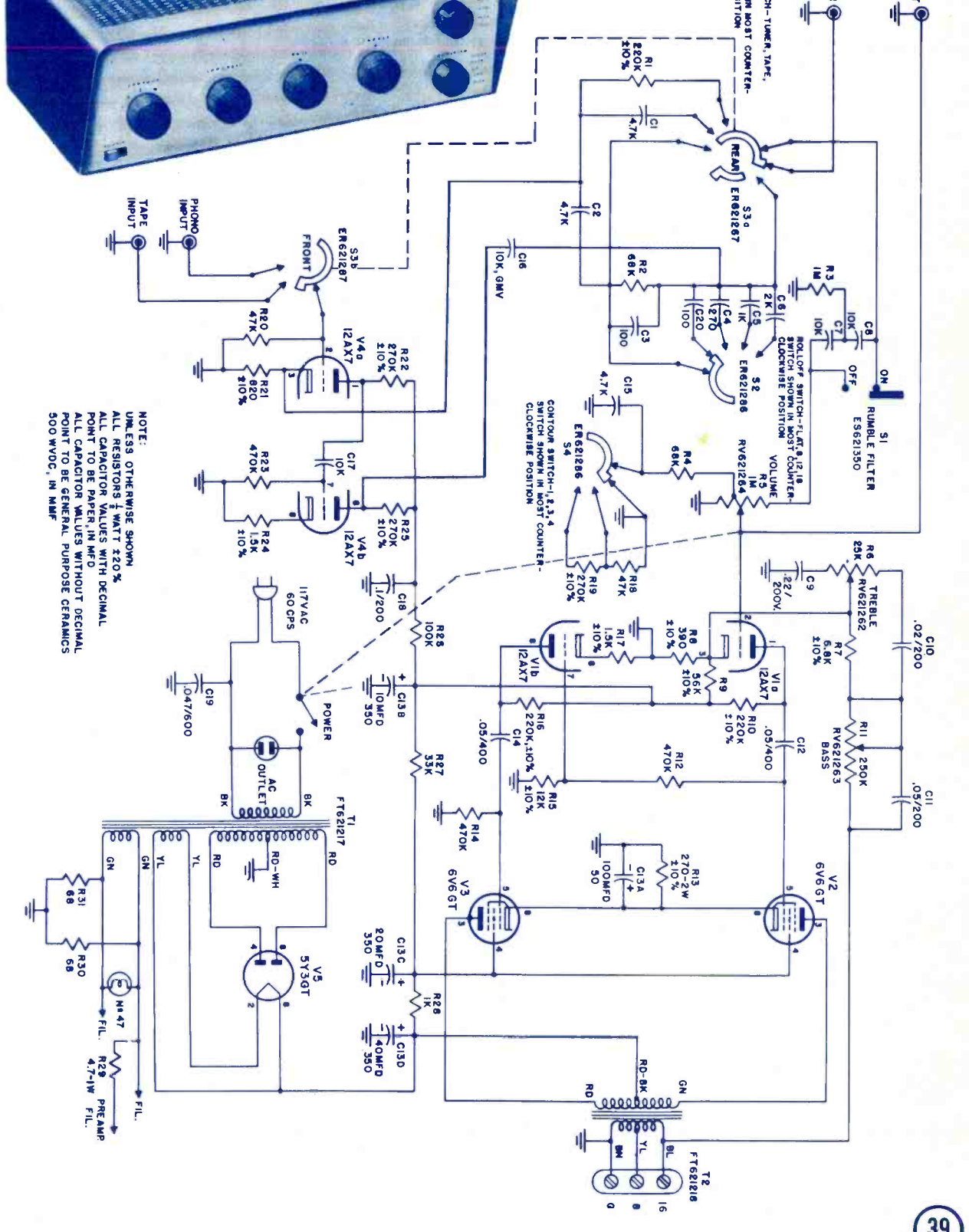
UNLESS OTHERWISE NOTED—
CAPACITORS MORE THAN 1=MMF
CAPACITORS LESS THAN 1=MF
RESISTORS ARE 1/2 WATT
K=1000

ALL VOLTAGES ARE POSITIVE WITH RESPECT TO GROUND.

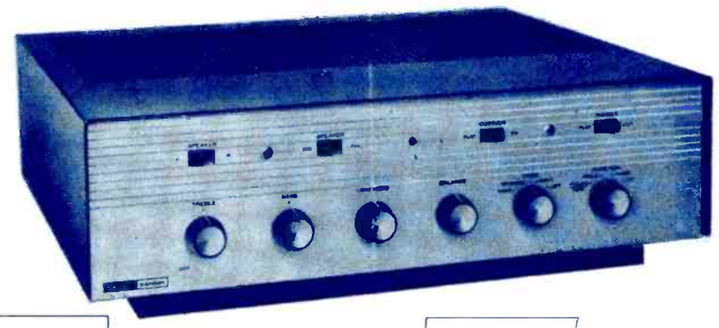
GRANCO
FM-AM-Phono Model RP-1000



HARMAN-KARDON
Hi-Fi Amplifier & Pre-amplifier, Model PC-200



HARMAN KARDON
Stereophonic Amplifier
Model Tri-Plex, A224

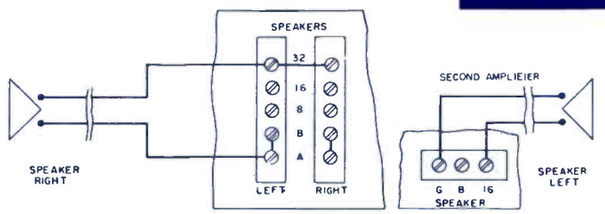


Speaker Connection For Conversion Arrangement:

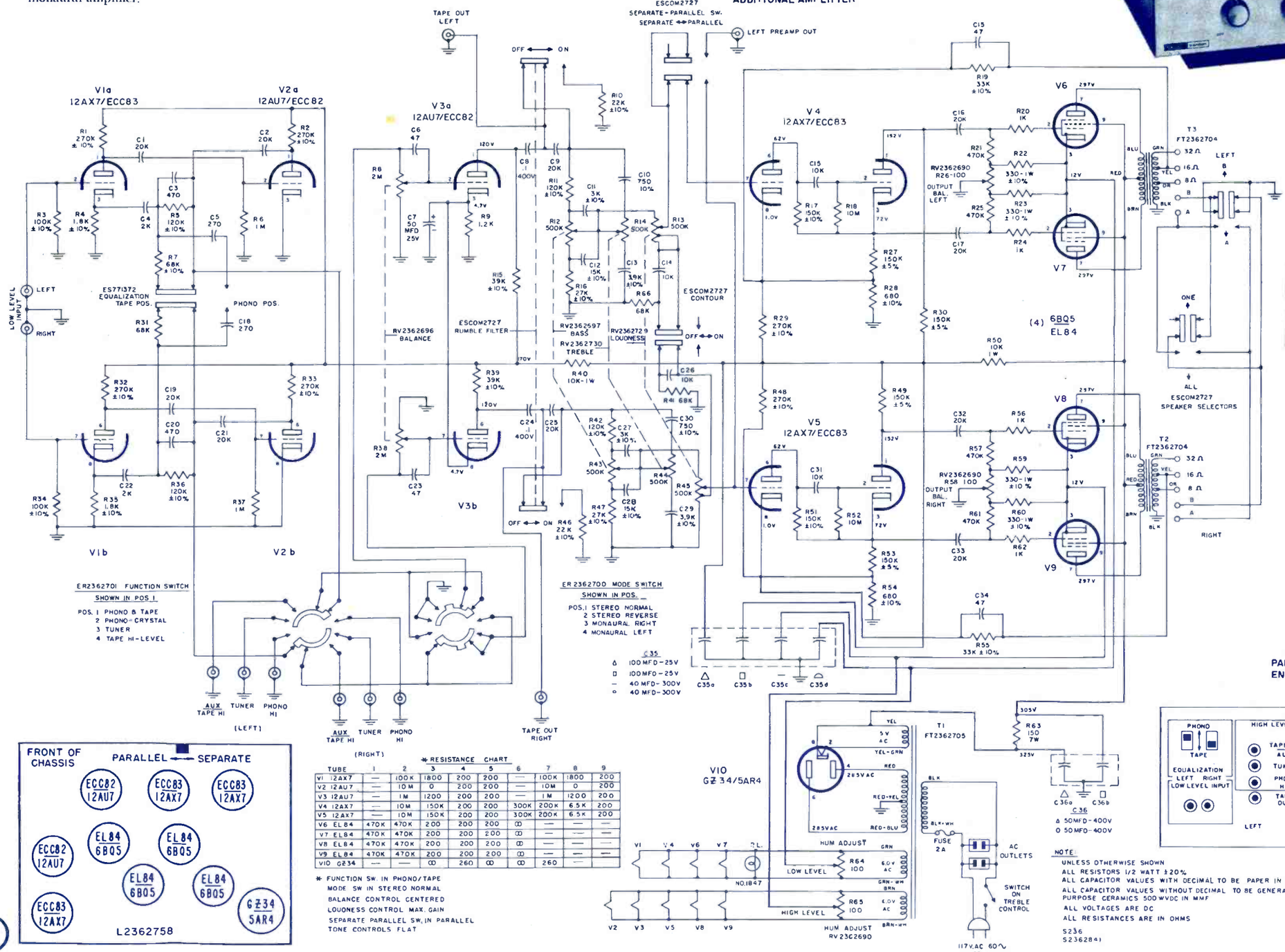
Set the POWER PARALLEL Switch located on the front chassis support apron to the left of the pilot light to the "PARALLEL" position and strap the appropriate Speaker Output terminals together. IMPORTANT: Whenever the POWER PARALLEL Switch is in the "PARALLEL" position, the Speaker Output terminals must be strapped together, and conversely whenever the Speaker Output terminals are strapped together, the POWER PARALLEL Switch must be in the "PARALLEL" position.

Connect Speaker A (refer to Diagram E) to either 32 ohm terminal on the Speaker Output strip and the other lead to either A terminal. Now tie the two, 32 ohm terminals together. The A and B terminals on both output strips have been strapped together at the factory, and should be left that way. If you are using an 8 ohm speaker, tie the two 16 ohm terminals together instead of the 32 ohm terminals as described. The SPEAKER SELECTOR Switch on the front panel may be placed in any position since it is inoperative for this method of installation.

Connect Speaker B to the "G" and 16 ohm speaker terminals on your other monaural amplifier.



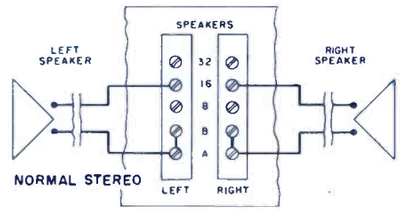
PARALLEL POWER & ADDITIONAL AMPLIFIER



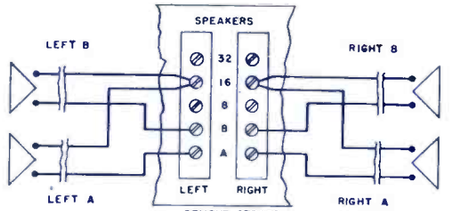
* RESISTANCE CHART

TUBE	1	2	3	4	5	6	7	8	9
V1 12AX7	—	100K	1800	200	200	—	100K	1800	200
V2 12AU7	—	10 M	0	200	200	—	10M	0	200
V3 12AU7	—	1M	1200	200	200	—	1M	1200	200
V4 12AX7	—	10M	150K	200	200	300K	200K	6.5K	200
V5 12AX7	—	10M	150K	200	200	300K	200K	6.5K	200
V6 EL84	470K	470K	200	200	200	∞	—	—	—
V7 EL84	470K	470K	200	200	200	∞	—	—	—
V8 EL84	470K	470K	200	200	200	∞	—	—	—
V9 EL84	470K	470K	200	200	200	∞	—	—	—
V10 GZ34	—	—	∞	260	∞	∞	260	—	—

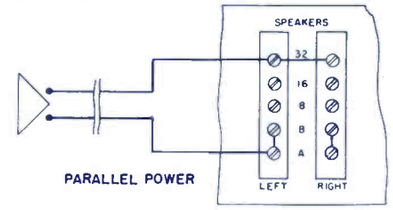
* FUNCTION SW. IN PHONO/TAPE
MODE SW IN STEREO NORMAL
BALANCE CONTROL CENTERED
LOUDNESS CONTROL MAX. GAIN
SEPARATE PARALLEL SW. IN PARALLEL
TONE CONTROLS FLAT



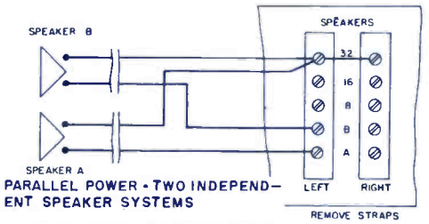
NORMAL STEREO



TWO INDEPENDENT STEREO SPEAKER SYSTEMS

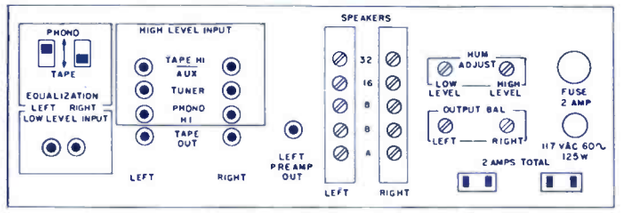


PARALLEL POWER



PARALLEL POWER - TWO INDEPENDENT SPEAKER SYSTEMS

REAR PANEL CONNECTIONS



REAR PANEL MODEL A224

NOTE
UNLESS OTHERWISE SHOWN
ALL RESISTORS 1/2 WATT ±20%
ALL CAPACITOR VALUES WITH DECIMAL TO BE PAPER IN MFD
ALL CAPACITOR VALUES WITHOUT DECIMAL TO BE GENERAL PURPOSE CERAMICS 500 WVDC IN MMF
ALL VOLTAGES ARE DC
ALL RESISTANCES ARE IN OHMS

S236
S236284

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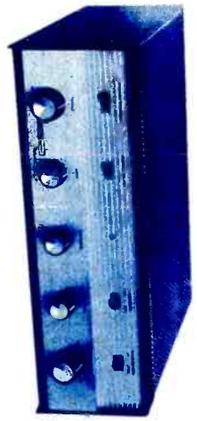
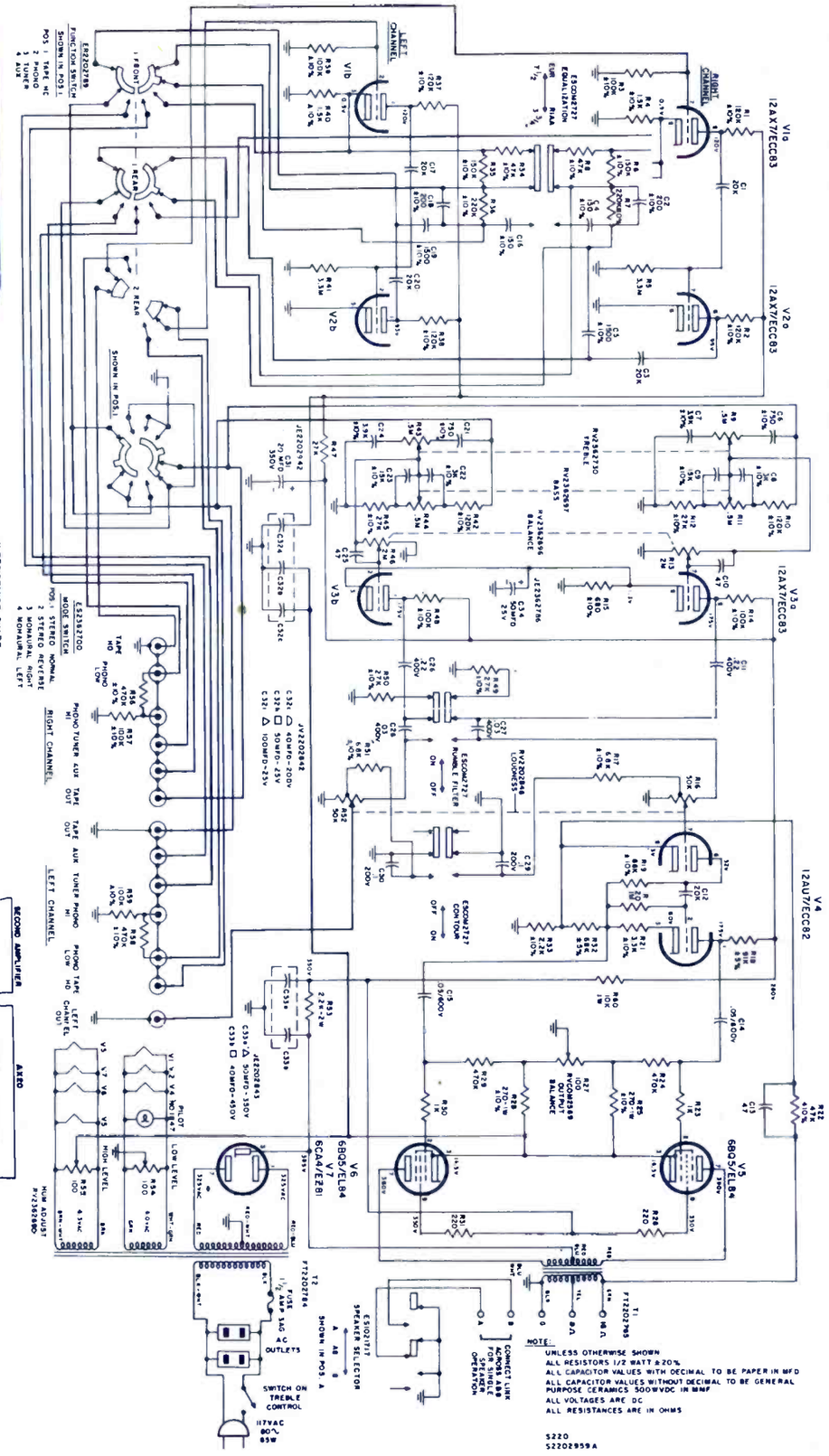
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

HARMAN KARDON
Stereophonic Conversion
20-Watt Amplifier
Model AX20





TUBE	1	2	3	4	5	6	7	8	9
V1 ECC83	—	100K	1.5K	25	25	—	100	1.5K	25
V2 ECC83	—	3.3M	0	25	25	—	33	33M	0
V3 ECC83	—	1M	73K	25	185	13.8K	50	2.2K	25
V4 ECC82	—	471K	185	185	185	—	—	—	—
V5 EL84	—	185	185	185	185	—	100	—	—
V6 EL84	—	185	185	185	185	—	—	—	—
V7 EZ81	100	—	185	185	—	—	—	—	—

* FUNCTION SWITCH IN PHONO.
MODE SWITCH IN STEREO NORMAL.
BALANCE CONTROL CENTERED.

* RESISTANCE CHART

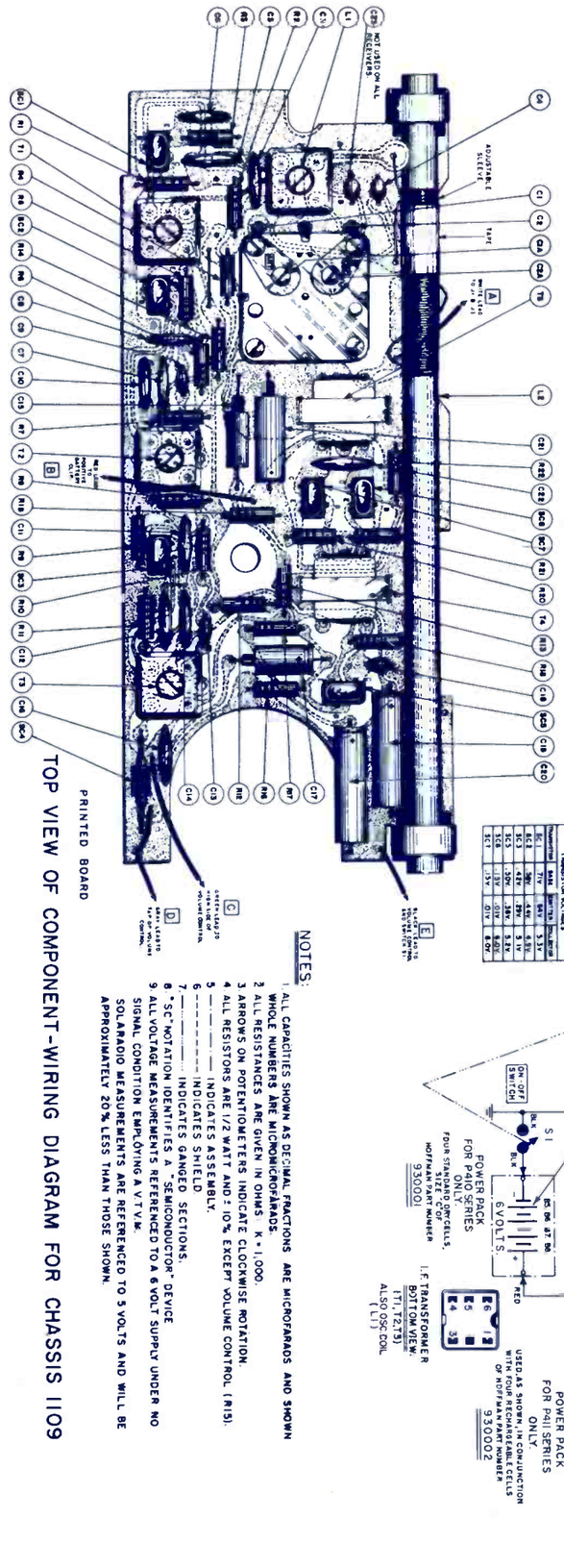
FUNCTION SWITCH SHOWN IN POS. 1
POS. 1 PHONO
2 TUNER
3 AUX
SHOWN IN POS. 1
POS. 1 STEREO NORMAL
2 STEREO REVERSE
3 MONAURAL RIGHT
4 MONAURAL LEFT

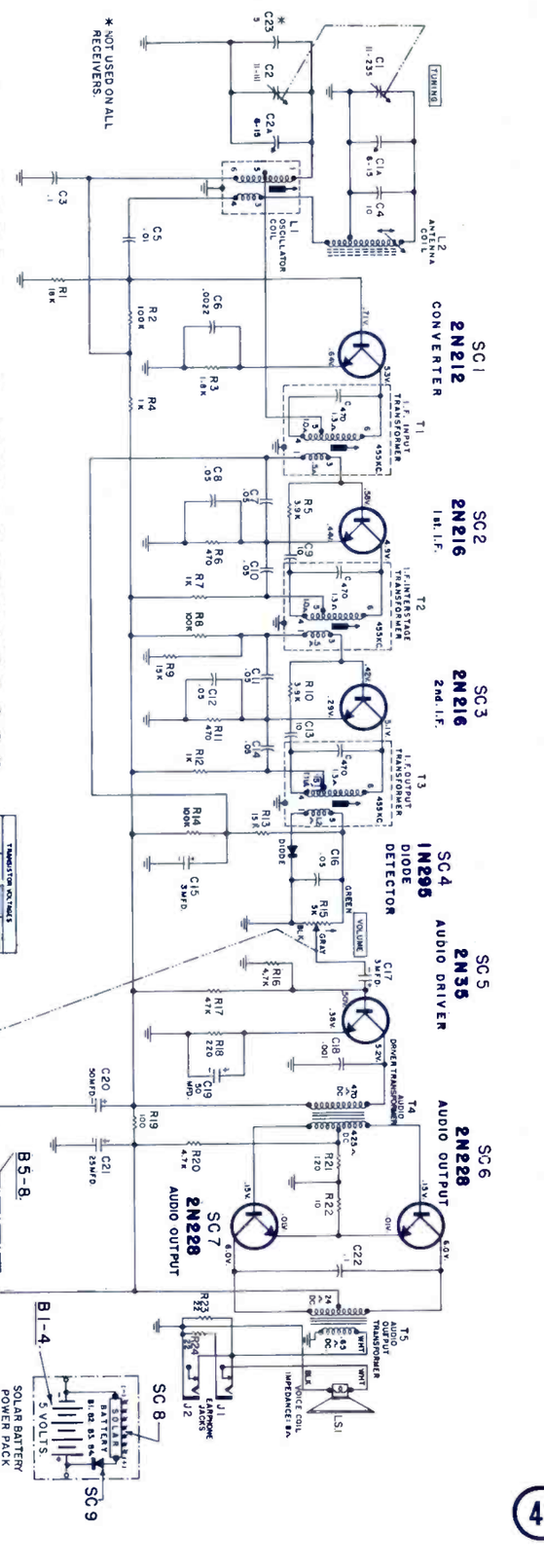
NOTE
UNLESS OTHERWISE SHOWN
ALL RESISTORS 1/2 WATT ±20%
ALL CAPACITOR VALUES WITH DECIMAL TO BE PAPER IN MFD
ALL CAPACITOR VALUES WITHOUT DECIMAL TO BE GENERAL PURPOSE CERAMICS 500WVDC IN MMF
ALL VOLTAGES ARE DC
ALL RESISTANCES ARE IN OHMS

S220
S2202959A

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

HOFFMAN
Transistor &
Solaradio P410 & P411





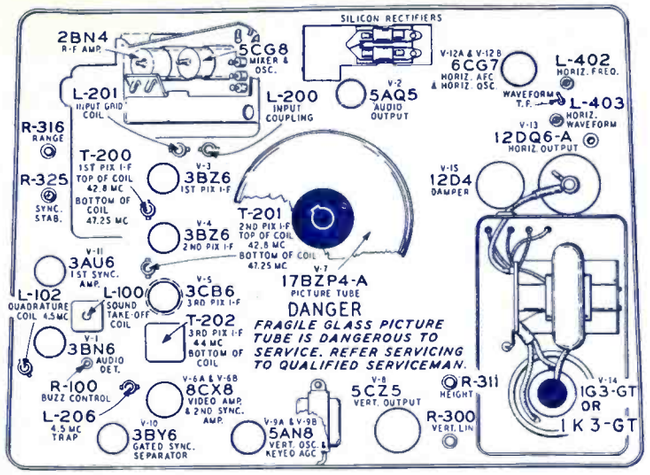
TOP VIEW OF COMPONENT-WIRING DIAGRAM FOR CHASSIS 1109

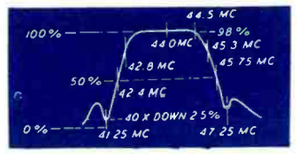
NOTES:
1. ALL CAPACITIES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN WHOLE NUMBERS ARE MICROMICROFARADS.
2. ALL RESISTANCES ARE GIVEN IN OHMS K = 1,000.
3. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
4. ALL RESISTORS ARE 1/2 WATT AND ± 10% EXCEPT VOLUME CONTROL (R15).
5. —·—·— INDICATES ASSEMBLY.
6. - - - - - - - INDICATES SHIELD.
7. ——·····—— INDICATES GANGED SECTIONS.
8. "SC" NOTATION IDENTIFIES A "SEMICONDUCTOR" DEVICE
9. ALL VOLTAGE MEASUREMENTS REFERENCED TO A 6 VOLT SUPPLY UNDER NO SIGNAL CONDITION EMPLOYING A V.T.V.M.

SOLARADIO MEASUREMENTS ARE REFERENCED TO 5 VOLTS AND WILL BE APPROXIMATELY 20% LESS THAN THOSE SHOWN.

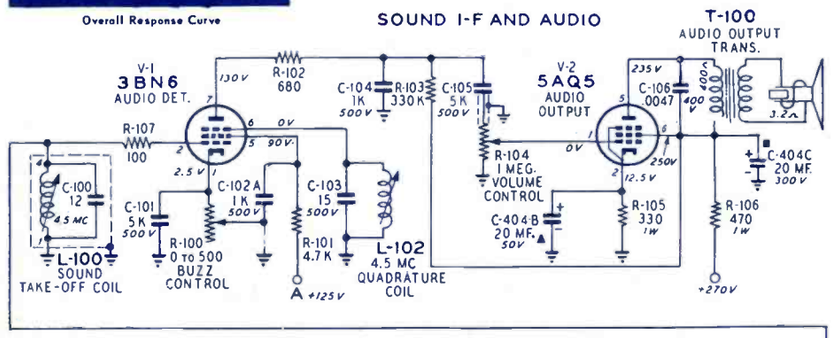
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

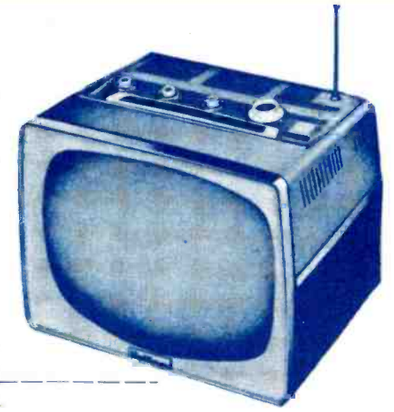
HOFFMAN
TV Chassis 338
Model Series 1707

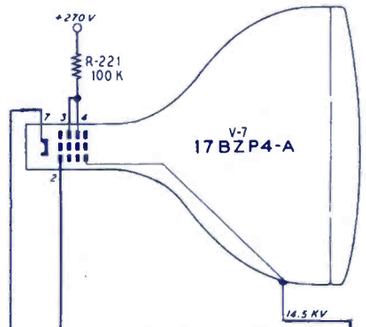


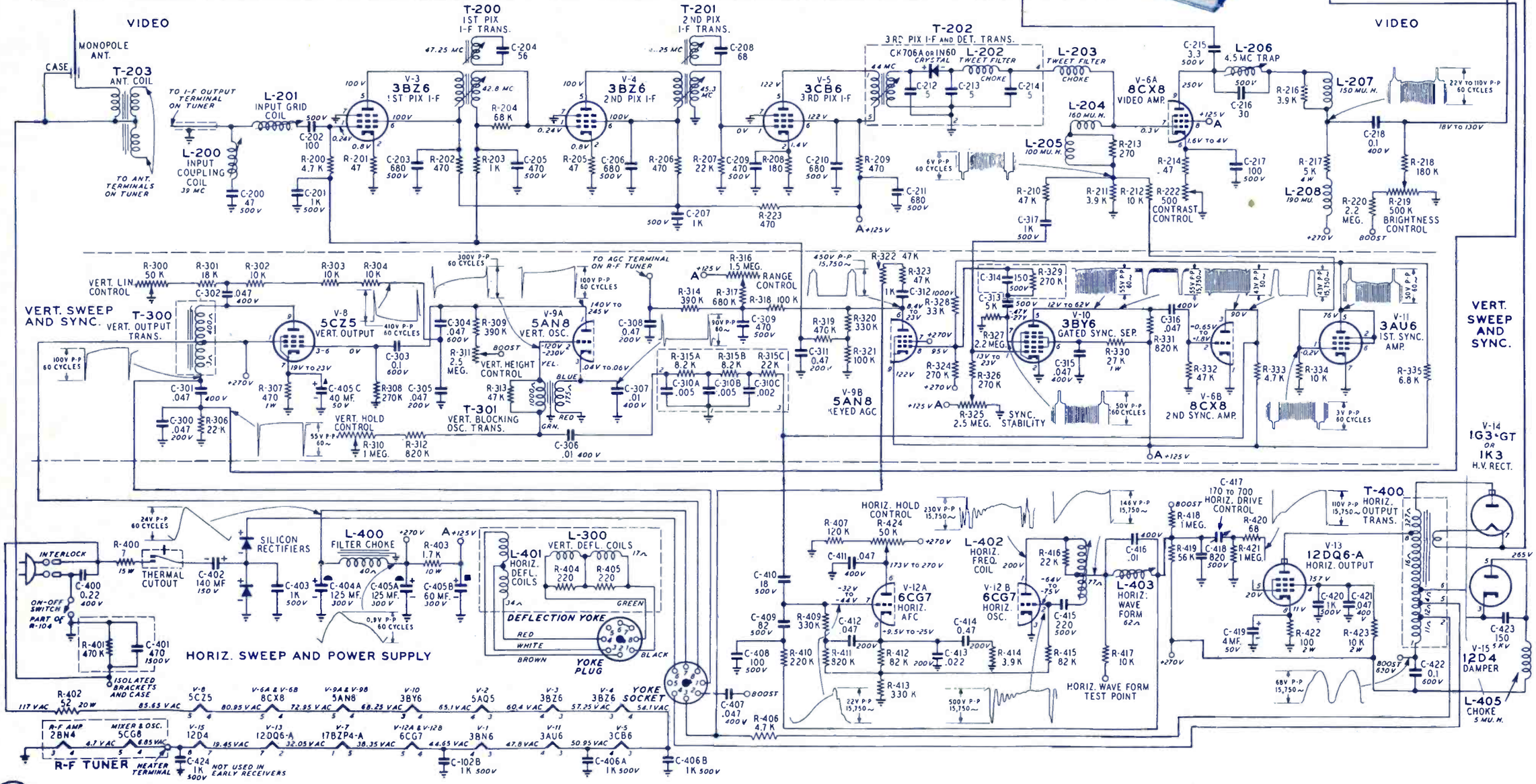


Overall Response Curve









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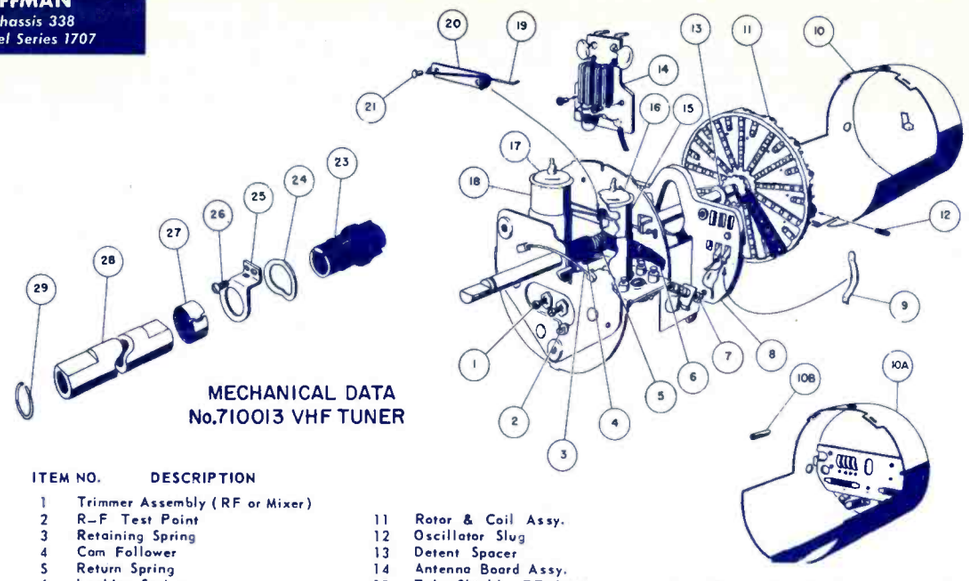
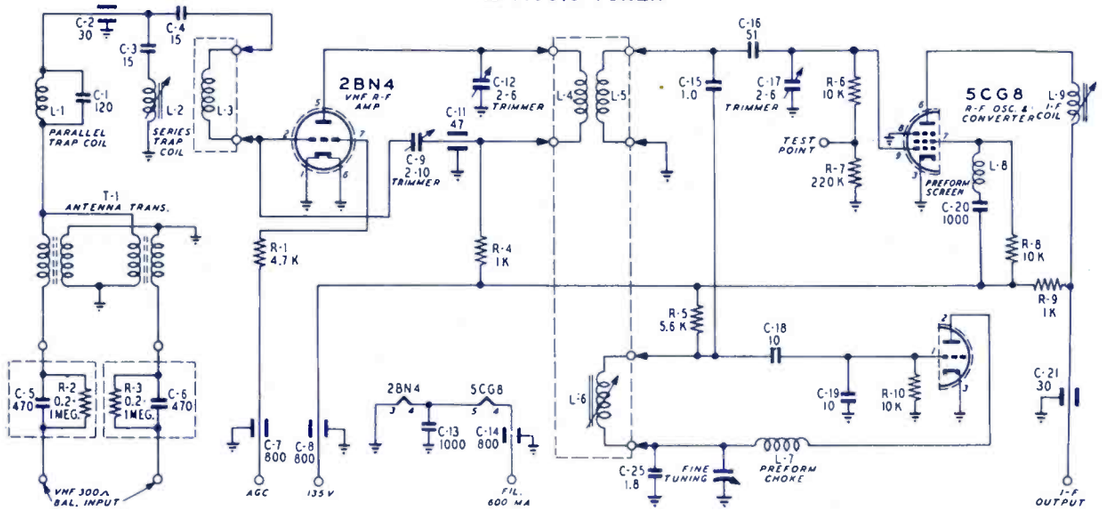


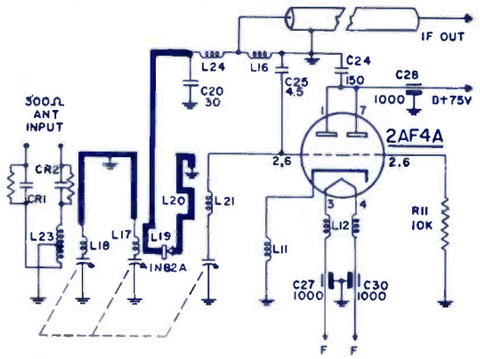
MECHANICAL DATA
No.710013 VHF TUNER

ITEM NO.	DESCRIPTION
1	Trimmer Assembly (RF or Mixer)
2	R–F Test Point
3	Retaining Spring
4	Cam Follower
5	Return Spring
6	Locking Spring
7	Neutralizing Trimmer Assy.
8	Stator Board Assy.
9	Contact Spring
10	Bottom Cover Assy.
10 A	UHF Bottom Cover
10 B	UHF Contact
11	Rotor & Coil Assy.
12	Oscillator Slug
13	Detent Spacer
14	Antenna Board Assy.
15	Tube Shield – RF Amp.
16	2N4 RF Amp.
17	5CG8 Osc – Mixer Tube
18	Tube Shield – 5CG8
19	Detent Spring
20	Detent Locator Assy.
21	Rivet
23	Cam – Fine Tuning
24	Washer
25	Fine Tuning Bracket
26	Screw – Fine Tuner Bracket
27	Shaft Retainer
28	Shaft – Fine Tuning
29	Retaining Ring

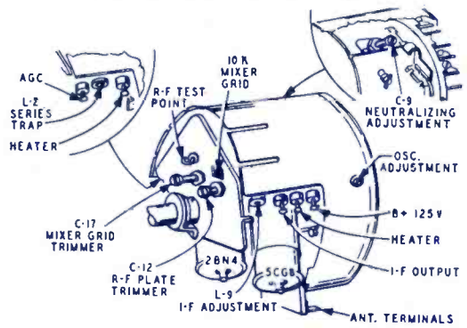
No. 710013 TUNER



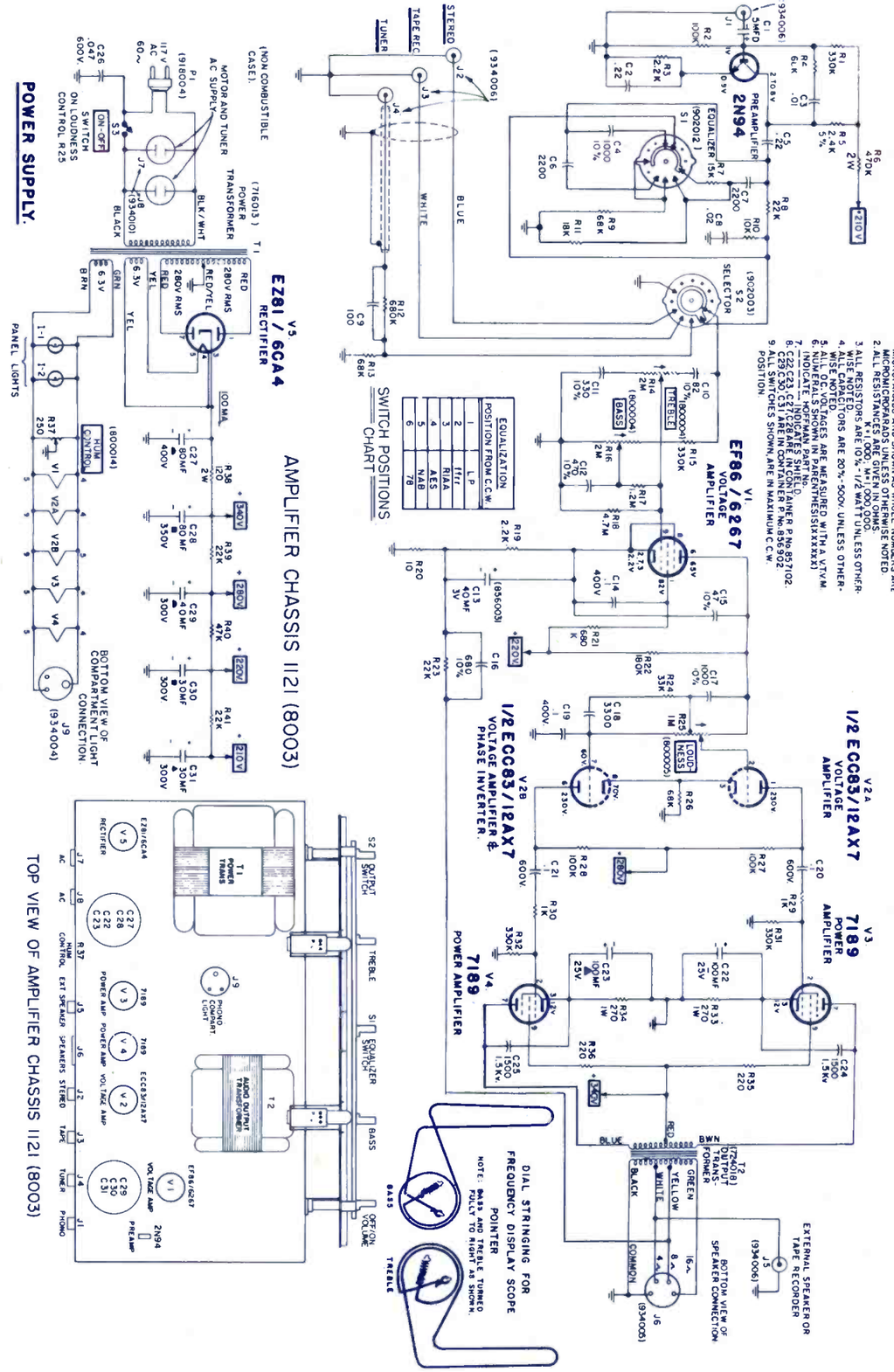
No. 712008 UHF PIGGY-BACK TUNER



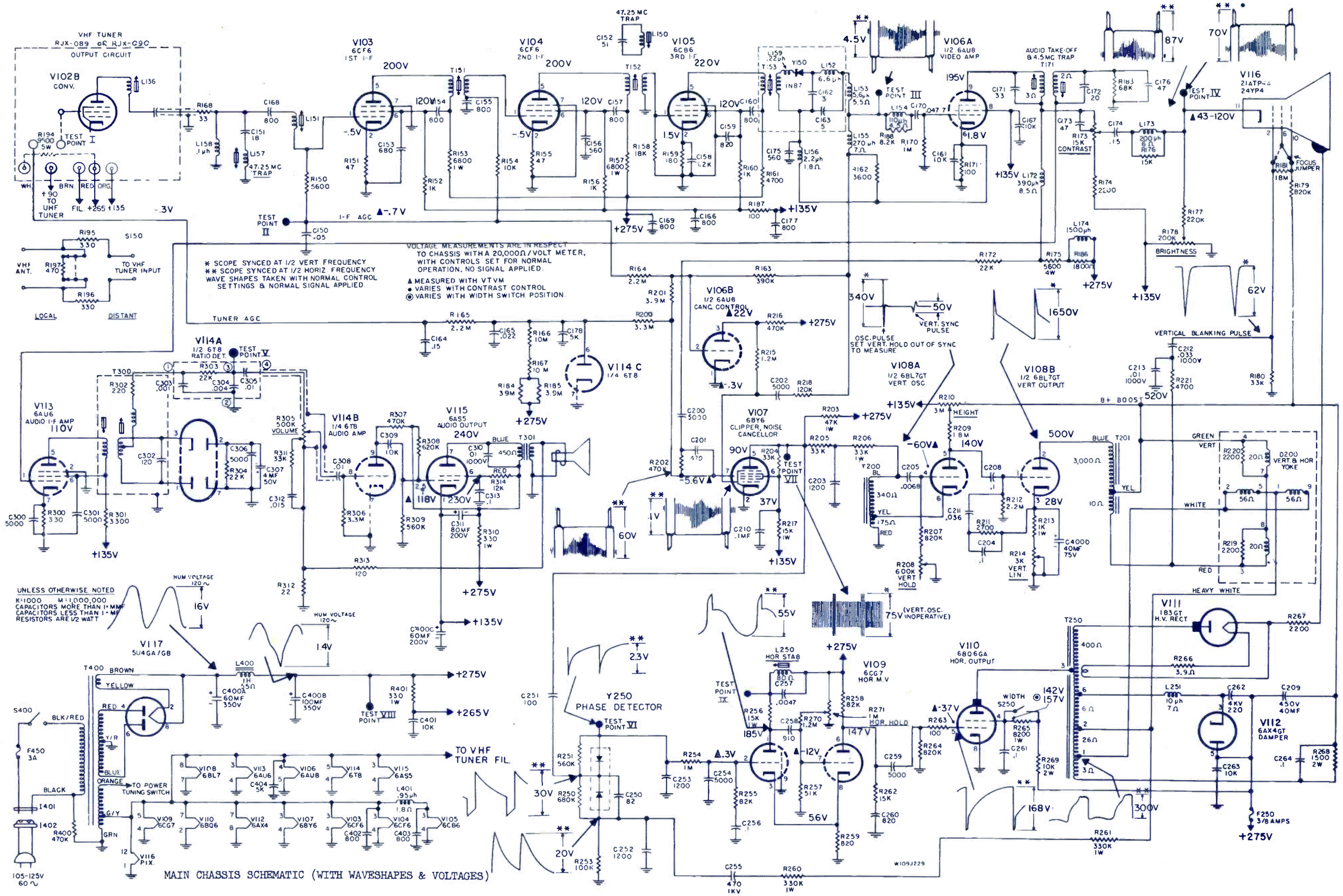
VHF TUNER ADJUSTMENT



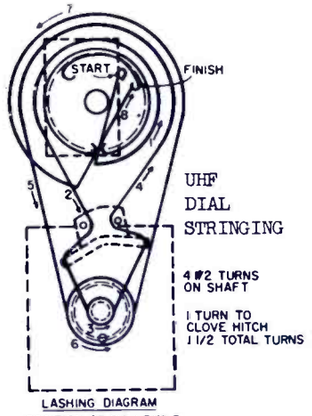
HOFFMAN
Hi Fi Amplifier
Chassis 1121

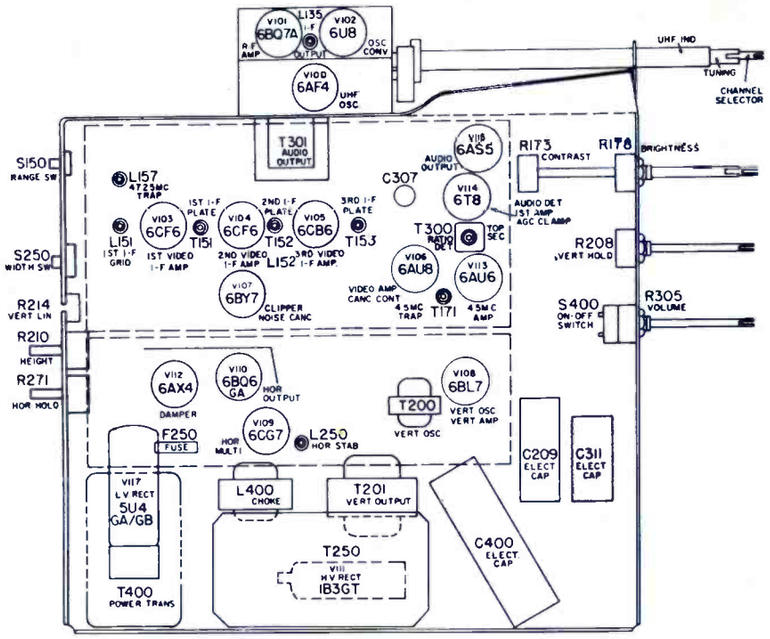


Models 21S401, 21S451, 21S452, 21S501, 21S502, 21S551, 21S552, 24S801, 24S802 and UHF

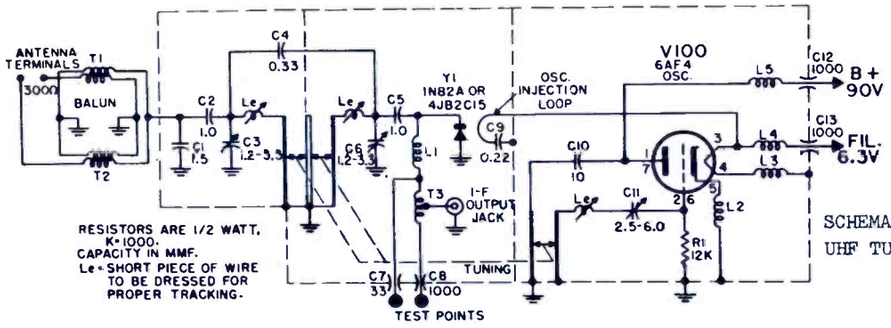


HOTPOINT
Chassis "U" series

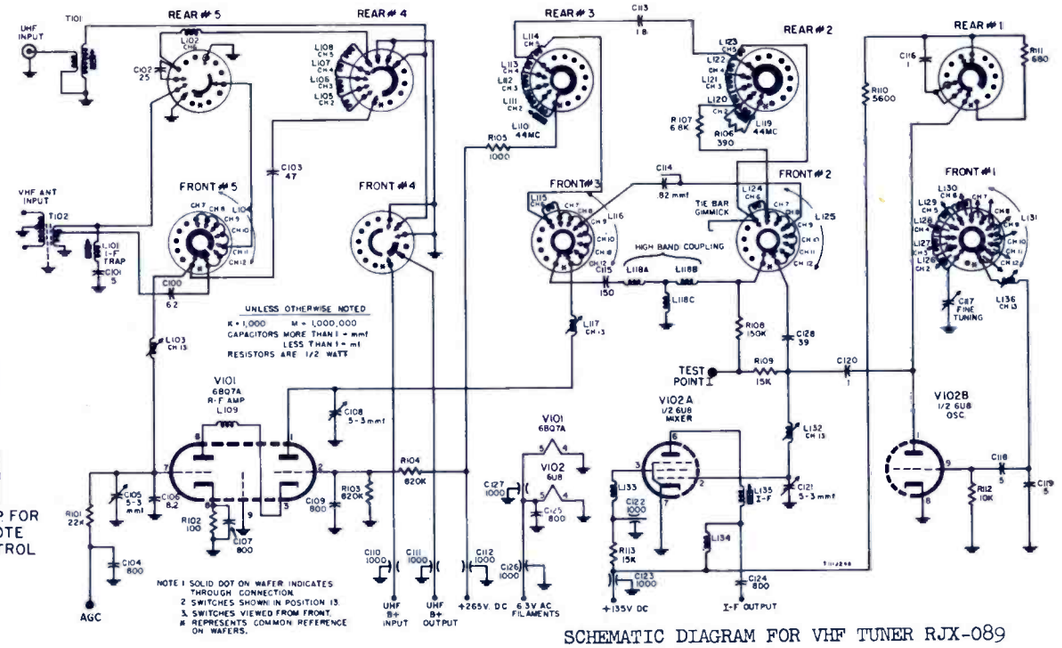




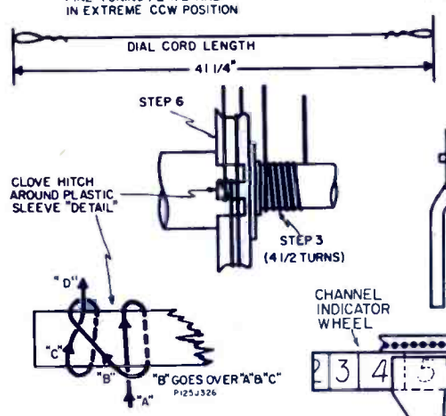
TUBE & TRIMMER LOCATION

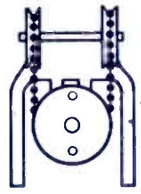


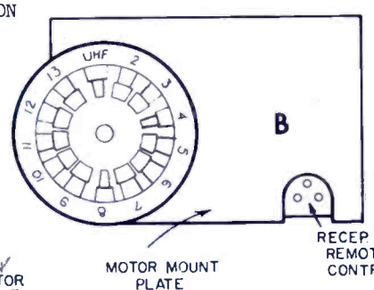
SCHEMATIC DIAGRAM FOR UHF TUNER RUX-017

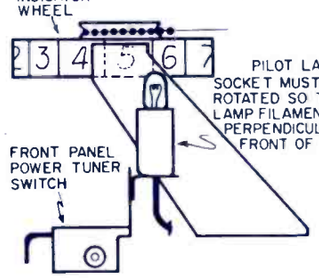


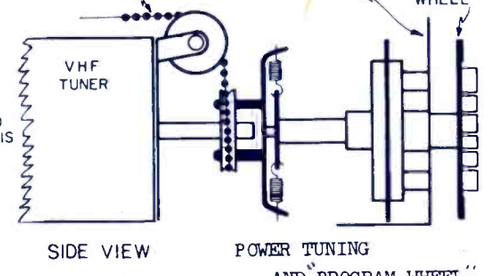
SCHEMATIC DIAGRAM FOR VHF TUNER RJX-089

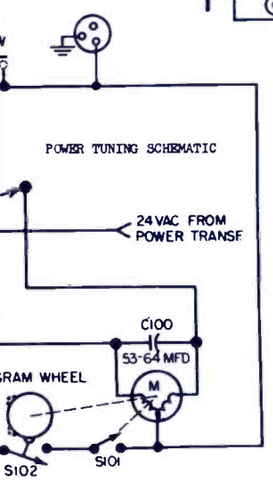


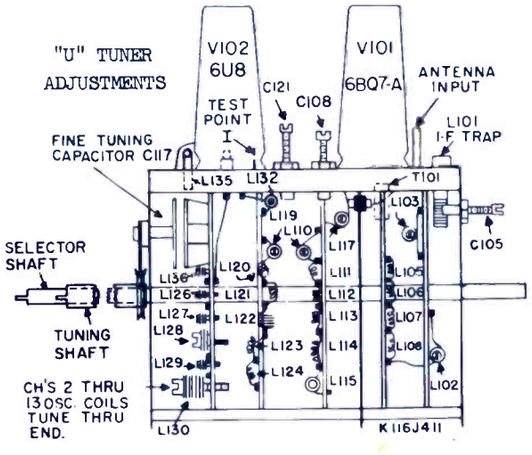


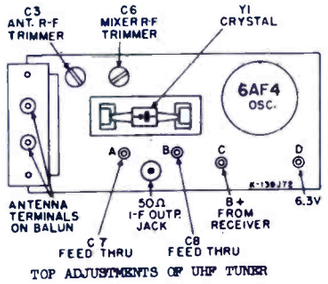




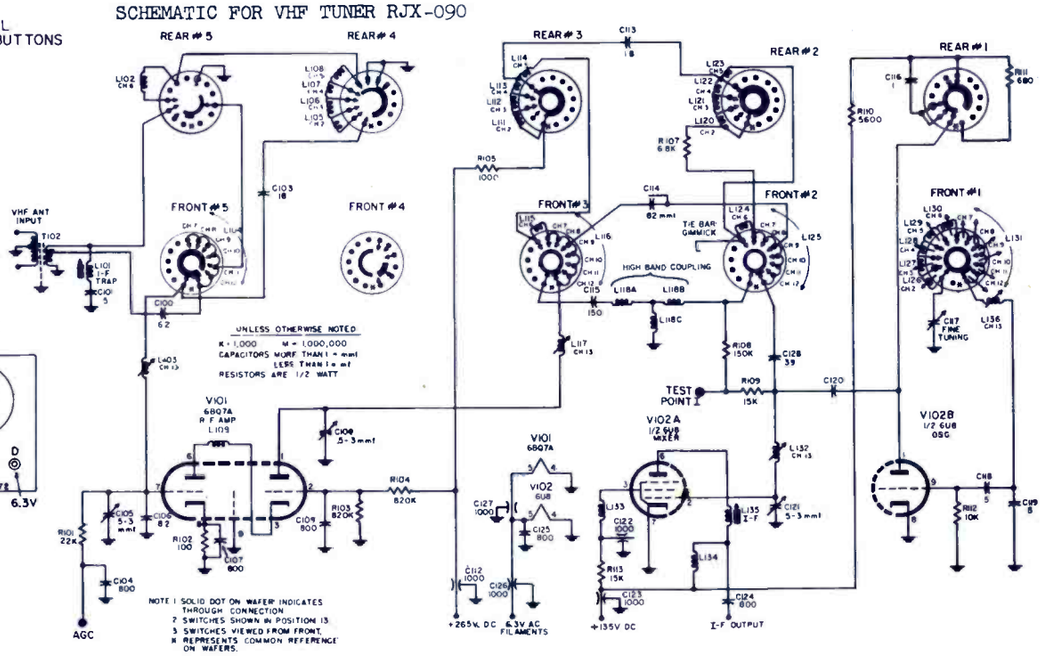








SCHEMATIC FOR VHF TUNER RJX-090



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Models 17S305, 17S306, 21S405, 21S505 and UHF

RJX-101 OR RJX-107 VHF
RJX-106 OR RJX-108 VHF-UHF

V102 CONV.
V103 3AU6 1ST I-F
V104 3AU6 2ND I-F
V105 3CB6 3RD I-F
V106A 1/2 8CX8 VIDEO AMP
V106B 1/2 8CX8 CLIPPER
V107 6CM7 VERT. MV — VERT. OUTPUT
V108A 1/2 5T8 RATIO DET.
V108B V4 5T8 AUDIO AMP
V108C 1/4 5T8 AGC CLAMP
V109 12C5 AUDIO OUT
V110 6CG7 VERT. BLANKING
V110A 1/2 6CG7 HORZ. M.V.
V110B 1/2 6CG7 HOR. M.V.
V111 12D06 HOR. OUTPUT
V112 1X2A H.V. RECT.
V113 12AX4 DAMPER
V114 3AU6 AUDIO I-F AMP
V115 PICTURE TUBE 17BRP4

VIDEO DETECTOR ASSEMBLY T153
AUDIO TAKE-OFF 8.4.5 MC TRAP T154
TO GRID V114 PIN 1
B+ TO UHF (THRU 8.8K 5W DROPPING RES.)
TO VHF TUNER INPUT
TO UHF TUNER INPUT
CABINET
FIL. FROM L403
+135V
+255V
+250V
+135V
I-F AGC
TUNER AGC ▲ -.65V
TEST POINT I
TEST POINT II
TEST POINT III
TEST POINT IV
TEST POINT V
TEST POINT VI
TEST POINT VII
TEST POINT VIII
TEST POINT IX
B+ BOOST 500V
CONTRAST
BRIGHTNESS
HEIGHT
VERT. HOLD
VERT. LIN.
HOR. HOLD CONTR.
HOR. STAB.
FOCUS JUMPER
DUAL UNIT
VERT. YOKE
HOR. YOKE
GERMANIUM PHASE DET.
VOLUME
FRONT CONTROL BRACKET
105-125V 60 ~

UNLESS OTHERWISE NOTED
K=1000 M=1,000,000
CAPACITORS MORE THAN 1 = MMF
CAPACITORS LESS THAN 1 = MF
RESISTORS ARE 1/2 WATT

CIRCUIT FOR GERMANIUM RECTIFIERS
CIRCUIT FOR SELENIUM RECTIFIERS
ON RJX-101 ONLY V102 IS A 5CL8

■ USED ON 17" MODELS ONLY
✝ USED ON 21" MODELS ONLY

* SCOPE SYNCED AT 1/2 VERT. FREQUENCY.
** SCOPE SYNCED AT 1/2 HORIZ FREQUENCY.
WAVE SHAPES TAKEN WITH NORMAL CONTROL SETTINGS & NORMAL SIGNAL APPLIED.

UNLESS OTHERWISE NOTED
VOLTAGE MEASUREMENTS ARE IN RESPECT TO CHASSIS WITH A 20,000 Ω/VOLT METER, WITH CONTROLS SET FOR NORMAL OPERATION, NO SIGNAL APPLIED.
ALL VOLTAGES INDICATED ON SERIES FILAMENT STRING ARE A.C.
▲ MEASURED WITH VTVM
● VARY WITH CONTROL SETTINGS

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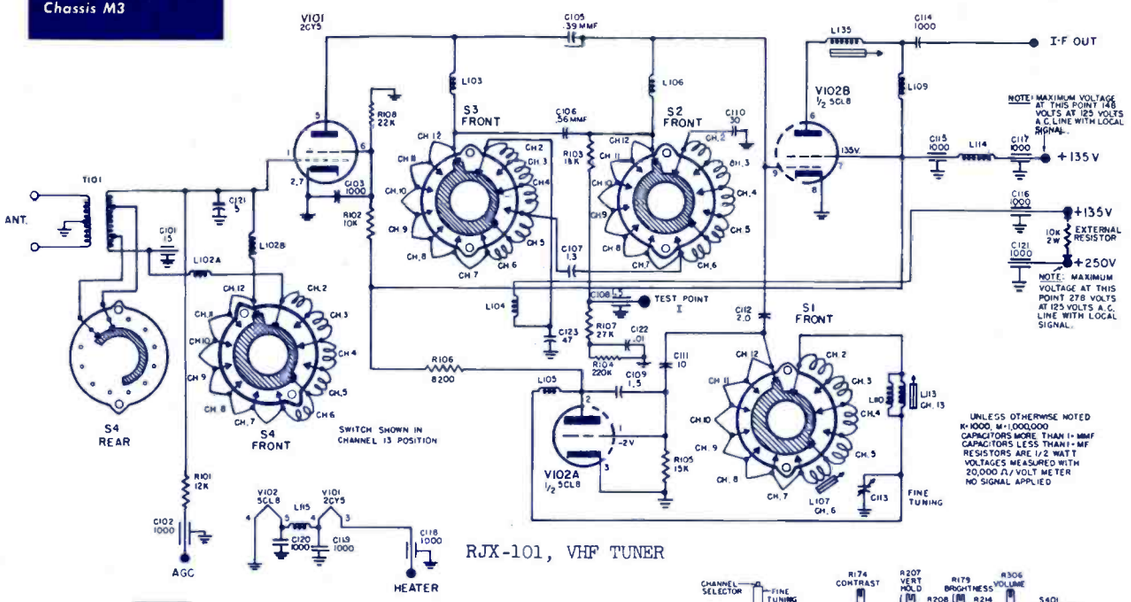
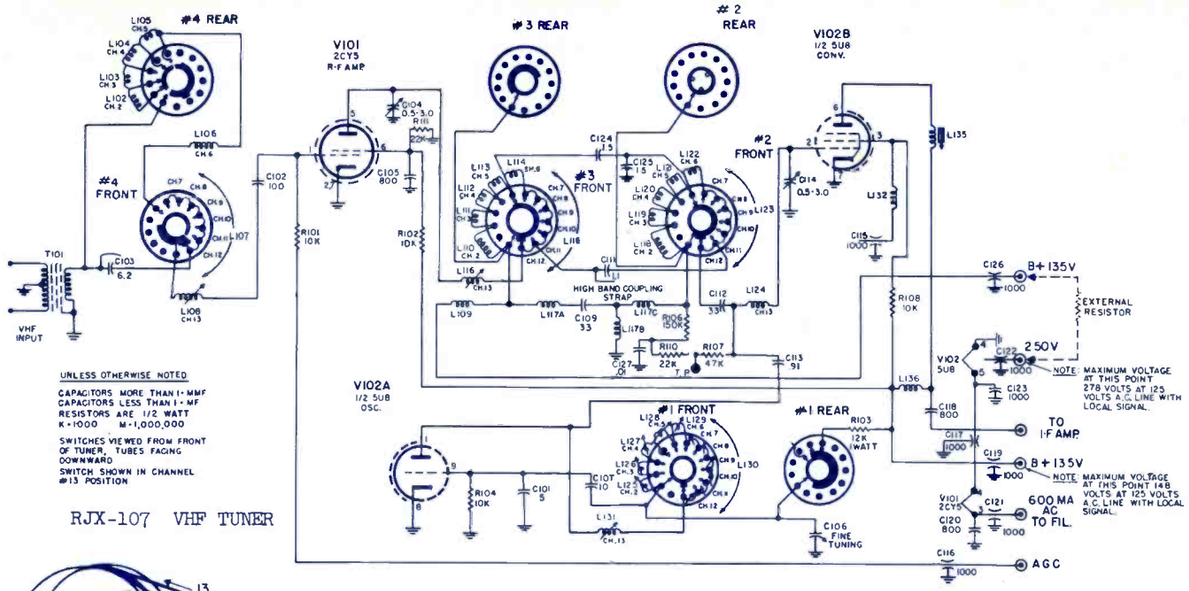
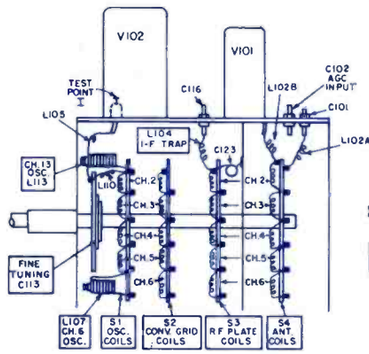
HOTPOINT
Chassis M3



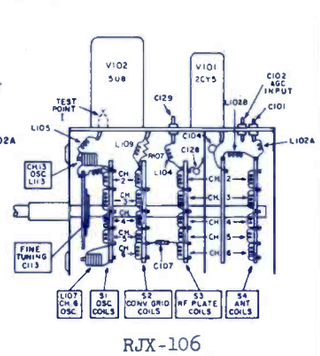
RJX-101, VHF TUNER



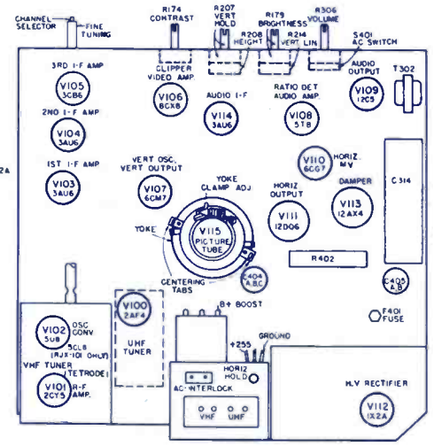
RJX-107 VHF TUNER



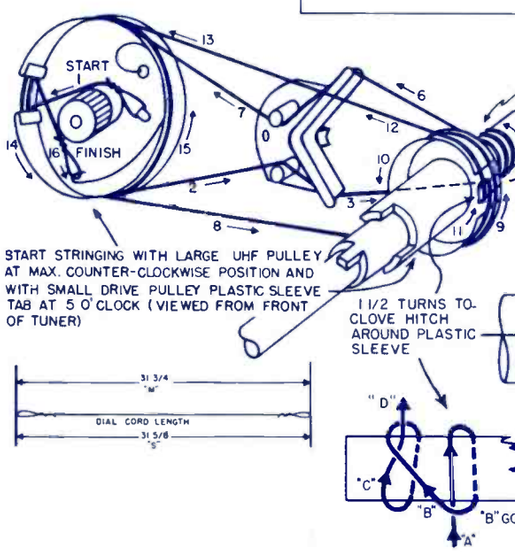
RJX-101 ADJUSTMENTS

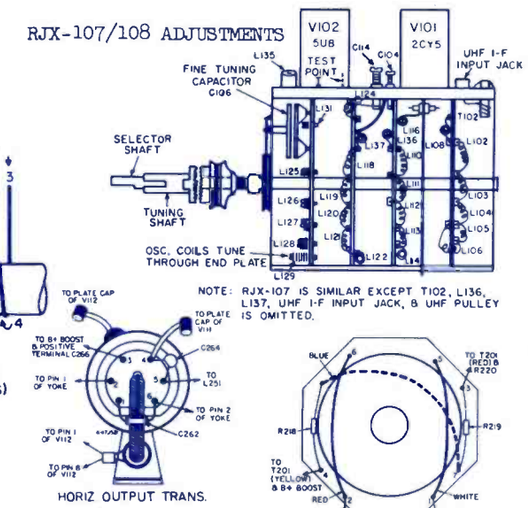


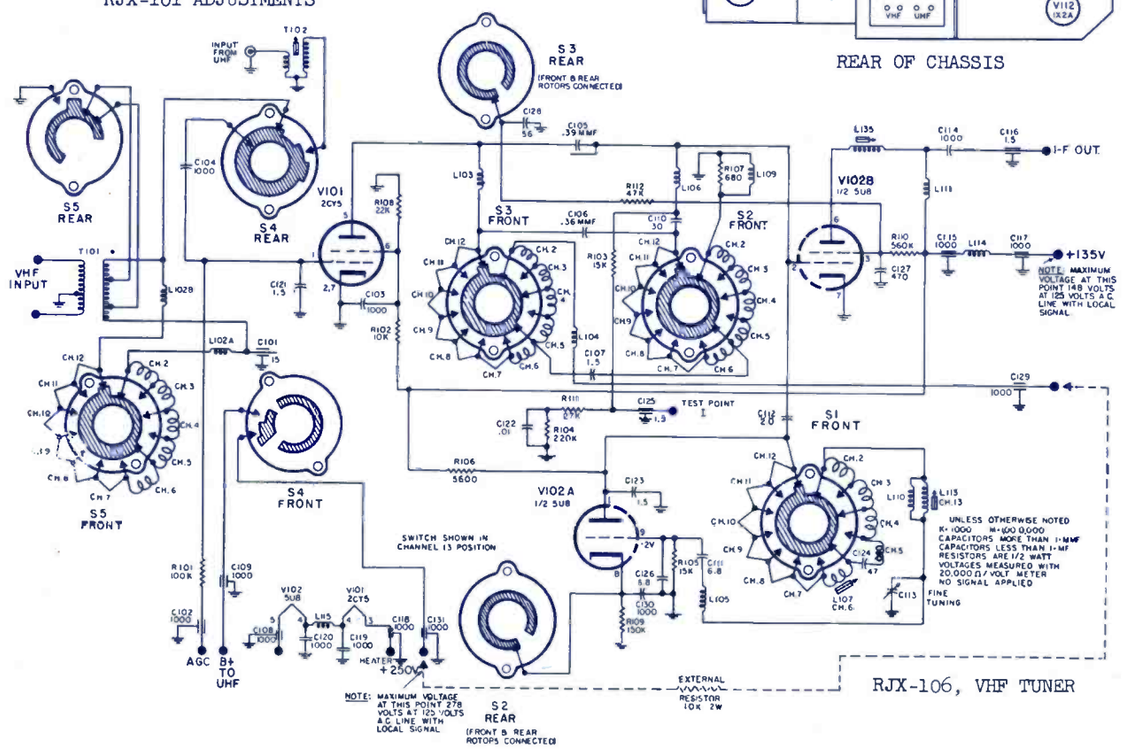
RJX-106



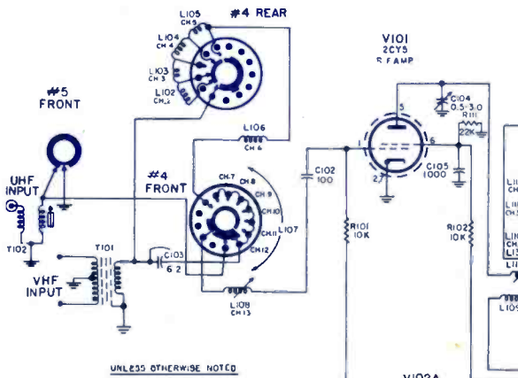
REAR OF CHASSIS



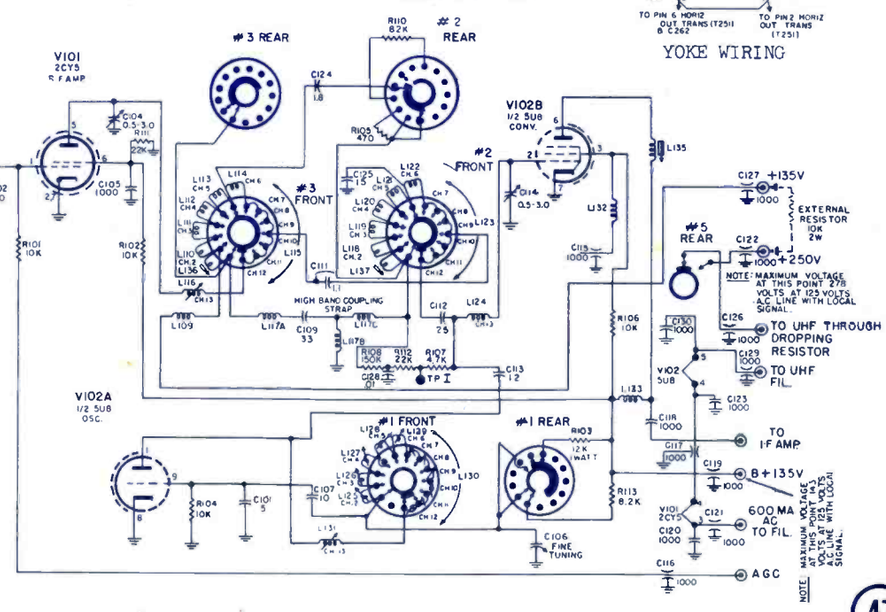




RJX-106, VHF TUNER

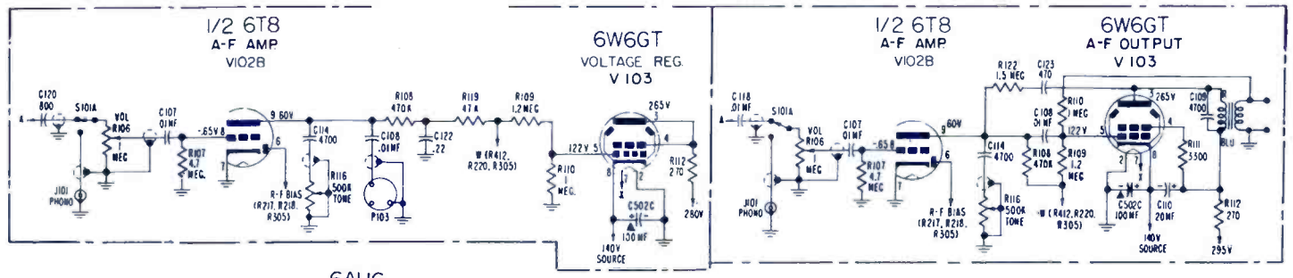


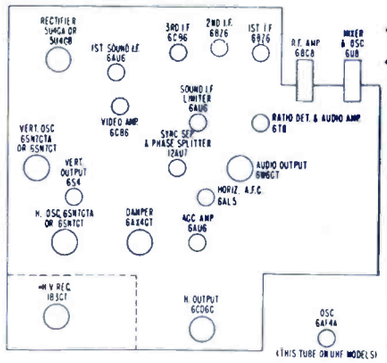
RJX-108 VHF TUNER

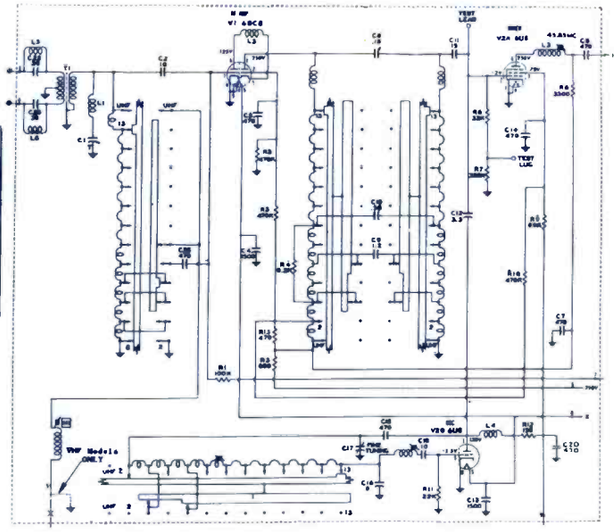


ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

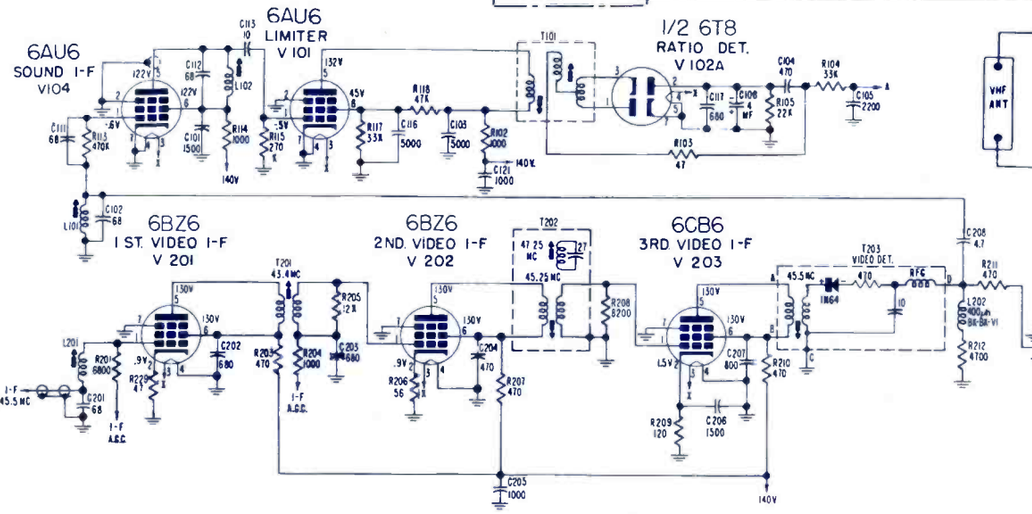
MAGNAVOX
Chassis 111/350 series

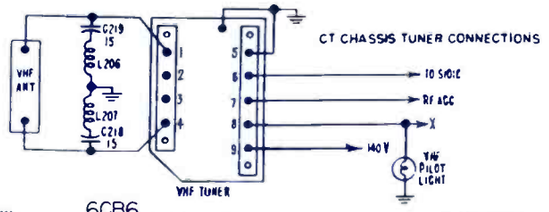




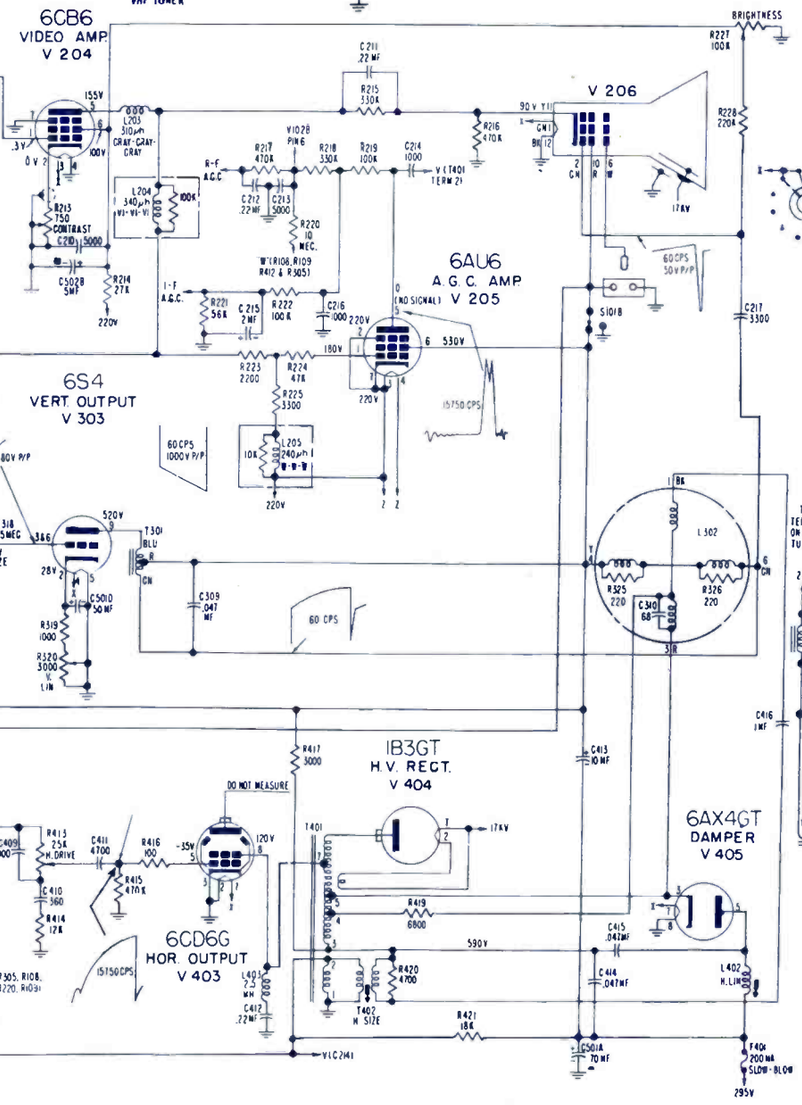


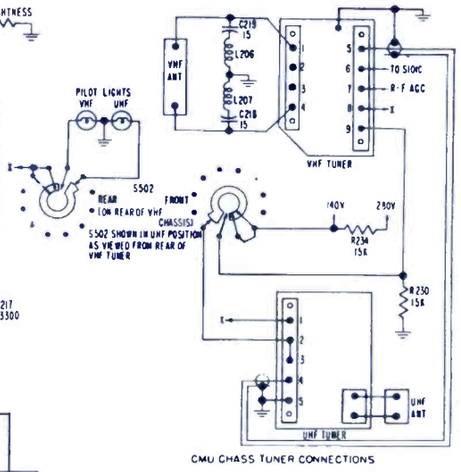
NO. 700458 VHF TUNER



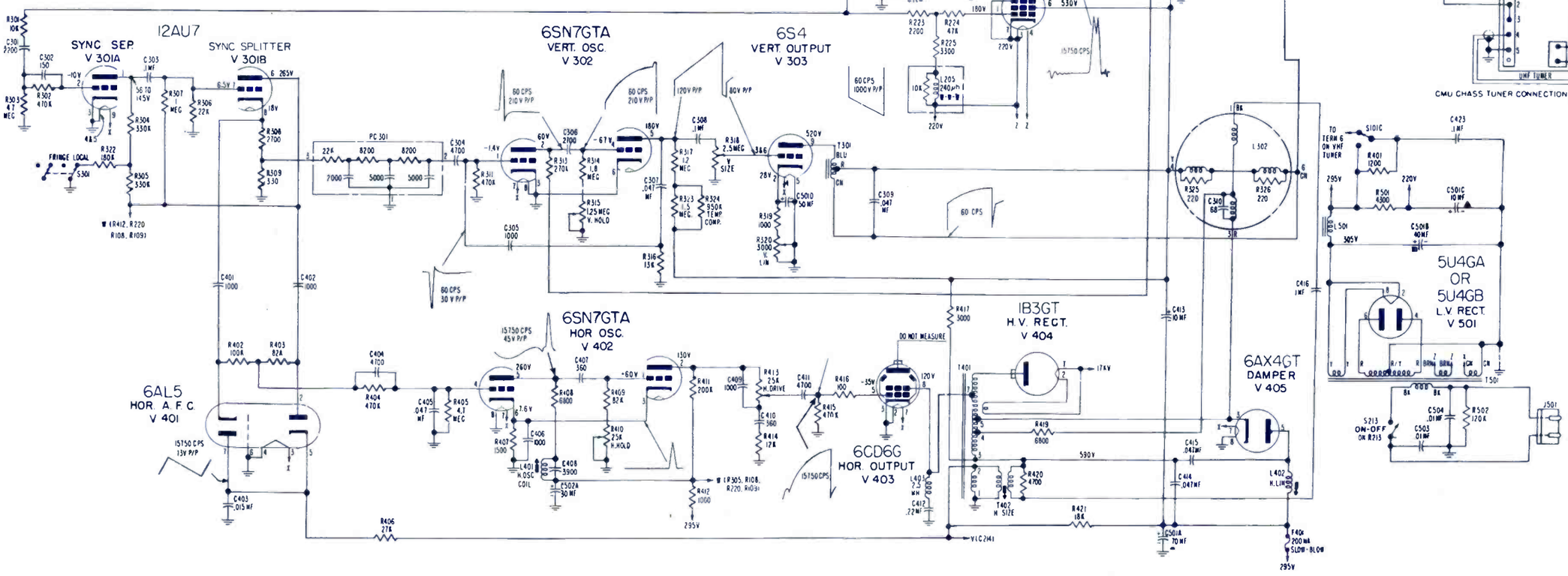


CT CHASSIS TUNER CONNECTIONS





CMU CHASS TUNER CONNECTIONS



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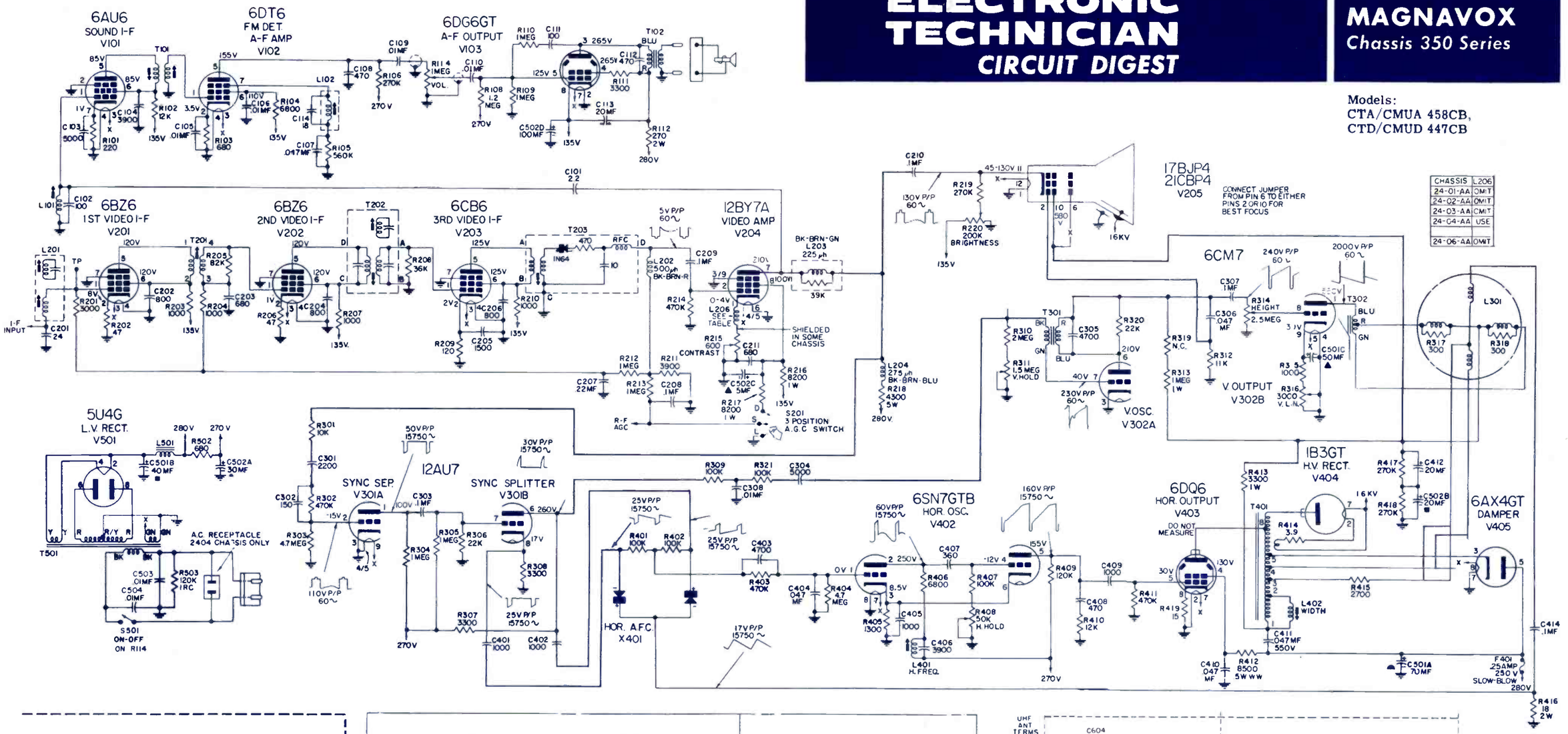
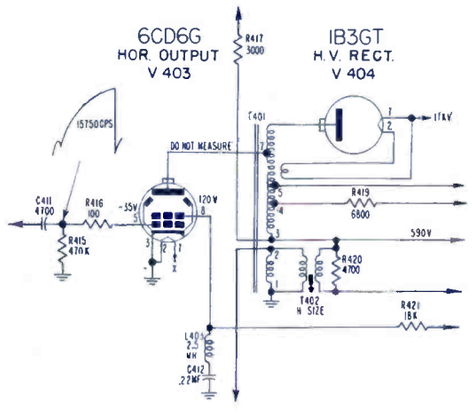
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

