NOVEMBER 1971 HBJ A HARCOURT BRACE JOVANOVICH PUBLICATION

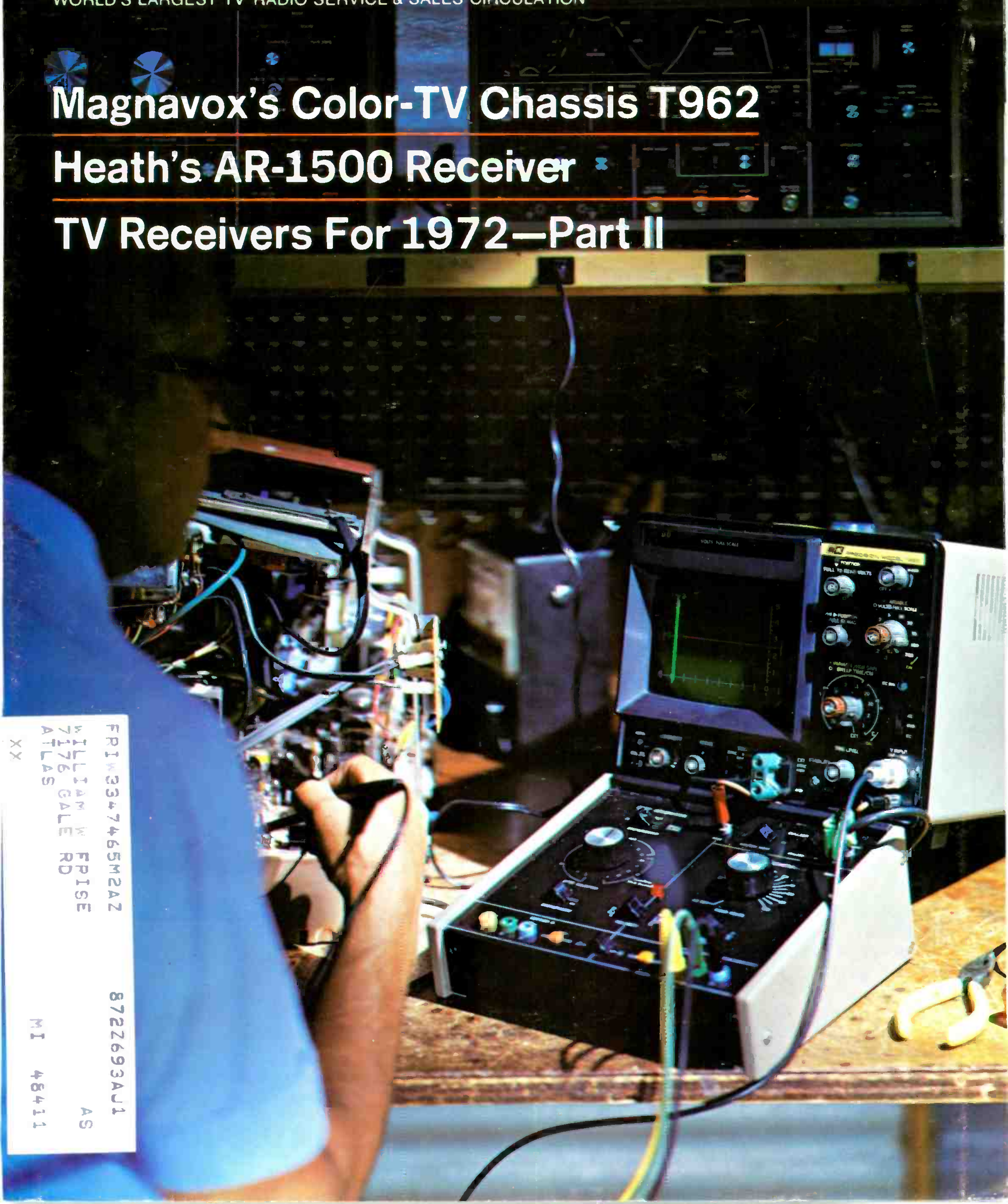
ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

Magnavox's Color-TV Chassis T962

Heath's AR-1500 Receiver

TV Receivers For 1972—Part II



1389

AIRLINE

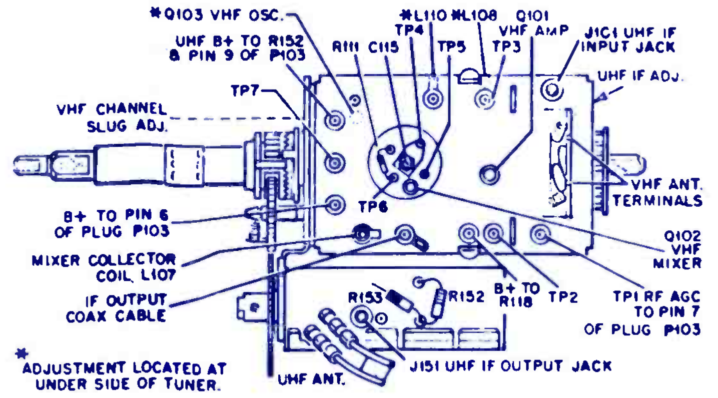
TV Models
GC1-14821A,
41A, 51A

ELECTRONIC TECHNICIAN/DEALER TEKFAX

NOVEMBER • 1971

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL	DESCRIPTION	AIRLINE PART NO.
C503A	250 µf, 165v electrolytic	67A30-14
C503B	250 µf, 150v electrolytic	67A30-14
C503C	20 µf, 150v electrolytic	67A30-14
C503D	100 µf, 50v electrolytic	67A30-14
R342	voltage dependent resistor, 60v, ±15%, 1ma	61A46-6
R444	1M thermistor, 20% cold	61A41-2
R501	5Ω, 5%, 10w	61A20-24
R502	390Ω, 10%, 5w	61A20-94
R503	900Ω, 10%, 10w	61A20-88
R117	1M, volume control (R117 includes S101)	75A44-51
R328	500Ω, contrast control	75A125-18
R329	100K, bright control	75A125-18
R336	1K, RF-AGC delay control	75A101-32
R403	10K, overall AGC control	75A101-18
R419	5M, height control	75A101-16
R425	500K, vert lin control	75A101-17
R430	1.2M, vert hold control	75A1-184
L202	quad coil (includes R208 & C205)	72A132-82
L301	47.25MHz trap coil	72A316-4
L303	44.5MHz IF coil	72A316-12
L305	4.5MHz sound take off coil	72A303-9
L401	horiz lock coil	94A17-19
L502	filter choke	74A18-61
T201	audio output assembly xformer	700A1035-4
T401	vert output xformer	79A100-19
T402	deflection yoke assembly	700A814-8
T403	horiz output assembly xformer	750A647-9
CB503	2.2a circuit breaker	84A17-4
F505	fuse, 1 in. of #30 copper wire	95A3-23
	VHF tuner	94A323-7
	UHF tuner	94A296-16



Top View of VHF Tuner Showing Test Point and Alignment Locations.

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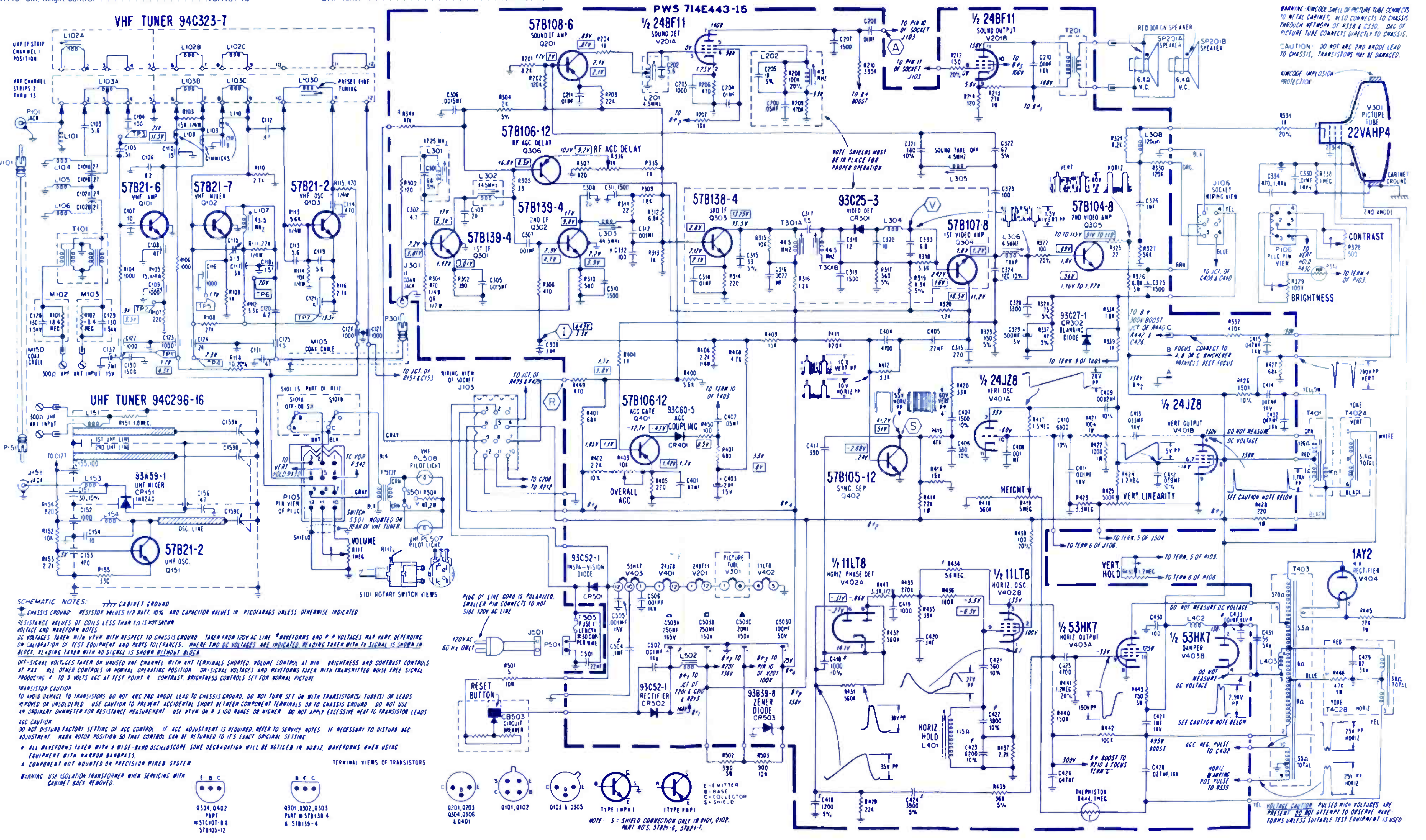


SCHEMATIC NOTES: CABINET GROUND
CHASSIS GROUND RESISTOR VALUES 1/2 WATT, 10% AND CAPACITOR VALUES IN PICOFARADS UNLESS OTHERWISE INDICATED
RESISTANCE VALUES OF COILS LESS THAN 1Ω IS NOT SHOWN
VOLTAGE AND WAVEFORM NOTES
DC VOLTAGES TAKEN WITH VTVM WITH RESPECT TO CHASSIS GROUND TAKEN FROM 120V AC LINE *WAVEFORMS AND P-P VOLTAGES MAY VARY DEPENDING ON CALIBRATION OF TEST EQUIPMENT AND PARTS TOLERANCES. WHERE TWO DC VOLTAGES ARE INDICATED, READING TAKEN WITH TV SIGNAL IS SHOWN IN BLOCK, READING TAKEN WITH NO SIGNAL IS SHOWN WITHOUT BLOCK

OFF-SIGNAL VOLTAGES TAKEN ON UNUSED VHF CHANNEL WITH ANT TERMINALS SHORTED. VOLUME CONTROL AT MIN. BRIGHTNESS AND CONTRAST CONTROLS AT MAX. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION. ON-SIGNAL VOLTAGES AND WAVEFORMS TAKEN WITH TRANSMITTED NOISE FREE SIGNAL PRODUCING 4 TO 5 VOLTS AGC AT TEST POINT R. CONTRAST, BRIGHTNESS CONTROLS SET FOR NORMAL PICTURE

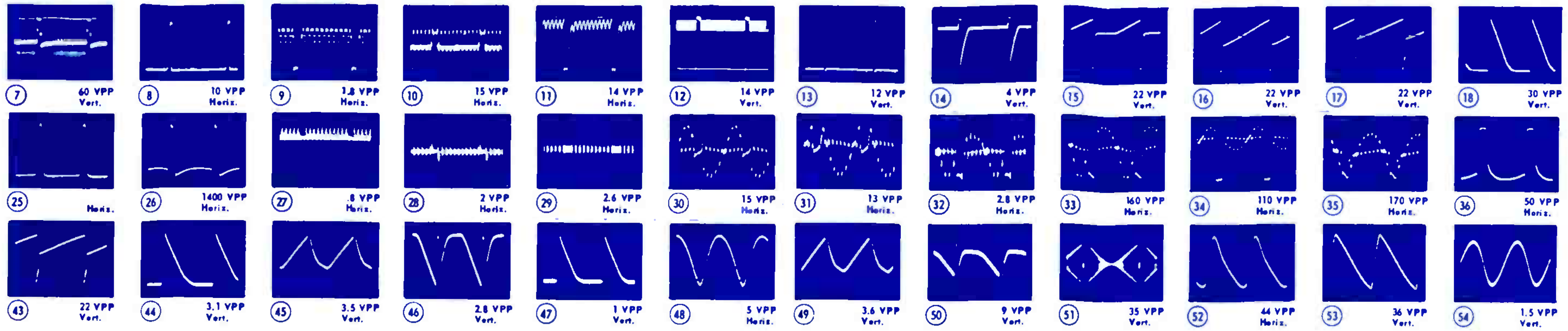
TRANSISTOR CAUTION
TO AVOID DAMAGE TO TRANSISTORS DO NOT ARC 2ND ANODE LEAD TO CHASSIS GROUND. DO NOT TURN SET ON WITH TRANSISTOR(S) TUBE(S) OR LEADS REMOVED OR UNSOLDERED. USE CAUTION TO PREVENT ACCIDENTAL SHORT BETWEEN COMPONENT TERMINALS OR TO CHASSIS GROUND. DO NOT USE AN ORDINARY OHMMETER FOR RESISTANCE MEASUREMENT. USE VTVM ON R X 100 RANGE OR HIGHER. DO NOT APPLY EXCESSIVE HEAT TO TRANSISTOR LEADS

AGC CAUTION
DO NOT DISTURB FACTORY SETTING OF AGC CONTROL. IF AGC ADJUSTMENT IS REQUIRED, REFER TO SERVICE NOTES. IF NECESSARY TO DISTURB AGC ADJUSTMENT, MARK ROTOR POSITION SO THAT CONTROL CAN BE RETURNED TO IT'S EXACT ORIGINAL SETTING

* ALL WAVEFORMS TAKEN WITH A WIDE-BAND OSCILLOSCOPE. SOME DEGRADATION WILL BE NOTICED IN HORIZ. WAVEFORMS WHEN USING EQUIPMENT WITH NARROW BANDPASS.
▲ COMPONENT NOT MOUNTED ON PRECISION WIRED SYSTEM

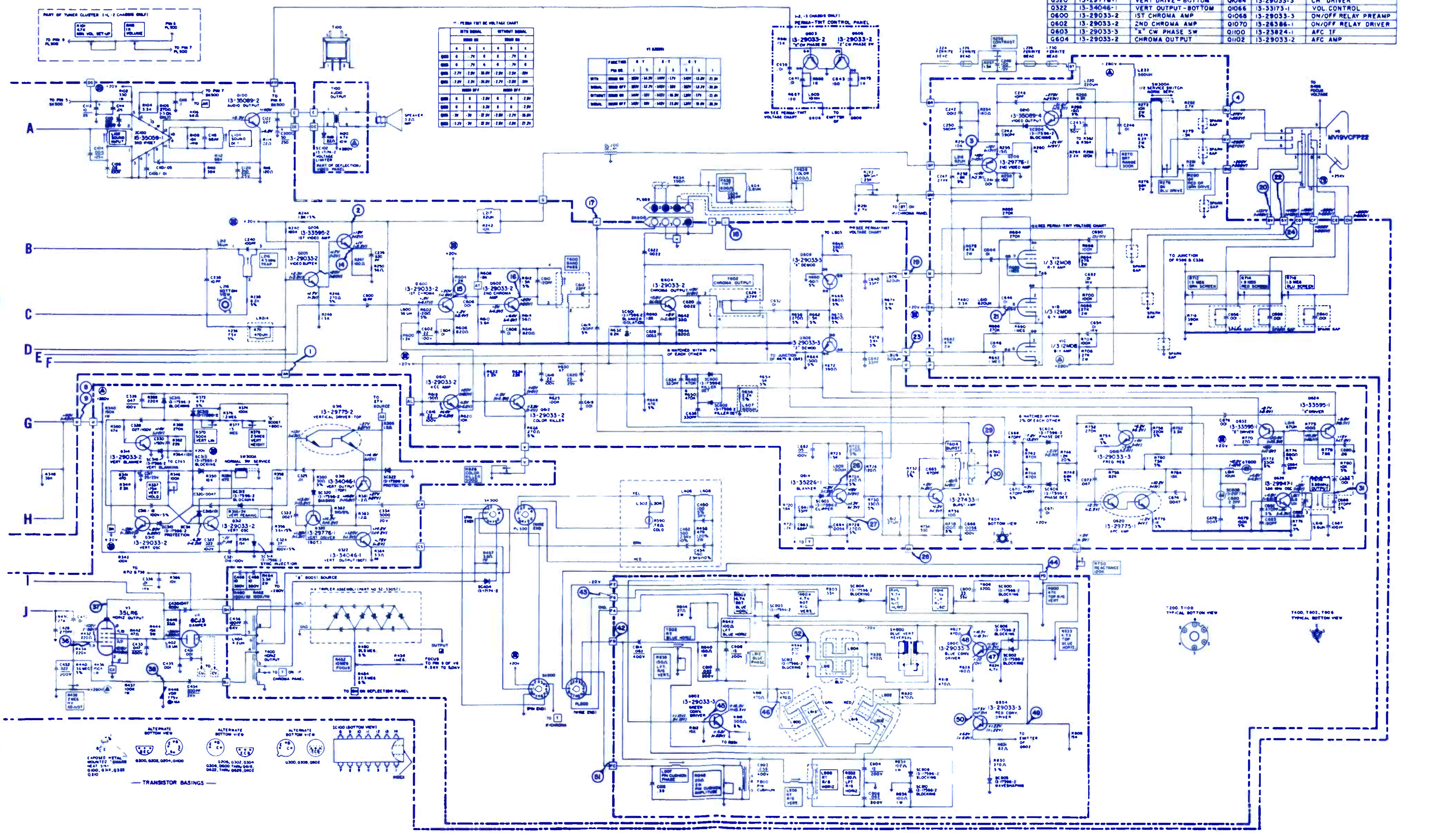
WARNING: USE ISOLATION TRANSFORMER WHEN SERVICING WITH CABINET BACK REMOVED.

SYLVANIA
Color TV Chassis
D19-1, -2, -3



TRANSISTOR FUNCTION CHART

CODING	SYL. PART NO.	DESCRIPTION	CODING	SYL. PART NO.	DESCRIPTION
IC100	15-35089-1	SOUND IF/DETECTOR	Q605	13-29033-3	"Z" CW PHASE SW
Q100	13-35089-2	AUDIO OUTPUT	Q606	13-29033-3	"X" DEMODULATOR
Q200	13-23822-1	1ST PIX IF	Q608	13-29033-3	"Z" DEMODULATOR
Q202	13-23824-1	2ND PIX IF	Q610	13-29033-2	ACC AMP
Q204	13-23824-1	3RD PIX IF	Q612	13-29033-2	COLOR KILLER
Q205	13-29033-2	VIDEO BUFFER	Q614	13-35226-1	BLANKER
Q206	13-33595-2	1ST VIDEO AMP	Q616	13-27433-1	BURST AMP
Q208	13-29776-1	2ND VIDEO AMP	Q618	13-29033-3	FREQ REG
Q210	13-35089-4	VIDEO OUTPUT	Q620	13-29775-1	APC AMP
Q302	13-29033-2	AGC AMP	Q622	13-33595-1	"Z" DRIVER
Q304	13-29033-2	AGC GATE	Q624	13-33595-1	"X" DRIVER
Q306	13-29033-2	NOISE GATE	Q626	13-29947-1	3.58 MHz OSC
Q308	13-27432-1	SYNC. SEP	Q1052	13-29033-3	INPUT BUFFER
Q310	13-29033-2	VERT OSC	Q1054	13-29033-3	1ST AMPLIFIER
Q312	13-29033-2	VERT OSC	Q1056	13-29033-3	2ND AMPLIFIER
Q314	13-29033-2	VERT BLANKER	Q1058	13-33595-2	CLIPPER
Q316	13-29775-2	VERT DRIVER-TOP	Q1060	13-29033-3	VOL. UP DRIVER
Q318	13-34046-1	VERT OUTPUT-TOP	Q1062	13-29033-3	VOL. DOWN DRIVER
Q320	13-29776-1	VERT DRIVE - BOTTOM	Q1064	13-29033-3	CH. DRIVER
Q322	13-34046-1	VERT OUTPUT-BOTTOM	Q1066	13-33173-1	VOL. CONTROL
Q600	13-29033-2	1ST CHROMA AMP	Q1068	13-29033-3	ON/OFF RELAY PREAMP
Q602	13-29033-2	2ND CHROMA AMP	Q1070	13-26386-1	ON/OFF RELAY DRIVER
Q603	13-29033-3	"X" CW PHASE SW	Q1100	13-23824-1	AFC IF
G604	13-29033-2	CHROMA OUTPUT	Q1102	13-29033-2	AFC AMP