MAGNAVOX
Chassis 350 Series

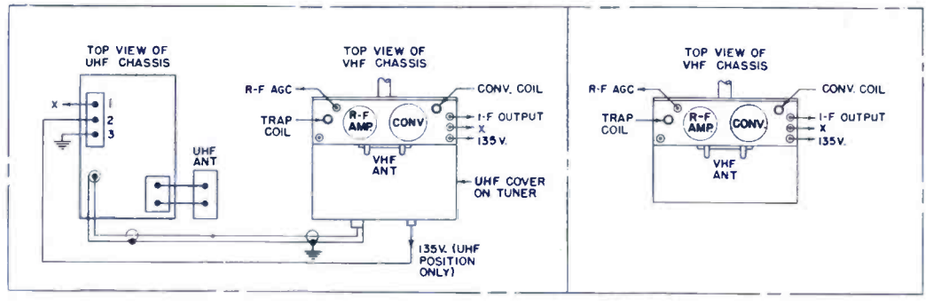
Models:
CTA/CMUA 458CB,
CTD/CMUD 447CB

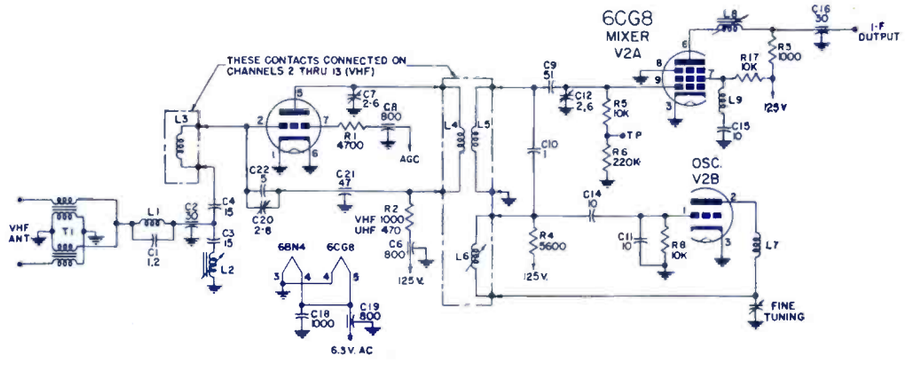


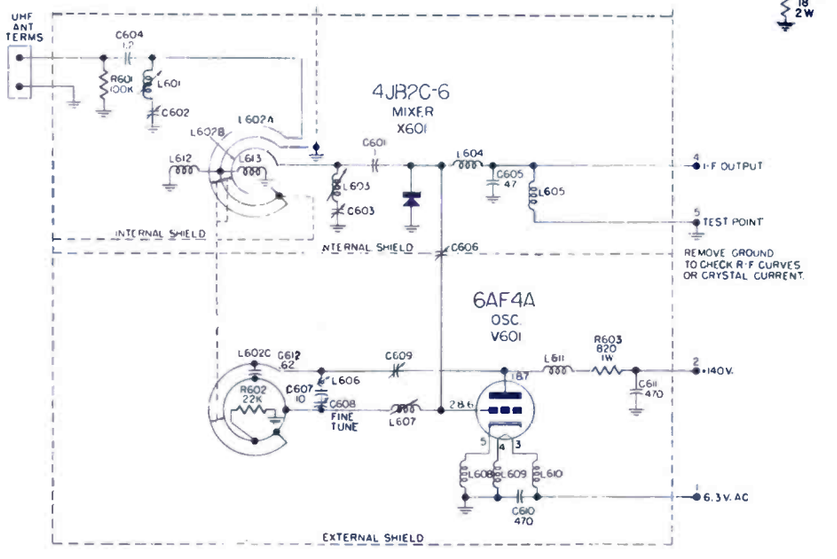


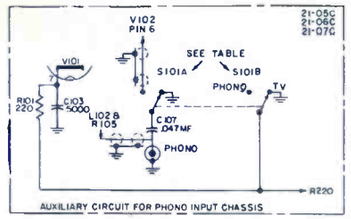
Correction:

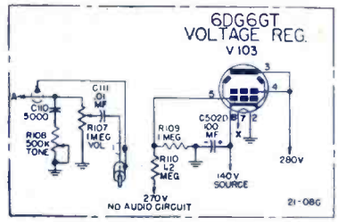
Magnavox chassis 111 / 350
Circuit Digest #352

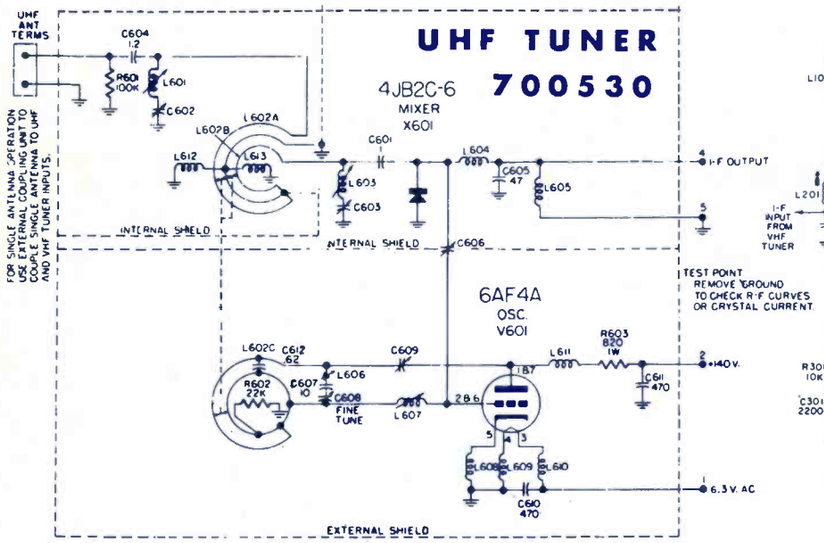


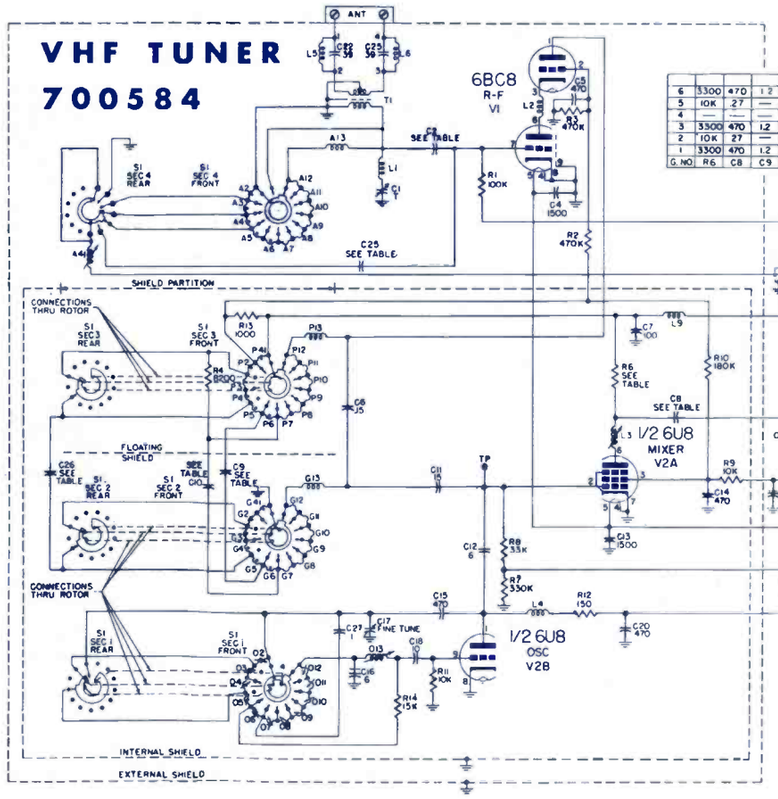




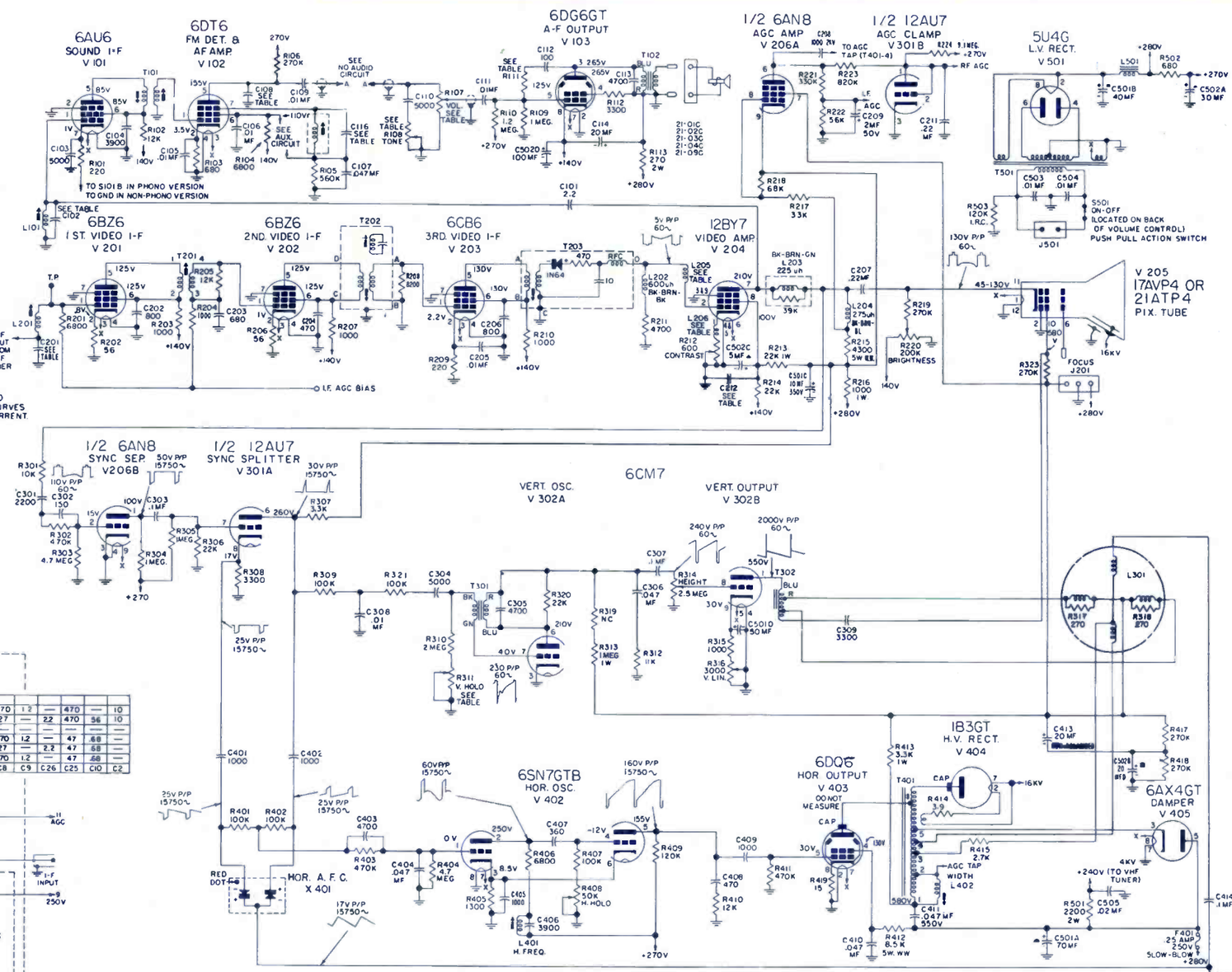


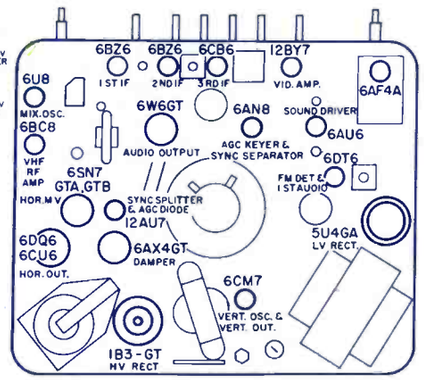


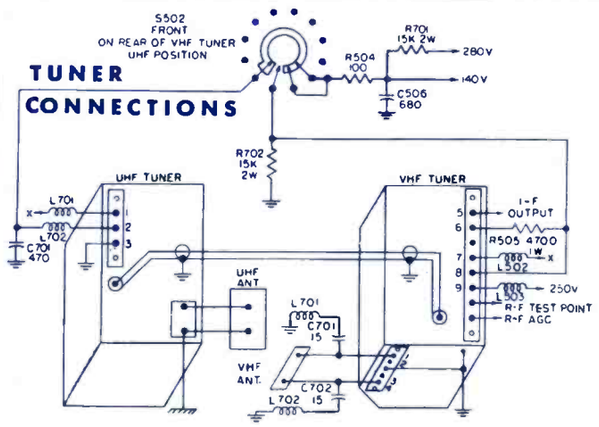




6	3300	470	12	—	470	—	10
5	10K	27	—	22	470	56	10
4	—	—	—	—	—	—	—
3	3300	470	12	—	47	68	—
2	10K	27	—	22	47	68	—
1	3300	470	12	—	47	68	—
G. NO	R6	C8	C9	C26	C25	C10	C2







ITEM	01-CB 02-CB 03-CB 04-CB 09-CB	01-DC 02-DC 03-DC 08-DC	05-CB	05-DC	06-DC 10-DC	06-CB	07-CB	07-DC	09-CB	11-DC	12-DC
C102	68	100	68	100	100	68	68	100	68	100	100
C108	470	470	470	470	470	220	220	220	470	220	470
C116	18	18	—	—	—	—	—	—	18	18	18
C201	82	82	82	—	—	82	82	—	68	—	82
C212	—	680	—	680	—	—	—	680	—	680	680
R107	1MEG	500K	1MEG	500K	500K	1MEG	1MEG	500K	1MEG	500K	500K
R108	500K	1MEG	500K	1MEG	1MEG	500K	500K	1MEG	500K	1MEG	1MEG
R111	1MEG	2.2MEG	1MEG	2.2MEG	2.2MEG	1MEG	1MEG	2.2MEG	1MEG	2.2MEG	2.2MEG
R311	1.25MEG	1.5MEG	1.25MEG	1.5MEG	1.5MEG	1.25MEG	1.25MEG	1.5MEG	1.25MEG	1.5MEG	1.5MEG
L205	—	—	—	—	6μh	6μh	6μh	6μh	—	6μh	6μh
L206	—	—	—	—	6μh	6μh	6μh	6μh	—	6μh	6μh
S101	—	—	USE	USE	USE	USE	USE	USE	—	—	—
PHONO	—	—	USE	USE	USE	USE	USE	USE	—	—	—

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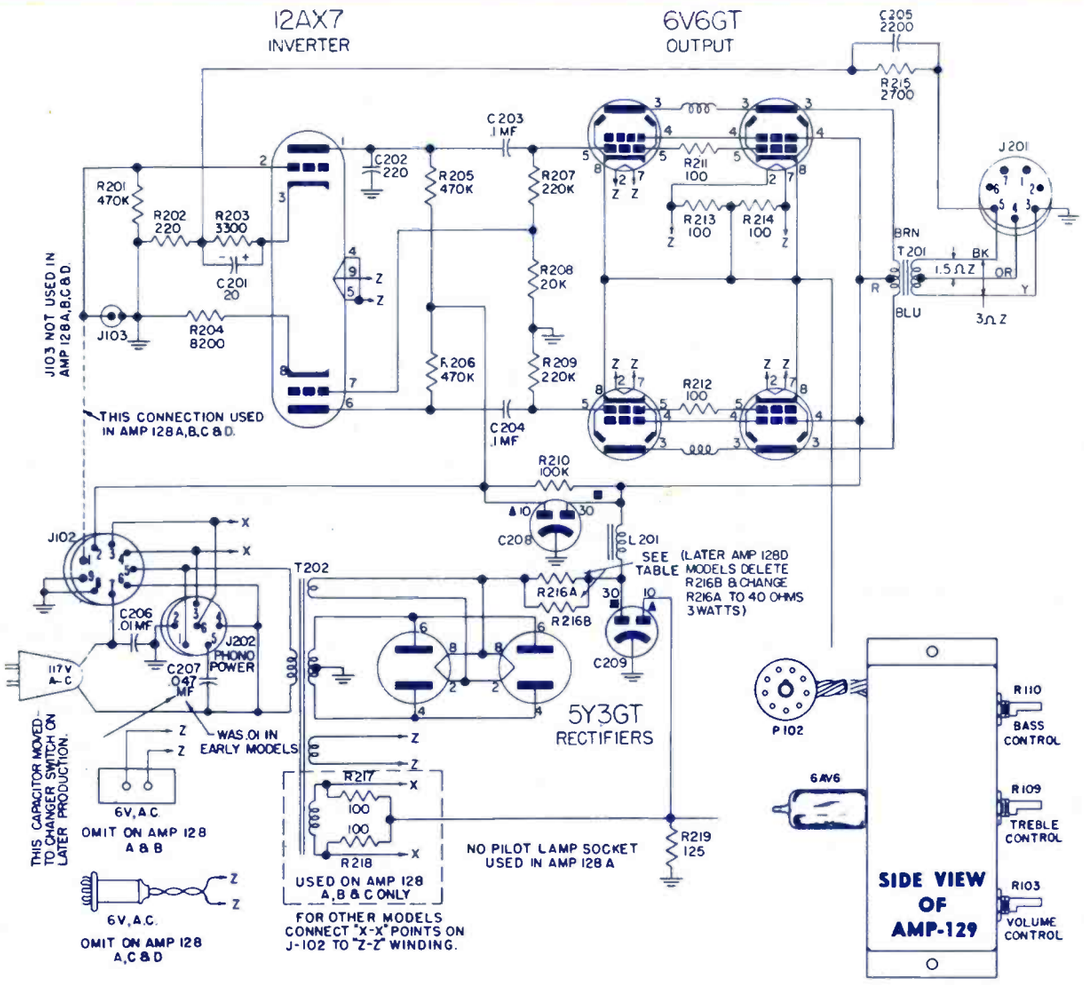
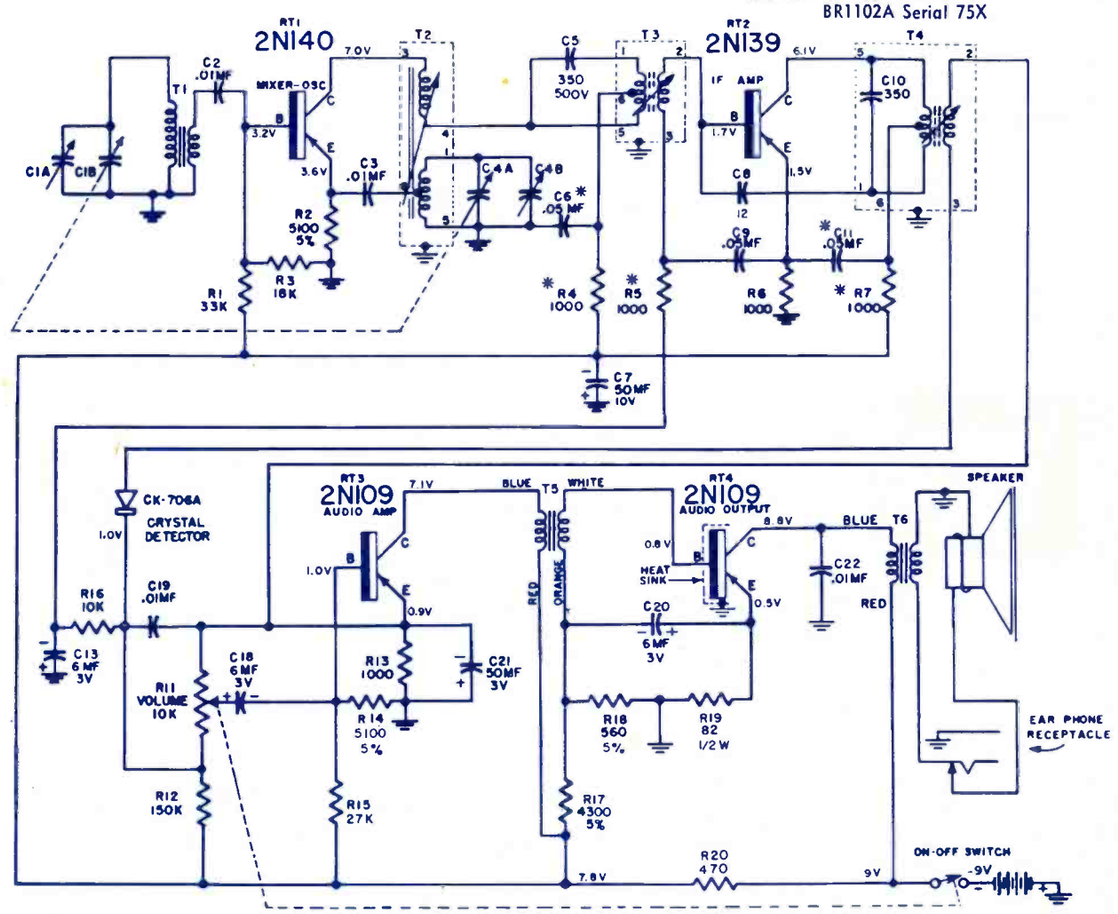
MAGNAVOX
Amplifier Chassis
AMP-129, AMP-128



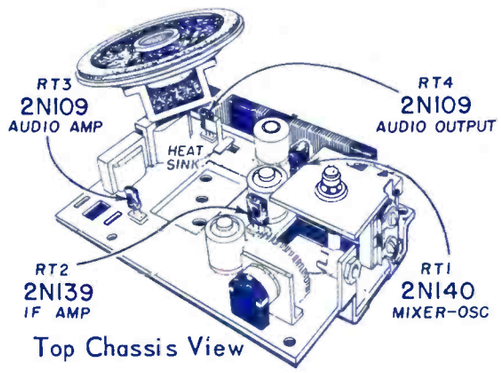
MONTGOMERY WARD
Airline Transistor Radio

Models: BR1100A Serial 65X
BR1102A Serial 75X



NOTE: All chassis marked "Run 2" include the following changes:

Ref. No.	Part No.	Description	Change
R-4,5,7		Resistor (1000 Ohm 10% ¼ Watt)	Delete these resistors and replace with jumper wire.
C-6,11	8G-26459	Capacitor (.05 mfd, 25V, Ceramic)	Omit, no connection



Top Chassis View

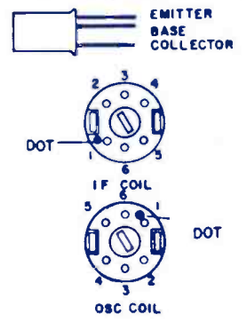
RESISTOR VALUES ARE IN OHMS, 1/4 WATT, 10% TOLERENCE, UNLESS OTHERWISE SHOWN. ✱

CAPACITOR VALUES ARE IN MICRO-MICROFARADS. UNLESS OTHERWISE SHOWN. DC WORKING VOLTAGE IS 25V UNLESS OTHERWISE SHOWN.

DC VOLTAGE READINGS TAKEN WITH VTVM, NO SIGNAL IN INPUT AND BATTERY VOLTAGE – 9VDC. VOLTAGES WILL VARY WITH TRANSISTOR CHANGES. ALL VOLTAGES ARE NEGATIVE.

MODEL NO. BR-1100A
SERIAL NO. 65 X
RT1 – 2N112 OR CK760
RT2 – 2N112 OR CK760
RT3 – 2N132
RT4 – 2N138
C8 – 15 μμf

TYPE 2N109, 2N112, 2N139, 2N140 AND CK760



TRANSISTOR SOCKET

(BOTTOM VIEW)

✱ REVISIONS FOR CHASSIS MARKED RUN 2
R-4,5 &7 REPLACED WITH JUMPER WIRE
C-6 & 11. OMIT-NO CONNECTION.
RUN 2 CHASSIS USE 1/4 WATT OR 1/2 WATT RESISTORS.

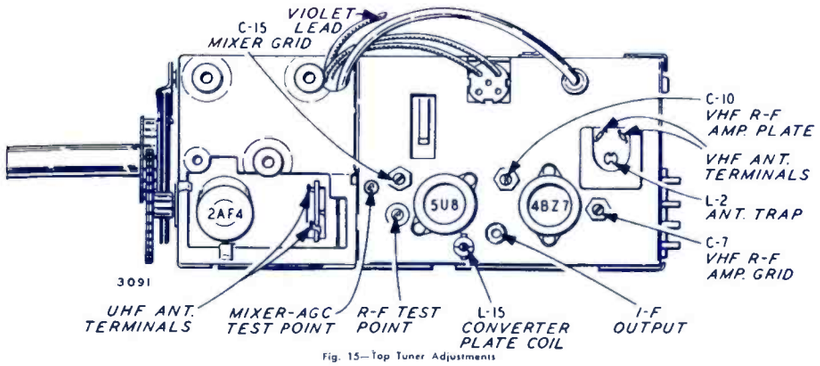
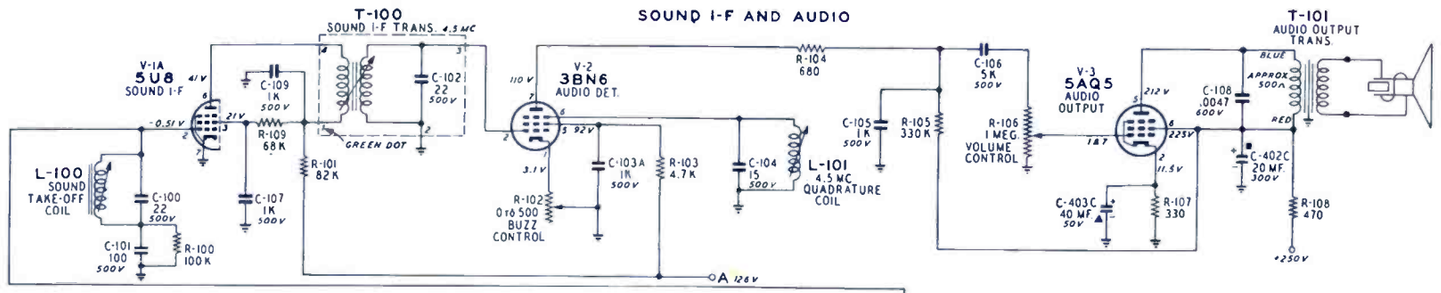
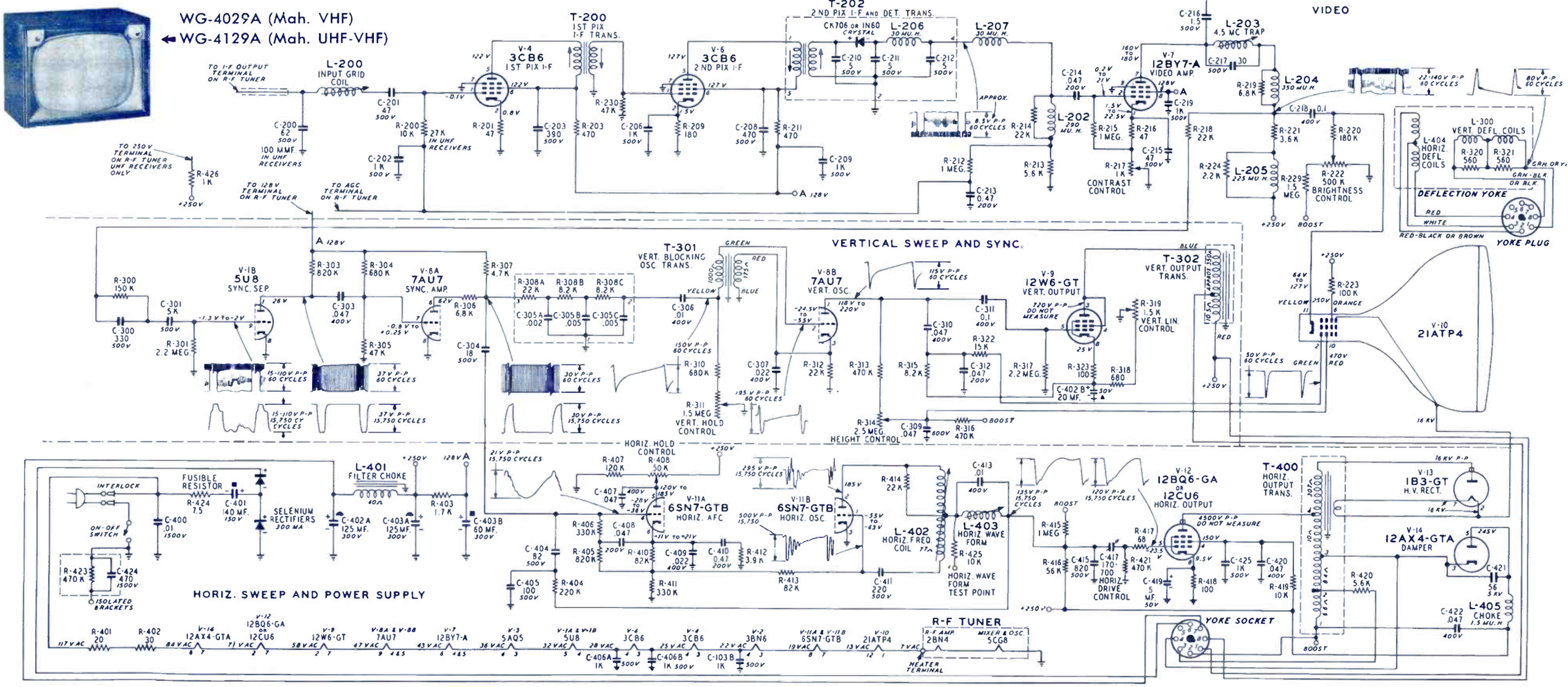


Fig. 15—Top Tuner Adjustments

WG-4029A (Mah. VHF)
WG-4129A (Mah. UHF-VHF)





All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.

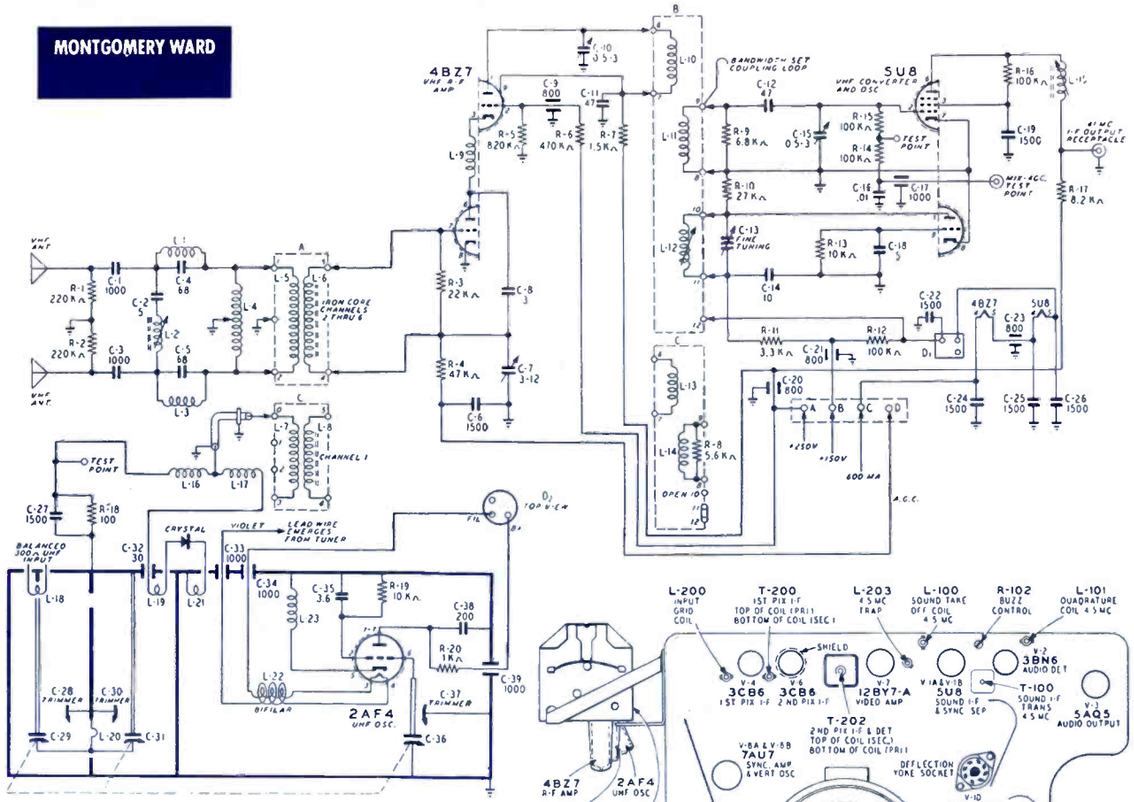
ALL RESISTANCE VALUES IN OHMS.
ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

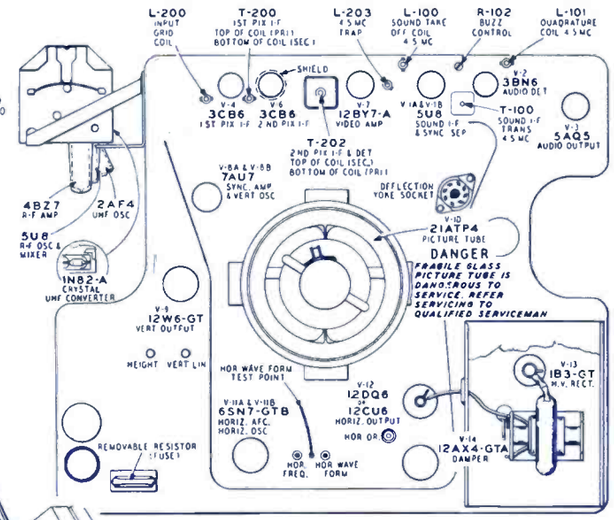
K=1000

MONTGOMERY WARD
Transistor Radio
Serial No. 75X
Model GEN-1106A

MONTGOMERY WARD

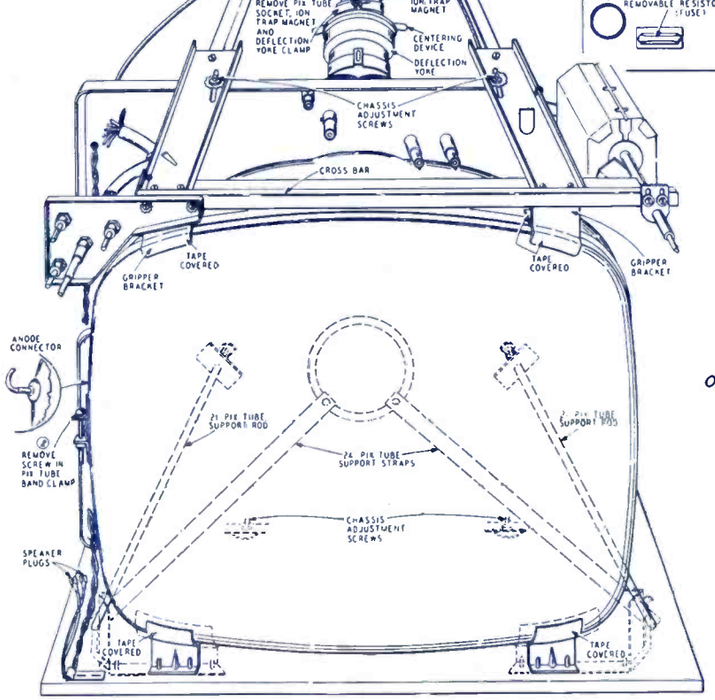


UHF Tuner Schematic

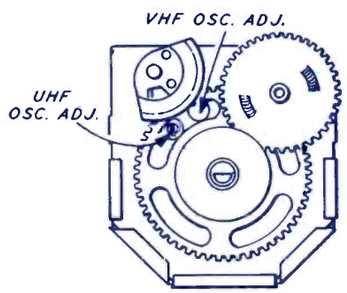


UHF-VHF Chassis Tube Layout and Trimmers

Removal of Picture Tube and Rear Chassis Controls

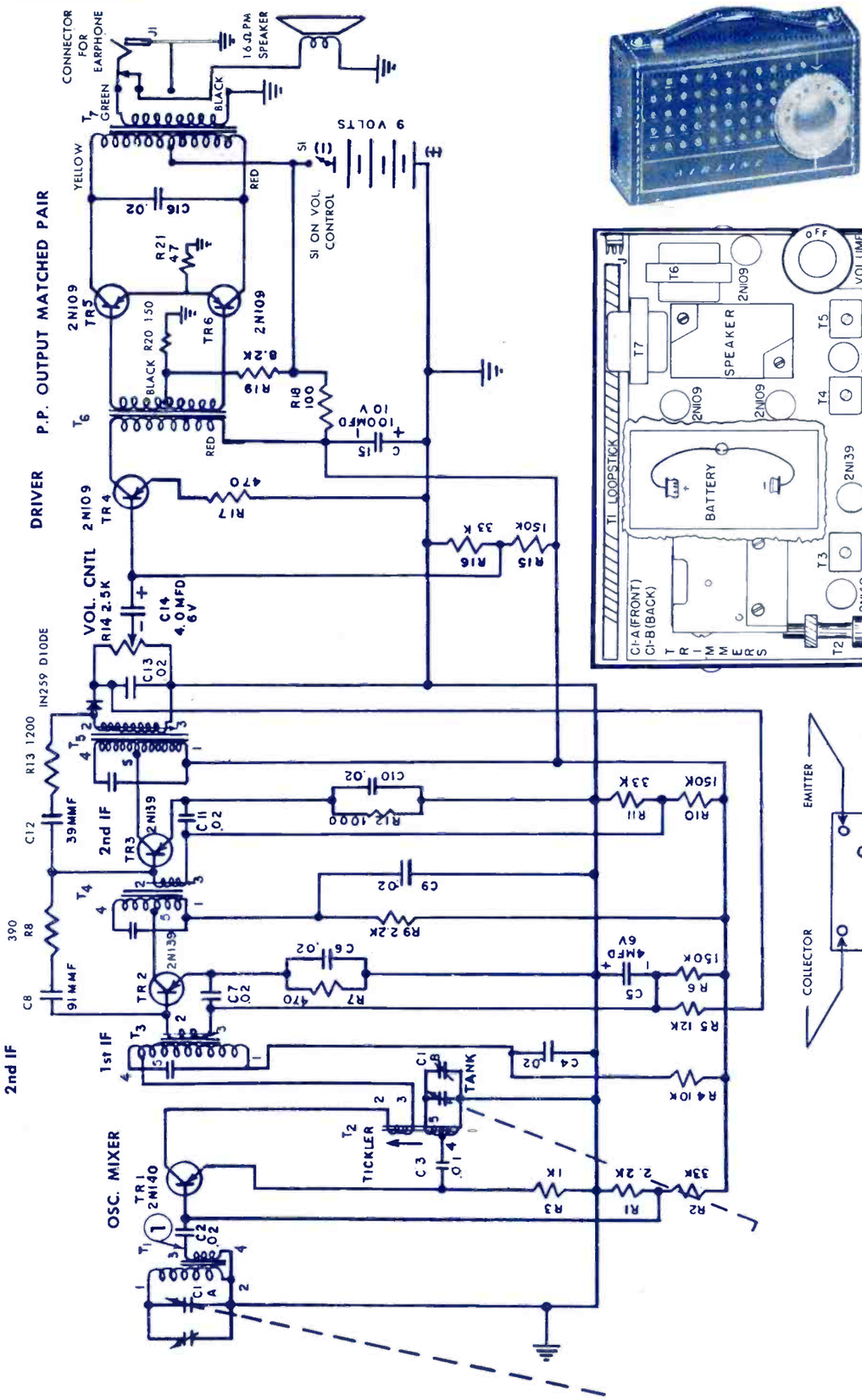


A-B	VHF DRUM SEGMENTS
C	44 MC I-F COILS CHANNEL 1 SWITCHED IN FOR UHF RECEPTION
D1 AND D2	POWER PLUG AND RECEPTACLE VHF TO UHF CHASSIS



NOTE POSITION OF FLAT OF TUNER SHAFT WHEN SET FOR UHF POSITION

Tuner Oscillator Adjustments



MONTGOMERY WARD
TV Models
WG-4203A-4303A

Tuner Schematic Diagram

SOUND I-F AND AUDIO

VIDEO

VERT. SWEEP AND SYNC.

HORIZONTAL SWEEP AND POWER SUPPLY

25A1159 UHF TUNER SCHEMATIC
STANDARD COIL PART No. NEUF5-103

25A1166 TUNER COVER SCHEMATIC
STANDARD COIL PART No. FCN-011

Tube Layout

Overall Pix IF Response Curve

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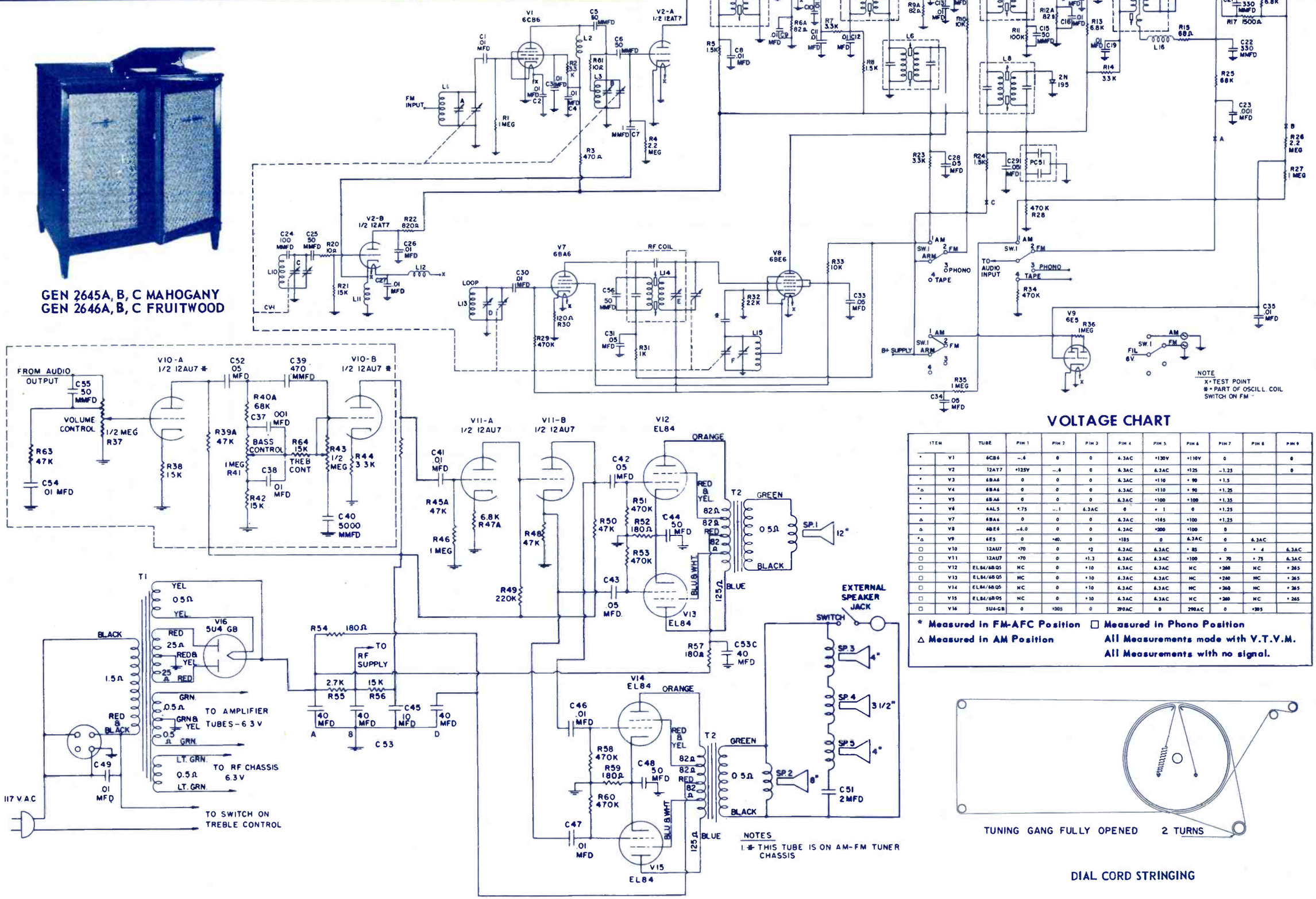
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

MONTGOMERY WARD
Hi Fi AM-FM Radio Phono

Model GEN 2645A, B, C; GEN 2646A, B, C
Serial No. 75X

GEN 2645A, B, C MAHOGANY
GEN 2646A, B, C FRUITWOOD



NOTES
1. * THIS TUBE IS ON AM-FM TUNER CHASSIS

NOTE
X = TEST POINT
* = PART OF OSCILL. COIL SWITCH ON FM

VOLTAGE CHART

ITEM	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
*	V1	6CB6	-.6	0	0	6.3AC	+130V	+110V	0	0
*	V2	12AT7	+125V	-.6	0	6.3AC	6.3AC	+125	-1.25	0
*	V3	6BA6	0	0	0	6.3AC	+110	+ 90	+1.5	
*△	V4	6BA6	0	0	0	6.3AC	+110	+ 90	+1.25	
*	V5	6BA6	0	0	0	6.3AC	+100	+100	+1.35	
*	V6	6AL5	+.75	-.1	6.3AC	0	+ 1	0	+1.25	
△	V7	6BA6	0	0	0	6.3AC	+165	+100	+1.25	
△	V8	6BE6	-6.0	0	0	6.3AC	+200	+100	0	
*△	V9	6E5	0	+40.	0	+185	0	6.3AC	0	6.3AC
□	V10	12AU7	+70	0	+2	6.3AC	6.3AC	+ 85	0	+ 4 6.3AC
□	V11	12AU7	+70	0	+1.3	6.3AC	6.3AC	+100	+ 70	+ 75 6.3AC
□	V12	EL84/6BQ5	NC	0	+10	6.3AC	6.3AC	NC	+260	NC + 265
□	V13	EL84/6BQ5	NC	0	+10	6.3AC	6.3AC	NC	+260	NC + 265
□	V14	EL84/6BQ5	NC	0	+10	6.3AC	6.3AC	NC	+260	NC + 265
□	V15	EL84/6BQ5	NC	0	+10	6.3AC	6.3AC	NC	+260	NC + 265
□	V16	5U4-GB	0	+305	0	290AC	0	290AC	0	+305

* Measured in FM-AFC Position
△ Measured in AM Position
□ Measured in Phono Position
All Measurements made with V.T.V.M.
All Measurements with no signal.

TUNING GANG FULLY OPENED 2 TURNS

DIAL CORD STRINGING

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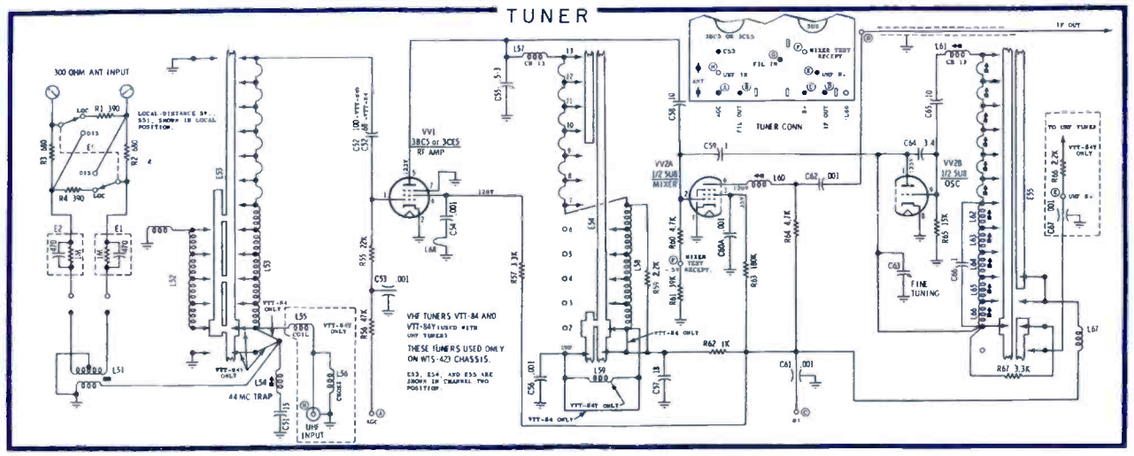
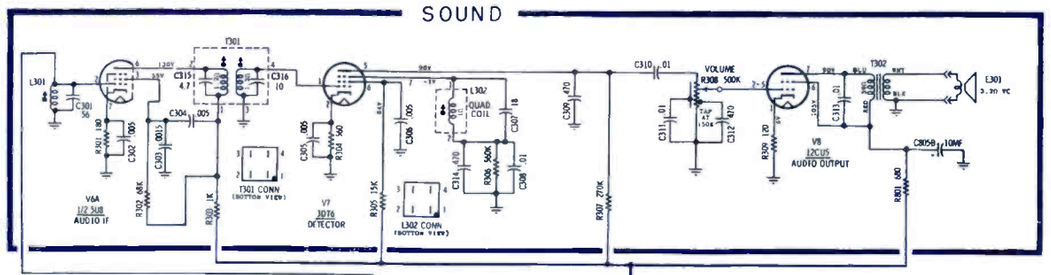
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

MOTOROLA
Portable TV
Chassis TS-423

Models 14P3, 4 & 5 Series

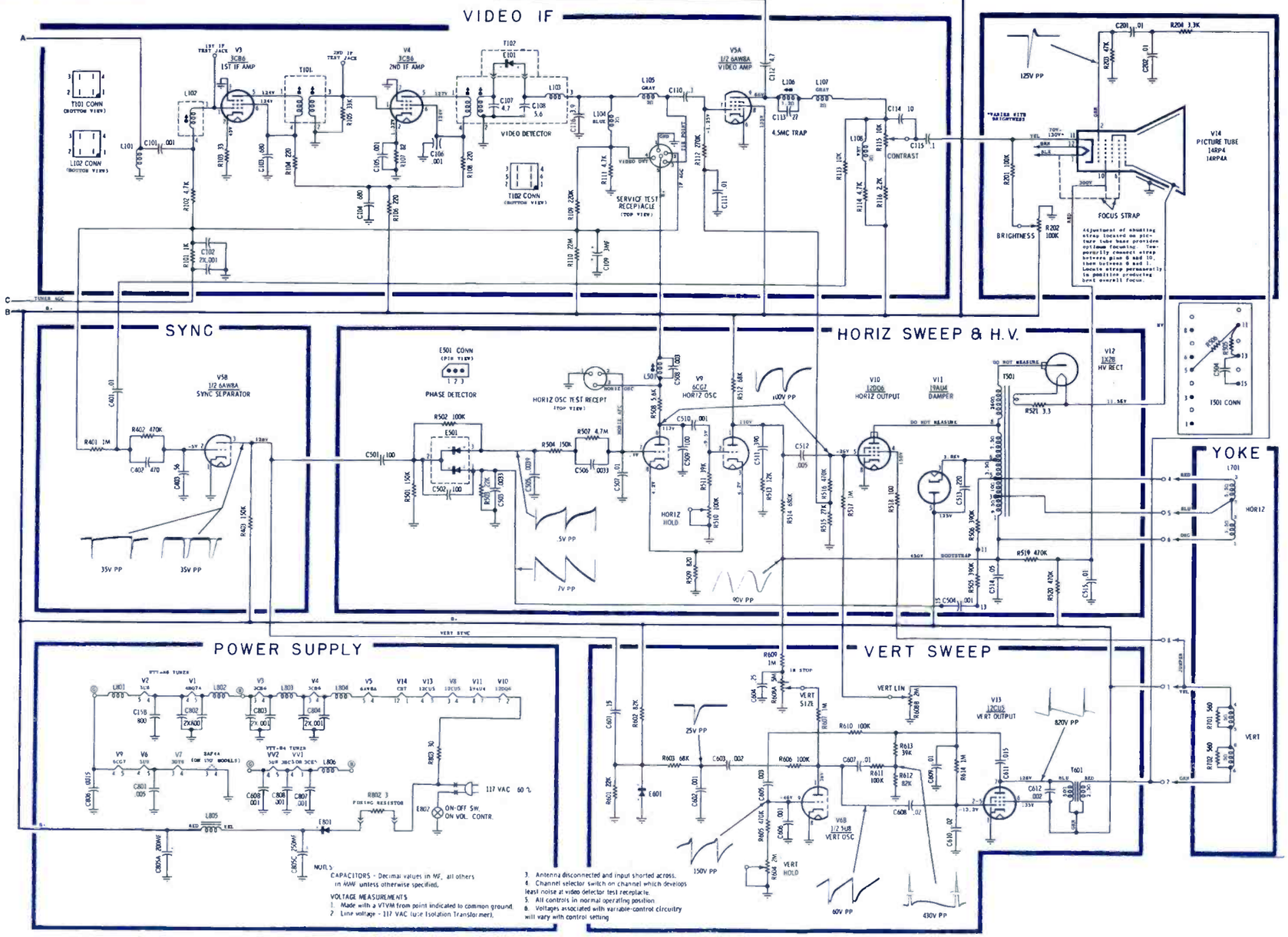




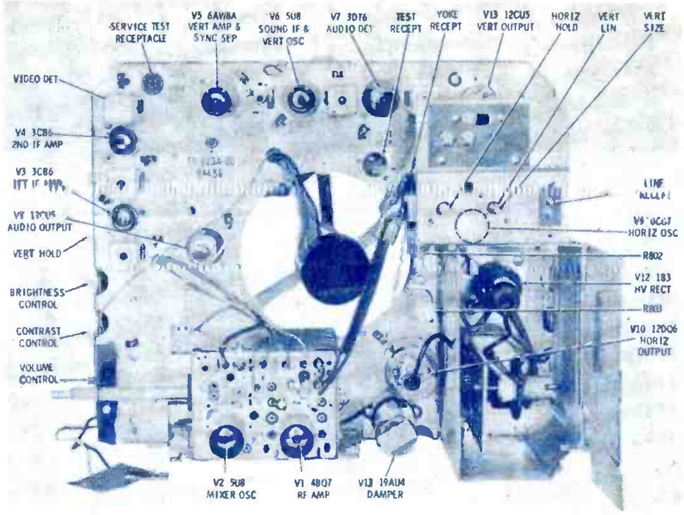
PRODUCTION CHANGES

TS 423A-00 thru A-12

Chassis Coding	Changes
A-01 A-00-1	To increase the range of the vertical size control grounded end of R-608A (vert size) is removed from ground.
A-01-1 A-02	To reduce line radiation C-809 (.25 mf -Part No. 8R121788) added between hot side of AC line and ground. To reduce radiation and remove static charge that may build up between the chassis and cabinet, C-810 (.0015 mf -Part No. 21R124121) and R-804 (2.2 meg -Part No. 6R3927) are paralleled and added between cabinet and chassis. The physical location is at the deflection yoke plug. To further reduce 4.5 Mc radiation, C-307 (18 mmf) removed from low end of coil and connected to ground. R-513 (12K) changed to 6.8K -Part No. 6R6428.
A-03	To prevent capacitor breakdown during picture tube arcing, C-202 (.01 mf) changed to .05 mf -Part No. 8R122185.
A-03-2 A-04	Three-pin receptacle (horiz osc adjust) removed: five-pin Service Test Receptacle re-located and re-wired; one-pin test receptacle (Part Number 9A722758) added. See Figure 5. T-102 changed to 24C742101 which has lug #5 grounded and lug #2 as a tie point.
A-05	To improve operation R-802 (3) changed to 7.5 ohm.
A-06 A-03-1	To improve audio output R-519 (470K) changed to 220K: R-307 (270K) removed from B+ and connected to junction of R-519 (220K) and R-520 (470K).
A-07	To remove B+ from horizontal and vertical circuits when the deflection yoke is removed, L-501 (horiz osc) and T-601 (vert out) are removed from common B+ source and moved to pin #8 of L-701 (defl yoke) receptacle.
A-08	To improve operation, R-802 (7.5) changed to 5 ohm.
A-07-1 A-09	To improve vertical and horizontal sync, R-113 (10K) changed to 22K and one end of resistor is re-located from top end of L-108 to the low end: C-403 (56 mmf), E-601 (diode crystal) and C-612 (.02 mf) removed: C-602 (.15 mf) removed - plate of V-5B (6AW8A sync separator) connects to junction R-601, R-602 and R-603: R-601 (22K) changed to 47K: R-611 (100K) changed to 150K: C-608 (.02 mf) changed to .05 mf: C-613 (.01 mf) added between plate of V-6B (1/2 5U8) and ground.
A-10	To decrease 4.5 Mc harmonic radiation, C-811 (470 mmf) added between pin #4 of V-7 (3DT6) and ground. This change affects only "Y" version chassis.
A-11	To decrease 43 Mc interference, L-2 changed to 24K724655: C-1 (150 mmf) changed to 15 mmf.
A-12	L-3 (UHF input) changed to 24A732397. This change affects only the "Y" version chassis.



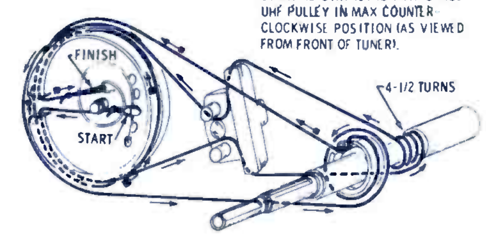
MOTOROLA
Portable TV
Chassis TS-423

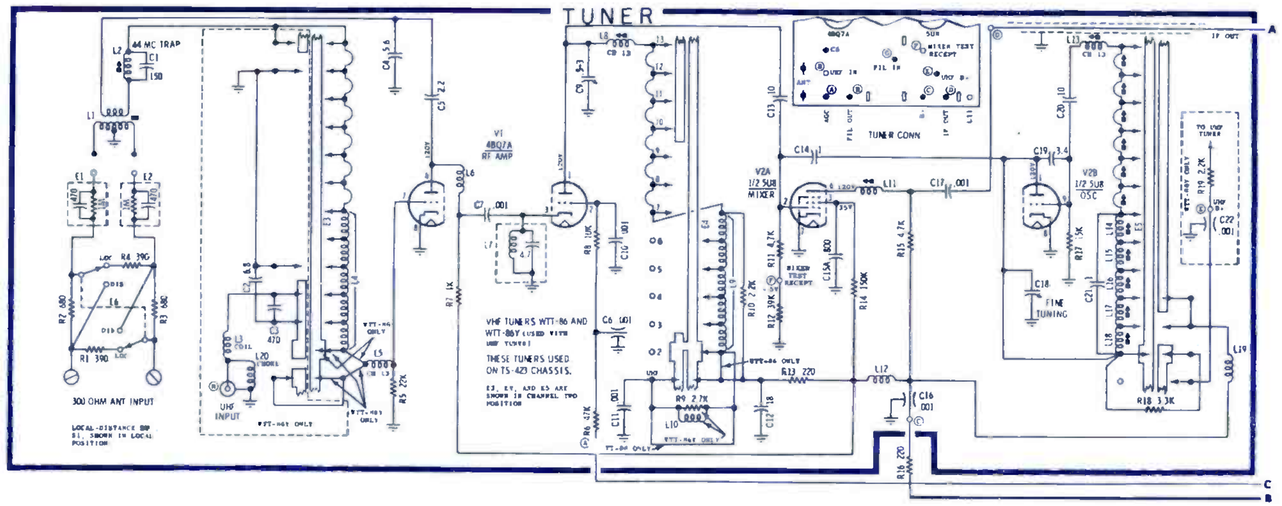


UHF TUNER 77K742138

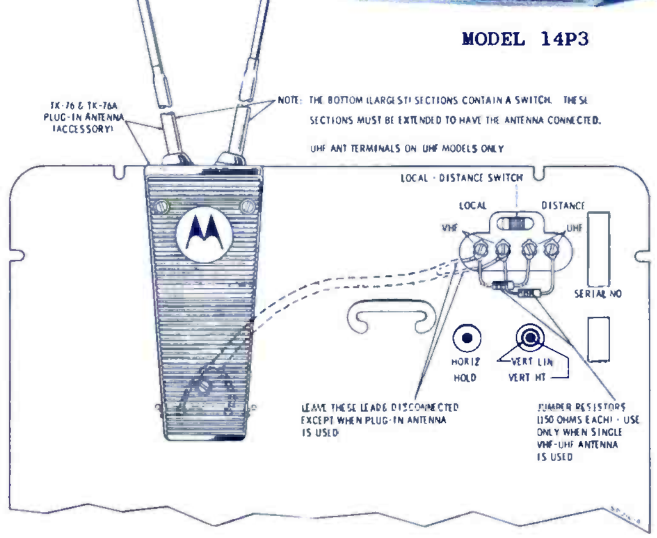
DRIVE STRINGING

START RE-STRINGING WITH LARGE UHF PULLEY IN MAX COUNTER-CLOCKWISE POSITION (AS VIEWED FROM FRONT OF TUNER).

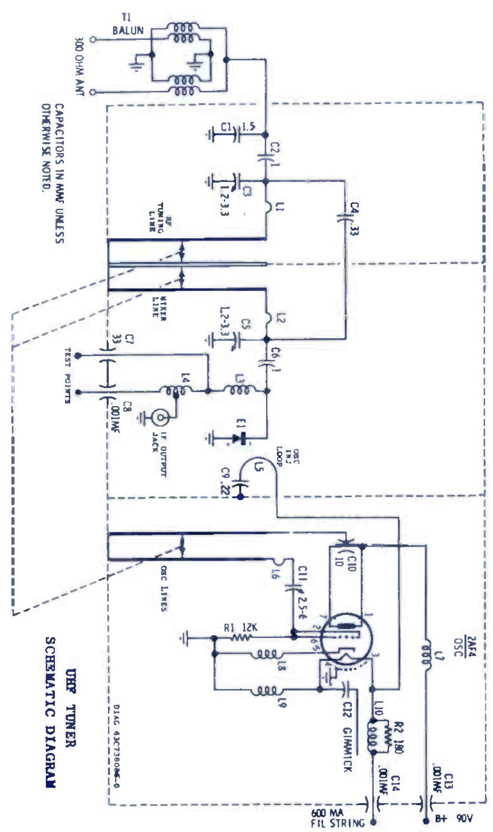




MODEL 14P3

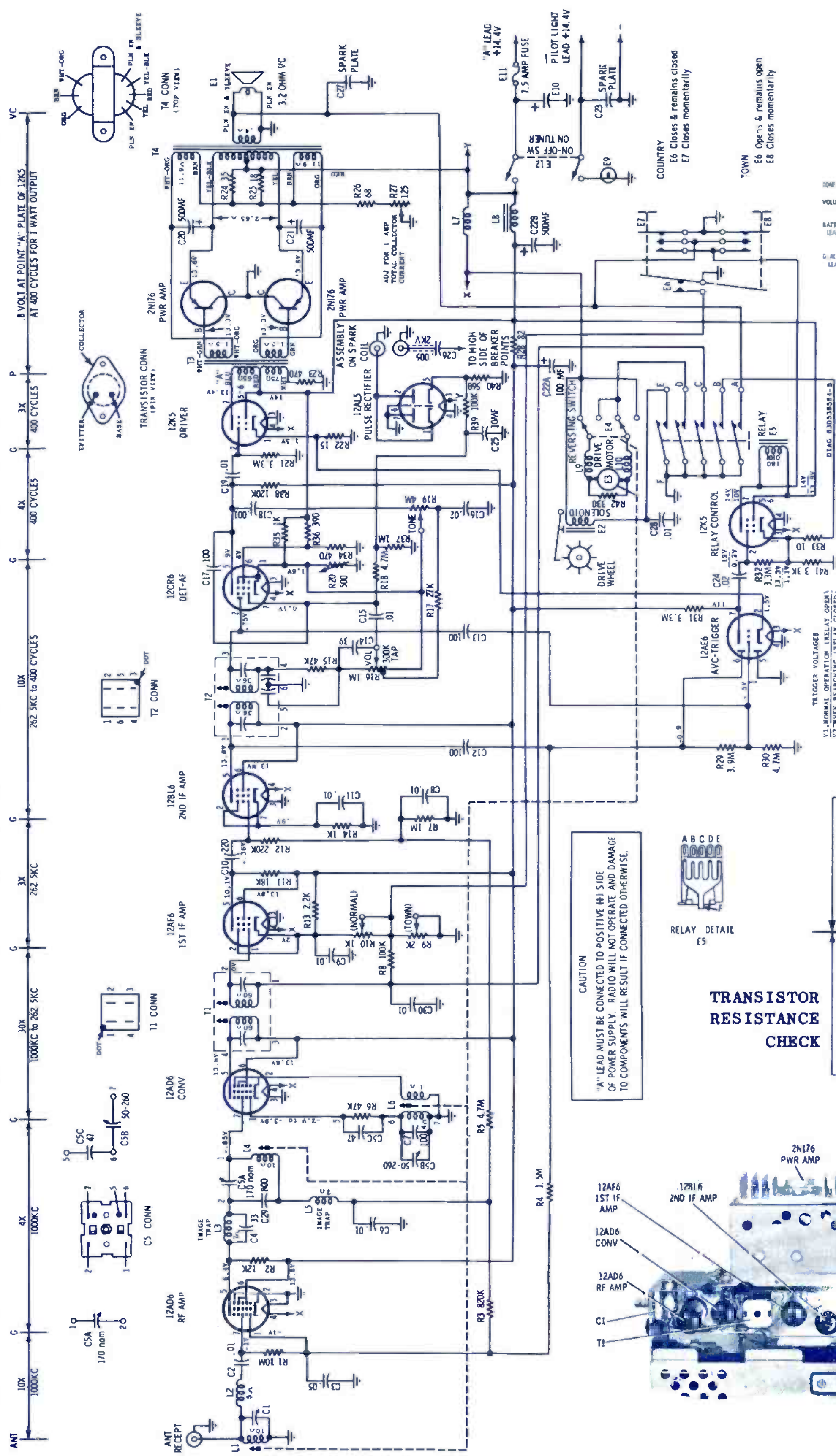


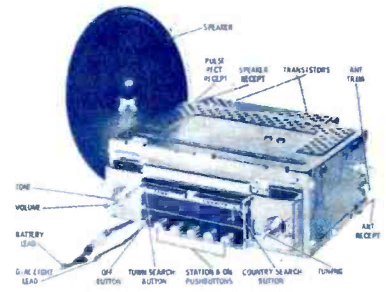
REAR CONTROLS



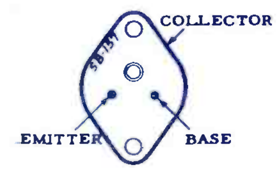
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

MOTOROLA
Auto Radio Model 79MS, Ford FEJ-18806-C



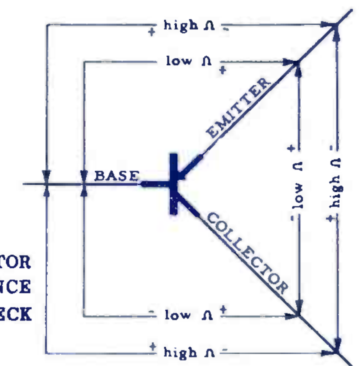


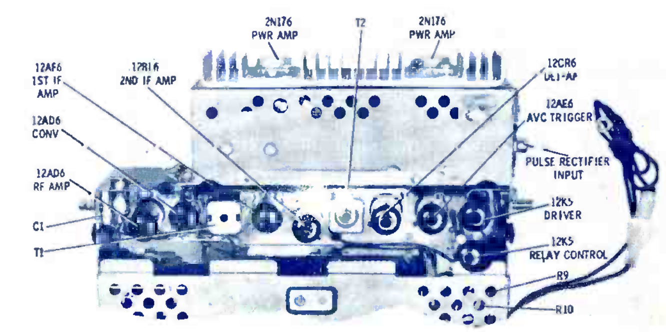
NOTES:
Capacitors - decimal values in MF. All others in MMF unless otherwise specified.
Voltages - measured from point indicated to chassis with a VTVM, ± 10%. No signal input, and TOWN-COUNTRY switch (E6) closed.
Input Voltage - 14.4 VDC.
Tuning Range - 540 to 1610 KC.
IF - 262.5 KC.
Resistances in Pwr Amp stage made with transistors removed.



TRANSISTOR CONNECTIONS
(PIN VIEW)

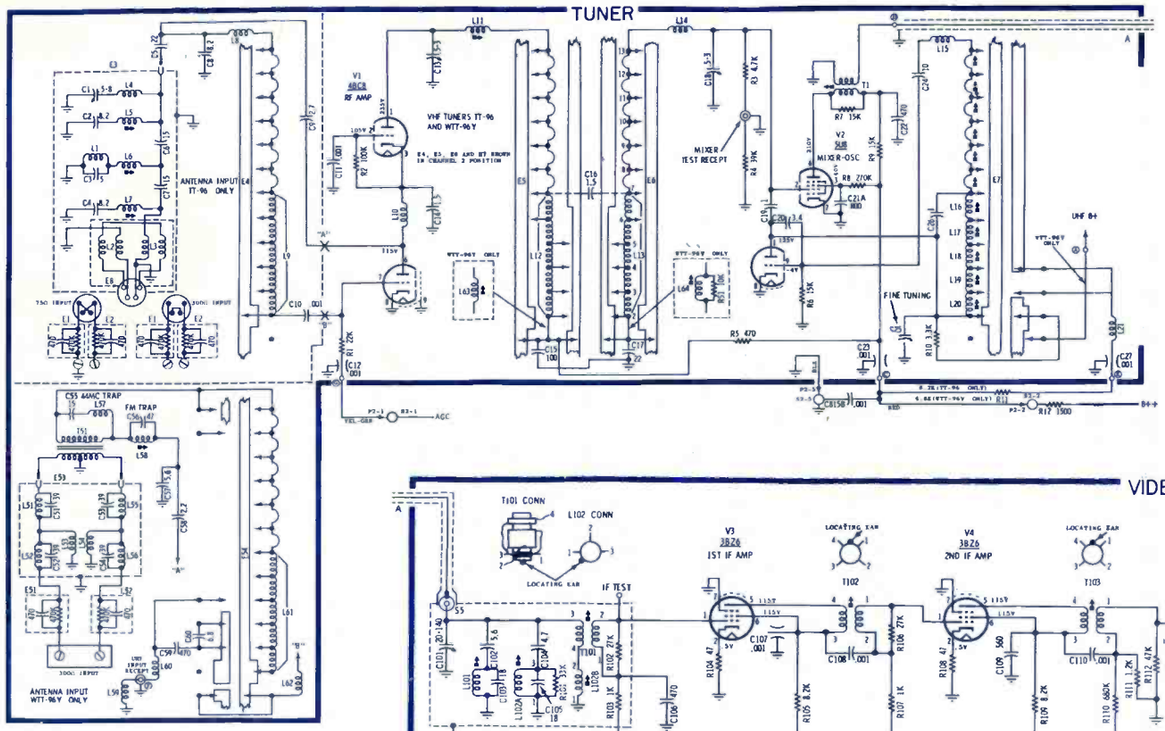
TRANSISTOR RESISTANCE CHECK

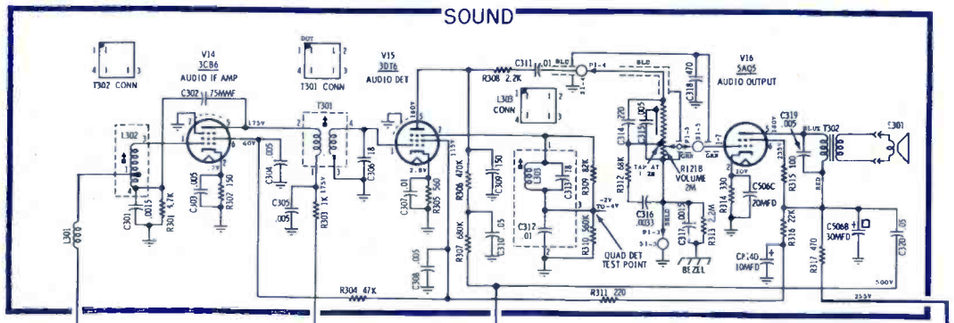


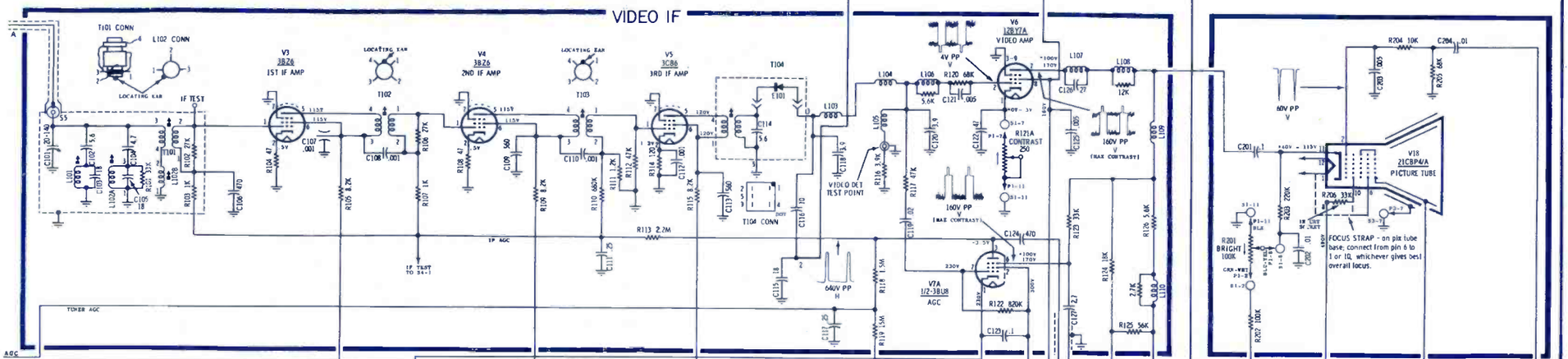


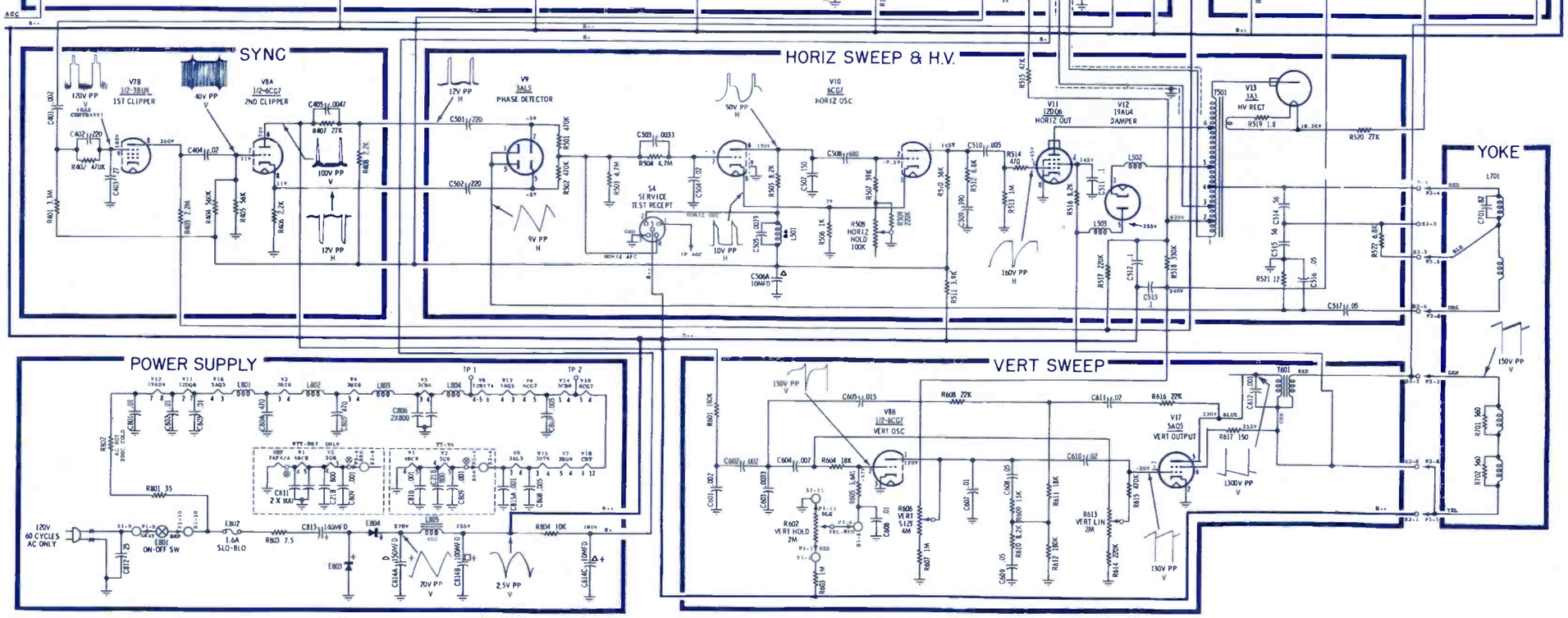
MOTOROLA
Chassis TS-542

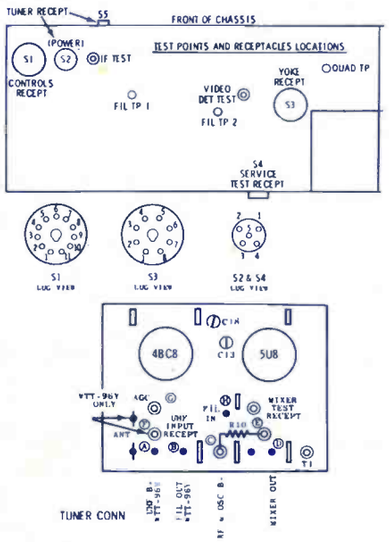
Models
21K70B,
Y21K70B,
21K70M,
Y21K70M,
21T37B,
Y21T37B,
21T37M,
Y21T37M











NOTES:

CAPACITORS - Decimal values in MF, all others in MMF unless otherwise specified.

VOLTAGE MEASUREMENTS
1. Made with a VTVM from point indicated to chassis.
2. Line voltage 120VAC (Use Isolation Transformer).
3. Voltages indicated by an asterisk (*) will vary with associated control setting.
4. Voltages taken with contrast control at minimum and all other controls in normal operating position with no signal input.

WAVEFORMS
1. Taken with a wide-band oscilloscope.
2. Receiver in operating condition and showing a normal picture.

V = VERTICAL
H = HORIZONTAL
TP = TEST POINT

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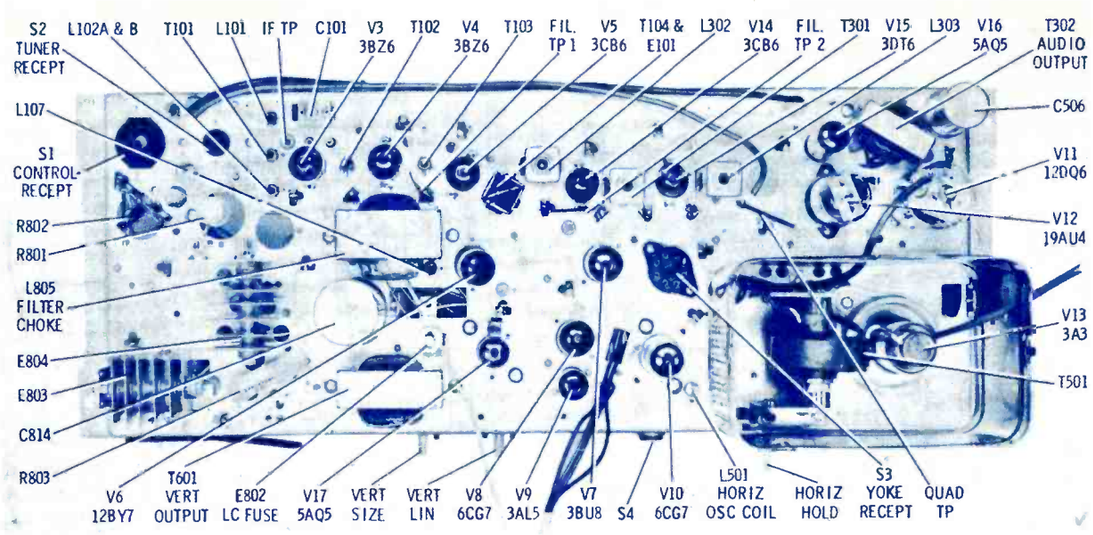
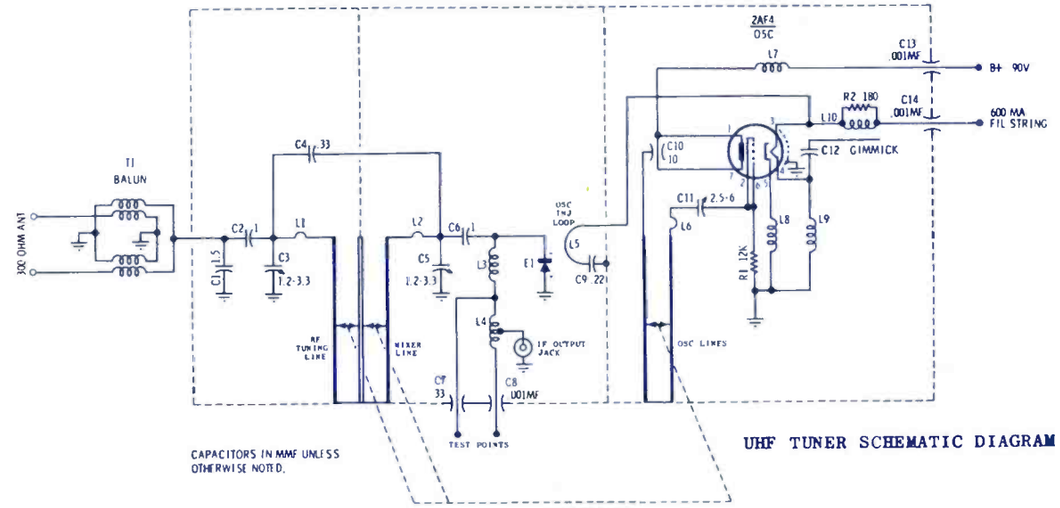
MOTOROLA
Chassis HS-562



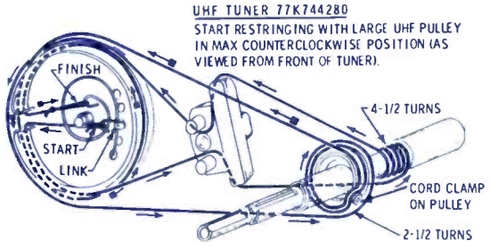


UHF TUNER SCHEMATIC DIAGRAM

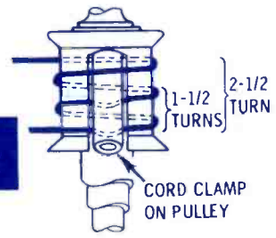
CAPACITORS IN MMF UNLESS OTHERWISE NOTED.

UHF TUNER 77K744280

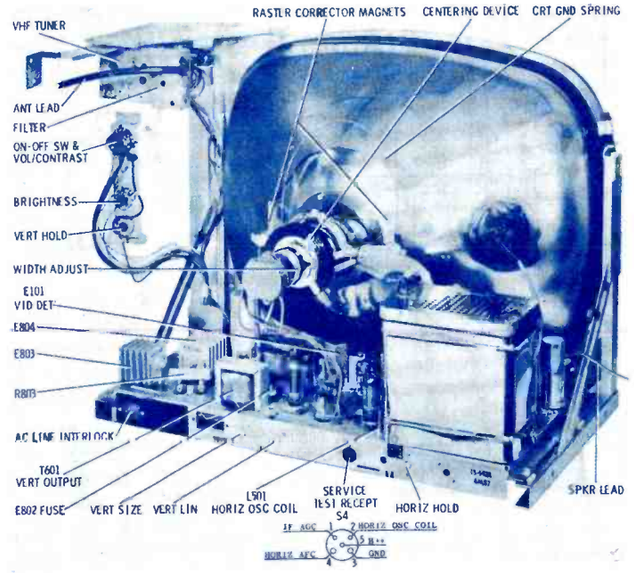
START RESTRINGING WITH LARGE UHF PULLEY IN MAX COUNTERCLOCKWISE POSITION (AS VIEWED FROM FRONT OF TUNER).



UHF TUNER DRIVE STRINGING



MOTOROLA
Chassis TS-542



REAR VIEW

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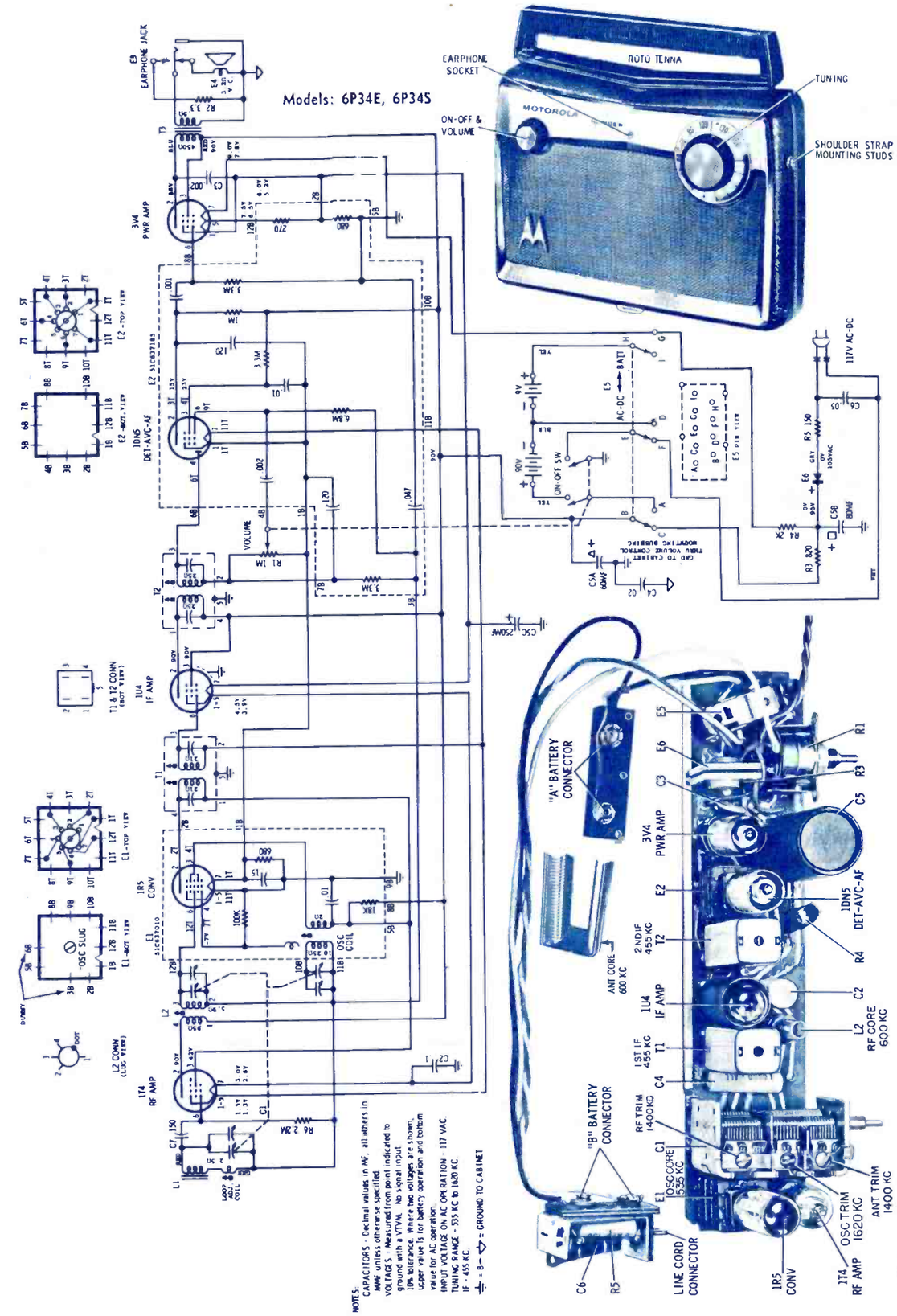
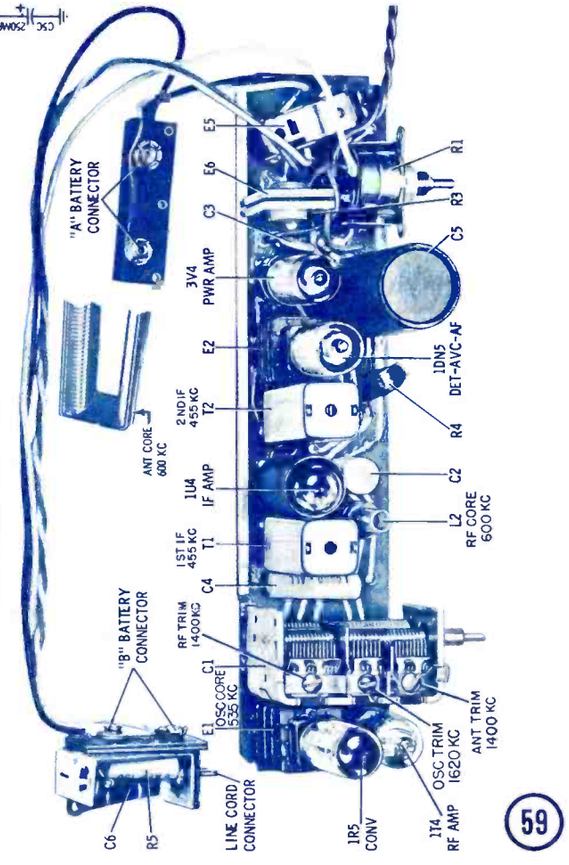
☆ 480 Lexington Ave., New York 17, N. Y.

Models: 6P34E, 6P34S



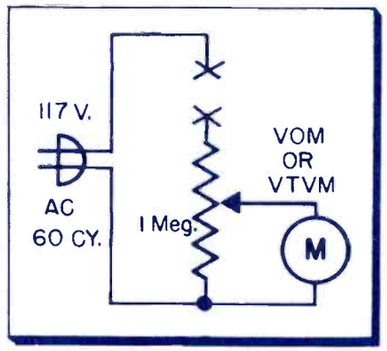
NOTES:
CAPACITORS - Decimal values in MF, all others in MMF unless otherwise specified.
VOLTAGES - Measured from point indicated to ground with a VTVM. No signal input. 10% tolerance. Where two voltages are shown, upper value is for battery operation and bottom value for AC operation.
INPUT VOLTAGE ON AC OPERATION - 117 VAC.
TUNING RANGE - 535 KC to 1620 KC.
IF - 455 KC.
⏚ = B− = GROUND TO CABINET



Shop Hint

Capacity Readings With A VOM

A quick and inexpensive measurement of capacity can be made with your VOM or VTVM and a potentiometer. The device may also be used to match or pair new components. It consists of nothing more than your meter, an extra pair of leads and a linear potentiometer on the order of 1 megohm. The value is not critical. The only precaution is not to exceed the wattage and current rating; as the control is placed directly across the a-c line. The hookup is shown in the diagram. Even the line voltage is not critical.



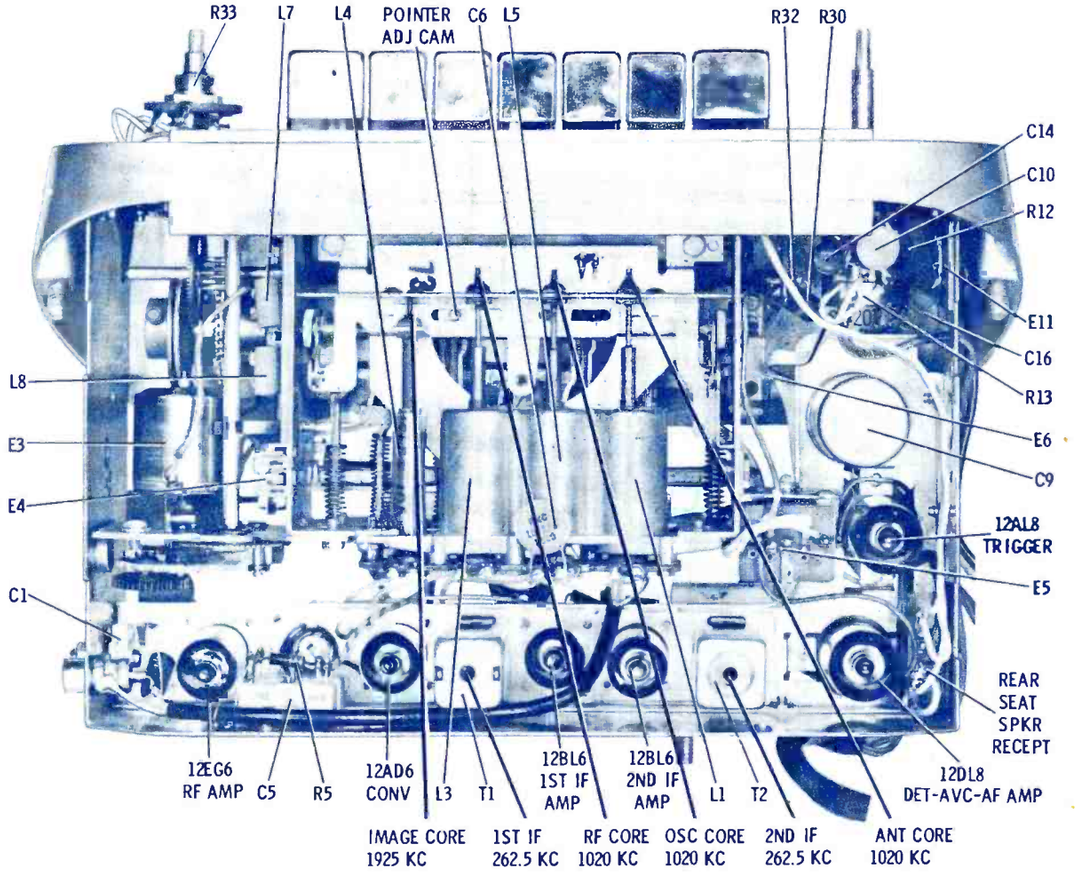
Divider network permits reactance readings.

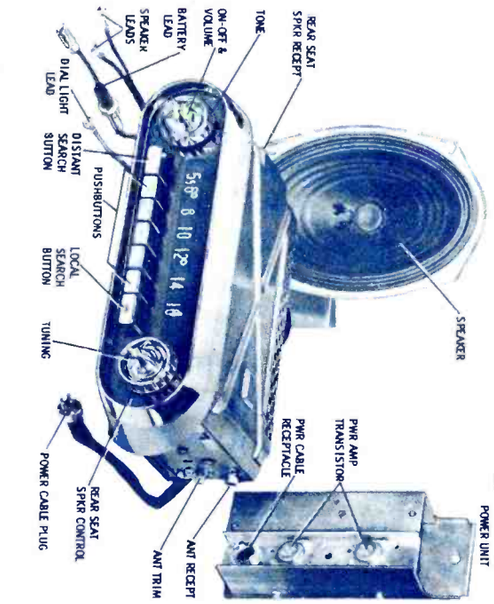
The important thing is to establish full scale deflection, using the a-c function and proper range. This is accomplished by shorting the test leads, at the points marked X and adjusting the pot. Graphs and charts could be plotted, but this is not necessary. To calibrate the meter, note the readings obtained from capacitors of known values. By using different potentiometer values and different a-c ranges, it is possible to obtain a fairly wide range of measurement. However, once the range and resistance have been selected and adjusted the scale will remain accurate.—*Frank D. Witmer, Camp Hill, Penna.*

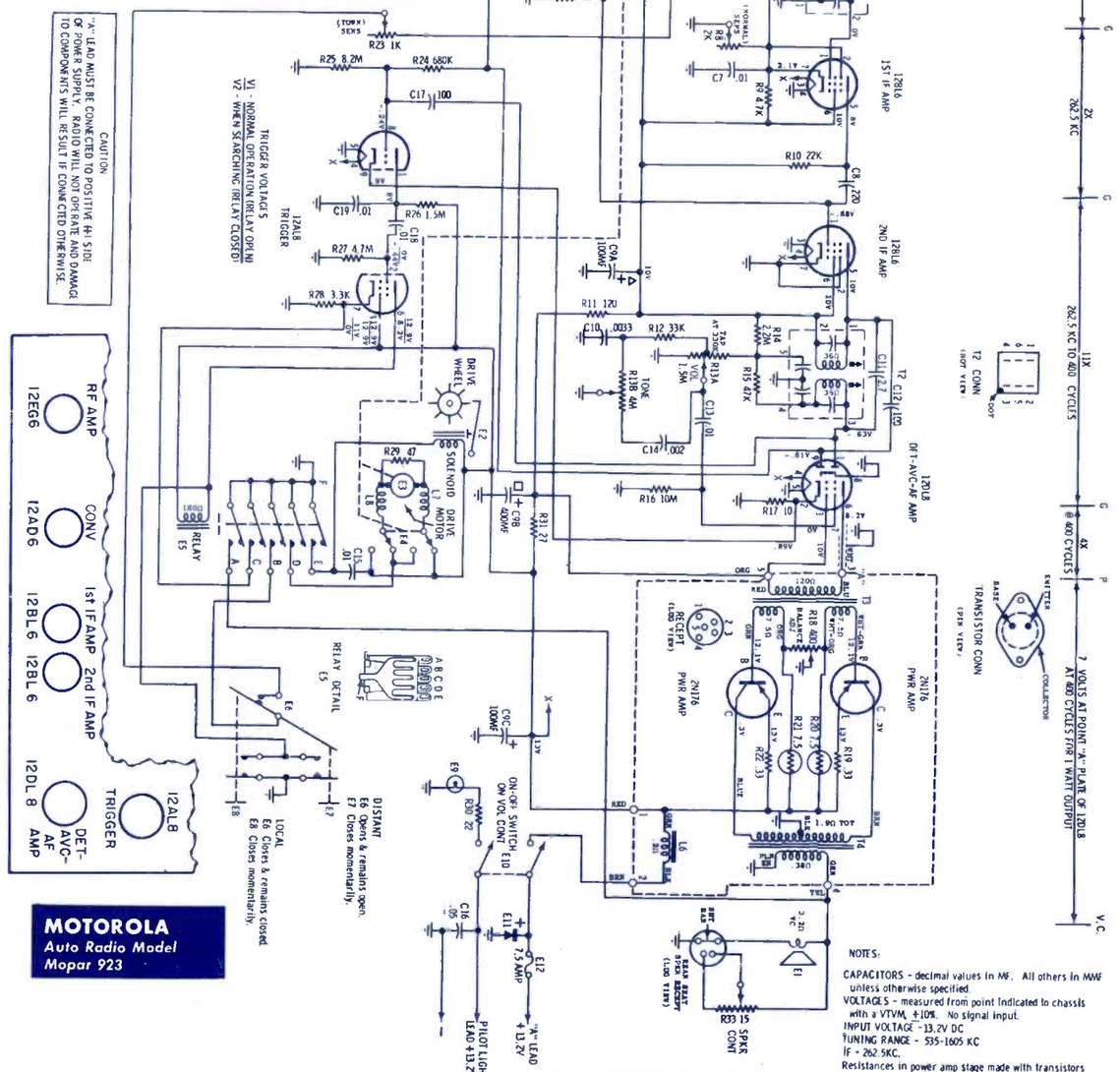
• *The above arrangement may also be used to determine the values of coils, chokes, yokes, etc. If 400-cycles, available on most signal generators, were used instead of the 60-cycle line voltage, even more accurate and wider range of readings would result.—ED.*

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

MOTOROLA
Auto Radio Model
Mopar 923



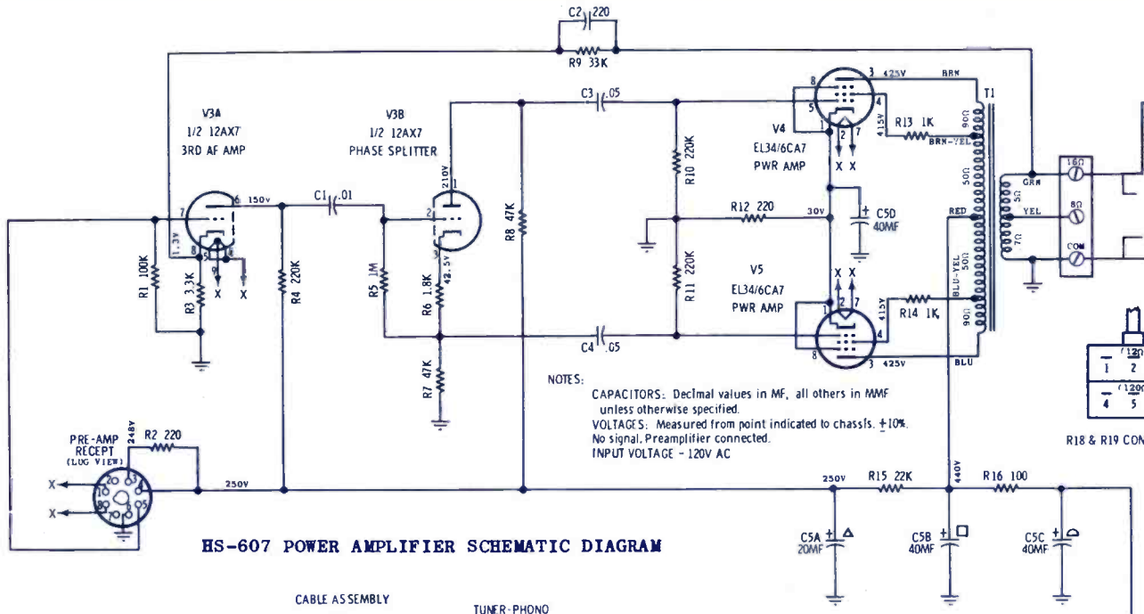




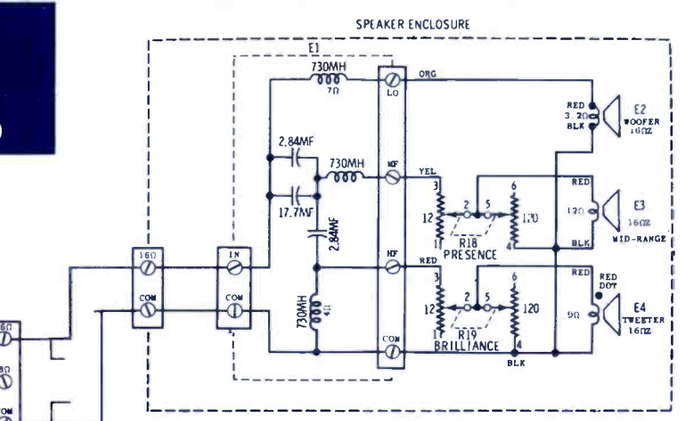
SCHEMATIC DIAGRAM

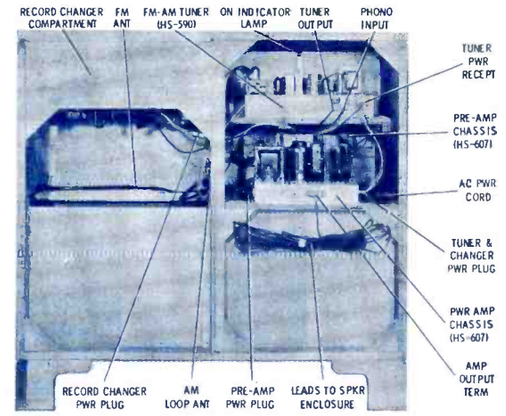
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

MOTOROLA
Hi-Fi Preamplifier and Amplifier Chassis HS-607 & HS590

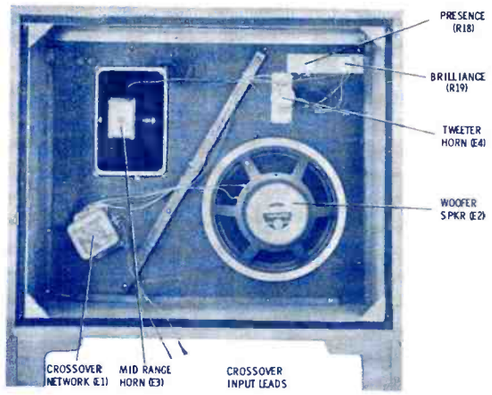


HS-607 POWER AMPLIFIER SCHEMATIC DIAGRAM

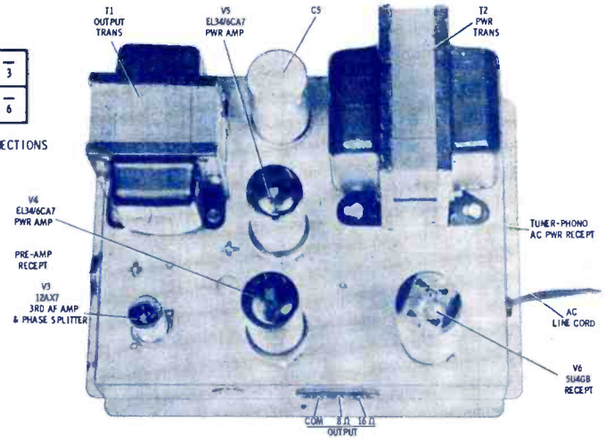




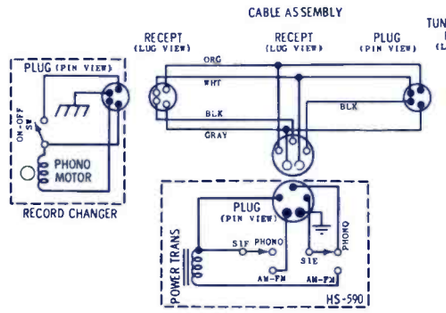
EQUIPMENT ENCLOSURE REAR VIEW

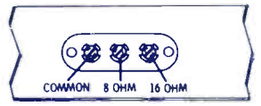


SPEAKER ENCLOSURE REAR VIEW

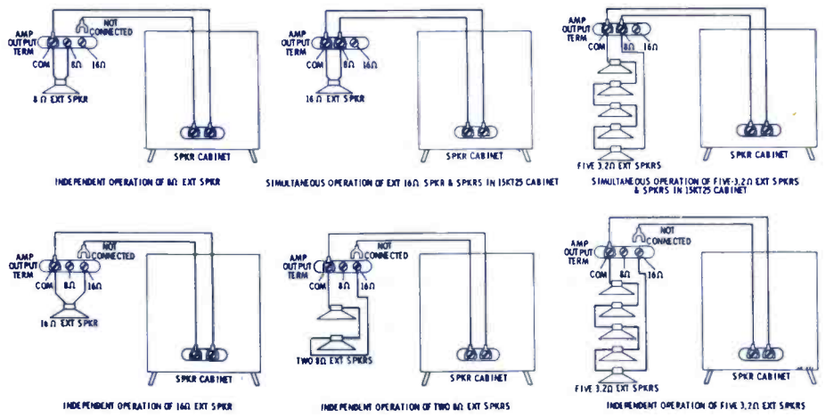


R18 & R19 CONNECTIONS

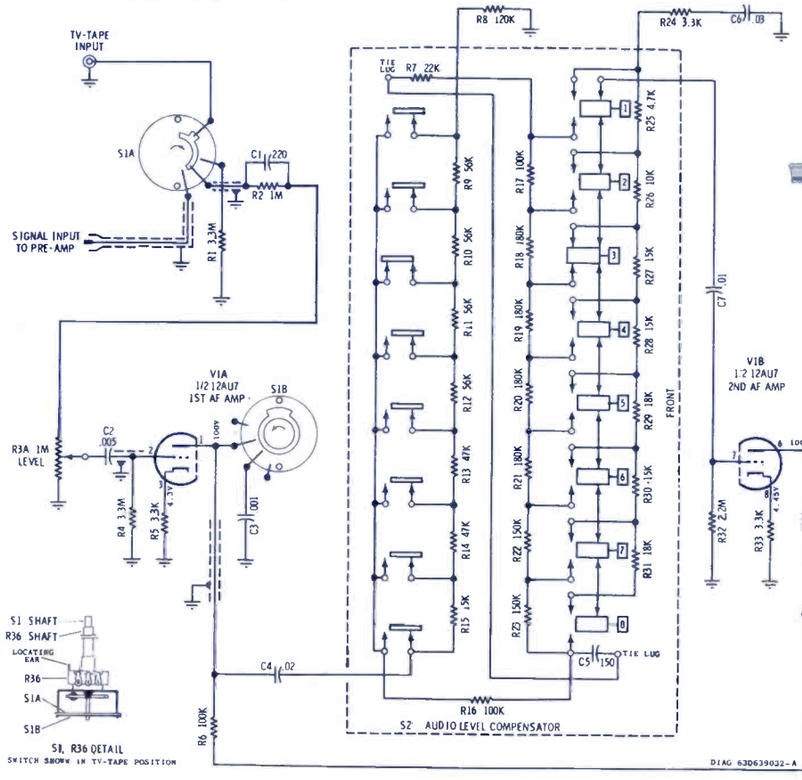


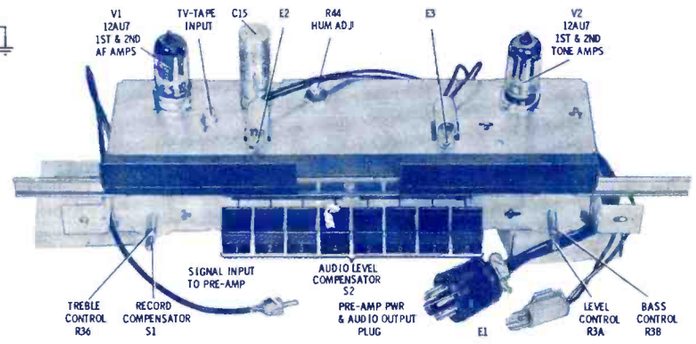


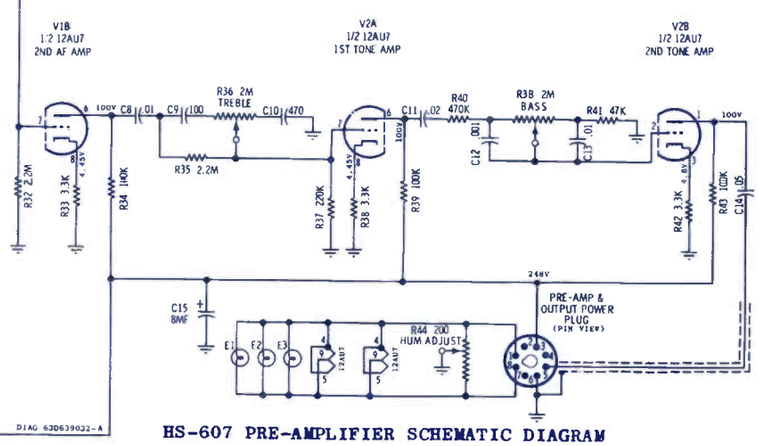
POWER AMPLIFIER OUTPUT TERMINALS



Models 15KT25B-1, 15KT25B-1S,
15KT25M-1, 15KT25M-1S,
15KT25MC-1, 15KT25MC-1S,
15KT25MCH-1, 15KT25MCH-1S







HS-607 PRE-AMPLIFIER SCHEMATIC DIAGRAM

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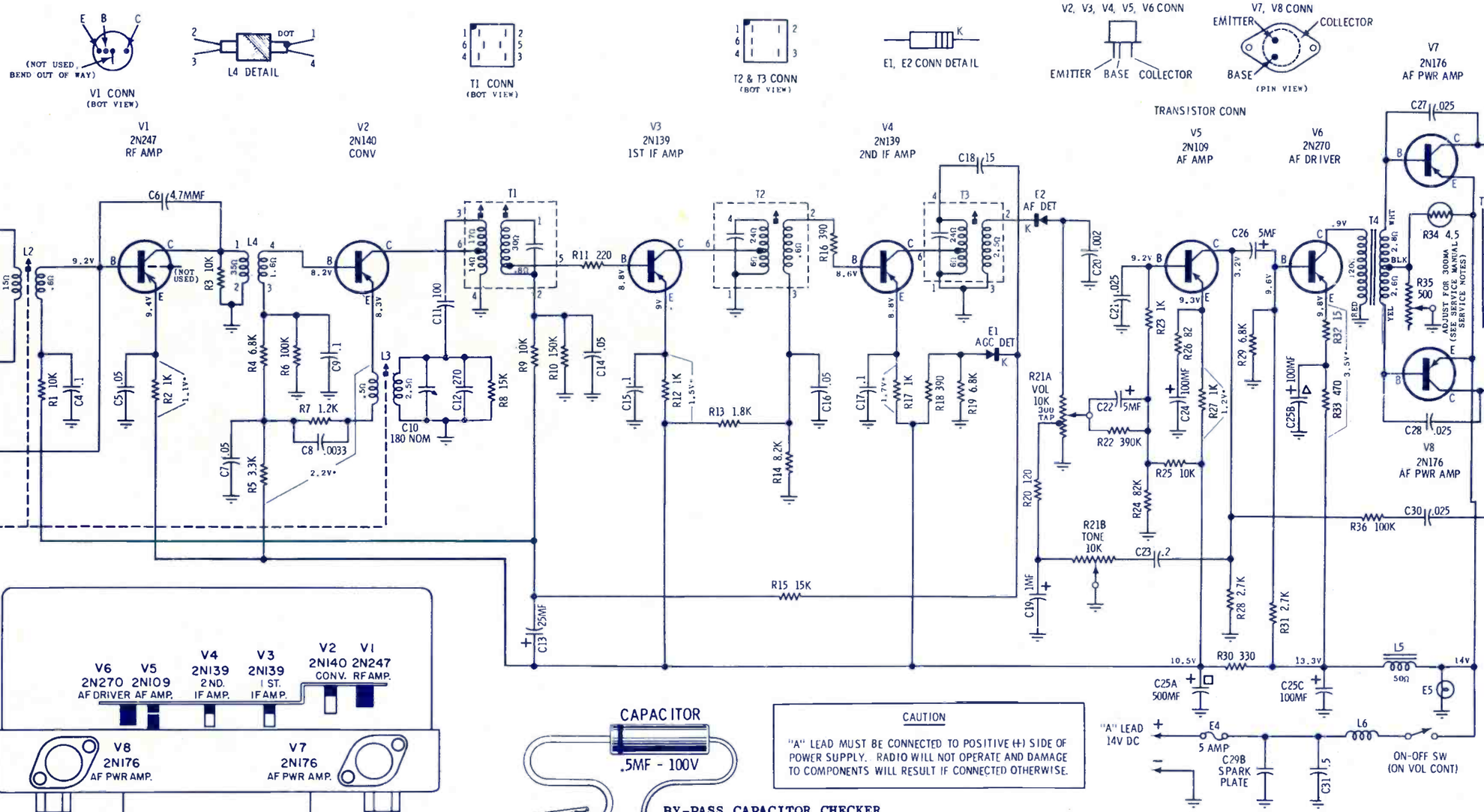
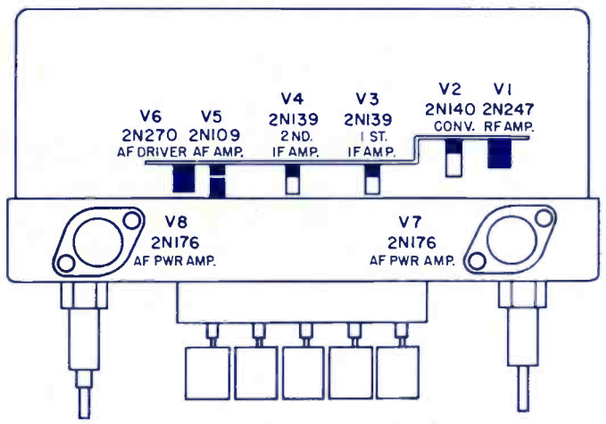
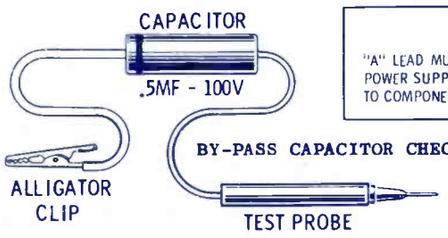
MOTOROLA
Transistor Auto Radio
Model GV-800

NOTES:
CAPACITORS - Decimal values in MF, all others in MMF unless otherwise specified.
VOLTAGES - Measured from point indicated to chassis with a VTVM, ±10%. No signal input. Tuner carriage at high frequency end stop.
INPUT VOLTAGE - 14V DC

TUNING RANGE - 540 KC to 1610 KC.
IF - 262.5 KC.
RESISTANCES MEASURED WITH TRANSISTORS REMOVED FROM ASSOCIATED CIRCUITRY.
*See service manual "EMITTER RESISTOR VOLTAGE" note.







CAUTION

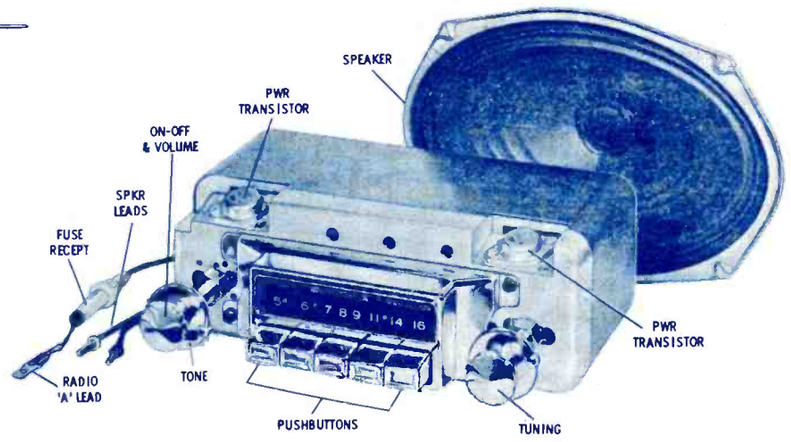
"A" LEAD MUST BE CONNECTED TO POSITIVE (+) SIDE OF POWER SUPPLY. RADIO WILL NOT OPERATE AND DAMAGE TO COMPONENTS WILL RESULT IF CONNECTED OTHERWISE.

In servicing transistor receivers, it will be found there are two main sources of failure, the bias networks and the signal paths. These sources can be checked with equipment now being used to service tube type receivers. The transistors can be checked by substitution or elimination.

When a receiver is defective, the first step is to locate the defective stage. This is accomplished by checking the emitter resistor voltage drops or by injecting a signal from stage to stage. Measuring the emitter resistor voltage drops will locate defects in the bias network or transistor. Signal injection will locate defects in the signal paths.

The next step is to determine if the defect is in the bias network or the transistor. The most rapid way of checking this is to substitute a known good transistor in the defective stage. If the emitter resistor voltage drop remains the same, the original transistor is OK and the defect is in the bias network. When a transistor is not available for substitution, make a resistance check of the stage. If the values are within the tolerance rating, the bias network can be eliminated as a source of defect and the transistor safely suspected.

One of the causes of weak receivers is open by-pass capacitors. To speed the checking of by-passes, a capacitor checker (shown in illustration) can be constructed. When using this aid, clip one end to the chassis and touch the probe to the ungrounded end of the by-pass capacitors. If the by-pass is open, the output level will increase. When checking in the audio section, an increase may not occur but the pitch of the sound will change.



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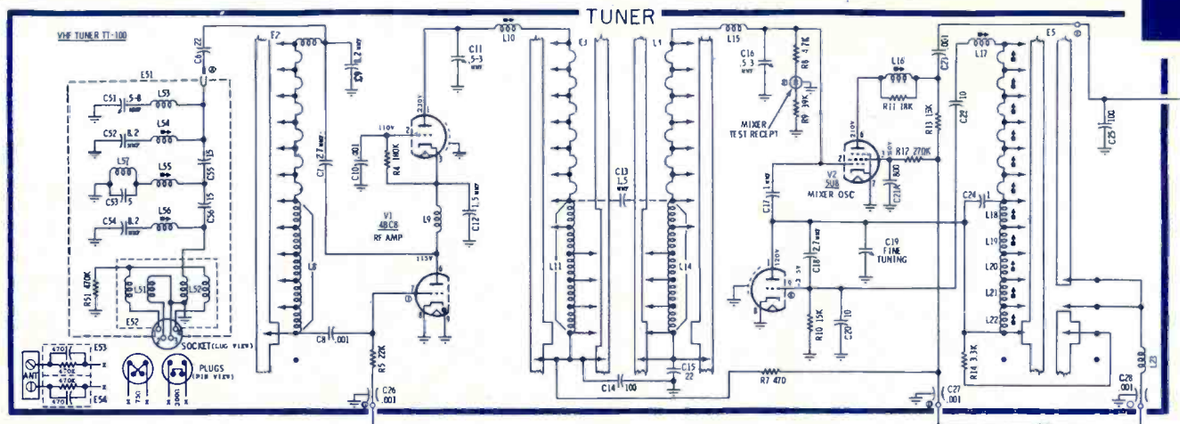
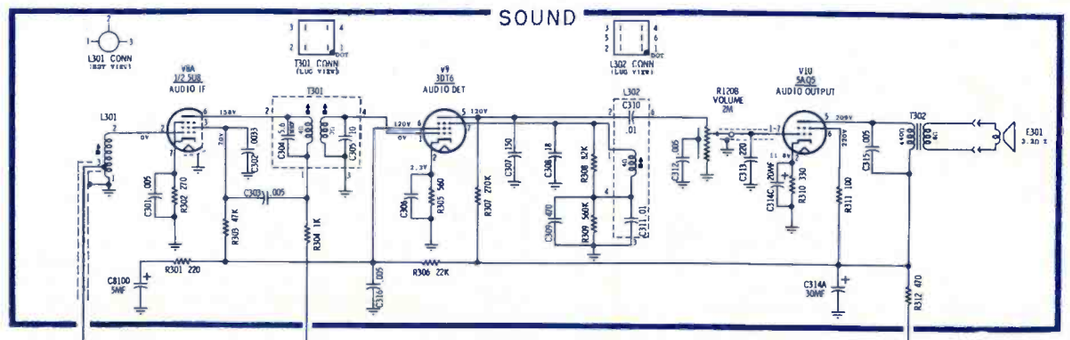
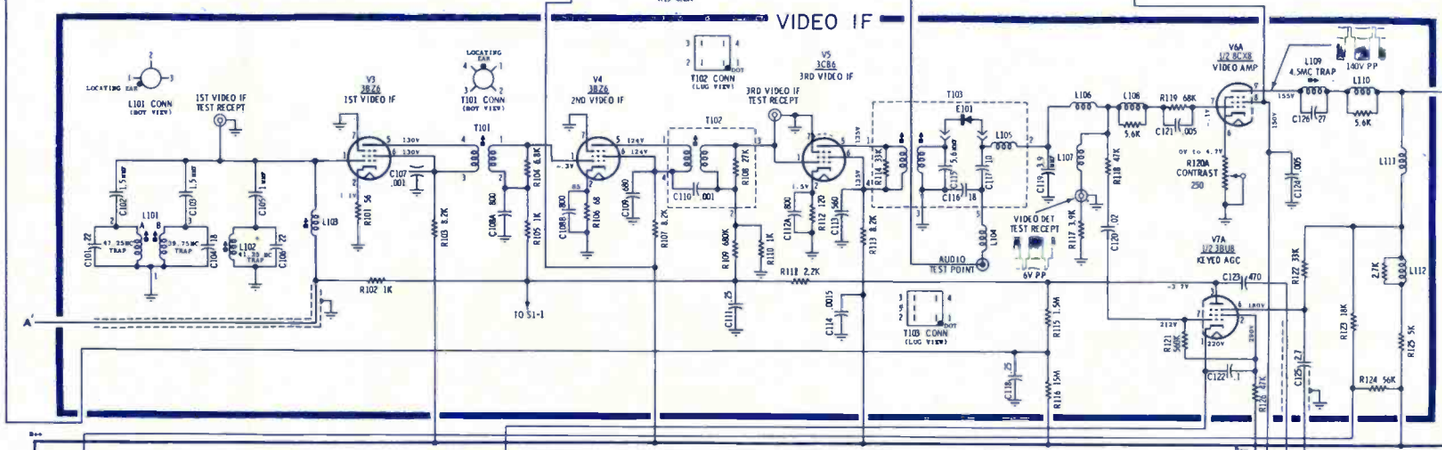
Models 17P3-1, Y17P3-1,
17P3-2, Y17P3-2,
17P3-3, Y17P3-3

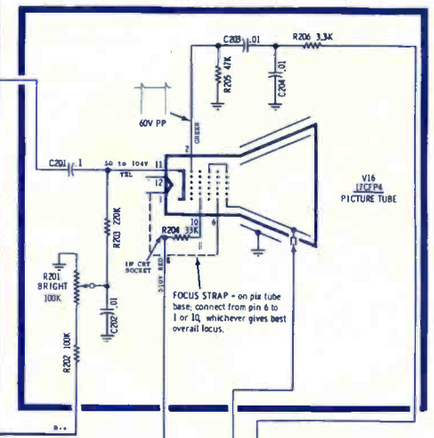
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

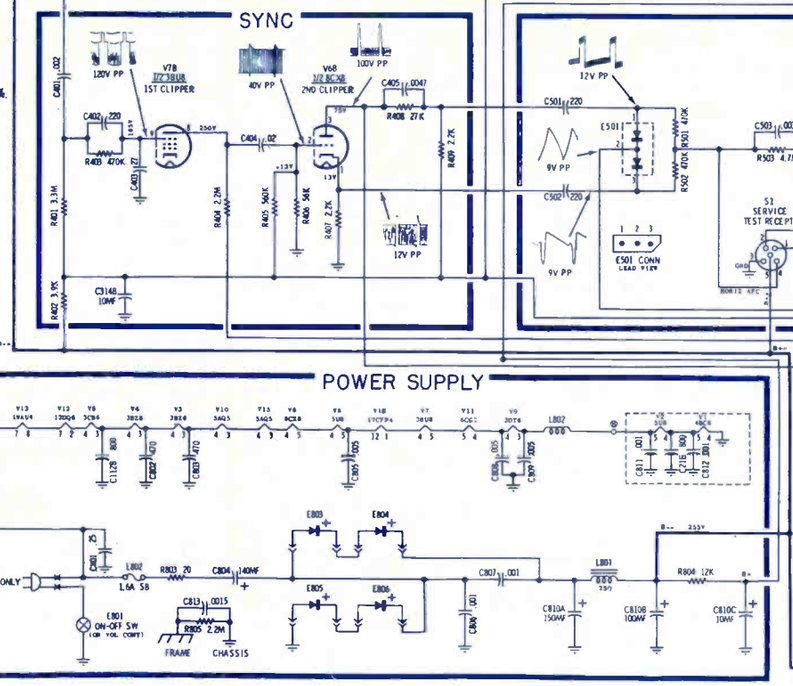
MOTOROLA
Chassis TS427, TS427Y

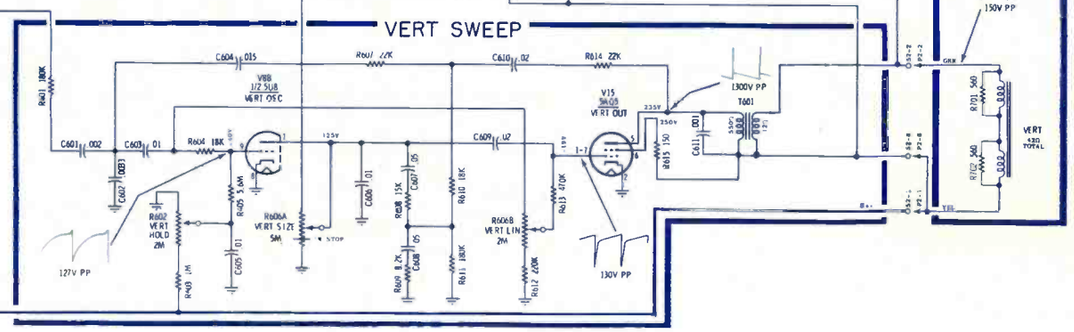


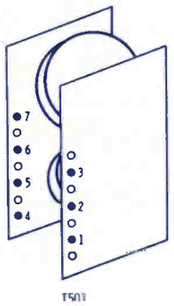












PRODUCTION CHANGES TS-427A-01 thru A-06

Chassis Coding	Changes
A-01	HI-PASS FILTER STANDARDIZATION: TT-100 tuner hi-pass filter (E-51) changed to 1V746007. The 1V746007 filter was used as original equipment on the TT-100Y tuner and is identified by Ref. No. E-1. "Y" chassis not affected.
A-02	R-119 (68K) and C-121 (.005) removed.
A-02-1	Same as production change A-05.
A-03	TO REDUCE REGENERATION: L-301 (Audio take-off) changed.
A-04	TO IMPROVE VERTICAL STABILITY: C-612 (.001 mf) removed.
A-05	RELIABILITY DEVELOPMENT: T-103 (3rd IF) changed: E-101 (diode crystal) changed: R-802 (6 ohms hot, 200 ohms cold) changed to 6 ohms hot, 265 ohms cold.
A-06	HORIZONTAL OUTPUT RELIABILITY CHANGE: R-513 (12 ohms, 1/2W) changed to 12 ohms, 1W. TO REDUCE REGENERATION: L-803 added between pin #4 of V3 and pin #3 of V-4; L-804 added between pin #4 of V-4 and pin #3 of V-5; C-814 (470 mmf) added between pin #4 of V-5 and ground.

NOTES:

CAPACITORS - Decimal values in MF, all others in MMF unless otherwise specified.

VOLTAGE MEASUREMENTS

1. Taken with a VTVM from point indicated to chassis ±20%.
2. Line voltage 120V AC (USE ISOLATION TRANSFORMER).
3. Voltages indicated by an asterisk (*) will vary with associated control settings.
4. Taken with contrast control at minimum and all other controls in normal operating position with no signal input.

WAVEFORMS

1. Taken with a wide-band oscilloscope.
2. Receiver in operating condition and showing a normal picture.

V=VERTICAL H=HORIZONTAL

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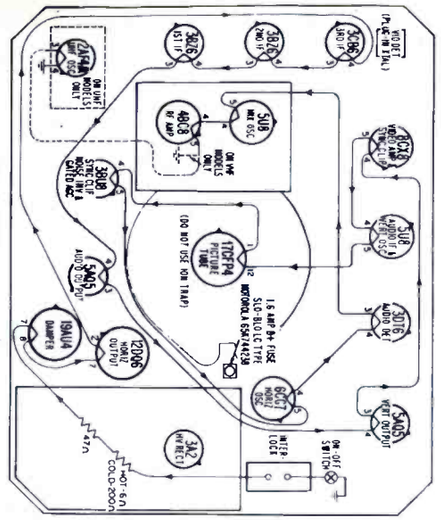
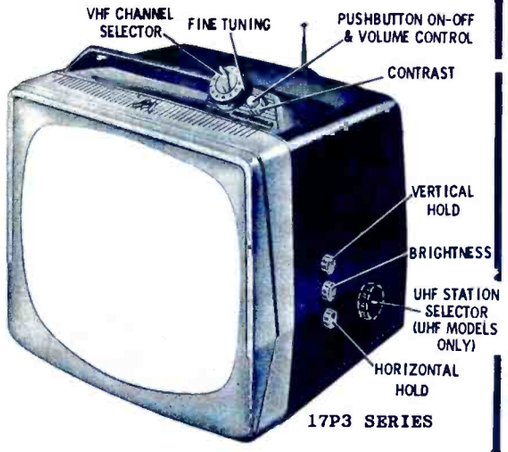
More Data on Reverse Side

TUBE LOCATIONS & FILAMENT WIRING





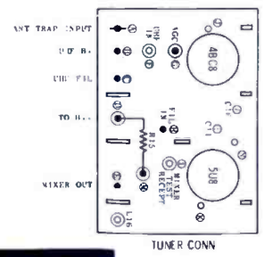
17P3 SERIES

PRODUCTION CHANGES

TV CHASSIS CODING SYSTEM

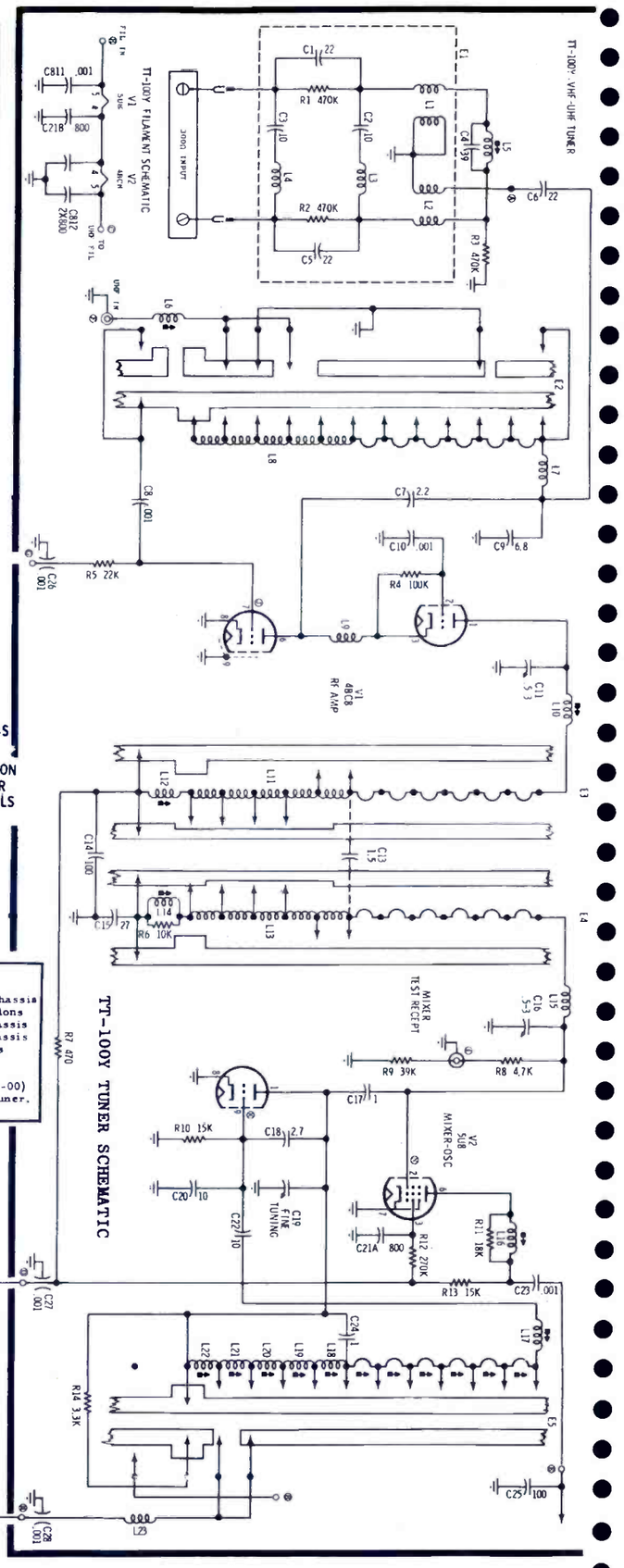
TS-427A-00 . . . . . The original chassis
A-01, 02, etc. . . . Minor electrical revisions of the "A" chassis
A-01-0, A-02-1 . . Deviations from minor electrical revisions
B-00 . . . . . First major revision of the original chassis
B-01, 02, etc. . . . Minor electrical changes of the "B" chassis
Prefixes such as W, R, V, T, etc... Mechanical differences between chassis

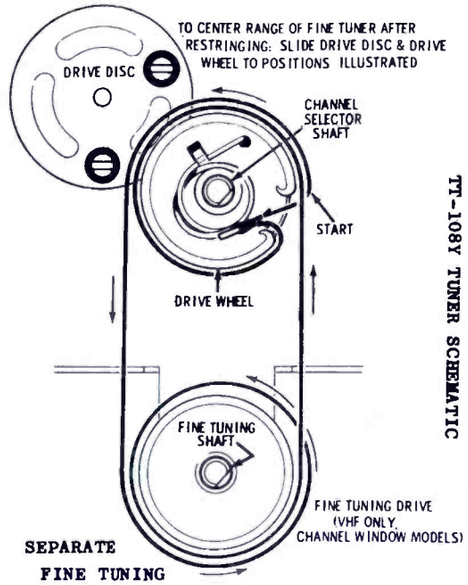
A "Y" suffix added to the basis chassis (example, TS-427YA-00) indicates that the chassis contains a factory-installed UHF tuner.

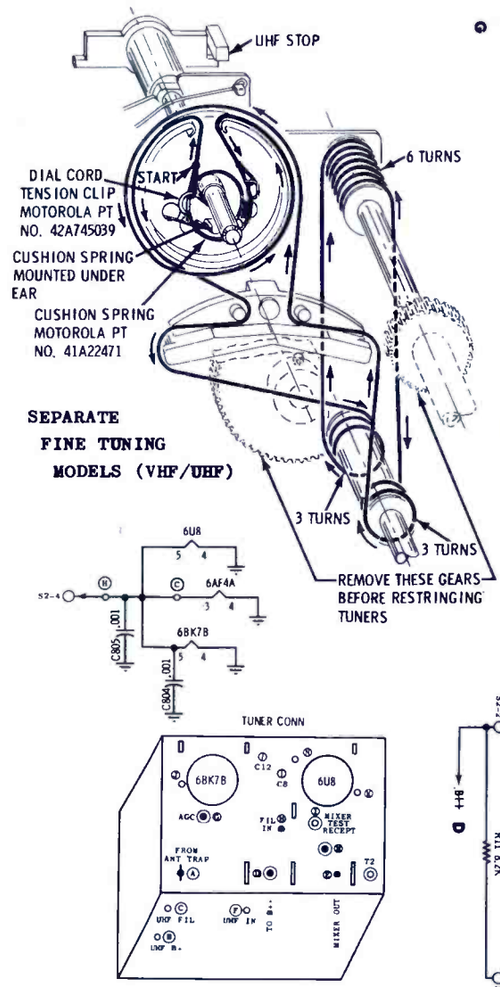


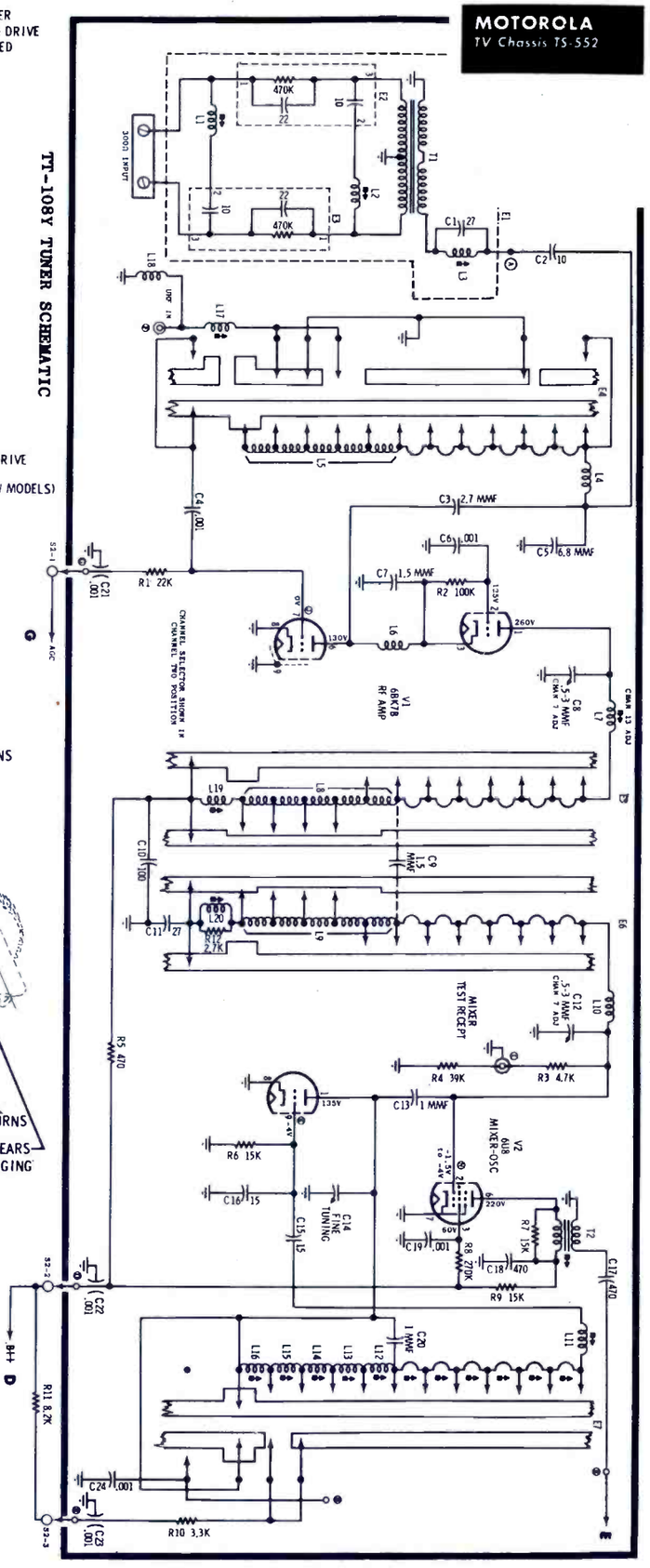
MOTOROLA
Chassis TS427, TS427Y

More Data on Reverse Side









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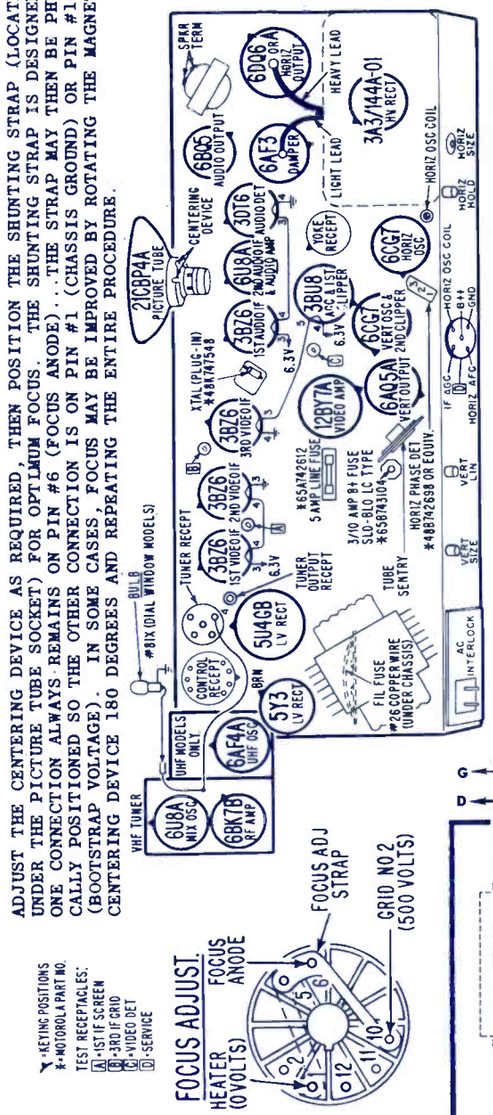
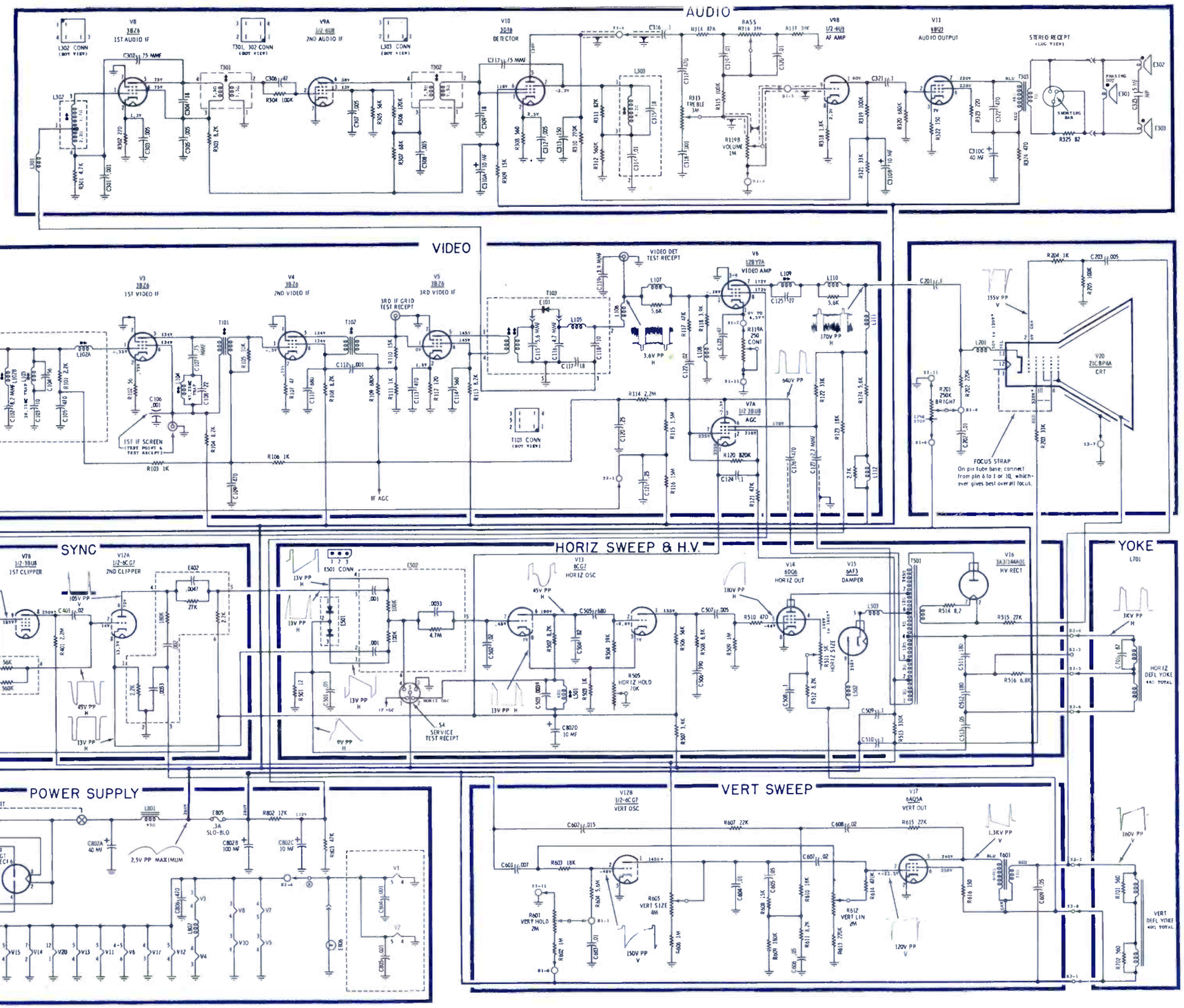
Models 21K104B, M, W,
21K105B, MC, W
21K108W, 21K109M, 21K110W

ADJUST THE CENTERING DEVICE AS REQUIRED, THEN POSITION THE SHUNTING STRAP (LOCATED UNDER THE PICTURE TUBE SOCKET) FOR OPTIMUM FOCUS. THE SHUNTING STRAP IS DESIGNED SO ONE CONNECTION ALWAYS REMAINS ON PIN #6 (FOCUS ANODE)..THE STRAP MAY THEN BE PHYSICALLY POSITIONED SO THE OTHER CONNECTION IS ON PIN #1 (CHASSIS GROUND) OR PIN #10 (BOOTSTRAP VOLTAGE). IN SOME CASES, FOCUS MAY BE IMPROVED BY ROTATING THE MAGNETIC CENTERING DEVICE 180 DEGREES AND REPRATING THE ENTIRE PROCEDURE.

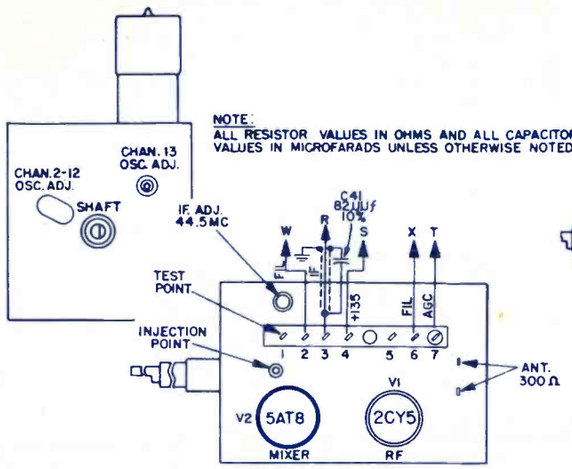
TUBE LOCATION, FUSE GUIDE, FOCUS INFORMATION & FILAMENT WIRING



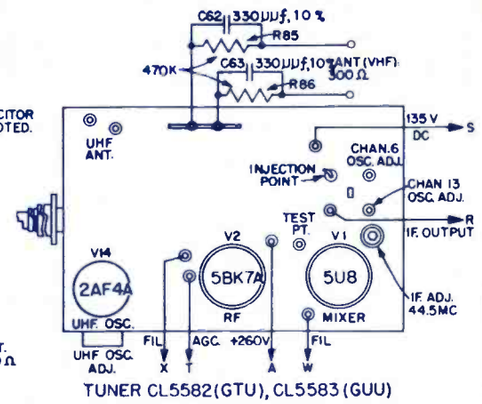


OLYMPIC
Chassis GT, GU, GTU, GUU

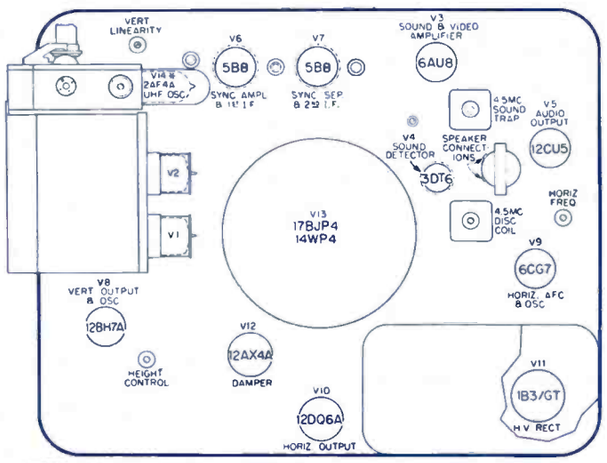
NOTE:
ALL RESISTOR VALUES IN OHMS AND ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE NOTED.



TUNER CL5593(GT), CL5594(GU)



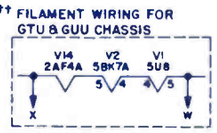
TUNER CL5582(GTU), CL5583(GUU)

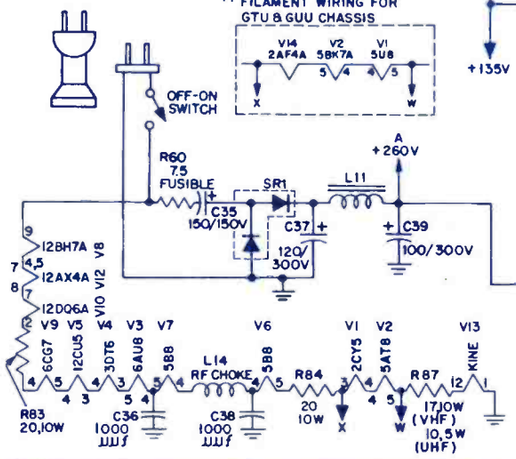


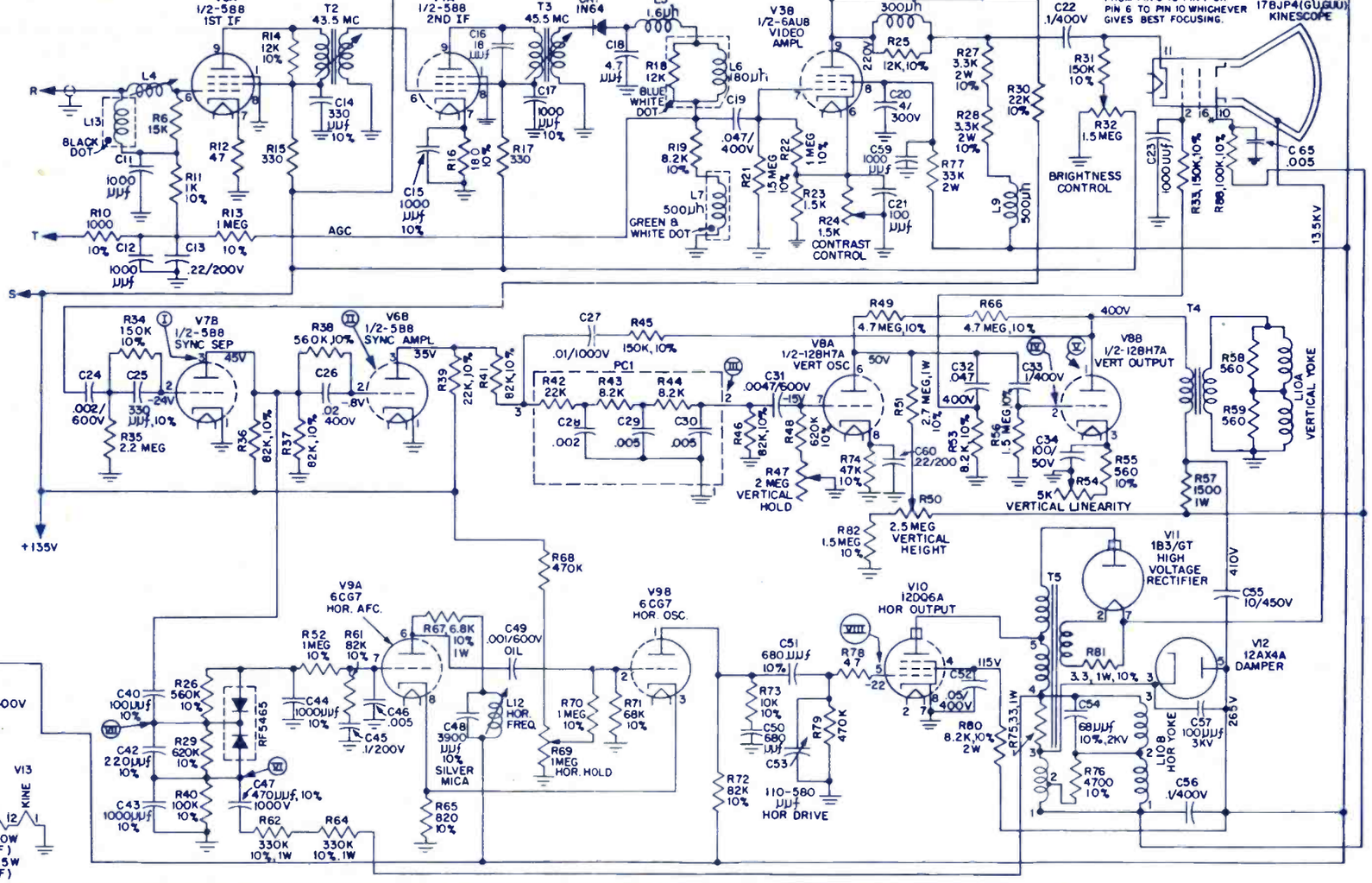
CHASSIS	TUNER	V1 FUNCTION	V2 FUNTION
GT, GU	VHF	2CY5 R.F.	5AT8 MIXER
GTU, GUU	VHF/UHF	5U8 MIXER	5BK7A R.F.
* USED IN	VHF/UHF	TUNER ONLY.	

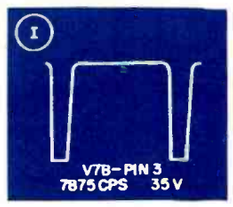
TUBE LAYOUT

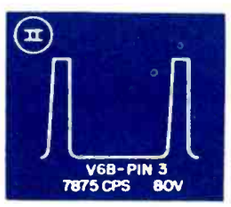
†† FILAMENT WIRING FOR GTU & GUU CHASSIS

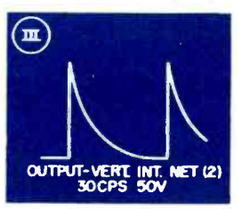


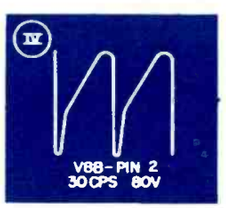


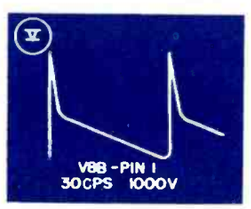


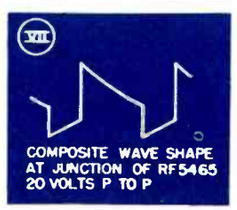


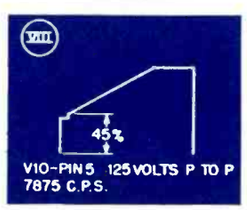












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ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

OLYMPIC
TV Chassis GD, GDU, GH, GHU

TUBE LAYOUT

ANTENNA BINDING POST

LOCAL-DISTANCE SWITCH

SPEAKER SOCKET

BUZZ CONTROL

LEVEL CONTROL

DRIVE CONTROL

LINE CORD SOCKET

WIDTH CONTROL

LINEARITY

CHANNEL SELECTOR & FINE TUNING

HEIGHT

OFF-ON (PUSH) VOLUME & CONTRAST

VERT. & HORIZ. CONTROL

BRIGHTNESS CONTROL

TONE CONTROL 3D-CONTROL (PUSH)

CHASSIS	TUNER	V1	FUNCTION	V2	FUNCTION
GD,GH	CL5661	6BS8	RF	6AT8	MIXER
GDU,GHU	CL5662	6U8	MIXER	6BK7	RF

* USED IN CL5662 (UHF TUNERS) ONLY.

OSC. ADJUST CH. 2-12

CH. 13

CH. 2-12

SHAFT

FRONT VIEW OF TUNER

VIDEO I.F.

44.5 MC I.F. ADJ. L301

R.F. TEST POINT

INJECTION POINT

FILAMENT

ANTENNA TERMINALS 300Ω

A.G.C.

+140 V.

+250 V.

6AT8 V2 MIXER

6BS8 V1 R.F.

OLYMPIC TUNER PART NO. CL 5661

UHF ANT. INPUT

VHF ANT. INPUT

CH. 6 OSC.

CH. 13 OSC.

INJECTION POINT

L301 I.F. COIL 44.5 MC

IF OUTPUT

+250 V.

AGC

AFT

6AF4A V18 UHF OSC.

6BK7 V2 R.F.

6U8 V1 MIXER

UHF OSC. ADJUSTMENTS

OLYMPIC TUNER PART NO. CL5662

SPEAKERS FOR COMBINATION MODELS ONLY

TWEETERS

YOKE PLUG

3D SWITCH (ON TONE CONTROL)

YOKE SOCKET

FOR ALL OTHER MODELS

TWEETER

3D SWITCH (ON TONE CONTROL)

6U8 V3A SOUND I.F. AMPLIFIER

6BN6 V4 DISCRIMINATOR

6DG6 OR 6W6/GT V5 AUDIO OUTPUT

T1 AUDIO OUTPUT TRANSFORMER

SPEAKER SOCKET

L2 FILTER CHOKE 6.2Ω

+140 V.

+280 V.

6BZ6 V6 1ST I.F.

6BZ6 V7 2ND I.F.

6CB6 V8 3RD I.F.

VIDEO DETECTOR CRYSTAL DIODE TYPE 1N64 OR 1N60

6AW8A V9A VIDEO AMPLIFIER

ADJ. SOUND TRAP

+280 V.

+140 V.

6AW8A V9B NOISE INVERTER

V3B 6U8 SYNC. SEPARATOR

12AU7 V10A SYNC. AMPLIFIER

12AU7 V10B SYNC. AMPLIFIER

12BH7A V11A VERT. OSCILLATOR

12BH7A V11B VERT. OUTPUT

T6 VERT. OUTPUT TRANSFORMER

VERTICAL DEFLECTION COIL

GROUNDED TO TUBE SUPPORT BRACKET

5U4GA OR 5U4-G V16 RECTIFIER

T7 POWER TRANSFORMER

L14 FILTER CHOKE 62Ω

280 V.

LINE CORD 105-120 V. A.C.

INTERLOCK

ON-OFF SWITCH ON SOUND VOLUME CONTROL

SOCKET ON MASONITE CABINET BACK

PLUG ON CHASSIS

6.3 V. 9.0 A.

5.0 V. 3.0 A.

TO TUNER ANTENNA (VHF) INPUT

300Ω VHF ANT. INPUT

LOCAL-DISTANT SWITCH

6CG7 V12A HORIZONTAL AFC & OSCILLATOR

6CG7 V12B

6DQ6 V13 HORIZONTAL OUTPUT

T8 HORIZ. OUTPUT & H.V. TRANSFORMER

1B3/GT V14 HIGH VOLTAGE RECTIFIER

6AX4/GT V15 DAMPER

KINESCOPE RECTANGULAR

L13B YOKE HORIZONTAL DEFLECTION COIL

+140 V.

+280 V.

+280 V. BOOST

NOTES:

1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. ALL MICA AND CERAMIC CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND CHASSIS, USING AN ELECTRONIC VOLTMETER. ALL VOLTAGE READINGS ±15%, MEASURED WITH AN INPUT VOLTAGE OF 117 VOLTS, 60 CYCLES, A.C. WITH INCOMING SIGNAL AND WITH CONTRAST CONTROL SET TO PRODUCE 50 VOLTS PEAK TO PEAK AT KINESCOPE.
4. VOLTAGE MEASUREMENTS FOR THE CG,CH CHASSIS ARE APPROXIMATELY 10% HIGHER THAN SHOWN ON THE SCHEMATIC DIAGRAM, EXCEPT FOR THE +140 VOLT SUPPLY.
5. CERAMIC CONDENSERS, DISC TYPE.
6. THE VALUES OF THESE CAPACITORS (C2, C20) IN SOME INSTANCES MAY BE 33μμf, 47μμf, OR 68μμf. REPLACE WITH IDENTICAL PART.
7. LEVEL-SWITCH CONTROL SHOWN IN LOCAL POSITION.
8. KINESCOPE FOCUSING: CONNECT SPRING JUMPER FROM PIN 6 TO PIN 1 OR FROM PIN 6 TO PIN 10, WHICHEVER GIVES BEST FOCUS.

I V3B - PIN 1 7875 CPS 20 V.

II V10B - PIN 8 7875 CPS 60 V.

III OUTPUT - VERT INT NET (2) 30 CPS 50 V.

IV V11 - PIN 2 30 CPS 80 V.

V V11B - PIN 1 30 CPS 1000 V.

VI FEEDBACK FROM TOP OF YOKE 2.6 VOLTS P TO P

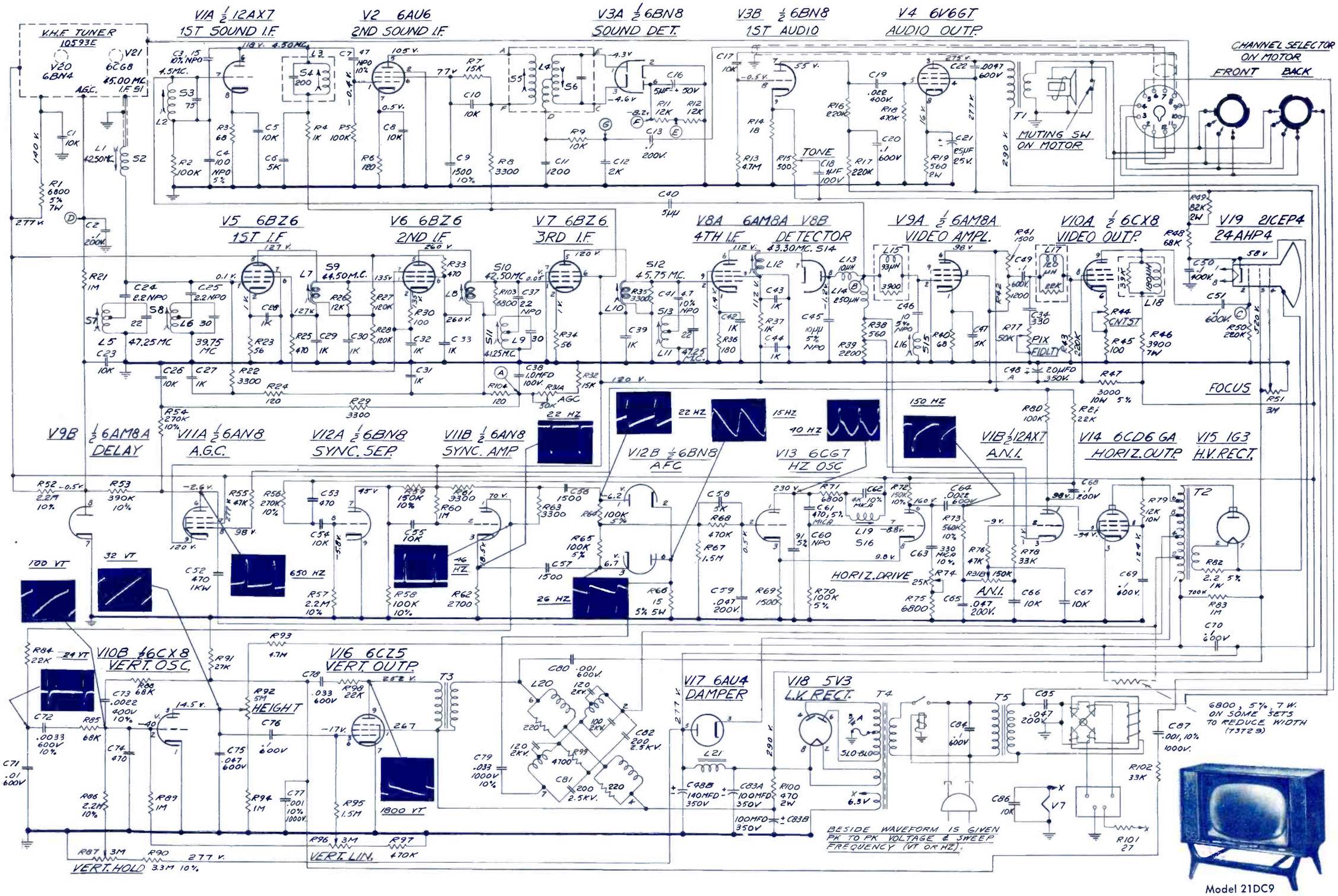
VII COMPOSITE WAVE SHAPE AT CENTRE OF SR1 7875 CPS 20 V.