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SYLVANIA

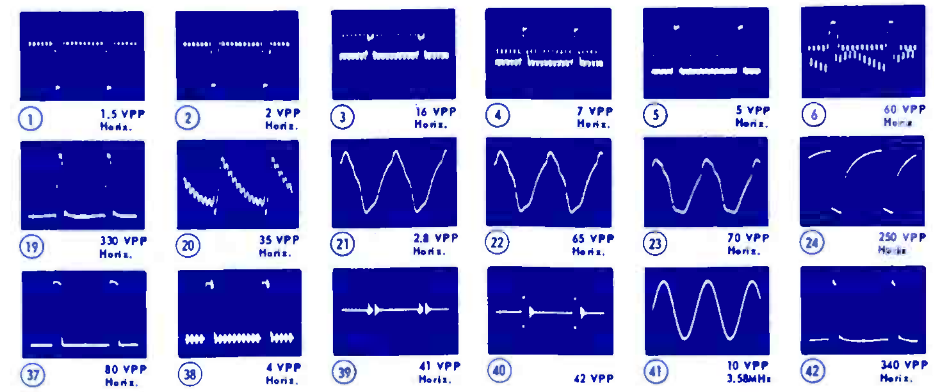
Color TV Chassis
D19-1, -2, -3

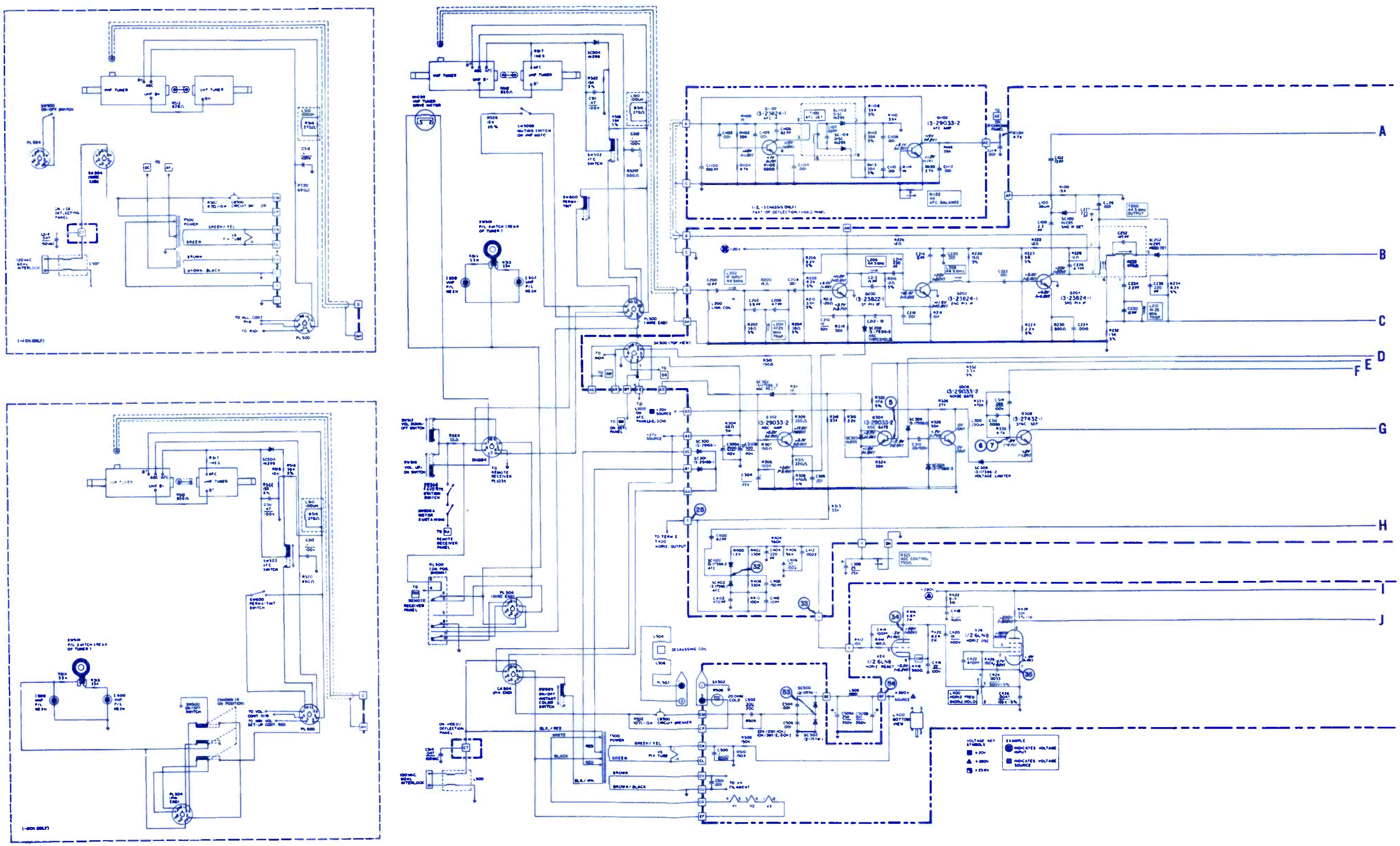
ELECTRONIC TECHNICIAN/DEALER TEKFAX

NOVEMBER • 1971

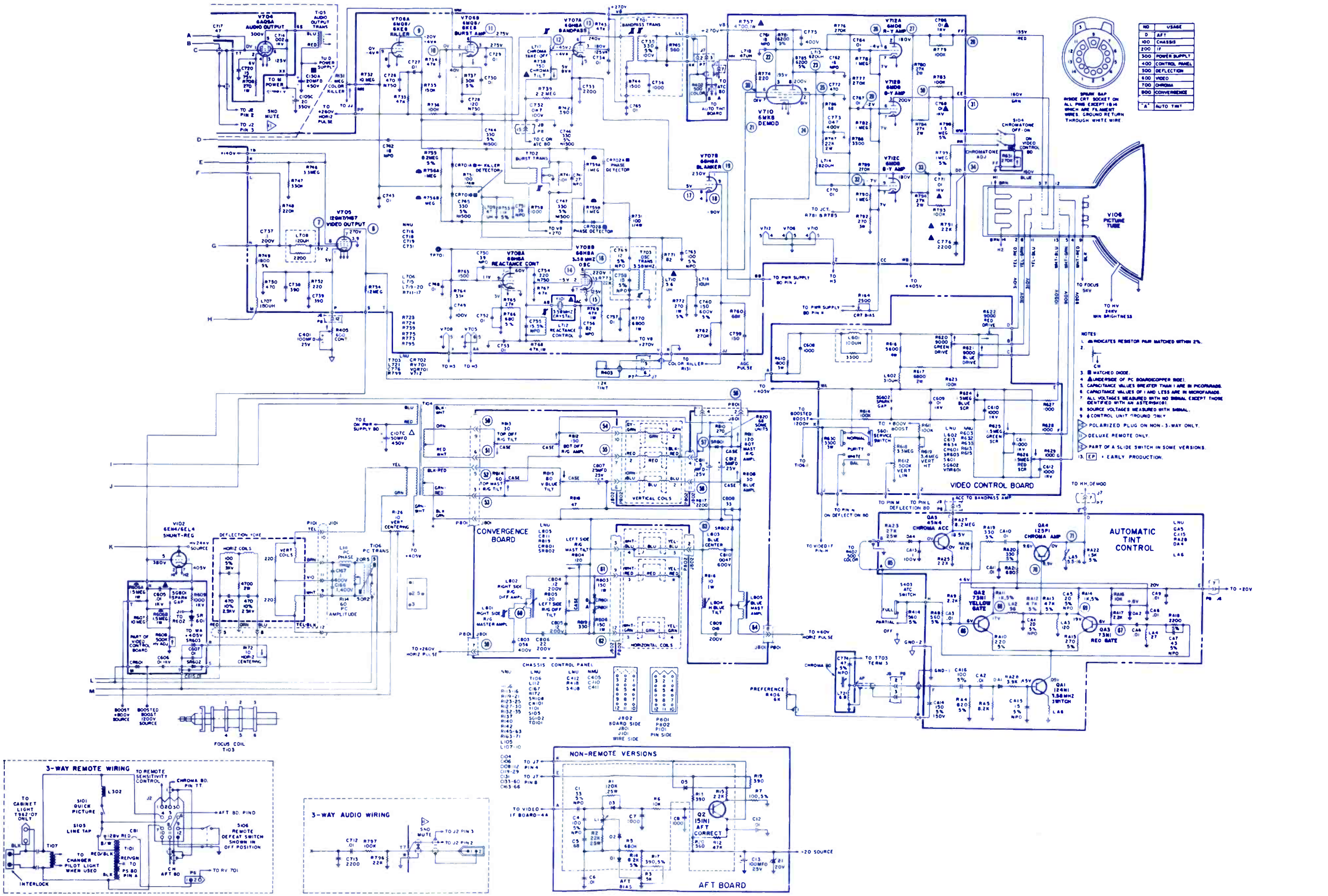
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL — DESCRIPTION	SYLVANIA PART NO.
C300A—2500/40v electrolytic	41-33942-1
C300B—500/40v electrolytic	41-33942-1
C300C—50/250v electrolytic	41-33942-1
C509A—250/350v electrolytic	41-33943-1
C509B—100/350v electrolytic	41-33943-1
R506—20Ω cold thermistor	38-33206-1
L104—sound detector coil	50-33195-1
L400—horiz freq hold coil	50-33955-1
T100—audio output xformer	56-27824-2
T400—horiz output xformer	50-33927-1
T500—power xformer	50-33937-2
T600—bandpass xformer	50-27405-1
T602—chroma output xformer	50-29658-1
T604—burst phase xformer	50-27406-2
T606—3.58MHz output xformer	50-29784-1
T800—pincushion phase xformer	50-33900-1
R118—1K volume control (-1)	37-27243-17
R118—1K volume control (-2)	37-27243-10
R256—1K contrast control	37-29783-14
R262—25K bright control	37-29783-13
R270—300K bright range control	37-29755-9
R323—750Ω AGC control	37-17931-2
R337—100K vert hold control	37-33036-5
R355—2K vert peaking control	37-14576-14
R370—500K vert lin control	37-14576-12
R378—2.5M vert height control	37-33036-5
R438—2M HV adjust control	37-14576-9
R452—10M focus control	37-17320-6
R628—500Ω color killer control	37-33036-5
R636—600Ω color control	37-33097-3
R638—600Ω tint control	37-33097-3
R848—20Ω pincushion amplitude control	37-29831-2
R1122—4.7K AFC balance control	37-33717-3
CB500—circuit breaker	29-33346-5
I500,I502—pilot lamp, NE2H	30-33062-3
HV tripler	32-33057-3
defleciton yoke	51-33657-2





MAGNAVOX
Color TV Chassis
T962 Series



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MAGNAVOX
Color TV Chassis
T962 Series

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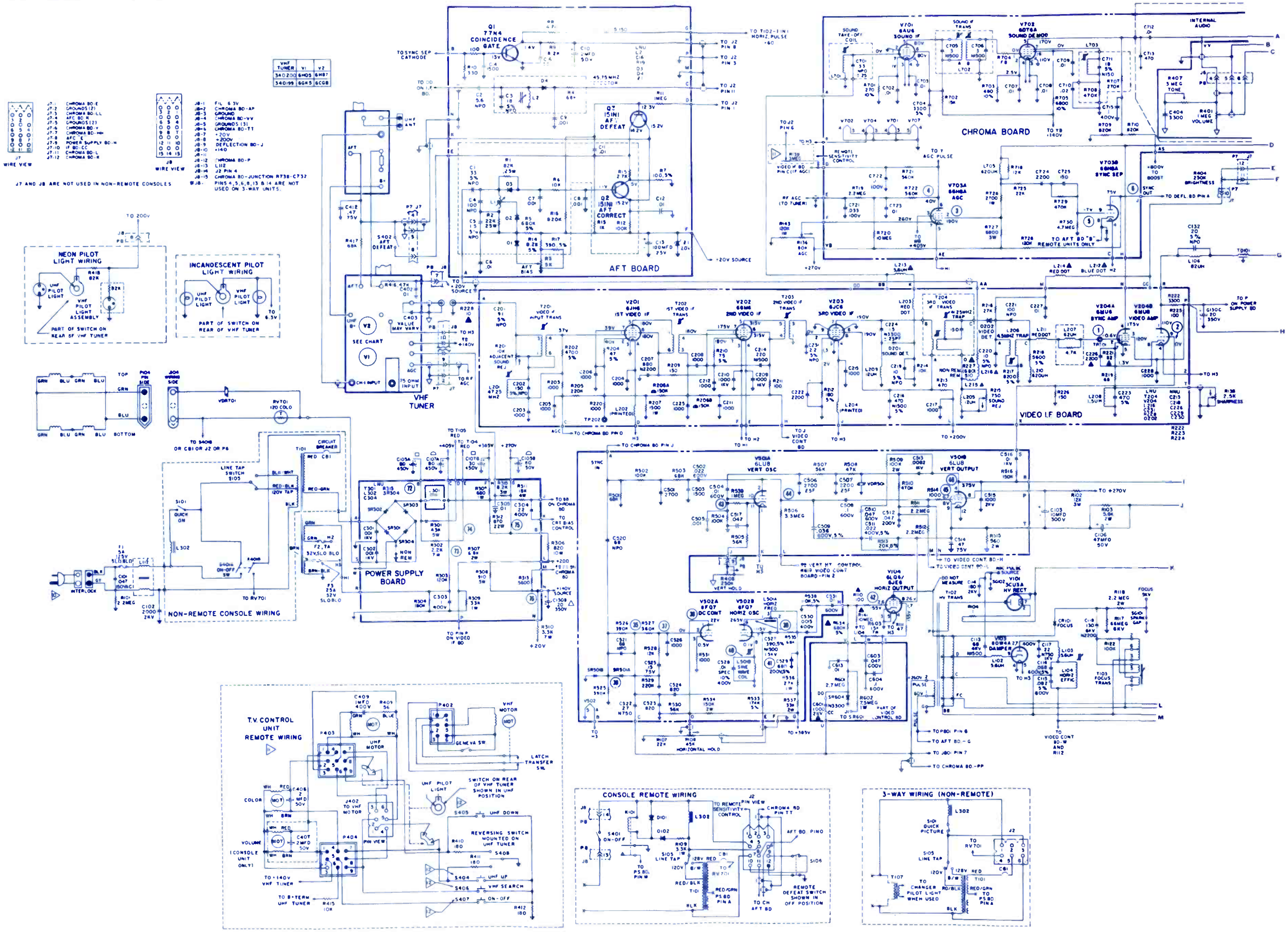
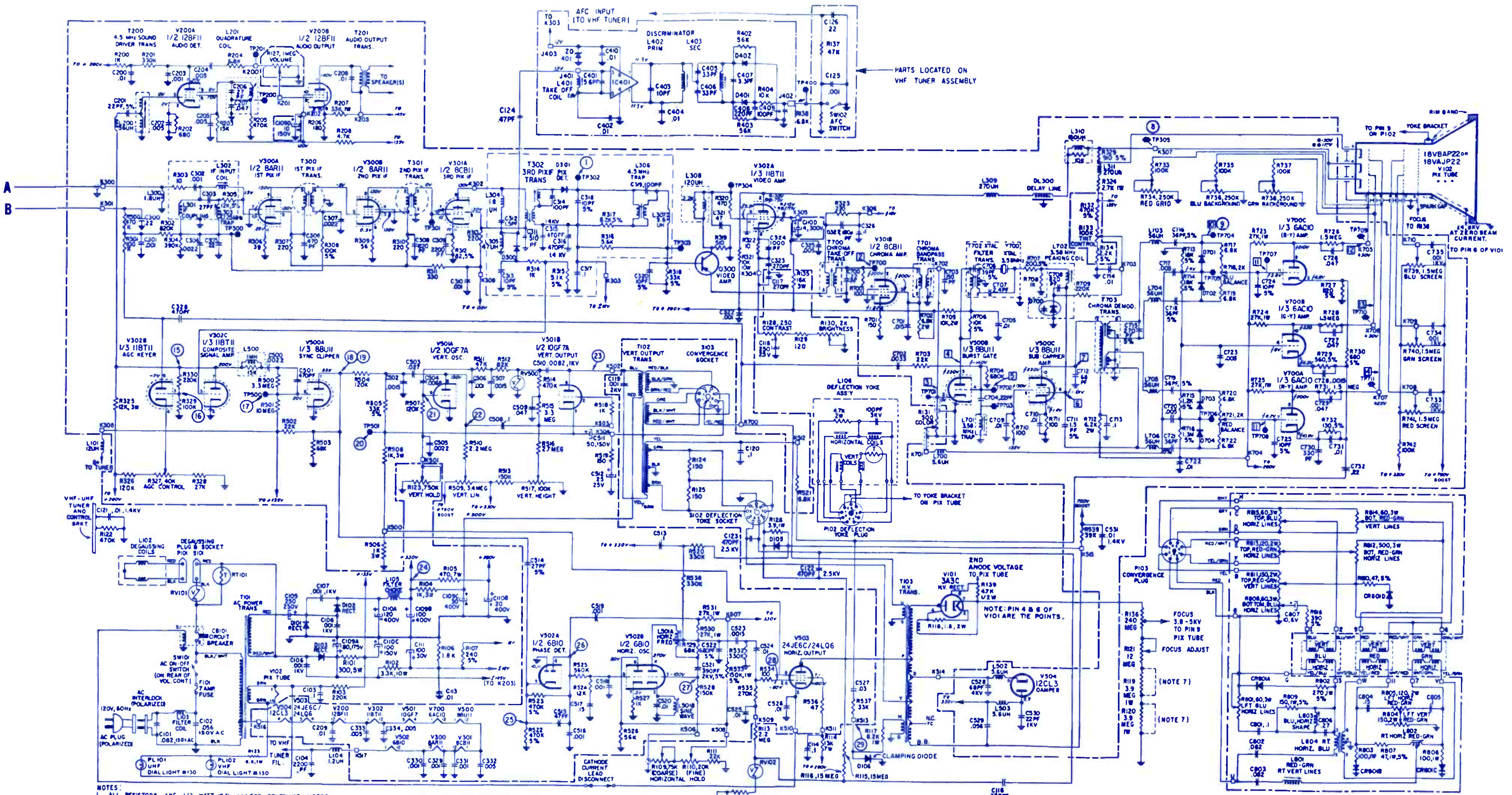
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS



SYMBOL DESCRIPTION	ADMIRAL PART NO.
R109—75K horiz control, coarse	75A156-1
R110—20K horiz control, fine	75A156-1
R123—750K vert control	75A156-1
R121—12M focus adj control	75A157-14
R127—1M on/off volume control	75A152-1
R128—250Ω contrast control	75A158-1
R130—2K bright control	75A158-1
R131—500Ω color control	75A149-7
R133—100K tint control	75A149-6
R136—240M focus bleeder	61A63-1
R327—40K AGC control	75A155-6
R736—250K blue background control	75A155-6
R738—250K green background control	75A155-6
R509—3.4M vert lin control	75A155-5
R517—100K vert height control	75A155-5
R734—250K red background control	75A155-5
C109A—80 μf/175v electrolytic	67A76-1
C109B—100 μf/400v electrolytic	67A76-1
C109C—30 μf/400v electrolytic	67A76-1
C109D—10 μf/150v electrolytic	67A76-1
C110A—120 μf/400v electrolytic	67A75-1
C110B—20μf/400v electrolytic	67A75-1
C110C—100 μf/150v electrolytic	67A75-1
C110D—4 μf/400v electrolytic	67A75-1
IC401—integrated circuit	56A1-1
DL300—delay line coil	72A372-1
L106—deflection yoke	94A405-1
L201—quad coil	72A366-1
L303—47.25 MHz trap coil	72A359-3
L306—4.5MHz trap coil	72A367-1
L501A,B—horiz freq/sine wave coil	72A373-1
L701—3.58MHz trap coil	72A363-1
L702—3.58MHz peaking coil	72A364-1
T101—power xformer	80A113-2
T102—vert output xformer	79A153-1
T103—HV xformer	79A154-1
T200—4.5MHz sound driver xformer	72A361-1
T201—audio output xformer	79A151-1
T700—chroma take-off xformer	72A368-1
T701—chroma bandpass xformer	72A358-1
T703—chroma demodulator xformer	72A357-1
CB101—circuit breaker	84A31-1
F101—7a fuse	84A30-1

ADMIRAL
Color TV Chassis
930 Series



NOTES:
1. ALL RESISTORS ARE 1/2 WATT, 10%, UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE IN MFD, UNLESS OTHERWISE NOTED.
3. CAUTION: USE ISOLATION TRANS WHEN WORKING ON CHASSIS.
4. DC VOLTAGES MEASURED WITH "VTVM" PLACED BETWEEN POINTS INDICATED & CHASSIS GRN, WITH NORMAL SIGNAL INPUT.

(*) INDICATES VOLTAGE READING TAKEN WITH BRIGHTNESS CONT AT MAXIMUM ROTATION (FULL CW).

(*)(*) INDICATES VOLTAGE READINGS TAKEN WITH BRIGHTNESS CONT AT MINIMUM ROTATION (FULL CCW).

† INDICATES VOLTAGE READING TAKEN WITH COLOR SIGNAL.

5. WAVEFORMS ARE TAKEN WITH NORMAL SIGNAL INPUT.
6. LINE VOLTAGE INPUT SET AT 120VAC

# INDICATES THESE VOLTAGES WILL VARY WITH VIDEO CONTENT OF THE PICTURE BEING RECEIVED AND ARE AVERAGE READINGS.

(O) INDICATES THESE VOLTAGES WILL VARY WITH BACKGROUND CONTROL SETTINGS.

7. JUMPER REMOVED AT FACTORY IF NECESSARY TO SET FOCUS CONTROL RANGE.
8. (/) INDICATES THE VOLTAGE WILL VARY WITH FINE TUNING SETTING FROM 0V TO ± 3V.

NUMBERS IN CIRCLES OR SQUARES IDENTIFY WAVEFORM OBSERVATION LOCATIONS. CONDITIONS FOR TAKING WAVEFORM MEASUREMENTS ARE GIVEN WITH WAVEFORM PHOTOGRAPHS.

CHASSIS GROUND.