VIII V 13 PIN 5 7875 CPS 115 V.

PACKARD-BELL

TV Chassis 98D4

Models 21DC9, 10; 24DC5



Model 21DC9

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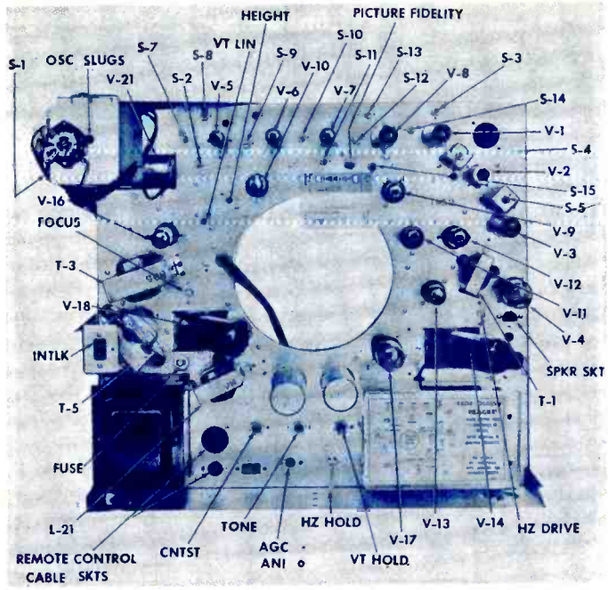
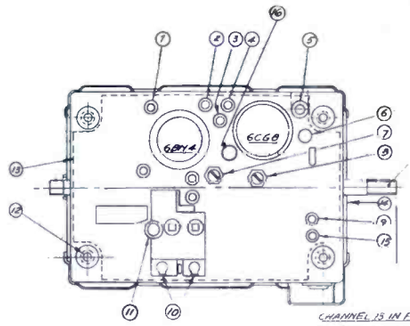
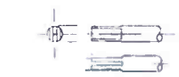
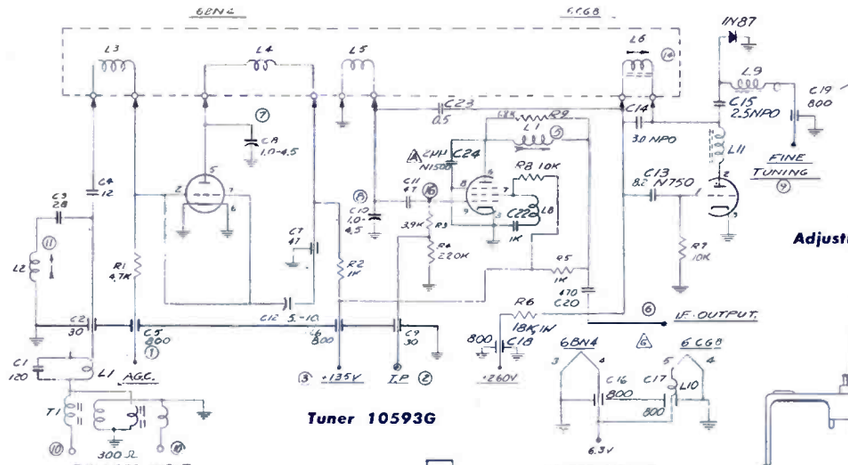


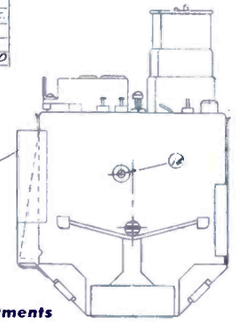


ITEM NO	DESCRIPTION
1	A.G.C.
2	RF TEST.
3	B + 135 V.
4	HEATER.
5	I.F. ADJUST.
6	I.F. TERMINAL.
7	RF TRIM.
8	MIXER TRIM.
9	FINE TUNING.
10	ANTENNA.
11	SERIES ADJUST.
12	8-32 TAP & HOLES.
13	MOUNTING CLEARANCE.
14	OSC SLUG ADJUST.
15	B+ 260 V.
16	ACCESS TO MIXER GRID.



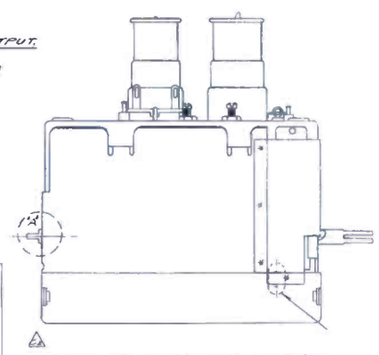


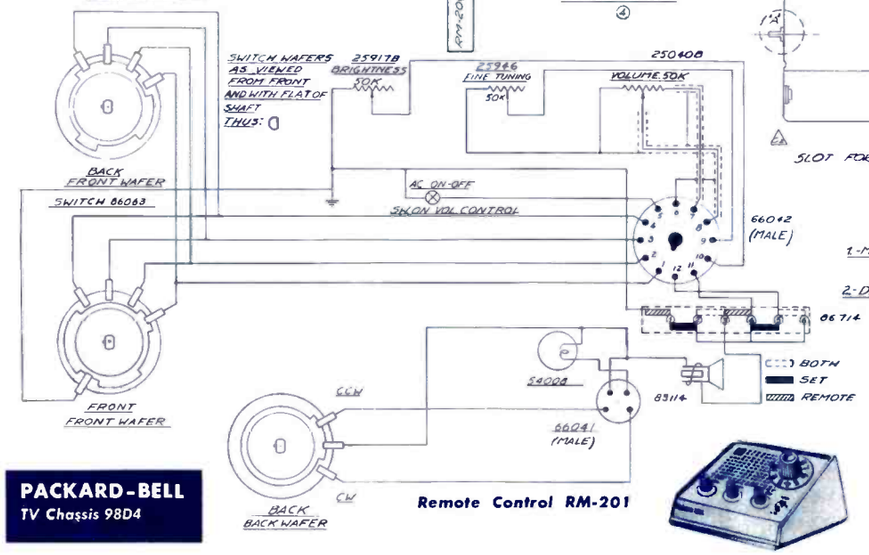
Tuner 10593G



EXTREME POSITION

Adjustments

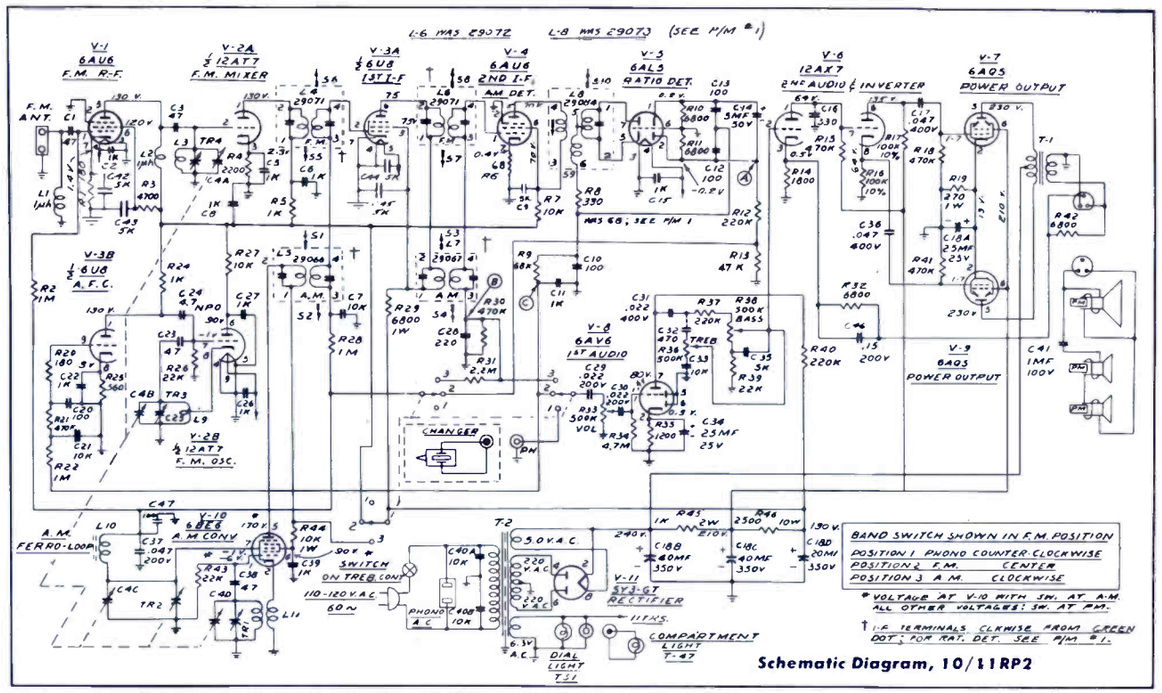




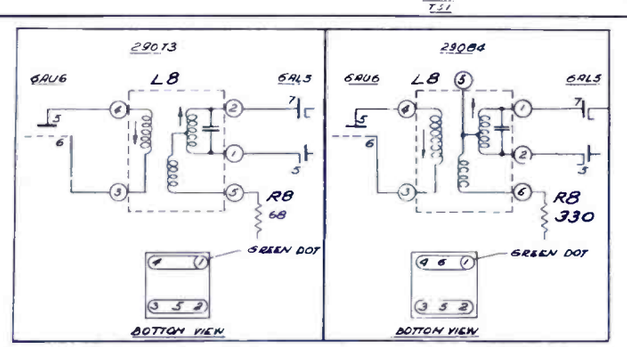
Remote Control RM-201

NOTES:
1-MFD BY STANDARD COIL CO PART NO TX-N4A-84
2-DETENTS FOR 12 CHANNELS
3-TORQUE: VHF 120 IN. OZ.
4-STAMP PACKARD BELL PART NO, ISSUE LETTER & MFR'S I.D. MARK ON PART.
5-FINE TUNING SWEEP: 4.3 MC MIN ON CHANNEL 2.- 2 MC ON CHANNEL 13.
6-OSCILLATOR INJECTION ON ANY CHANNEL SHALL NOT BE LESS THAN TWO VOLTS WITH FINE-TUNING ADJUSTED FOR LOWEST INJECTION

PACKARD-BELL
TV Chassis 98D4



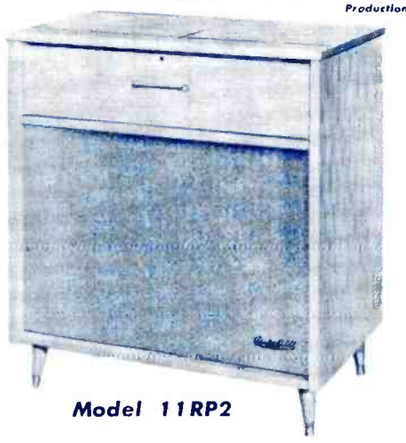
Schematic Diagram, 10/11RP2



Production Modification 1

LIST OF ADJUSTMENTS:

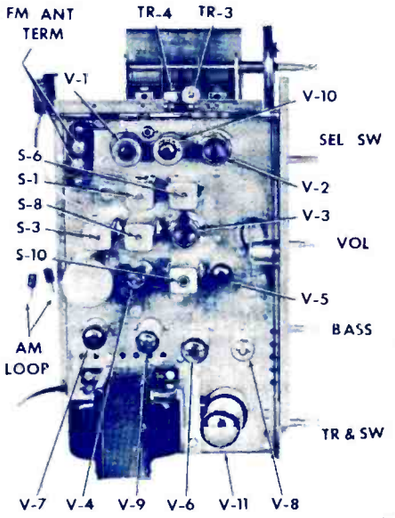
S-1	1st I-F, AM, primary
S-2	1st I-F, AM, secondary
S-3	2nd I-F, AM, primary
S-4	2nd I-F, AM, secondary
S-5	1st I-F, FM, primary
S-6	1st I-F, FM, secondary
S-7	2nd I-F, FM, primary
S-8	2nd I-F, FM, secondary
S-9	Ratio detector, primary
S-10	Ratio detector, secondary
TR-1	Trimmer, AM oscillator
TR-2	Trimmer, AM R-F
TR-3	Trimmer, FM oscillator (C-25)
TR-4	Trimmer, FM R-F



Model 11RP2

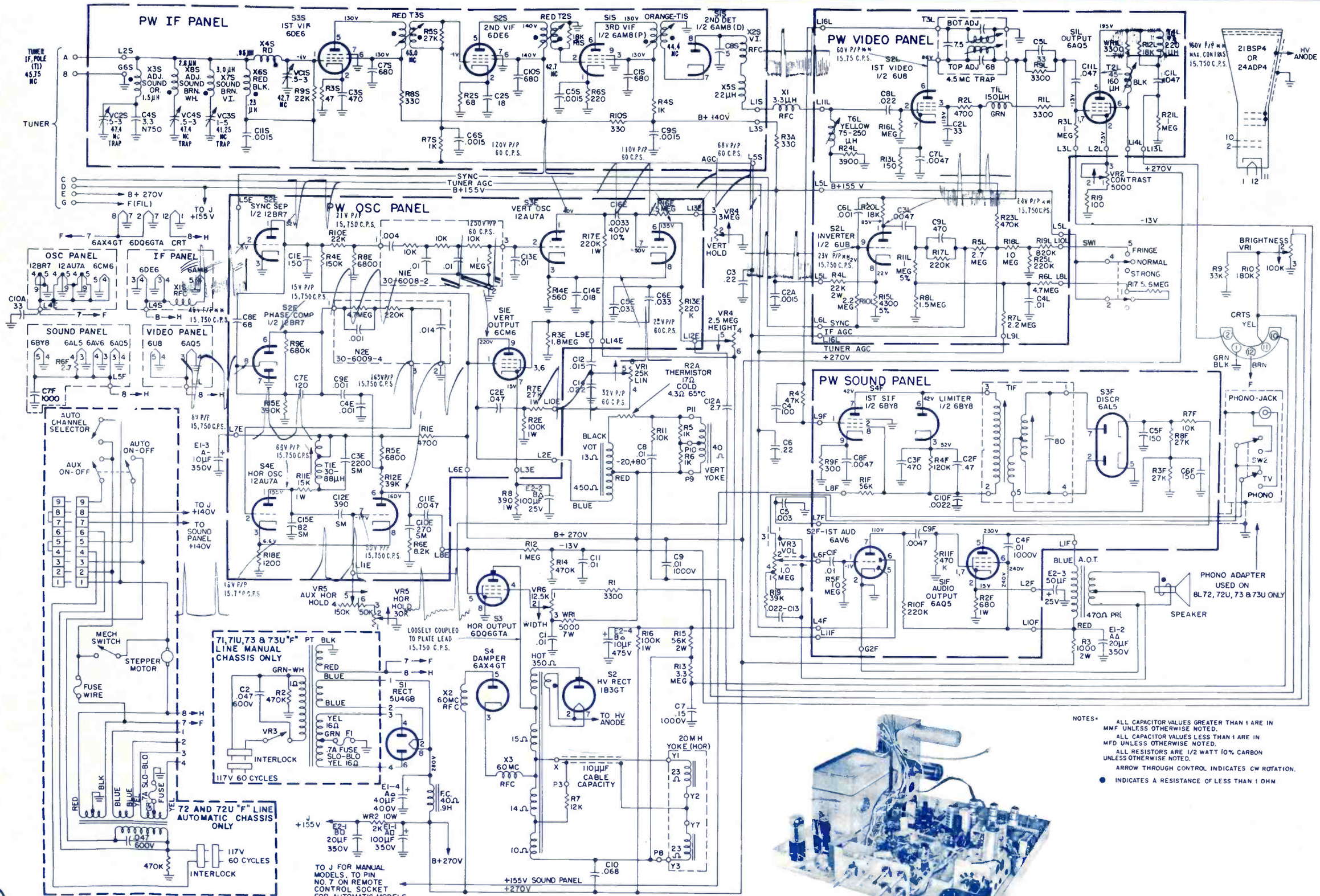
PRODUCTION MODIFICATIONS
(abbreviated p/m)

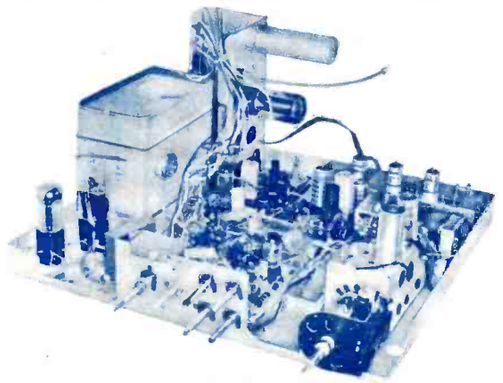
1. Ratio detector coil 29073 was replaced by 29084. This involved a change in connections which is illustrated in Fig. 3. (The coil number is stamped on the can). Also with this change the value of R-8 went from 68 to 330 ohms. Ratio detector change was covered in Service Note SN-32 but resistor change was not mentioned there.
2. To reduce the directional characteristic of the ferroloop, an additional antenna was added. This consists of two turns of wire extending around the inside of the cabinet and coupled to the ferroloop. See chassis photo, Fig. 5.
3. The four 5000 mmf capacitors, C-42, C-43, C-44, & C-45 in V-1 and V-3A circuits were, in original production, two dual 4000 mmf capacitors.
4. To reduce radiation, capacitor C-47 and resistor R-6 were added to the circuit. (V-10 and V-4 sections.)
5. I-F transformer 29072 was replaced by 29071, but this change does not affect other circuitry or the alignment.
6. To prevent I-F shift with strong signal, R-13 was changed from 100,000 ohms to 47,000 ohms.



PHILCO

Chassis 8L71, 8L71U, 8L72, 8L72U, 8L73, 8L73U





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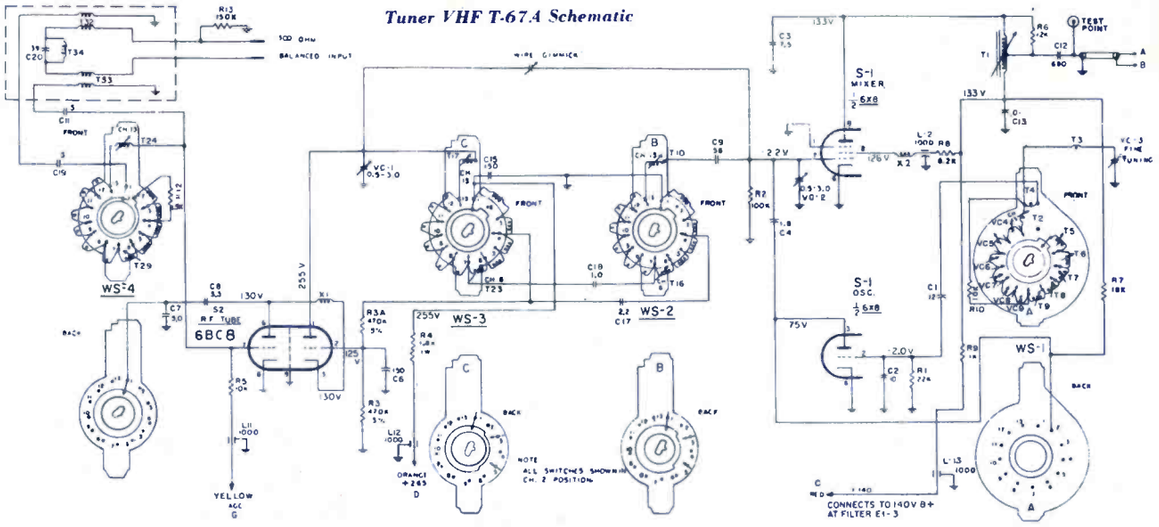
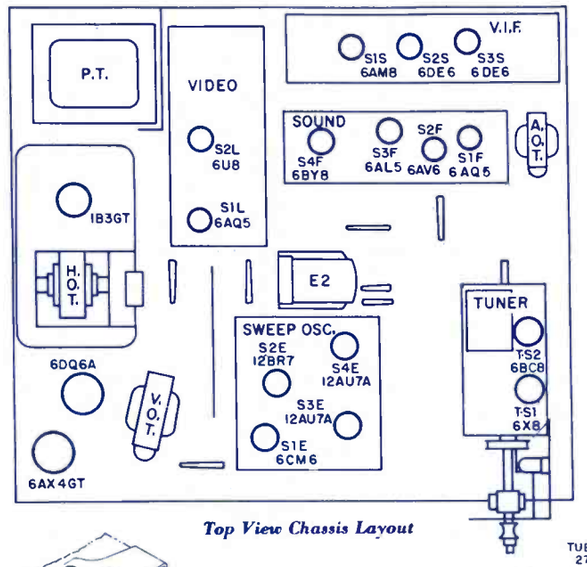
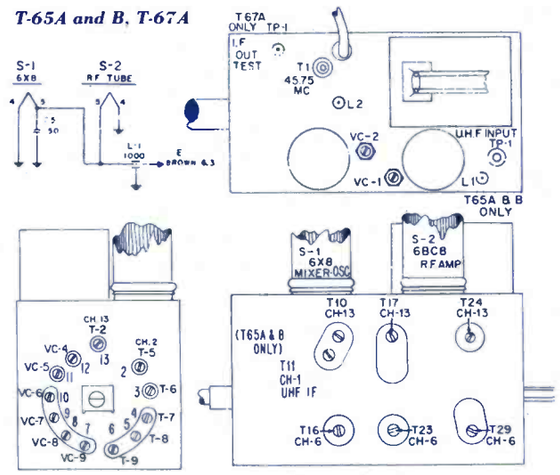
Tuner VHF T-67A Schematic

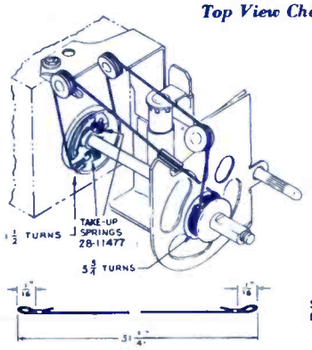


Top View Chassis Layout

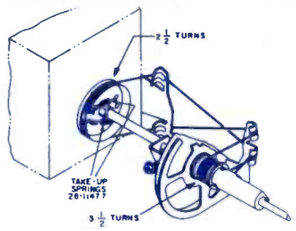


T-65A and B, T-67A

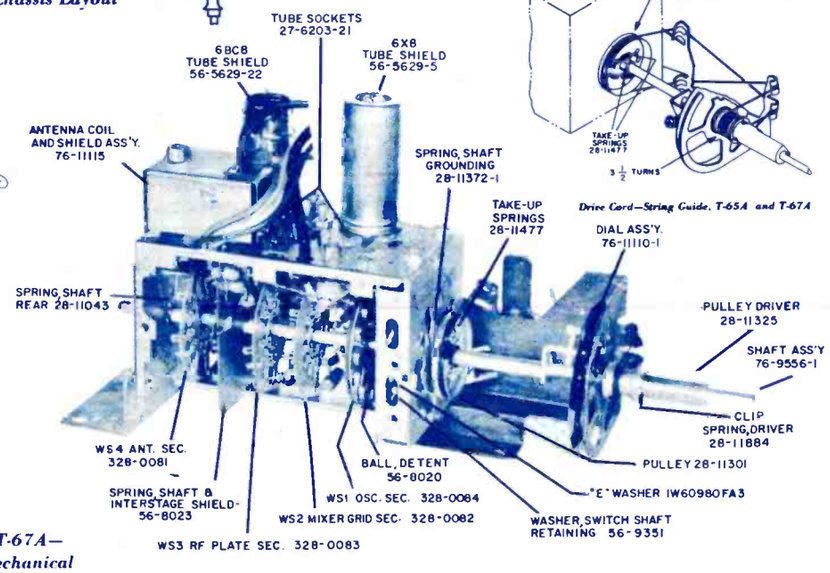




Drive Cord—String Guide, T-65B



Drive Cord—String Guide, T-65A and T-67A

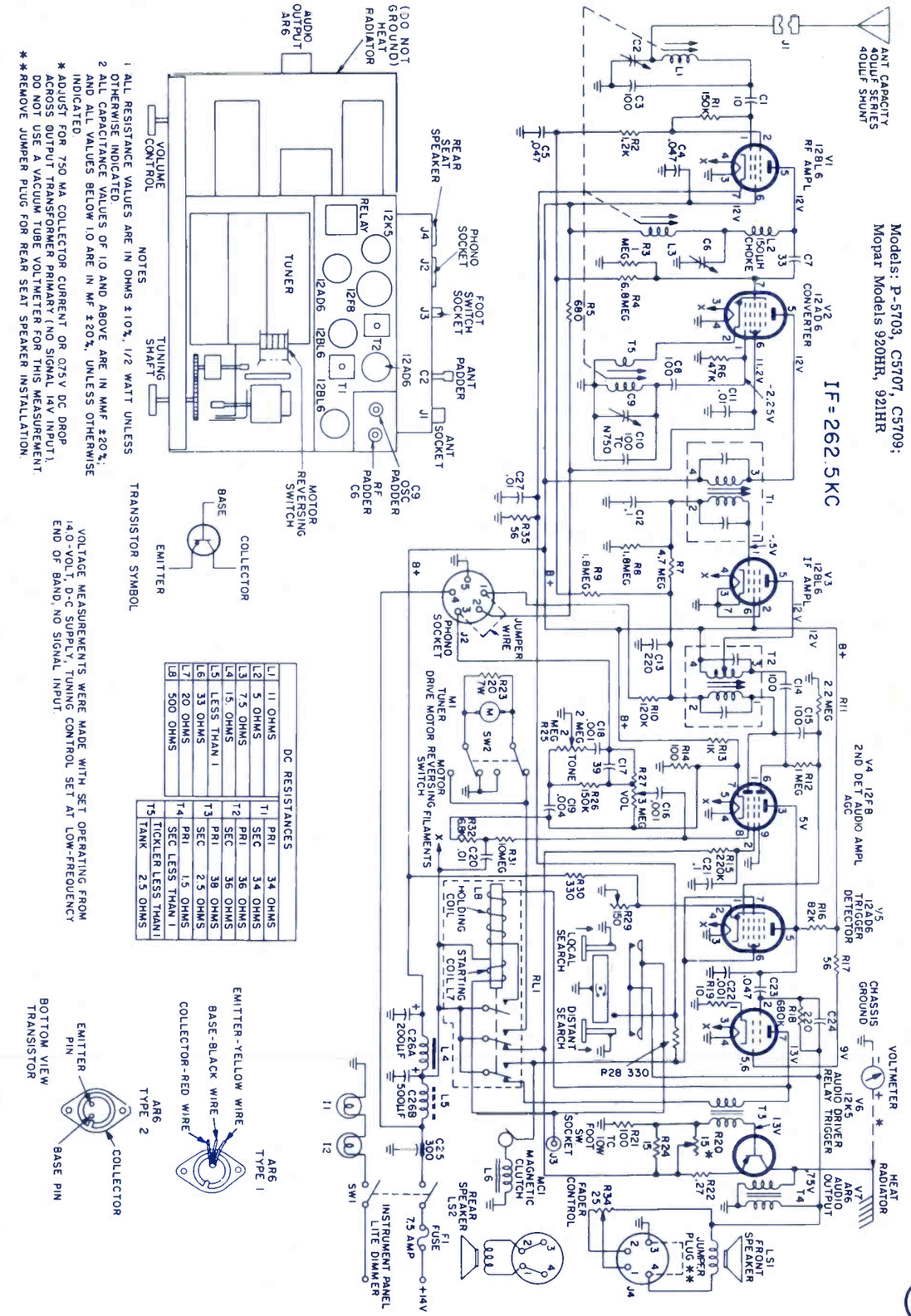


Tuner T-67A—Photo Mechanical Components

PHILCO
Chassis 8L71, 8L71U, 8L72, 8L72U, 8L73, 8L73U

Models: P-5703, C5707, C5709; Mopar Models 920HR, 921HR

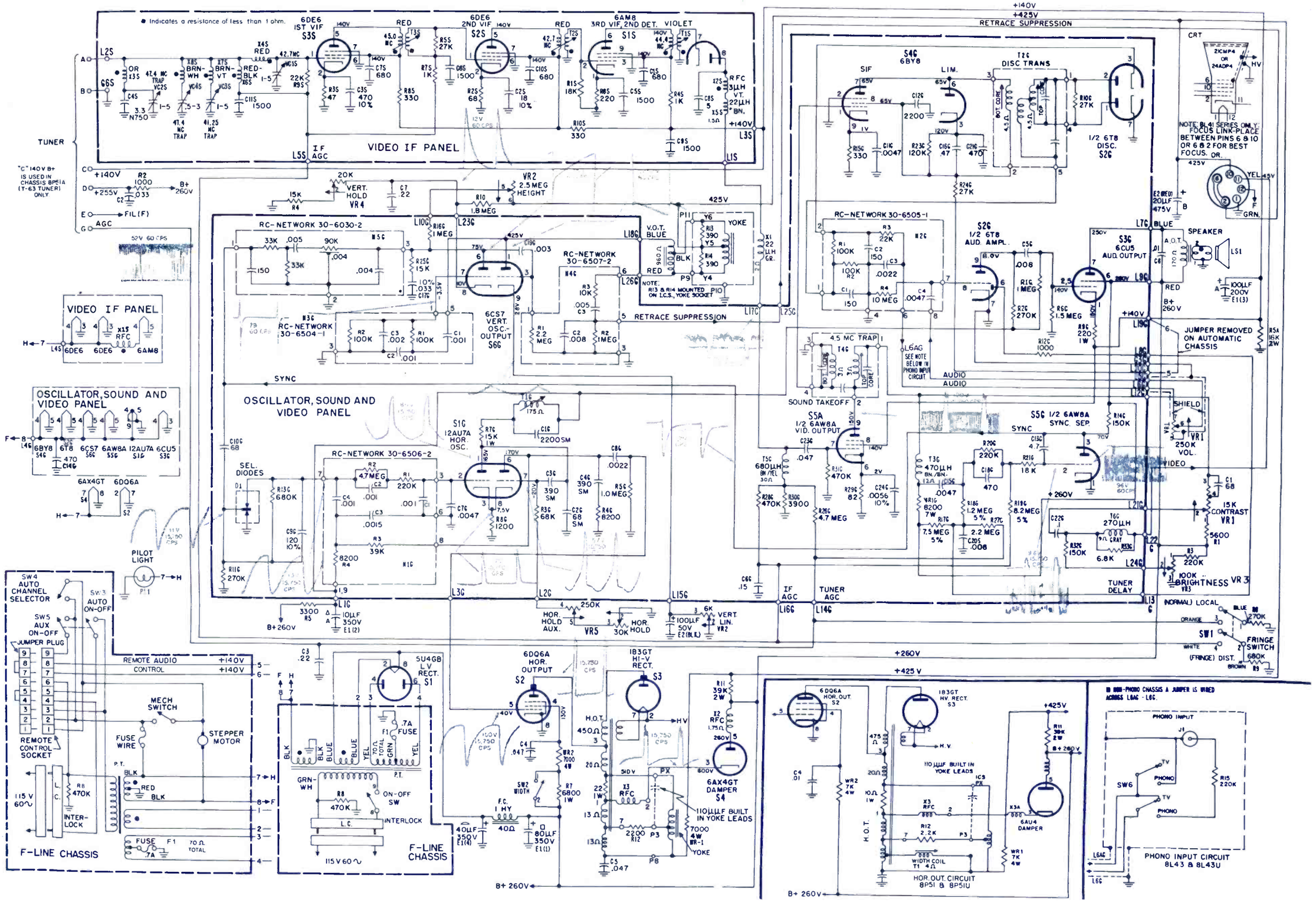
IF = 262.5 KC



DC RESISTANCES			
L1	11 OHMS	T1	PRI 34 OHMS
L2	5 OHMS		SEC 34 OHMS
L3	7.5 OHMS	T2	PRI 36 OHMS
L4	15 OHMS		SEC 36 OHMS
L5	LESS THAN 1	T3	PRI 38 OHMS
L6	33 OHMS		SEC 2.5 OHMS
L7	20 OHMS	T4	PRI 1.5 OHMS
L8	500 OHMS		SEC LESS THAN 1
		T5	TICKLER LESS THAN 1
			TANK 2.5 OHMS

PHILCO

Chassis 8L41, 8L41U, 8L42, 8L42U, 8L43, 8L43U, 8P51, 8P51A, 8P51U



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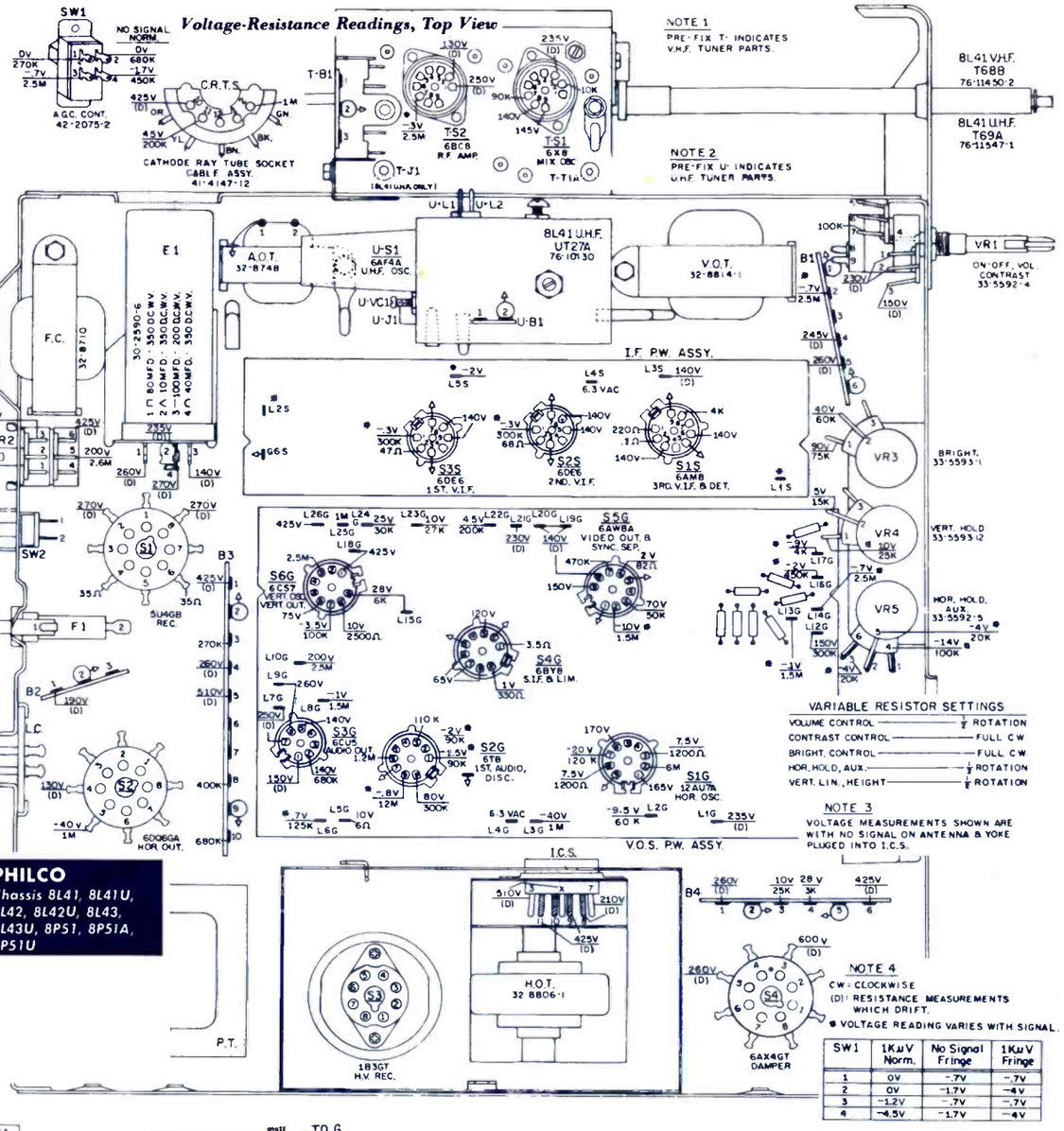
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

PHILCO
Auto Radio Model M5841

PHILCO
Chassis 8L41, 8L41U, 8L42, 8L42U, 8L43, 8L43U, 8P51, 8P51A, 8P51U

Voltage-Resistance Readings, Top View



SW1	1KuV Norm.	No Signal Fringe	1KuV Fringe
1	0V	-.7V	-.7V
2	0V	-1.7V	-4V
3	-1.2V	.7V	-.7V
4	-4.5V	-1.7V	-4V

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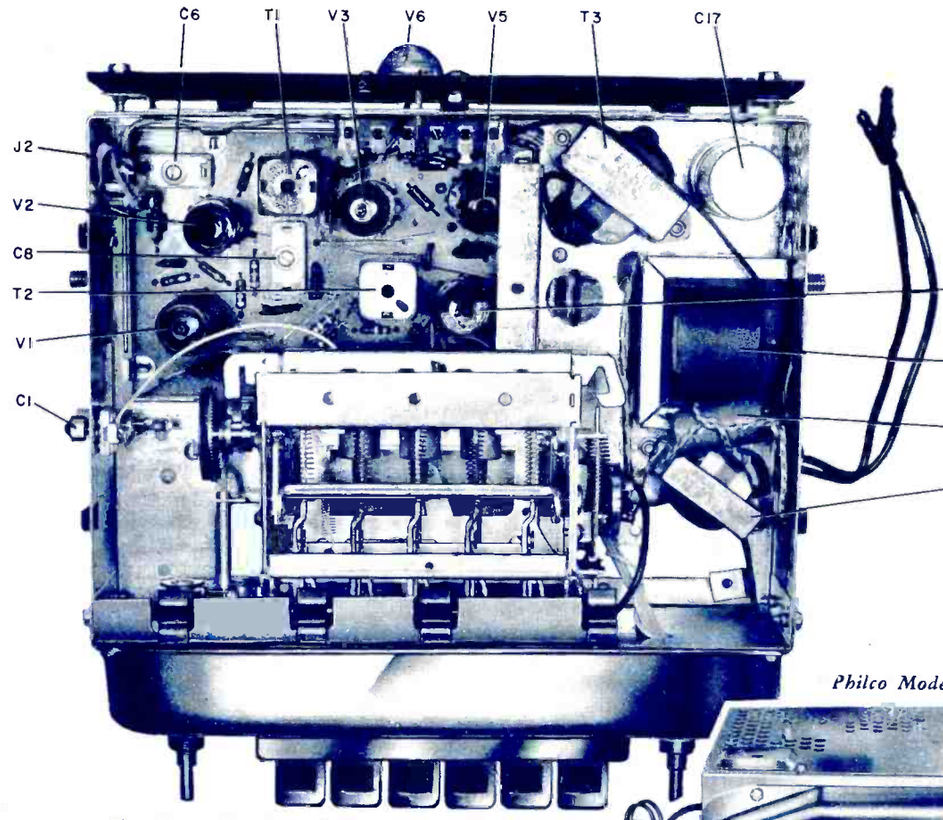
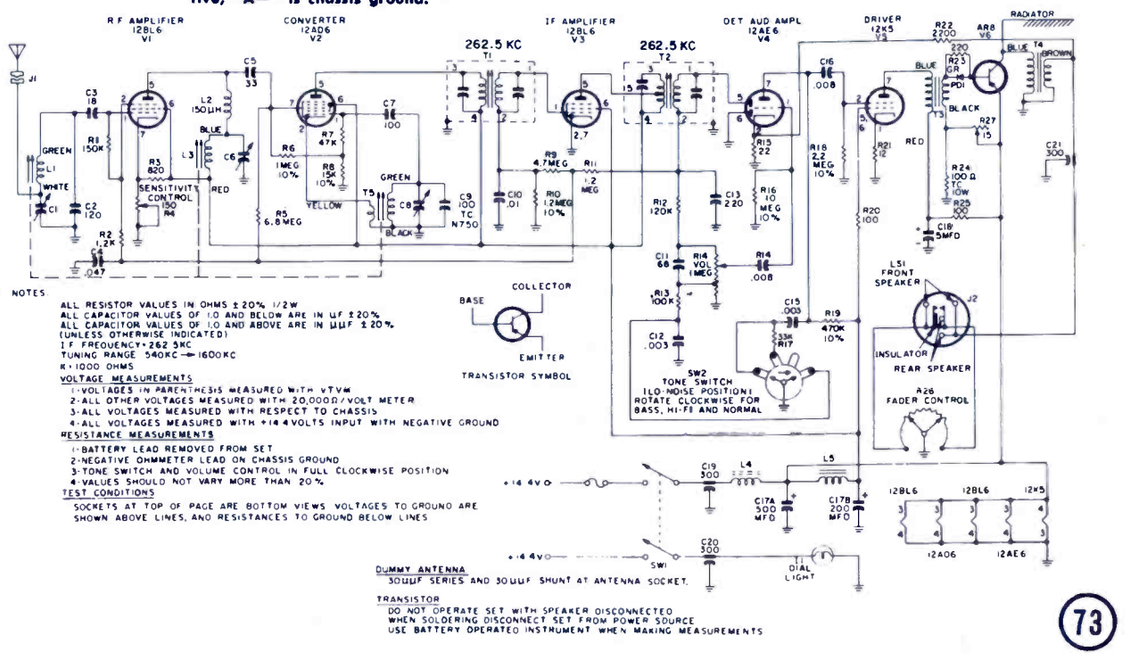


Philco Model M-5841

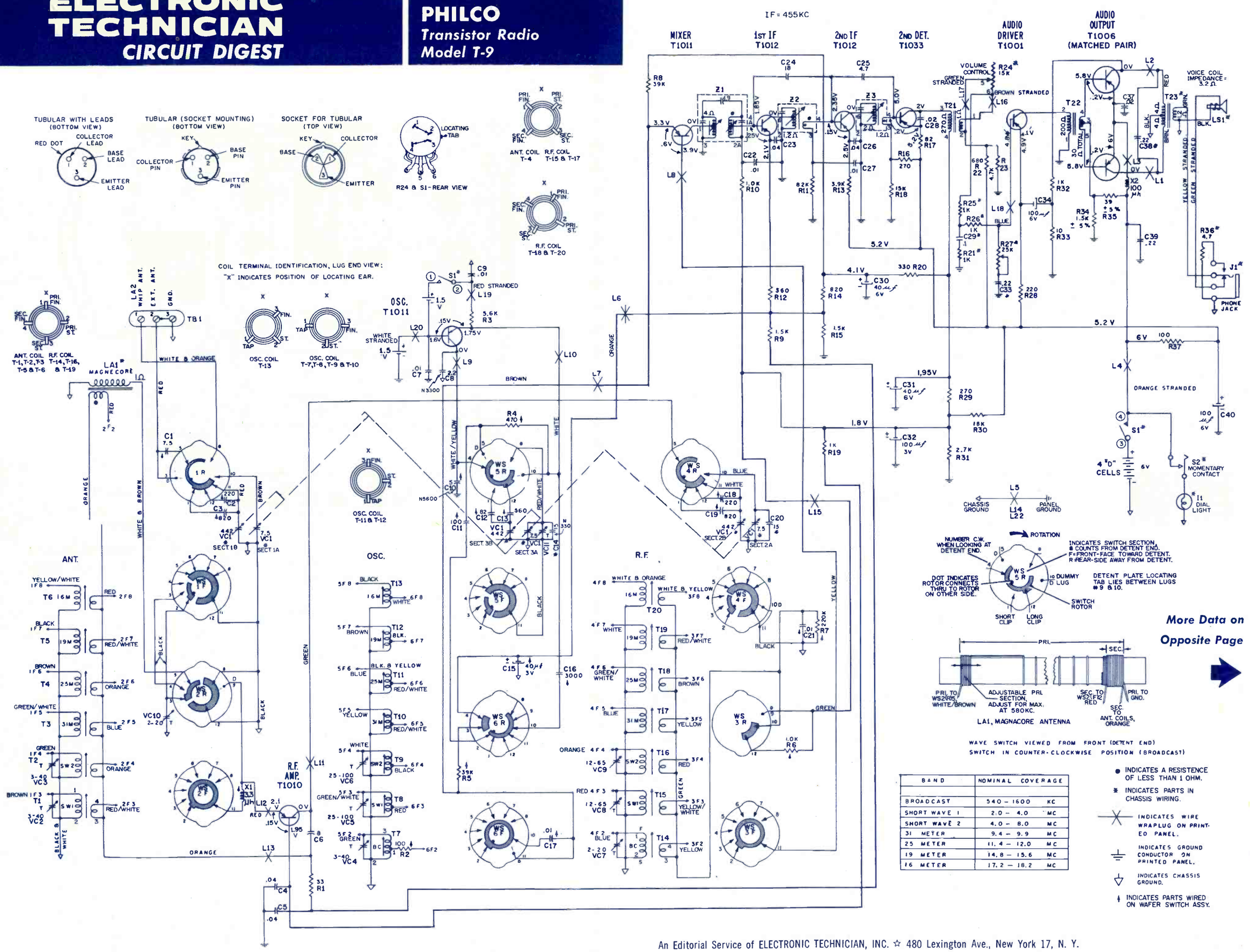
Top View, Showing Alignment Points, Tubes, and Location of Parts

IMPORTANT: When connecting radio to "A" supply, either in car or on test bench, polarity must be observed. "A+" lead is positive, "A—" is chassis ground.



ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

PHILCO
Transistor Radio
Model T-9



BAND	NOMINAL COVERAGE
BROADCAST	540 – 1600 KC
SHORT WAVE 1	2.0 – 4.0 MC
SHORT WAVE 2	4.0 – 8.0 MC
31 METER	9.4 – 9.9 MC
25 METER	11.4 – 12.0 MC
19 METER	14.8 – 15.6 MC
16 METER	17.2 – 18.2 MC

- ● INDICATES A RESISTENCE OF LESS THAN 1 OHM.
- * INDICATES PARTS IN CHASSIS WIRING.
- INDICATES WIRE WRAPLUG ON PRINTED PANEL.
- INDICATES GROUND CONDUCTOR ON PRINTED PANEL.
- INDICATES CHASSIS GROUND.
- INDICATES PARTS WIRED ON WAFER SWITCH ASSY.

More Data on Opposite Page

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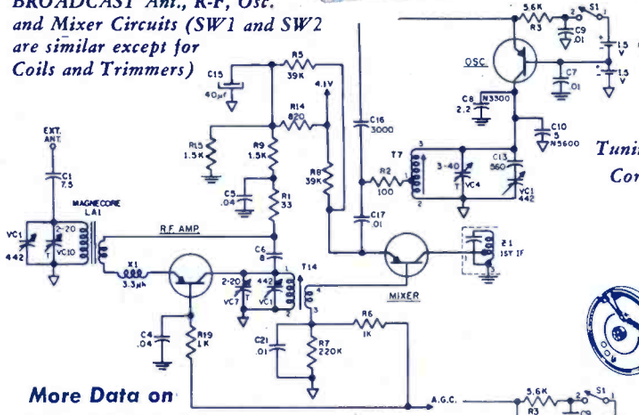
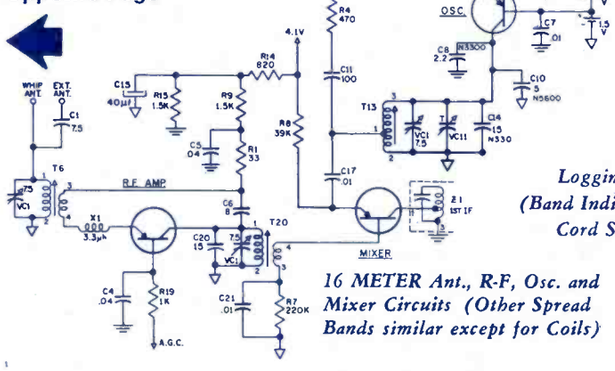
PHILCO
Transistor Radio
Model T-9

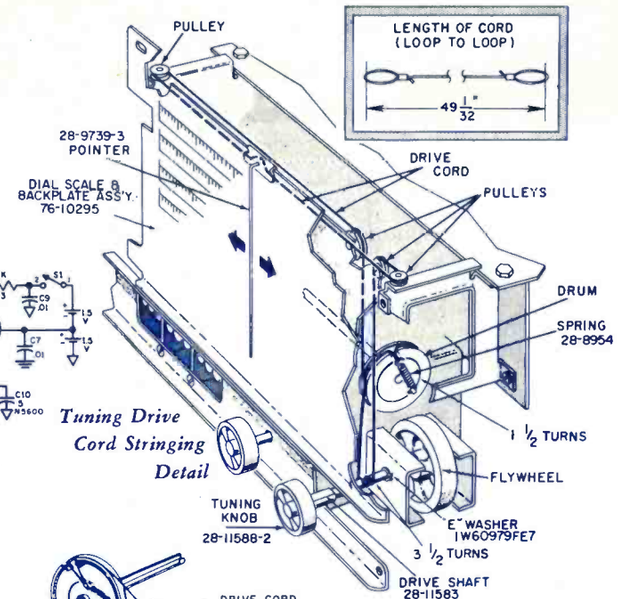
BROADCAST Ant., R-F, Osc. and Mixer Circuits (SW1 and SW2 are similar except for Coils and Trimmers)



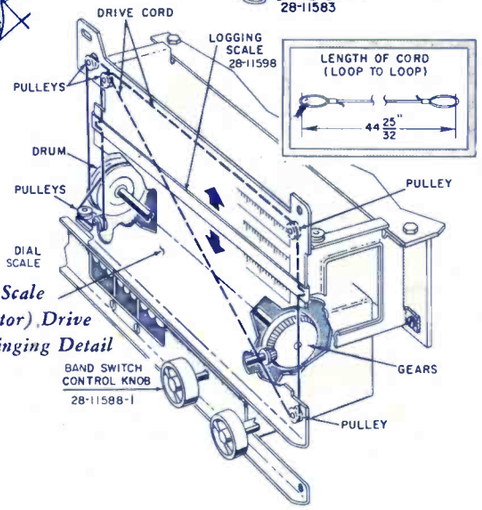
More Data on Opposite Page



16 METER Ant., R-F, Osc. and Mixer Circuits (Other Spread Bands similar except for Coils)



Tuning Drive Cord Stringing Detail



Logging Scale (Band Indicator) Drive Cord Stringing Detail

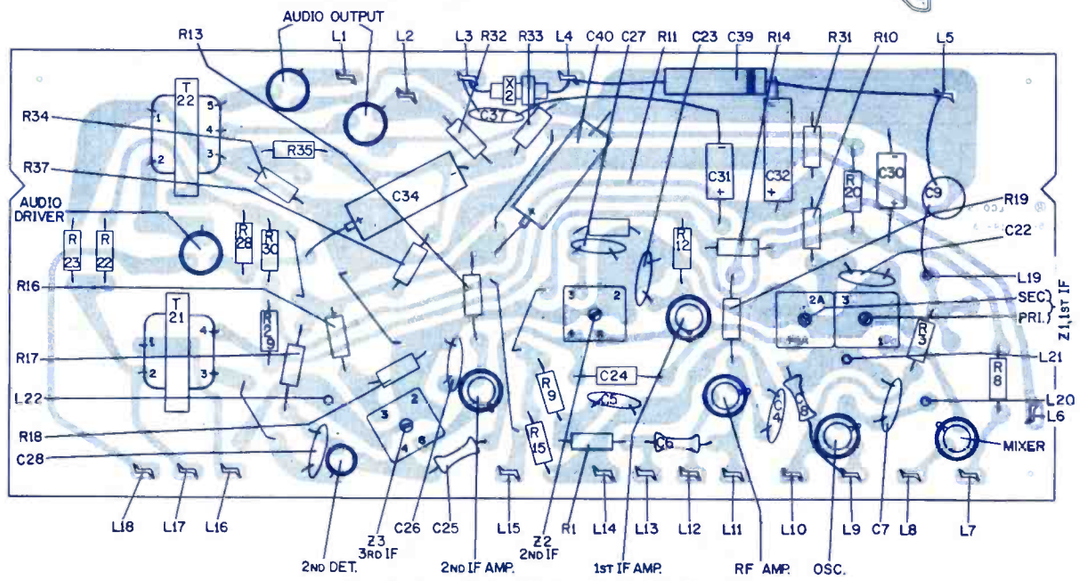
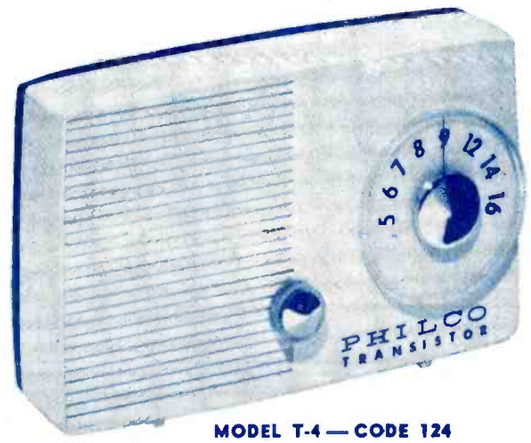


Figure 7. Composite Panel View — Showing Parts Placement

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

PHILCO
Transistor Radio
Models T-4, T-4J



MODEL T-4 — CODE 124

T-4J PRIVATE LISTENING JACK TERMINAL LEADS

Terminal 1—Brown lead to speaker.
Terminal 2—One end of R16, P.L. shunt resistor.
Terminal 3—Black ground lead to on-off switch and other end of R16.
Terminal 4—Green lead of T3.

SERVICE NOTES

When signal tracing, inject signal at transistor collector and limit input to keep signal across speaker below 0.275 volts. Normally, the transistors should be the last item suspected.

SCHEMATIC NOTES

Due to 2nd IF transistor variations the values of resistors R6 and R7 must be selected, within limits, for optimum performance.

When transistor R186 is defective, kit number 324-8003 must be ordered. This kit contains a R186 transistor and two resistors (R6 and R7) properly matched. All three components must be replaced.

The stage may be checked as follows:

The value of R6 is selected to allow the 2nd IF transistor collector to draw 2 milliamps. This is checked by measuring the voltage across R11, the 560 ohm collector return resistor. This voltage should be 1.12 volts, with a tolerance of approximately ±12 volts. The value of R6 falls within the limits of 27K to 390K.

All resistors are 1/2 watt, 10%, carbon.

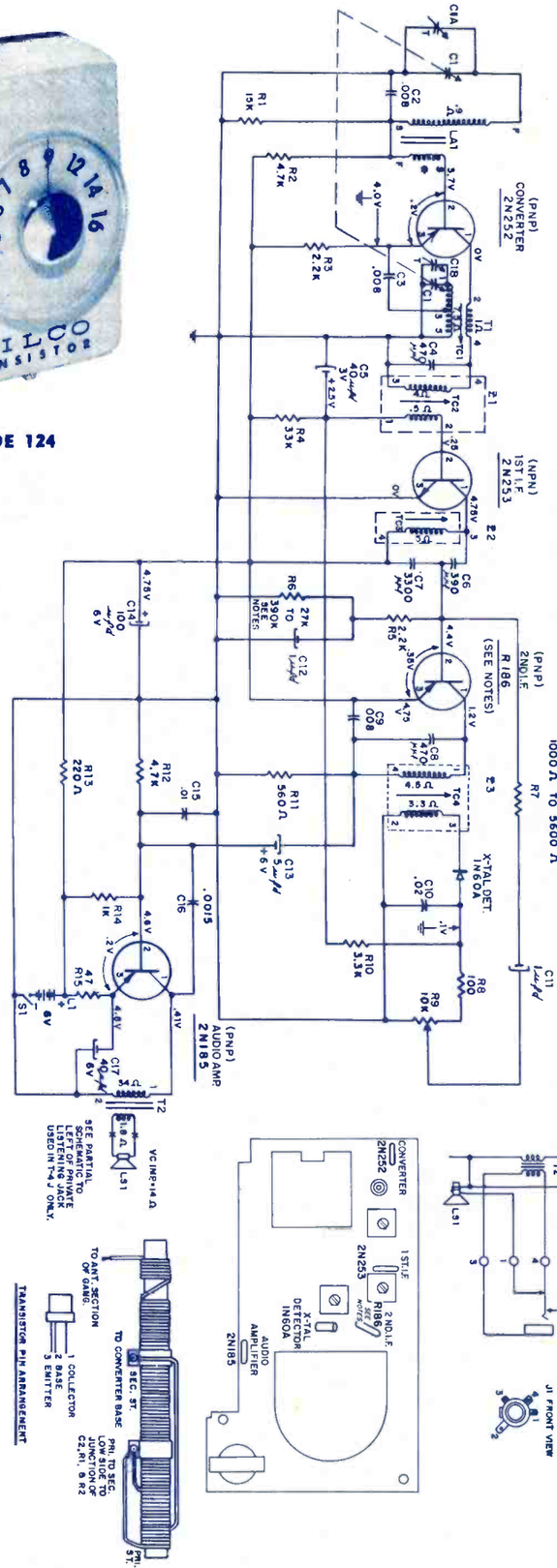
Coil resistances read with coil in circuit.

Voice coil impedance = 14 ohms.

Voltages measured to ground with a 20,000 ohms/volt meter under no signal condition.

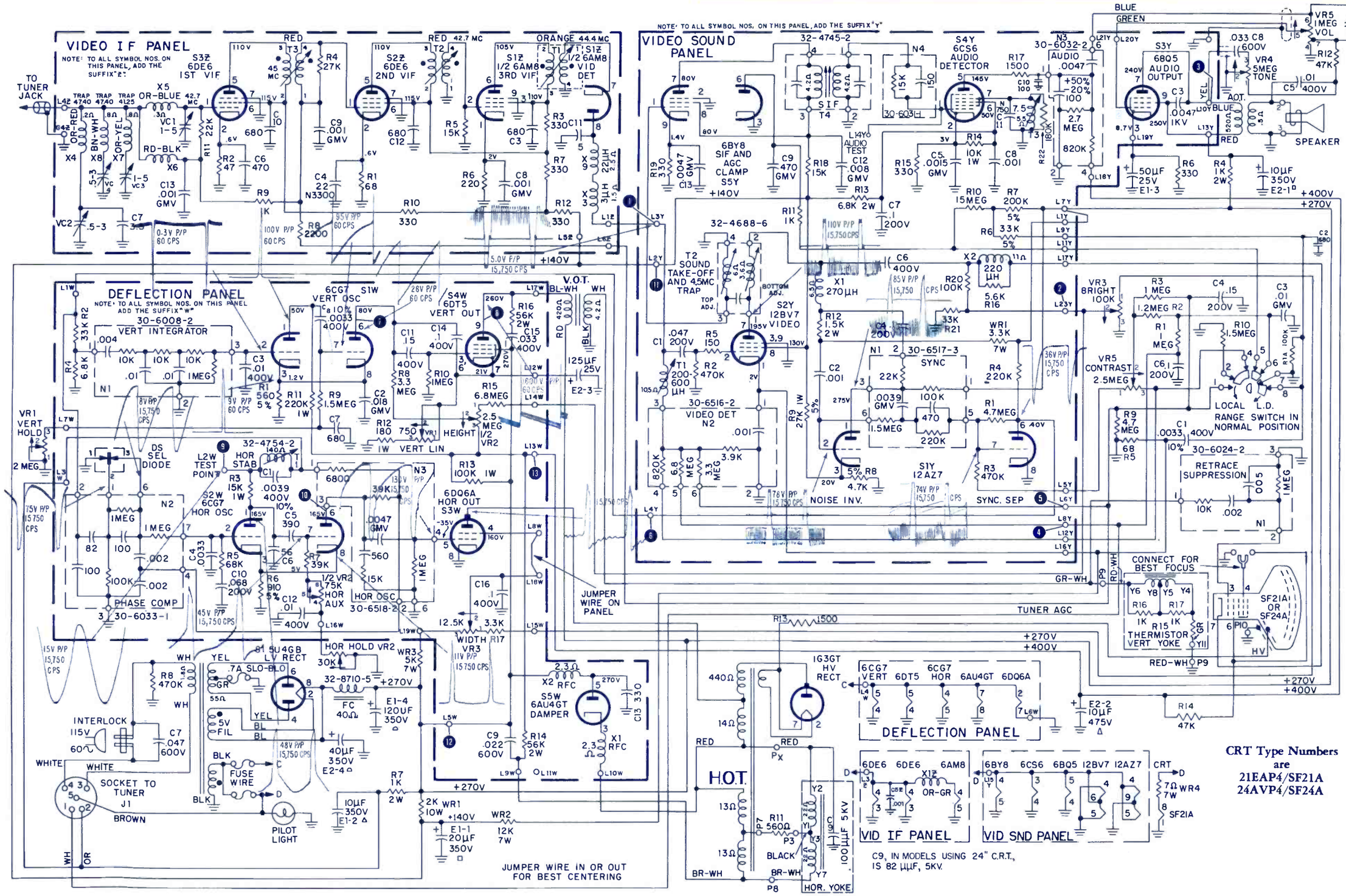
Emitter to base voltages were measured with positive lead to emitter, except for the 1st IF which is an NPN type and measured with the positive lead to the base.

Run #51 — to improve low end sensitivity. The value of R1 was changed to 15,000 ohms, part number 66-3-58340. Some few sets may have a 10,000 ohm resistor for R1.



Models T-4 & T-4J — Code 124

PHILCO
TV Chassis 9L60



CRT Type Numbers are
21EAP4/SF21A
24AVP4/SF24A

NOTES: All capacitor values greater than 1 are MMF unless otherwise noted. All capacitor values less than 1 are in MFD unless otherwise noted. All resistors are ½ watt, 10%, carbon unless otherwise noted. Arrow through control indicates clockwise rotation. Voltages are DC from point shown to chassis unless otherwise noted. Voltages were read using a 20,000 ohms/volt meter. Voltages were taken with no signal. The receiver was adjusted for a good quality picture; ie., normal contrast, brightness, width, height, vertical lin. and sound, picture in sync, then removed signal.

* Focus voltage optional for best focus.
Coil resistance read with coil in circuit.
● Indicates a coil resistance of less than 1 ohm.

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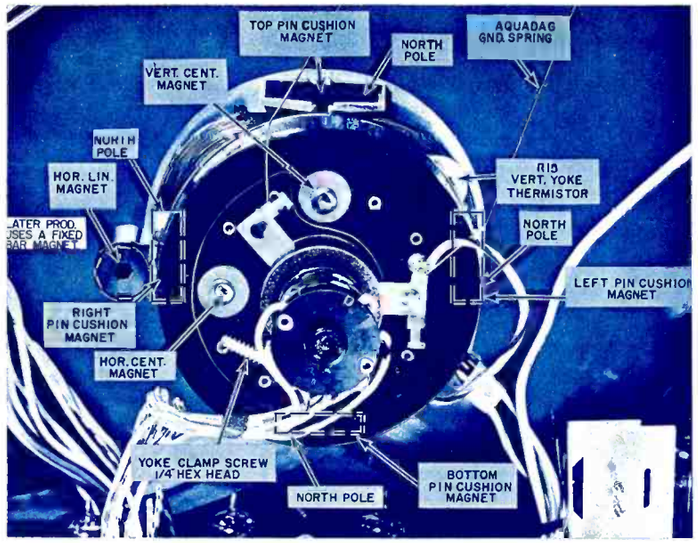
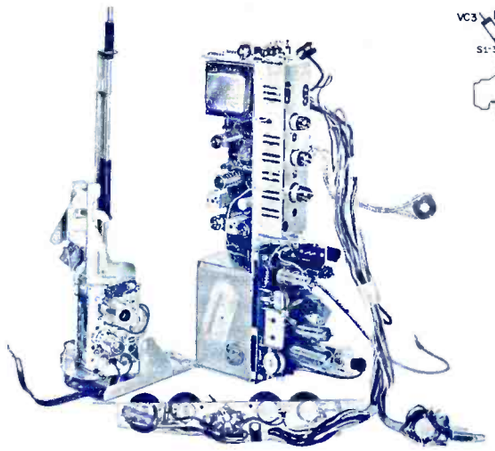
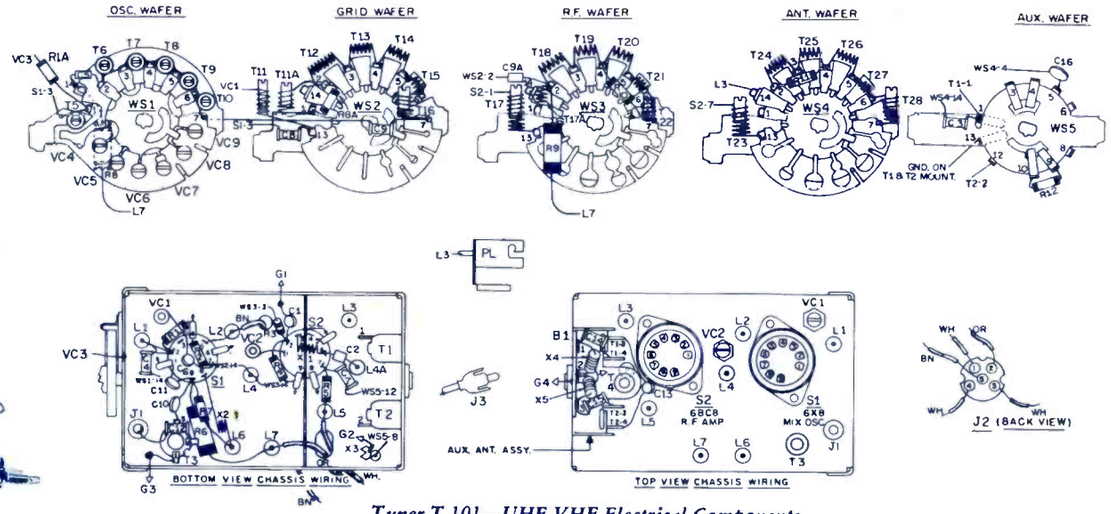


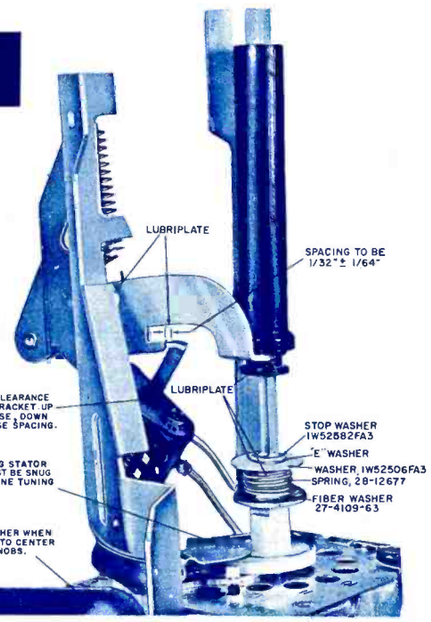
21" 9L60 CRT Adjustments (CRT Adjustments)



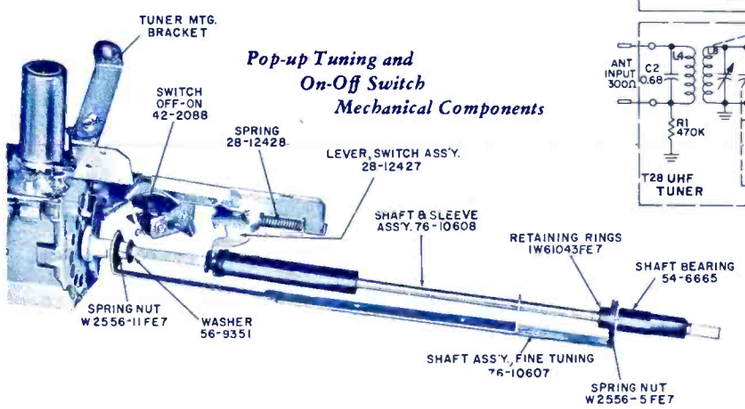


Tuner T-101—UHF-VHF Electrical Components

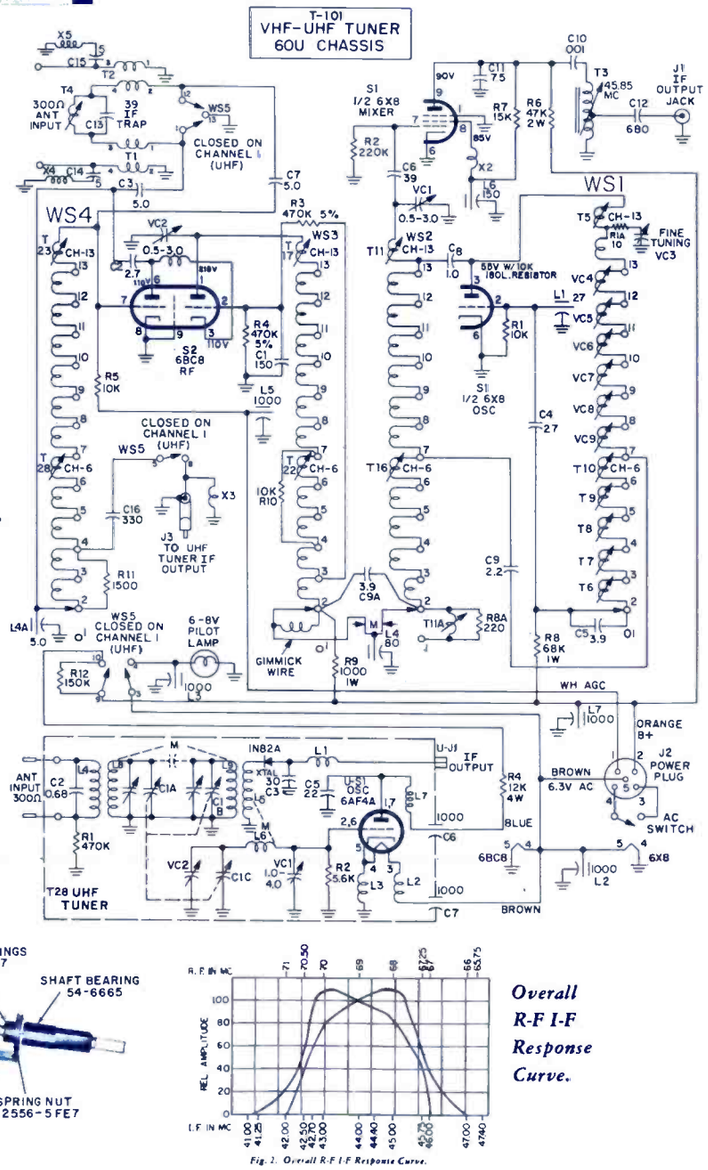
PHILCO
TV Chassis 9L60



On-Off Switch Adjustment and Later Mechanical Components



Pop-up Tuning and On-Off Switch Mechanical Components



Overall R-F I-F Response Curve.

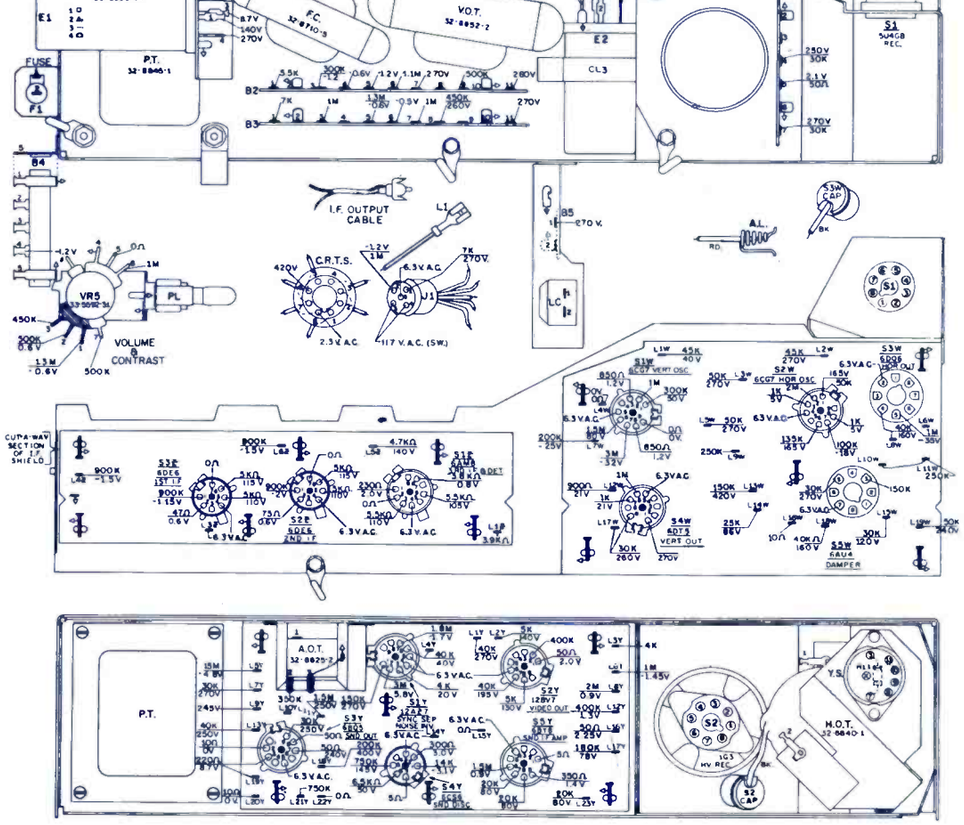
Fig. 2. Overall R-F I-F Response Curve.

Chassis Layout Showing Voltage and Resistance Readings

ALL RESISTANCE & VOLTAGES MEASURED TO CHASSIS GROUND

VOLUME	FULL CCW
VERT. LIN.	FULL CCW
CONTRAST	FULL CW
VERT. HOLD	FULL CCW
HOR. AUX.	FULL CW
HOR. HOLD	FULL CW
BRIGHTNESS	FULL CW
WIDTH	FULL CCW
HEIGHT	FULL CW
FRINGE SWITCH	NORMAL

VOLTAGE MEASUREMENTS SHOWN ARE WITH YOKE PLUGED INTO Y.S. AND NO SIGNAL ON ANTENNA, 117 V. AC.



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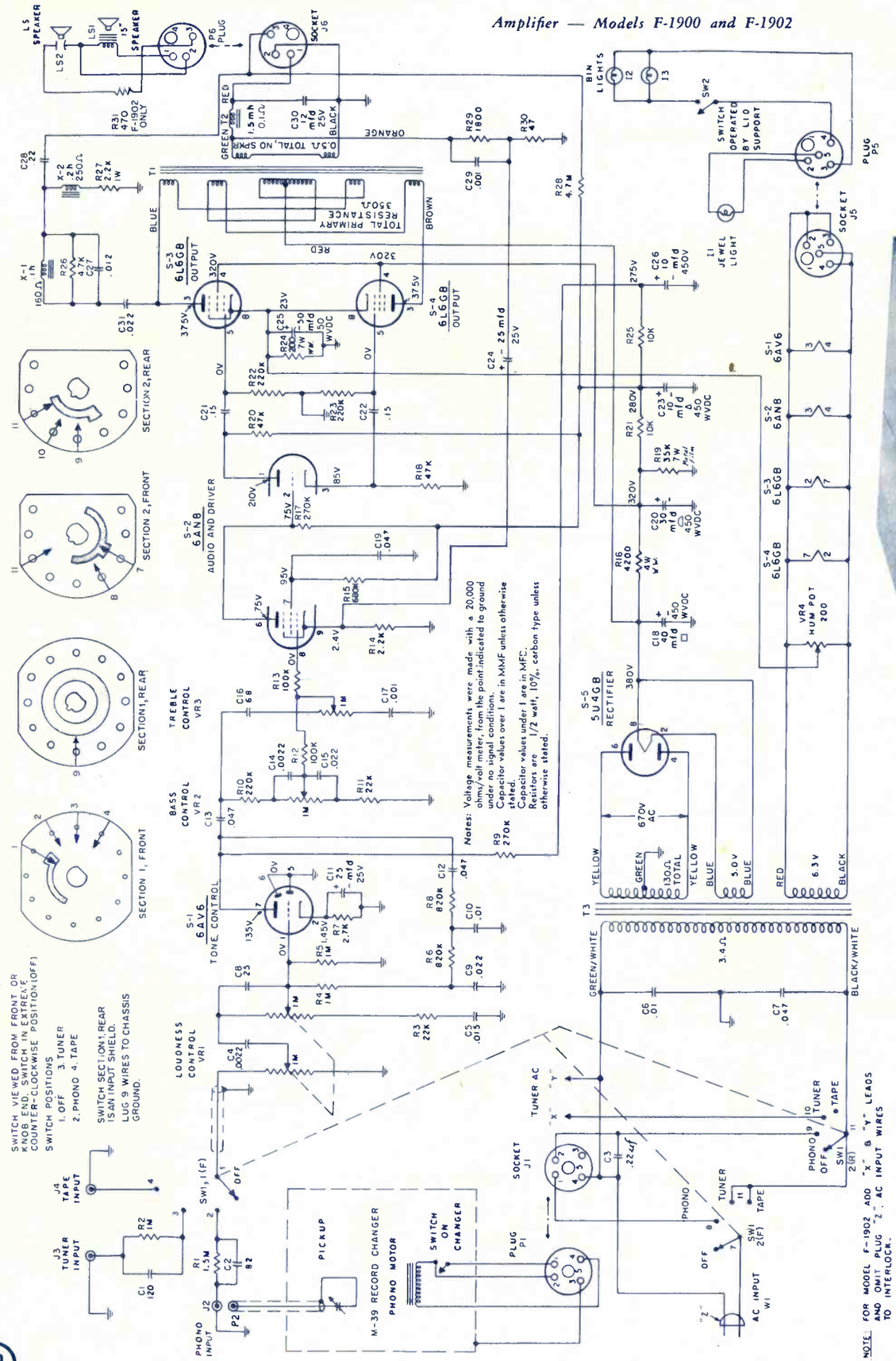
PHILCO
Hi-Fi Phonorama IV

Amplifier — Models F-1900 and F-1902



Bottom View of Amplifier — Models F-1900 and F-1902

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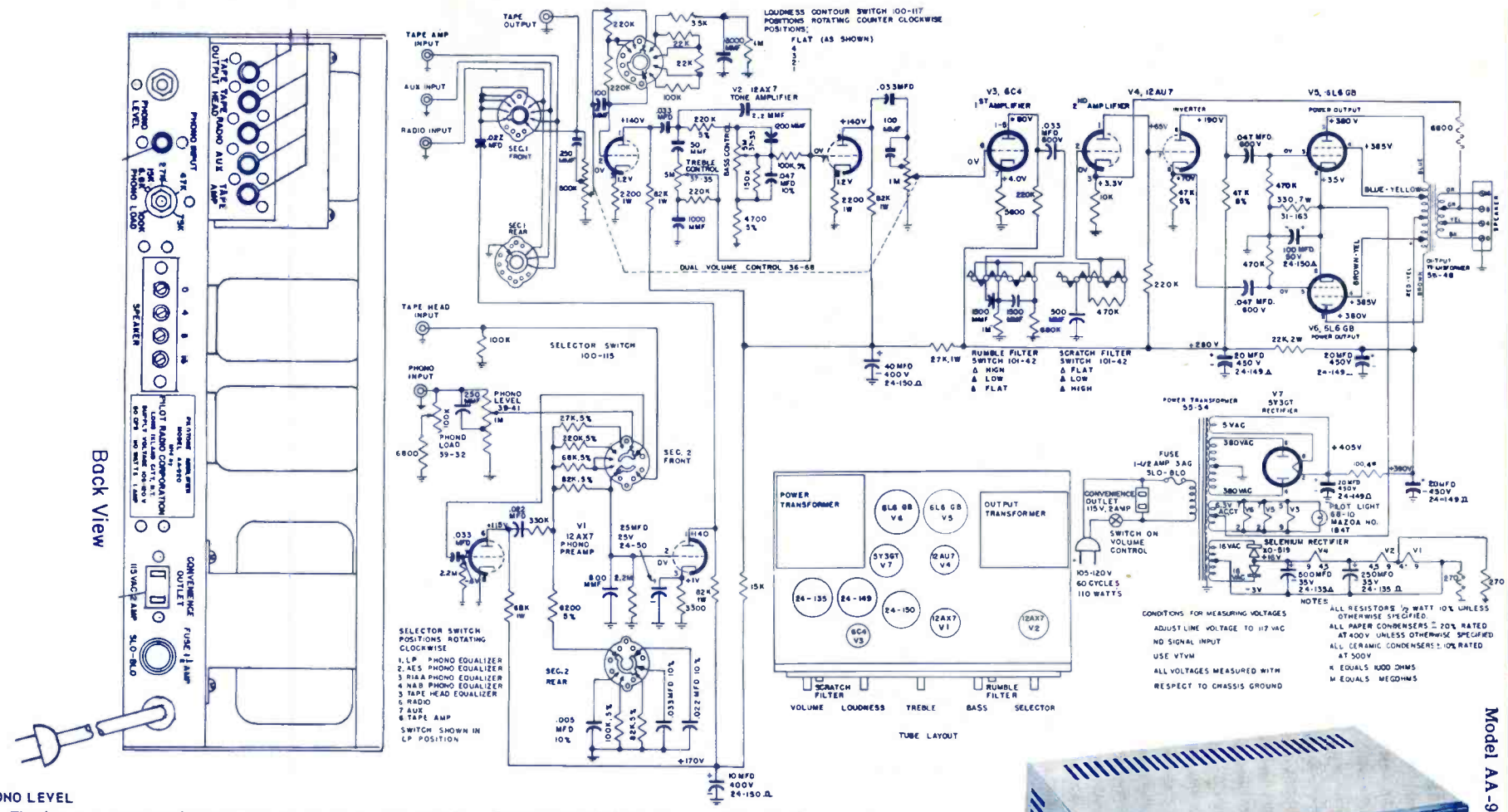


PHONO LEVEL

This frequency compensated control varies the sensitivity of the PHONO channel and prevents overdriving the PHONO preamplifier stage with high output pickups. The control is factory set at maximum and should be turned to a lower volume when cartridges of more than 75 millivolts output are used. Millivolt output of cartridge is specified in manufacturer's literature.

SENSITIVITY: For full output — Phono, Tape Head 3 MV; Radio, Aux., Tape Amp. 250 MV.
HUM LEVEL: 80 db below full output.
POWER OUTPUT: 20 watts.
TOTAL HARMONIC DISTORTION: Less than 1% at 20 watts.
INTERMODULATION DISTORTION: 1.5% at 20 watts. 60 and 3000 cycles 4:1.
NEGATIVE FEEDBACK: 18 db.
SPEAKER OUTPUT IMPEDANCES: 4, 8, and 16 ohms.

POWER CONSUMPTION: 120 watts, 117 volts, 60 cycles, AC.