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ADMIRAL
Color TV Chassis
930 Series

ELECTRONIC TECHNICIAN/DEALER TEKFAX
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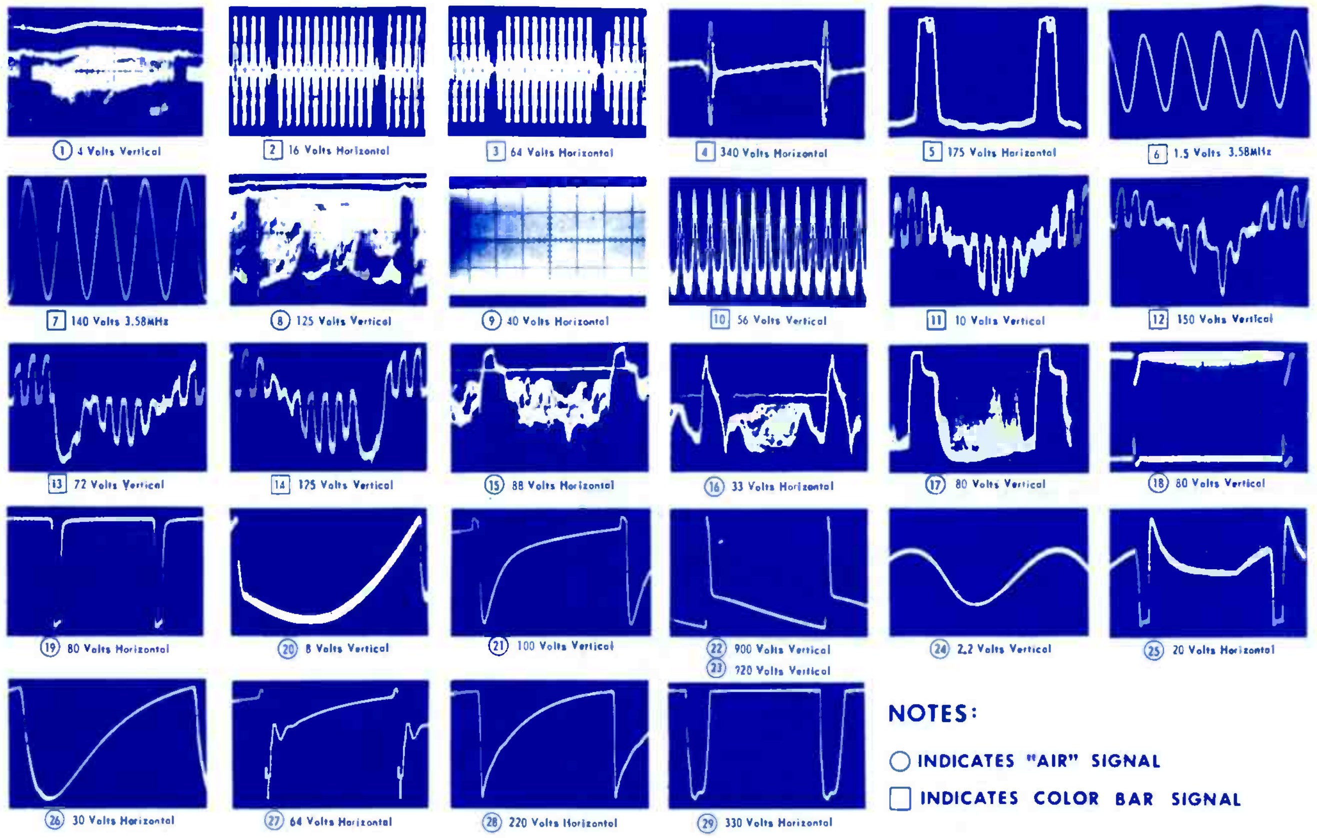
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

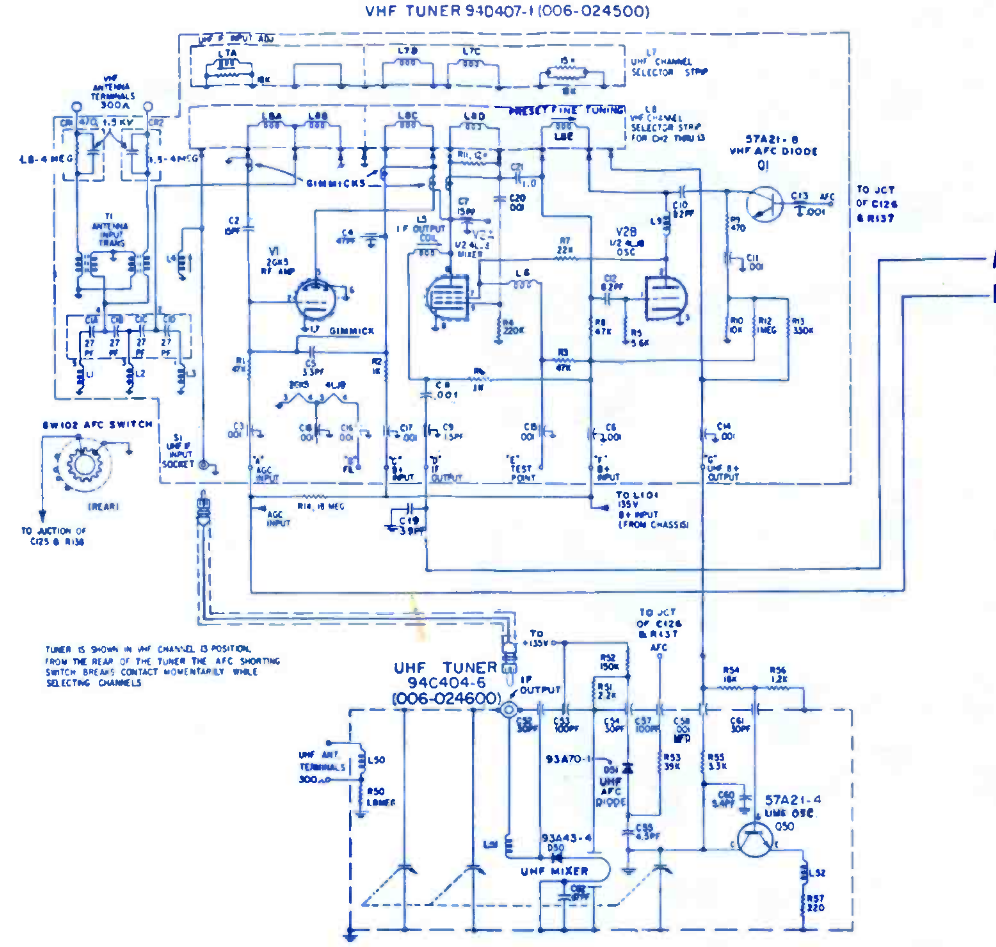
MODEL CHART				
MODEL	COLOR	SIZE	TUNER	CHASSIS
8T391C	Walnut	*18"	94A407-1 VHF 94A404-6 UHF	930-000030
8T760	Black		94A416-1VHF 94A402-1 UHF	930-000060
8T771C	Walnut			

*Picture diagonal measurement.

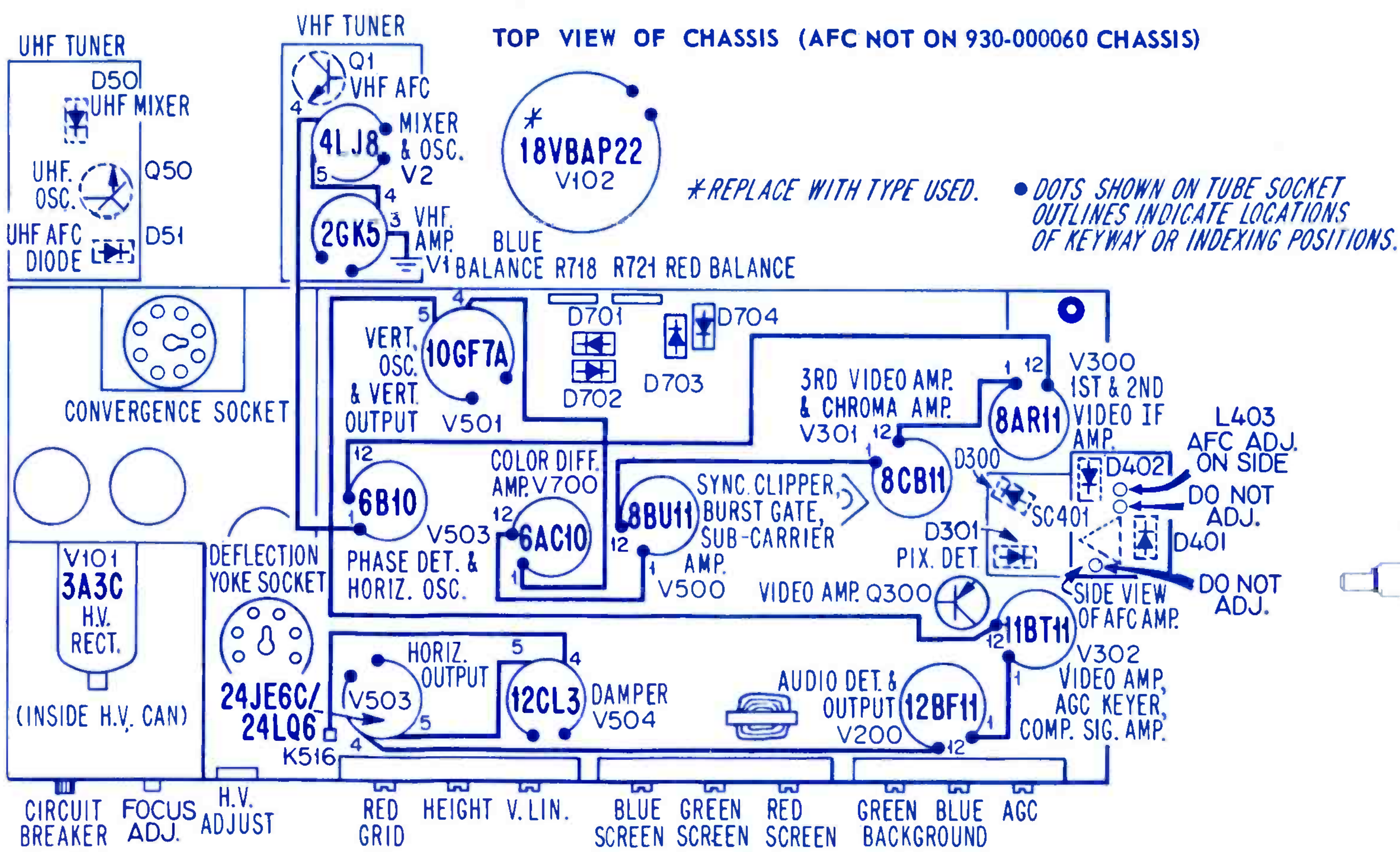


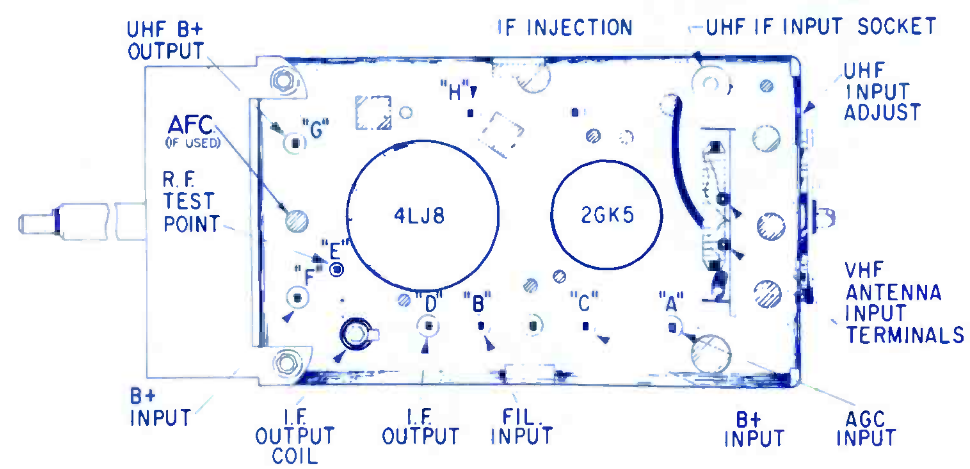
NOTES:
○ INDICATES "AIR" SIGNAL
□ INDICATES COLOR BAR SIGNAL

VHF TUNER 940407-1 (006-024500)



TOP VIEW OF CHASSIS (AFC NOT ON 930-000060 CHASSIS)





TOP VIEW OF 94A407-1 & 94A416-1 VHF TUNERS

ELECTRONIC TECHNICIAN/DEALER

TEKFAX

COMPLETE MANUFACTURER S' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

GROUP 231

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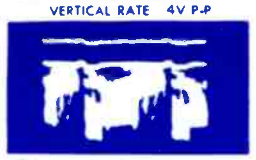
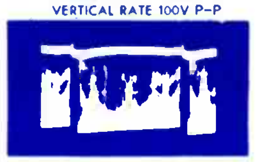
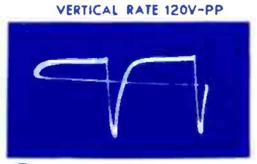
1385 RCA SALES CORP.

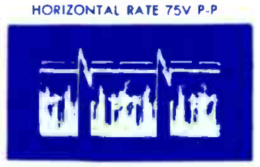
TV Chassis KCS172 Series

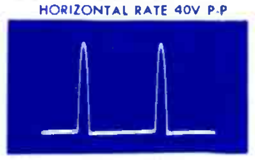

TP-3 SECOND DETECTOR VERTICAL RATE 4V P-P


V205 PIN 9 VIDEO OUTPUT PLATE VERTICAL RATE 100V P-P


C246 & C235 JUNCTION INPUT V201B VERTICAL RATE 120V-PP

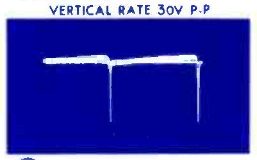

V201 PIN 1 SYNC PLATE HORIZONTAL RATE 75V P-P

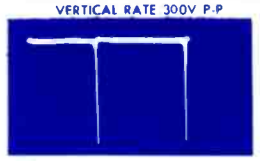

V205 PIN 2 AGC GRID HORIZONTAL RATE 40V P-P

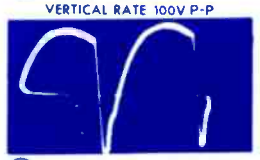

V205A PIN 3 AGC PLATE HORIZONTAL RATE 900V P-P

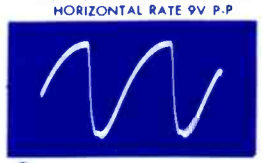

V206 PIN 9 VERTICAL OSCILLATOR GRID VERTICAL RATE 200V P-P

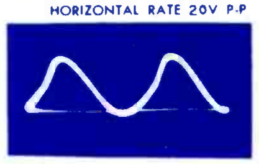

V206 PIN 2 VERTICAL OUTPUT GRID VERTICAL RATE 30V P-P

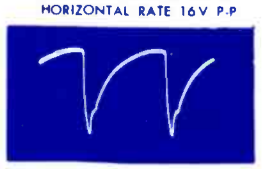

PW-200, TERMINAL "L" VERTICAL OUTPUT TRANSFORMER VERTICAL RATE 300V P-P

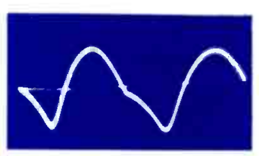

V105 PIN 2 PICTURE TUBE GRID VERTICAL RATE 100V P-P

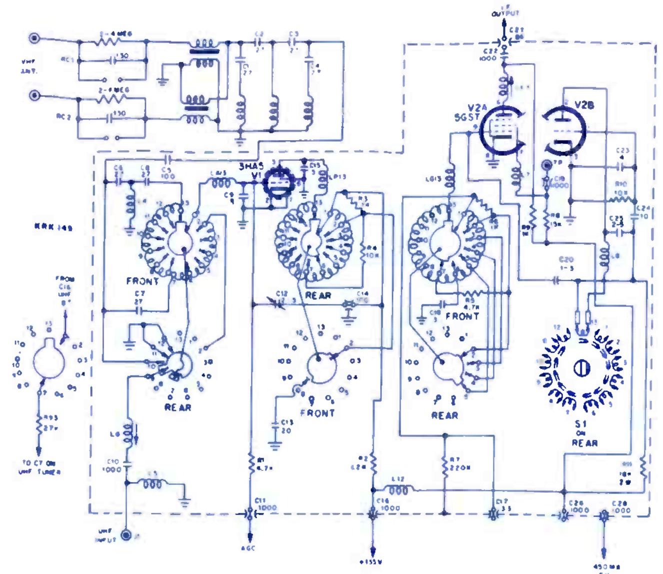

SR201 CATHODE JUNCTION HORIZONTAL PHASE DETECTOR HORIZONTAL RATE 9V P-P


SR201 ANODE HORIZONTAL PHASE DETECTOR HORIZONTAL RATE 20V P-P

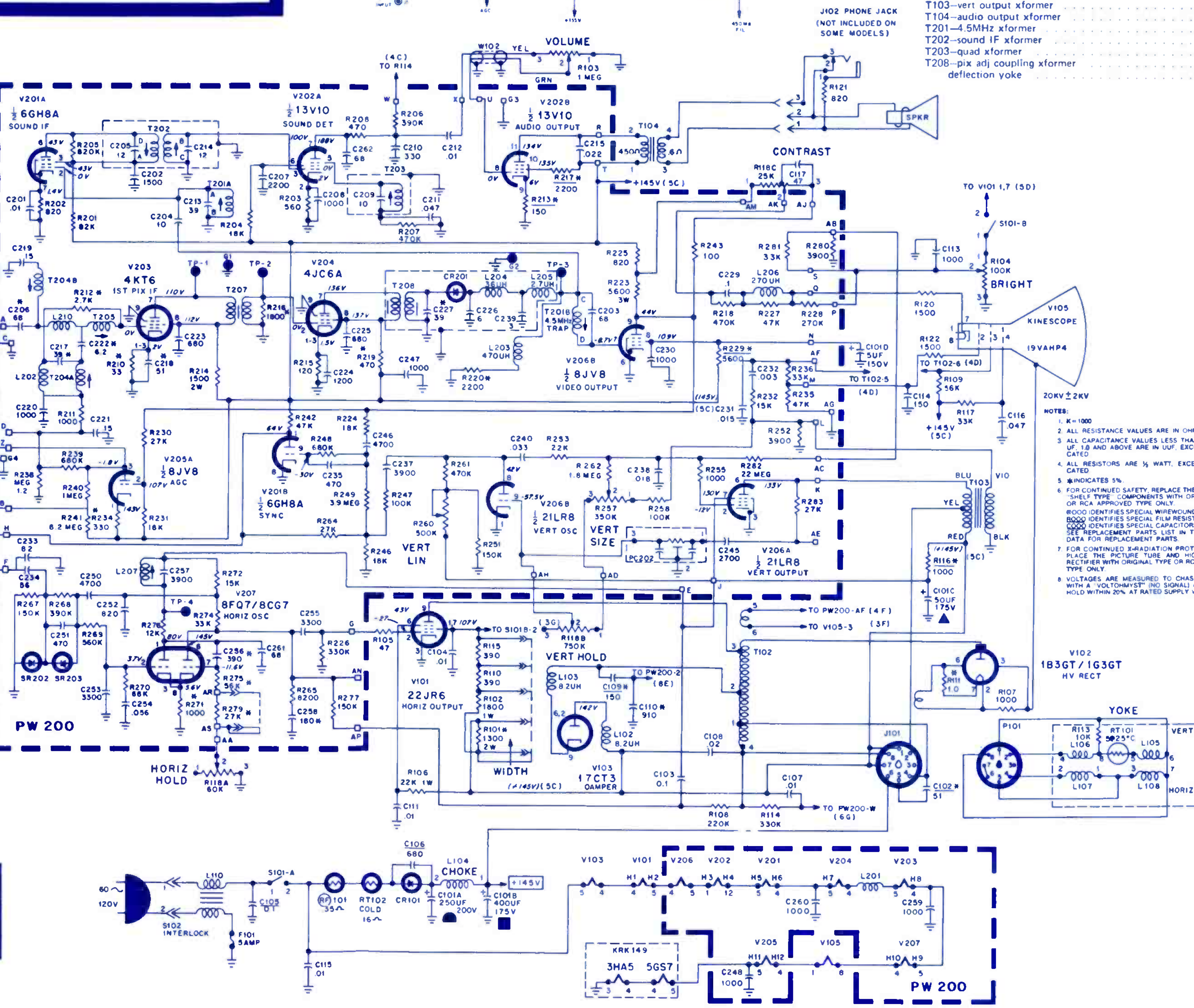

TP-4 HORIZONTAL SINE WAVE HORIZONTAL RATE 16V P-P


V101 PIN 2 HORIZONTAL OUTPUT GRID HORIZONTAL RATE 150V P-P


PW-200 TERMINAL "T" 145V B+ RIPPLE VERTICAL RATE 3V P-P



SYMBOL	DESCRIPTION	RCA PART NO.
C101A	250 μf, 200v electrolytic	114845
C101B	400 μf, 175v electrolytic	114845
C101C	50 μf, 175v electrolytic	114845
C101D	5 μf, 150v electrolytic	114845
C258	180pf 5%, 500v mica	330186
CR201	video det diode	112524
F101	5a, 250v fuse	118969
L102	8.2 μh coil	107385
L110	line choke	114293
L202	AGC	114315
L205	2.7 μh coil	107466
L206	270 μh coil	115427
L207	stabilizer coil	114486
PC202	circuit-R/C comb	114916
PW200	circuit-printed video, defl	133341
R118	contrast, vert, horiz hold control	130871
R257	vert size control	121223
R260	vert lin control	121944
RF101	0.35Ω fuse resistor	124263
RT102	16Ω cold thermistor	114480
T102	horiz output xformer	131972
T103	vert output xformer	124274
T104	audio output xformer	124275
T201	4.5MHz xformer	114489
T202	sound IF xformer	118411
T203	quad xformer	118410
T208	pix adj coupling xformer	133170
	deflection yoke	133338



NOTES:

1. K = 1000
2. ALL RESISTANCE VALUES ARE IN OHMS
3. ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN UF, 1.0 AND ABOVE ARE IN UUF, EXCEPT AS INDICATED
4. ALL RESISTORS ARE ½ WATT, EXCEPT AS INDICATED
5. ★ INDICATES 5%.
6. FOR CONTINUED SAFETY, REPLACE THE FOLLOWING "SHELF TYPE" COMPONENTS WITH ORIGINAL TYPE OR RCA APPROVED TYPE ONLY.
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   R000 IDENTIFIES SPECIAL FILM RESISTORS
   C000 IDENTIFIES SPECIAL CAPACITORS
   SEE REPLACEMENT PARTS LIST IN THIS SERVICE DATA FOR REPLACEMENT PARTS.
7. FOR CONTINUED X-RADIATION PROTECTION, REPLACE THE PICTURE TUBE AND HIGH VOLTAGE RECTIFIER WITH ORIGINAL TYPE OR RCA APPROVED TYPE ONLY.
8. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHMYST" (NO SIGNAL) AND SHOULD HOLD WITHIN 20% AT RATED SUPPLY VOLTAGE

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NOVEMBER 1971 • VOLUME 93 NUMBER 11

This month's cover photo, courtesy of Dynascan Corp., shows the Cali Brain feature of their new B & K scope. The CRT trace is positioned alongside the correct graticale scale, the exact value of the full-scale voltage being displayed on a digital readout directly above it.

FEATURES

A HARCOURT BRACE JOVANOVICH PUBLICATION

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GENERAL ELECTRIC

288-37

EDITORIAL

Those Are Fighting Words!