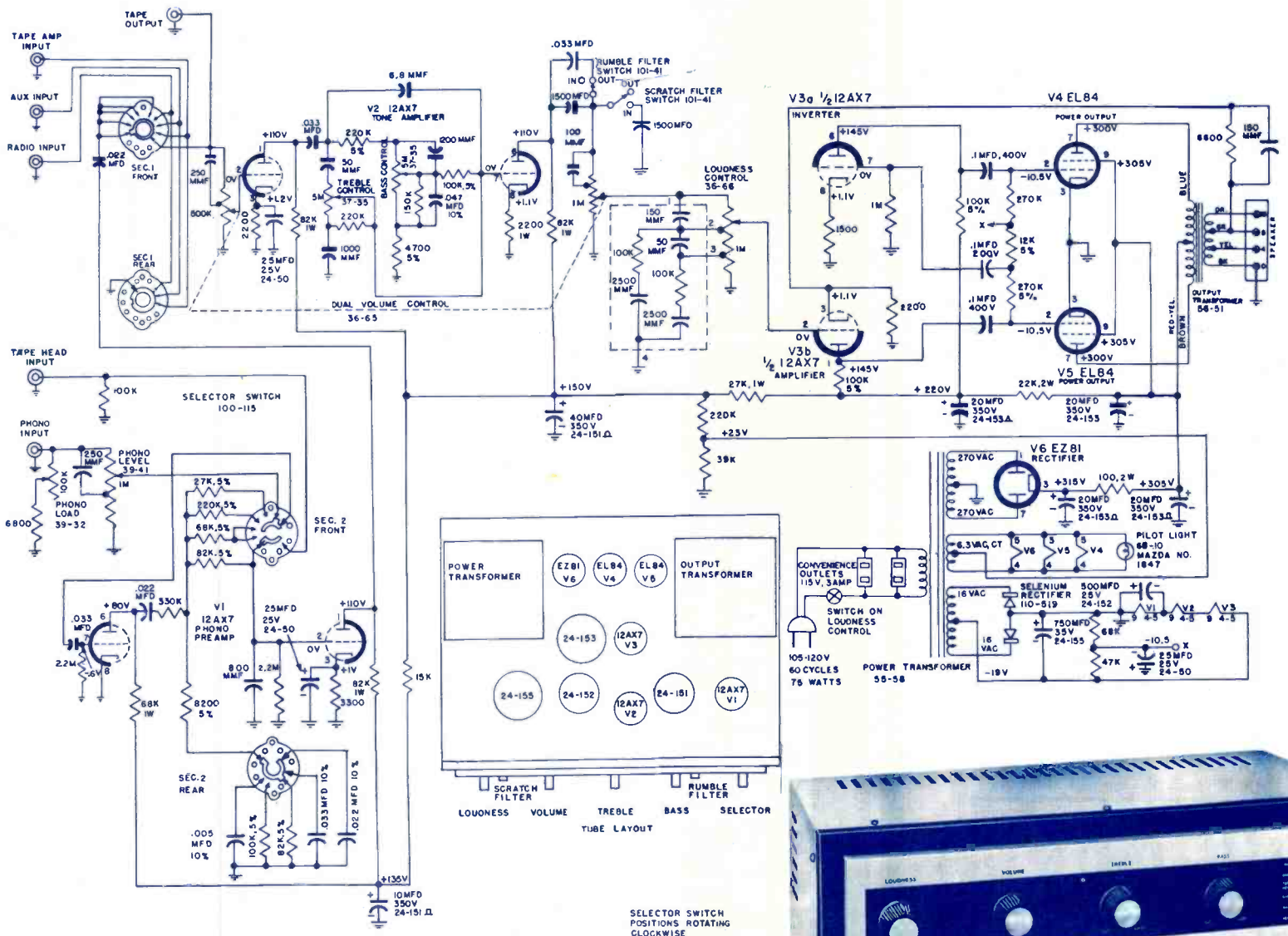
INPUT IMPEDANCE: Radio, Aux, Tape Amp. - 470,000 ohms. Phono: adjustable from 6800 to 100,000 ohms. Tape Head 100,000 ohms.
FREQUENCY RESPONSE: ±1 db 20 to 20,000 cps. (see Figure 4)
TONE CONTROL RANGE:

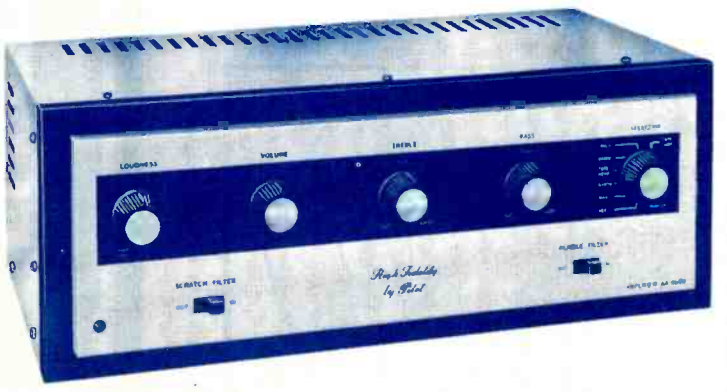
	20 cps.	100 cps.	800 cps.	10,000 cps.	20,000 cps.
Boost	18 db	11 db	0 db	15 db	18 db
Cut	18 db	11 db	0 db	15 db	18 db

PHONO LOAD

G.E.	47K	Pickering	27K
Fairchild	47K	Audak	100K

PILOT
Hi-Fi Audio Amp., Preamp. Model AA-920
Model AA-920



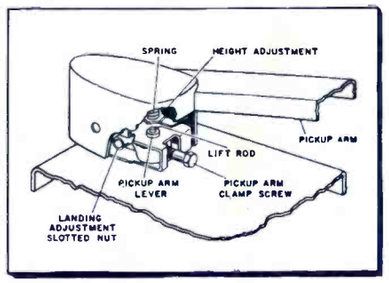


PILOT
Audio Amplifier & Preamplifier
Model AA-903B

Shop Hints

Cartridge Removal Stereo Record Changer

For easy access to the cartridge, remove the tone arm assembly from its mounting. It is clamped to the vertical shaft of the trip lever. By loosening the clamping screw, the whole arm assembly may be lifted upward and off the trip lever shaft. It is then an easy matter to replace either the stylus or the cartridge.



Loosen clamp screw to remove pick-up arm.

When reassembling the arm to the shaft, it is necessary to position the arm so that the stylus will land at the correct distance in from the edge of the record. A locating hole in the vertical shaft of the trip lever enables the arm assembly to be self positioned for correct landing. It is only necessary that the arm be in the approximate correct position, tightening the clamp screw will then bring it to the correct position. Tighten the clamp screw securely and put the mechanism through several complete cycles while checking landing position. An adjusting screw at the side of the arm permits fine adjustment of the set-down position.

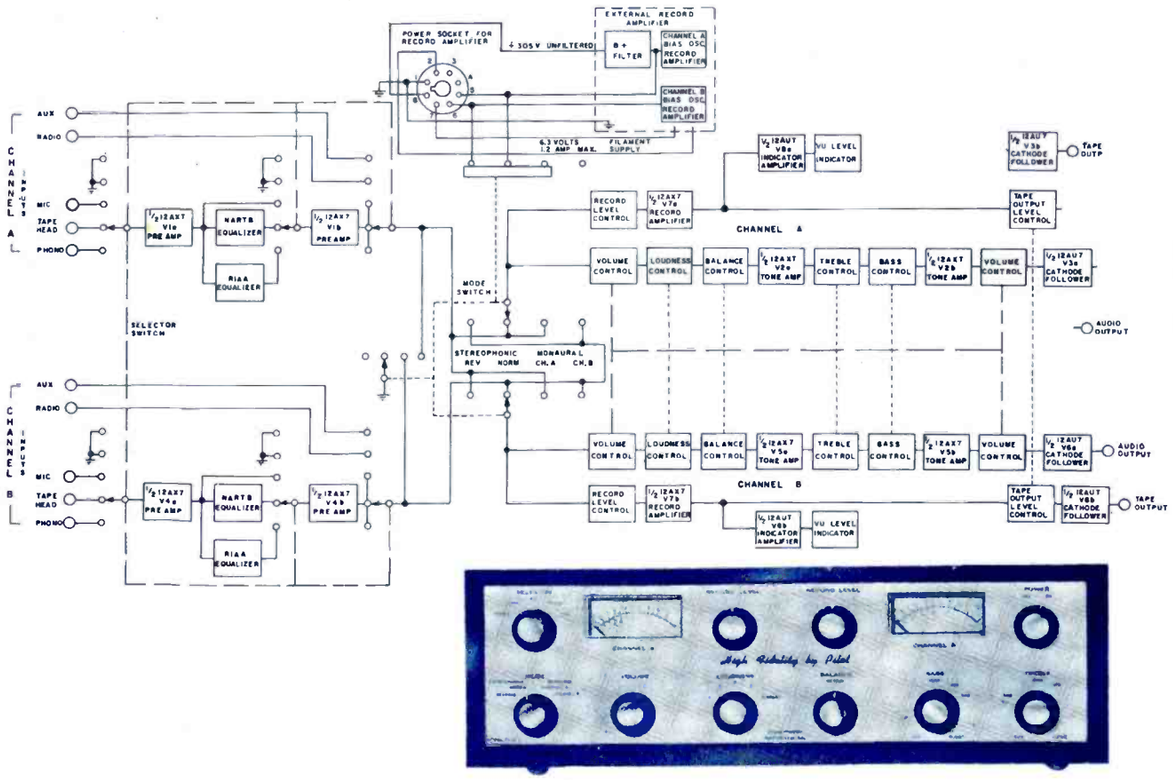
The pickup cable at the back of the arm should be dressed so that there is no restriction in arm movement.—*RCA Service Co., Camden, N.J.*

Antenna Cheater Cord

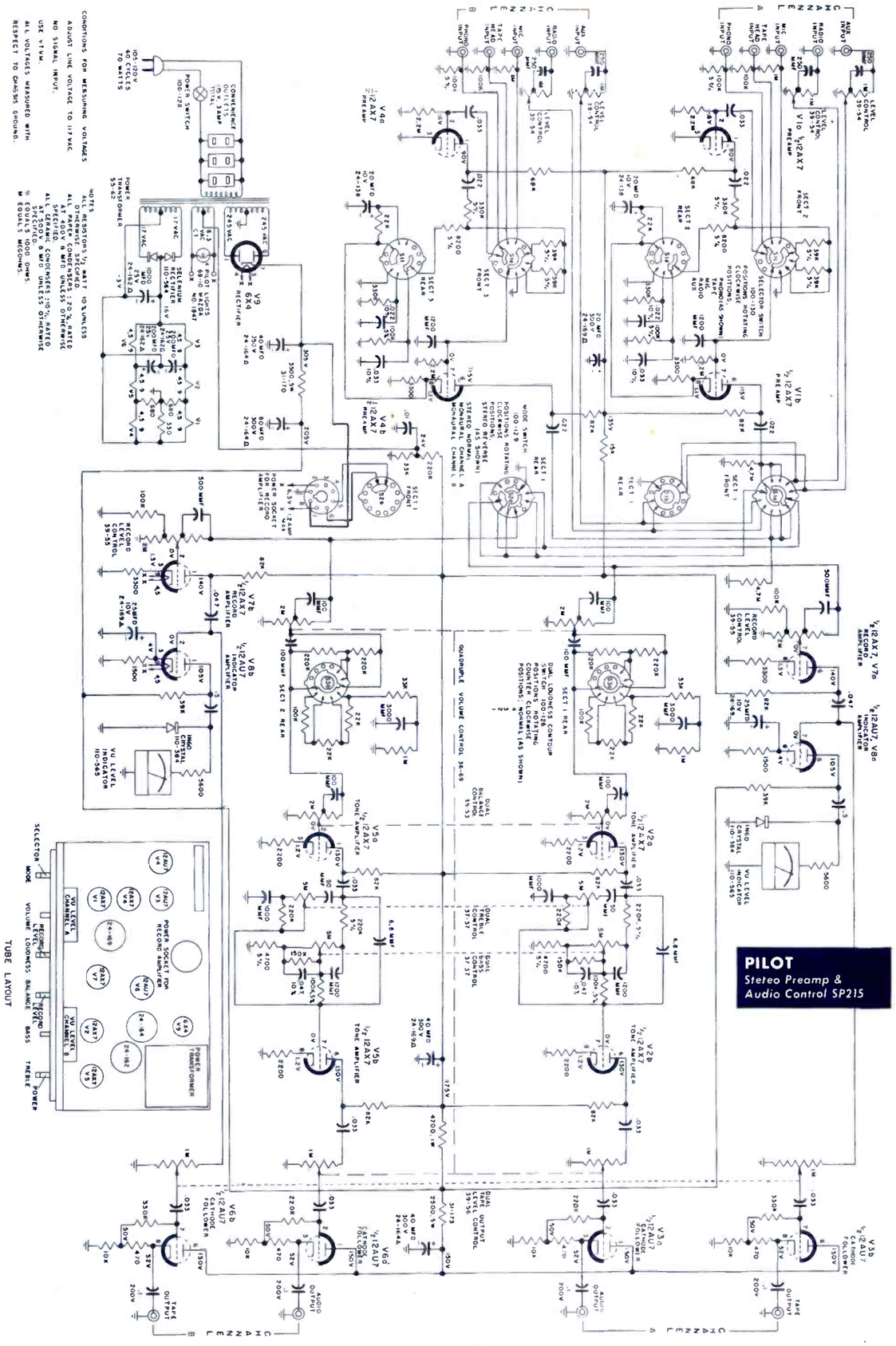
Many TV sets have a short 300 ohm lead connected between the tuner and the protective cover on the rear of the set. The length of this lead is just not long enough to permit the back cover to remain connected without causing a great deal of stress and strain. Broken strands and complete severance often occurs. The only remedy is to dig out the soldering gun, and then solder. After having to repair a number of these broken leads, I made up an extension consisting of 24 inches of 300 ohm wire, pins to fit into the socket on the back cover, and a double jack to accommodate the lead coming from the tuner. Some servicemen may be inclined to use insulated alligator clips instead of the plugs and jacks. It takes up little room in the tool box, and I haven't had a broken lead since.—*Wm. R. Burgess, Cedar Falls, Iowa.*

ELECTRONIC TECHNICIAN CIRCUIT DIGEST

PILOT *Stereo Preamp & Audio Control SP215*

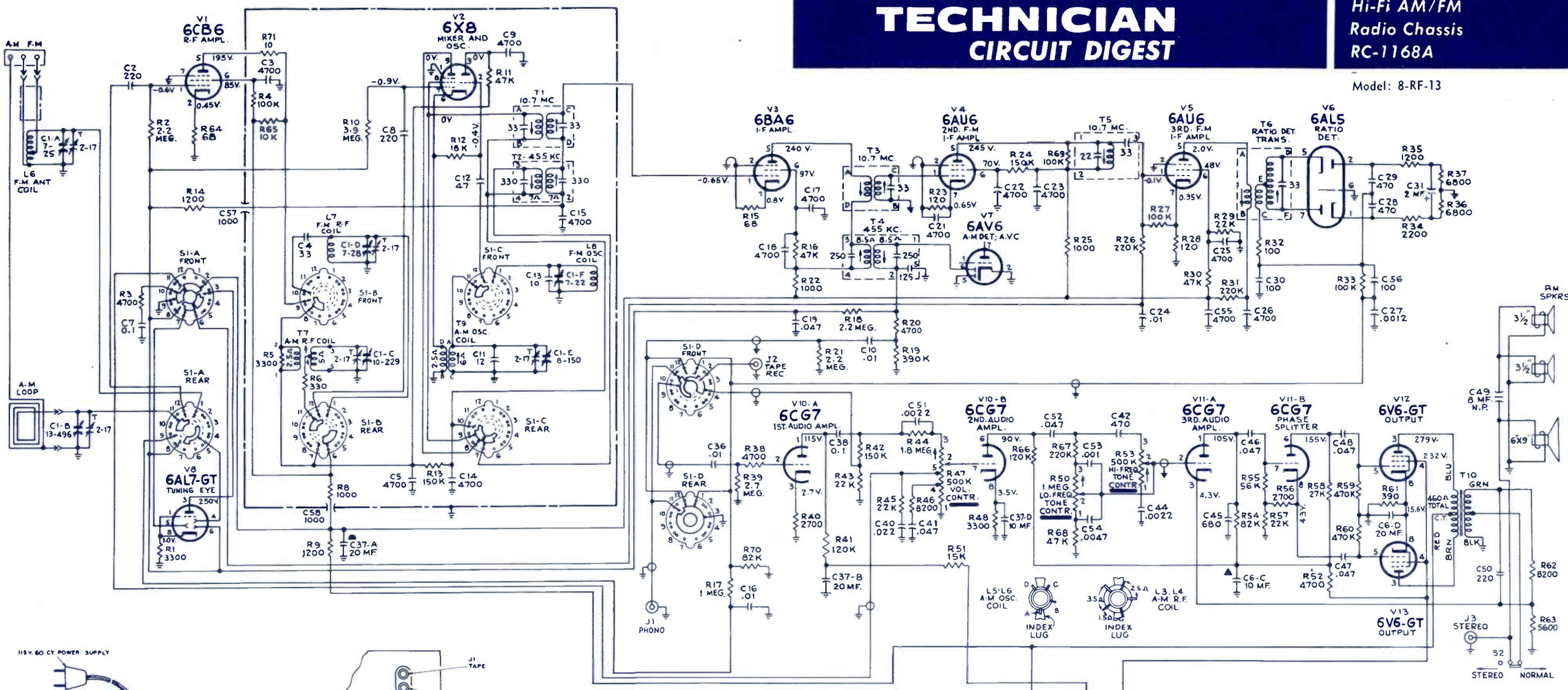


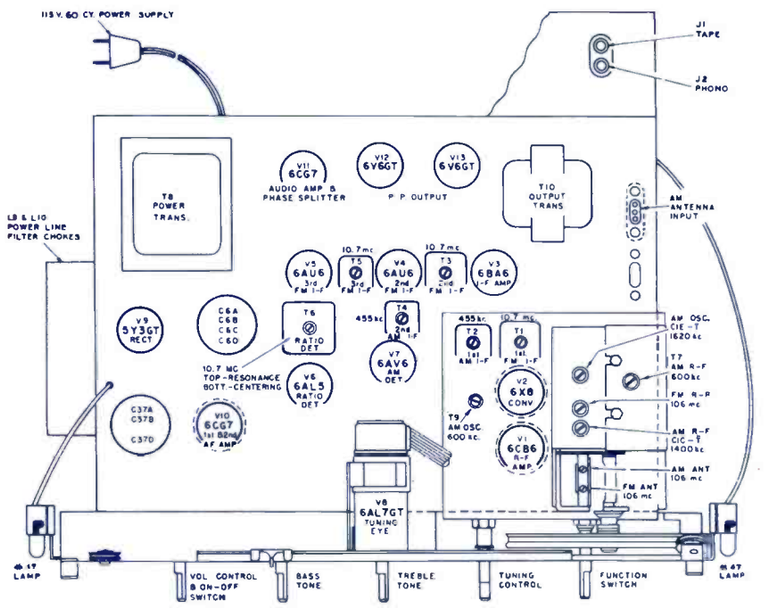
TUBE LAYOUT



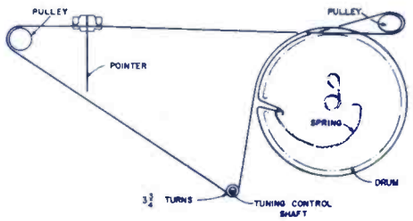
RCA
Hi-Fi AM/FM Radio Chassis RC-1168A

Model: 8-RF-13



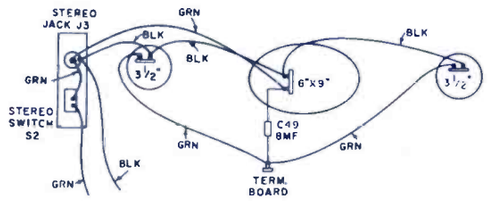


Tube and Trimmer Locations



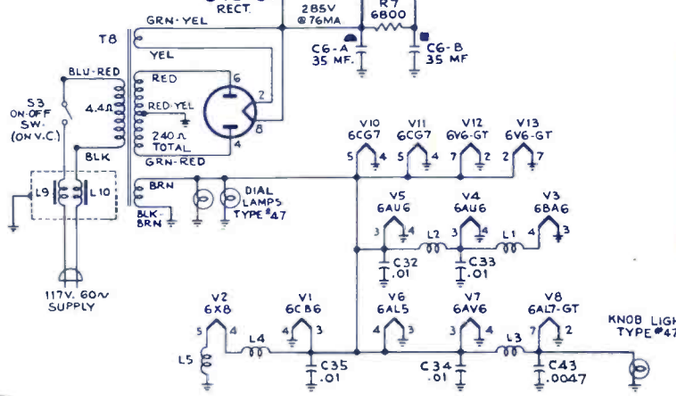
TUNING DRIVE CORD ASSEMBLY SHOWN WITH GANG IN CLOSED POSITION

Dial Cord and Drive Assembly



FROM TERMINAL BOARD ON CHASSIS

Speaker Wiring Assembly



FUNCTION SWITCH S1 FRONT AND REAR SECTIONS VIEWED FROM FRONT AND SHOWN IN POS. NO.1 (MAX. COUNTER-CLOCKWISE)
POS. 1 - PHONO.
2 - A.M. RADIO.
3 - F.M. RADIO.
4 - TAPE.

RESISTANCE VALUES IN OHMS. K=1000.

CAPACITANCE VALUES LESS THAN 1 IN MF., 1 AND ABOVE IN MMF. UNLESS OTHERWISE NOTED.

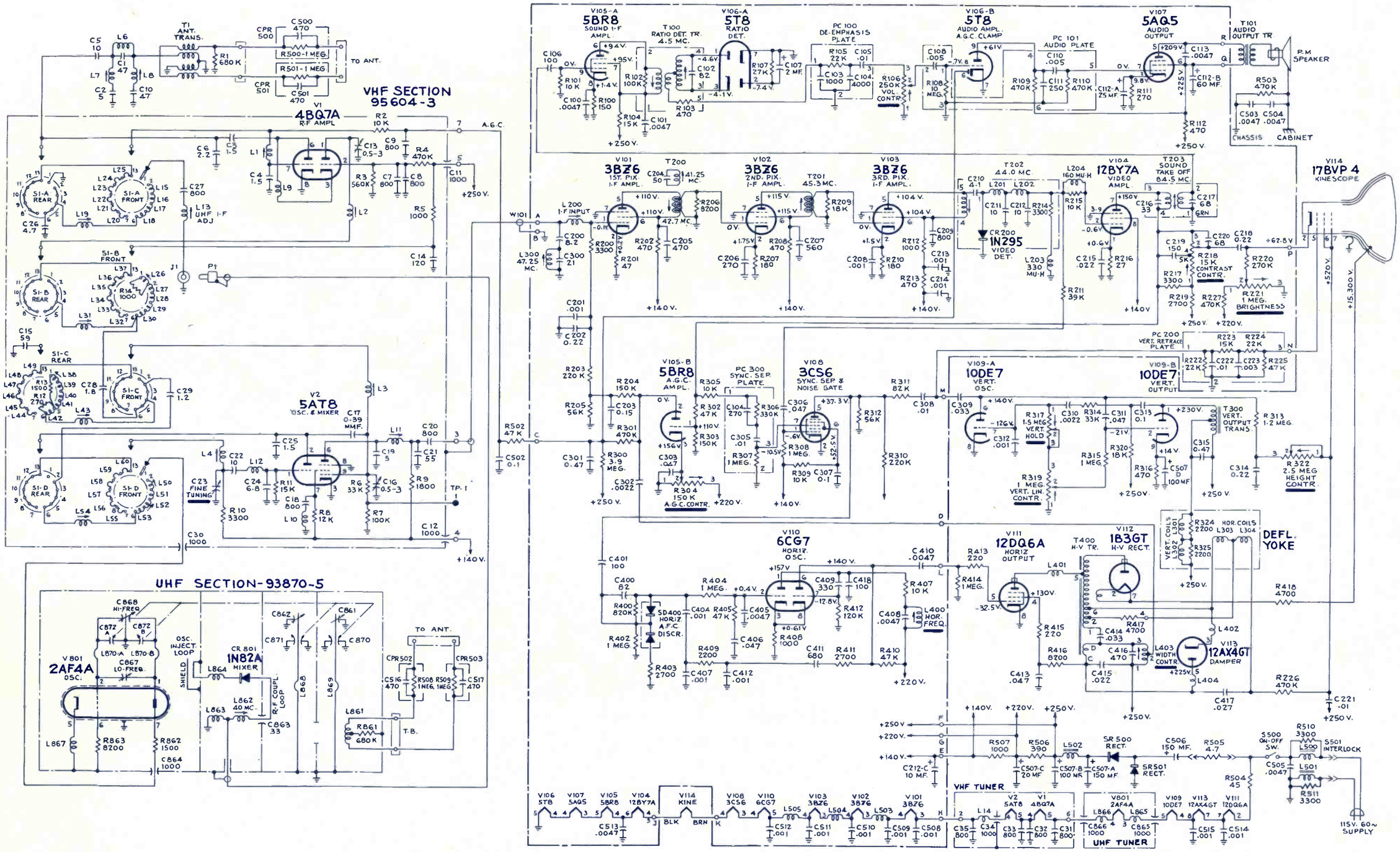
VOLTAGES MEASURED WITH "VOLTOHMYST" WITH FUNCTION SW. IN PHONO. OR TAPE POS. AND SHOULD HOLD WITHIN ± 20% WITH 117 V. A.C. SUPPLY.

DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION.

The "CORDON BLEU" Model 8-RF-13 Mahogany, Maple or Oak

RCA
Chassis 5377, 5378

Models: 17-S-7090, 17-S-7092, 17-S-7093, 17-S-7099, 17-S-7090U, 17-S-7092U, 17-S-7093U, 17-S-7099U



The schematic is shown in the latest condition at the time of printing.

All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

All voltages measured with vacuum tube voltmeter and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

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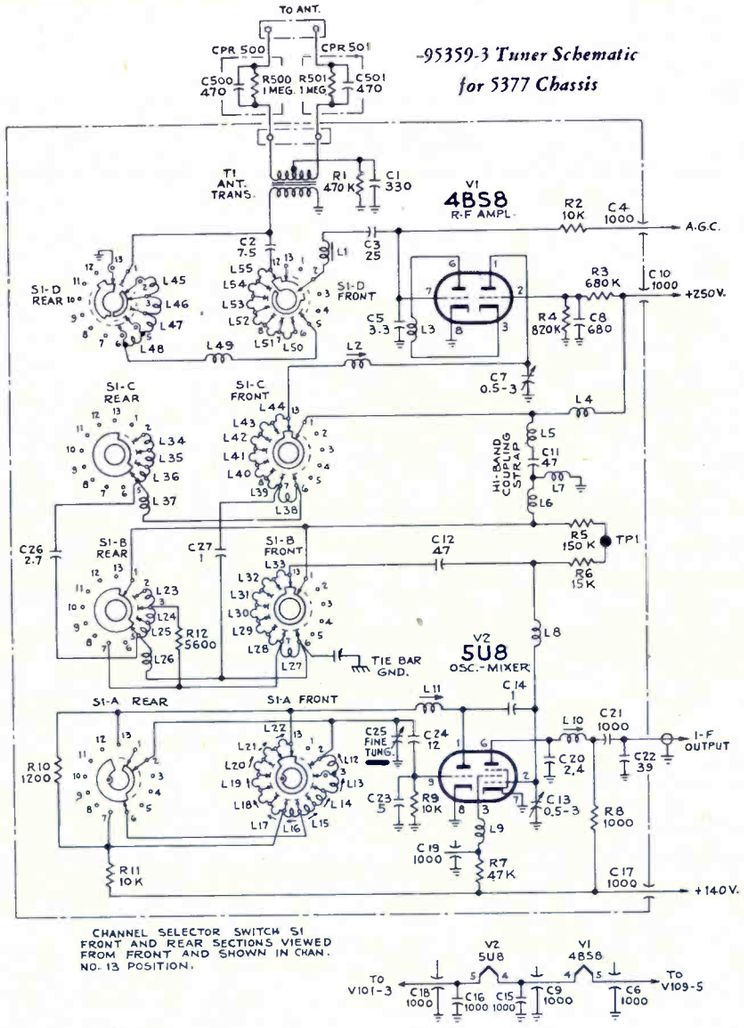
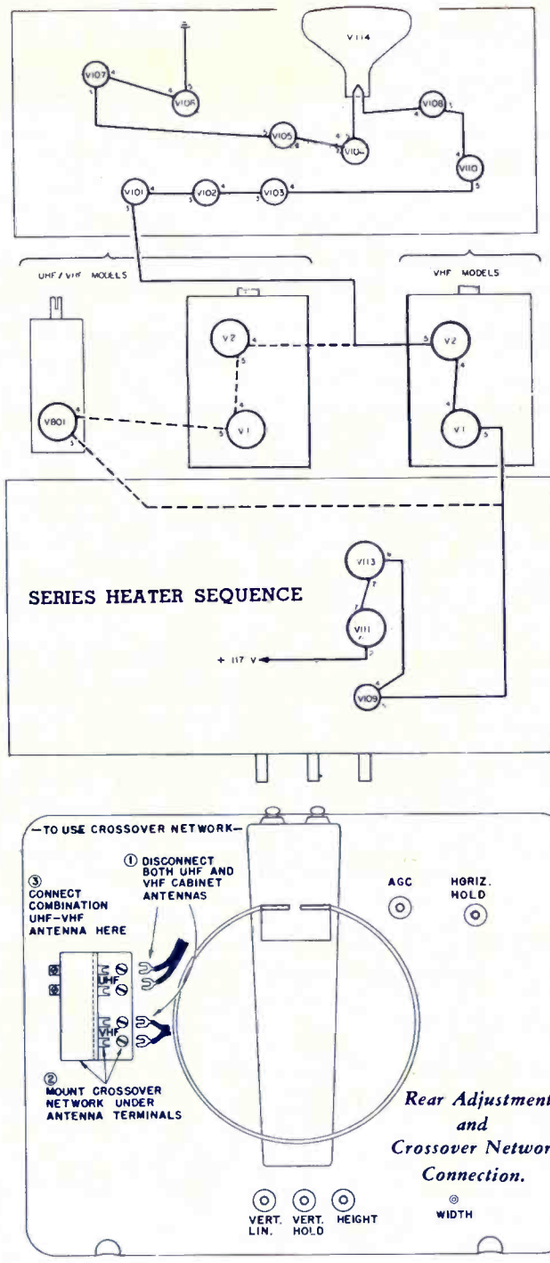
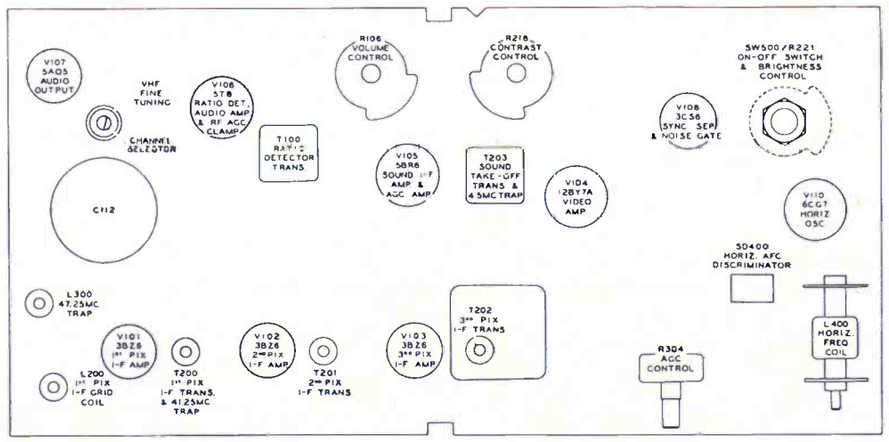
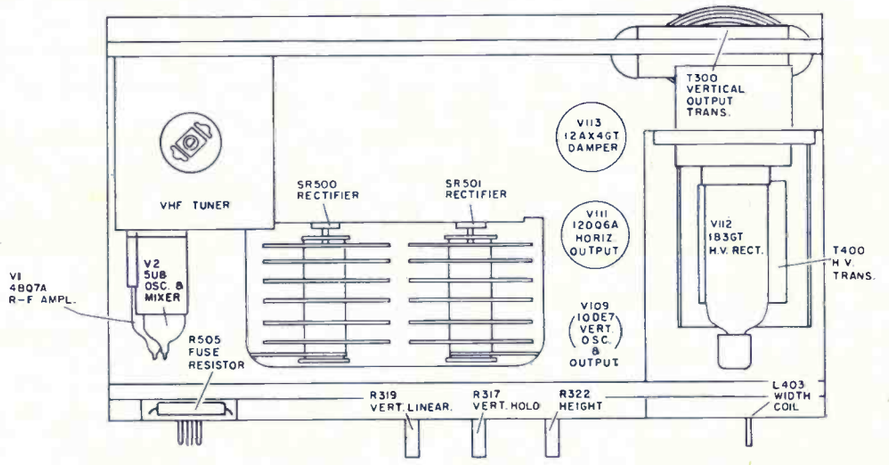
-95359-3 Tuner Schematic for 5377 Chassis





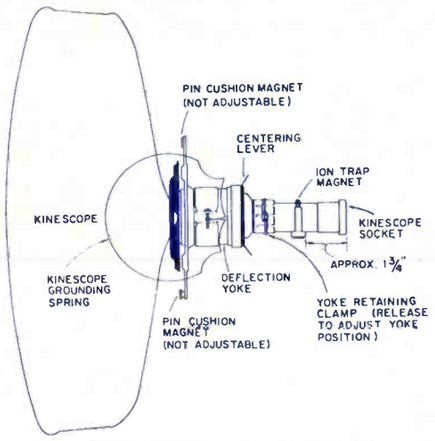


PRINTED BOARD TOP VIEW

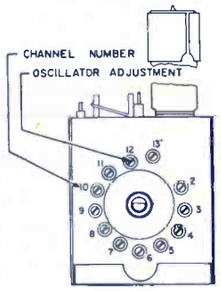


CHASSIS TOP VIEW

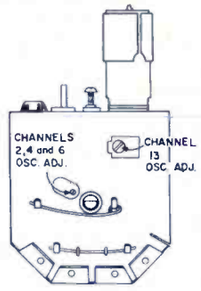
Models 17-S-7093 & 17-S-7093U



—Yoke and Centering Magnet Adjustments.

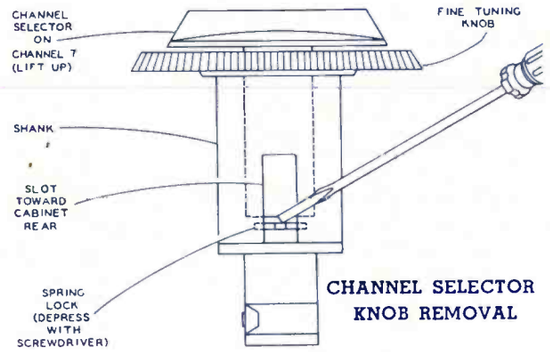


95359-3 TUNER
A

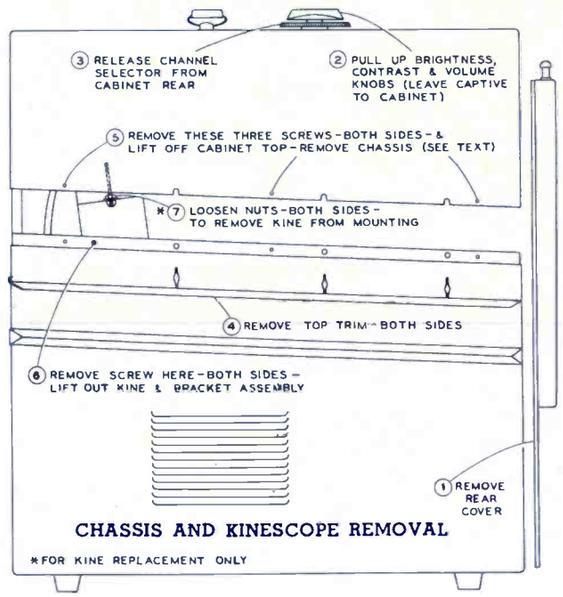


95604-3 TUNER
B

VHF OSCILLATOR ADJUSTMENTS



CHANNEL SELECTOR KNOB REMOVAL



CHASSIS AND KINESCOPE REMOVAL

*FOR KINE REPLACEMENT ONLY

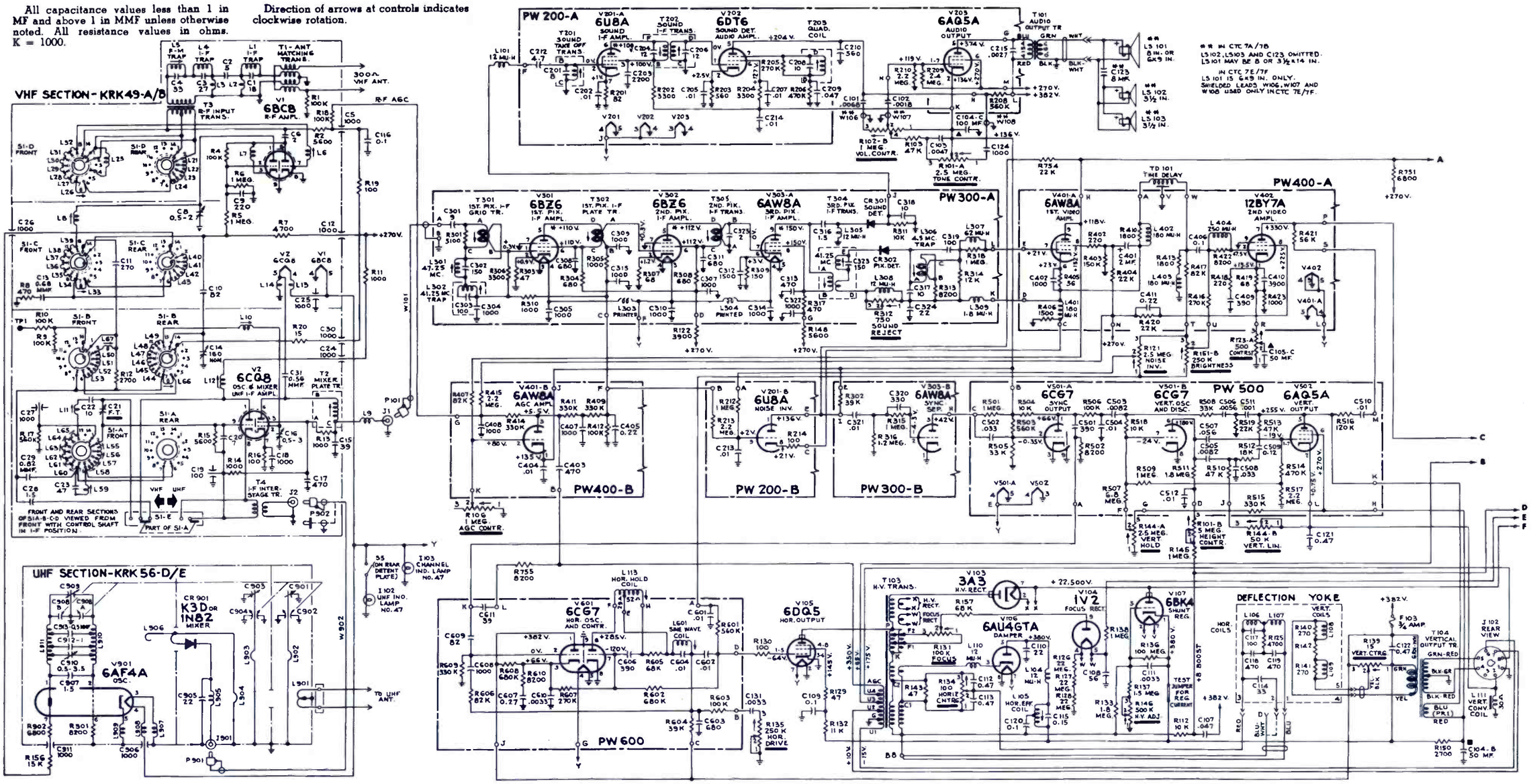
Models: 21-CD-8725 & U, 21-CD-8727 & U, 21-CD-8775 & U, 21-CD-8776 & U,
21-CD-8777 & U, 21-CD-8865 & U, 21-CD-8866 & U, 21-CD-8867 & U,
21-CD-8885 & U, 21-CD-8886 & U, 21-CD-8888 & U, 21-CD-8906 & U,
21-CD-8907 & U, 21-CD-8926 & U, 21-CD-8927 & U, 21-CD-8949 & U.

★★★★ ELECTRONIC TECHNICIAN COLOR CIRCUIT DIGEST

RCA
Color TV Chassis
CTC7A, B, C, D

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted. All resistance values in ohms. K = 1000.

Direction of arrows at controls indicates clockwise rotation.



All voltages measured with "Volt-Ohmyst" and no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

KINESCOPE TEMPERATURE, SCREEN AND BACKGROUND ADJUSTMENTS

The object of this procedure is to obtain the brightest picture possible, while maintaining proper tracking of the kinescope at all brightness levels. This condition depends upon having one (or more, as explained below) of the kinescope screen controls set to their maximum positions. This results in the brightest picture that it is possible to obtain.

Set the screen controls maximum clockwise and the background controls maximum counter-clockwise. Turn the brightness and contrast controls fully counter-clockwise after tuning in a signal. Use a program which displays the full range of contrast conditions from highlights to lowlights.

Advance the brightness control to obtain a picture just slightly below normal brightness level, the control will usually fall approximately two-thirds clockwise. Be careful not to advance brightness too close to overload. If the picture appears too dim at above setting advance the contrast control slightly.

Adjust the red, green and blue background controls to produce white in the highlight area of the picture. (Color temperature of 8200° Kelvin).

The screen control (or controls) which should remain at maximum control setting is determined as follows.

Reduce the brightness to produce a low brightness level picture and observe the lowlight areas (dark objects) of the picture. Some color will prevail in the low light areas. Depending upon which color is evident proceed as outlined below to determine which screen will be set at it's maximum position:

1. YELLOW IN LOW LIGHT AREAS—This condition indicates that the blue screen should remain at maximum setting.
2. CYAN IN LOWLIGHT AREAS—This condition indicates that the red screen should remain at maximum setting.
3. MAGENTA IN LOWLIGHT AREAS—This condition indicates that the green screen should remain at maximum.
4. RED, GREEN OR BLUE IN LOWLIGHT AREAS—This condition indicates that the screen, of whichever of these colors appears, is set too high and must be reduced from maximum. Turn this screen control down *slowly*. One of the following conditions will occur.

A. The picture will become gray in the lowlight areas. If this occurs the remaining two screen controls should remain at maximum setting and the corresponding background control for the screen that was turned down should be adjusted, with the brightness advanced to normal brightness, to produce white in the highlight areas. The kinescope should now track at all brightness levels. Recheck at low level and if necessary retouch slightly the screen control that was previously turned down to obtain grey in the lowlights.

No further adjustments are required and the balance of this procedure will not apply.

B. The picture will become yellow in the lowlight areas. This condition corresponds to 1. above and indicates the blue screen should remain at maximum.

C. The picture will become cyan in the lowlight areas. This condition corresponds to 2. above and indicates the red screen should remain at maximum.

D. The picture will become magenta in the lowlight areas. This condition corresponds to 3. above and indicates the green screen should remain at maximum.

At this point either the kinescope is already tracked as explained in A. or the maximum position screen control has been determined. ***From this point on do not adjust either the screen or background control for the color which remains at maximum screen control setting. This is important.***

Turn the brightness to a low level and adjust the two remaining screen controls to produce a gray picture in the lowlight areas.

Advance the brightness to normal level and adjust the two remaining background controls for white in the highlight areas.

Check at all brightness levels for proper tracking. It may be necessary to retouch slightly the two screen controls at lowlights and the two backgrounds at highlights, remembering ***not to adjust*** either the screen or background of the color set to maximum screen.

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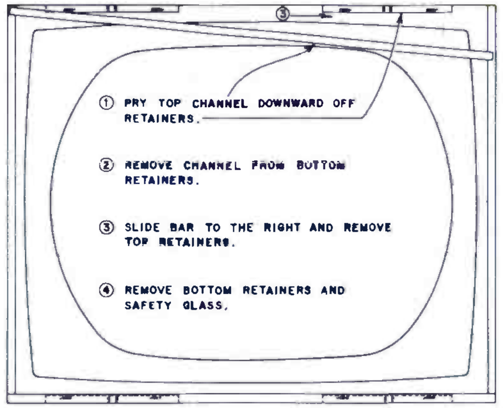
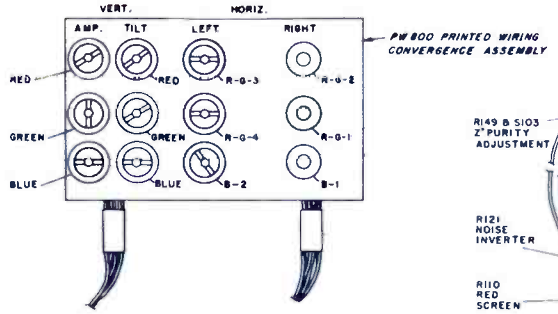
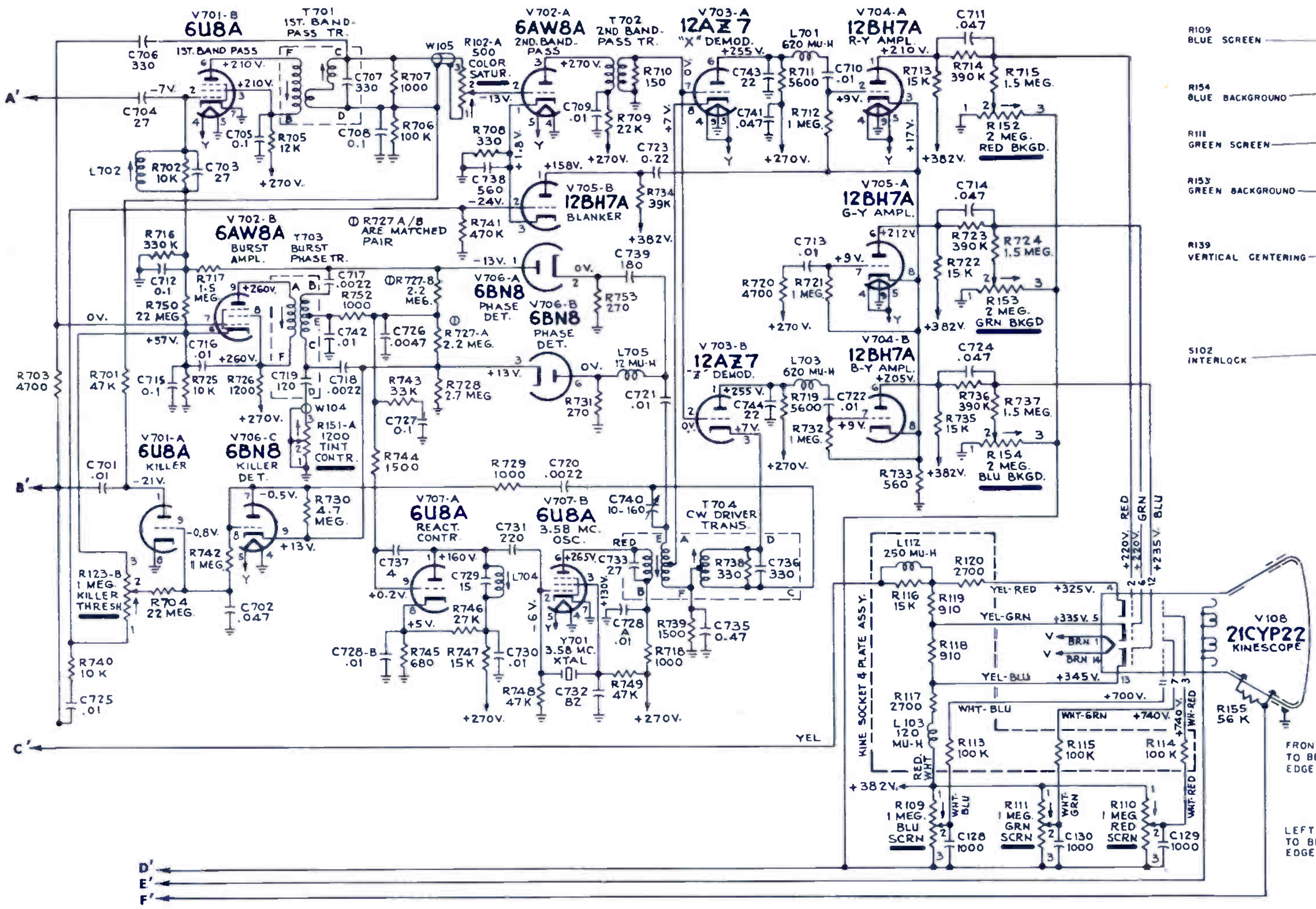
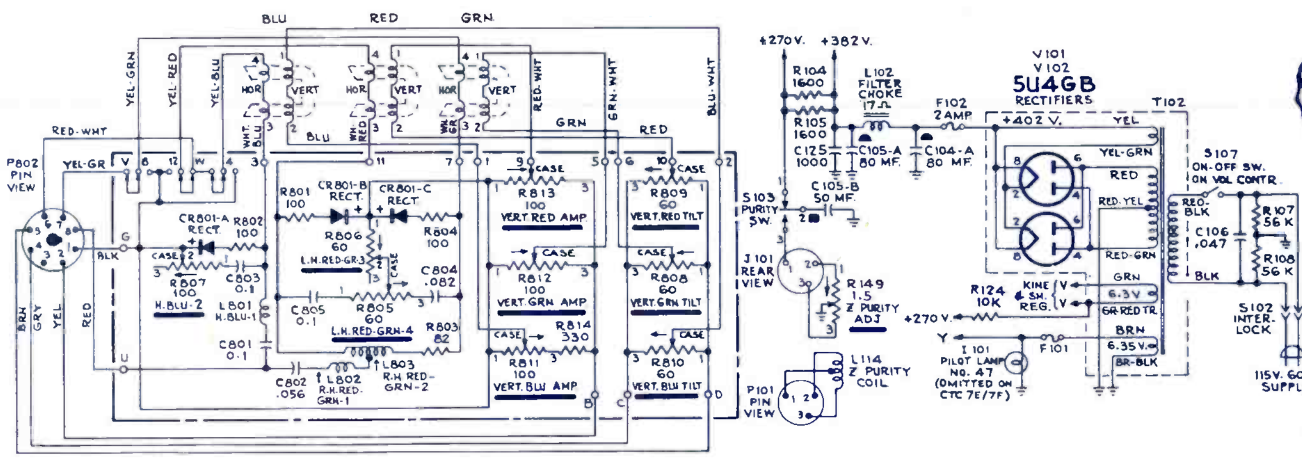
RCA
Color TV Chassis
CTC7A, B, C, D

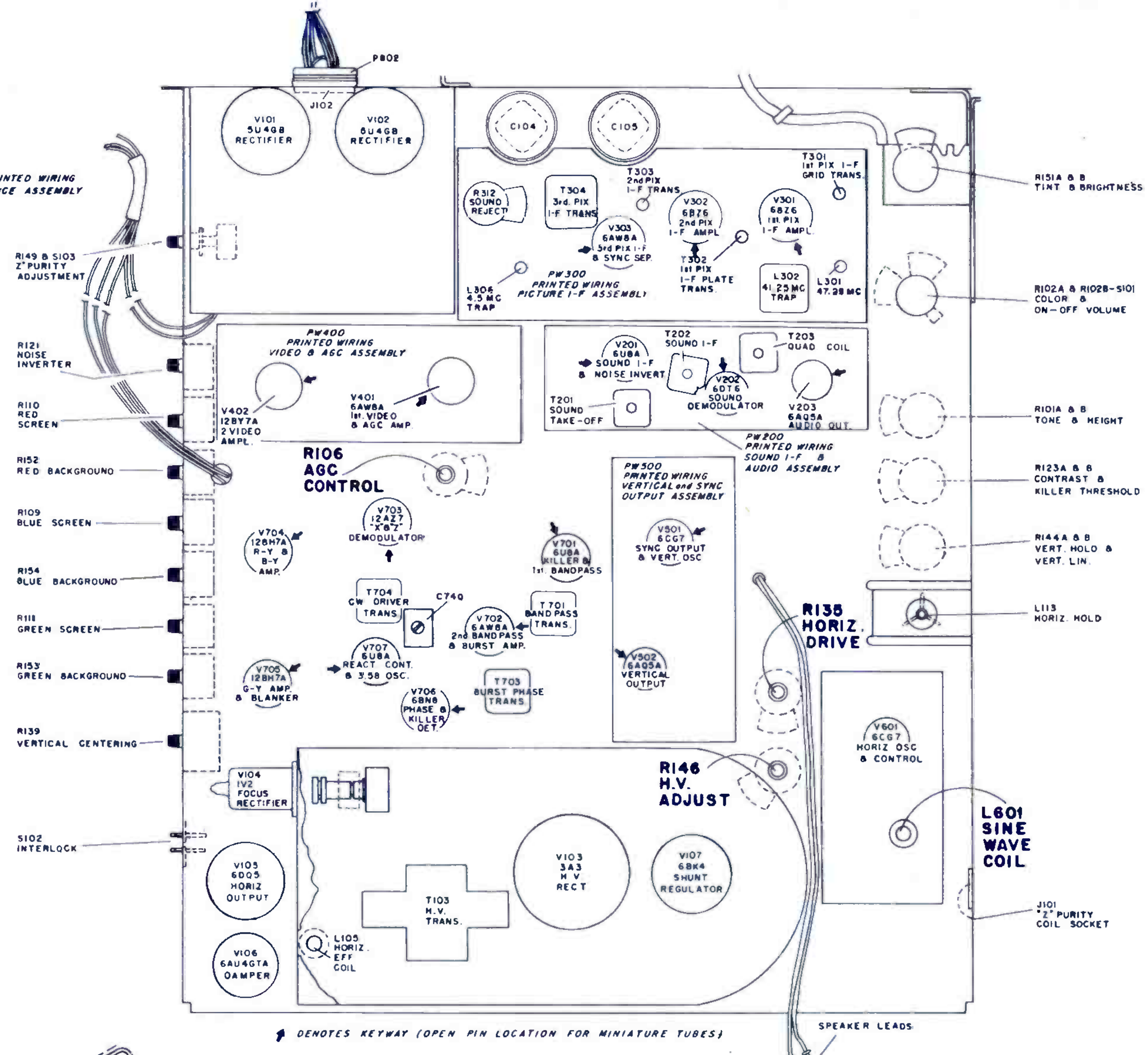


Safety Glass Removal

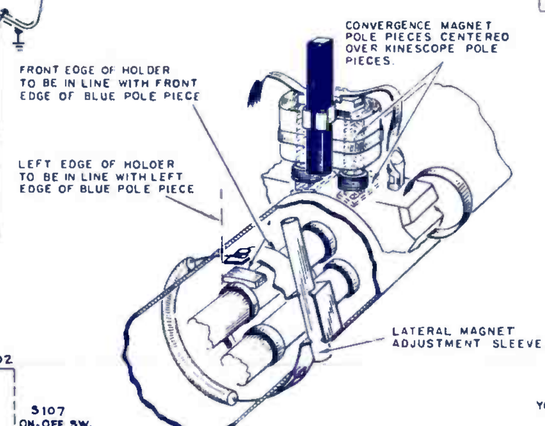




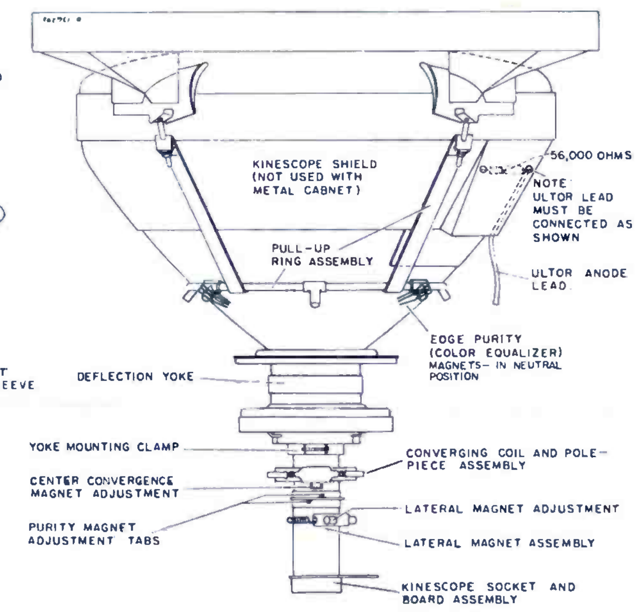




CHASSIS TOP VIEW



—Location of Convergence and Lateral Beam Magnets

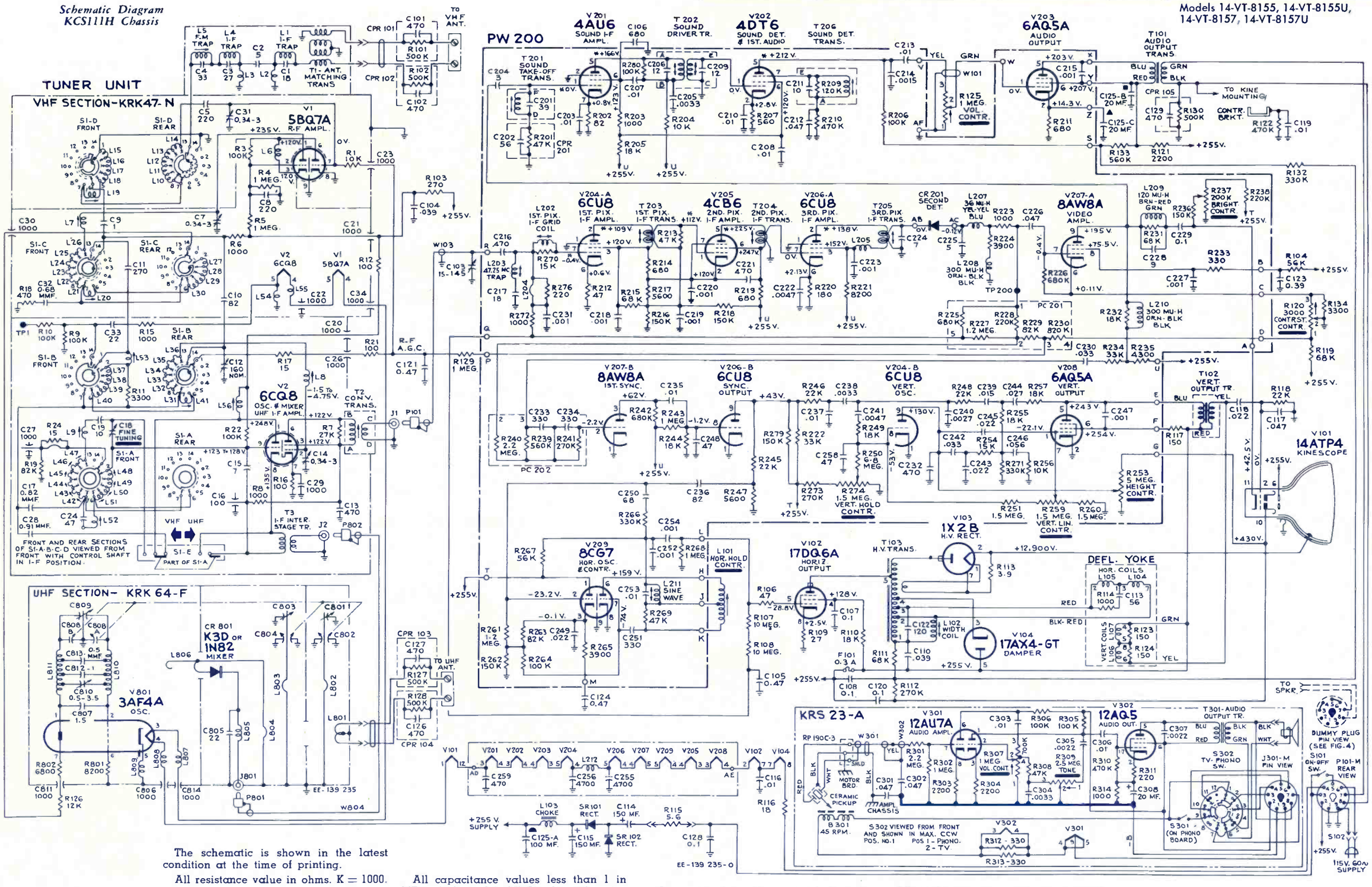


-Kinescope Adjustments and Components

RCA
Chassis KCS111F & H

Schematic Diagram
KCS111H Chassis

Models 14-VT-8155, 14-VT-8155U,
14-VT-8157, 14-VT-8157U



The schematic is shown in the latest condition at the time of printing.

All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

All voltages measured with "Volt-Ohmyst" and no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

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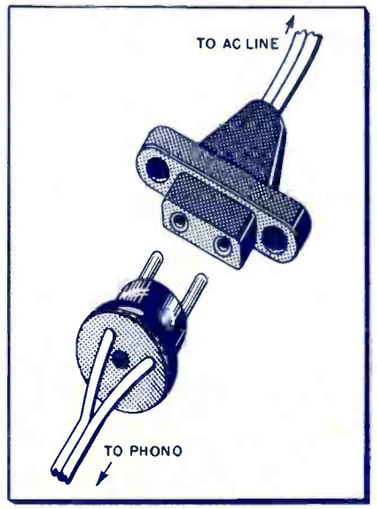
Shop Hints

Cheater-Cord Extension

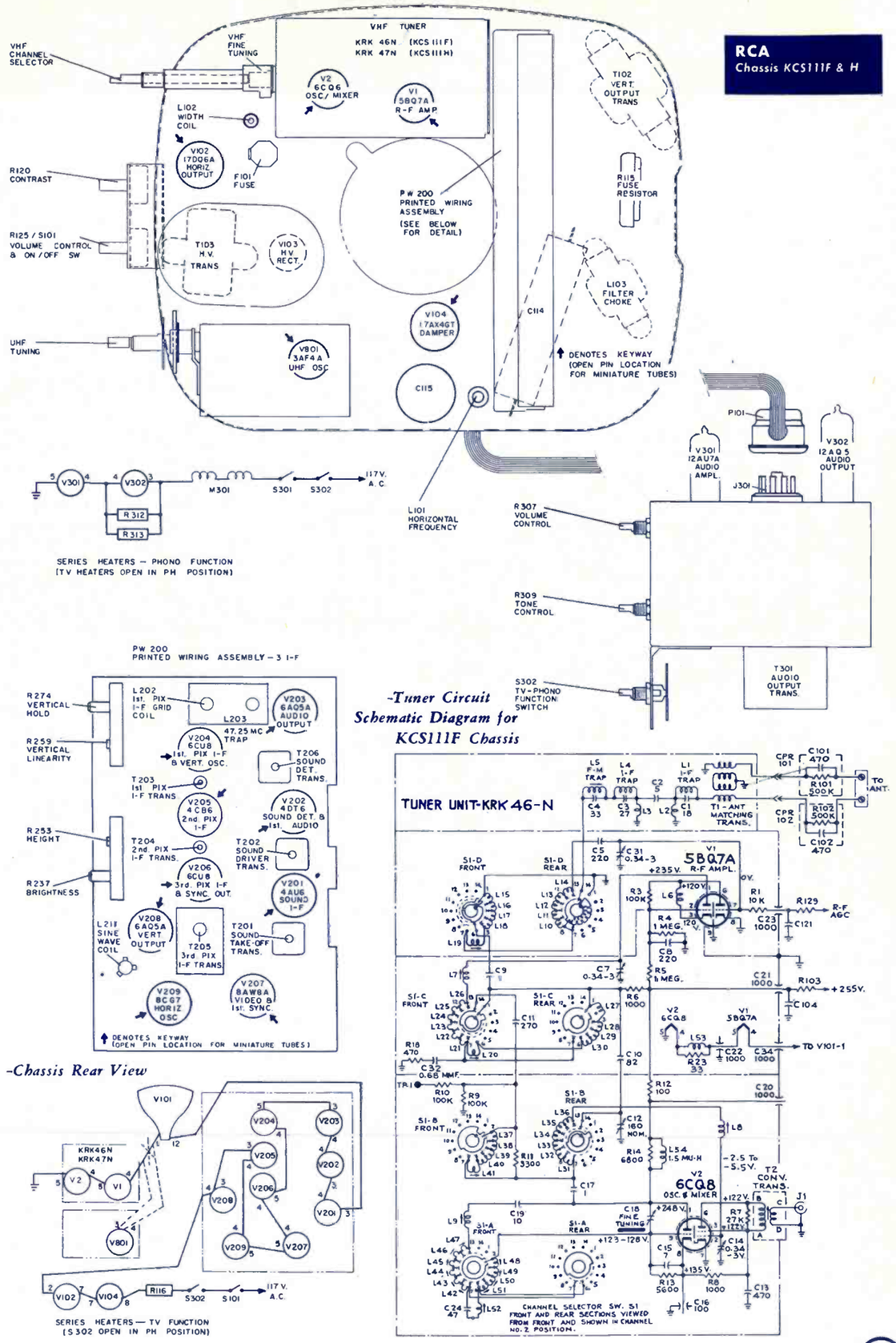
In many cases it is virtually impossible to remove the record player from its cabinet and still have the line cord and phono input cord attached to the amplifier. When servicing the record player, power may be obtained by using a TV cheater cord which makes a safe and handy extension line cord. Where there are more than two terminals, a careful check should be made to select the correct pair leading to the phono motor. Otherwise the fuses will pop. The cheater cord will accommodate the majority of record players. Some machines lend themselves quite readily to the use of regular electric-iron and the smaller waffle-iron type of plugs.—*Bill Ivan, Rahway, N. J.*



Cheater cord helps phono-motor servicing.

AGC Prescription

In most cases an aspirin will help. In many cases, I have found that a horizontal amplifier tube will check satisfactorily in a tube checker, but it will not function properly in the set. On those receivers deriving the AGC pulse from the horizontal output, with poor AGC action, the first thing to do is change the 6BQ6, or 6BG6, regardless of how the tube checks out. Do not rely on this as a cure all. The more usual sources of this difficulty should not be overlooked. They are in part, gassy, leaky or shorted tubes, defects in the horizontal circuit, and defects in the load circuit of the flyback transformer. Defective damper tube, linearity coil and condensers, width coil, yoke, etc. and the flyback itself will affect the amplitude of the AGC pulse.—*Robert Lipzen, Los Angeles, Calif.*

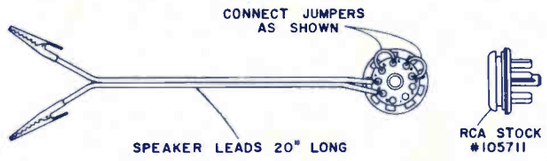


-Tuner Circuit Schematic Diagram for KCS111F Chassis

-Chassis Rear View

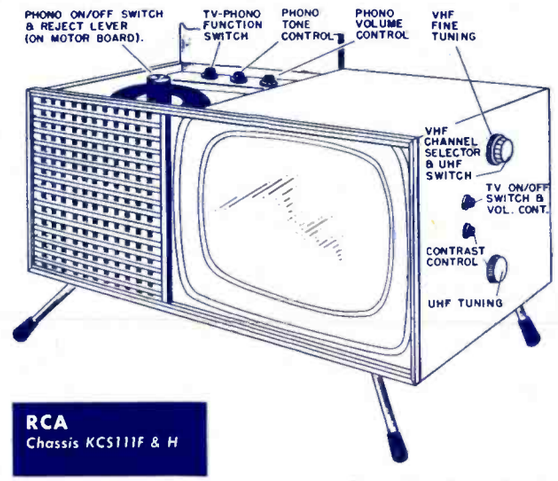
DUMMY PLUG FOR SERVICING

The dummy plug shown in Figure 3 may be used to operate the television portion of the receiver independently, if desired, from the phonograph amplifier and record changer.

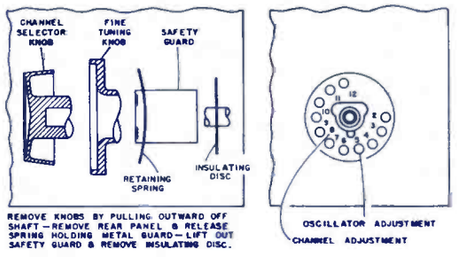


Dummy Plug for Servicing

-Kinescope and Safety Glass Cleaning



Receiver Operating Controls



R-F OSCILLATOR ADJUSTMENTS

WIDTH AND SINEWAVE ADJUSTMENTS

It is possible to adjust the horizontal sine wave in the field by the following method when such adjustment is indicated.

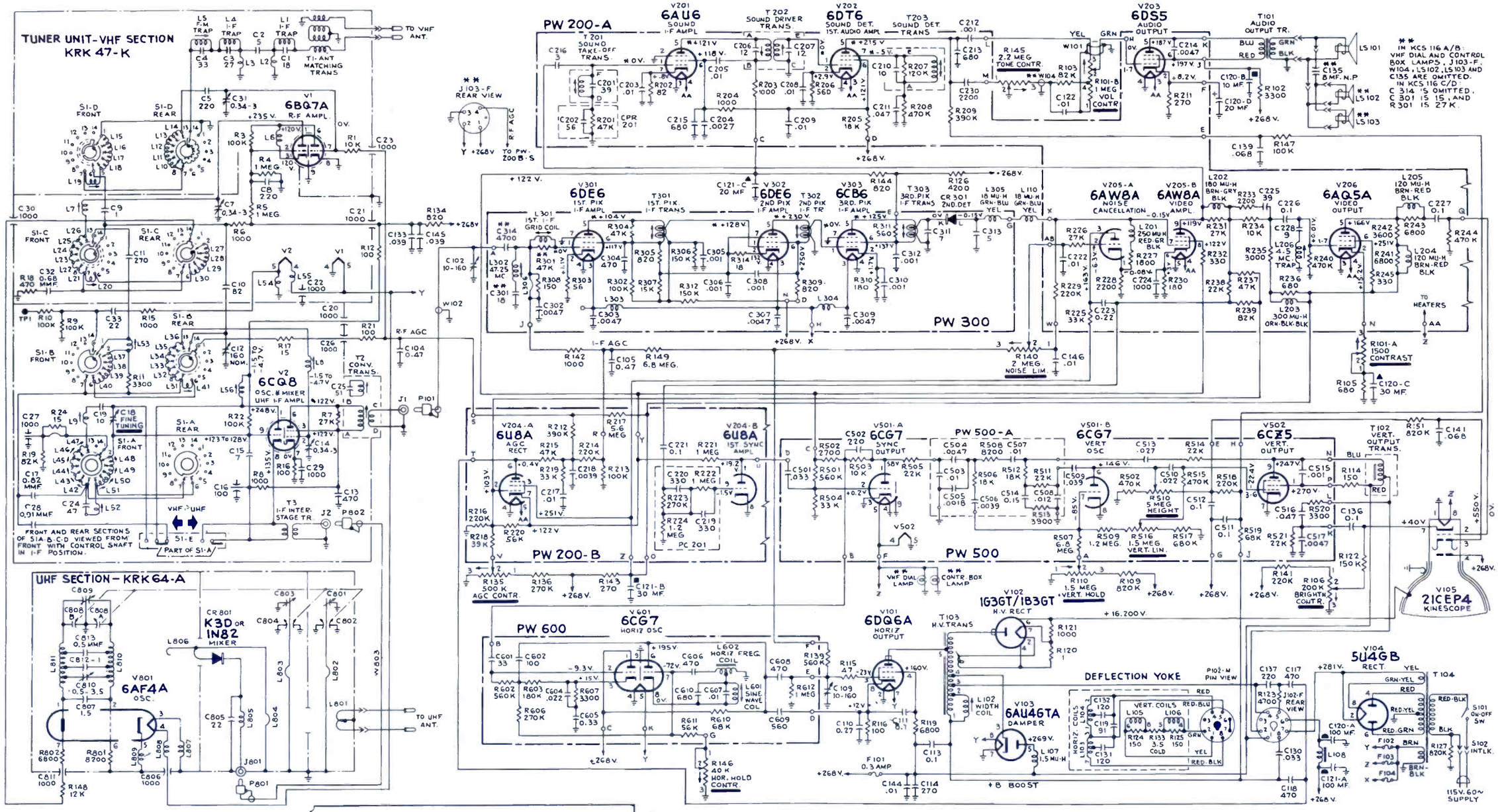
A. Adjust width for ½" overscan at each side, with normal line voltage and normal brightness.

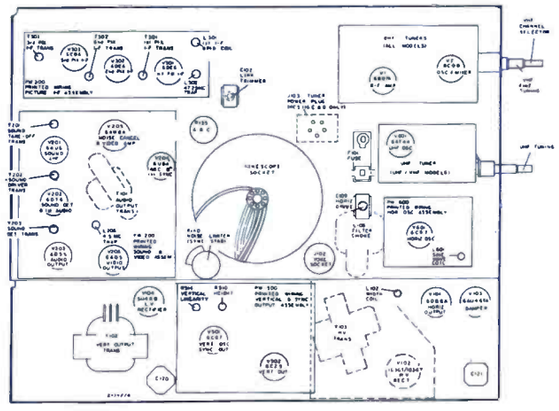
B. Turn horizontal hold control to the left, out of sync, to the point where interrupted oscillation occurs.

C. Adjust sinewave core, as the horizontal hold control is rotated to the left beyond the locked-in position, until 3 bars occur between the fall out point and interrupted oscillation.

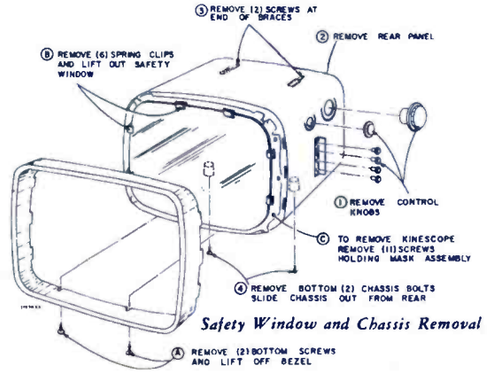
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

RCA
Chassis KCS116A, KCS116B, KCS116C, KCS116D





Models 21-D-8281(U), 21-D-8282(U), 21-D-8305(U), 21-D-8306(U), 21-D-8307(U), 21-D-8628(U)



Safety Window and Chassis Removal

The schematic is shown in the latest condition at the time of printing.
All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

All voltages measured with "VoltOhmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

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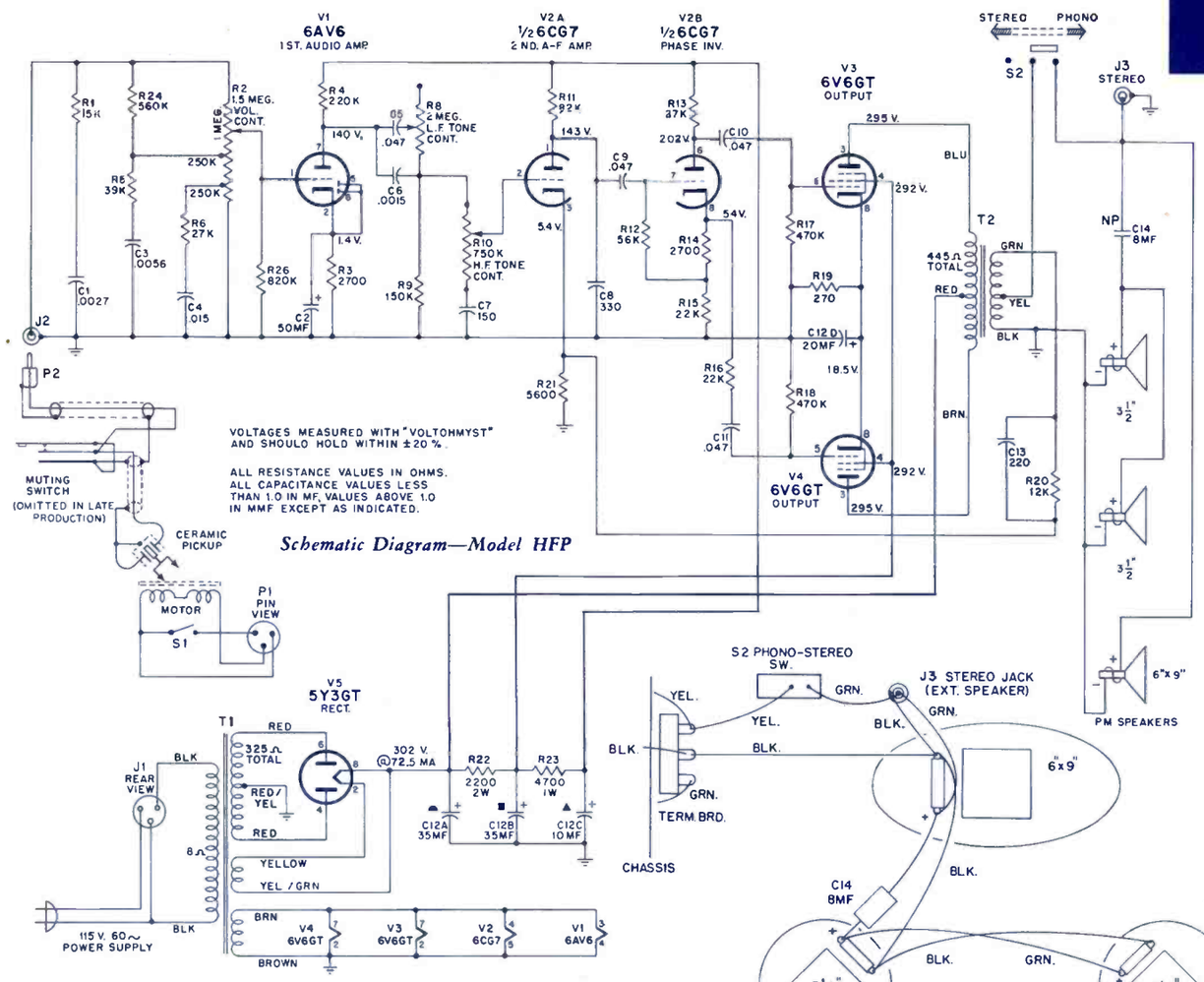
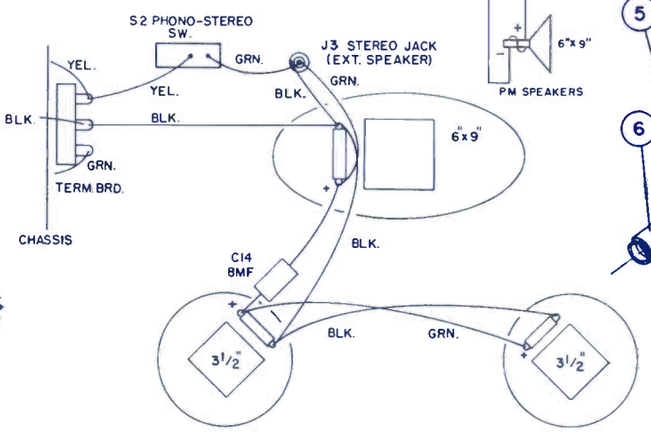
RCA
Hi Fi Chassis RS-164B
Models HFP, HFR, HFA
STD-2, STD-3



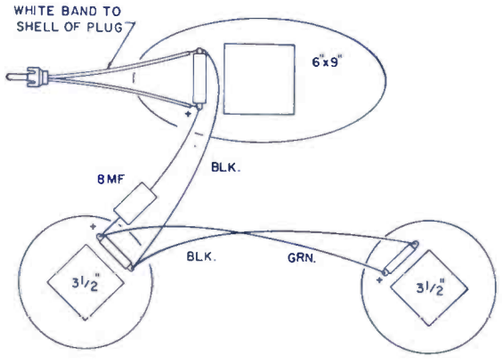
VOLTAGES MEASURED WITH "VOLTOHMYST" AND SHOULD HOLD WITHIN ±20 %.

ALL RESISTANCE VALUES IN OHMS. ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF, VALUES ABOVE 1.0 IN MMF EXCEPT AS INDICATED.

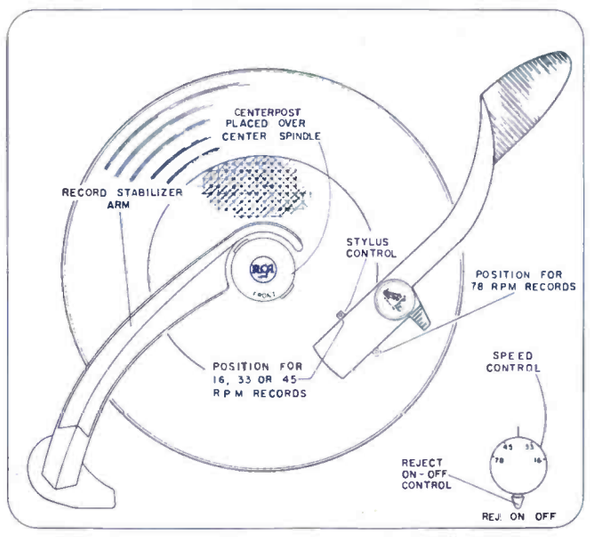
Schematic Diagram—Model HFP



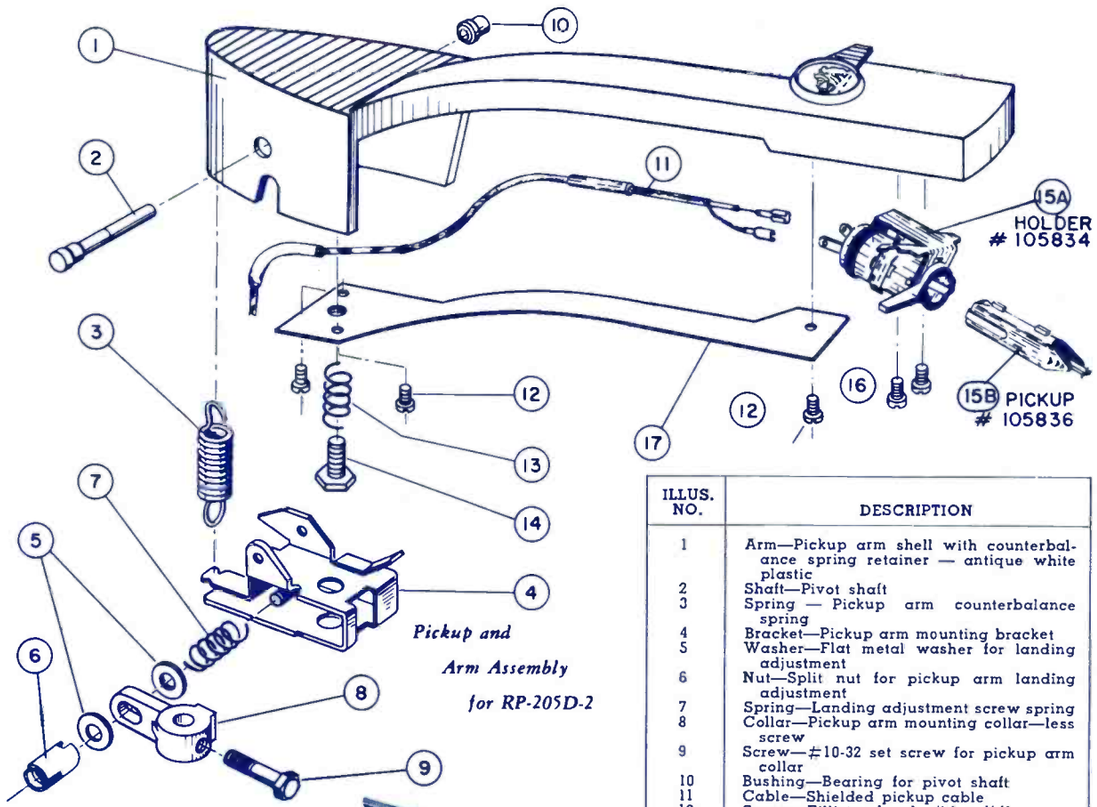
Speaker Connection Diagram—Model HFP



Speaker Connection Diagram—Model HFA



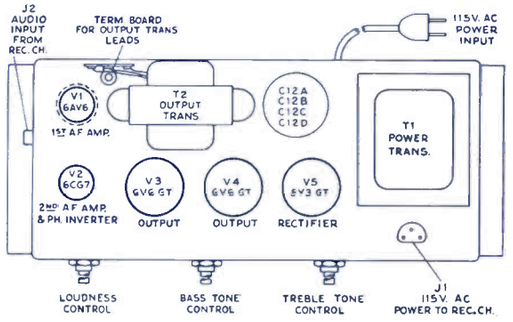
Record Changer Controls



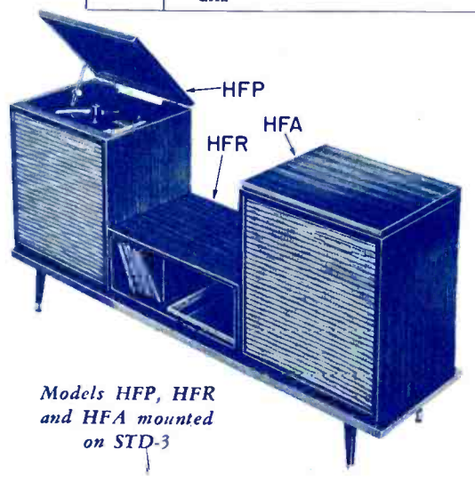
Pickup and Arm Assembly for RP-205D-2

ILLUS. NO.	DESCRIPTION
1	Arm—Pickup arm shell with counterbalance spring retainer — antique white plastic
2	Shaft—Pivot shaft
3	Spring — Pickup arm counterbalance spring
4	Bracket—Pickup arm mounting bracket
5	Washer—Flat metal washer for landing adjustment
6	Nut—Split nut for pickup arm landing adjustment
7	Spring—Landing adjustment screw spring
8	Collar—Pickup arm mounting collar—less screw
9	Screw—#10-32 set screw for pickup arm collar
10	Bushing—Bearing for pivot shaft
11	Cable—Shielded pickup cable
12	Screw—Fillister head, #4 x ¼"
13	Spring—Spring for height adjustment screw
14	Screw—Hex head, #6-32 height adjustment screw
15A	Pickup—Ceramic pickup complete with 1-mil and 3-mil synthetic sapphire styli — LESS holder
15B	Holder—Pickup holder only
16	Screw—Fillister head, #4 x ¼" pickup mounting screw
17	Plate—Metal plate for underside of pickup arm

Model HFP The "Medley" Black, Mahogany, Oak or Walnut



Top View of Amplifier



Models HFP, HFR and HFA mounted on STD-3

RCA, Canada

TV Chassis CT2128(U), CT2132(U), 33(U), CT2410(U), 11(U)

TV Models 21T194(U), 21T203(U), 21T204(U), 21T205(U), 21T206(U), 21T207(U), 21T209(U), 21T210(U)

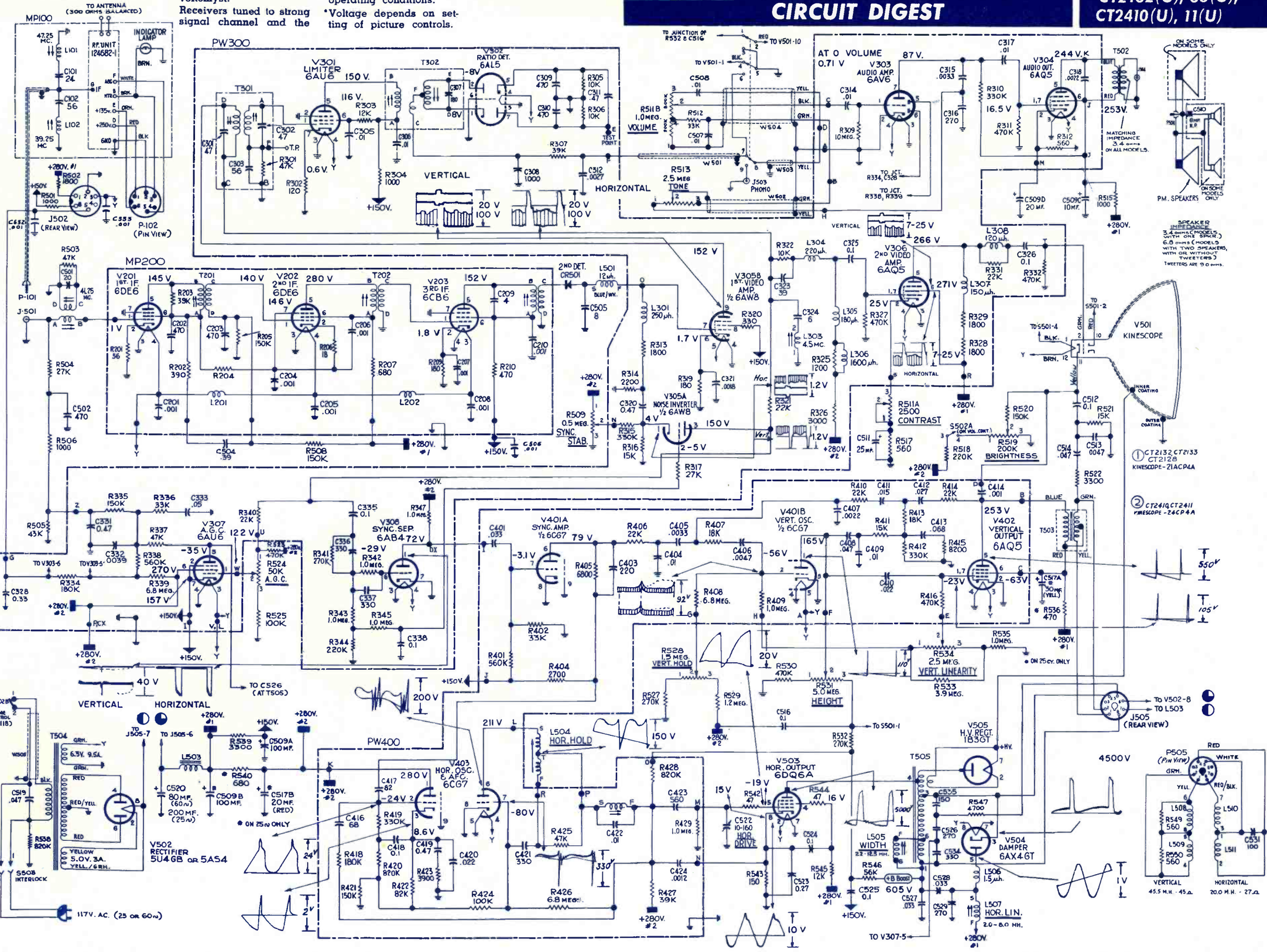
NOTE: All voltages between test signal and ground measured with voltomyst.

Receivers tuned to strong signal channel and the antenna input terminals shorted.

All controls set to normal operating conditions.

*Voltage depends on setting of picture controls.

Voltages should hold within 20% with 117 V. A.C.



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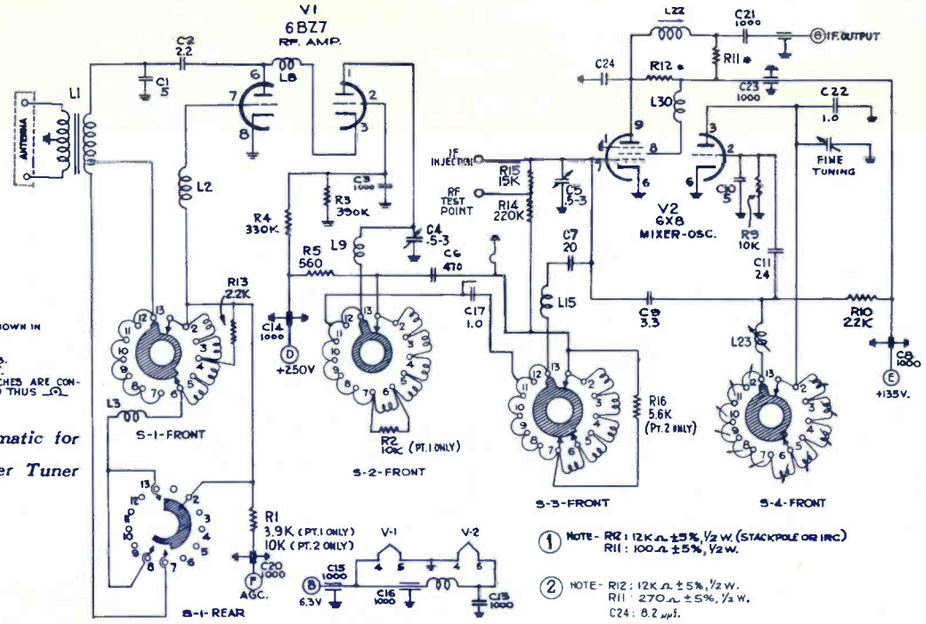
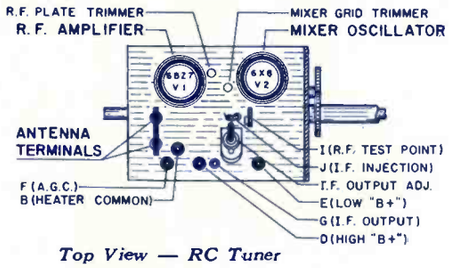
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

RCA, Canada

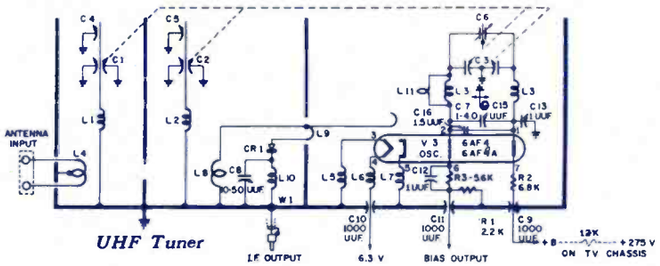
TV Chassis CT2128(U), 32(U), 33(U), CT2410(U), 11(U)



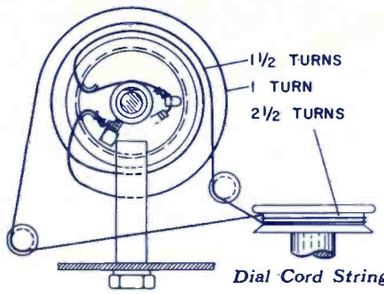
Tuner Schematic for Radio Condenser Tuner



Top View — RC Tuner



UHF Tuner

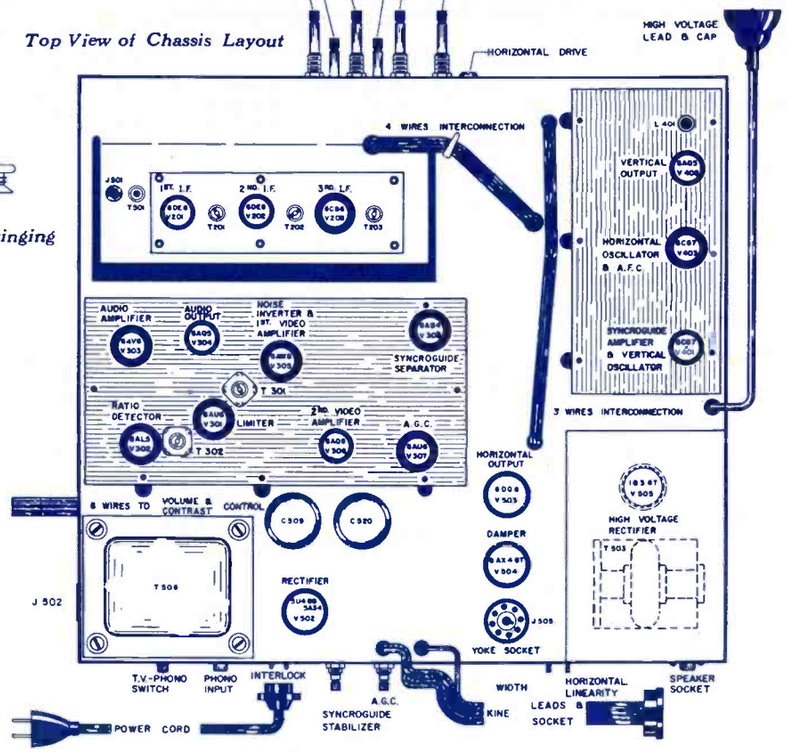


Dial Cord Stringing

NOTE: TURN SHAFT & PULLEY COUNTERCLOCKWISE UNTIL STUD AND SET SCREW MEET, THEN START CORD WIRING AS SHOWN.

MODEL 21T194(U) THE CLIFTON

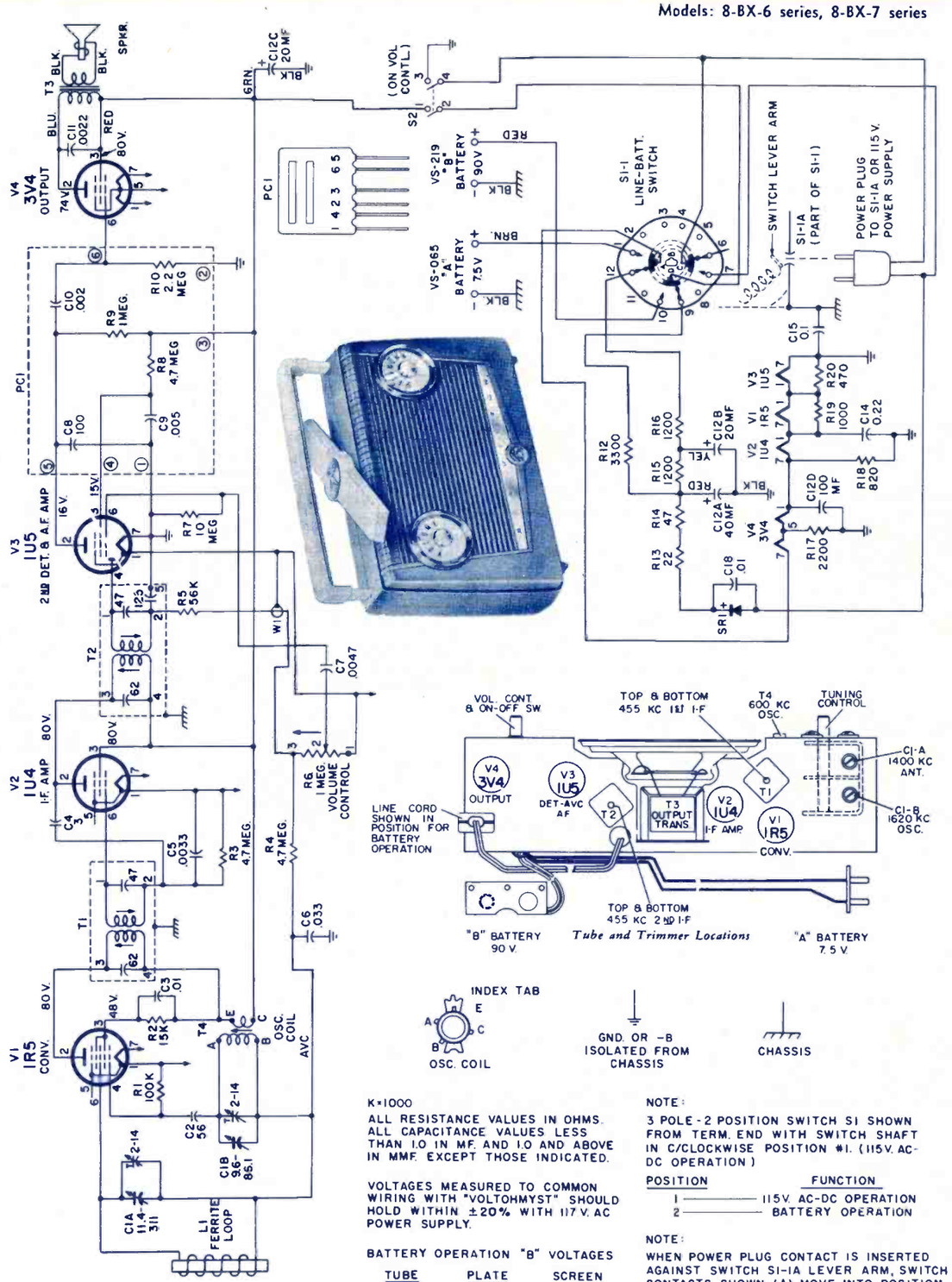
Top View of Chassis Layout



RCA

AC-DC-Battery Portable Radio, Chassis RC-1161, RC-1161A

Models: 8-BX-6 series, 8-BX-7 series



Tube and Trimmer Locations

GND. OR −B ISOLATED FROM CHASSIS

CHASSIS

K=1000

ALL RESISTANCE VALUES IN OHMS. ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND 1.0 AND ABOVE IN MMF. EXCEPT THOSE INDICATED.

VOLTAGES MEASURED TO COMMON WIRING WITH "VOLTOHMYST" SHOULD HOLD WITHIN ±20% WITH 117 V. AC POWER SUPPLY.

BATTERY OPERATION "B" VOLTAGES

TUBE	PLATE	SCREEN
1R5	63 V.	37 V.
1U4	63 V.	63 V.
1U5	15 V.	14 V.
3V4	61 V.	63 V.

NOTE:
3 POLE - 2 POSITION SWITCH S1 SHOWN FROM TERM. END WITH SWITCH SHAFT IN C/CLOCKWISE POSITION #1. (115 V. AC-DC OPERATION)

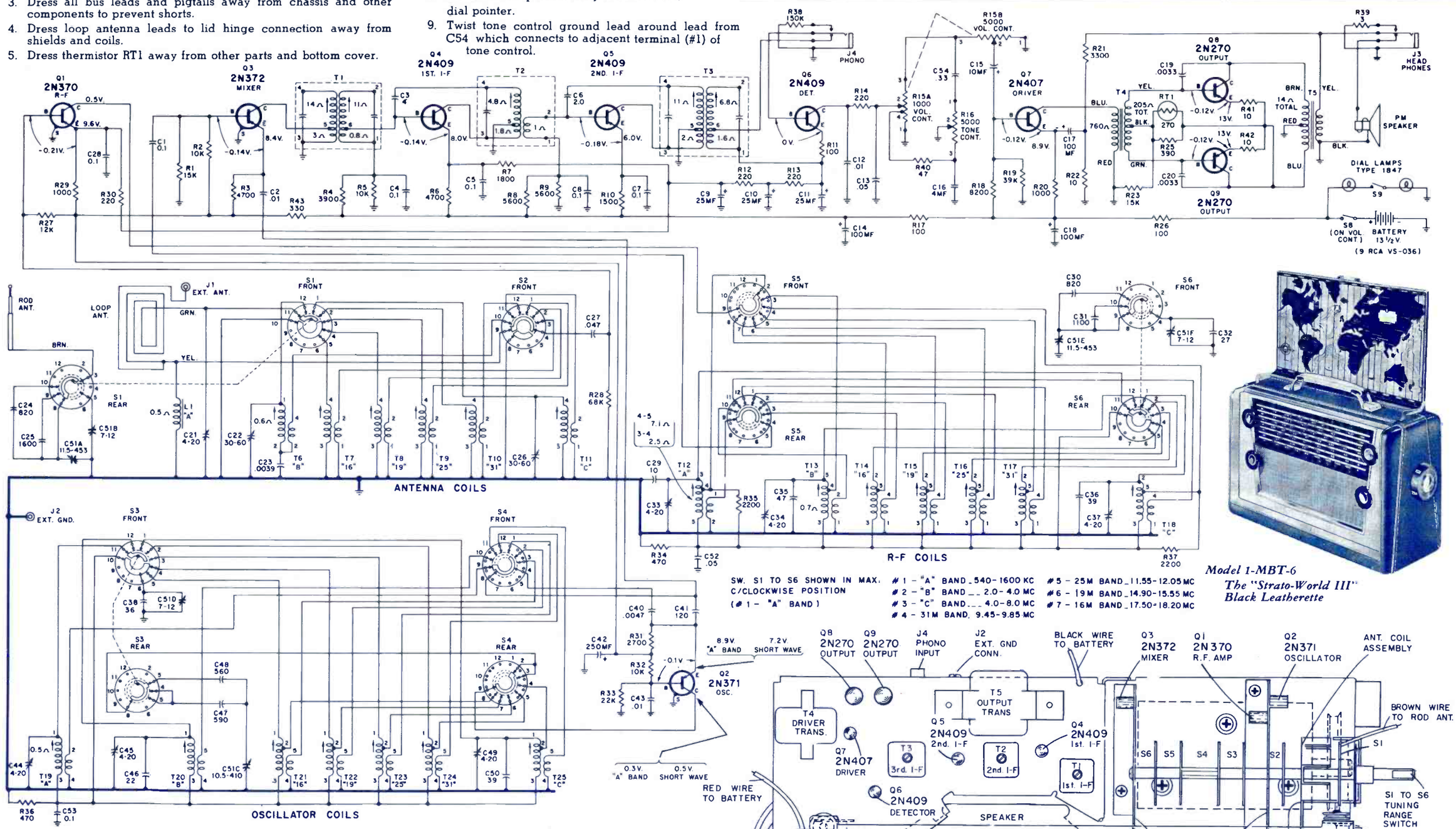
POSITION	FUNCTION
1	115 V. AC-DC OPERATION
2	BATTERY OPERATION

NOTE:
WHEN POWER PLUG CONTACT IS INSERTED AGAINST SWITCH S1-1A LEVER ARM, SWITCH CONTACTS SHOWN (•) MOVE INTO POSITION 2 FOR BATTERY OPERATION. (INNER CONTACTS REMAIN STATIONARY).

RCA
Transistor 7-Band Port. Radio Chassis RC-1184

CRITICAL LEAD DRESS

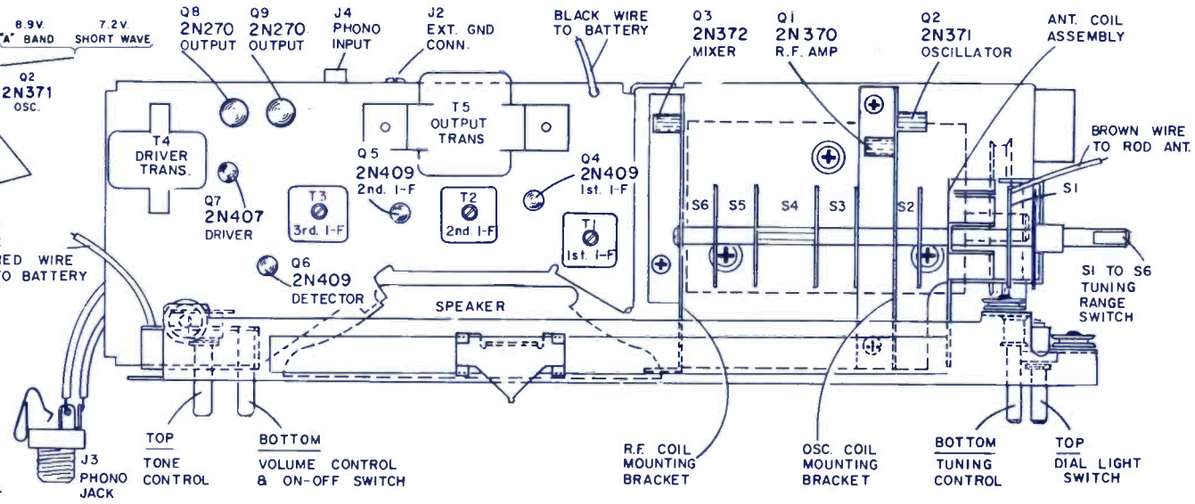
1. Lead from C44, "A" osc. trimmer, to S3 terminal #11 and from S3 terminal #11 to oscillator coil T19, must be dressed away from metal shield to reduce capacity.
2. Dress all leads away from coils, particularly the short-wave oscillator coils, to prevent microphonics.
3. Dress all bus leads and pigtails away from chassis and other components to prevent shorts.
4. Dress loop antenna leads to lid hinge connection away from shields and coils.
5. Dress thermistor RT1 away from other parts and bottom cover.
6. Dress lead from Base of Q6 to J4, as short as possible and down to chassis.
7. Dress lead from J4 to T3 as short as possible and down to chassis.
8. Dress dial lamp leads away from coils and dial pointer.
9. Twist tone control ground lead around lead from C54 which connects to adjacent terminal (#1) of tone control.



Model 1-MBT-6
The "Strato-World III"
Black Leatherette

SW. S1 TO S6 SHOWN IN MAX. C/CLOCKWISE POSITION (#1 - "A" BAND)

#1 - "A" BAND 540-1600 KC
#2 - "B" BAND 2.0-4.0 MC
#3 - "C" BAND 4.0-8.0 MC
#4 - 31M BAND 9.45-9.85 MC
#5 - 25M BAND 11.55-12.05 MC
#6 - 19M BAND 14.90-15.55 MC
#7 - 16M BAND 17.50-18.20 MC



Top View of Chassis Showing Location of Transistors and Major Components

PHONO INPUT

Radio signal is disconnected when plug is inserted in "Phono" jack (back of chassis).

PHONES JACK

Speaker is disconnected when phones plug is inserted in "Phones" jack (front panel).

OSC INJECTION VOLTAGE MEASURED AT Q3 EMITTER

"A", "B", "C", "31M"	0.09 v. to 0.12 v. r.m.s.
"25M"	0.08 v. to 0.11 v. r.m.s.
"19M"	0.10 v. to 0.13 v. r.m.s.
"16M"	0.04 v. to 0.11 v. r.m.s.

VOLTAGES MEASURED TO CHASSIS GROUND UNLESS OTHERWISE INDICATED.

VOLTAGES MEASURED WITH "VOLTOHMYST" SHOULD HOLD WITHIN ±20% WITH NEW BATTERY.

K=1000. ALL RESISTANCE VALUES IN OHMS.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF AND 1.0 & ABOVE IN MMF EXCEPT THOSE INDICATED.

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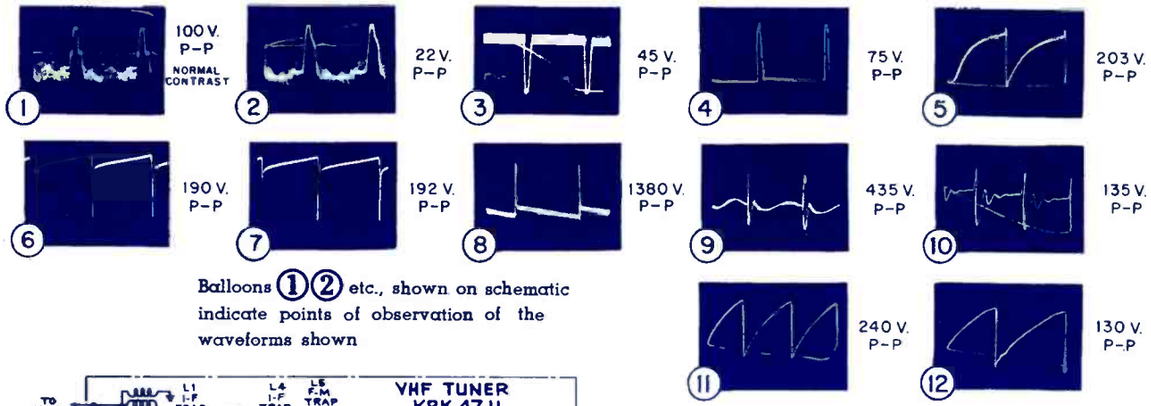
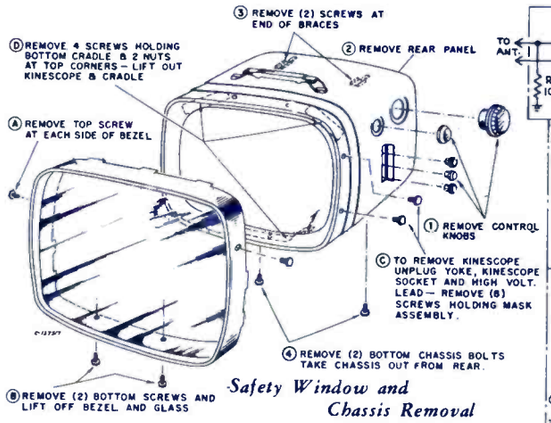
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

RCA
TV Chassis KCS117A & B



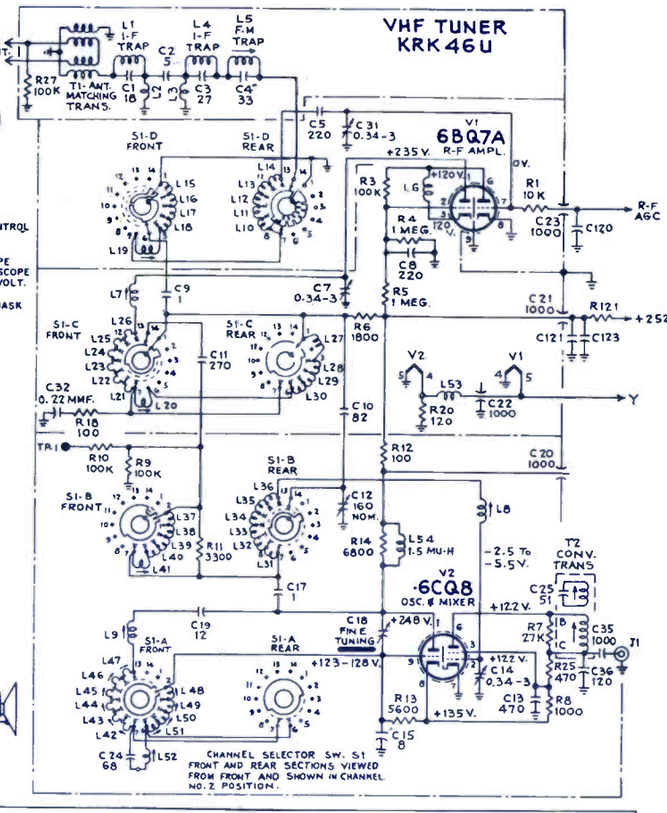
Balloons (1) (2) etc., shown on schematic indicate points of observation of the waveforms shown

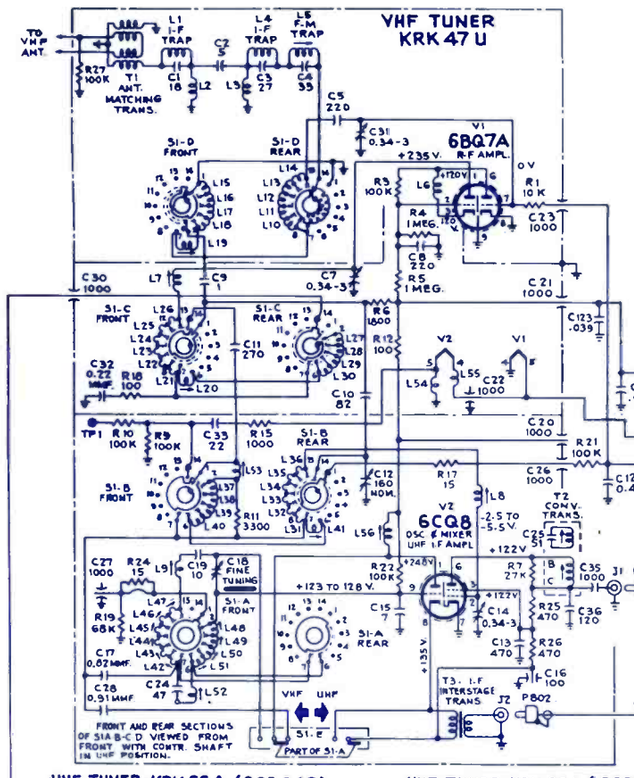


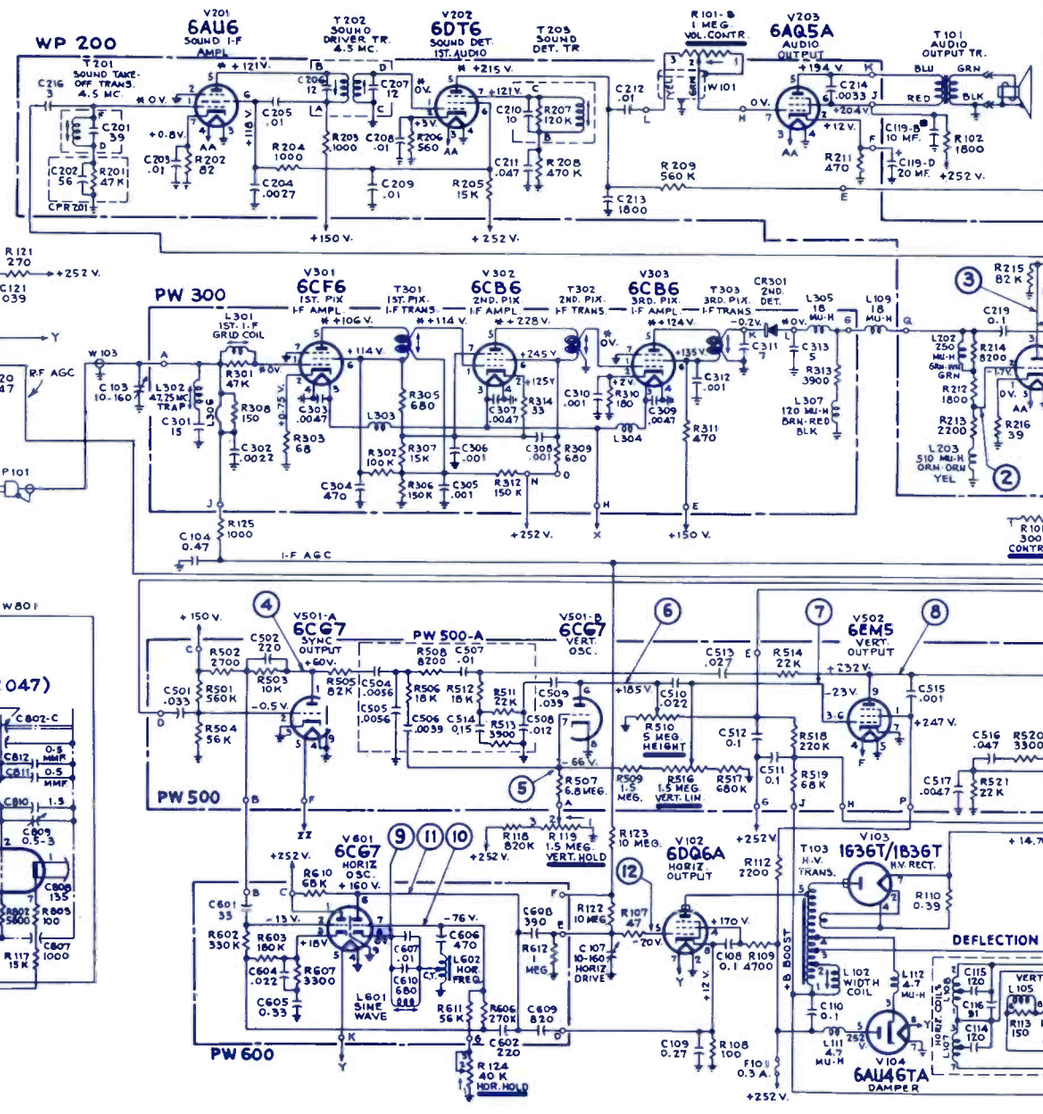
Safety Window and Chassis Removal

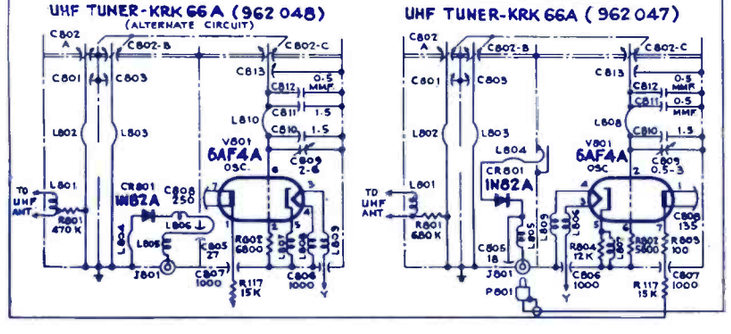
All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

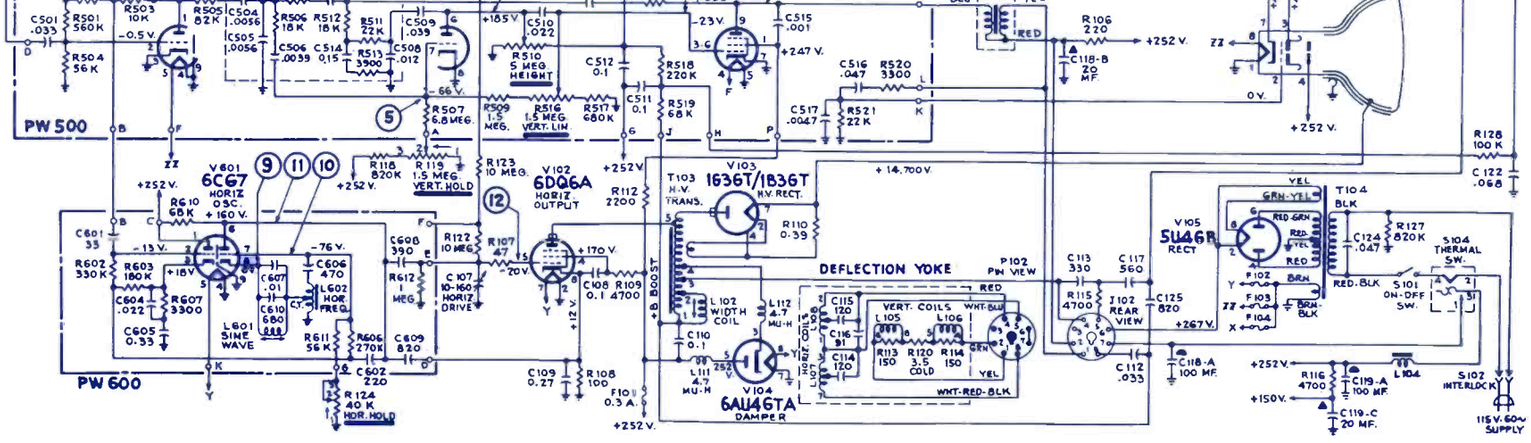
*Measured with 1 megohm ½ watt resistor in series with meter probe.





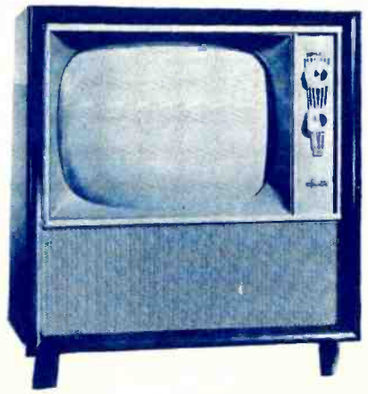






ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

SPARTON (of Canada, Ltd.)
Chassis 21G1



NOTES

UNLESS OTHERWISE SHOWN
ALL CAPACITORS IN mmf
ALL RESISTANCES IN OHMS (1/2 WATT)
VOLTAGES TAKEN WITH V.T.V.M. WITH RECEIVER CONTROLS AT NORMAL VIEWING POSITION AND NO SIGNAL BEING RECEIVED
COIL RESISTANCES SHOWN WHEN OUT OF CIRCUIT
COILS LESS THAN 1.0 OHM NOT MARKED

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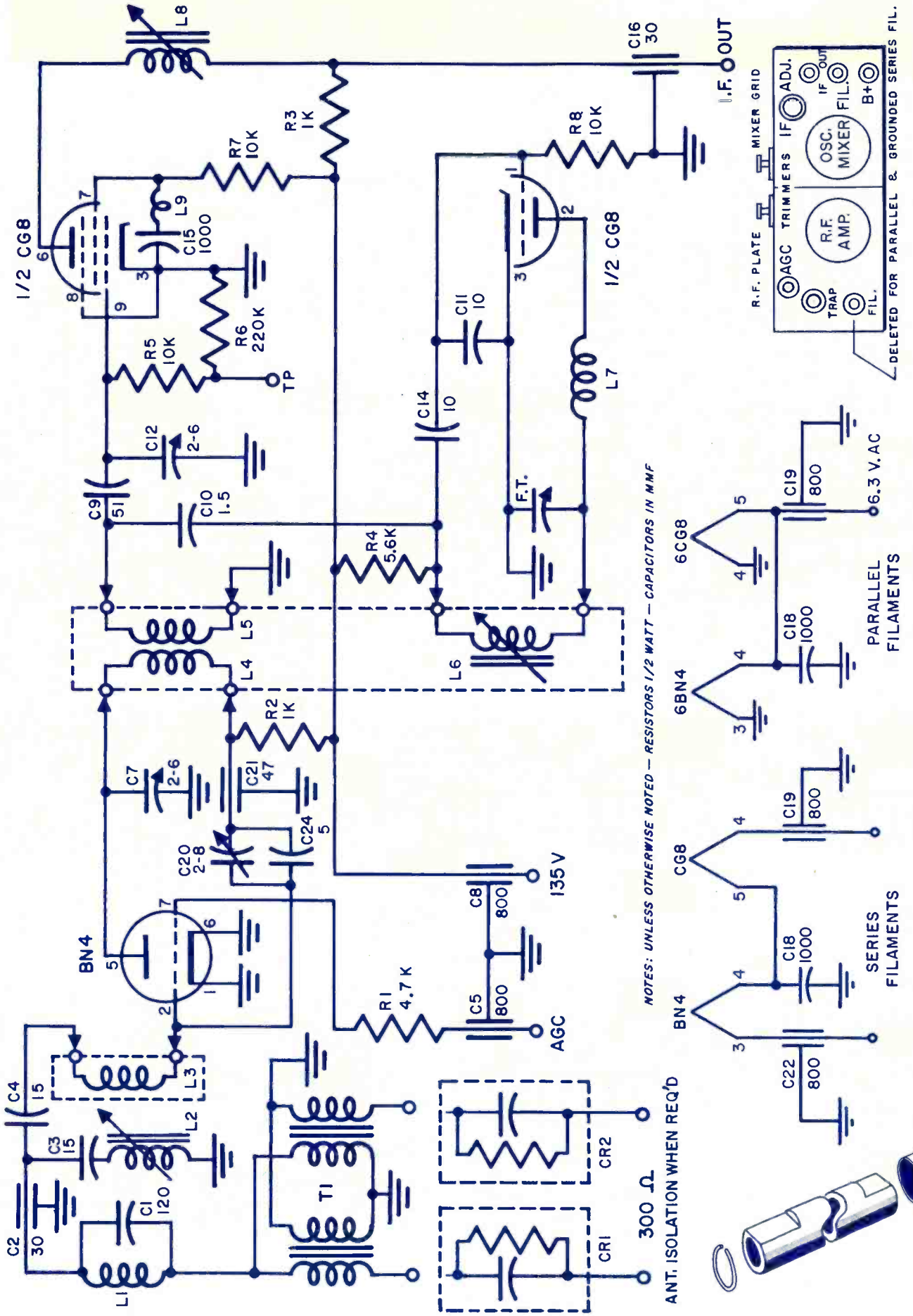
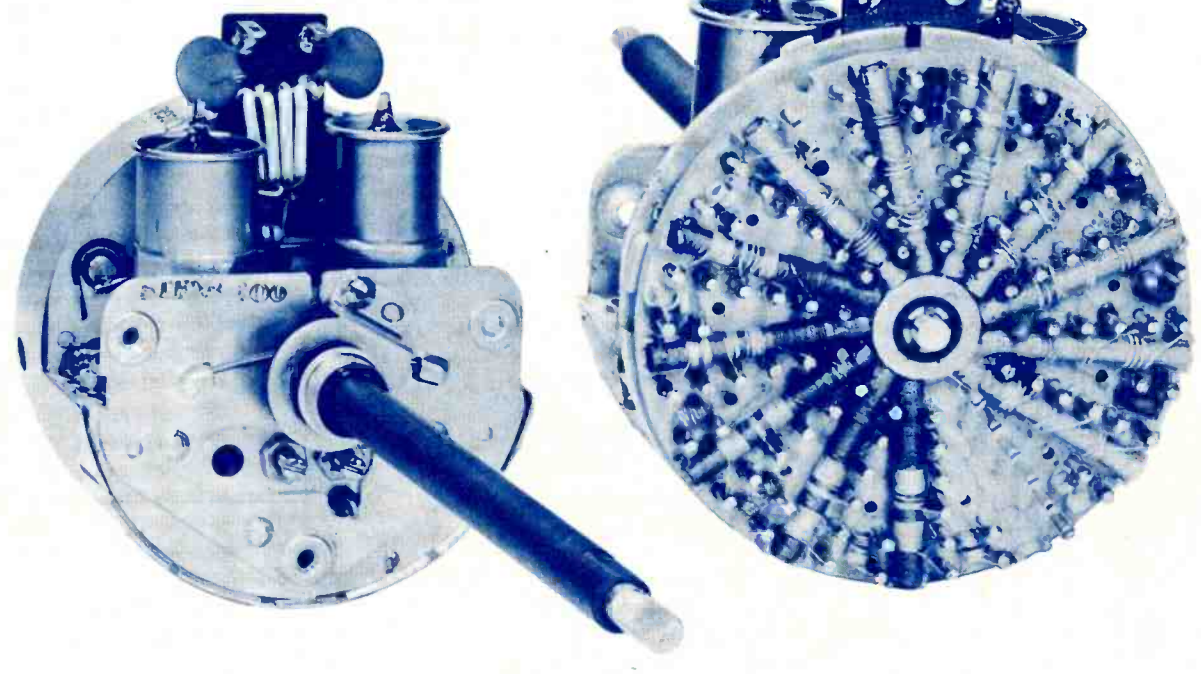
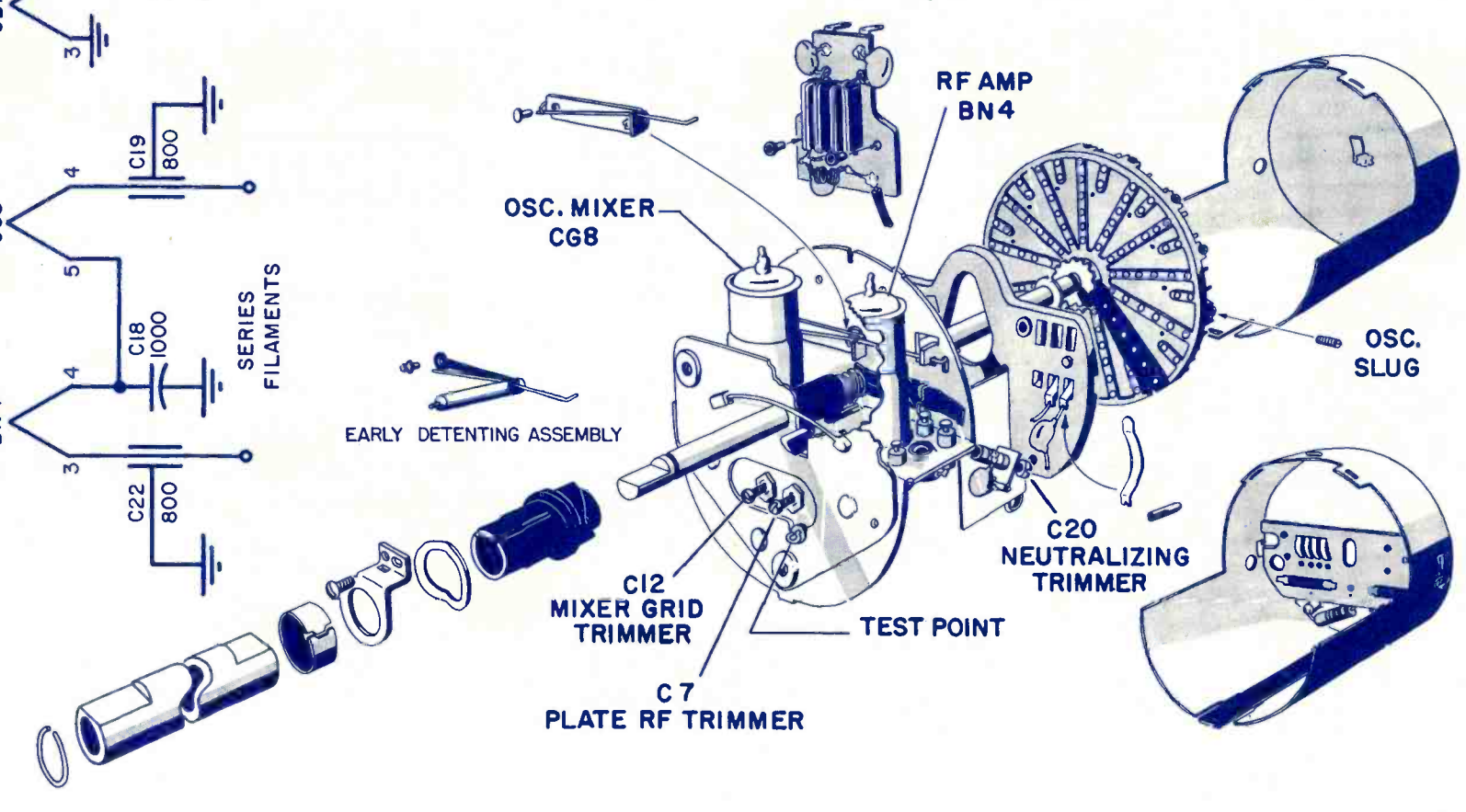
STANDARD COIL
The "Fireball" Tuner







ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

SYLVANIA
Chassis 1-537-1-3-4

Models: 17P101, 17P102, 17P201

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED:

1. VOLTAGE MEASURED TO CHASSIS USING SYLVANIA POLYMETER (VTVM).
2. AC POWER SOURCE 117V. 60 CYCLE LINE.
3. VOLTAGE READINGS IN BRACKETS TAKEN WITH NO SIGNAL INPUT: CHANNEL SELECTOR SET TO FREE CHANNEL. ANTENNA DISCONNECTED. ANTENNA TERMINALS SHORTED TOGETHER AND GROUNDED TO CHASSIS.
4. VOLTAGE READINGS NOTIN BRACKETS TAKEN WITH A STRONG SIGNAL INPUT: TUNER SET TO STRONG LOCAL STATION DEVELOPING APPROXIMATELY - 7V. ON IF AGC BUS (JUNCTION OF C-203 & R-205.)
5. CONTRAST CONTROL SET TO MAXIMUM. BRIGHTNESS CONTROL SET TO MINIMUM.
6. VOLTAGE VALUES SHOWN ARE AVERAGE READINGS. VARIATIONS MAY BE OBSERVED DUE TO NORMAL PRODUCTION TOLERANCES.

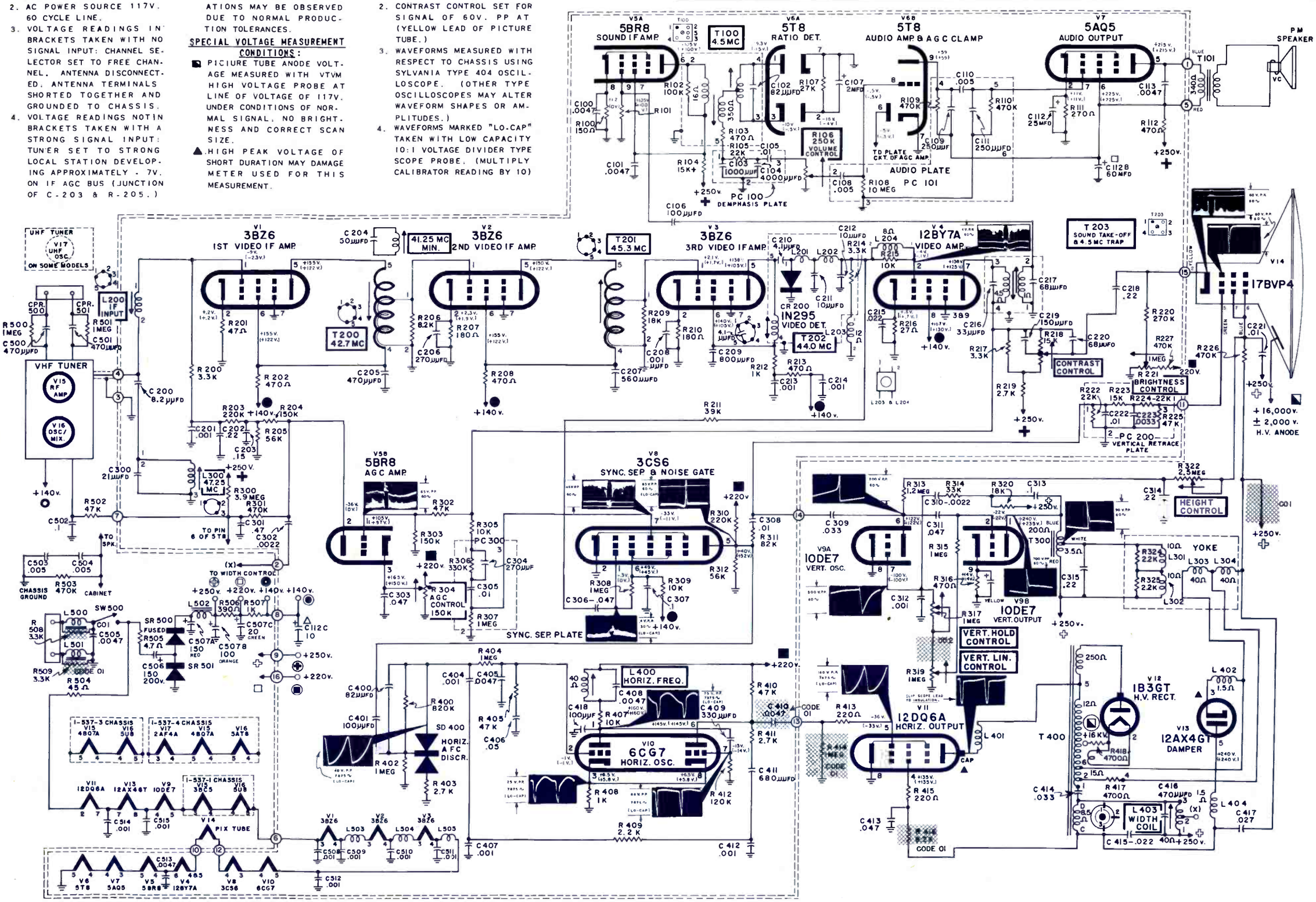
SPECIAL VOLTAGE MEASUREMENT CONDITIONS:

■ PICTURE TUBE ANODE VOLTAGE MEASURED WITH VTVM HIGH VOLTAGE PROBE AT LINE OF VOLTAGE OF 117V. UNDER CONDITIONS OF NORMAL SIGNAL, NO BRIGHTNESS AND CORRECT SCAN SIZE.

▲ HIGH PEAK VOLTAGE OF SHORT DURATION MAY DAMAGE METER USED FOR THIS MEASUREMENT.

WAVEFORM MEASUREMENT CONDITIONS:

1. CHANNEL SELECTOR SET TO STRONG CHANNEL.
2. CONTRAST CONTROL SET FOR SIGNAL OF 60V. PP AT (YELLOW LEAD OF PICTURE TUBE.)
3. WAVEFORMS MEASURED WITH RESPECT TO CHASSIS USING SYLVANIA TYPE 404 OSCILLOSCOPE. (OTHER TYPE OSCILLOSCOPES MAY ALTER WAVEFORM SHAPES OR AMPLITUDES.)
4. WAVEFORMS MARKED "LO-CAP" TAKEN WITH LOW CAPACITY 10:1 VOLTAGE DIVIDER TYPE SCOPE PROBE. (MULTIPLY CALIBRATOR READING BY 10)



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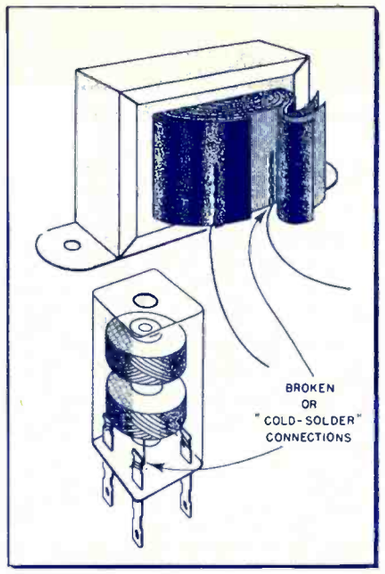
Shop Hint

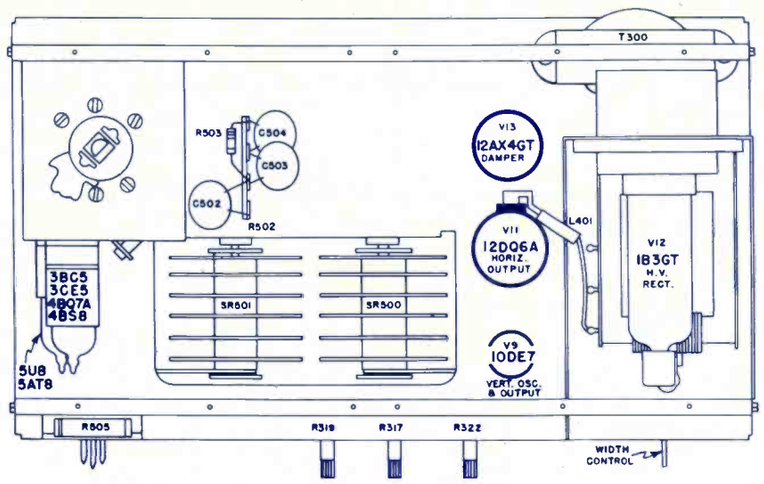
Transformer First Aid

What may appear to be a transformer replacement job in a fairly new set may in fact turn out to be only a minor repair to a major component. In many cases a winding which reads open or very high resistance may be due to a defective or broken solder joint inside the transformer, where the heavy leads are attached to the comparatively very thin winding ends. Power, audio output, i-f transformers, chokes and other coils may suffer from this difficulty. All that is needed is to clean and re-solder the joint to restore the transformer to operating condition. It is more likely that this condition will be found in new equipment. Breakdown in older transformers usually occurs within the windings. In some cases it is possible to dig the coil, find the trouble and correct it. The chances for breakdown are ever present in the latter proccdure and is therefor not usually recommended. With a sharp knife, cut one layer or insulation at a time and fold back. Cut only as many layers as needed to expose the coil winding ends. Precaution against cutting too deep should be exercised to avoid damaging the transformer coil windings.

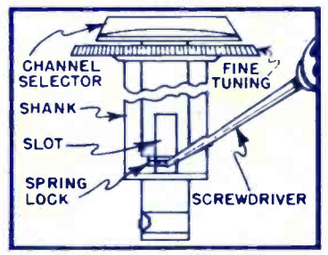
Extreme care should be exercised in preparing the short coil ends for connection, a break too close to the coil proper may terminate any further first aid procedure. Use fine emery cloth to remove the enamel coating. It is a good idea to provide strain relief on these leads. Fold the insulation back into place and tape. *K. Bramham, Vancouver, B.C.*



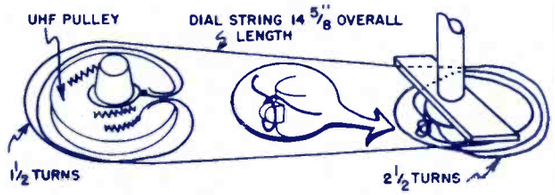
Breaks usually occur at these points.



TOP PARTS LAYOUT (LOWER) CHASSIS

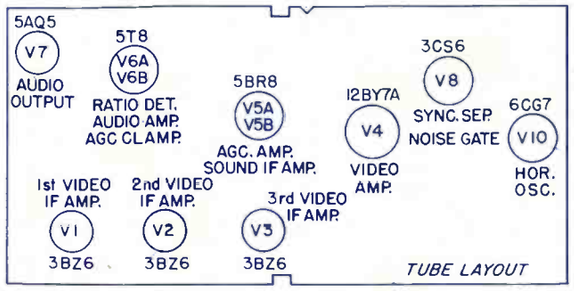


KNOB REMOVAL

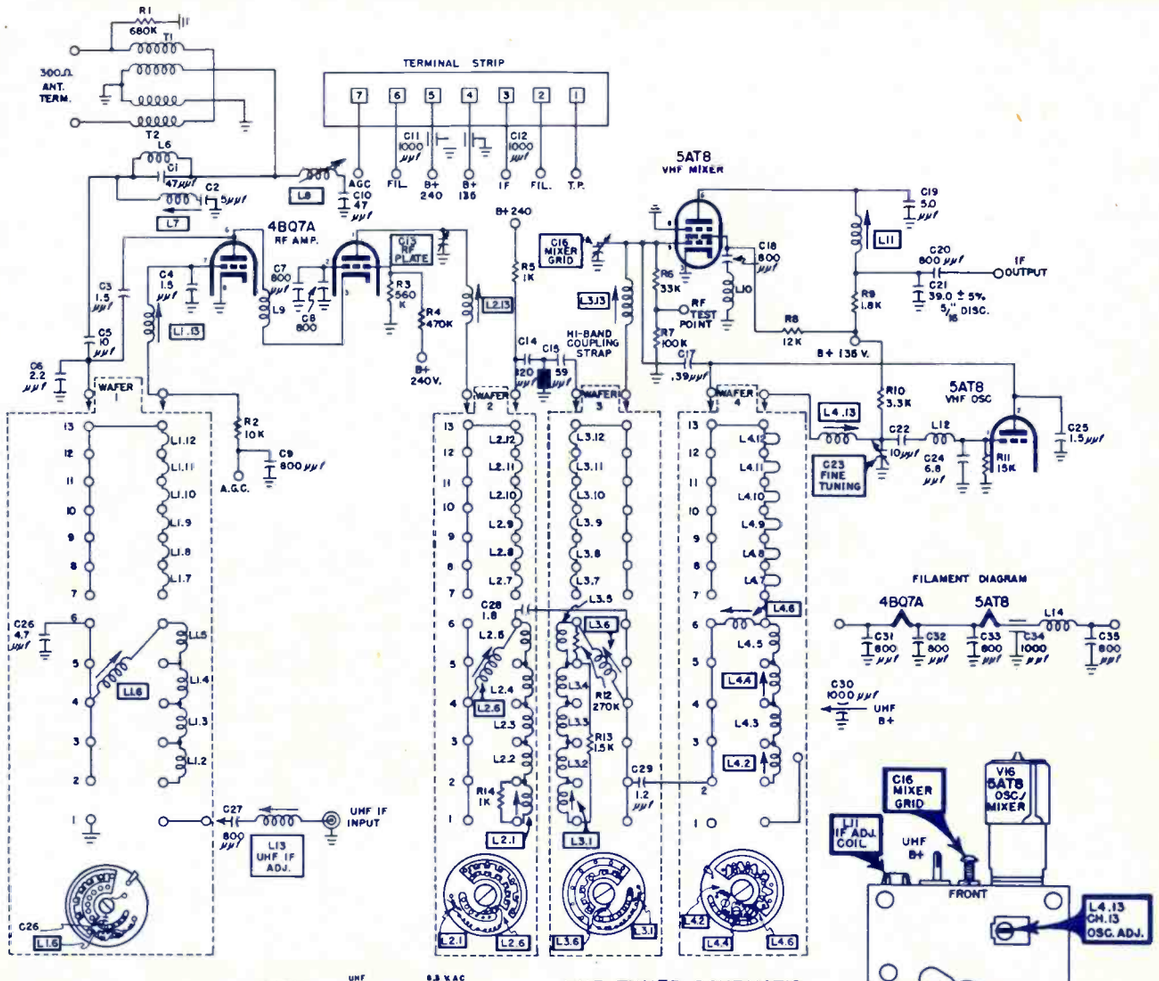


UHF DIAL STRINGING

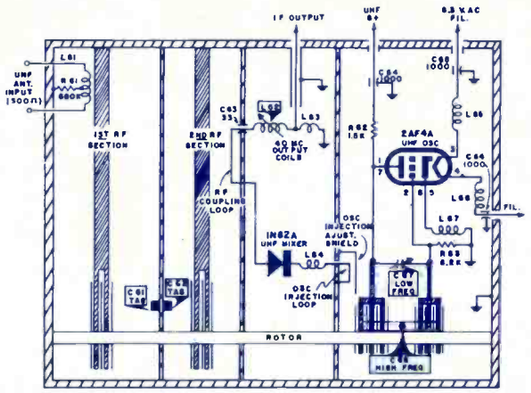
SYLVANIA
Chassis 1-537-1-3-4



TUBE LAYOUT

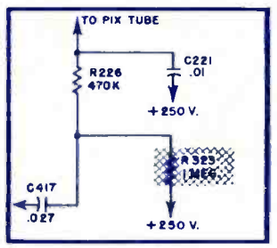


VHF TUNER SCHEMATIC
PROD. NO. 54-95604-1



UHF TUNER SCHEMATIC
PROD. NO. 54-93870-4

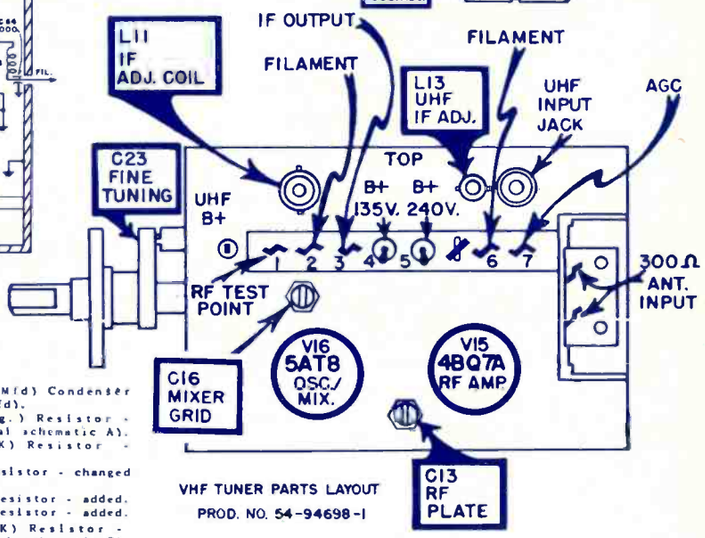
CODE CHANGES



PARTIAL SCHEMATICS A

C01 - C410 (.001 Mfd) Condenser changed to (.0047 Mfd).
C01 - R323 (1 Meg.) Resistor - deleted (see partial schematic A).
C01 - R414 (560 K) Resistor - changed to (1 Meg).
C01 - R416 (15K) Resistor - changed to (8.2K).
C01 - R508 (3.3K) Resistor - added.
C01 - R508 (3.3K) Resistor - added.
C02 - R318 (220 K) Resistor - deleted (see partial schematic B).

Shaded areas denote code change.



VHF TUNER PARTS LAYOUT
PROD. NO. 54-94698-1

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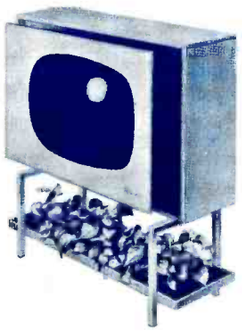
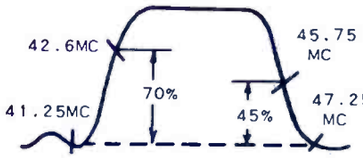
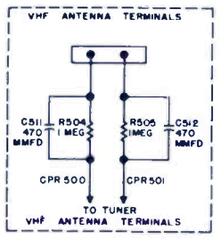
SYLVANIA
TV Chassis 1-541-3-4-5-6







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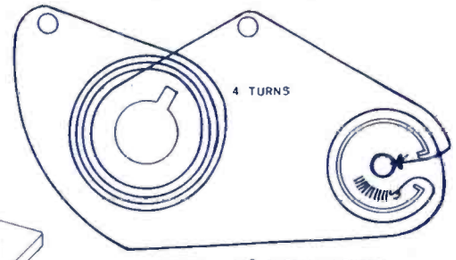
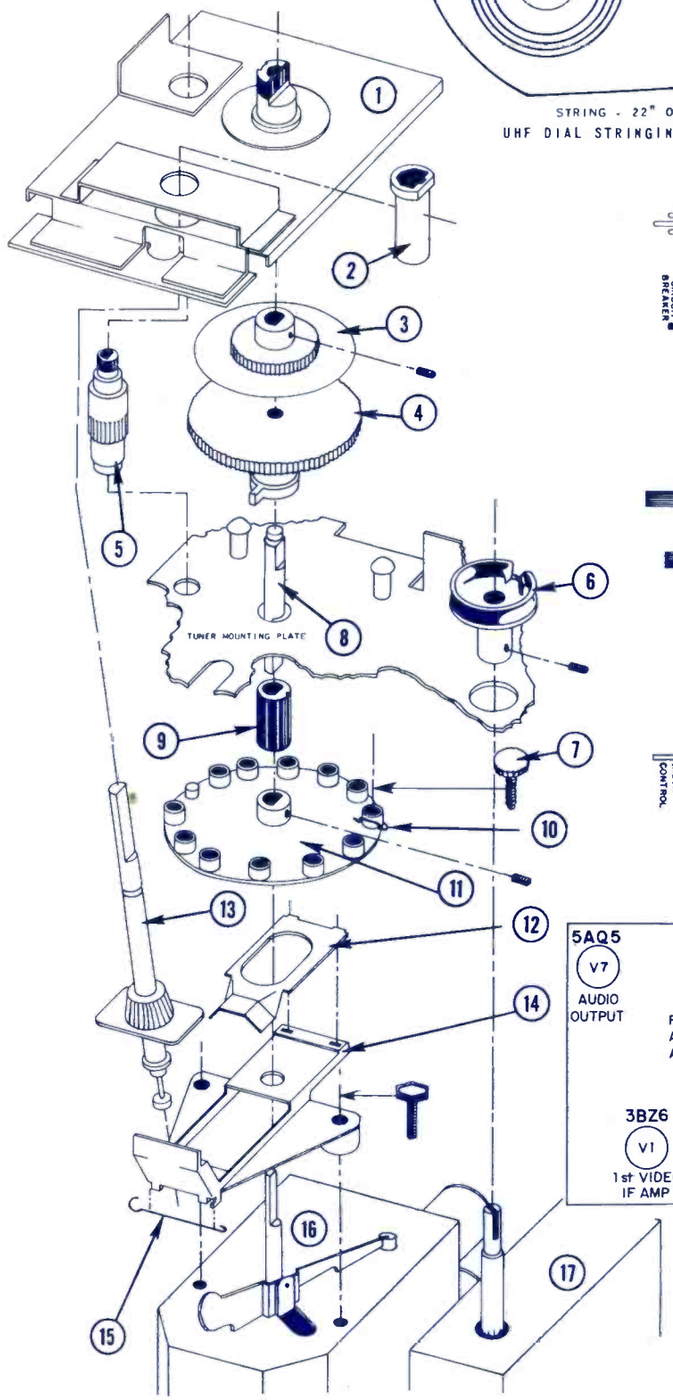
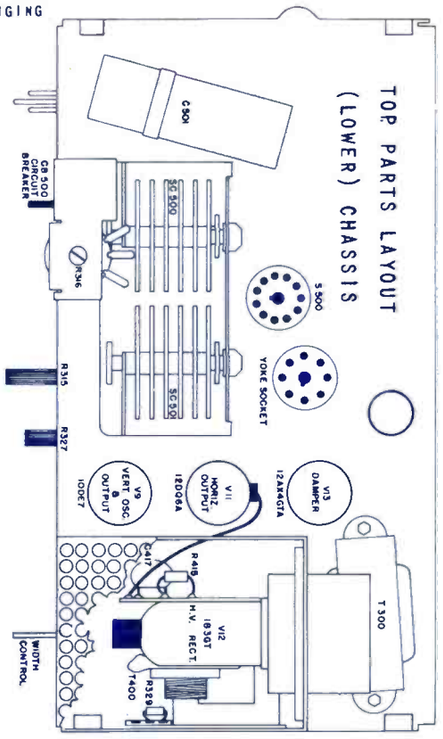
SYLVANIA
TV Chassis 1-541-3-4-5-6

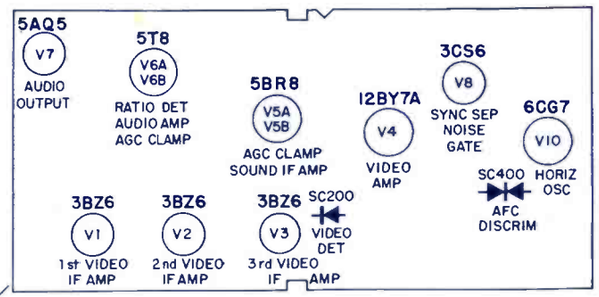


STRING - 22" OVERALL LENGTH

UHF DIAL STRINGING







ITEM NO.	SERVICE PART NO.	DESCRIPTION
1	489-0023	RATCHET-BRACKET ASSEMBLY
2	490-0020	COUPLING-FINE TUNE
3	722-0065	WHEEL AND DIAL ASSEMBLY
4	722-0026	DIAL-UHF
5	484-0033	GEAR-UHF
6	494-0026	HUB AND PULLEY ASSEMBLY
7		SCREW
8	493-0138	SHAFT-VHF EXTENSION
9	490-0018	INSULATOR-COUPLING
10	496-0186	SPRING-SCREW RETAINING
11	338-0019	DISC-FINE TUNE
12	338-0018	LEVER-FINE TUNE
13	493-0140	FINE TUNE SHAFT ASSEMBLY
14		BRACKET-ROCKER STOP
15	496-0185	SPRING-DISENGAGING
16		TUNER-VHF
17		TUNER-UHF

EXPLODED VIEW OF PICTURE PROMPTER AND VHF-UHF TUNER ASSEMBLY

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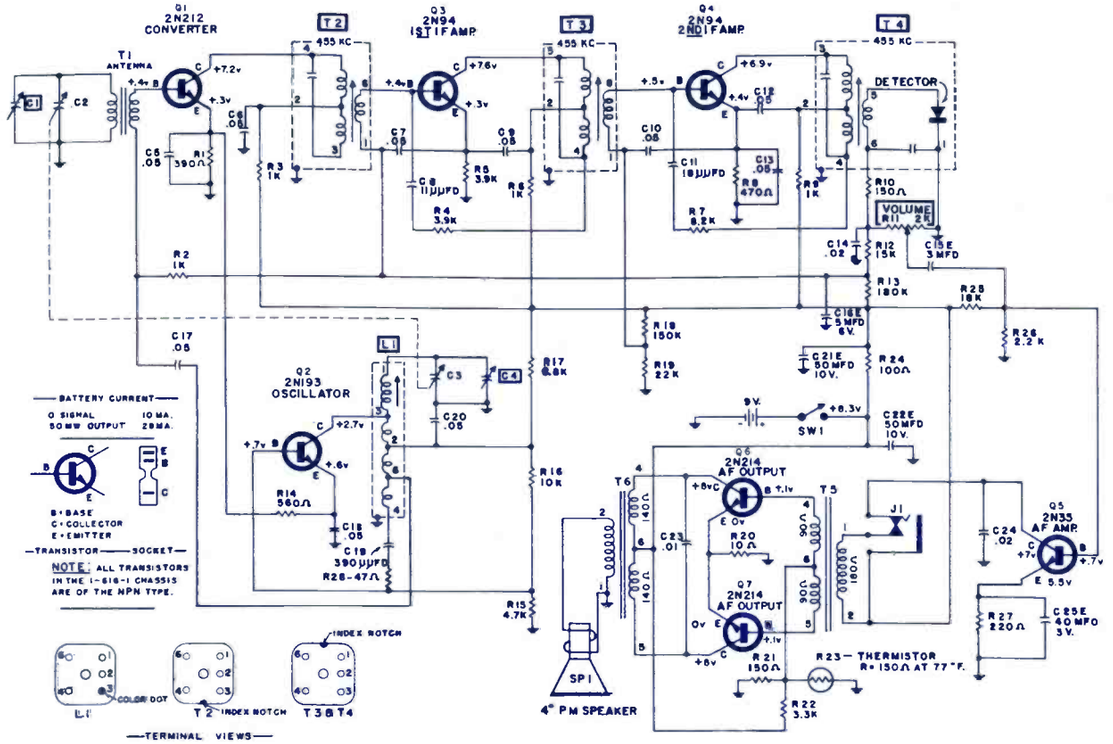
ELECTRONIC TECHNICIAN CIRCUIT DIGEST

SYLVANIA
Trans. Radio
Chassis 1-616-1

Model 3102

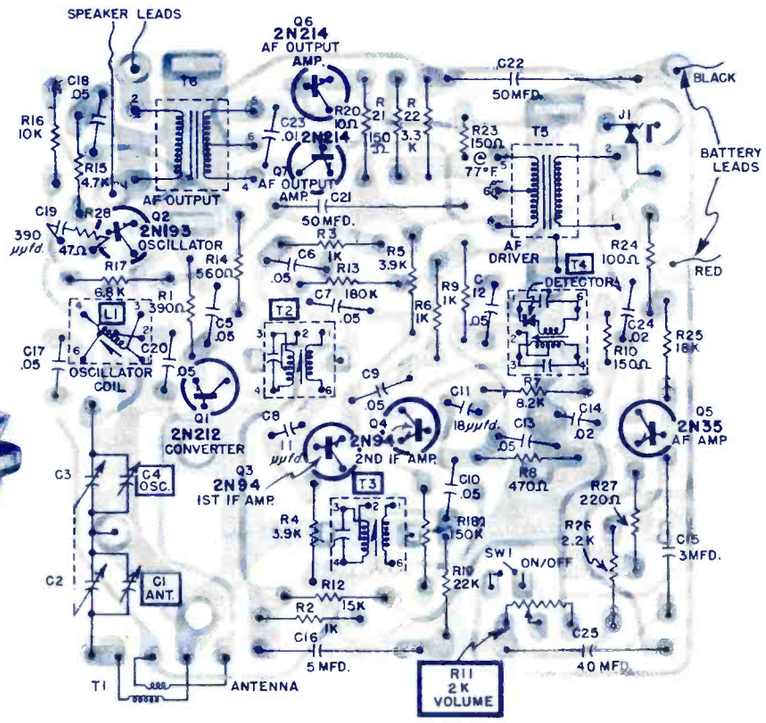


BOTTOM VIEW OF T5 & T6

SCHEMATIC NOTES:

1. VOLTAGES TAKEN WITH SYLVANIA POLYMETER (VTVM).
2. BATTERY VOLTAGE WITH RECEIVER OPERATING 8.5V.
3. VOLTAGE VALUES SHOWN ARE AVERAGE READINGS.
4. VARIATIONS MAY BE NOTED DUE TO NORMAL PRODUCTION TOLERANCES.
5. T2, T3, T4 ARE BIFILAR. T5, T6, PRIMARIES ONLY ARE BIFILAR.

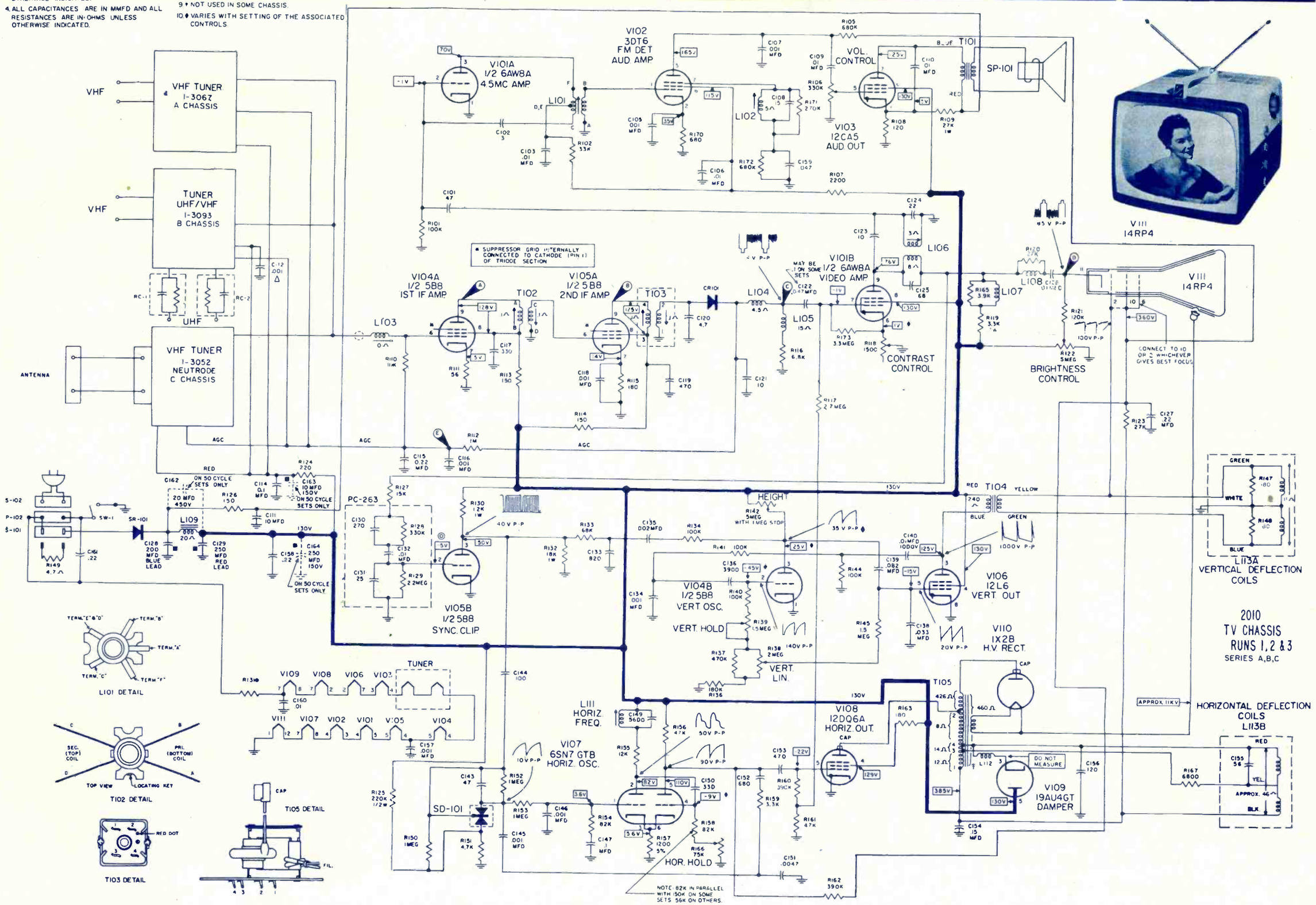
MODEL 3102



TRUETONE
Portable TV Models 2D3770C, 2D3775C

NOTES:

1. ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER TO CHASSIS GROUND.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. ALL VOLTAGES ARE DC + POSITIVE UNLESS OTHERWISE INDICATED.
4. ALL CAPACITANCES ARE IN MMFD AND ALL RESISTANCES ARE IN OHMS UNLESS OTHERWISE INDICATED.
5. ■ INDICATES MULTIPLE SECTION CAPACITOR.
6. • 35 OHMS ON VHF MODELS, 30 OHMS ON UHF/VHF MODELS.
7. Δ USED ON UHF MODELS ONLY.
8. @ VOLTAGE VARIES WITH SIGNAL LEVEL.
9. ♦ NOT USED IN SOME CHASSIS.
10. ♦ VARIES WITH SETTING OF THE ASSOCIATED CONTROLS.



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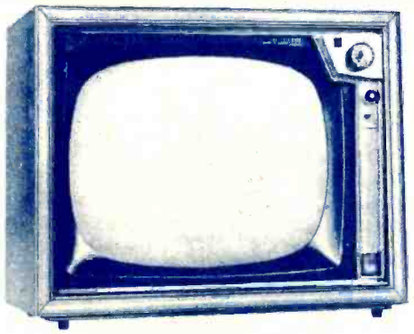
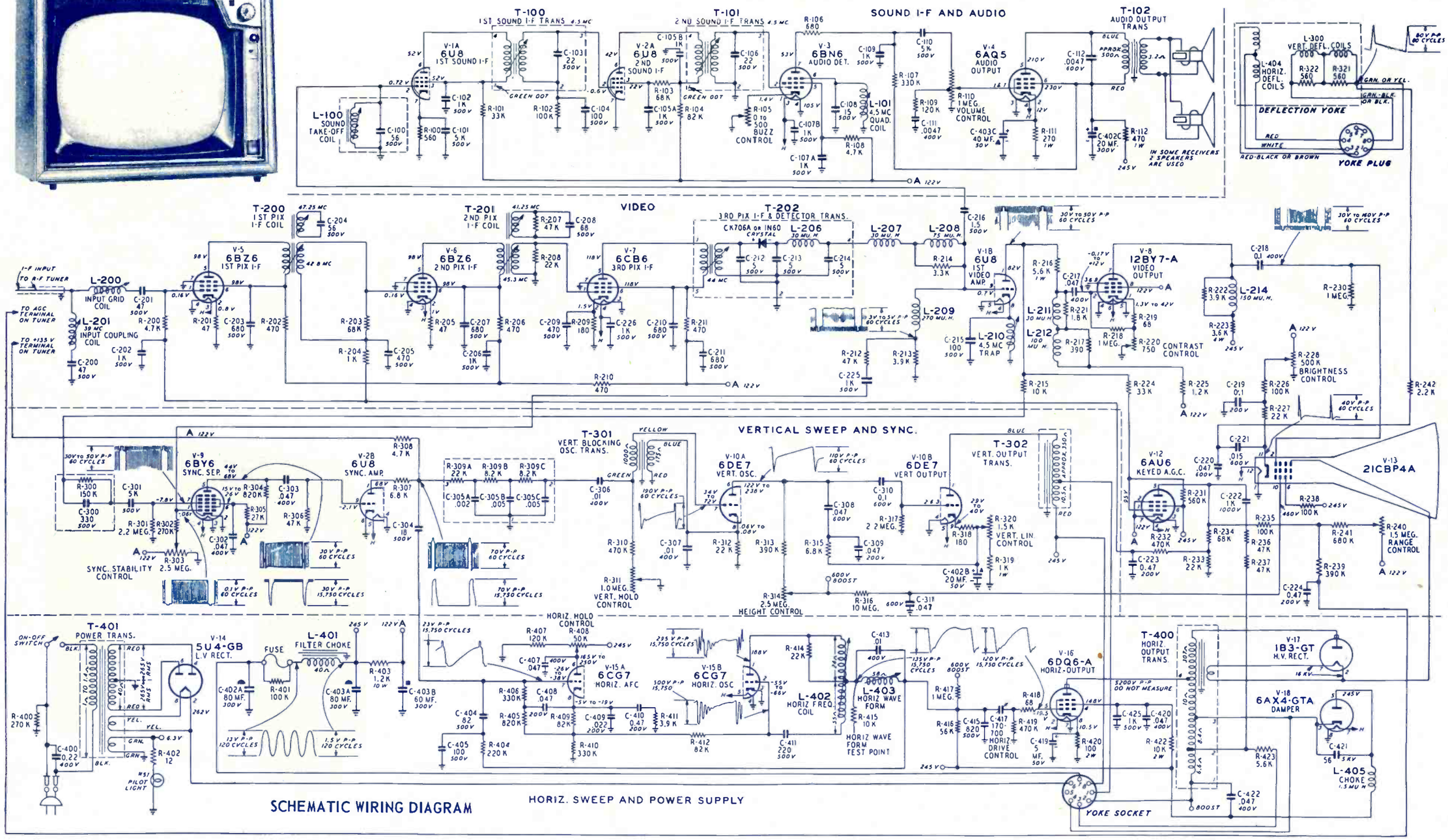
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

TRUETONE

TV Models 2DC1840B 2DC1845B
2DC1841B 2DC2840B
2DC1842B 2DC2841B
2DC1843B 2DC2842B
2DC1844B 2DC2843B





SCHEMATIC WIRING DIAGRAM

SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

ALL RESISTANCE VALUES IN OHMS AND $\frac{1}{2}$ WATT UNLESS OTHERWISE SPECIFIED.