Recently the NEW YORK TIMES printed an article that thoroughly disgusted us and which in our opinion reflected the type of irresponsible consumerism that is infecting segments of our society.

The author, Grace Lichtenstein, began her article by asking her readers if they feel that they have been gypped by a TV repairman. She then answered her own question by saying that just about anyone owning a TV set requiring maintenance would say yes. At least according to state and local consumer officials at a New York State joint legislative committee hearing.

The author continues by quoting Harry Smith, the Queens' assistant district attorney, as saying that such a negative reply does not refer to an "occasional bad apple." He and other speakers reportedly said that TV repairmen are too often either incompetent or crooks. He claimed that you, our readers, are guilty of charging outrageous prices for service procedures that actually ruin rather than repair TV sets.

This the NEW YORK TIMES indicated was part of testimony in support of a bill sponsored by Joseph Kunzeman, a state assemblyman, which would require that all electronic repair shops be registered with the state. According to the reported conditions of that bill, a service dealer found guilty of gross negligence, fraud or deception in his work would be fined up to $500 and would lose his license to operate in that state.

Near the end of the article, the author reports that there was no one representing our industry at the hearing. She quotes Mr. Kunzeman as having said that we apparently have no organized association to represent us except for those organized by major TV-set manufacturers, and they were not asked to appear.

In the September issue, I quoted Morris Finneburgh, Sr., EHF, as saying that we are guilty of cowing to criticism. Electronic technicians and dealers worth their salt should by now be so steamed up as a result of such unreasonable criticism that before going to bed tonight they fill their pens with red ink and place their signatures to fiery little notes to the NEW YORK TIMES and their government representatives!

There is no need to stand for such ridicule. There are already such reputable associations as NARDA, NATESA and the NEA, which are working hard to defend you against such irresponsible accusations. And without your help, they must alone face the difficult task of defending **you** against equally irresponsible laws.

We must certainly acknowledge that there are people who call themselves electronic technicians but aren't . . . that there are people who falsely represent our profession.

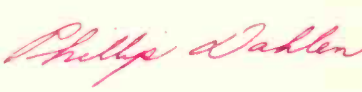
We have too frequently encountered electronic technicians and dealers that are repulsed with the idea of becoming affiliated with a national trade association. Some get the false notion that such organizations represent a creeping unionization of our industry. Yet, NARDA, NATESA and the NEA are organizations formed by shop owners involved in servicing—unions are for labor not management. Membership to the ISCET (described in this and the two previous issues) consists primarily of qualified electronic technicians (all are qualified, but not all are employed as technicians). It was formed as an arm of the NEA. Now I ask you, what shop owner is going to unionize his employees? (And then too, making negative generalizations concerning all unions is just as irresponsible as making negative generalizations concerning all electronic technicians and service dealers.)

These are trade associations that have been formed to represent you. Apparently the New York State assemblyman, that feels he knows our industry well enough to call it corrupt, isn't even aware of our trade associations, their high ethical standards and their work to promote high technical standards.

I know that Frank Moch of NATESA is going to do his part in setting this assemblyman straight, for he has already begun correspondence for that purpose. I am certain that the same is also true for John Gooley of NARDA, Dick Glass of NEA and Ron Crow of ISCET.

My position is well known. The vast majority of our readers are capable, honest, hard-working professionals! If they tend to be guilty of anything, its their failure to charge enough to be fair—fair to themselves.

Are you going to sit back and watch these associations attempt to win the fight alone? Or are you going to roll up your sleeves and join them in the battle? Your livelihood may depend on it!



LETTERS

Reader comments concerning past feature articles, Editor's Memos, previous reader responses or other subjects of interest to the industry.

Voluntary Self-Regulation

In the September issue of ELECTRONIC TECHNICIAN/DEALER you ran an article concerning voluntary self-regulation. As the owner of my own company, I have the following to say:

I have been in the TV service business since 16 years of age—about 22 years ago. I never went to school to learn how to repair sets, and yet I can fix almost every complaint that I have seen to date. I may not be able to answer the technical questions that you may ask me, but put the set in front of me and I will repair it.

I think you people are trying to find a new way for the union to come into the electronics repair field—just as the electricians have done.

I have a one-man shop, and I live in a very small town that has a population of 9000 people. I know that I have a very good reputation in my area.

The TV-set manufacturers are saying that, "any serviceman can come into your home and just replace a board." However, I say that they are making it harder for us to repair because you need the right board for the right set. But if we just have to replace a board, we don't really have to know as much now as we did with the tube sets.

You agitators who are trying to get us licensed are only doing it to make it harder for the newcomers to come into the repair line—and I feel that we are in dire need of such men. Men are getting out of our field. And you know ### well that people can always find ways to bellyache about any serviceman in any line.

All that I can see is that you will be giving a person a license to steal, but the public will not be protected. If a person has a legitimate complaint, there are ways that he can protect himself in court—free of charge. I have seen this done.

A company can only cheat so much, then the word gets around and he is out of business. You can't be dishonest and stay in business long—the people are not stupid.

From what I see with CET, you just want to make a bundle of loot from the dues and eventually it will cost the repairman a small fortune to stay with the group.

Joseph Dianella

We are very pleased to hear that your one-man shop is a successful business. However, please note this month's Editor's Memo and the report of what the government plans to do in your neighboring state of New York. Who will protect you from just as unreasonable legislation in New Jersey or elsewhere in the country. And if reasonable licensing legislation is passed in your state, as a result of consumer demands, who will assist you in preparing for the tests?

The members of these various trade associations are electronic technicians and dealers interested in helping each other develop better technical and business skills—men of high moral character, proud of their profession. Ed.

Technicians Must Eat Too

I have been in this industry for about nine years and am as competent as any shop owner that has been in it for 10 to 15 years! And I am writing to say something about whose fault it is that our industry suffers so many ills and ugly reputations! My opinions are mainly drawn from the efforts that I have made in my area of the state [Washington]. At this time I wish to restrict myself to the subject of the working electronic technician in relation to the shop owners.

First, let us consider the old crutch that bosses use when wages are discussed. For instance, the technician doesn't produce, so how can he expect a decent and/or comparable wage (comparable to other trade journeymen)? Well, you needn't be a CPA to realize that the technician cannot produce if your rates vs. overhead aren't productive.

If the shop owner decides that the technicians should do warranty work at reduced rates and handle and process parts with no profit, that is his business. Or is it? If the shop owner does not have the confidence or business sense to charge for repeat work of varying natures after the warranty, that's his business. If the shop owner performs what is termed cheap customer service as his moral obligation and then really sticks it to them when the color-TV set comes in, that's his business. So you see, there are a few reasons why a technician cannot produce—and few of them are the technician's fault.

If you have a technician that is stupid and cannot produce, then you are not much of a businessman to keep him! If the technician is, as some believe most are, "soft-spoken, shy, underachievers," then why don't you offer him some incentive and reward for improving? As it stands today, a

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Sprague gives you 2,442 exact replacement capacitors to choose from... so why fool around with makeshifts?

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LETTERS . . .

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technician is told, or forced, to leave our profession for better wages. One technician in this area—who was not a soft-spoken, shy, underachiever—was forced out primarily because he tried to get a decent wage. He was fired without notice from a "reputable" shop because he and I refused to work Saturdays without receiving time and a half.

A point of interest arose locally when it was learned that a technician had been with another established firm for 10 years, held a CES, and was putting in 48 hours a week at $3.00 per hour . . . $1.00 per hour less than other technicians in this area. Oh, yes . . . he also put in 20 hours a week in part-time work.

This being an area of high pay, high respect and high prestige, I felt that the situation should be rectified. I took the information to a working technicians' group to gain some support. We located a job for this man at standard wages for this area. He then gave his notice to his present employer and two days later was given the pay raise and working conditions that he should have had five years ago. But, for having failed to do so back then, this man has donated almost $10,000 to his employer and customers!

Another point of interest. After two of these technician group meetings, 11 to 12 shop owners called an impromptu (and not an association) meeting themselves. (More shop owners showed up for this meeting than attend the monthly association meetings.) As I have been, and am, promoting the CES program for technicians, I was interested in learning that these shop owners all agreed that the CES meant nothing to them. They also agreed that they would not accept the union (IBEW) as a means of upgrading wages in this area.

I have only touched on the fair-play attitude that some shop owners extend towards the working technician. I realize that as long as the technician accepts his low wages, stays buddy-buddy with the boss, minds his own business and keeps his mouth shut, everything is supposedly hunky-dory. During which time his wife must work to supplement his wages, his children must do without, and he does without. He probably works part time in electronic servicing and patiently waits for things to improve.

I have been waiting for three years and am learning that no one is going to help me if I don't help myself. The independent shop owner is more worried about his family than he is mine—so every two-bits off my salary is two-bits in his.

This letter would not have even been written if the industry wasn't always crying for more competent technicians. Just how does the industry expect to woo any intelligent young technician into this profession if there is not the basic inducement—a fair day's pay? Or imagine a young *intelligent* applicant roaming into a hole in the wall looking for a future. That is what most shops are . . . dumpy, dirty, cheap messes, operated by a hobbyist and usually his wife.

Until respect is exchanged between the shop owner and technician, very little will be gained in this industry. No shop owner is going to make it without the working technician.

I would appreciate any and all correspondence in rebuttal, approval or disapproval concerning wages and wages alone! I am not interested, at this time, in solving the shop owners' business problems.

Tony Cizerle CES/CET

Having done a great deal of traveling across the country, I would be the last to agree that the average service dealer operates in a dumpy, dirty shop. However, I will acknowledge that there is a shortage of qualified

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NEWS OF THE INDUSTRY

National Service Conference Passes Important Resolutions

In the October issue of Electronic Technician/Dealer we reported on many of the activities at the National Electronics Service Conference in Hot Springs, Ark. on August 26, 1971. However, printing schedules were such that it was not then possible to include the formalized resolutions. They are as follows:

Standardization of in-warranty parts and labor forms

Resolution: We resolve that there should be *one form* for both labor and parts, standardized by physical size. [The form should be] colored where each color represents its separate function. [Questions should be arranged in such a sequence that there would be] uniform placement of information on the form, with a minimum amount of information called for, as required by the manufacturer.

The committee further recommended that the resolution be officially sent to the Electronic Industries Assn. for recommendation to the member firms.

Determining fair rates for in-warranty product service

It was recommended that service dealers should suggest that the manufacturers pay the "going rates" for each warranty-work job charged by that dealer. The manufacturer should pay for unavoidable "nuisance" calls at the regular rate. B/W-TV calls should have the same rates as color-TV calls. The manufacturer should do some policing of the "in-board" service programs through its distributors. The trade associations' membership should push harder to get dealers to management meetings and training schools to teach them how to scientifically compute their service rates.

Resolution: The service organizations should determine an average time schedule for all service repair function. Labor rates should be based on these predetermined time factors. These should consider efficient service practices [as a factor in determining how much time should be required for a specific job] in making these time studies.

Such a study, the committee suggested, should be performed by the NEA/NATESA/NARDA liaison committee and should be completed by the next conference meeting, January 29, 1972.

Mr. Borlaug (Sylvania) indicated that some information is available and that it should be forwarded to the committee. (It may be sent to Dick Glass, 1309 W. Market St., Indianapolis, Ind. 46222, now.)

Mr. Gooley (NARDA) asked if such rates would be accepted by manufacturers. Should the manufacturers possibly allot the times for each job?

Some felt that manufacturers should pay an extra amount for the costs incurred in reporting warranty work and parts exchanges. One manufacturer's representative suggested that such costs are part of the normal service shop "cost of doing business" and should be already included in that shop's rates.

Consumerism and the responsibility of each segment of the electronics industry

Resolution: Consumerism is a common problem for the whole industry—manufacturers, dealers and technicians. Consumers all see different facets, but it is the same problem. The industry must get together (as in this session) to take *joint* action to cure our consumer problems. The key person in the whole thing is the technician. He is the interface between the industry and the consumer. He must do the vital job of educating the consumer. Service associations such as NATESA, NEA and NARDA *must* get their members involved in this effort and help them. Independent technicians must also help. Electronics manufacturers and other trade elements should help reach the unorganized technicians. It must be realized that consumerism is a reaction and we must take counteraction in order to prevent serious trouble for the whole industry.

EIA staff member G. Koschella explained EIA's product complaint procedure. There a lawyer was hired (lady) to handle all complaints from all sources. Miss Knauer sends complaints to EIA to handle. Some companies, such as Maytag, have councils to handle complaints.

Don Martin mentioned the NEA complaint postcards for customers as another step along these lines. Gene Dillingham, CET, (president of the Louisville Electronics Technicians Assn.) outlined their area's consumer "Bill of Rights" which was commended by Miss Knauer, the Better Business Bureau, etc.

Jack Darr noted that information booklets explaining various service and product procedures were also very helpful in reducing the problems.

How can electronics parts manufacturers speed up the development of universal parts for newly introduced products?

There were many comments concerning this subject.

Mr. Gooley: "Service inventory at retail should turn over

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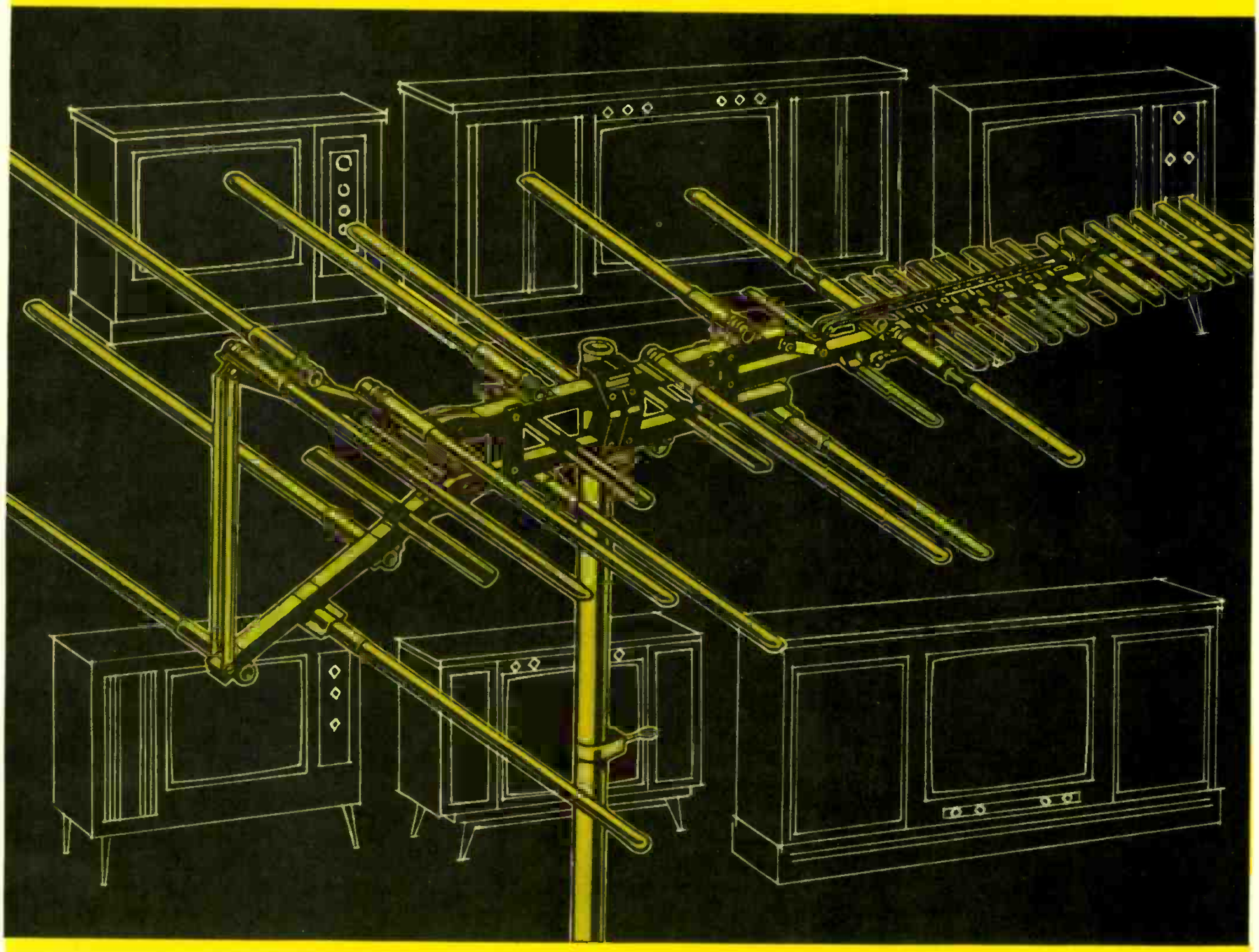

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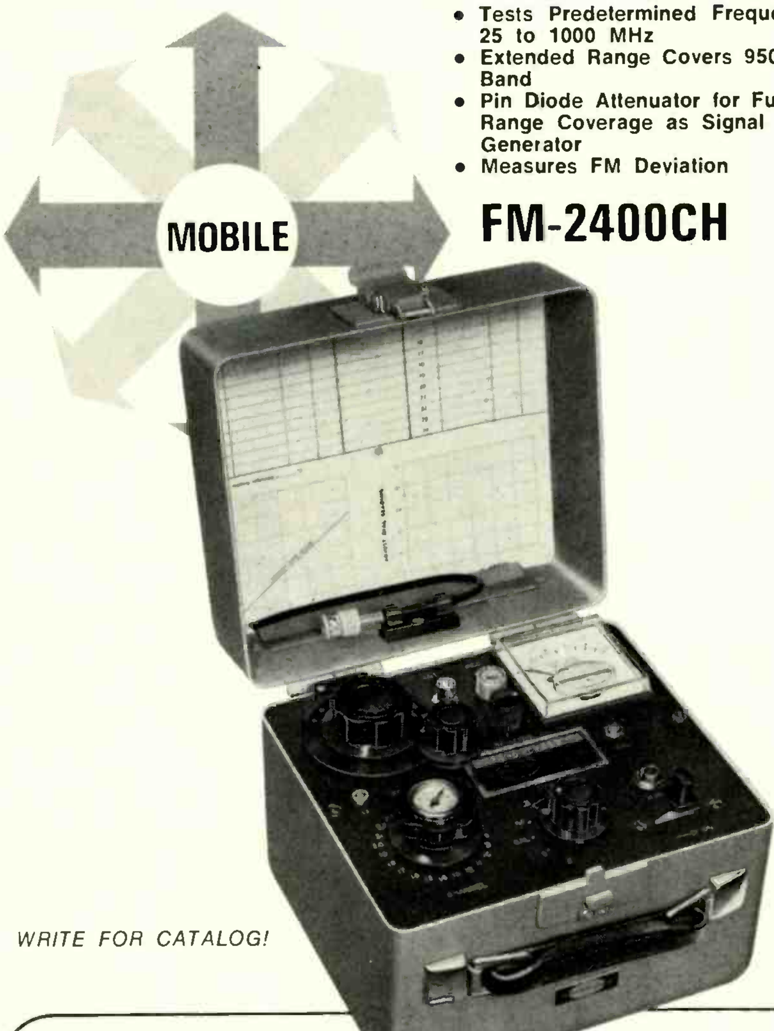

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ARTHUR CRABB
Art's TV-MATV
930 Graphic Arts Rd. #15
Emporia, Kansas 66801

Needs Roll Chart and Handbook

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WILLIAM L. CUTRORE
7160 Tuolumne Dr.
Sacramento, Calif. 95826

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HANK DAVINO
Twentieth Century Electronics
98-20 165th Avenue
Howard Beach, N.Y. 11414

LETTERS . . .

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electronic technicians, and that more bright young men and women would be interested in entering this profession if more was done to promote to the public the importance of this profession, and if both salaries and working conditions were improved. Reader comments on this subject would be appreciated. Ed.

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NEWS . . .

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6 times, but in practices it is found to be an average of only 2.4 times."

Mr. Reitzammer: "Proliferation of parts makes them economically unfeasible to stock."

Mr. Carlton: "The cost of universal replacements is usually less, but dealers are not buying."

Mr. Harrison: "So called universal parts are frequently not adequate as a replacement."

Mr. Legoto: "There are inadequate specs for most replacement transistors."

Mr. Steckler: "Mechanical parameters are more deficient than electrical parameters."

Resolution: On transistors: Manufacturers should make parameters available in their own technical literature and to H. W. Sams Co. Parts should be adequately identified. On transformers: To reduce the number of transformers necessary, we recommend that the EIA establish practical standards of physical packages and mounting. On capacitors: With technological changes in the industry, an effort should be made to educate the service dealer as to the acceptable range that he can use as a capacitor replacement. The values of electrolytics should be shown on the cartons along with their mechanical description. On special fusing devices: The problem of identifying them—as well as glow bars, thermistors, varistors, etc.—should be aided by manufacturers by making parameters available in their technical literature and to H. W. Sams Co. and by adequately identifying them on packages. On controls and switches: It is recommended that the EIA establish standards for the physical packages of slide controls.

Ways to implement the national training coordinator program

Those attending this conference were reminded of the fact that at the last National Electronic Service Conference in Dallas it was resolved by the entire assembly that a national training program be coordinated and that a person should be hired to fill the coordinator post for the purpose of upgrading electronics technicians currently in the industry.

Resolution: We of NESC support the Joint Electronics Service Upgrading Program (JESUP) as [it has been] outlined. A representative committee shall present it for consideration of the EIA at its educational subcommittee meeting on Sept. 14, 1971 in Chicago. A series of national conferences of manufacturers' instructors and/or training coordinators should be held to discuss further implementing the program—the suggested first meeting to be held on October 23, 1971 in Indianapolis, Ind. We propose that at the October meeting a group be formed to observe and evaluate the coordinating training programs as they are implemented in California, Indiana and Louisville, Ky. (and elsewhere). A progress report shall be submitted at the next service conference on January 29, 1972 in Chicago, Ill.

As an additional part of the resolution, a list gave the reasons for needing a coordinator program.

- Duplication of training subject matter.
- Conflicting scheduling where meetings will often appear at the same time in the same town.
- Seminars often degenerate into sales meetings.
- Not enough basic material being taught.
- Instructors are often engineering level people who do not reach the technicians.
- A need to introduce more daytime meetings to train the people while they are more alert.
- A need to encourage more of the "hands on" type of meetings where the technician will be taught techniques.

The next National Electronic Service Conference will be held at the Sheraton Chicago Hotel in Chicago, Ill. on January 29, 1972. It will be held in conjunction with the NARDA Trade Show and School of Service Management, which is a four-day program.