K=1000

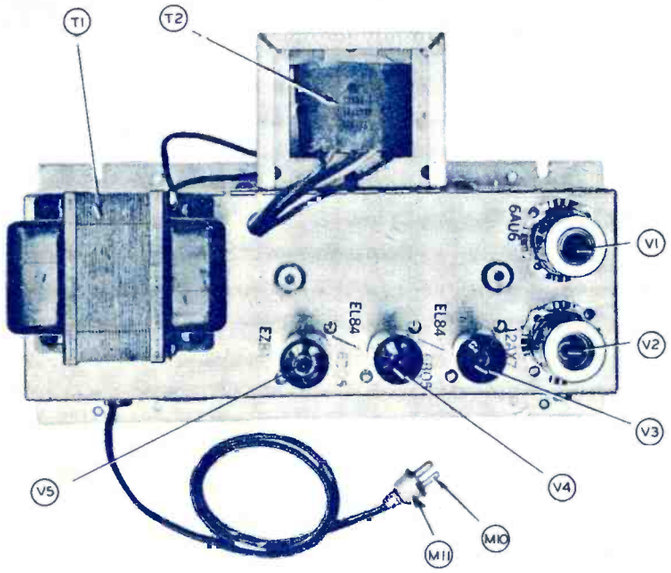
OSCILLOSCOPE WAVEFORM PATTERNS

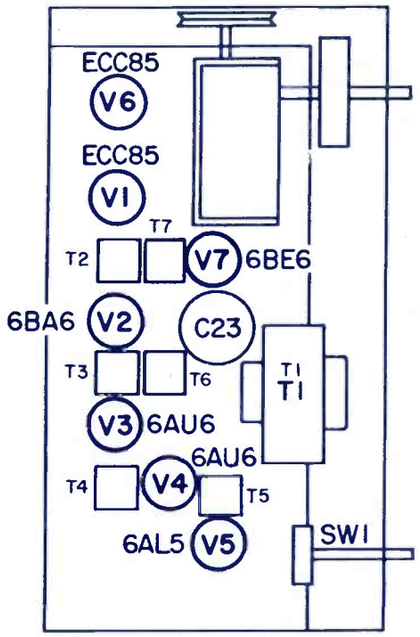
The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

DC SOCKET VOLTAGES

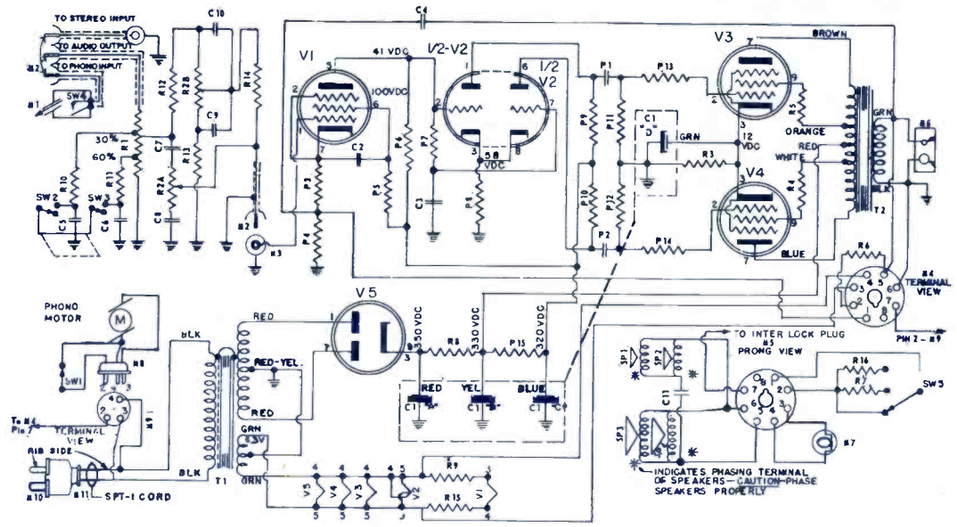
All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.

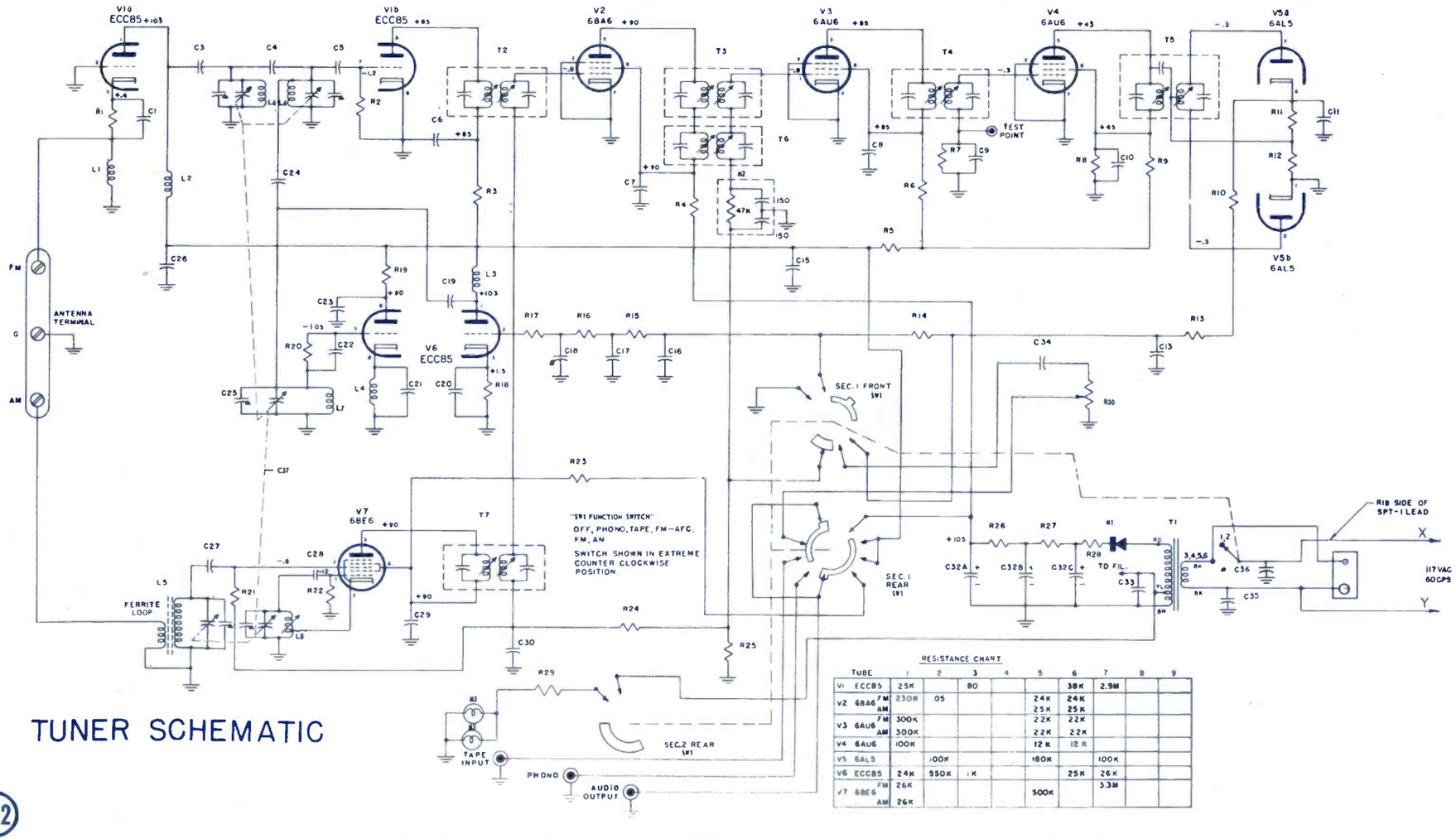
V-M
Hi-Fi Tuner and Amplifier Model 568





TUNER TOP VIEW





TUNER SCHEMATIC

RESISTANCE CHART

TUBE		1	2	3	4	5	6	7	8	9
V1 ECC85		25K		80			38K	2.9M		
V2 6BA6	FM	230K	05			24K	24K			
	AM					25K	25K			
V3 6AU6	FM	300K				22K	22K			
	AM	300K				22K	22K			
V4 6AU6		100K				12K	12K			
V5 6AL5			100K			180K		100K		
V6 ECC85		24K	550K	1K			25K	26K		
V7 6BE6	FM	26K				500K		3.3M		
	AM	26K								

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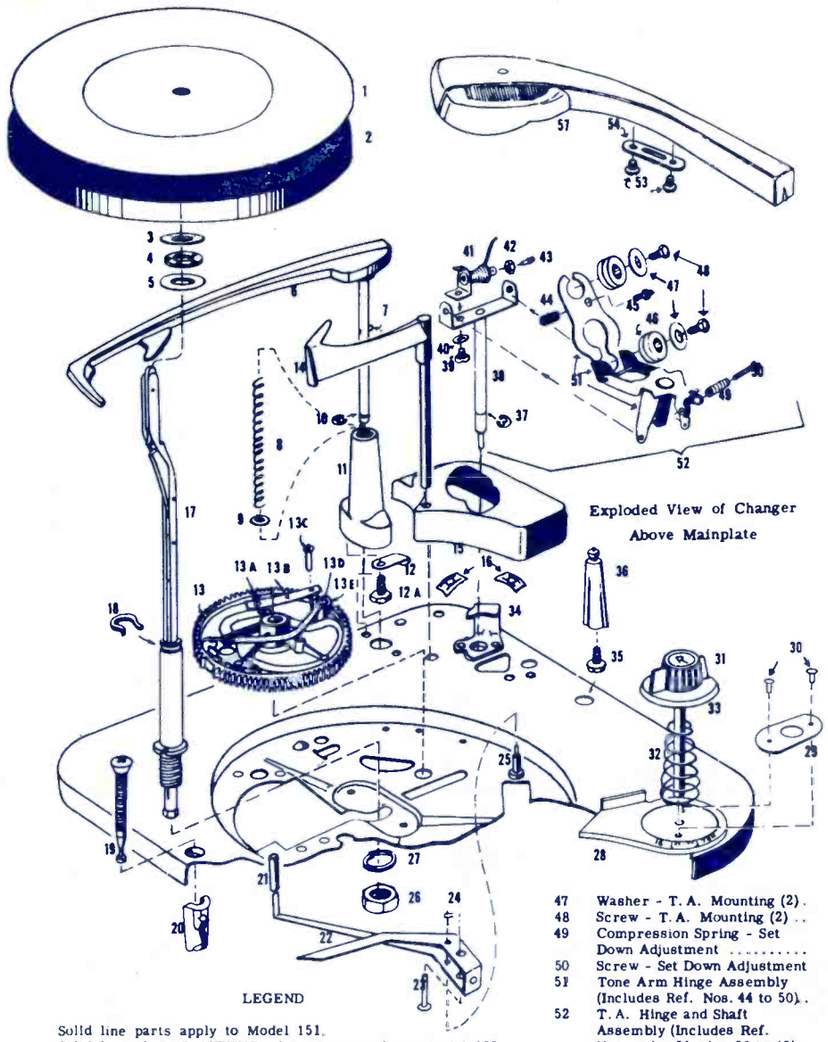
WEBCOR

4-speed Intermix Record Changer Model 151-152

Also Motorola Model 11RC

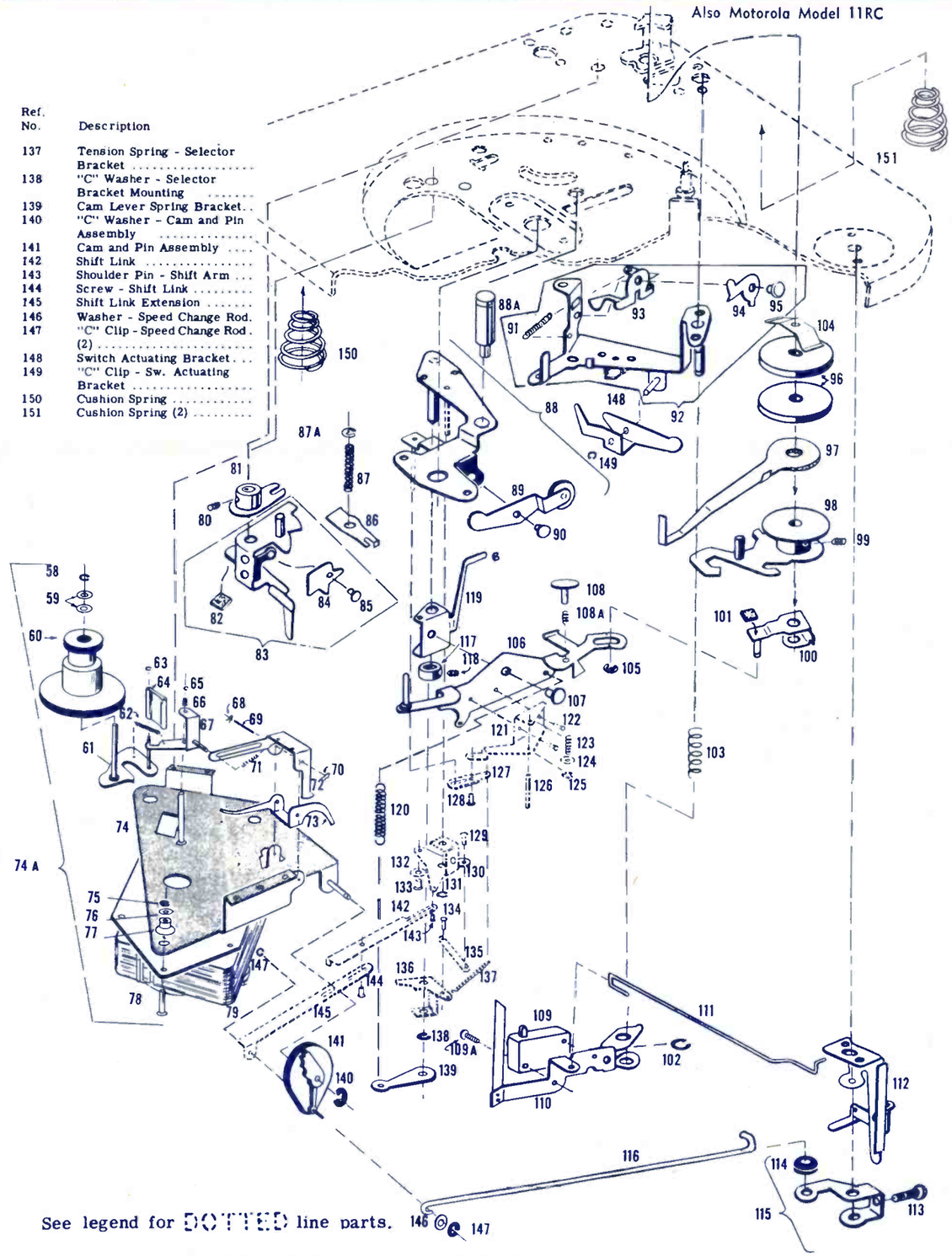


Exploded View of Changer Above Mainplate

LEGEND

Solid line parts apply to Model 151.
Solid line plus DOTTED line parts apply to Model 152.

Ref. No.	Description
1	Turntable Mat - Specify Color
2	Turntable - Specify Color
3	Bearing Race Washer
4	Turntable Bearing Race
5	Bearing Race Washer
6	Overarm Pin Assembly (Incl. Ref. No. 7)
7	Pin - Overarm Mounting
8	Compression Spring - Overarm
9	Washer - Overarm Shaft
10	"C" Clip - Overarm
11	Overarm Housing - Specify Color
12	Cord Clamp
12A	Screw - Overarm Housing Mounting (2)
13	Main Cam
13A	Drive Screw - Main Cam
13B	Detent Spring - Main Cam
13C	Plunger - Main Cam
13D	Shoulder Pin - Main Cam
13E	Slide Plate and Lever - Main Cam
14	Semaphore - Specify Color
15	Tone Arm Housing - Specify Color
16	Speed Nut - T. A. Housing Mounting (2)
17	Spindle
18	Turntable Clip
19	Changer Mounting Screw - Specify Color (2)
20	Changer Mounting Clip
21	Sleeve - Trip Bracket
22	Trip Bracket
23	Pin - Trip Bracket
24	Clip - Trip Bracket
25	Trip Bracket Stud
26	Nut - Spindle Mounting
27	Lockwasher - Spindle Mounting
28	Escutcheon - Specify Color and Number Color
29	Anchor Plate - Escutcheon
30	Rivets - Escutcheon Anchor Plate (2)
31	Selector - Reject Knob - Specify Color
32	Knob Compression Spring
33	Knob Reject Shaft
34	Lift Stop Bracket
35	Screw - T. A. Rest
36	Tone Arm Rest - Specify Color
37	"C" Clip - T. A. Shaft
38	Tone Arm Shaft
39	Screw - T. A. Shaft
40	Washer - T. A. Shaft Screw
41	Spring and Bracket - T. A. Counterbalance Assembly
42	Hex Nut Pivot Screw - Adjustment
43	Pivot Screw
44	Height Adjusting Screw
45	Height Screw Insert
46	Grommet - Hinge Mounting (2)
47	Washer - T. A. Mounting (2)
48	Screw - T. A. Mounting (2)
49	Compression Spring - Set Down Adjustment
50	Screw - Set Down Adjustment
51	Tone Arm Hinge Assembly (Includes Ref. Nos. 44 to 50)
52	T. A. Hinge and Shaft Assembly (Includes Ref. Nos. under 51, also 38 to 43)
53	Screw - Latch Plate (2)
54	T. A. Latch Plate Assembly
55	Tone Arm - Specify Color
55A	Cartridge Mounting Screws (2)
55B	Cartridge Bracket
55C	Tension Spring - Cartridge Bracket
55D	Groove Pin - Cartridge Bracket
55E	Hub and Mounting Plate - Cartridge Bracket
55F	Needle Selector Knob
55G	Screw - Needle Selector Knob
56	Tone Arm, G. E. Cartridge Type - Specify Color
56A	Mounting Bracket - G. E. Cartridge
56B	Spacer - G. E. Cartridge Mounting (2)
56C	Screw - G. E. Cartridge Mounting (2)
57	Tone Arm, Ceramic Cartridge Type - Specify Color
57A	Ceramic Cartridge Mounting Bracket and Turnover Assembly
58	"C" Washer - Idler Wheel
59	Washers - Idler Wheel (3)
60	Idler Wheel Assembly
61	Idler Link and Stud Assy.
62	Tension Spring - Idler Wheel
63	"C" Washer - Connecting Link
64	Connecting Link
65	"C" Washer - Yoke
66	Compression Spring - Yoke
67	Yoke and Pin Assembly
68	Spring Clip - Yoke Lever
69	Pin - Yoke Lever
70	Spring Clip - Yoke Lever
71	Tension Spring - Yoke Lever
72	Yoke Lever
73	Push Lever
74	Bracket and Cam Stud Assembly
74A	Motor Mtg. Plate Assy. (Includes Ref. Nos. 58 to 77, also 140 and 141)
75	"C" Washer - Motor Mtg. (3)
76	Washer - Motor Mtg. (3)
77	Grommet - Motor Mtg. (3)
78	Stud - Motor Mtg. (3)
79	2-Pole Motor - Complete (Includes Ref. Nos. under 74A, also 78)
80	Screw - Link
81	Link
82	Friction Pad - Lift Plate
83	Record Size Bracket Assy.
84	Pawl - Record Size Bracket
85	Shoulder Rivet - Pawl
86	Semaphore Latch
87	Compression Spring - Semaphore Latch
87A	"C" Clip - Semaphore Latch
88	Stiffener Assy. (Includes Ref. Nos. 89 and 90)
88A	Main Cam Stud
89	Spindle Lever and Roller
90	Rivet - Spindle Lever
91	Tension Spring - Tone Arm Bracket
92	Tone Arm Bracket Assy.
93	Lock Out Lever
94	Lock Out Pawl
95	Shoulder Rivet - Lock Out Pawl
96	Tone Arm Weight (2)
97	Velocity Trip Arm
98	Plate and Set Screw
99	Set Screw - Plate
100	Lift Plate and Pad
101	Friction Pad - Lift Plate
102	"C" Washer - T. A. Bracket
103	Torsion Spring - T. A. Bracket
104	Friction Spring
105	"C" Washer - Lift Plate and Pad
106	Cam Lever and Pin Assy.
107	Shoulder Rivet - Cam Lever and Pin Assembly
108	Adjusting Screw
108A	Compression Spring - Adjusting Screw
109	A. C. Switch
109A	Screws - A. C. Switch Mounting (2)
110	Switch Bracket Assy.
111	Reject Rod
112	Reject Bracket
113	Screw - Selector Link
114	Grommet - Selector Link
115	Selector Link, Grommet and Screw Assy.
116	Speed Change Rod
117	Collar
118	Collar Set Screw
119	Pivot Bracket
120	Tension Spring - Pivot Bracket
121	Pin Bracket
122	Rivet - Pin Bracket (2)
123	Compression Spring - Pin Bracket
124	Washer - Pin Bracket
125	"E" Clip - Pin Bracket
126	Retracting Pin - Pin Bracket
127	Spring Guide Lug
128	Shoulder Rivet - Pin Bracket
129	Shoulder Rivet - Shift Arm
130	Shift Arm
131	"C" Clip - Shift Arm Mtg.
132	Roller - Shift Arm
133	Shoulder Rivet - Shift Arm Roller
134	Shoulder Rivet - Connector Link
135	Connector Link
136	Selector Bracket
137	Tension Spring - Selector Bracket
138	"C" Washer - Selector Bracket Mounting
139	Cam Lever Spring Bracket
140	"C" Washer - Cam and Pin Assembly
141	Cam and Pin Assembly
142	Shift Link
143	Shoulder Pin - Shift Arm
144	Screw - Shift Link
145	Shift Link Extension
146	Washer - Speed Change Rod
147	"C" Clip - Speed Change Rod (2)
148	Switch Actuating Bracket
149	"C" Clip - Sw. Actuating Bracket
150	Cushion Spring
151	Cushion Spring (2)



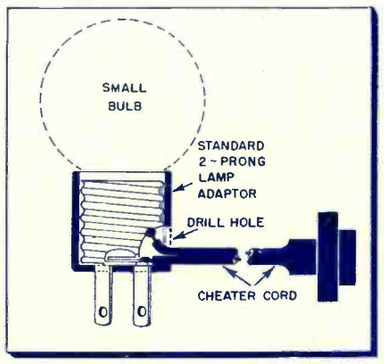
See legend for DOTTED line parts.

Exploded View of Changer Below Mainplate

Shop Hints

Cheater Cord

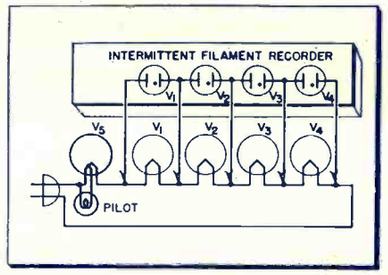
It wasn't until I had lost a half dozen cheater cords, by leaving them plugged into sockets, in customers living rooms, that I hit upon this idea. Take a standard 2 prong lamp adaptor, drill a ¼" hole in the side, where there is a gap for the lamp center pin connection, cut the plug from the cheater cord and insert in the hole, solder one wire to the center and one to the screw part of the lamp holder. This gimmick acts as an indication as to whether the customers socket is OK, plus the fact that a light will always be noticed. I haven't lost a cheater cord since. *Lewis Holder, Sethbridge, Alta, Canada.*



Cheater cord and line voltage indicator.

Intermittent Filament Recorder

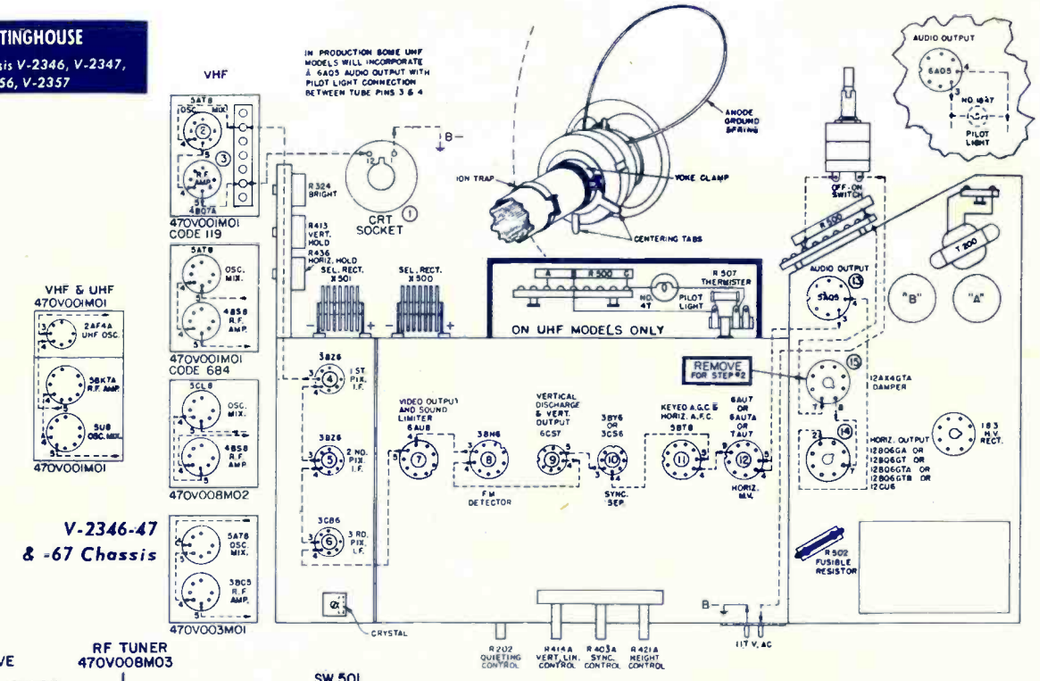
Four neon test lamps, mounted in a small box, plus five test leads is all that is needed for finding an intermittent filament in an AC/DC radio. Place the leads across the tube filaments as shown in the diagram. Turn on the radio and allow it to play.



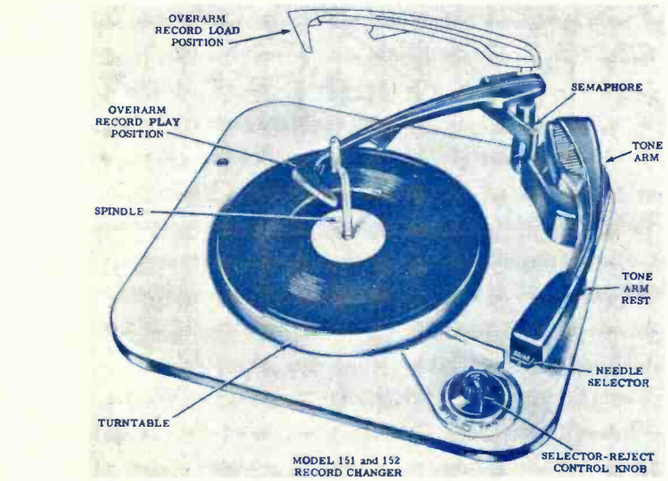
Intermittent filament recorder

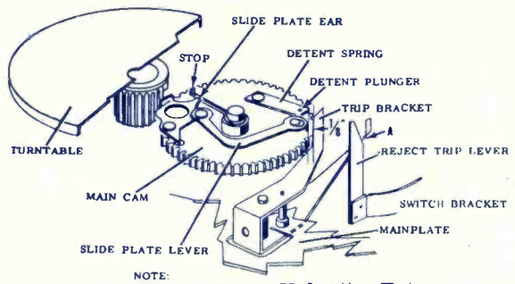
When the filament circuit is interrupted, the neon light connected across the break will glow. In the event none of the lights go on, when a break occurs, then it can be assumed that the rectifier tube is the culprit. The beauty part of this procedure is that the technician is free to work on other equipment while the radio under test is in working order.—*Jules Elkish, Philadelphia, Pa.*

WESTINGHOUSE
Chassis V-2346, V-2347, V-2356, V-2357

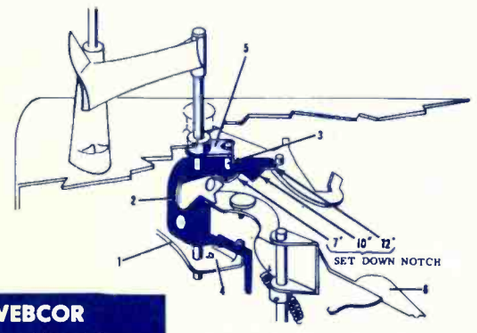


V-2346-47 & -67 Chassis



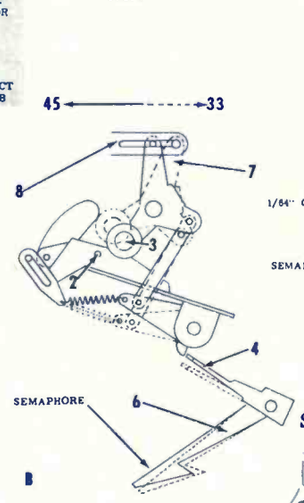


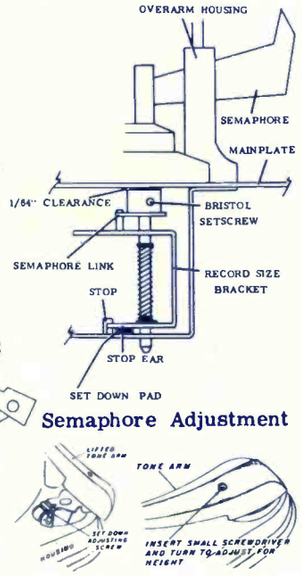
Velocity Trip Adjustment



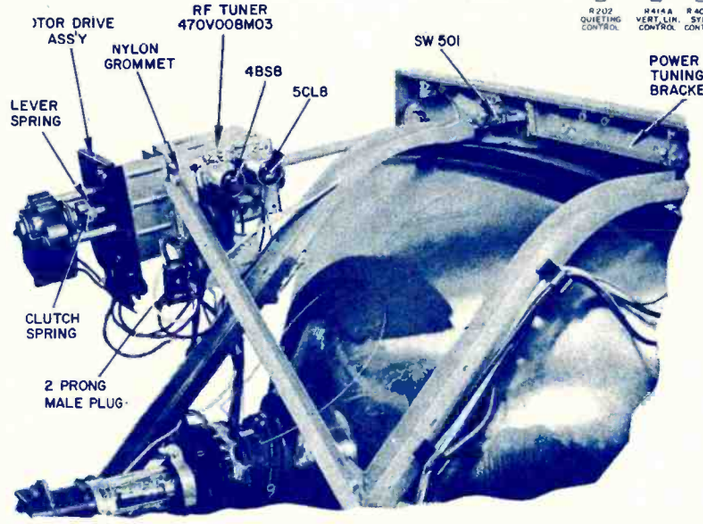
WEBCOR
4-speed Intermix Record Changer Model 151-152

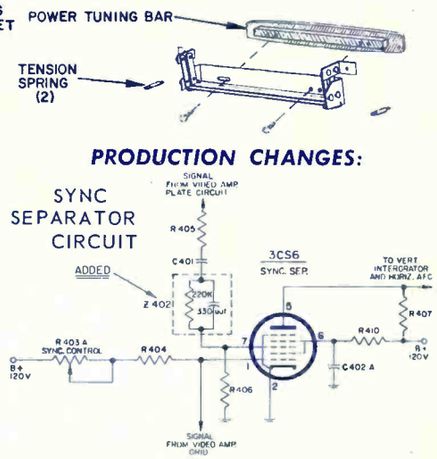
Record Size Bracket





Automatic Speed Change Mechanism
45-33-1/3 RPM



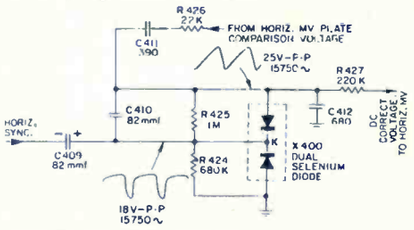


PRODUCTION CHANGES:

SYNC COUPLING NETWORK

In later production a combination capacitor-resistor network Z402 (capacitor 330 mmf and resistor 220K ½ Watt) has been added as shown in figures 4, 6, and 7. This network provides improved horizontal and vertical sync stability.

AFC using Selenium diode

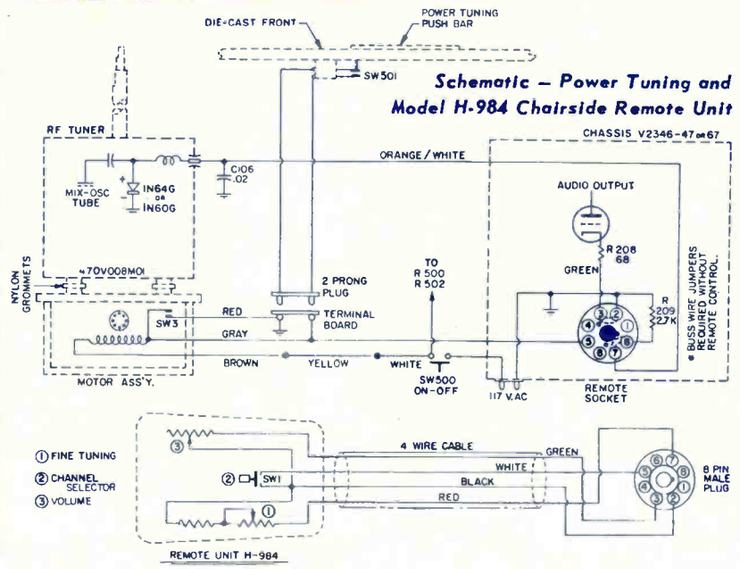


AFC USING DUAL SELENIUM DIODE

All television receivers using the V-2346-81, -85, -88, -89 and V-2356-805 and -806 chassis will have a dual selenium diode in the AFC control circuit. The printed board has been changed, as shown in figures 6 and 7 and the dual selenium diode, X400, is mounted directly to the printed board.

ANTENNA ISOLATION NETWORK

In later production the antenna isolation network for the VHF tuner sections of the 475V007M01 and 475V007M03 combination VHF-UHF tuners is a capacitor-resistor network (part number 219V004M02) in each leg of the Antenna input to the tuner.



Schematic — Power Tuning and Model H-984 Chairside Remote Unit

More Data on Reverse Side

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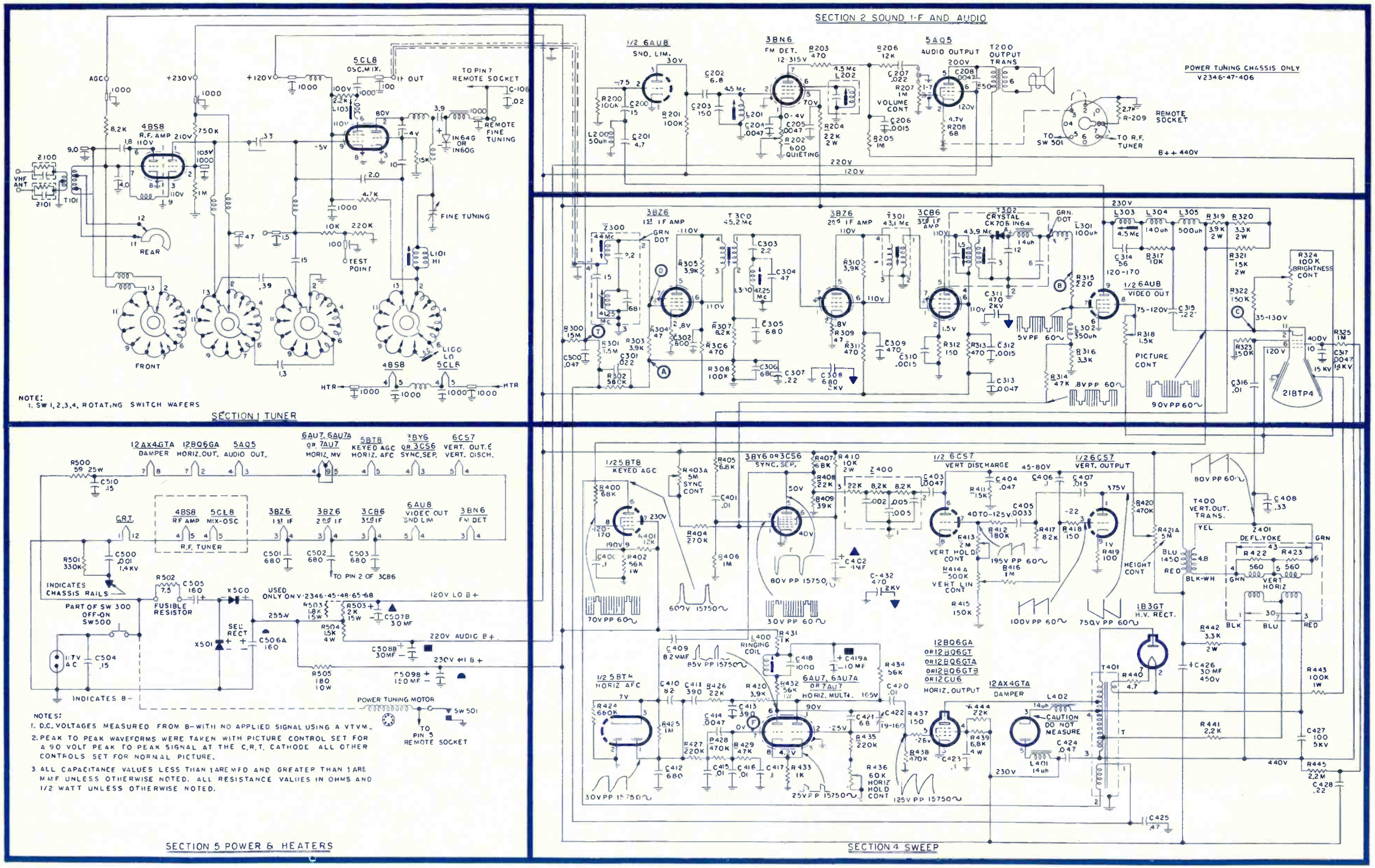
WESTINGHOUSE

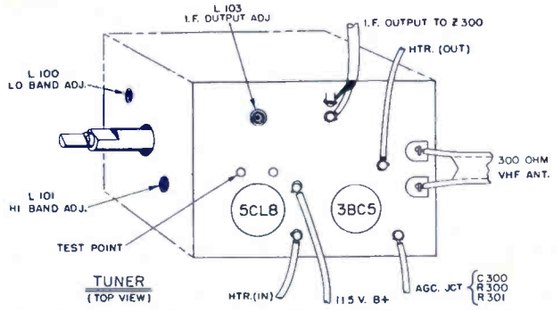
Chassis V-2346, V-2347, V-2356, V-2357

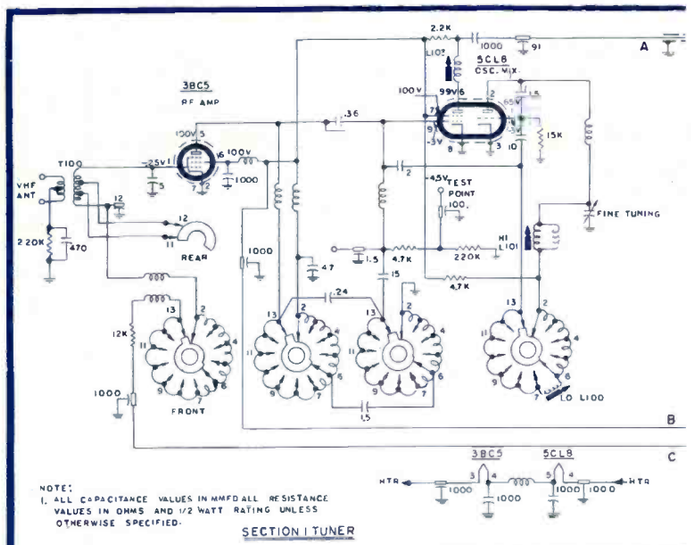


Models: 21T107A, 21T108A, 21K112A, 21T101B, 21T107B, 21T108B, 21K112B, 21K113B, 21KR113A, 21KR114A, 21KR115A, 21KR116A, 21TU107B, 21TU108B, 21KU112B, 21KU114B, 21TU101A, 21TU107A, 21KU112A, 21KU113A, 21KU114A, 21KU115A, 21KU116A, 24KR126A, 24KU126A

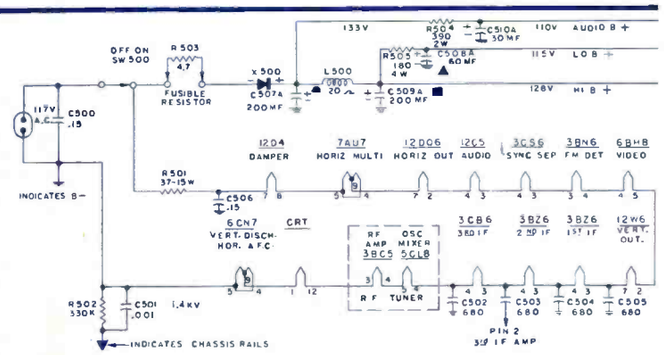
WESTINGHOUSE
Chassis V-2311, V-2321, V-2370, V-2380

Models 14T170, 14T171, 14T172, 14TU170, 14TU171, 14TU172





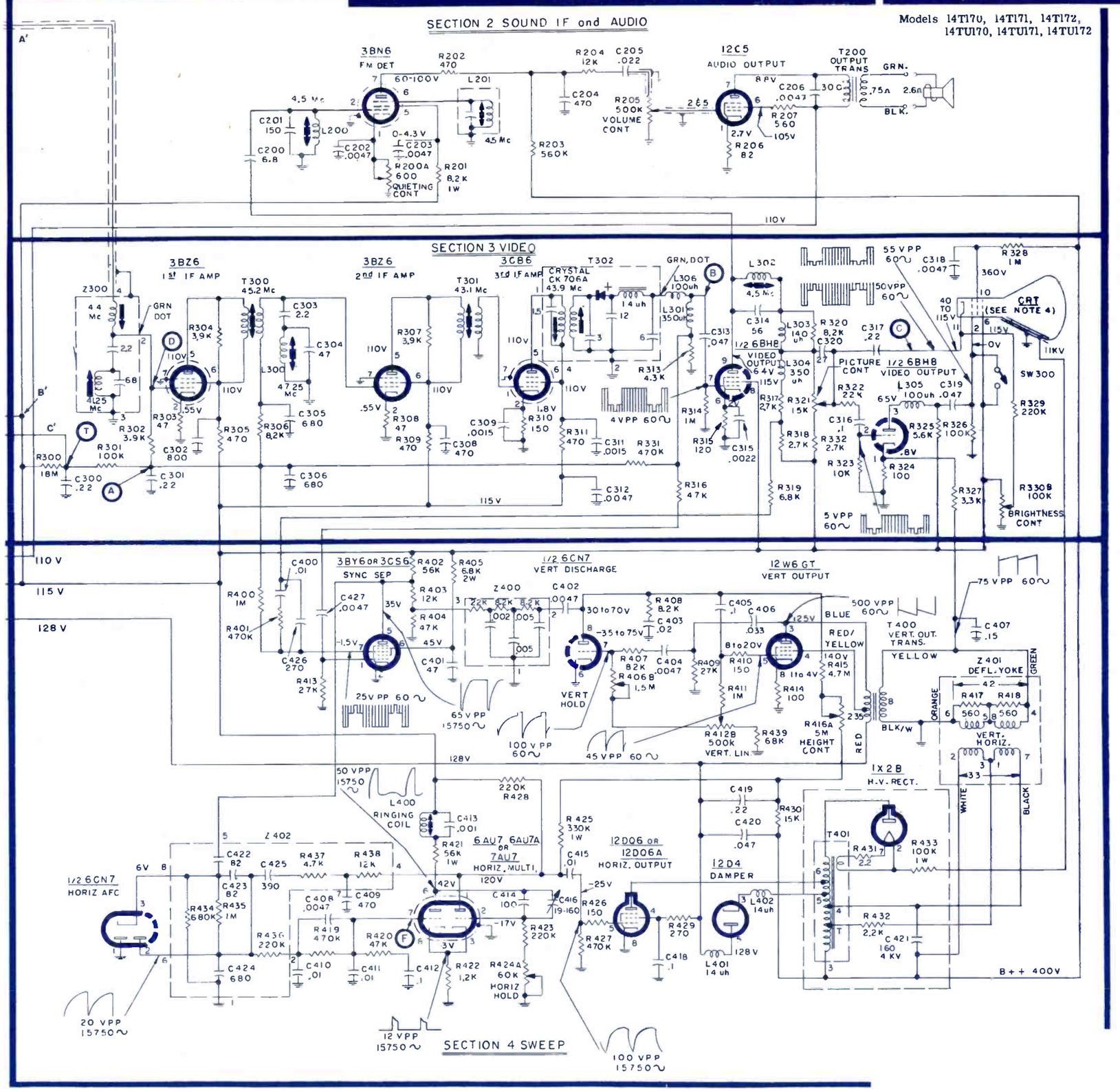
SECTION 1 TUNER



SECTION 5 POWER & HEATERS

QUIETING CONTROL

The quieting control R200A is located on the back of the receiver. This control determines the AM rejection characteristics of the sound system. In very weak signal areas, a reduction in noise of hiss on the sound may be obtained by slightly readjusting the control.

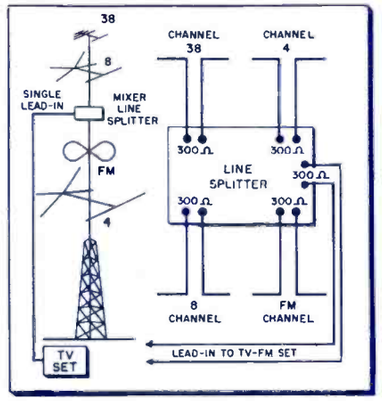


Shop Hints

Reverse Coupling

I have found it practical in fringe area installations to reverse the hookup of a line splitter and use four different antennas with but a single lead-in to a TV set. On the line splitter I feed each separate antenna into the output and the single lead-in to the input. Instead of splitting the line this has the effect of mixing four different signals into the single lead-in.

In one case I have been using a commercial line splitter as a mixer for Channels 4, 8, 38 and an FM station. Results seem to be as good as using four separate lead-ins from each of the antennas stacked on the antenna mast.—*Harry J. Miller Sarasota, Fla.*



Coupler used to connect 4 antennas to 1 set.

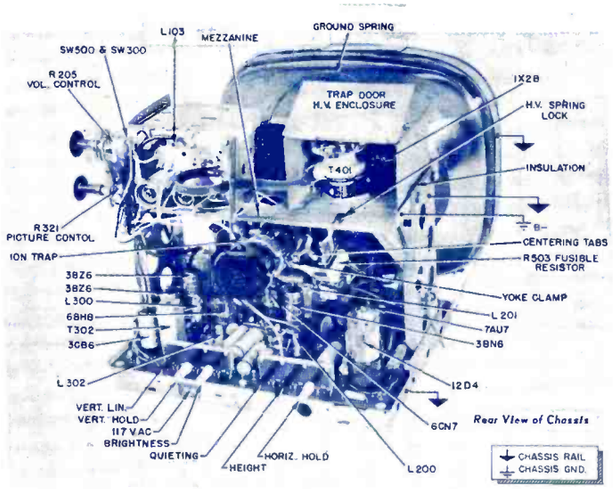
Installing Nuts and Washers In Inaccessible Places

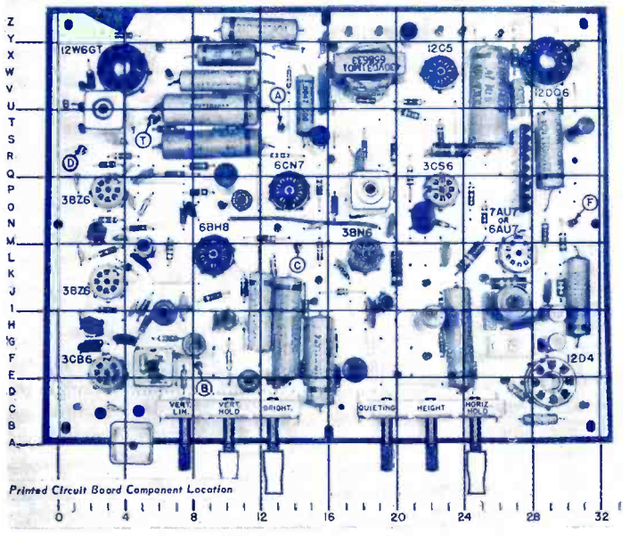
Cramped fingers and frayed tempers can be avoided when installing nuts, washers, spacers, etc., on bolts in inaccessible places. Slip the nut and washers over a rod, stiff wire, or ice pick, in the proper sequence. Hold the small parts high on the rod with a finger, and place on the bolt. Allow the parts to slide down the shaft, one at a time, and if necessary dress the rod slightly so that the washer fits on the bolt properly. When the nut is dropped it can also be aligned in this manner, while another rod or screwdriver is used to turn the nut enough to catch a thread or two. The rods can then be removed, and a spinner wrench can finish the job.—*H. C. Garrett, Kansas City, Mo.*

WESTINGHOUSE
Chassis V-2311, V-2321, V-2370, V-2380

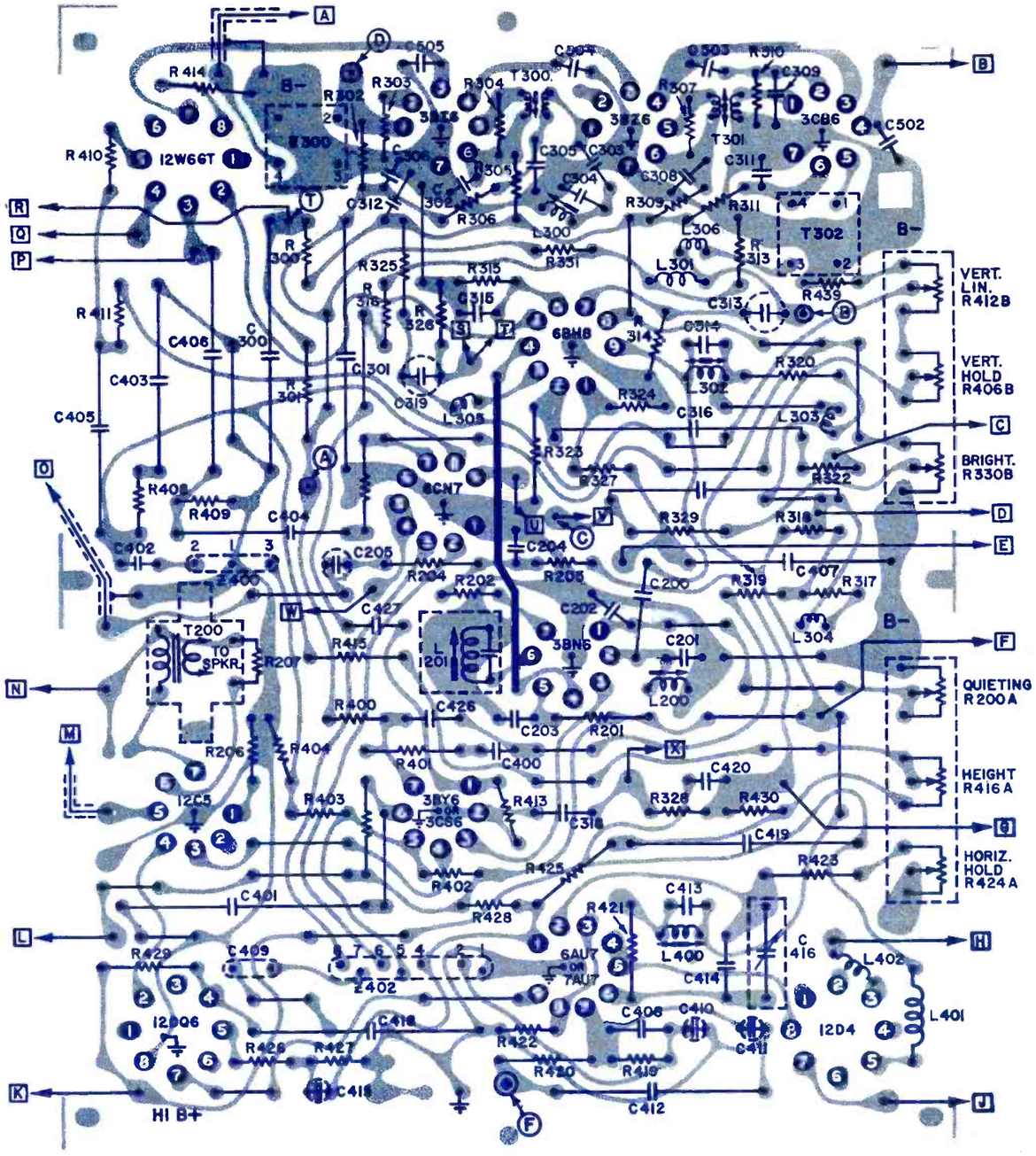
PRINTED CIRCUIT BOARD COMPONENT LOCATIONS

C200	J17	R305	N5	C414	H27
C201	I18	R306	O5	C415	T31
C202	K17	R307	I3	C416	G27
C203	N20	R308	L3	C418	S29
C204	N15	R309	I5	C419	G24
C205	S15	R310	G2	C420	I22
C206	Y21	R311	H5	C426	P20
L200	I19	R312	I7	C427	R17
L201	O18	R313	G7	L400	I27
R200A	C19	R314	J9	L401	B29
R201	L20	R315	N7	R400	R20
R202	O16	R316	Q8	R401	Q21
R203	M13	R317	E17	R402	P25
R204	P15	R318	E15	R403	S23
R206	U21	R319	G17	R404	U21
R207	U18	R320	F10	R405	R23
T200	W18	R322	E13	R406B	C10
C300	U9	R323	M12	R407	R13
C301	S10	R324	J11	R408	X14
C302	O4	R325	Q7	R409	W14
C303	K4	R326	P8	R410	Y4
C304	L5	R327	K13	R411	Y8
C305	M4	R328	I22	R412B	C8
C306	Q4	R329	I15	R413	M23
C308	I4	R330B	C10	R414	W3
C309	F2	R331	M7	R415	R18
C311	G4	T300	M2	R416A	C22
C312	S9	T301	H2	R419	J30
C313	F8	T302	E6	R420	M30
C314	H9	Z300	U8	R421	K26
C315	O8	Crystal detector	F5	R422	N29
C316	I12	C400	N21	R423	E25
C317	G14	C401	V25	R424A	C25
C318	L23	C402	Y16	R425	L24
C319	Q10	C403	X11	R426	U30
L300	M5	C404	U15	R427	S30
L301	I7	C405	Z12	R428	O26
L302	H10	C406	V10	R429	X27
L303	E12	C407	F16	R430	G22
L304	E18	C408	J29	R439	E7
L305	O11	C409	U27	Z400	V16
R300	T7	C410	I29	Z402	Q29
R301	T11	C411	G29	C502	C3
R302	R4	C412	J31	C503	I2
R303	Q3	C413	I26	C504	L2
R304	N3			C505	Q1





WESTINGHOUSE
Chassis V-2311, V-2321, V-2370, V-2380

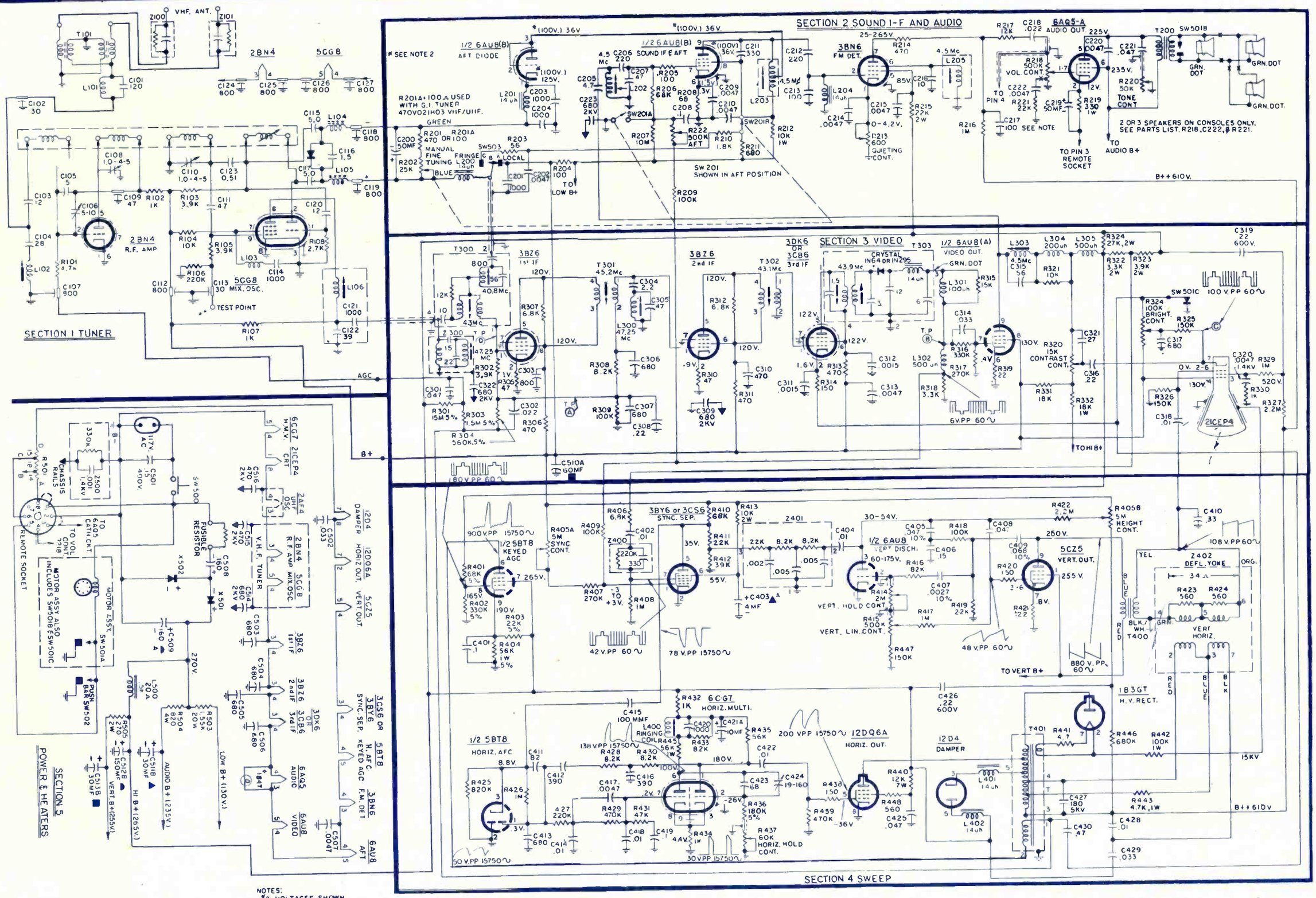


Bottom View of Printed Board Showing Top Components Symbolically

A. Tuner IF output
B. Brown wire – heater to tuner
C. Green wire to arm of picture control
D. Blue wire to top of picture control
E. Yellow wire to Vertical Output Transformer
F. Gray wire to CRT pin #6 (low B ≠)
G. Black wire to Flyback pin #3 (B ≠ boost)
H. Red wire to Flyback pin #5
J. Brown wire – heater to R501
K. Red-White wire to C509A (high B ≠)
L. Orange wire to C509A (low B ≠)
M. To arm of volume control
N. Orange-White wire to C510A (audio B ≠)
O. To top of volume control
P. Blue wire to Vertical Output Transformer
Q. Red-Yellow wire to Vertical Output Transformer
R. White wire – AGC to tuner
S. Green wire to CRT pin #2
T. Green wire to SW300
U. Black wire to CRT pin #1
V. Brown wire to CRT pin #11
W. Black wire to B-
X. Red wire to CRT pin #10

WESTINGHOUSE
TV Chassis
V-2372-27-67
V-2382-202-204-602-604

TV Models H21T218, 219, 220, 221,222
H21K223, 224, 225, 226, 227
228, 229, 232, 233
(Also TU & KU MODELS)



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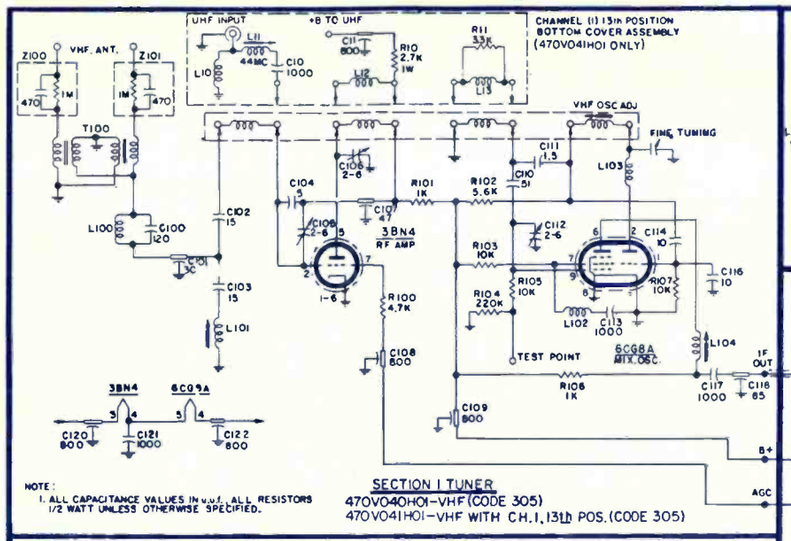
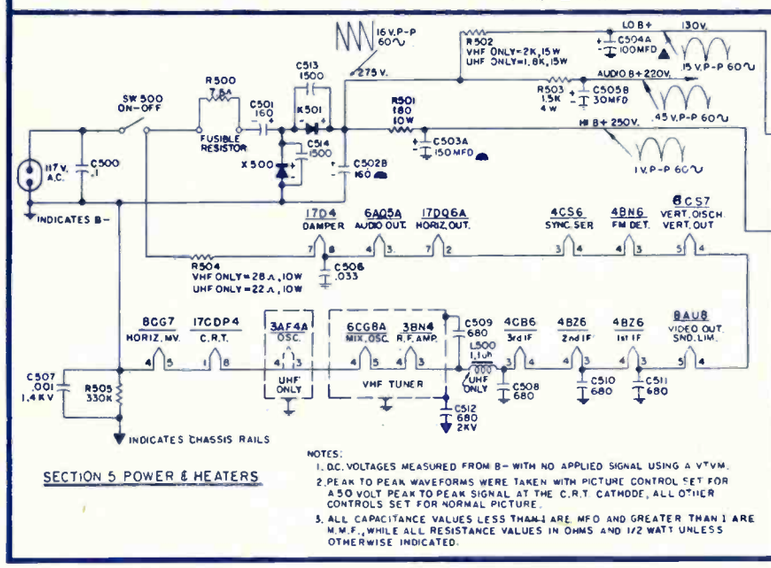
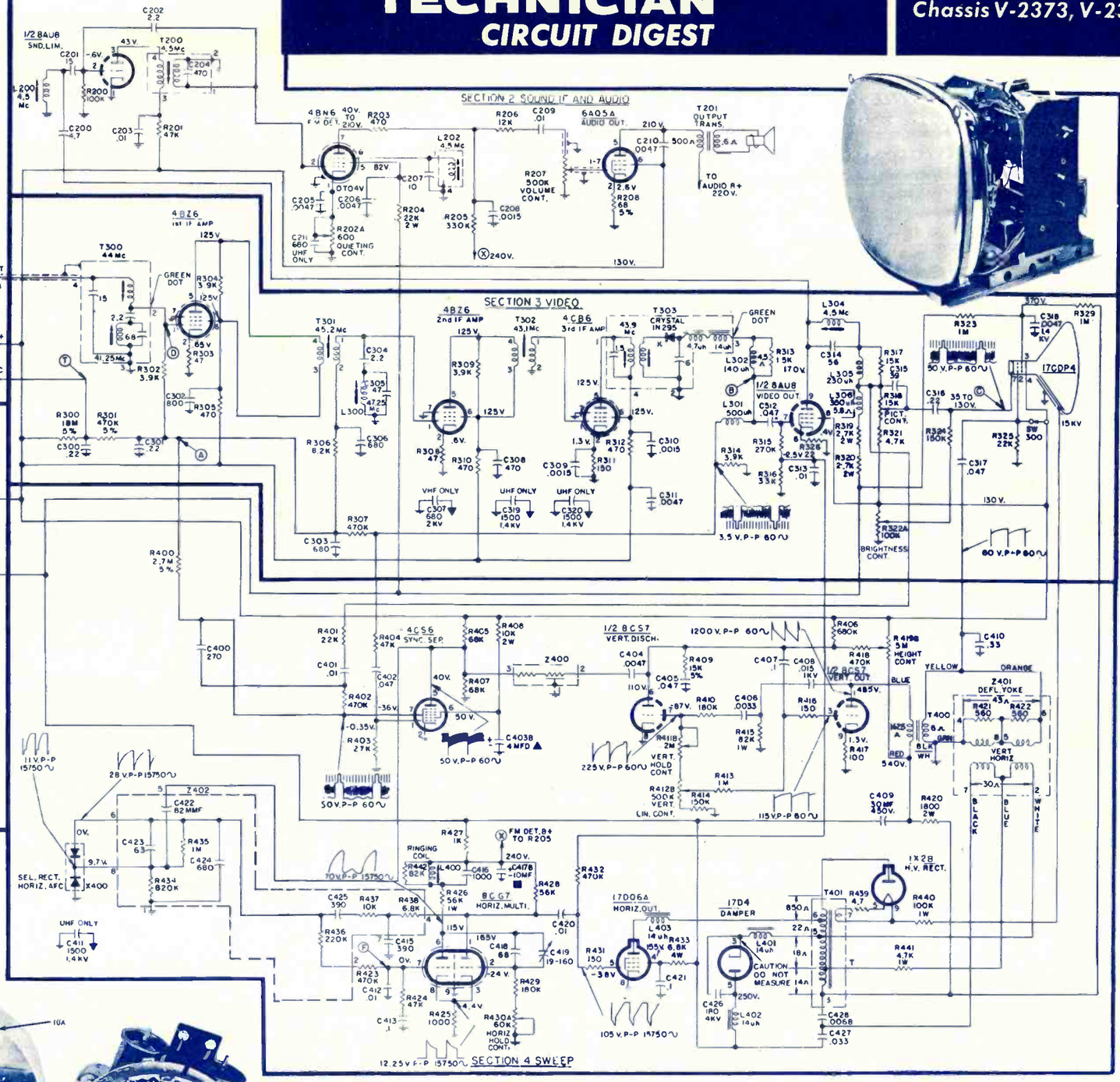
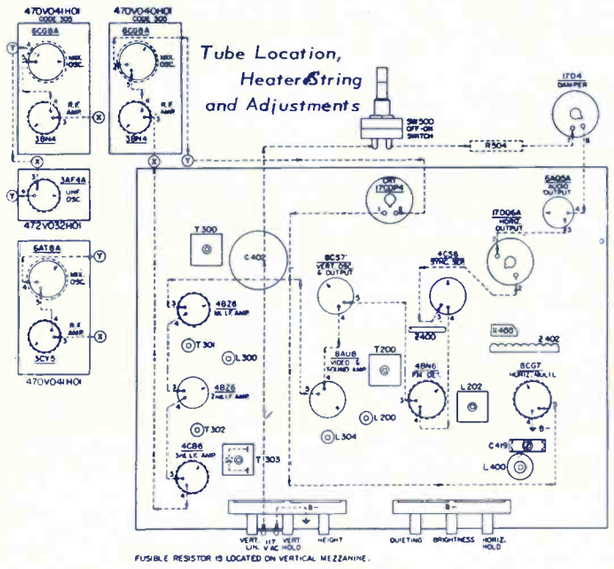
ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

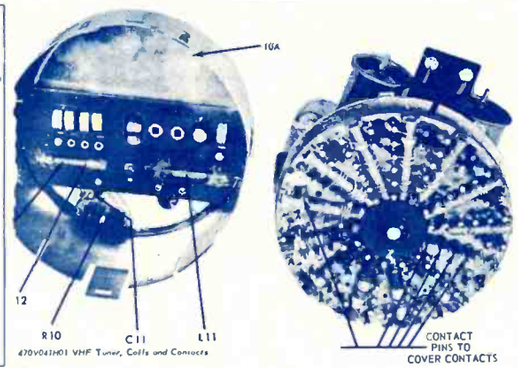
WESTINGHOUSE
Chassis V-2373, V-2383

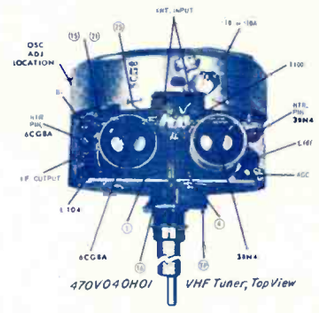








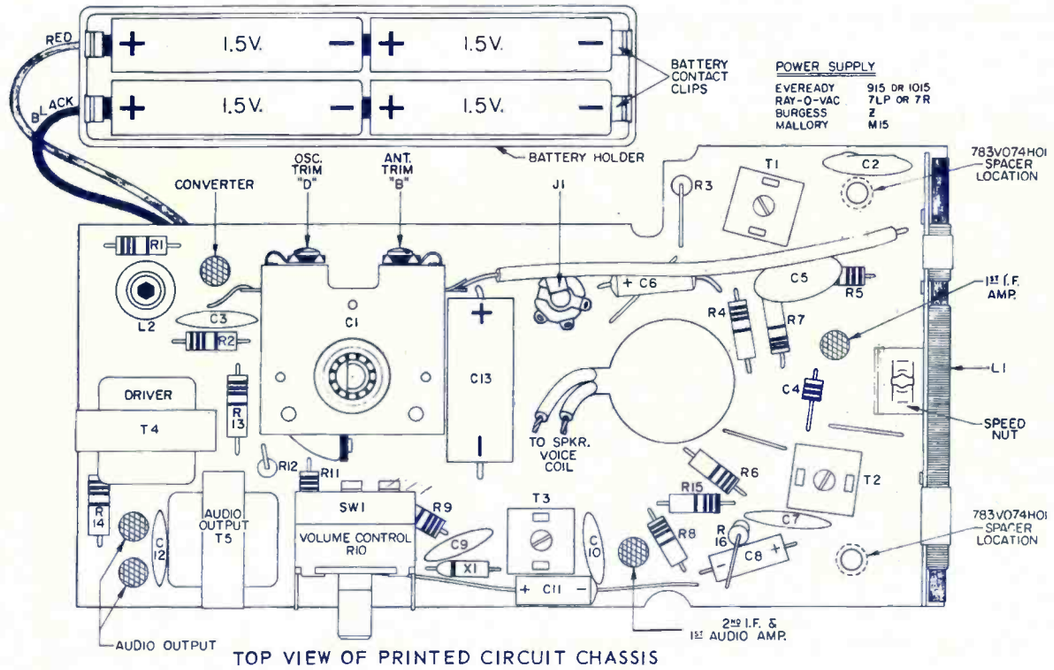




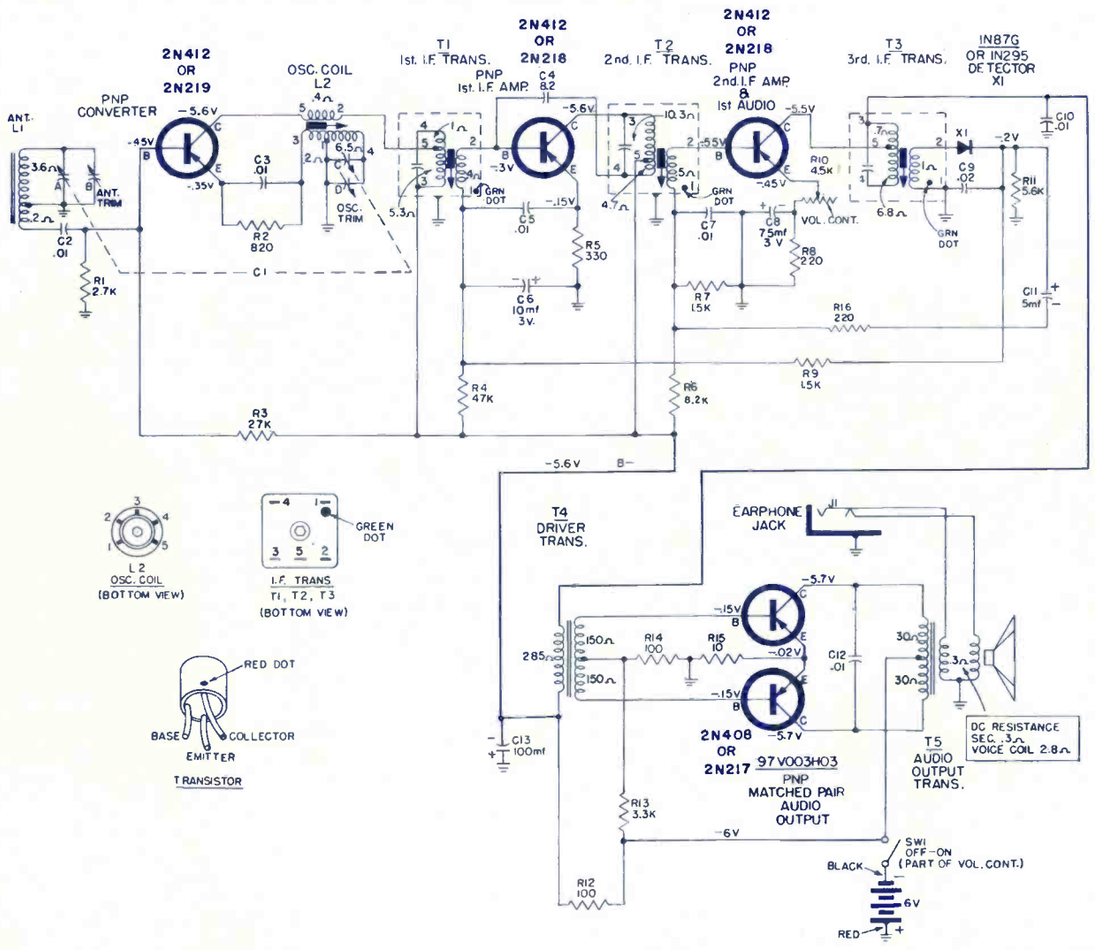
For Mechanical Detail of "FIREBALL" Tuner, See Circuit Digest #373

Models 17T241, 17T242, 17T243, 17T244, 17T245, 17TU241, 17TU242, 17TU243, 17TU244, 17TU245

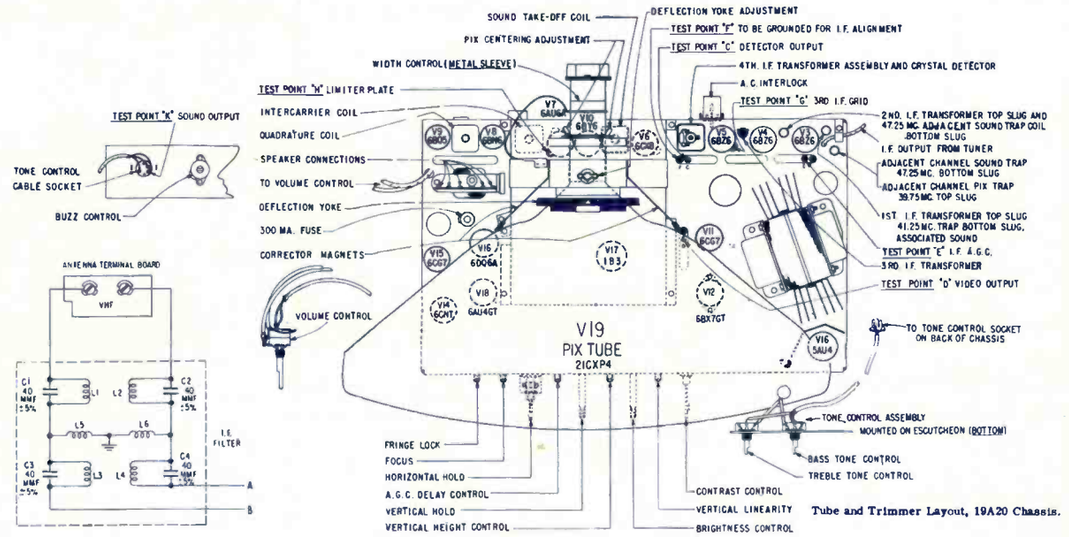
WESTINGHOUSE
Transistor Radio
Chassis V-2393-1
Model H655P5, H656P5



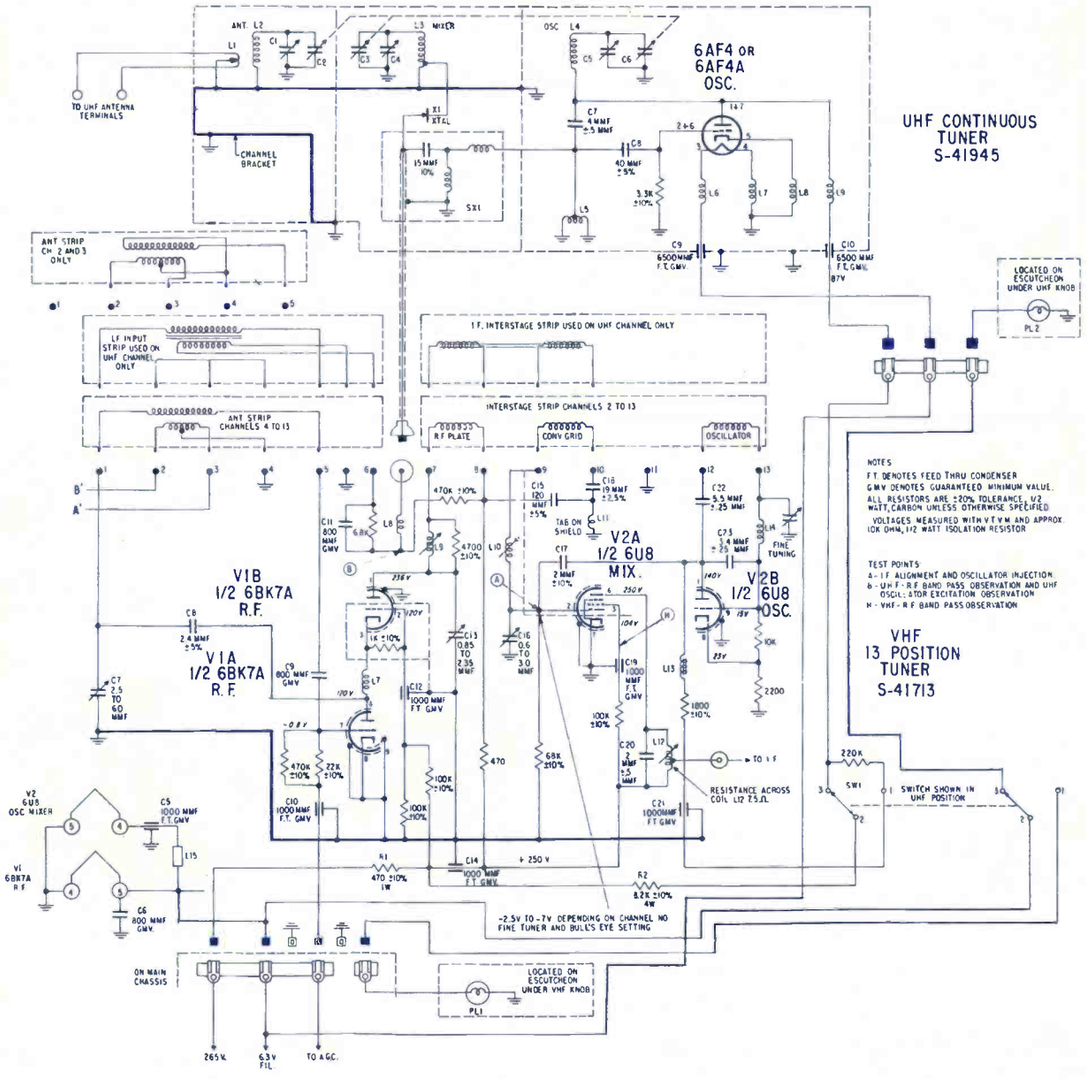
TOP VIEW OF PRINTED CIRCUIT CHASSIS



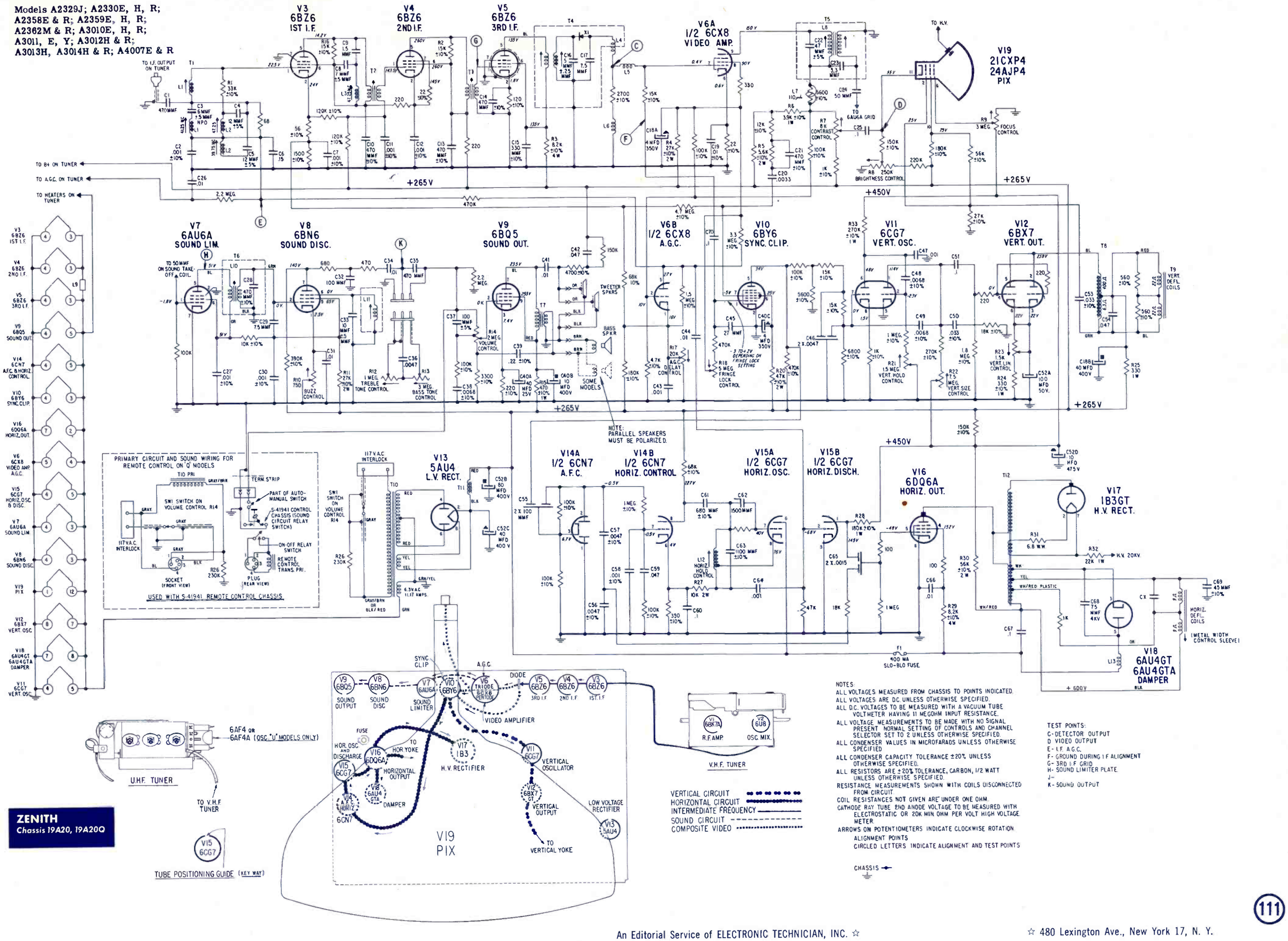
ZENITH
Chassis 19A20, 19A20Q



Tube and Trimmer Layout, 19A20 Chassis.