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STEREO 8-TRACK TAPE DECK 701

Indicator lights show which track is playing

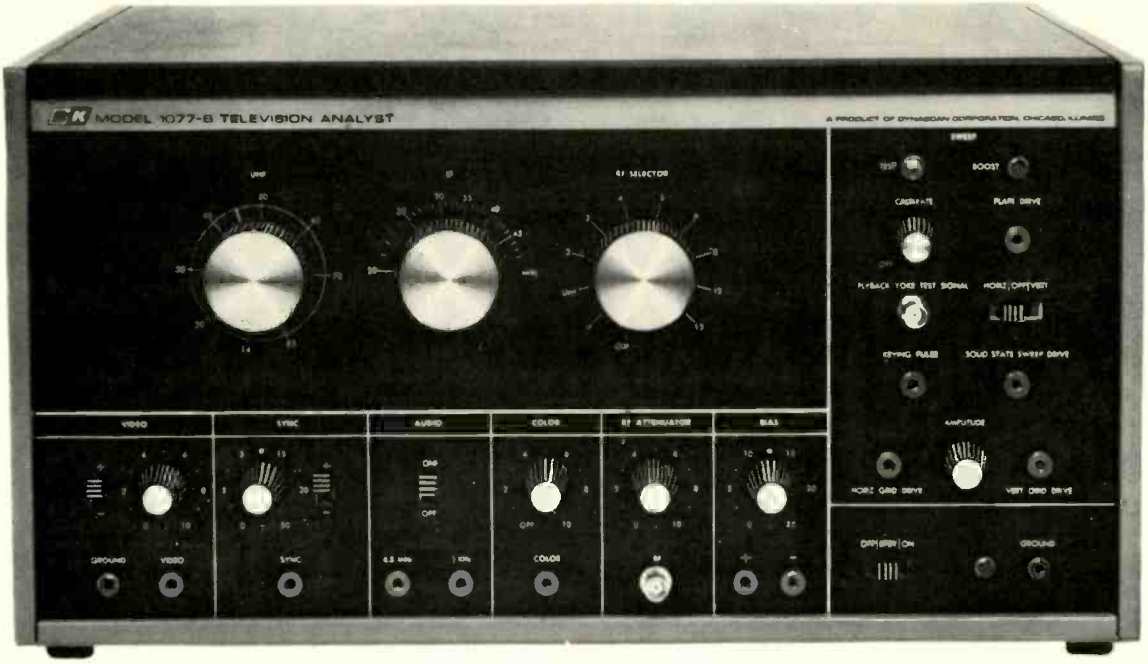
A solid-state 8-track stereo cartridge playback deck, Model TD-8, is said to connect to a stereo amplifier or receiver tape input and play 8-track stereo cartridges. Four individual track indicator lights show which track is playing, and a selector push-button permits track switching. Specifications indicate power output of 1v, signal-to-noise ratio better than 38dB with wow and flutter less than 0.03% rms and the tape speed is 3¾ ips. It is said to use a 4-pole ac synchronous motor. The metal case is walnut grain finished with a brushed aluminum front panel. The size is 9 in. W by 4¼ in. H by 9¼ in. D. Shipping weight is 10¼ lb. Price: $49.95. EICO Electronic Instrument Co., Inc.

SOLDERING SYSTEM 702

Emits no chemical fumes

This soldering tool reportedly can be used where electricity is not available, where use of electric current or open flame would be hazardous, or where electric current might disturb magnetic fields. A cartridge powers the soldering tool and releases 10,000 calories of heat from its steel encased thermit compound. It is said to be non-flammable and non-explosive and only a built-in trigger mechanism can release its energy. When actuated, the cartridge reportedly heats the copper tip to 862°F within seconds and maintains soldering temperature for as long as 8 min. The cartridge is said to require no special storage precautions as the ignition temperature is specified as 650°F. In addition, the cartridge reportedly emits no chemical fumes—either during storage or during use. The soldering iron has detachable tip construction, allowing for numerous tips of different sizes and shapes—all interchangeable. Geneva Electronics Co.

FOR MORE NEW PRODUCTS SEE PAGE 70



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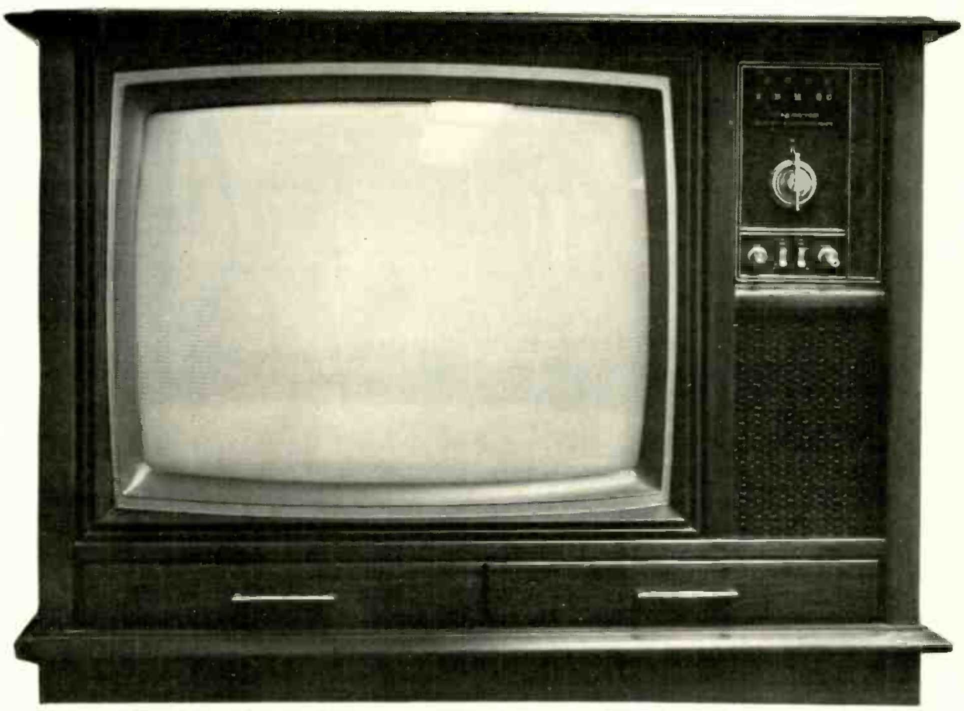
TEKLAB REPORT

Magnavox's Total-Automatic Color-TV Chassis T962

by Joseph Zauhar

The remote control receiver search tunes for a TV channel, stops after receiving composite sync pulses and automatically shuts the TV set off after the sync pulses are lost



Magnavox Model 1C7153 color-TV set employing the T962 chassis.

■ As you may already know, the term Total Automatic Color (TAC) refers to those Magnavox color-TV models that feature automatic control of fine tuning, chroma level and tint correction. The Model 1C7153 receiver, employing T962 color-TV chassis, used for this report includes all of these color circuits, plus remote control which is not in the TAC classification.

The T962 color-TV chassis is used in the upper end of the 1972 product line. This tube type chassis is transformer powered and is only used in console and stereo theater entertainment centers equipped with the 25-in. matrix-type color-picture tube. The circuit boards used in this chassis are "road mapped" on both sides to simplify the location of components and test points.

Most of the circuits used in the T962 color-TV chassis are identical to the circuits used in the T958 chassis. (See this month's Tekfax Schematic No. 1387.) However, there are some distinct differences. The 6BK4 high voltage regulator tube has been changed to a 6EN4, which has the grid internally connected to both Pins 5 and 6. Since the internal connection to the grid in a 6BK4 tube is made only at Pin 5, the tubes cannot be directly interchanged. The vertical deflection circuit has been modified and the familiar 6GF7 vertical oscillator/output tube has been replaced by a 6LU8 tube.

The automatic tint control (ATC) circuit used with this chassis is the basic deluxe ATC circuit that was used with the T951 chassis. The operation of this circuit does not effect the screen color temperature so the Chromatone circuit used with the T951 chassis is still used in this chassis.

A special antenna connector block (Fig. 1) is located on the back of the cabinet. In many TV models the coax cable is connected directly to a standard "F" fitting on this block, to which a 75Ω antenna or cable system can be directly connected. Standard 300Ω screw type twin-lead connectors are also provided and are connected to the 75Ω tuner input cable through a permanently installed balum type input transformer and link connector. When the con-

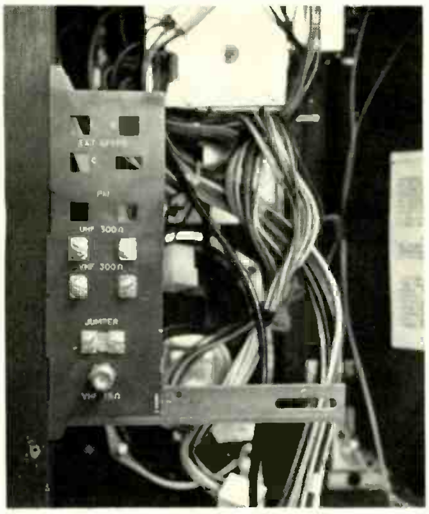


Fig. 1—A special antenna connector block will accept a 75Ω coax cable system or standard 300Ω twin lead. It also includes a permanently mounted balum-type input transformer.

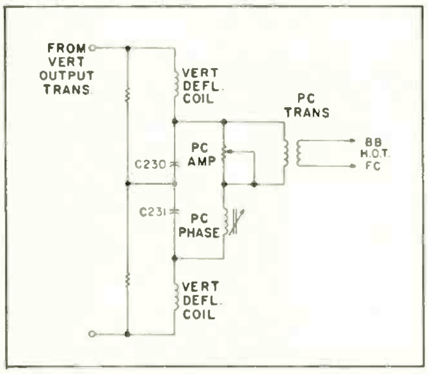


Fig. 2—Simplified schematic of the pincushion correction circuit, which corrects raster distortion at the top, bottom and both sides. *Courtesy of Magnavox.*

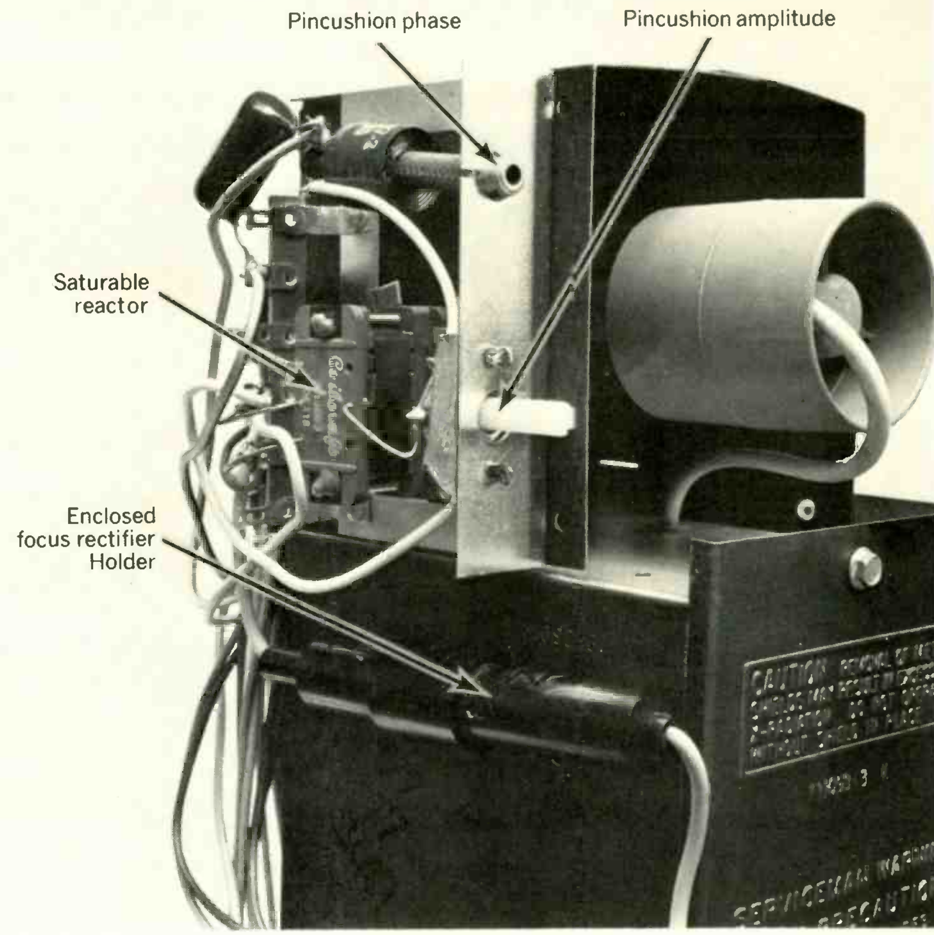


Fig. 3—The saturable reactor, called the pincushion transformer, looks somewhat like a transformer, but is designed and constructed to produce minimum transformer action.

necting link is closed, a 300Ω antenna system can be connected directly to the twin-lead connectors and the balum transformer provides the proper matching between the 300Ω impedance of the antenna system and the 75Ω impedance of the tuner input.

VHF tuners used with this chassis require an input impedance of 75Ω and include a special input housing designed to accept a special coax cable plug-in type connector.

Pincushion Correction Circuit

The pincushion correction circuit (Fig. 2) used in the T962 color-TV chassis corrects raster distortion at the top, bottom and on the two sides. The circuit includes a saturable reactor, called the pincushion transformer, AMPLITUDE control, PHASE control and two capacitors. One reactor winding is connected in series with the vertical windings of the deflection yoke, and the other winding is connected in parallel with a portion of horizontal-output transformer terminal points BB and FC. A resonant circuit at the horizontal scanning frequency is formed by the phase coil, the reactor windings, and the capacitor.

The downward bowing of the horizontal lines at the top of the raster and the upward bowing of the lines at the bottom are corrected by varying the amplitude of the vertical-sweep current at the horizontal rate. The left and right sides of the raster are corrected by varying the amplitude of the horizontal deflection current at the vertical rate, which is obtained through the use of the saturable reactor.

We noted the saturable reactor (Fig. 3) appears to look somewhat like a transformer, but is actually designed and constructed to produce minimum transformer action. Over the designed operating range, the impedance of the windings varies more or less inversely with the degree of saturation of the core material, and the saturation of the core material varies with current flow through the windings designated as the control winding.

There is interaction between the vertical and horizontal corrections, both windings acting as control windings besides acting as signal windings at various times throughout the sweep cycle.

Automatic Tint Control Circuit

A new automatic tint control (ATC) circuit is used on this chassis to make the setting of the TINT control less critical (Fig. 4). This circuit can be switched ON or OFF by the AUTO TINT OFF/ON switch, located in the enclosed control panel on the front of the cabinet.

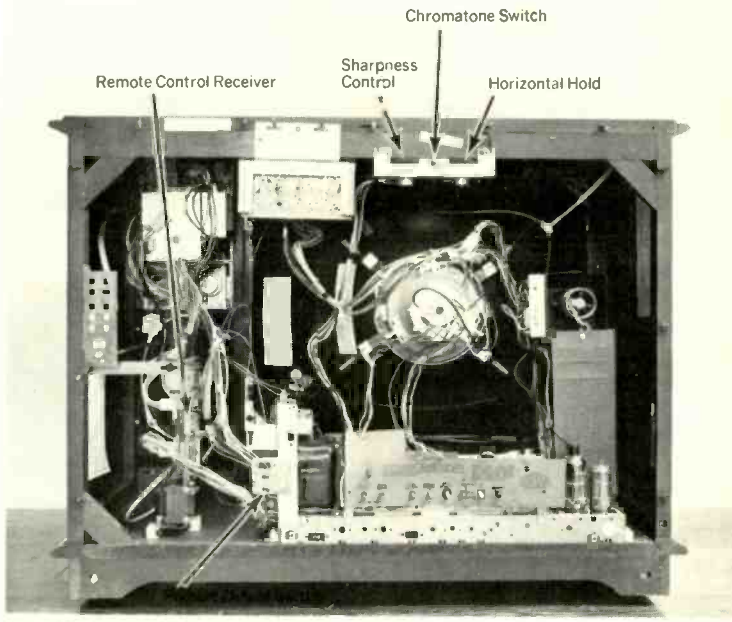
The circuit makes the reproduction of fleshtones less dependent upon the precise setting of the tint. This is accomplished by increasing the phase angle between the two 3.58MHz signals applied to the color demodulator grids whenever the AUTO TINT switch is placed in the ON position.

The new phase angles cause the demodulated signals for the colors in the fleshtone and blue regions to have higher than normal amplitudes, resulting in a difference in color saturation in these regions between the ON/OFF settings of the AUTO TINT switch. To maintain equal saturation levels of these colors for both settings of the switch, so that there will be less noticeable difference in saturation as the switch is moved from one position to the other, a fixed amount of degeneration is introduced into the color demodulator when the switch is in the ON position.

When the AUTO TINT switch is in the OFF position, a positive dc voltage is applied to the base of transistor Q71, causing the transistor to saturate and connect the cathode of the color demodulator to ground. When the switch is in the ON position, the dc voltage is removed from its base and the transistor cuts off. With the transistor cut off, the 47Ω resistor in the cathode circuit of the color demodulator is in series with the cathode of the tube and produces a small amount of degeneration. As a result, the color saturation in the fleshtone and blue regions have approximately the same respective amplitudes for either position of the AUTO TINT switch.

Remote Control System

The Model 704064 Eight-Function Remote Control Receiver (Fig. 5) is used with the T962 color-TV chassis. This remote control is physically and electronically similar to the Model 704058, which was used with the T951 color-TV chassis. This receiver employs a transformer-type power supply, which is



Rear view of the TV chassis with the remote-control receiver panel mounted in a vertical position.

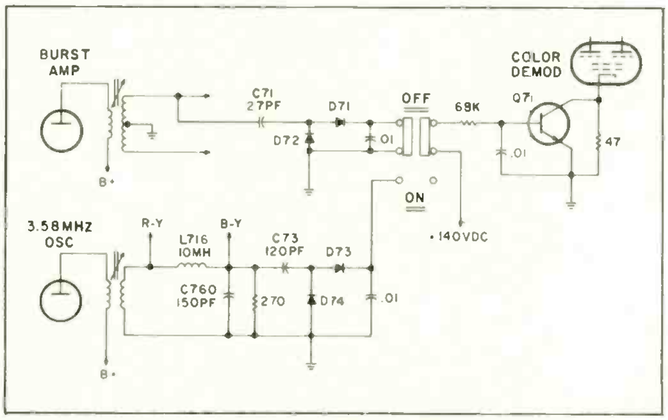
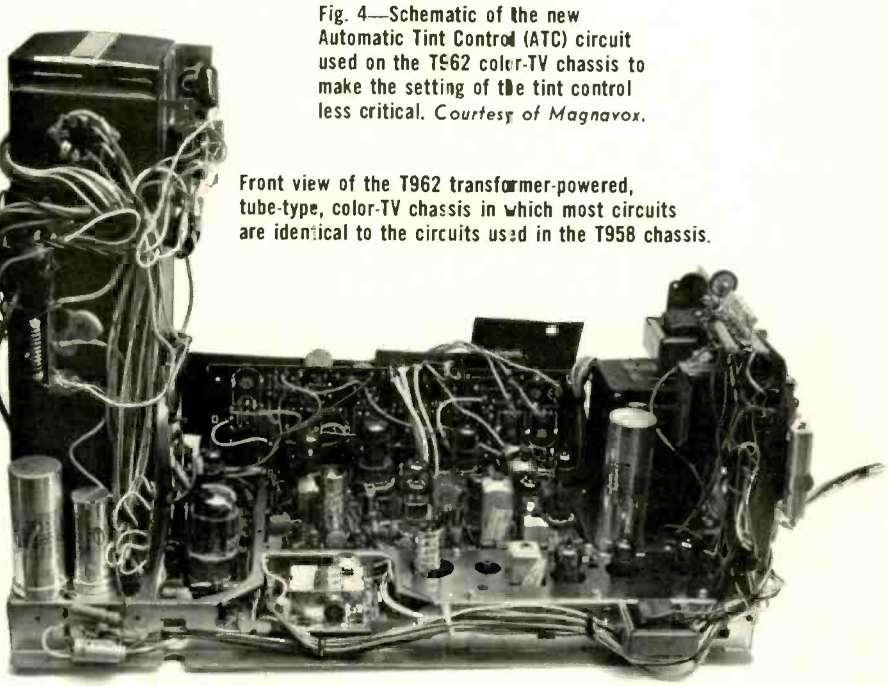


Fig. 4—Schematic of the new Automatic Tint Control (ATC) circuit used on the T962 color-TV chassis to make the setting of the tint control less critical. *Courtesy of Magnavox.*



Front view of the T962 transformer-powered, tube-type, color-TV chassis in which most circuits are identical to the circuits used in the T958 chassis.

separate from the ac power supply of the TV receiver, but the location of some components has been rearranged.

This eight-function remote control unit incorporates solid-state relays called "Triacs." The Triac, like the SCR, is a three-terminal solid-state switch. The two power handling electrodes are referred to as anode 1 and anode 2, and the control electrode is called the gate. The operation of a Triac differs from other types of thyristers in the type of voltage that it handles.

The complete remote receiver is contained on one circuit board, which includes the power supply, four amplifier stages, eight tuned circuits and driver transistors, seven Triacs, one to three relays, and search and latch circuits. Connection to the tuner and TV chassis are simplified by using Molex connectors. The circuit board is mounted in a vertical position to the left of the TV chassis and is easy to remove if service is required.

When a transmitter button is pressed, one of eight frequencies will be generated and radiated to the

continued on page 68

A control panel door hides most of the controls on the front panel.

The remote control transmitter is compact and controls eight TV functions.

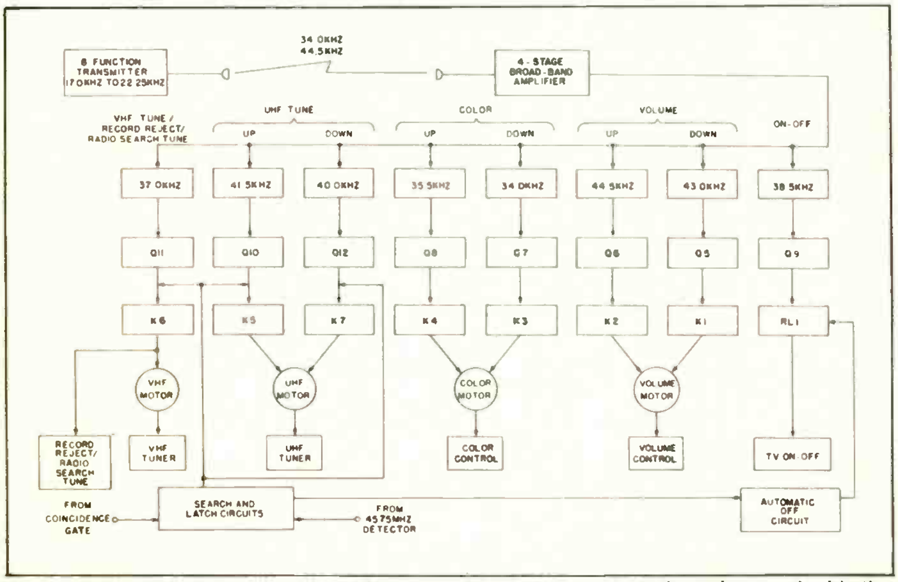
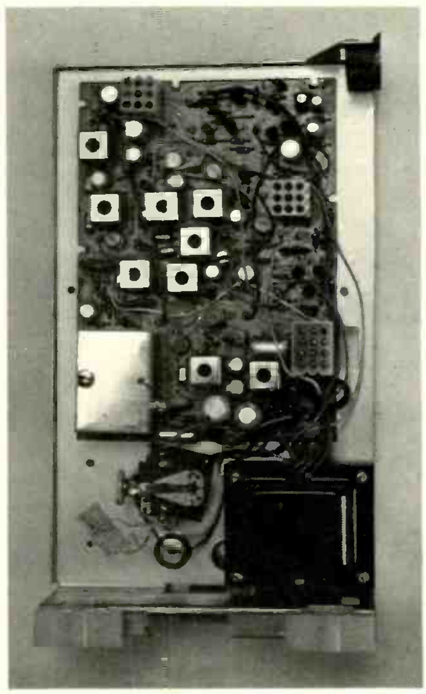


Fig. 5—Block diagram of the Model 704064 eight-function remote-control receiver used with the T962 color-TV chassis. *Courtesy of Magnavox.*



The complete remote control receiver is contained on one circuit board. Connections to the tuner and TV chassis are simplified by using Molex connectors.

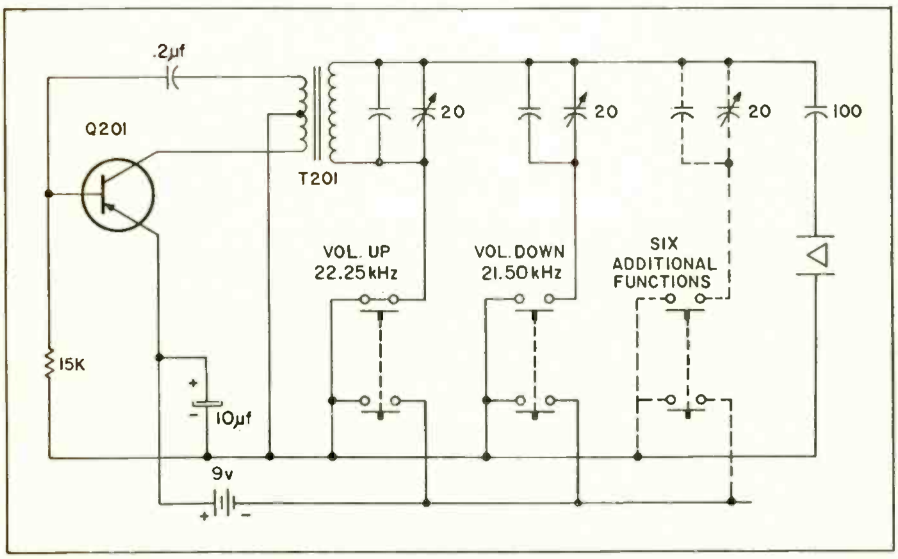


Fig. 6—Schematic of the remote control transmitter. *Courtesy of Magnavox.*

Heath's AR-1500 Receiver–Part I

by Phillip Dahlen

The first in a series of articles telling what we encountered when examining various makes of audio equipment.

■ There is a lot that can be said concerning the desirability of constructing sophisticated consumer products purchased in kit form, since they can help the electronic technician develop a familiarity to a type of product that he may not have yet serviced—the practical application of electronic theory. To assist in assembling, aligning and understanding the operation of this receiver, a 10⅞- by 8½- by 11/16-in. thick, 248-page manual is supplied with this kit. Although we were loaned an early model that had already been assembled, by tearing it down we were able to observe the helpful construction techniques designed into the receiver and the quality of its physical design.

Realizing that the receiver is of entirely solid-state construction and does not include an audio output transformer, it was surprising to note that it is still relatively heavy. This, we discovered, is due to the use of a massive 14-lb ac power transformer.

Heath's AR-1500 receiver has a 90w per channel music power rating when connected across an 8Ω load.

Upon turning the ac power on, the dial panel and meters can be seen through the receiver's tinted window.

Home Testing

Although the receiver arrived with an impressive list of specifications, the real test comes from actual use, and it was taken home for a three-week examination. For AM reception we used merely the receiver's pivoted rod antenna. In our location, and with the receiver's high gain, we did not find the antenna's angular position at all critical. And in the Duluth area, during the evening, we experienced no difficulty in receiving AM stations as far south as Fort Worth, Texas, and as far east as Toronto, Ontario.

Rabbit ears were used for FM reception, and during the hours of best reception we were able to clearly receive FM multiplex signals from as far south as Minneapolis. In fact, reception was so good that we were even receiving local Iowa news from one unidentified FM station. Of course, during other weather conditions reception was not quite so distant, although it could have certainly been improved with the use of a properly directed roof antenna. (There was no point in using our roof antenna since it is quite directional and points only at the Duluth stations.)

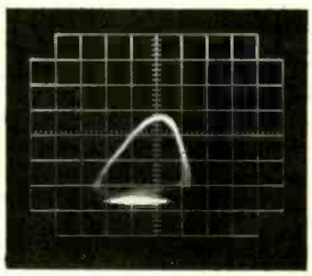


Fig. 1—Time exposure of dc-coupled scope trace as the receiver is tuned from below to above the frequency of a local FM station.

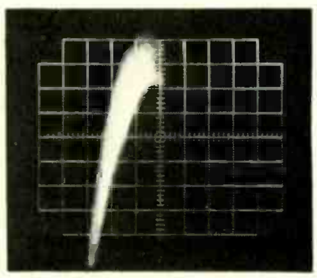


Fig. 2—Pattern formed on ac-coupled scope when the receiver is tuned above the FM station frequency.

Lab Testing

Once returned to the Electronic Technician/Dealer lab, we attached the scope leads to the horizontal and vertical trace terminals at the back of the receiver and tuned in one of the local FM stations (the local stations are so near our lab that several strong FM signals are received through the receiver shielding, no antenna being necessary). While tuning the receiver

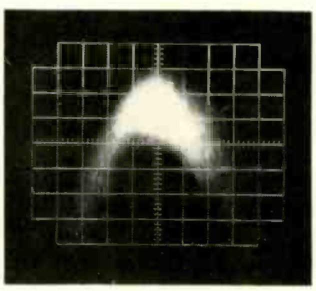


Fig. 3—Pattern formed on ac-coupled scope when the receiver is tuned to the frequency of the FM station.

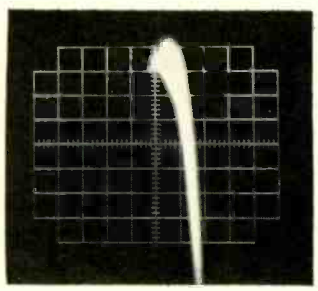


Fig. 4—Pattern formed on ac-coupled scope when the receiver is tuned below the FM station frequency.

from just below to just above the frequency of one of these FM stations—with the scope dc coupled to the receiver—a time exposure was made of the scope trace as it rotated to form a triangular pattern (Fig. 1). (Although formed in a different manner and used for a different purpose, in many ways this scope trace is like those in the article "Aligning FM Stereo Receivers" beginning on page 38 of the February 1971 issue of ELECTRONIC TECHNICIAN/DEALER.) The vertical sweep in this photo is formed by a dc voltage generated from an early stage IF signal (corresponding to signal strength) while the horizontal sweep in this photo is formed by a dc voltage generated in the discriminator circuit (corresponding to the range of frequencies swept). The curved apex of this triangular figure represents the signal strength when on frequency, while the left slope represents the above-frequency relative signal strength and the right slope represents the below-frequency relative signal strength.

The receiver's scope terminals are actually designed for determining whether or not the FM antenna used is obtaining the desired reflection-free FM signal. And the Heath manual contains photographs showing the apex of this curve when proper conditions and improper conditions exist—specifying the antenna problems encountered.

As a matter of interest, we also ac coupled the scope's vertical input and increased its gain while leaving the horizontal input dc coupled. We then took photographs of the pattern formed when the receiver was tuned above the station frequency (Fig. 2), at the station frequency (Fig. 3) and below the station frequency (Fig. 4). The on-frequency setting corresponded well with the receiver's FM tuning meter.

Next, we connected an audio generator to the receiver's auxiliary input, set the tone switch for a flat response and connected a dual-trace scope to both the auxiliary input and the speaker output. Upon applying a 20Hz square wave, the resulting waveform was surprisingly good—particularly since a relatively low-cost

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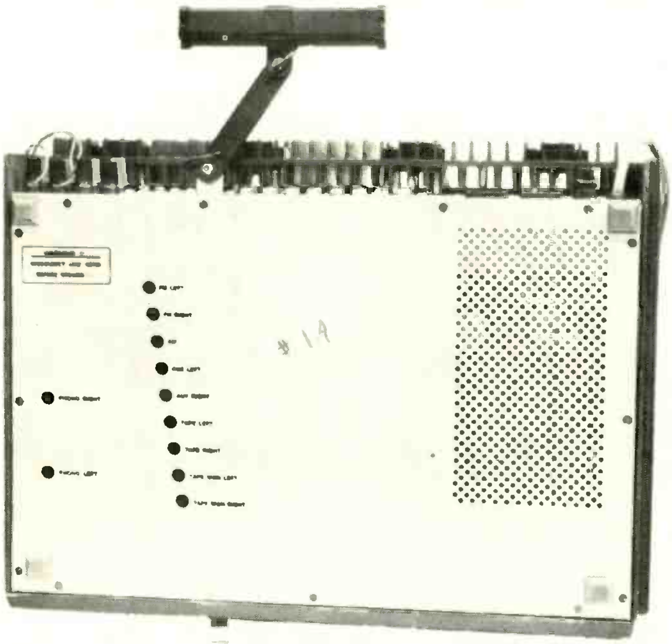
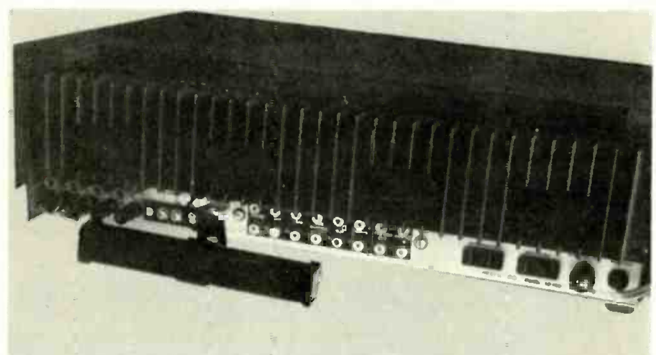
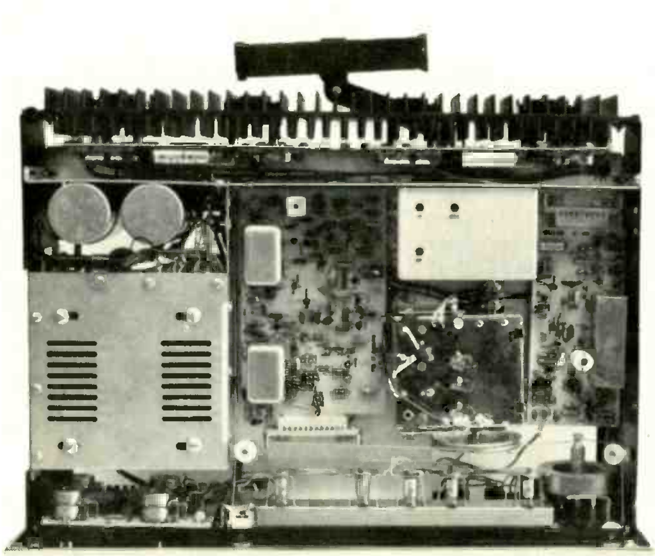


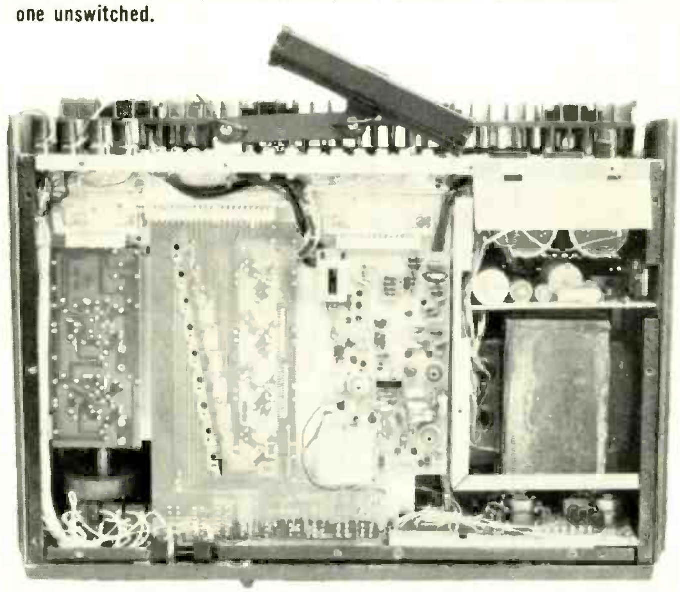
Controls beneath the receiver permit making individual adjustments for every type of signal fed to the receiver amplifier.



In addition to a pivoted AM rod antenna, the back of the receiver contains eight speaker terminals, AM and FM antenna terminals, five stereo input terminals, two stereo output terminals, scope horizontal and vertical trace terminals, and two ac power terminals—one switched and one unswitched.

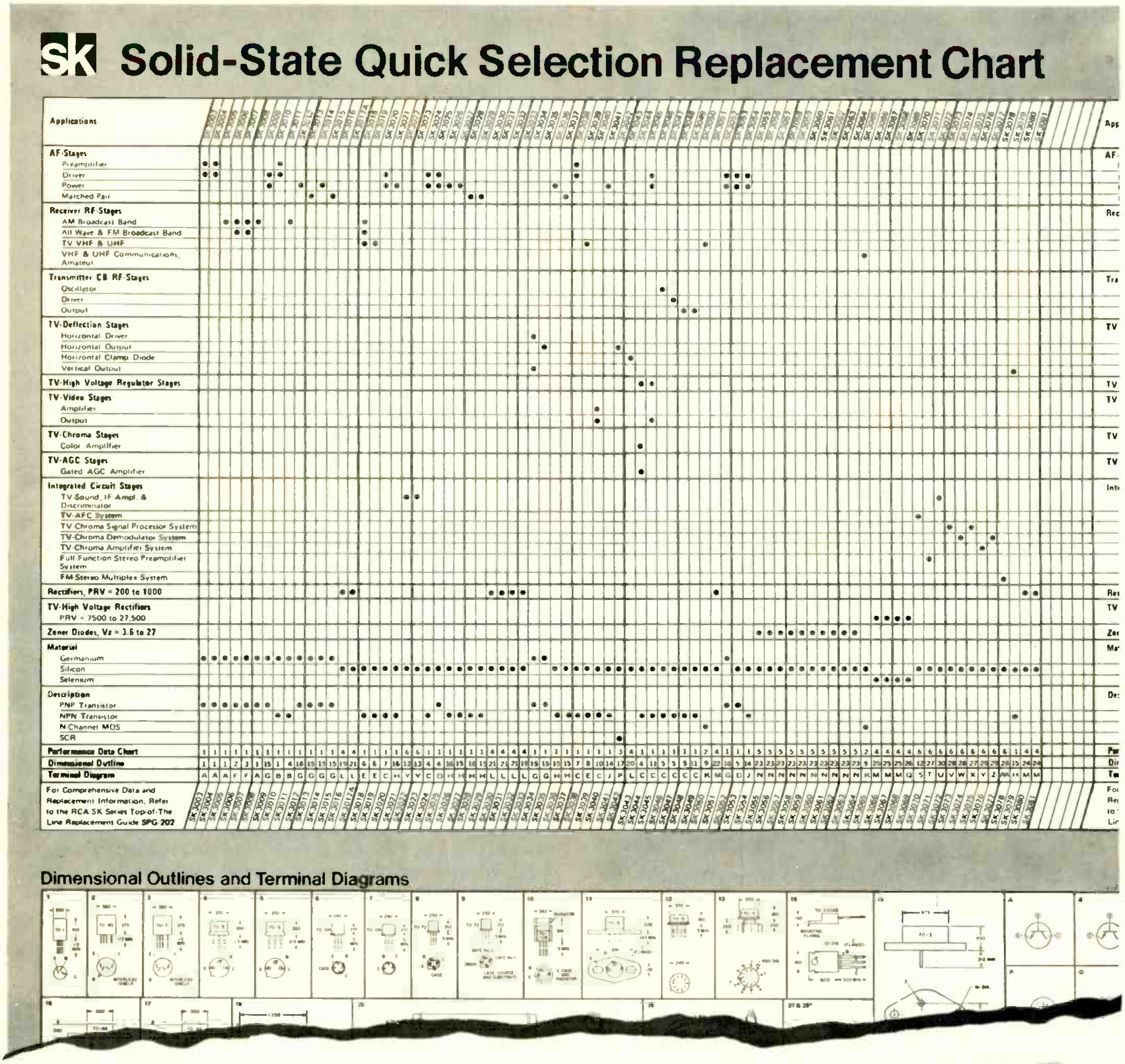


Top view of receiver chassis with circuit boards in place.



Bottom view of receiver chassis with circuit boards in place.

Find SK replacements fast with the new RCA SK Wall Chart



A brand new expanded, king-size SK Quick Selection Wall Chart which shows you the correct SK replacement when the device to be replaced cannot be identified is now available from your local RCA distributor.

Keying all RCA SK types to applications, and showing terminal diagrams and performance data charts, this 23" x 35" chart is just what you need for fast SK replacement.

Also available is the new edition of RCA's SK Series Top-of-the-Line Replacement Guide which shows how only 79 RCA SK devices can replace more that 20,000 OEM solid state devices in radios, TV's, stereos, tape equipment and other home entertainment equipment.

The new Guide also features 17 industrial type SK's that replace devices used in power control and switching circuits and other industrial applications.

All RCA SK types are accurately cross-referenced with industry types in this updated Replacement Guide which you can use to advantage on every service call. See your local RCA distributor for both the SK Quick Selection Wall Chart (1L1367) and the SK Replacement Guide (SPG-202L). They work hand in hand to make your replacement job faster and easier.

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RCA

What's New In TV Receivers For 1972

Part II

It is generally agreed that within the next few years most TV sets will be of solid state and modular designed

by Joseph Zauhar

■ More 25-in black-matrix picture tubes, increased use of modular circuits with solid-state components, and prices lowered on some remote control units were some of the highlights in last month's review of TV receivers. The TV sets discussed included Admiral, Electrohome, Magnavox, Motorola and Panasonic.

The TV receivers reviewed this month also employed more new automatic tuning systems and improved earlier designs. Several manufacturers are introducing their first all solid-state modular chassis. One major company spokesman indicated that they are aiming to make their entire color-TV set line completely solid-state over the next few years.

We will review some of the features and circuits employed in the new TV sets, and a more detailed review will be presented on various TV sets each month in the Teklab report.

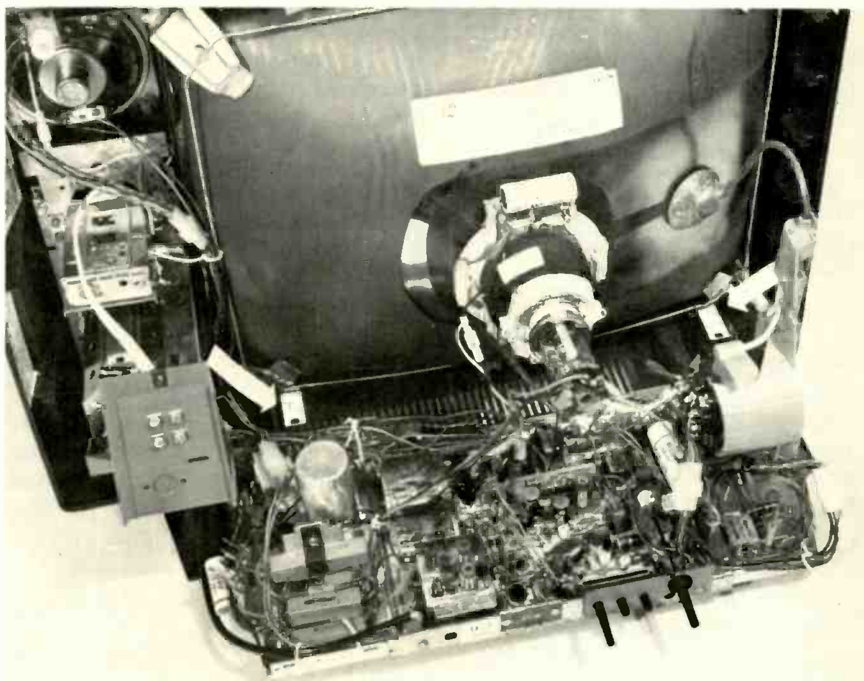
Channel Master

Channel Master's 25-in. color-TV consoles feature a new Integrid Chassis to help reduce service time and cost. The chassis consists of six plug-in modules that can be replaced in the home when service is required. They also employ a high-voltage multiplier which reportedly eliminates the hazards of transformer burnout.

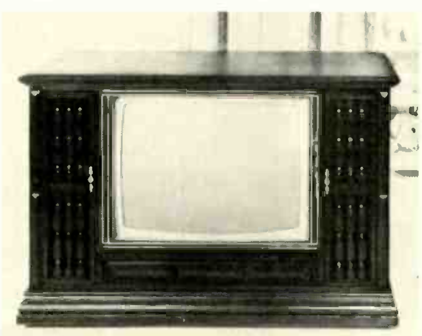
Also featured is Auto-Color circuitry for easier tuning. This circuit includes Automatic Tint Control, an Automatic Dynamic Correction Circuit, Automatic Chroma Control, Automatic Fine Tuning, Automatic Gain and an Instant-On feature. In addition, all console sets have a 25-in. (measured diagonally) Chroma-Grid black-matrix picture tube.