Models A2329J; A2330E, H, R;
A2358E & R; A2359E, H, R;
A2362M & R; A3010E, H, R;
A3011, E, Y; A3012H & R;
A3013H, A3014H & R; A4007E & R



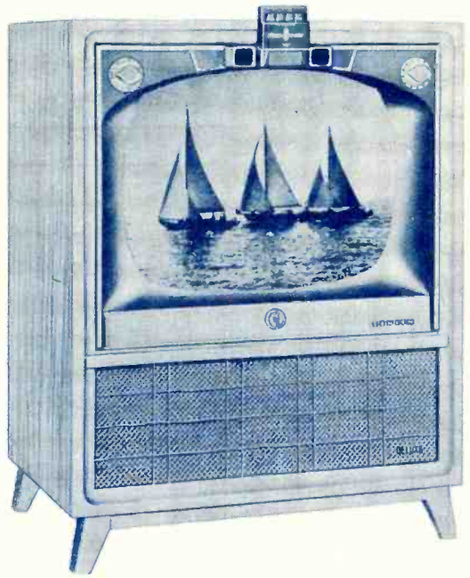
NOTES:
ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT, NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO 2 UNLESS OTHERWISE SPECIFIED.
ALL CONDENSER VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
ALL CONDENSER CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE ±20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.
COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT HIGH VOLTAGE METER.
ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
ALIGNMENT POINTS
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS

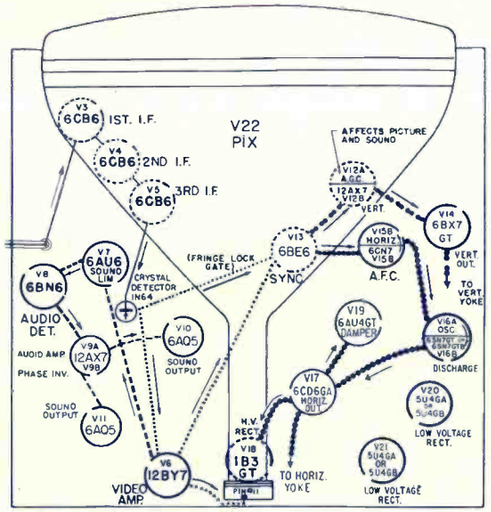
ZENITH
Chassis 19A20, 19A20Q

ELECTRONIC TECHNICIAN
CIRCUIT DIGEST

ZENITH
Chassis 22Z30,22Z30Q

Chassis 22Z30: Models Z2359EZ, RZ, Z; Z2360RZ
Chassis 22Z30Q: Models Z3012HZ, RZ; Z3014HZ, RZ

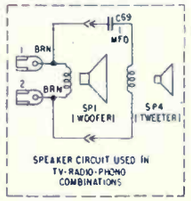


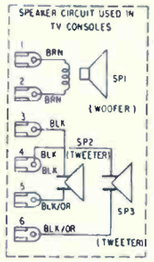


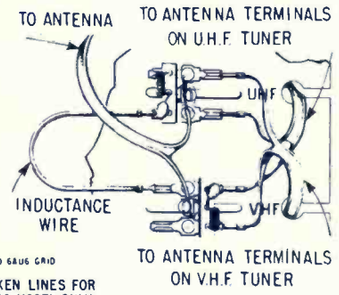
VERTICAL CIRCUIT
HORIZONTAL CIRCUIT
SOUND CIRCUIT
COMPOSITE VIDEO
INTERMEDIATE FREQUENCY

NOTES
ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED
ALL D.C. VOLTAGES TO BE MEASURED WITH VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT, NORMAL SETTING OF CONTROLS, AND CHANNEL SELECTOR SET TO 2 UNLESS OTHERWISE SPECIFIED
ALL CONDENSER VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
ALL CONDENSER CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE ±20%, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED
RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT
COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM
CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN OHM PER VOLT HIGH VOLTAGE METER
ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION
(A) ALIGNMENT POINTS
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS

TEST POINTS
C- 2ND I.F. GRID
D- 3RD I.F. GRID
E- VIDEO DETECTOR
F- VIDEO OUTPUT
G- SOUND LIMITER PLATE
H- AUDIO OUTPUT
J- BIAS

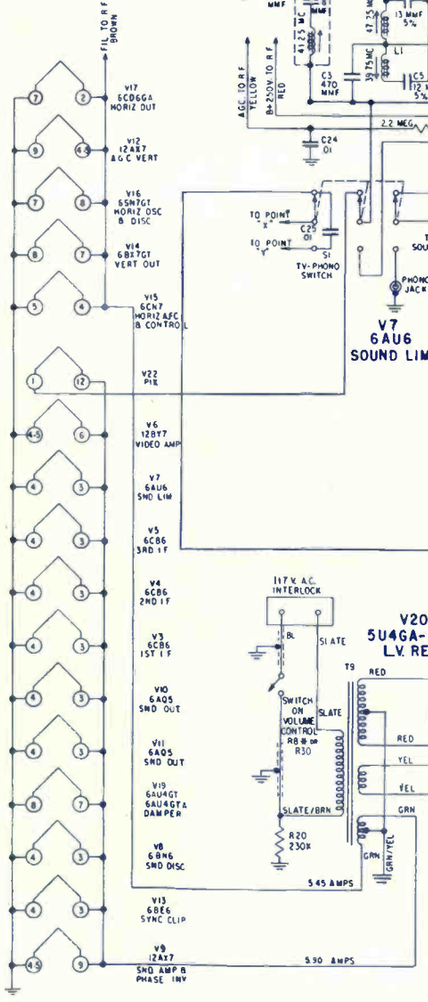


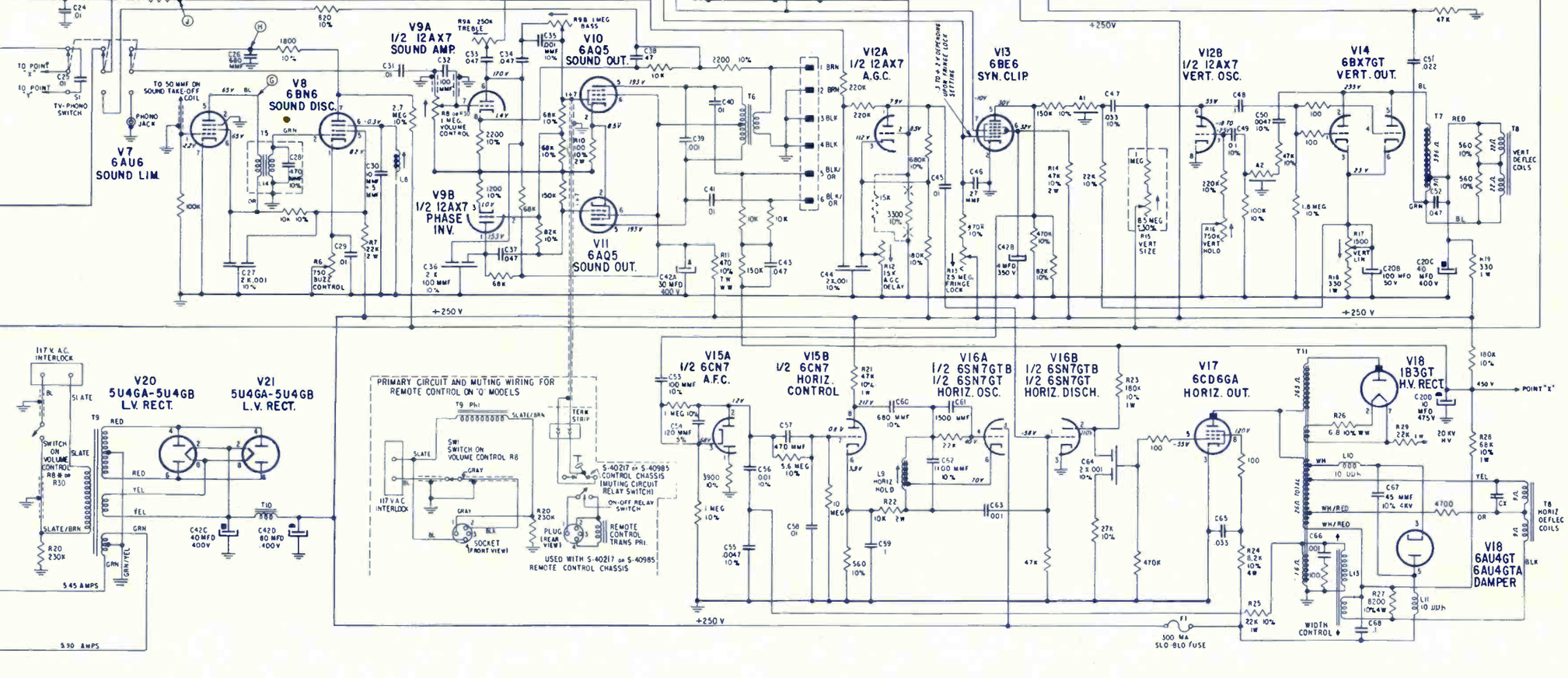




BROKEN LINES FOR 22Z30 MODEL ONLY.

V22 21CUP4 PIX





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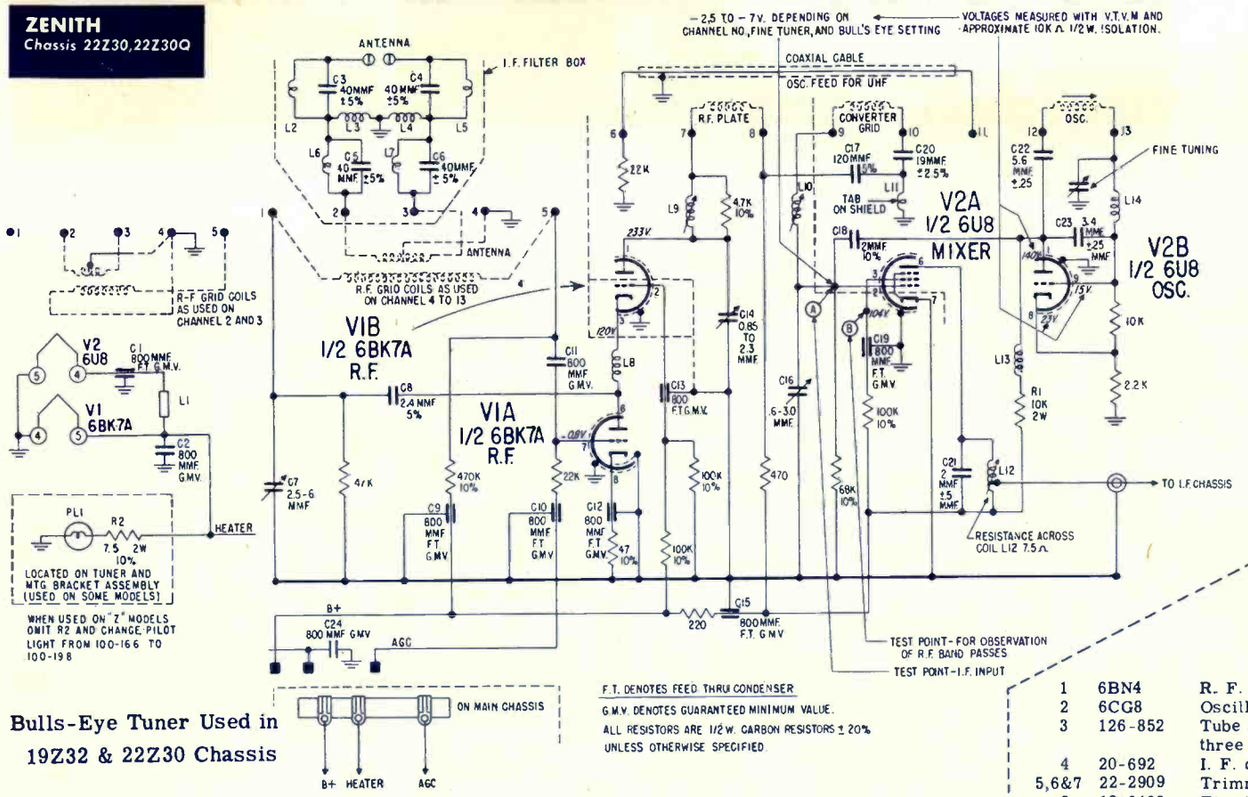
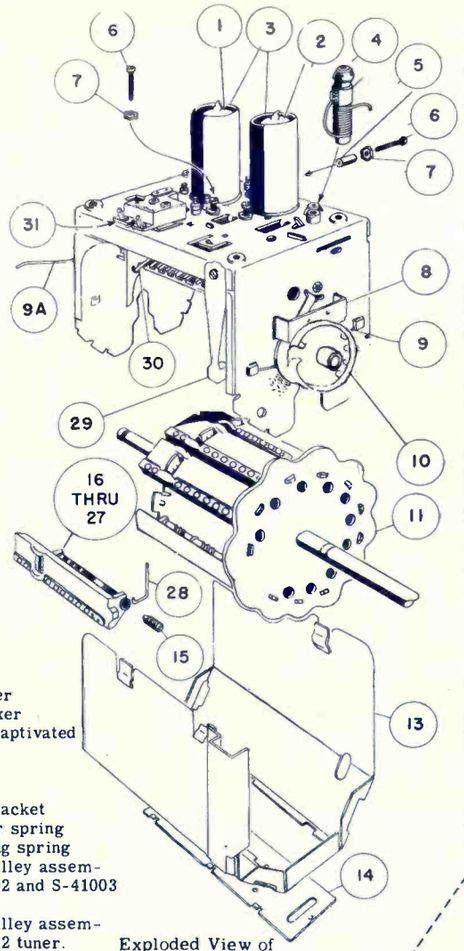
ZENITH
Chassis 22Z30, 22Z30Q



Bulls-Eye Tuner Used in 19Z32 & 22Z30 Chassis

F.T. DENOTES FEED THRU CONDENSER.
G.M.V. DENOTES GUARANTEED MINIMUM VALUE.
ALL RESISTORS ARE 1/2 W. CARBON RESISTORS ± 20% UNLESS OTHERWISE SPECIFIED.

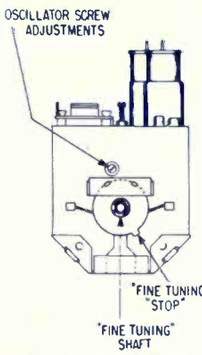


Exploded View of S-41002, S-41003 and S-41012 Target Tuners

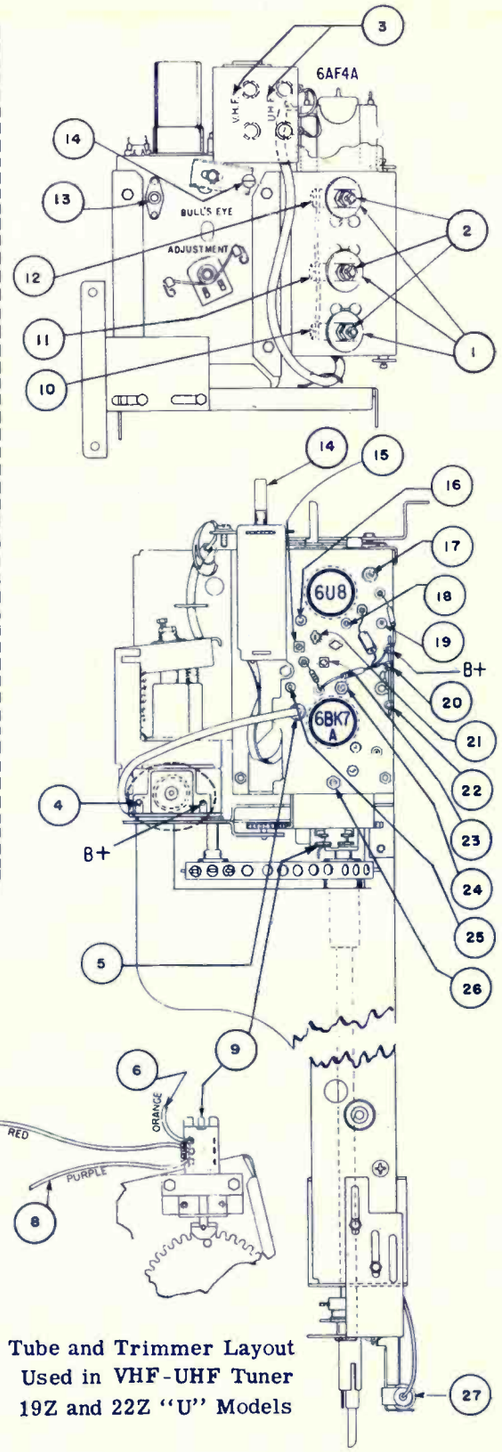
1	6BN4	R. F. Amplifier
2	6CG8	Oscillator mixer
3	126-852	Tube shield (captivated three section)
4	20-692	I. F. coil
5,6&7	22-2909	Trimmer
8	12-2428	Fine tuning bracket
9	80-1134	Drum retainer spring
9A	80-1152	Drum retaining spring
10	S-41513	Fine tuning pulley assembly for S-41002 and S-41003 tuners.
	S-41584	Fine tuning pulley assembly for S-41012 tuner.
11	S-41585	Turret drum assembly for S-41002 tuner.
	S-41586	Turret drum assembly for S-41003 tuner.
	S-41587	Turret drum assembly for S-41012 tuner.
13	S-40494	Bottom cover & removable plate
14	57-2293	Removable plate for bottom cover
15	149-176	Osc. tuning slug
16-27		VHF channel strips
28	80-1136	Slug retainer spring
29	S-41590	Detent spring & roller assembly
30	80-1137	Spring, ground
31	S-41511	Ant. balance trans.

NOTE: Refer to Service Manual TV-17 for parts list on the following Target Tuners.

S-24772, S-24773, S-24782, S-24783 and S-24792.

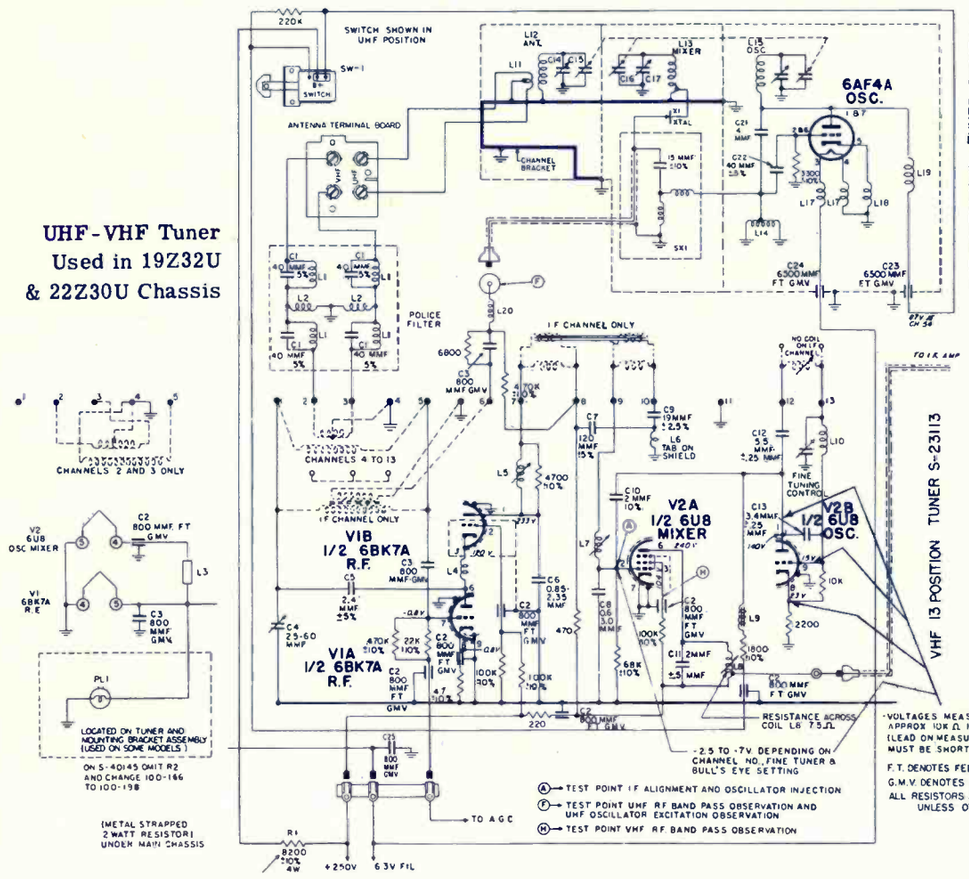


Bulls-Eye Tuning Adjustment



Tube and Trimmer Layout Used in VHF-UHF Tuner 19Z and 22Z "U" Models

UHF-VHF Tuner Used in 19Z32U & 22Z30U Chassis

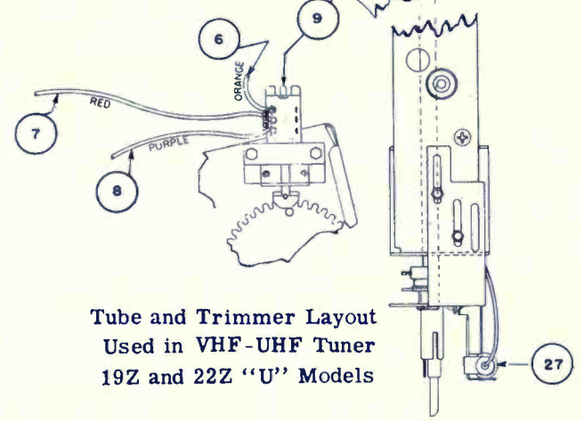


·VOLTAGES MEASURED WITH V.T.V.M. AND APPROX 10K Ω 1/2W ISOLATION RESISTOR (LEAD ON MEASURING END OF RESISTOR MUST BE SHORT, 1/4 INCH OR LESS.)

F.T. DENOTES FEED THRU CONDENSER.
G.M.V. DENOTES GUARANTEED MINIMUM VALUE.
ALL RESISTORS ARE 1/2W. CARBON RESISTORS ± 20% UNLESS OTHERWISE SPECIFIED.

-2.5 TO -7V. DEPENDING ON CHANNEL NO., FINE TUNER & BULL'S EYE SETTING

Ⓐ TEST POINT I.F. ALIGNMENT AND OSCILLATOR INJECTION
Ⓕ TEST POINT UHF R.F. BAND PASS OBSERVATION AND UHF OSCILLATOR EXCITATION OBSERVATION
Ⓗ TEST POINT VHF R.F. BAND PASS OBSERVATION



1 TRAVEL ADJUSTMENT SET AT CHANNEL 14

2 POSITIONING ADJUSTMENT SET TO CHANNEL 54 WITH ROCKER ARM PERPENDICULAR TO SLUG AXIS.

3 U.H.F. AND V.H.F. ANTENNA TERMINALS

4 HEATER

5 I.F. INPUT

6 TO B+ FEED-THRU CAPACITOR ON UHF TUNER

7 TO 8.2K 2W RESISTOR UNDER TUNER HOUSING

8 TO OSCILLATOR B+ FEED-THRU CAPACITOR ON VHF TUNER

9 FRONT VIEW OF UHF CHANGE-OVER SWITCH

10 ANTENNA TRIMMER PEAK AT CHANNEL 83

11 MIXER TRIMMER PEAK AT CHANNEL 83

12 OSCILLATOR TRIMMER SET AT CHANNEL 83

13 I.F. OUTPUT JACK

14 FINE TUNING

15 CONVERTER GRID IND. TRIMMER

16 I.F. SWEEP GEN. INJECTION AND TEST POINT FOR V.H.F. OSC. EXCITATION

17 CONVERTER PLATE TUNING

18 TEST POINT "H" (SCOPE CONNECTION FOR V.H.F. R.F. BAND PASS OBSERVATION) ("X" SCREEN FEED-THRU CAPACITOR.)

19 OSCILLATOR B+ SUPPLY FEED-THRU CAPACITOR

20 HEATER

21 CONVERTER GRID CAPACITOR TRIMMER

22 A.G.C.

23 R.F. PLATE IND. TRIMMER

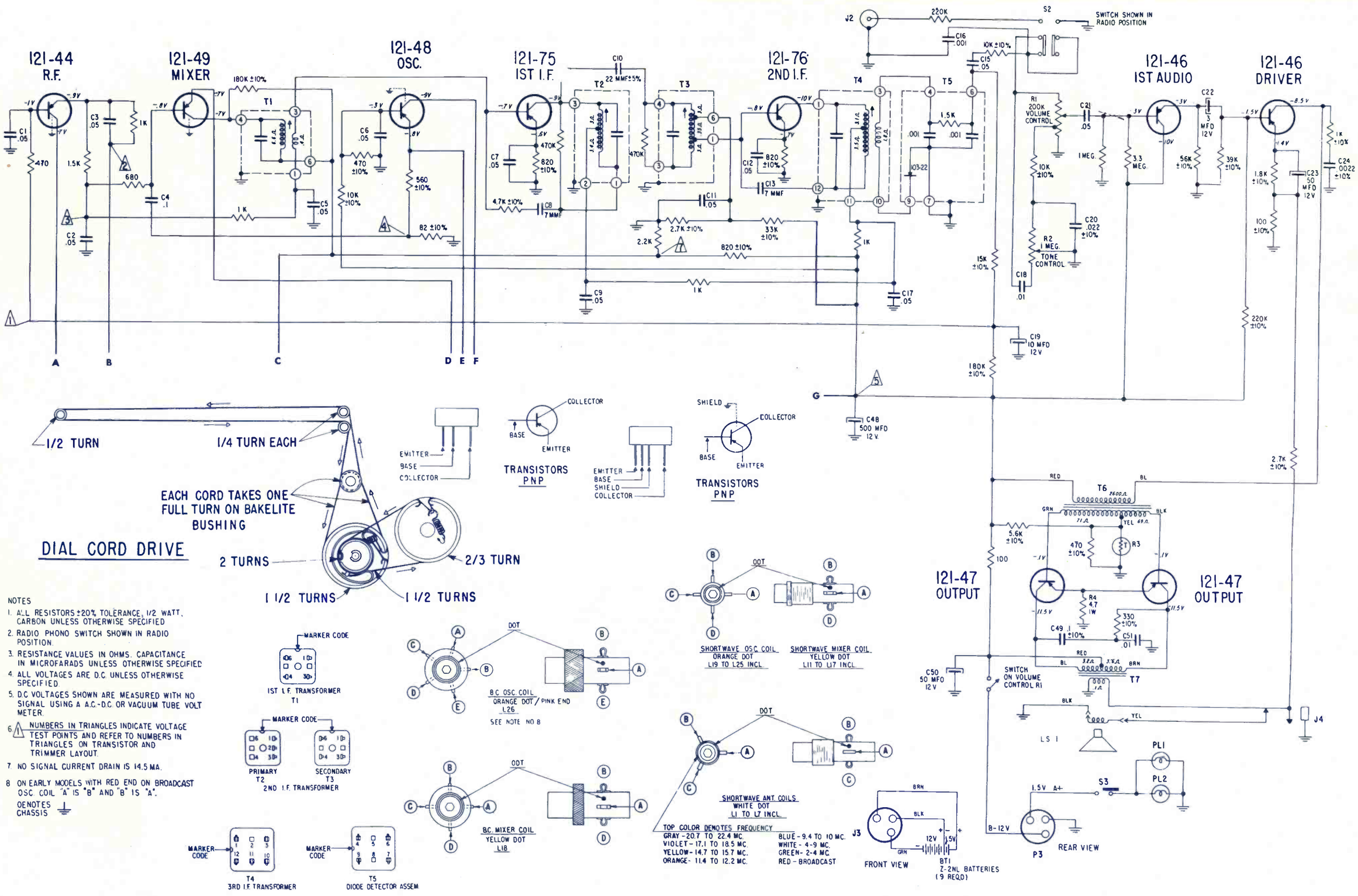
24 R.F. PLATE CAP. TRIMMER

25 TEST POINT "F" (SCOPE CONNECTION FOR V.H.F. R.F. BAND-PASS OBSERVATION AND U.H.F. OSCILLATOR EXCITATION AND I.F. SWEEP GENERATOR (INJECTION.)

26 R.F. GRID CAP. TRIMMER

27 U.H.F. AND V.H.F. PILOT LIGHT

ZENITH
Transistor Transoceanic Radio
Model Royal 1000



DIAL CORD DRIVE

NOTES

1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIED
2. RADIO PHONO SWITCH SHOWN IN RADIO POSITION.
3. RESISTANCE VALUES IN OHMS. CAPACITANCE IN MICROFARADS UNLESS OTHERWISE SPECIFIED
4. ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
5. D.C VOLTAGES SHOWN ARE MEASURED WITH NO SIGNAL USING A A.C.-D.C. OR VACUUM TUBE VOLT METER.
6. △ NUMBERS IN TRIANGLES INDICATE VOLTAGE TEST POINTS AND REFER TO NUMBERS IN TRIANGLES ON TRANSISTOR AND TRIMMER LAYOUT.
7. NO SIGNAL CURRENT DRAIN IS 14.5 MA.
8. ON EARLY MODELS WITH RED END ON BROADCAST OSC. COIL "A" IS "B" AND "B" IS "A".

⏚ DENOTES CHASSIS

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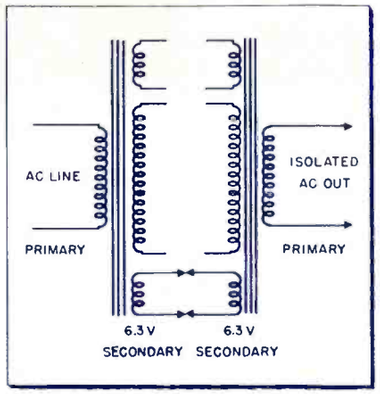
Shop Hints

Emergency Isolation

When the shock hazard becomes a problem especially when working on radio or TV sets whose chassis are tied to one side of the a-c power line, an emergency isolation transformer can be quickly hooked up by using any two similar transformers. Care must be taken not to exceed the transformer's wattage rating. Two TV power transformers will do. Where there are multiple windings, it is best to use the heaviest; this is usually the 6.3-volt filament winding. One transformer steps up as much as the other transformer steps down in a symmetrical back-to-back hookup, as shown in the diagram. (Less a very small loss; the amount depending upon the efficiency of the transformer.) Exposed leads should be taped.—*B. O. Riis, Miami, Fla.*

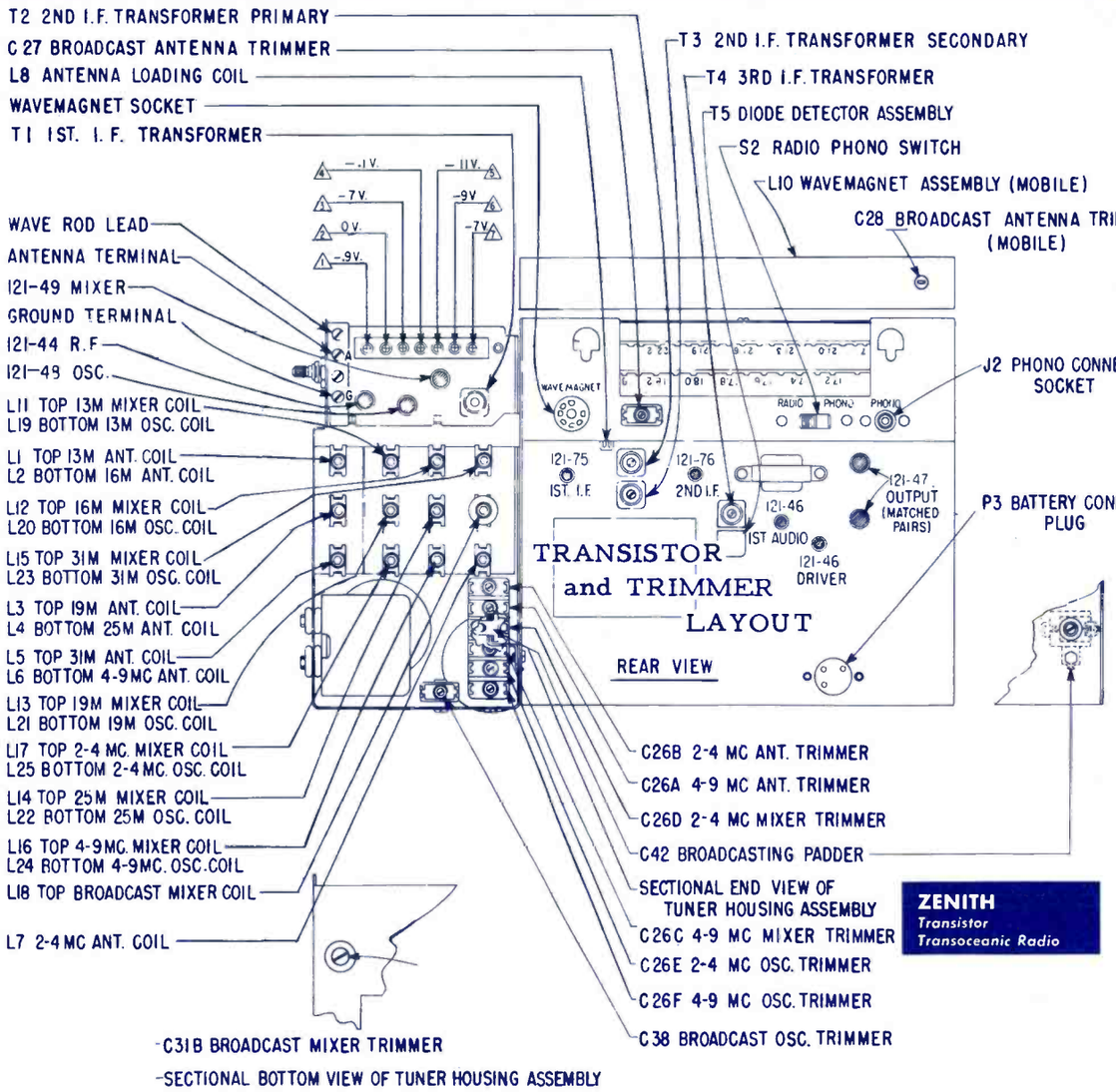


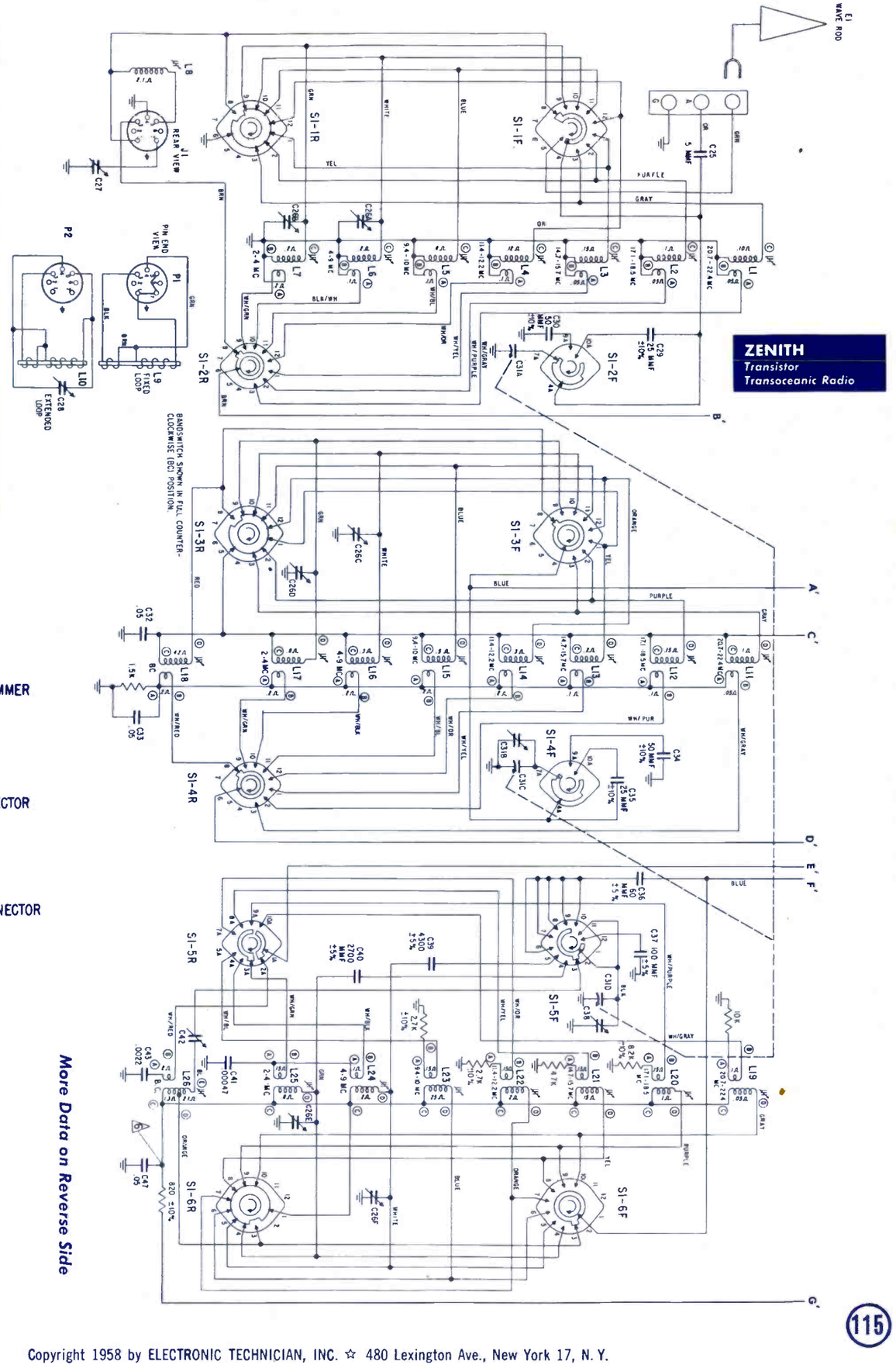
Emergency power line isolation device.

• *Commercial isolation transformers are available. Some have provisions for raising or lowering the voltage to facilitate certain trouble shooting procedures.—Ed.*

Tube Kink

A defective 6J5 vertical-output tube located in a 630 chassis, which was in a home about 15 miles from my shop, gave me a hard time because I did not have a replacement or even a poor substitute with me. What to do? I modified a 6K6 by snipping off part of pin 4 and soldering a jumper from pin 3 to pin 4. This tied the plate and screen together. Pin 4 was cut just in case the socket connection was used as a tie point. It worked very well. It saved me a long trip and the customer was happy. I replaced the contraption with a new 6J5 on my next visit to that area.—*Roy Hale, Middlesboro, Ky.*

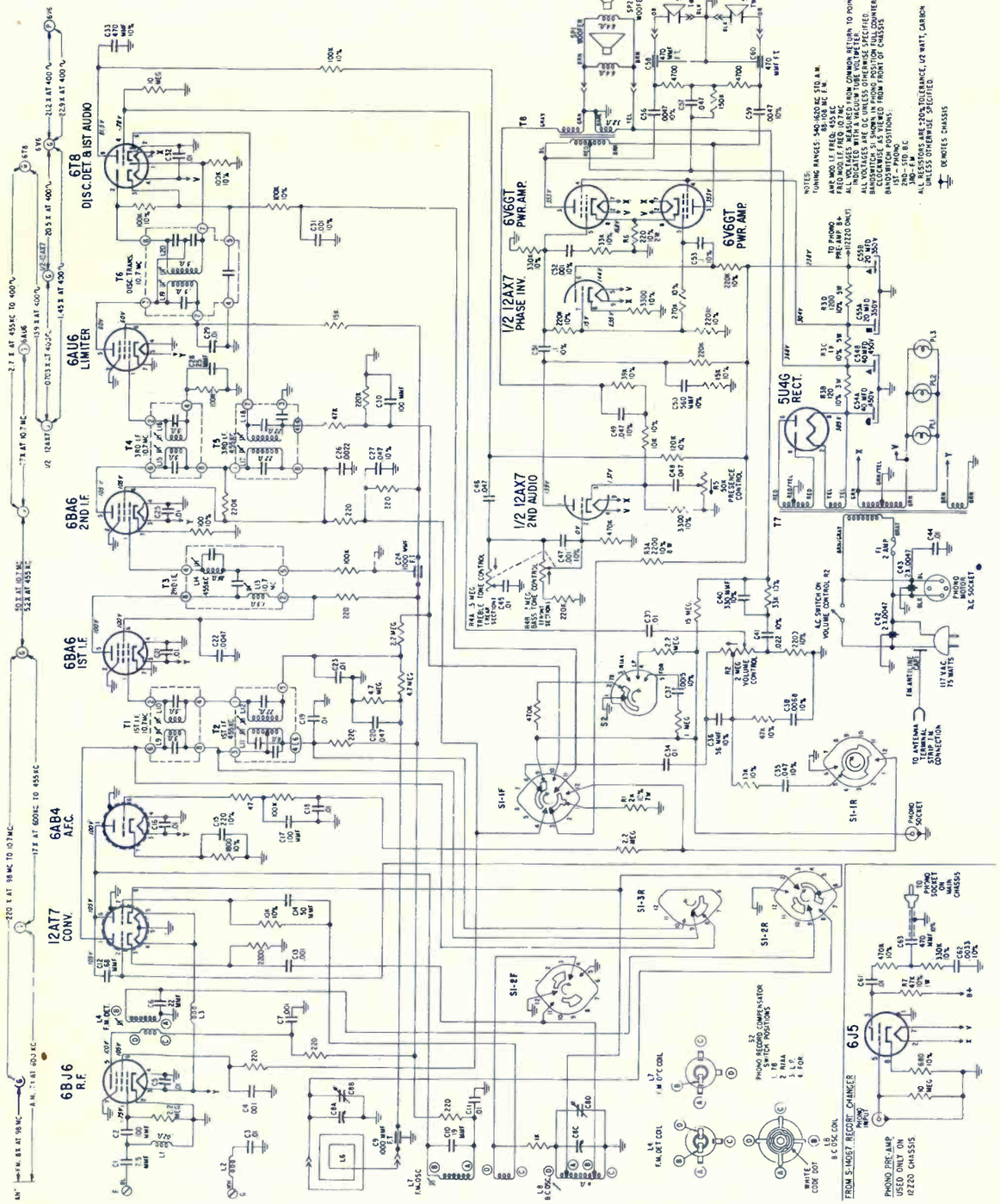


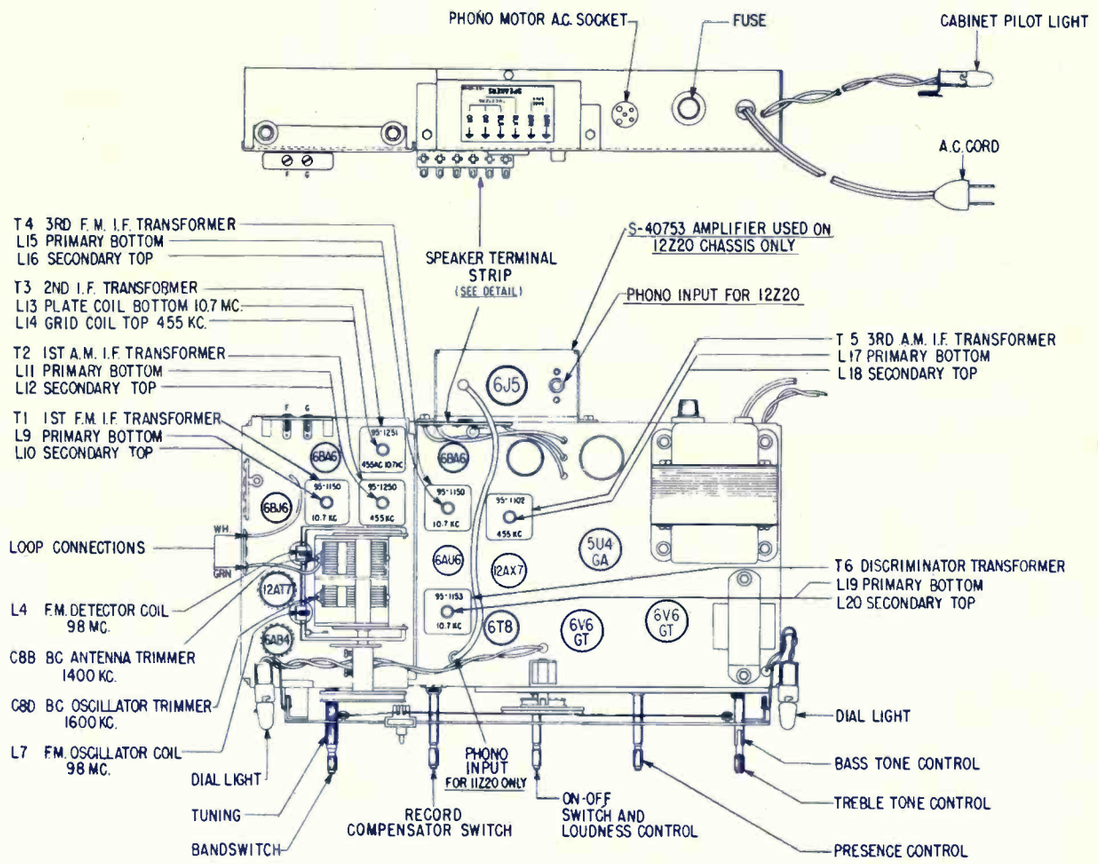


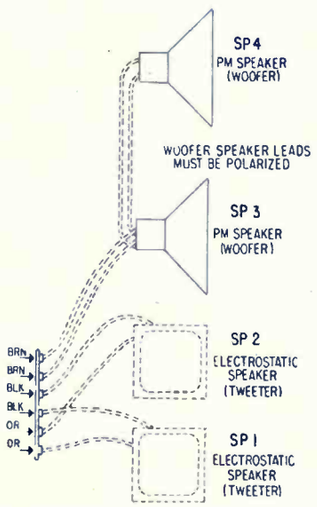
More Data on Reverse Side

ZENITH

Hi-Fi AM/FM Radio & Amp. Chassis 11Z20, 12Z20

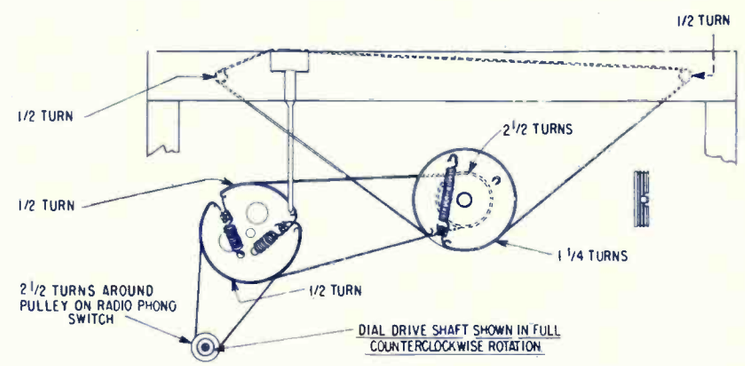






SPEAKER CONNECTIONS

DIAL CORD DRIVE



Models: HF1180R, HF1182E
HF1284, HF1284E

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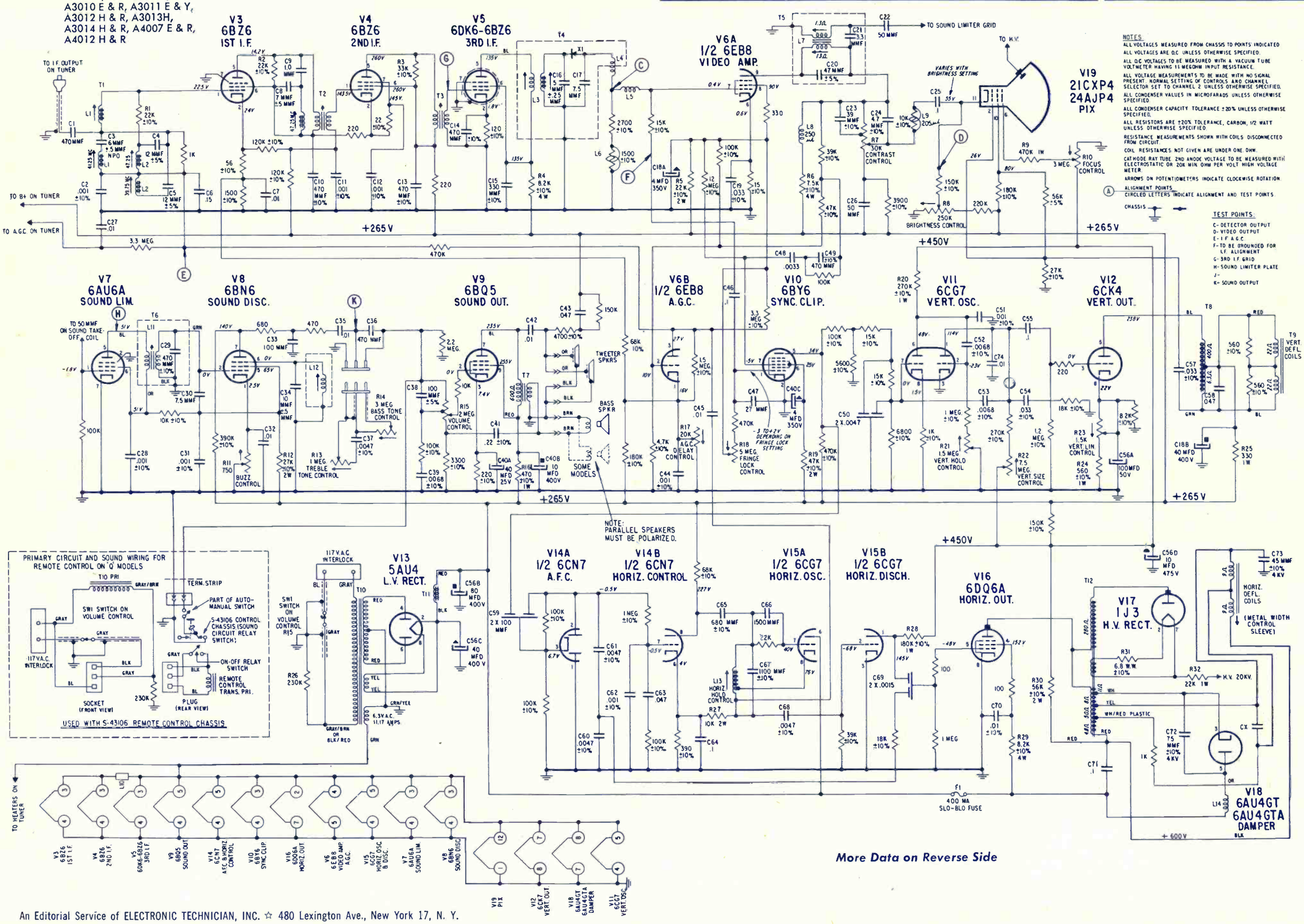
ZENITH
TV Chassis 19A30, 19A30Q

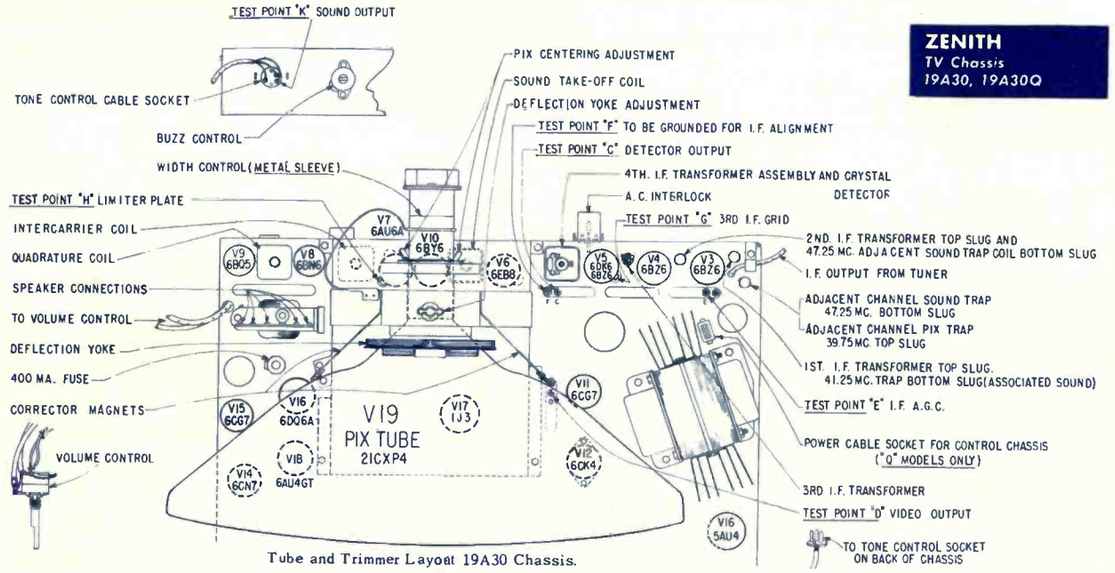
Models A2260 M & R,
A2329R, A2330 E & R,
A3010 E & R, A3011 E & Y,
A3012 H & R, A3013H,
A3014 H & R, A4007 E & R,
A4012 H & R



More Data on Reverse Side

ZENITH
Transistor Radio
Chassis 8AT41Z2
Model Royal 750L

ZENITH
TV Chassis
19A30, 19A30Q

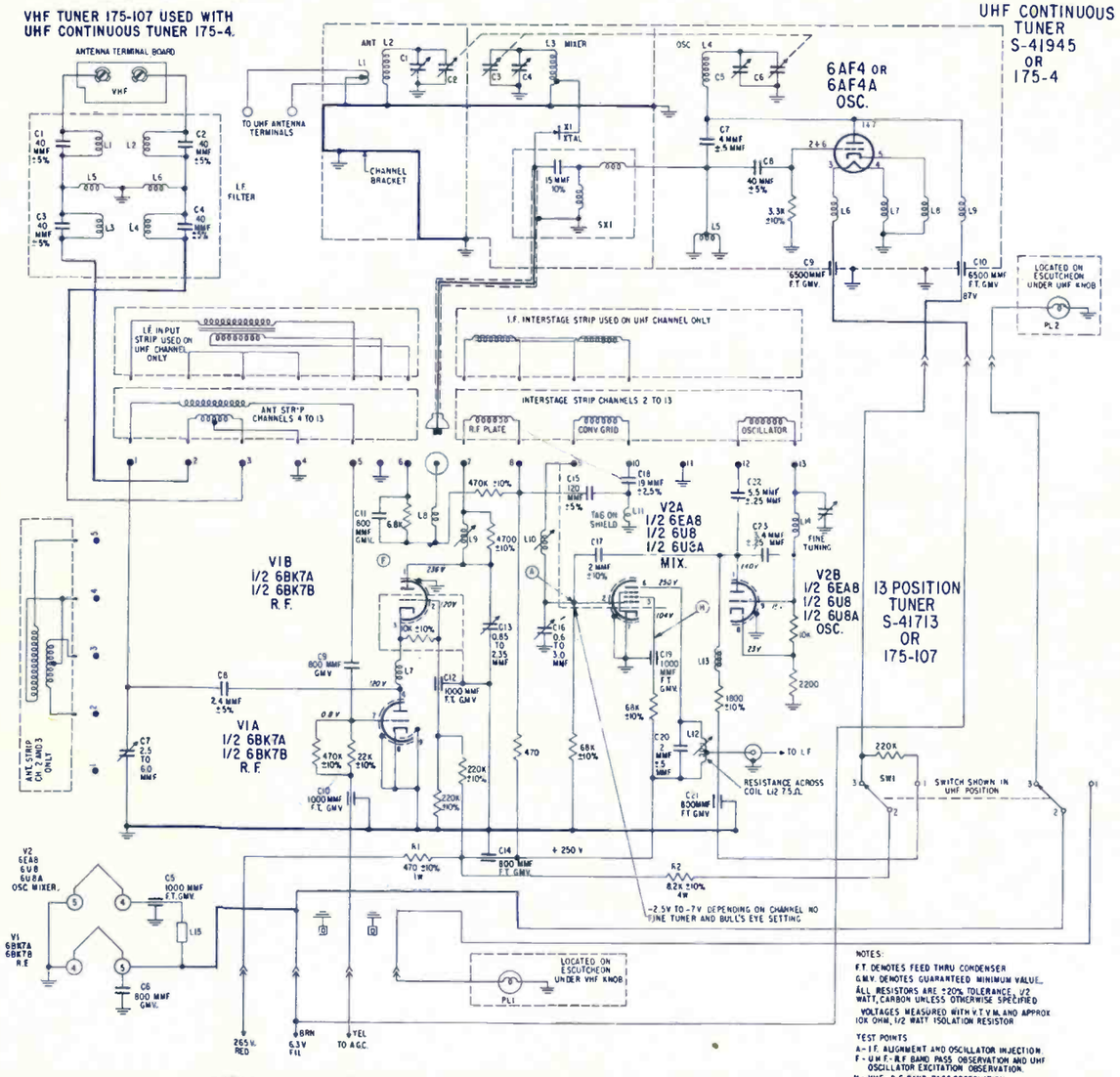


Tube and Trimmer Layout 19A30 Chassis.

V19
PIX TUBE
21CXP4

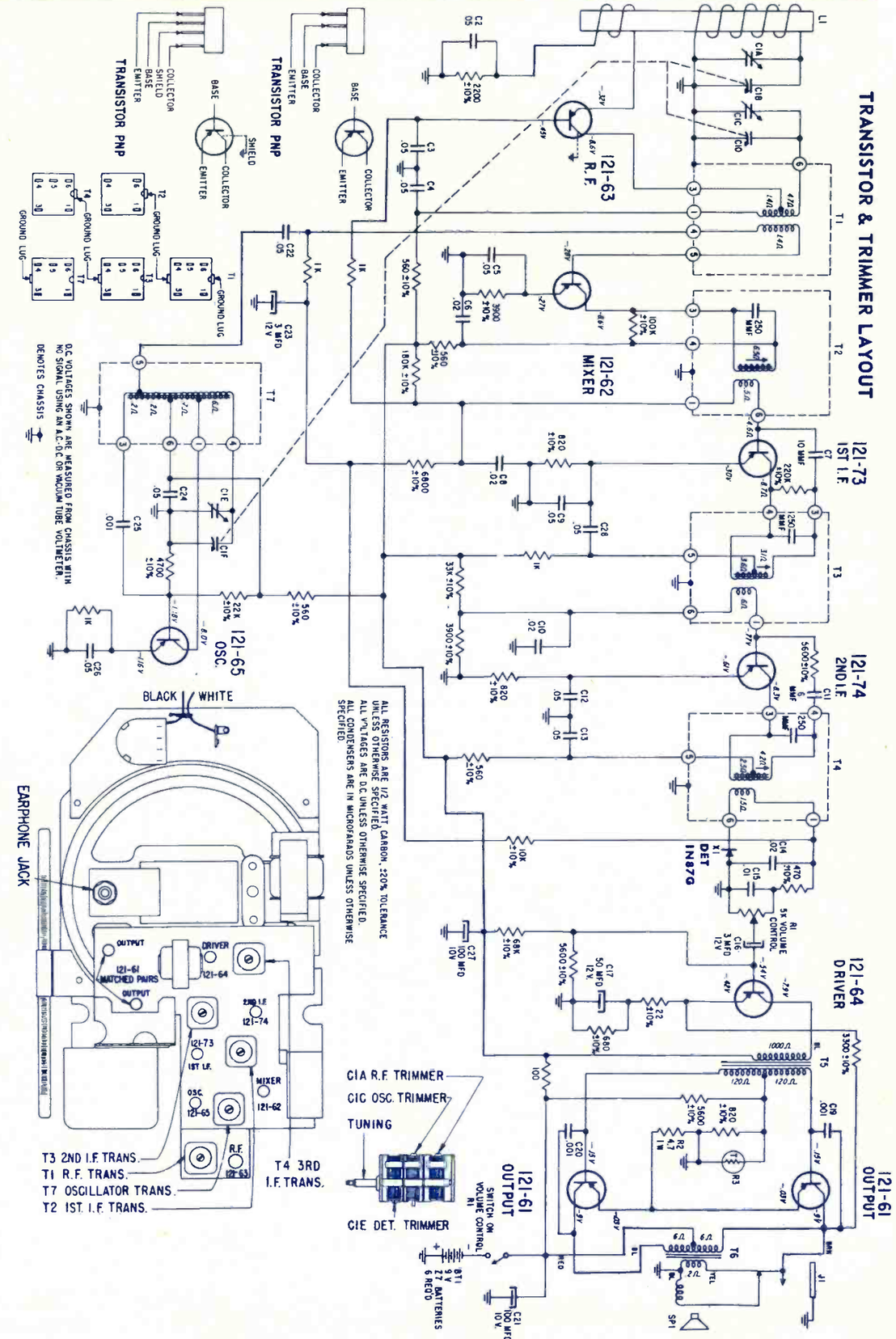
VHF TUNER S-41713 USED WITH UHF CONTINUOUS TUNER S-41945.

VHF TUNER 175-107 USED WITH UHF CONTINUOUS TUNER 175-4.



NOTES:
FT. DENOTES FEED THRU CONDENSER
G.M.V. DENOTES GUARANTEED MINIMUM VALUE.
ALL RESISTORS ARE ±20% TOLERANCE, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIED
VOLTAGES MEASURED WITH V.T.V.M. AND APPROX 10K OHM, 1/2 WATT ISOLATION RESISTOR

TEST POINTS
A - I.F. ALIGNMENT AND OSCILLATOR INJECTION
F - U.H.F. - R.F. BAND PASS OBSERVATION AND UHF OSCILLATOR EXCITATION OBSERVATION.
H - VHF - R.F. BAND PASS OBSERVATION



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Deciphering TV-Radio Model & Chassis Numbers

Guide To Chassis and Model Numbers Aids Servicing, Parts Ordering, Finding Data, And Identifying Sets.

ROBERT CORNELL
TECHNICAL EDITOR

• What do the numbers on TV and radio sets mean? Do you get them, or do they get you? Sometimes they pack a load of information and sometimes they are meaningless. Sometimes they are an orderly alphabetical and numerical arrangement, and sometimes they are a hopeless, chaotic and disjointed mess of hieroglyphics. Some manufacturers admit that a state of hopeless confusion exists and that something should be done about it. An orderly and planned system of numbering can do much to simplify inventory control, billing, ordering and even selling. The technician's life would be much easier if he could indentify a set easily, file and find schematics, and know in a flash what set a customer or distributor has in mind when a number is mentioned.

All is not lost, thanks to the Electronic Industry Association, located at 1721 De Sales St. N. W., Washington 6, D. C., and to some individual manufacturers, a system has been developed. Actually, several different systems have materialized over the years. So far as the technician is concerned the serial numbers (as differentiated from model numbers) which are placed on a set for accounting purposes only, might be considered as useless, and only tend to complicate matters even more; but even these numbers may offer a clue as to vintage and run. Most schemes consist of a combination of letters and numbers, and some have only numbers. Besides the serial number, there are three other numbers likely to be encountered:

1—The model number of the complete unit may give details as to the types of cabinet, style, and finish, and may also indicate if it is a radio or TV, portable or fixed, year of production, size of CRT, etc.;

2—The chassis number, in most cases the most important one to the technician, indicates the actual piece of electronic equipment used. Schematics, technical information and parts required may be ascertained by being able to identify the chassis. Some model TV sets may come equipped with any one of a number of different chassis, and by the same logic, or lack of it, a chassis may be fitted into many different models. The chassis number may also indicate size of CRT, number of tubes, VHF only or UHF/VHF, year of production, etc.;

3—Run numbers may or may not be indicated. Some set makers use letters after the chassis number, others may use R1, R2, R3, etc. and still others may use just numbers. As was pointed out earlier, sometimes the serial number may be a clue to the run number. The run number designates electrical and mechanical changes. In many cases an earlier run set may be upgraded in the field by installing some of the modifications a manufacturer used to stabilize or otherwise improve a set's performance.

One other set of numbers appear on most major components and the chassis itself. That is the Electronic Industries Association Production Source Code. It is a standard numeric symbol, assigned and registered by EIA headquarters. Manufacturers may stamp or mark any or all of their products to identify the production source. In addition to the standard code, which usually consists of 3 or 4 numbers, a date code may be added. However, in most cases, it should not be necessary to trace a component further back than the producer of the completed consumer product. In many instances the technician, by applying some of these numbering principles and studying a group of numbers, may be able to decipher and obtain the intelligence hidden in these codes. About the best advice one can follow, when lost in the maze of digits, is to contact the manufacturer directly.

Another advantage to knowing the manufacturer's system of numbering may help identify the chassis, even when the numbers are obliterated. The Guide To Model and Chassis Numbers Chart, presented here, is in most cases self explanatory. In the interest of presenting as large a cross-section of the industry's endeavors to identify their products, in a rapid and convenient form for reference purposes, some details were omitted from the chart and presented in the text. For one reason or another, certain details of some of the numbering systems, were not available at the time of writing.

Highlights of the different systems used by different set producers follow:

Andrea

The combination numbering system applies to both radio and TV chassis and in a general way to hi-fi. The latter portion of the model number includes the chassis number.

Du Mont

A personal touch is added by giving each TV set a name. From Allenby to Winthrop past Newport, Riviera and Versailles, the road is fortunately identified with RA numbers. RA in this case stands for Receiver Apparatus. The numbers run in sequence from RA-101 up to the latest RA-406/407, and represent the order of engineering development. When two numbers are combined as in RA-402/403, the first number stands for a VHF set only and the second is for a VHF/UHF version. Earlier sets used a sticker or metal plate attached to the chassis for identification. Later sets have a serial number stamped on the rear panel. The first 3 numbers of a 9 digit configuration is the RA number from RA-301 on.

Emerson

Both model and chassis numbers are basically all numerical, and do not indicate size of picture tube, type of chassis, etc. The first digits of the TV chassis number are meaningless to the technician. Both radio and TV chassis carry the same first 3 digits (120). The last 3 digits indicate the order of release of different chassis. One consolation perhaps is that within the past year and a half to two years, radio model numbers are under 1000 and TV models are over 1000.

General Electric

TV—A new numbering sequence, started recently, identifies size of CRT, type of cabinet, chassis, and cabinet color, style and finish. Chassis styles run from the letters A to U with some pauses for double lettered jobs such as EE, MM, etc. More recent chassis whose circuitry is similar to previous issues but have mechanical differences bear Q2, M3, U2, etc., designations.

Radio—All new table models to be introduced within the next few years will run numerically from 100 to 399. Clock radios will run numerically between 400 and 699. Portable radios between 700 and 999. Provision is made to identify 5 different colors.

List of companies covered in this report. See Guide To Radio and TV Model Numbers.

Manufacturer or Prime Source	EIA Production Source Code Number
Admiral Corporation 3800 W. Cortland St., Chicago 47, Ill.	101
Andrea Radio Corp. 27-01 Bridge Plaza, North Long Island City 1, N. Y.	113
Allen B. Du Mont Laboratories, Inc. 35 Market St., East Paterson, N. J.	158
Emerson Radio & Phonograph Corp. 14th & Coles Streets Jersey City 2, N. J.	171
General Electric Co. Electronics Park, Syracuse, N. Y.	188
The Hallicrafters Co. 5th & Kostner Ave., Chicago 24, Ill.	199
Hoffman Electronics Corp. 6200 S. Avalon Blvd., Los Angeles 3, Calif.	207
Hotpoint Co. 5600 W. Taylor St., Chicago 44, Ill.	—
The Magnavox Co. Fort Wayne 4, Ind.	232
Montgomery Ward 618 W. Chicago St., Chicago 7, Ill.	—
Motorola, Inc. 4545 Augusta Blvd., Chicago 51, Ill.	185
Olympic Radio & Television 34-01 38th Ave., Long Island City 1, N. Y.	200
Philco Corp. Tioga & C Streets Philadelphia 34, Pa.	260
Radio Corp. of America Camden 8, N. J.	274
Sylvania Electric Products, Inc. 700 Ellicott St., Batavia, N. Y.	312
Trav-ler Radio Corp. 571 W. Jackson Blvd., Chicago 6, Ill.	320
Western Auto Supply Co. (Truetone) 2107 Grand Ave., Kansas City 8, Mo.	—
Westinghouse Electric Corp. TV-Radio Division Metuchen, N. J.	337
Zenith Radio Corp. 6001 Dickens Ave., Chicago 39, Ill.	343

Hoffman

A new model numbering system was put into use with the introduction of the 1956 line of TV receivers. It was designed to cut down the quantity of numbers required.

Hotpoint

The letter S is used in the model numbering system to designate the TV receiver as a Hotpoint product. Because they are a division of the General Electric Co., many similarities appear. The chassis used in 1957 and 1958 productions are designated as follows:

Chassis	CRT	Year
MM	17"	1956-57
M3	17" & 21"	1958
Q	14"	1957
Q2	14"	1958
T	9"	1957
U	21" & 24"	1957
U2	21" & 24"	1958

Production runs are identified as early or late production.

Magnavox

In addition to chassis numbers, there are model numbers and style numbers. The easiest way to dig out the service data, in the absence of the manufacturer's service manual index and service manuals, is to go according to chassis numbers. Several descriptive letters in front of the number help identify the equipment.

Each chassis is also given a series number. These numbers are included in some chassis numbers and are preceded by a letter V or U, which stands for VHF or UHF/VHF respectively. The series 21 chasis might appear as V-21-02CB. Other meanings are built into these numbers, for example the 02 in this case, in addition to other things, indicate a 24-inch CRT, as does 04, 06, 07, and 10. Numbers 01, 03, 05, 08, 11, and 12 indicate a 21-inch tube plus other changes. However, these numbers do not have the same meaning in other series TV sets.

Montgomery Ward

A 4-digit number which is part of the company's uniform article numbering system, is used to identify both radio and TV. The higher the number, the more recent the set.

Olympic

Chassis identification is relatively simple. An alphabetical sequence is used such as GA, GB, etc. HB, HC, HD, etc. will probably follow GZ as new chassis are produced. Combinations of letters which spell words or have other connotations such as HA are avoided. If the letter U is added, it represents UHF/VHF.

Upgraded and deluxe sets usually carry a higher letter in the alphabetical order. Run numbers and EIA date-source code are stamped on the chassis.

RCA

TV—Model numbers on sets from 1951 to date have followed a fairly stable pattern. They indicate size of CRT, general price classification and model details. Chassis numbers are perhaps the most important to the technician for servicing purposes. Black and white TV chassis have a KCS designation, such as KCS 107. Some other letters and their meanings as used on and around the TV chassis are:

KRK	Miscellaneous TV assembly used on r-f tuners, optical barrels, etc.
CTC	Color TV chassis.
KC	Prewar TV chassis.
KK	Prewar TV power unit.
KRS	Postwar TV power units (mostly with projection TV).
RC	Radio tuner chassis with or without power supply.
RK	Miscellaneous radio assembly. RK-121 is AM-FM tuner unit. RK-203 is earphone attachment for transistor radio.
RP	Record playing mechanism.
RS	Radio power unit with or without audio amplifier.

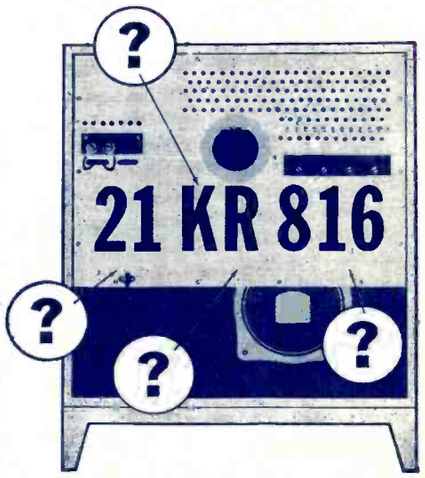
Radio—Model numbers cannot be used to determine year of manufacture or number of tubes. A combination of letters and numbers, such as 6-XF-9, are used. The letters do have a meaning as follows:

C	Clock radio. (In prewar years denoted console radio).
X	AC-DC
BX	Batt-AC-DC
RF	Power trans
XF	AC-DC, AM-FM
BT	Battery transistor (Previously denoted battery table radio.)
HF	High-fidelity
JS	3 or 4-speed attachment
JD	2-speed attachment (45-33).
JY	"45" attachment.
EMP	Electrical - manual - portable record player.
TR	Tape recorder.
EY	Electrical "45" record player.

Sylvania

TV—The serial numbers are quite interesting in that they are also packed with information. Service literature would be coded 537-1 for the example used in the chart.

Radio—The first two digits of the



four used for radio and phono models have some meaning. The last two numbers are for factory use.

In addition a suffix letter is used to designate color.

Table Model Radios	
Leader	11
Deluxe	12
Super Deluxe	13
Clock Radios	
Leader	21
Deluxe	22
Super Deluxe	23
Portable Radios (3 way or battery only)	
Miniature	31
Leader	32
Deluxe	33
Super Deluxe	34
Phonographs	
Table Model	41
Base Model (For use with TV)	42
Console	43
Portable	44
Radio-Phono Combinations	
Radio-Phono Portable	45
Radio-Phono Table Model	46
Radio-Phono Console	47
Radio-Phono—Tape Recorder Combinations	
Radio-Phono—Tape Recorder Console	48
Tape Recorders	
Tape Recorder Portable	49

Trav-ler

There is no set procedure for identifying radio and phonograph model numbers. Clock radios do have the letter C inserted in the model number, as in 56C42. Transistor radios have the letters TR preceding the numerical portion as in TR-250.

Trutone

The model numbers consist of a 4-digit number preceded by a prefix. These sets are made for and merchandised by Western Auto Supply Co. •

Guide To Radio & TV Model Numbers

ADMIRAL EIA Code 101

RADIO MODEL

5 A 4 3
- 5 — NUMBER OF TUBES OR TRANSISTORS
- A — CHASSIS NUMBER
- 4 — CABINET FINISH
- 3 — CABINET FINISH

TV MODEL

P H 14 D 11
- P — C-CONSOLE, L-LOWBOY, P-PORTABLE, T-TABLE
- H — H-HIGH FIDELITY, R-REMOTE CONTROL
- 14 — CRT SIZE
- D — CHASSIS
- 11 — CHASSIS

TV CHASSIS

19 S Z 4 FS
- 19 — NUMBER OF TUBES (IF USED 41 MC IF, OTHERWISE 21 MC IF)
- S — CHASSIS
- Z — ENGINEERING NUMBER
- 4 — ENGINEERING NUMBER
- FS — MODEL VARIATIONS

ANDREA* EIA Code 113

TV & RADIO MODEL

B-CO-V P-21 K
- B — CABINET FINISH: B-BLONDE, W-WALNUT, E-EBONY, F-FRUITWOOD, M-MAHOGANY
- CO — CABINET STYLE: CO-COMBINATION, T-TABLE MODEL, C-CONSOLE, MC-MODERN CONSOLE, 2C-CABINET w/DOORS or SPCL. CABINET
- V — V-TV, R-RADIO
- P — CHASSIS TYPE
- 21 — SIZE OF PICTURE TUBE OR NUMBER OF TUBES IF IT'S A RADIO CHASSIS
- K — REVISIONS

DUMONT* EIA Code 158

EMERSON* EIA Code 171

GENERAL ELECTRIC* EIA Code 188

TV MODEL

17 P 13 30
- 17 — CRT SIZE
- P — T-TABLE, P-PORTABLE, C-CONSOLE
- 13 — YEAR: 1-1958, 2-1959, 3-1960
- 30 — CHASSIS: 2-Q2, 3-M3, 17" CRT, 4-M3, 21" CRT, 5-U2
- COLOR, STYLE & FINISH

RADIO MODEL

P 725
- P — T-TABLE, C-CLOCK, P-PORTABLE
- 725 — MODEL
- COLOR

HALLICRAFTERS EIA Code 199

TV MODEL

21 K T 640 B
- 21 — CRT SIZE
- K — K-CONSOLE, T-TABLE
- T — T-TOP TUNING, F-FRONT TUNING, S-SIDE TUNING
- 640 — ENGINEERING MODEL
- B — B-BLONDE, M-MAHOGANY

HOFFMAN* EIA Code 207

TV MODEL

M U 1 0 2 4 C
- M — P-CHERRYWOOD OR PROVINCIAL FINISH, W-WALNUT, M-MAHOGANY, B-BLONDE
- U — If Used, U-UHF/VHF
- 1 — 1-B&W TABLE, 2-COLOR TABLE, 3-B&W OPEN-FACE CONSOLE, 4-COLOR OPEN-FACE CONSOLE, 5-B&W HALF-DOOR CONSOLE, 6-COLOR HALF-DOOR CONSOLE, 7-B&W FULL-DOOR CONSOLE, 8-HI-FI 800-AMPL. & SPKR. ONLY, 8000-Includes AM FM Tuner, 9-B&W COMBINATION, 10-COLOR COMBINATION
- 0 — 1
- 2 — 2
- 4 — CRT SIZE: 7-17", 1-21", 4-24"
- C — RUN

HOTPOINT*

TV MODEL

21 S 405
- 21 — CRT SIZE
- S — COMPANY DESIGNATION
- 405 — ENGINEERING NUMBER
- 5 — CABINET FINISH: 3-PORTABLE, 4-TABLE, 5-CONSOLE, 6-LOWBOY, 8-CONSOLE

MAGNAVOX* EIA Code 232

TV MODEL

CTA 458 AA
- C — T-VHF, U-VHF/UHF CONVERTER, MU-VHF UHF TUNER, R-RADIO
- TA — AMP-AMPLIFIER
- 458 — A-AUDIO OUTPUT STAGE, B-USES AUDIO OUTPUT OF RADIO, E-NO AUDIO OUTPUT, BUT HAS TONE & VOL. CONTROLS, D-SEPARATE AUDIO AMPLIF.
- AA, BA, BB — Different Versions of the Same Chassis

MONTGOMERY WARD*

4 0 4 1
- 4 — 1-PORTABLE TABLE RADIO PORTABLE PHONO; 2-HI-FI RADIO CONSOLES PHONO; 3-TV PRIOR TO 1954; 4-TABLE & PORT. TV; 5-CONSOLE TV
- 0 — STOCK NUMBER
- 4 — STOCK NUMBER
- 1 — IN TV SETS: 0-UHF, 1-UHF/VHF

MOTOROLA EIA Code 185

RADIO MODEL

5 7 C D 2
- 5 — NUMBER OF TUBES
- 7 — WHEN USED, CLOCK RADIO
- C — CABINET FINISH
- D — CABINET FINISH
- 2 — CABINET FINISH

TV CHASSIS

W TS-538 A-01
- W — W, R, V, T, WHEN USED, MECHANICAL DIFFERENCES
- TS — TV SET
- 538 — ENGINEERING NUMBER
- A — A, B, C, etc.-MAJOR ELECTRICAL REVISIONS; Y-UHF TUNER
- 01 — MINOR ELECTRICAL REVISIONS

TV MODEL

YA 21 C 5 B
- YA — If Used, UHF/VHF
- 21 — CRT SIZE
- C — P-PORTABLE, T-TABLE, K-CONSOLE, C-CONSOLETTE
- 5 — CABINET FINISH
- B — CABINET FINISH

OLYMPIC* EIA Code 200

TV MODEL

1 K D 82 B F
- 1 — CRT SIZE: 14-14", 17-17", 1-21", 4-24"
- K — K-COMBINATION, T-TABLE & PORTABLE, C-CONSOLE
- D — CHASSIS
- 82 — ENGINEERING NUMBER
- B — FINISH
- F — F-FM, U-UHF/VHF, FU-FM/UHF

TV MODEL

TA 100
- TA — CABINET TYPE
- 100 — CRT SIZE

PHILCO EIA Code 260

TV CHASSIS

8 L 71 U
- 8 — CRT SIZE: E-14", H-17", L-21", P-24"
- L — YEAR OF PRODUCTION
- 71 — ENGINEERING NUMBER
- U — If Used, UHF/VHF
- CHASSIS TYPE: 2-PORTABLE, 4&5-STANDARD, 7-DELUX, 10-COLOR

TV MODEL

UF 4216 L
- UF — If Used, UHF/VHF
- 4 — YEAR OF PRODUCTION
- 2 — CRT SIZE: 2-14", 3-17", 4-21", 6-24"
- 16 — CRT SIZE
- L — CABINET TYPE

RCA-VICTOR* EIA Code 274

TV MODEL

24-C D-7545 U
- 24 — CRT SIZE
- C — C-If Used, COLOR
- D — D, S or T-GENERAL PRICE RANGE
- 7545 — ENGINEERING NUMBER
- U — If Used, UHF/VHF
- CABINET FINISH

SYLVANIA* EIA Code 312

TV MODEL

21 C 513 M U P
- 21 — CRT SIZE, As Indicated, Except 21" Color is 31
- C — P-PORTABLE, T-TABLE, M-MODULAR TABLE, C-OPEN CONSOLE, D-CONSOLE w/DOORS, R-CONSOLE COMBINATION
- 513 — ENGINEERING NUMBER
- M — CABINET FINISH: A-BEIGE, B-BLONDE, L-BLUE, J-BROWN, C-CHARTREUSE, E-EBONY (Black), D-GRAY, Dk. (Incl. Charcoal), F-GRAY, Lt. (Incl. Fruitwood), G-GREEN, H-IVORY, K-MAPLE, N-MAROON, Q-PINK, R-RED, S-TAN, T-TURQUOISE, W-WALNUT, Z-WHITE, Y-YELLOW, X-GOLD
- U — If Used, UHF/VHF
- P — If Used, POWER TUNING

TV CHASSIS

537 101 233 4048
- 537 — ENGINEERING NUMBER
- 101 — TUNER DESIGNATION CODE
- 233 — ELECTRICAL REVISION CODE
- 4048 — FOR FACTORY INFORMATION

TRAV-LER* EIA Code 320

TV MODEL

721-K-611U
- 7 — YEAR OF PRODUCTION
- 21 — CRT SIZE
- K — CABINET TYPE: K-CONSOLE, LP-COMBINATION, MT-METAL TABLE, T-TABLE, TL-TABLE w/LEGS
- 611 — CABINETRY
- U — UHF/VHF

TV CHASSIS

740-17
- 740 — CHASSIS BLANK; TUNER No. (Prior to 1957 Indicated a Change in Circuitry)
- 17 — YEAR OF PRODUCTION
- 17 — MODIFICATION

TRUETONE*

D1844
- D — D-RADIO OR PHONO, 2D-TV
- 1 — CABINET STYLE: 1-CONSOLE, 2-TABLE, 3-PORTABLE, 4-AUTO RADIO, 5-PHONOGRAPH
- 8 — SELLING YEAR
- 44 — COLOR OR MODEL
- EQUIPMENT MANUFACTURER

WESTINGHOUSE EIA Code 337

TV MODEL

21 K R 190
- 21 — CRT SIZE
- K — K-CONSOLE, T-TABLE OR PORTABLE, C-COMBINATION
- R — R-PROVISIONS FOR REMOTE CONTROL
- 190 — MODEL, COLOR, Etc.

RADIO MODEL

587 P 7
- 587 — MODEL, COLOR, Etc.
- P — TYPE OF RADIO: T-TABLE MODEL, P-PORTABLE, C-CONSOLE, R-PROVISIONS FOR RECORD PLAYER, PR-PORTABLE RECORD PLAYER
- 7 — NUMBER OF TUBES OR TRANSISTORS

ZENITH EIA Code 343

TV MODEL

A 15 10 L
- A — YEAR OF PRODUCTION: Z-1957, A-1958
- 15 — CRT SIZE: 15-14", 18-17", 22 or 23-21", 26-24"
- 10 — TYPE OF CABINET: 10 TO 30-TABLE, 31 and UP-CONSOLE
- L — CABINET COLOR

TV CHASSIS

15 A 25 Q
- 15 — NUMBER OF TUBES
- A — ENGINEERING NUMBER
- 25 — YEAR OF PRODUCTION
- Q — U-UHF/VHF, Q-EQUIPPED w/SPACE COMMAND

RADIO CHASSIS

7 Z 20
- 7 — SPACE COMMAND: 30-w/21", 40-w/24"
- Z — CABINET COLOR OR FINISH
- 20 — CABINET COLOR OR FINISH

* See Text for More Details

* See Text for More Details

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