The new portable color- and B/W-TV sets cover many screen sizes and price ranges. The top of the line is their 18-in. (measured diagonally) color-TV Model 6136. This set features pre-set COLOR and TINT controls for automatic color reception at the turn of a switch.

A personal 15-in. color TV Model 6131 features slide COLOR and TINT controls, while the B/W-TV 19-in. slimline model is continued with a removable sun screen. A 12-in. B/W-TV personal model is also offered.



General Electric's U-1 solid-state main chassis is held in place by two spring clips. The high voltage, vertical output and picture-tube-filament transformers are each fastened by one screw. *Courtesy of General Electric.*



Channel Master's 25-in. (measured diagonally) Model 6123 color-TV receiver. *Courtesy of Channel Master.*

General Electric's Alexandria Model M996EPN 25-in. (measured diagonally) color-TV set. *Courtesy of General Electric.*

General Electric

General Electric will emphasize the 19-in. and under screen sizes for a bigger share of the 1972 color market. According to the company, they have sold nearly 2½ times as many sets in this category as in the previous year.

The Dimension series of their 19-in. (measured diagonally) receivers offers One Touch Color system along with a new generation of Spectra-Brite picture tubes. The new picture tube is said to have improved phosphor glass transmission and electron gun, which reportedly yields a brighter and sharper picture. All models in the Dimension series feature solid-state components, Insta-Color for picture and sound in seconds, a 5- by 5-in. upfront speaker and a direct-lighted VHF/UHF channel selection dial.

All 25-in. (measured diagonally) TV receivers offer pre-set fine-tuning, solid-state UHF tuner, SHARPNESS control and two-screw four-latch back cover. Most of the console receivers have a feature that accepts a coax VHF antenna system. Five of the models in the 19-in. (measured diagonally) and the 25-in. screen sizes have six position detent UHF tuning for VHF/UHF comparability.

General Electric has not yet offered an all solid-state color-TV set but has introduced a new 19-in. (measured diagonally) Model TR465UWD solid-state B/W-TV receiver.

The solid-state portable TV receiver reportedly offers high reliability, a clear, sharp picture and easy serviceability. The design of the "U" chassis receiver, like most tube model chassis, employs many high-voltage, low-current circuits. When servicing this chassis, most equipment and techniques used currently in servicing tube-type TV receivers can be applied to the chassis.

Other features include unplug disconnect leads from the circuit board, keyed by color-coded roadmaps; pull-out, audio IC module; and low component density, making all components visible and easily accessible.

A five-year guarantee is offered on the nickel-cadmium battery pack used in the 5-in. (measured diagonally) solid-state TV receiver, Model TR120RVY.

Philco-Ford

"Automatic" is the key word for Philco-Ford's new line of color-TV receivers.

On many of its new models the company has introduced a color-TV system known as Philcomatic. The system simplifies color-TV opera-

Philco-Ford 25-in. (measured diagonally) Model C7372 color-TV set reportedly incorporates 14 automatic circuits, systems and controls. *Courtesy of Philco-Ford.*

tion by reportedly incorporating 14 totally automatic circuits, systems and controls.

With the 1972 models, the company has introduced its first color-TV sets with 19-in. screens, and expanded its 25-in. line.

The total line now has 27 models in screen sizes ranging from 14 to 25 in. (measured diagonally), including portables, consoles and home theater combinations.

The Philcomatic system includes a new color control light, which glows when the viewer has fine-tuned the set accurately enough for the Auto-Lock channel tuning (ATC) circuit to function properly.

The following chassis are new "A" line designations, 22LT45/R, 22QT79/80, 22ST80/81 and 21ST91P.

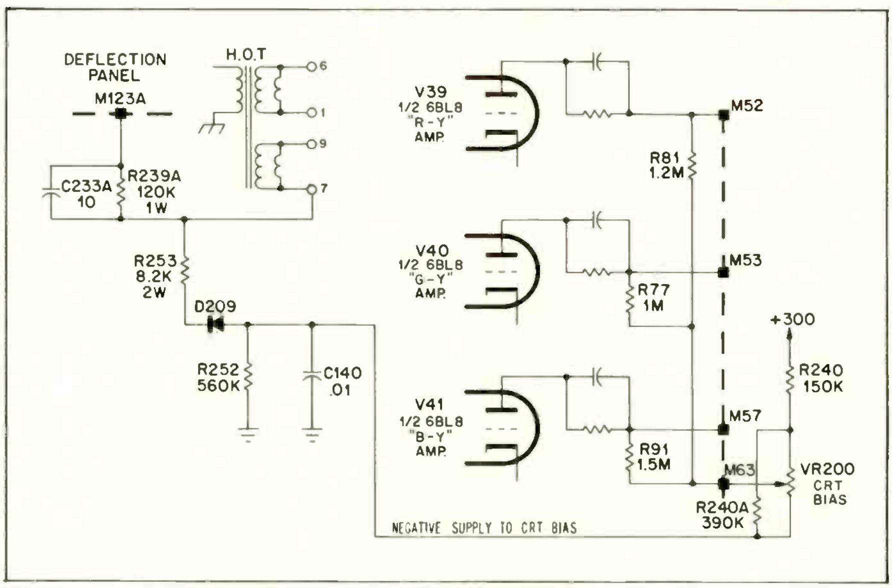
The 19-in. color-TV chassis 22LT45 is in many respects similar to the 20QT76 chassis, but with a few modifications: Chassis 22LT45 employes a new 19-in. picture tube (19VATP22) with a 185-sq.-in. viewable area. This "Kimcode" tube is non-bonded, using a "T" band and formed metalic mask for integral implosion protection.

The same video IF and deflection panel is used as on the 20QT76, but it contains a new chroma/sound panel. This new panel contains two 14 lead IC "H" chips mounted in their own individual plug-in sockets. One IC (IC91) is designated as a 4.5MHz amplifier/sound demodulator, the other IC (IC92) is designated as a 3.58MHz oscillator/reactance/demodulator.

A color light indicator is also used on this chassis, which glows only when a color program is being telecast.

In addition to the circuit breaker, located in the power-transformer high-voltage winding, the chassis also contains a ½ a fuse connected between the ac line choke and one side of the ON/OFF switch.

The 22QT79 23-in. color-TV chassis is almost identical to the "U" line 20QT74 23-in. chassis. The 22QT79 chassis employs a



Philco-Ford's new dc-coupling circuit supplies additional dc coupling to the picture tube grids on the 22ST80/81, 21ST91P color-TV chassis. *Courtesy of Philco-Ford.*

23VAQP22 Kimcode picture tube and contains a 4a slow-blow fuse in the ac line.

Another new color-TV set chassis is the 22QT80, which is similar in configuration to the 22QT79 chassis, but contains some step-up features. This chassis uses an IC ACT circuit similar to the 20QT76 chassis containing the Philcomatic circuit and a slow-blow fuse in the ac line. The 22QT80 uses a front mounted PICTURE PREFERENCE control and the 22QT79 employs rear mounted two position PICTURE PREFERENCE switch.

The 22ST80 color-TV chassis is almost identical to the 21ST90 series chassis with the following exceptions: An ACTC background switch is not used on the 22ST80 chassis, but it still uses the zener for auto-ACTC without the switch. A new circuit is employed for additional dc coupling to the picture tube grids.

The company's 1972 B/W-TV line ranges from an 8-in. portable to the top-of-the-line 22-in. console.

There are three 8-in. Chassenger portables, each employing solid-state circuits and weighing only 11 lb.

RCA Sales Corporation

RCA, with about 65 percent of its new color-TV set line 100 percent solid-state, is aiming to make the entire line solid-state over the next few years, according to a company spokesman.

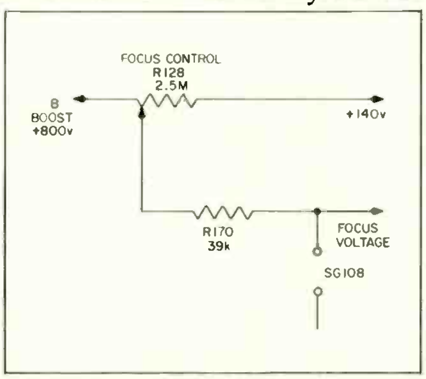
There will be a total of eight chassis in the 1972 color-TV line. The CTC54 chassis introduced in May is used in remote controlled table, console and combination entertainment centers. This chassis combines varactor tuning with a modular chassis similar to the CTC46. It will be used in the top of the line position vacated by the CTC44 chassis. All models feature AccuMatic color monitor, black-surround picture tubes and remote control.

The CTC46 color-TV Chassis introduced in March is a modular chassis, which employs the same modules (except for power supply and first chroma) as the CTC49 introduced last year. One additional module is used for the sound output,

The RCA 25-in. (measured diagonally) Model GQ-829FRTWD color-TV set employing the CTC46 chassis. *Courtesy of RCA Sales Corp.*

which is a class-B push-pull audio amplifier rather than the single-ended Chassis A sound circuit used in the CTC49 chassis.

The familiar CTC39X color-TV chassis carried over from previous years, continues in the new line. This chassis includes features such as: AccuTint and a 75Ω input to be used with cable antenna systems. A

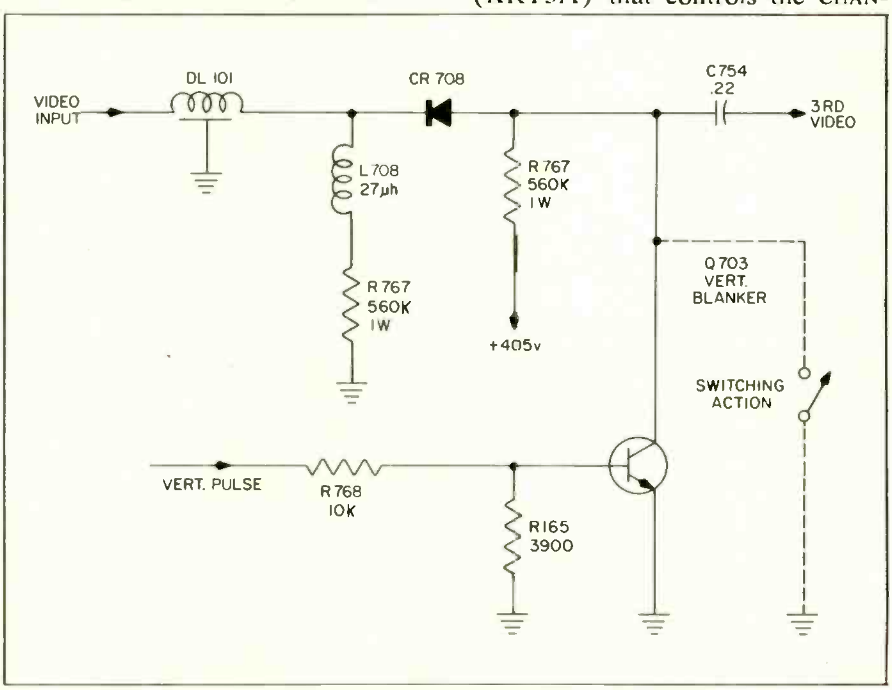


The focus voltage is obtained from a focus rectifier in the RCA CTC50 color-TV chassis.

moveable link is set in either the 75Ω or 300Ω position. A change was made in the hold-down bias circuitry of the horizontal output stage, and the bias for the horizontal output stage is obtained (after rectifying and filtering) from a positive pulse taken from the horizontal-output transformer. This pulse system limits the maximum obtainable high voltage.

Two models in the console line, with 20-in. screens (measured diagonally), employ the CTC50 chassis. This chassis includes AFT and Accu-Tint circuits quite similar to the CTC39X chassis, but some specific changes have been made. Vertical blanking is now accomplished by a transistor and the focus voltage is obtained from a focus control. The CTC50 chassis employs a 6KM6 horizontal output, 3A3B high voltage rectifier, 6BS3A damper and a 6EN4A shunt regulator tube.

Four portable chassis, the CTC51, 52, 53 and 55 are used in the 1972 color-TV line. The CTC51 chassis is used in models featuring a 14-in. (14VAHP22) color-picture tube and is available with or without AFT. The CTC52 chassis is used in models equipped with a 16-in. (16VACP22) color-picture tube. The CTC52XR remote system employs a new one button (single function) mechanical hand unit (KRT5A) that controls the CHAN-



Vertical blanking is now accomplished by a transistor in the RCA CTC50 color-TV chassis.

NEL-CHANGE and ON/OFF function, generating a 35.75kHz signal.

The remote receiver preamplifier board, PW900, contains two common-emitter stages, while the PW1100 board (with three resistors) contains a two-stage amplifier, a tuning circuit with a relay driver, a single relay activating the channel-change motor, and the remote receiver power supply. The ON/OFF function may be preset to turn the TV receiver OFF when the tuner is turned to an unused channel.

The CTC55 chassis is used in color-TV sets featuring a 19-in. (measured diagonally) picture tube, and the CTC53 chassis features an 18-in. picture tube.

The CTC53 and 55 chassis are electrically similar to the CTC43 color chassis, although there are differences in the chroma (because of the AccuTint circuit), the sync and the horizontal deflection circuits. The new chassis also employs a polarized interlock system.

New B/W-TV chassis for 1972 include the KCS172, KCS186 and the recently introduced KCS188.

The KCS172 is a tube-type vertically mounted chassis with a 19-in. (measured diagonally) screen size (19VAHP4). Electrically and physically, this chassis is similar to the familiar KCS171 chassis.

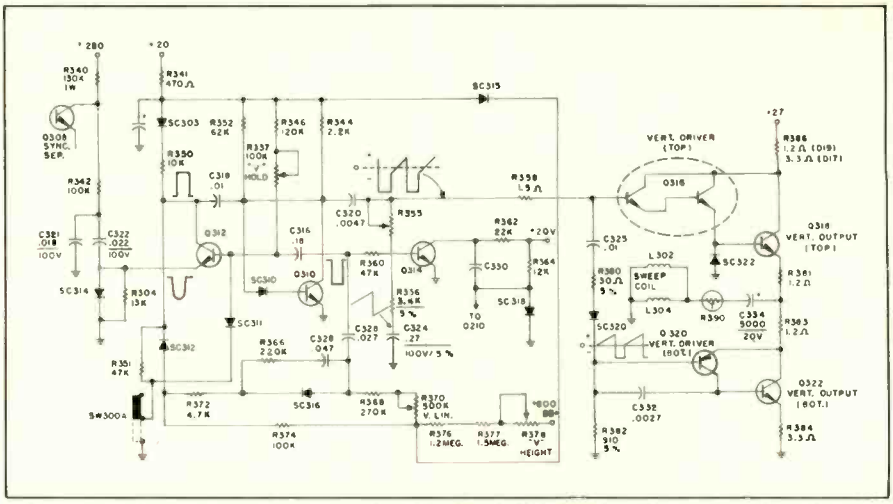
The KCS186 chassis circuitry consists of 19 transistors, 2 integrated circuits and 10 diodes, mostly contained on five plug-in modules. A 19-in. (measured diagonally) 19VAHP4 picture tube is used.

Sylvania

Sylvania's 25-in. (measured diagonally) color-TV models include 40 sets and seven home entertainment centers. Each of the sets employ the new Color Bright 100 picture tube, which reportedly provides a sharper, brighter picture.

Six home entertainment centers and 39 25-in. color-TV receivers feature Perma-Tint to help eliminate flesh tone variations.

Twelve of the 25-in. sets and two home entertainment centers employ the Gibraltar 100, a completely solid-state chassis. Tuning and channel selection are accomplished by pushbuttons. Any 11 VHF or UHF channels may be selected by pushing a button on the control panel, replacing mechanical tuner parts with solid-state electronic circuits. This chassis will also include plug-in type transistors for easy serviceability.



Schematic of the vertical sweep system in Sylvania's D17/D19 color-TV chassis, which eliminates the vertical output transformer. *Courtesy of Sylvania.*

Sylvania's Model CL1439P 25-in. (measured diagonally) color-TV set features a chassis which is of more than 85 percent solid-state in design. *Courtesy of Sylvania.*

Additional features on the Gibraltar 100 chassis include: automatic degaussing, keyed automatic gain control, solid-state high voltage and deflection multiplier, color level monitor (Chroma AGC), deluxe dc video coupling, channel indicator lights and Instant Color. In addition, a four-stage video IF amplifier is used for more gain in difficult reception areas.

The D17 and D19 is Sylvania's newest generation of Gibraltar color chassis and is designed to be used in portable and table model TV sets.

Most of the circuits are similar to the D14 color-TV chassis, but the following circuits are new: The RC11 remote control, power supply on the D19, vertical circuits, convergence and pincushion circuits.

The service features include: flat-bed construction, plug-in transistors and IC, tuner cluster and yoke plugs, top and bottom panel road maps, elimination of the high-voltage cage and even plug-in tuner transistors on some TV sets.

Sylvania's 1972 line of B/W sets feature a variety of models in the 12-, 9-, 19-, and 22-in. (measured diagonally) screen sizes.

One of the 9-in. and three of the 12-in. models reportedly feature completely solid-state chassis.

Zenith

Zenith broadened the use of solid-state devices with the company's first all-solid-state color-TV chassis, the Titan 110. This chassis is introduced in five 25-in. (measured diagonally) Chromacolor consoles and one console combination, employing five Dura-Modules that plug-in for easy removal.

A complete description of this chassis can be found in the September and October Teklab report.

Zenith's Chromacolor picture tube is now used in 32 of the company's 39 color-TV models in the 19-, 23-, and 25-in. (measured diagonally) sizes, including the two 16-in. diagonal super bright tube sets. *continued on page 73*

If your problem is measuring μV, μA and milliohms in transistorized and integrated circuits . . . Solve it with Triplett's 801

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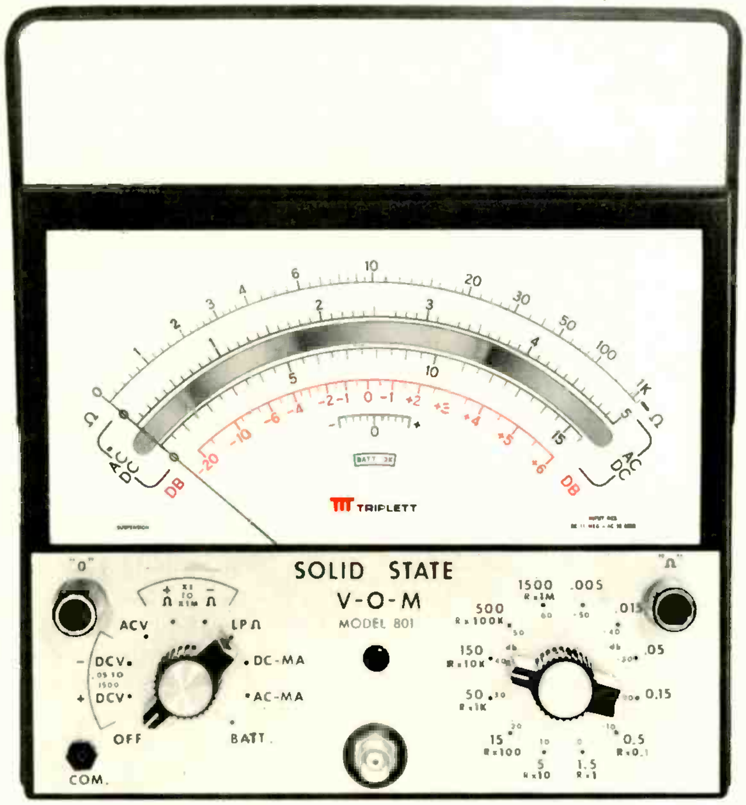

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Understanding Today's Capacitors

by Richard Marsh

Suggested capacitor substitutions for reducing the size of your tool kit and faster servicing

■ It will help to quickly review some of the important points of my previous two articles on "Understanding Today's Capacitors." Understanding the differences between electrolytic and electrostatic capacitors is most helpful. Remember that the electrolytic capacitor is manufactured quite differently from the electrostatic capacitor and is generally used in applications accommodating its broad tolerances. On the other hand, the electrostatic capacitor can be built to very close tolerances and in many instances the circuit demands are critical.

It is worth repeating here the EIA tolerances for electrolytic capacitors. On the other hand, electrostatic capacitors, such as film types, mica, ceramic, etc., are usually built to a ±10 percent tolerance and in many instances even to much tighter tolerances. In the case of mica capacitors, 1 percent or better is available.

Tubular Electrolytic Capacitors

By carefully selecting a very few values and case sizes that do not duplicate, the sly electronic technician can have almost every requirement in his tool kit with relatively few units. Although both 500μf, 25v capacitors and 500μf, 35v capacitors are available on the market, there is certainly no need for the electronic technician to carry around both. The higher voltage rating is all that is necessary. There are many other duplications, some of which may be a fraction of an inch larger for a higher voltage.

To help simplify your selections, I have listed a good coverage group (Table 1). These will satisfy all but unusual cases with the substitution of higher voltage or capacitor ratings, or both. Remember, it is almost always permissible to parallel capacitors. This selection represents a modest investment and broad coverage.

The author is distributor market manager of Cornell Dubilier Electronics.

Aluminum-Can Electrolytic Capacitors

In the case of twist-prong or tab-mounted aluminum-can capacitors, reducing the number of types is not so simple. I have chosen 26 types out of the more than 3000 different combinations available (Table II). They should satisfy a great number of replacement situations. An asterisk (*) is used to designate the most flexible 12 of that group. By inventorying just these 12, you will be amazed by the number of replacements possible in your work.

Table I

Suggested Stock of Tubular Electrolytic Capacitors

VALUE	RATING	SIZE
100μf	35vdcw	3/8 by 1 in.
500μf	35vdcw	5/8 by 1 7/16 in.
25μf	50vdcw	3/8 by 5/8 in.
60μf	50vdcw	3/8 by 1 in.
125μf	50vdcw	1/2 by 1 7/16 in.
250μf	50vdcw	5/8 by 1 7/16 in.
500μf	50vdcw	3/4 by 1 11/16 in.
1000μf	50vdcw	7/8 by 2 in.
2000μf	50vdcw	1 by 2 11/16 in.
5000μf	50vdcw	1 3/8 by 3 5/8 in.
5μf	150vdcw	3/8 by 5/8 in.
30μf	150vdcw	3/8 by 1 1/2 in.
100μf	150vdcw	3/4 by 1 11/16 in.
40μf	250vdcw	5/8 by 1 11/16 in.
160μf	250vdcw	1 by 2 3/16 in.
80μf	450vdcw	1 by 2 11/16 in.
120μf	450vdcw	1 1/8 by 3 in.
10μf	500vdcw	5/8 by 1 11/16 in.
30μf	500vdcw	7/8 by 1 11/16 in.
60μf	500vdcw	1 by 2 1/2 in.

Many of the can sizes that I have chosen are quite long, and where cramped quarters are experienced, substitution will not be possible. And it is not practical to substitute one diameter twist-prong-type capacitor for another—the two sizes in general use being 1- and 1 3/8-in. diameters. For this reason, I have chosen quite a number of 1-in. diameter capacitors that duplicate some of the 1 3/8-in. ones.

Pay particular attention to the fact that these choices include extremely high values of both capacity and voltage, and in many cases it might be desirable to leave some of the sections unconnected, other sections might be connected in parallel. Remember that electrolytic capacitor tolerances are so great that much higher values will rarely create problems.

With the use of adapters, standard mounting facilities can be converted to printed-circuit types, thus eliminating the necessity for inventorying that type of capacitor. The popularity of that capacitor is diminishing.

For those really difficult replacement situations, tubular electrolytic capacitors can be mounted on a special base similar to that used on a twist-prong capacitor. These capacitors can be inserted with the leads

EIA STANDARD

RS-154-B

(Revision RS-154-A)

3.4.5 The tolerance from nominal rated capacitance shall be:

Rated DC Voltage	*Capacitance Tolerance*
From 3 to 50 volts, inclusive	—10% to +150%
From 51 to 350 volts, inclusive	—10% to +100%
From 351 to 450 volts, inclusive	—10% to + 50%

Table II

Suggested Stock of Aluminum-Can Electrolytic Capacitors

VALUE	RATING	SECTIONS	SIZE
1250 to 2500µf	20vdcw	2	1 by 3 in.
1250 to 2500µf	20vdcw		
*100 to 200µf	200vdcw	2	1 by 4 in.
100 to 200µf	200vdcw		
*70 to 100µf	300vdcw	2	1 by 3½ in.
70 to 100µf	300vdcw		
40 to 60µf	350vdcw	2	1 by 2½ in.
30 to 40µf	350vdcw		
*250 to 500µf	50vdcw	3	1 by 3 in.
250 to 500µf	50vdcw		
250 to 500µf	50vdcw		
250 to 470µf	100vdcw	3	1⅜ by 3½ in.
150 to 300µf	100vdcw		
120 to 220µf	100vdcw		
*60 to 100µf	150vdcw	3	1 by 2½ in.
60 to 100µf	150vdcw		
60 to 100µf	150vdcw		
40 to 60µf	200vdcw	3	1 by 2½ in.
40 to 60µf	200vdcw		
30 to 40µf	200vdcw		
*100 to 150µf	250vdcw	3	1 by 4 in.
60 to 100µf	250vdcw		
30 to 50µf	250vdcw		
*20 to 30µf	450vdcw	3	1 by 3½ in.
20 to 30µf	450vdcw		
30 to 30µf	450vdcw		
*15 to 20µf	500vdcw	3	1 by 3 in.
15 to 20µf	500vdcw		
15 to 20µf	500vdcw		
*1250 to 2500µf	25vdcw	4	1⅜ by 4 in.
1250 to 2500µf	25vdcw		
1250 to 2500µf	25vdcw		
1250 to 2500µf	25vdcw		
1500 to 3000µf	40vdcw	4	1⅜ by 5⅛ in.
1000 to 2000µf	40vdcw		
750 to 1500µf	40vdcw		
500 to 1000µf	40vdcw		
*500 to 1000µf	50vdcw	4	1⅜ by 4 in.
500 to 1000µf	50vdcw		
500 to 1000µf	50vdcw		
500 to 1000µf	50vdcw		
300 to 500µf	100vdcw	4	1⅜ by 5⅛ in.
300 to 500µf	100vdcw		
300 to 500µf	100vdcw		
300 to 500µf	100vdcw		

VALUE	RATING	SECTIONS	SIZE
350 to 500µf	150vdcw	4	1⅜ by 4½ in.
150 to 250µf	150vdcw		
150 to 250µf	150vdcw		
150 to 250µf	150vdcw		
200 to 250µf	200vdcw	4	1⅜ by 5⅛ in.
400 to 650µf	180vdcw		
30 to 50µf	180vdcw		
7 to 10µf	180vdcw		
250 to 400µf	200vdcw	4	1⅜ by 5⅛ in.
200 to 300µf	200vdcw		
120 to 200µf	200vdcw		
60 to 100µf	200vdcw		
150 to 250µf	250vdcw	4	1⅜ by 4½ in.
150 to 250µf	250vdcw		
60 to 80µf	250vdcw		
30 to 50µf	250vdcw		
120 to 200µf	350vdcw	4	1⅜ by 4½ in.
100 to 150µf	200vdcw		
60 to 100µf	200vdcw		
60 to 100µf	200vdcw		
*150 to 250µf	350vdcw	4	1⅜ by 5⅛ in.
100 to 150µf	350vdcw		
60 to 100µf	350vdcw		
15 to 25µf	350vdcw		
275 to 350µf	350vdcw	4	1⅜ by 5⅛ in.
30 to 50µf	350vdcw		
30 to 50µf	350vdcw		
7 to 10µf	350vdcw		
60 to 80µf	450vdcw	4	1⅜ by 4½ in.
40 to 60µf	450vdcw		
60 to 100µf	250vdcw		
60 to 100µf	250vdcw		
*80 to 100µf	450vdcw	4	1⅜ by 5⅛ in.
80 to 100µf	450vdcw		
60 to 80µf	450vdcw		
30 to 40µf	450vdcw		
50 to 60µf	500vdcw	4	1⅜ by 4 in.
30 to 40µf	500vdcw		
30 to 40µf	500vdcw		
30 to 40µf	500vdcw		
*60 to 80µf	500vdcw	4	1⅜ by 3½ in.
30 to 40µf	500vdcw		
20 to 30µf	500vdcw		
15 to 20µf	500vdcw		

protruding through the lug assembly at the base of the unit. The common ends can then be fastened together on a vertical support, which is the can side of the original capacitor.

This bundle of capacitors will often be wider than the original component. However, in most cases you will find that there is room in one or more directions on the chassis.

In the event that you are confronted with a twist-prong capacitor that has a positive common, you can simply insert the individual capacitors in the opposite direction to satisfy this condition.

In the event that a non-polarized twist-prong capacitor is encountered, put both positive ends through the respective solder lugs and connect the negative ends together—remembering *not* to ground them. In this situation, you have to use capacitors with higher voltage ratings and twice the capacity of the original. Example: Two 100µf, 450vdc capacitors connected back-to-back will result in a 50µf, 300vac equivalent capacitor.

Although you will find it more costly to substitute capacitors, I am sure that you value your time. The importance of customer satisfaction resulting from quick and efficient completion of the job will more than offset the modest difference in cost.

continued on next page

Paper-Mylar* Capacitors

The dipped paper-mylar* capacitor is the best choice for universal by-pass capacitor replacement. I have chosen 22 values (Table III)

Table III

Suggested Stock of Paper-Mylar* Capacitors

VALUE	VALUE	VALUE
.0010µf	.0050µf	.033µf
.0015µf	.0068µf	.047µf
.0020µf	.010µf	.050µf
.0022µf	.015µf	.068µf
.0030µf	.020µf	.10µf
.0039µf	.022µf	.20µf
.0047µf	.025µf	.25µf
		.33µf

out of the many that are available. You will note that those listed have 600v ratings. Those that I have intentionally omitted from this group can be found amongst those available with 1600v and 2000v ratings.

There is certainly little harm in using higher voltages, and the difference in cost is negligible. In most instances, a great deal of latitude is available in the replacement of this class of capacitor. However, there are some circuits that do demand relatively close tolerances.

The dipped paper-mylar* capacitor is a suitable replacement for molded wax, paper, mylar* and combination dielectrics generally found in consumer-electronic products.

Remember that the dipped paper-mylar* capacitor is a dc rated component. You must, therefore, go to a higher voltage rating if this type capacitor is to be used in ac applications. Example: a 200vac application will require a capacitor rated between 400vdc and 600vdc.

Mica Capacitors

There are many thousands of different mica capacitors manufactured—most of them finding their way into computers, military and commercial applications. Surprisingly few of these components are used in consumer electronic products, and they are seldom ever replaced.

In Table IV I have listed a selection that should cover most of the needs of an electronic technician. All are the dipped type and have 5 percent tolerances.

Mica capacitors can be readily obtained with 1 percent tolerances or even better on order or by selection. Remember, you can take a mica capacitor with a relatively high value and parallel it with one having a very small value to obtain small corrections. As an example: A 100pf capacitor could be connected in parallel with a 5pf capacitor to obtain a combined capacitance of approximately 105pf.

Disc Ceramic Capacitors

I have not made a suggested list of disc ceramic type capacitors, since many of the circuits in which they are used are frequency critical and the cost of this component is relatively small. It is not expensive to have quite a number of them on hand.

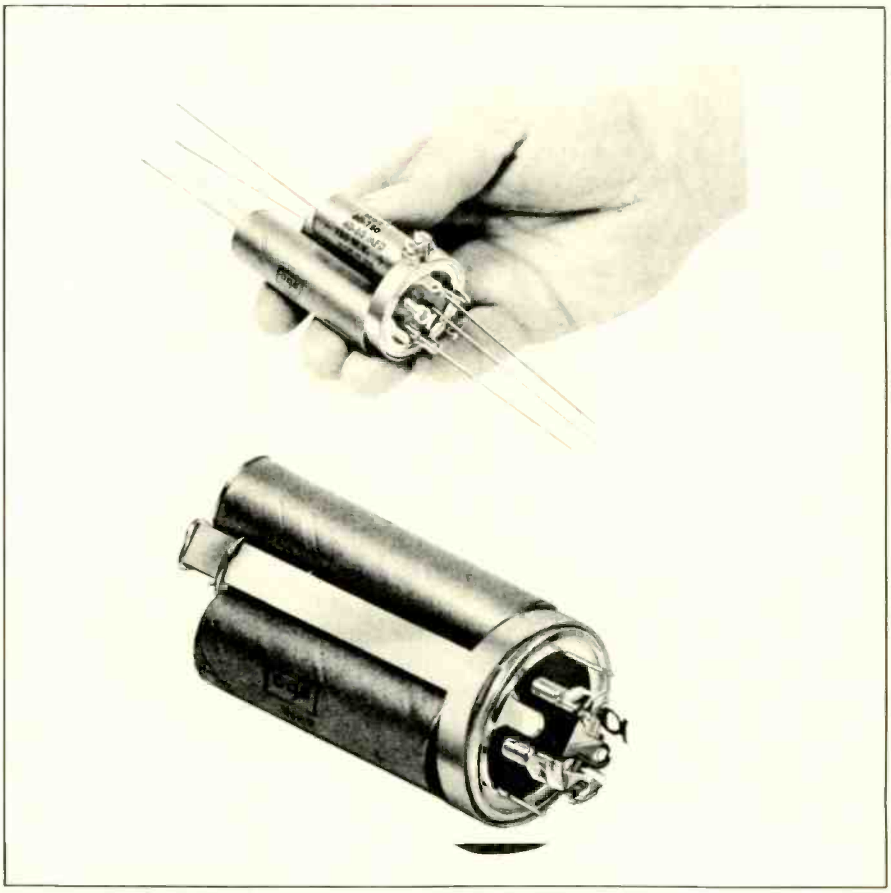
Conclusion

The consumer-electronic market has expanded rapidly during the past few years, and today it is not always possible to conveniently get an exact replacement part. Capacitors are a good example of a component that can be replaced quickly and with a minimum of inventory. Use your ingenuity and knowledge of components to improve your effectiveness and profit. The wise and successful technician recognizes what most of his needs are and carries an adequate stock of components carefully selected to accommodate most of the situations that he may encounter. ■

Table IV

Suggested Stock of Mica Capacitors

VALUE	VALUE	VALUE	VALUE
5pf	56pf	270pf	680pf
10pf	68pf	300pf	750pf
18pf	75pf	330pf	820pf
22pf	82pf	360pf	1000pf
27pf	100pf	390pf	1100pf
33pf	120pf	430pf	1500pf
39pf	150pf	470pf	1800pf
43pf	180pf	510pf	2000pf
47pf	200pf	560pf	2200pf
51pf	240pf	620pf	2400pf
			3300pf



Tubular electrolytic capacitors can be mounted on a special base similar to that used on a twist-prong capacitor.

* Trade Mark Dupont

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8. Coliseum Server
9. Stemware monogram glasses
10. Black Walnut Cheese Board
11. Crystal Cocktail glasses monogrammed
12. Couroc Companion Bowl
13. Royal Dane Circlette Tray
14. Black Walnut Candy Bowl
15. RCA WV-519A VOM
16. RCA WV-518A VOM
17. RCA WV-516A VOM

RCA Test Instruments

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- Sweep Chanalyst WR-514A
- Crystal-calibrated Marker Generator WR-99A
- Solid State Master Volt Ohmyst WV-510A
- Senior VoltOhmyst WV-98C
- Solid State Volt Ohmyst WV-500B
- In-Circuit/Out-of-Circuit Transistor Tester WT-501A
- Dual Solid State Regulated DC Power Supply WP-702A
- 5" Oscilloscope WO-505A
- 3" Oscilloscope WO-33A
- Color/B&W Picture Tube Tester WT-509A

RCA

. . . for more details circle 134 on Reader Service Card

William T. Buschmann is vice president of Marketing for the Electronic Components Group of GTE Sylvania Incorporated. He and his staff have their offices at the group's headquarters in Waltham, Mass.

GUEST AUTHOR

Adjusting to Changing Markets

by William Buschmann

What the future holds for us in the dynamic and fast-changing electronics industry

■ Every manufacturer of electronic components used in home entertainment equipment is aware of the important role played by independent electronic technicians and dealers. These are the businessmen who deal directly with and must satisfy the often demanding requirements of our ultimate customer, the consumer. It's not an easy task, but it can be a rewarding one. In this article, I would like to comment on the existing marketplace and give you my ideas on what the future holds for us in the dynamic and fast-changing electronics industry.

As you are well aware, the last 20 years have seen many changes in products and markets which have affected both manufacturers and dealers. We have had to make many adjustments in order to survive and prosper. I think it is a tribute to the people in our industry that we have been able to acclimate to these changes and grow at a rate which far outpaces other segments of the economy. In your case, it has been possible only because you've recognized the dangers of obsolescence and have made a conscious effort to keep abreast of the new products and technologies. In most cases, this has meant extra hours devoted to technical manuals, training seminars and special courses. In this respect, we are not unlike other professions whose members must constantly study, absorb and implement new techniques to keep up with the state-of-the-art.

In your specific area of interest—home entertainment equipment—I see further product evolution and continuing market changes. Before examining these, I want to discuss the outlook for one of our mainstay products—replacement tubes.

In my opinion, tube sales will remain strong in the near-term future because manufacturers will continue to use them extensively in TV receivers at least until mid-decade and usage will decline only gradually thereafter. By 1975, about 120 million TV sets will exist in this country and, of sets then in production, some 45 percent of the color-TV models and 75 percent of the B/W-TV types will utilize receiving tubes. I believe that renewal sales of receiving tubes will average almost 100 million units annually through 1975 and sales of replacement color picture tubes will approach 1.5 million per year by that date. I think you will agree that these indications promise a healthy replacement tube market for some time.

Although the tube business remains a viable one, we must also recognize the importance and growing usage of semiconductors in home entertainment equipment. Many contemporary products are hybrid models and some are completely solid-state. There is no doubt that manufacturers will design these devices into new equipment in increasing numbers. Because of its growing significance to you, our semiconductor replacement line figures prominently in our future plans. It will be expanded and refined as market conditions dictate.

But what about the new products that these components will be used in? How do they affect you and your business? I believe they represent profitable opportunities for us. It has been estimated that total consumption of home electronic products will reach $8 billion by 1974. TV and entertainment systems will account for a large share of this, but other sophisticated electronic devices are gradually coming into use. I am referring to items which offer utility, efficiency and convenience to the entire family. Many such products are available now, others are in development and more are on the horizon. They include: medical electronics equipment, anti-intruder alarms, microwave ovens, automotive safety and pollution control systems, central lighting controls, automatic garage door openers, film and video tape recorders, and home communication centers utilizing centralized computers. These are just a few of the exciting new products which have been or will be introduced to consumer markets. They all share one thing in common. They employ electronic components which will eventually require replacement or repair. These, of course, are the new business opportunities I mentioned earlier.

With continued effort on your part, you can be ready to capitalize on changes in the marketplace as they materialize. I recommend that you keep track of emerging products and developments in several ways —stay current with product literature, ads and introductions; sub-

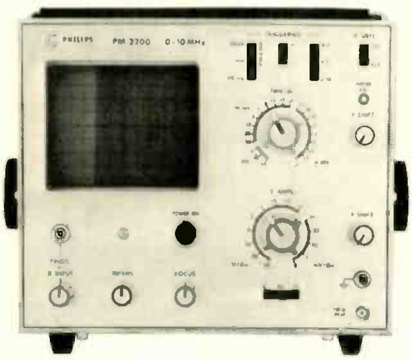
continued on page 76

TEST INSTRUMENT REPORT

Philips PM 3200 Scope

by Philip Dahlen

Designed to speed and simplify testing procedures



Philips PM 3200 Scope. For more details circle 900 on Reader Service Card.

■ At one time I worked in an electronic research lab using some of the most sophisticated scopes then available. Unfortunately the many knobs on their front panels were frequently too tempting for those passing through and upon returning to my scope I occasionally found it inoperative. It can be extremely frustrating to trace down the scope controls only to discover that the desired waveform couldn't be obtained because the intensity control had been turned down or the stability control had been readjusted—there were just too many controls to check. This scope has been designed to virtually eliminate such problems.

Manufacturer specifications indicate that dc balancing, trigger-level setting, time-base synchronization, stability adjustment, and astigmatism correction are all automatically accomplished or rendered unnecessary by new circuits so that controls for these functions are no longer required—not even in screwdriver adjustment form. The only controls required for operating this scope are shown in the accompanying front panel photograph.

Other interesting manufacturer specifications for this scope include the following:

Vertical Amplifier

Sensitivity:	2mv/div. to 50v/div. (0.75cm = 1 div.), ±3%, 14 ranges
DC frequency response:	DC to 10MHz (—3dB)
AC frequency response:	2Hz to 10MHz (—3dB)
Rise time:	35ns
Input resistance:	1M
Input capacitance:	30pf
Maximum input voltage:	400v (dc + peak ac)

Sweep Circuit

Sweep system:	Triggered or free running in absence of input signal
Sweep time:	100ns/div. to 0.5s/div. ±5%, 21 ranges

Triggering

Type:	Internal, line frequency or external (1v p-p or higher)
Trace slope:	Positive or negative
Trigger level:	Mean (trigger derived from average ac component value of signal), Top (trigger derived from peak ac component value of signal) or HF Reject (trigger derived from peak component value of signal, via low-pass filter and demodulator)
Range:	10Hz to 1MHz, minimum 1 div. of deflection 1MHz to 10MHz, minimum 2 div. of deflection

Horizontal Amplifier

Sensitivity:	300mv/div.
Frequency response:	10Hz to 100kHz (—3dB)
Input resistance:	100K (approximately)
Input capacity	25pf or less

Power Requirements

Line voltage:	100 to 125vac or 200 to 250vac, 40 to 400Hz, 20va maximum
External dc:	22 to 30vdc, 0.6a maximum
Portable battery:	Available as a 10-lb option adding 2.3 in. to overall scope height

Dimensions

6.8 in. H by 8.3 in. W by 13 in. D.

Weight

11.7 lb

COLORFAX

The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

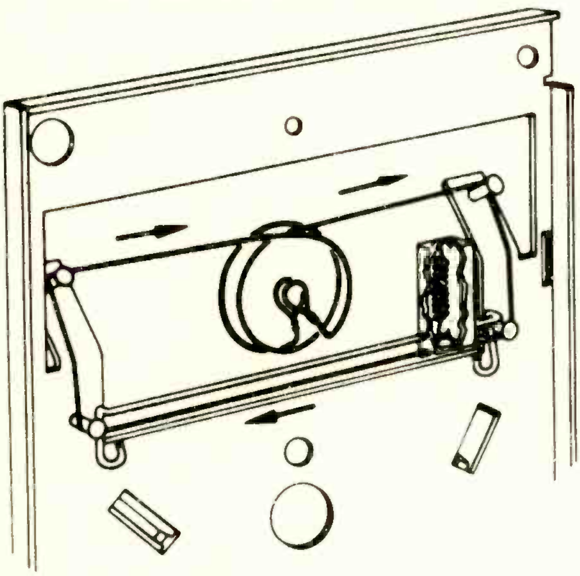
MAGNAVOX

Color-TV Chassis T950/T951/T958/T962—UHF Dial Cord Breakage

It has been determined that breakage of the UHF dial cord has in some cases been caused by the dial cord rubbing against sharp burrs on the edges of the cord guide flanges of the tuner mounting assembly in the front panel (see illustration).

To eliminate this problem, Teflon rings (Part No. 103142-1) are being placed over the brass guide posts, on

UHF INDICATOR STRINGING

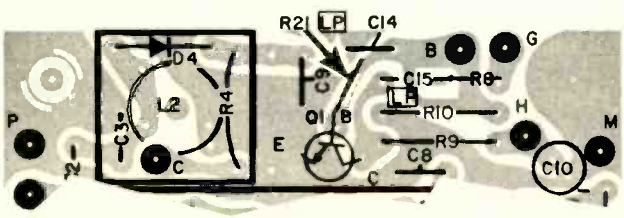


the outer end of the guide flanges, and located between the dial cord and the metal flanges. The Teflon ring will keep the cord from rubbing against the flange edges. These rings can be easily installed and are available from your Magnavox parts center.

Color-TV Chassis Early T950/T951 with Remote Control—Protection of the Coincidence Gate Transistor

On early production versions of these chassis it is possible that coincidence gate transistor Q1 on the AFT board could be damaged as a result of a high-voltage arc within the chassis. To prevent such damage, a 100Ω resistor, R21, was added in series with the base of Q1 in later versions of these chassis.

AUTOMATIC FINE TUNING (AFT) BOARD
(EARLY PRODUCTION)



If transistor Q1 on an early version AFT board should require replacement, a 100Ω protective resistor should be added to the circuit at the same time. To accomplish this, cut the copper clad off the AFT board between the base of Q1 and the junction of C14, as shown in the illustration, install a 100Ω, ½w resistor, R21, in series between the base of Q1 and point B on the AFT board.

Remote Control Receivers 704058/704064/704065—Faulty Capacitor Causing Distorted Audio in TV Set

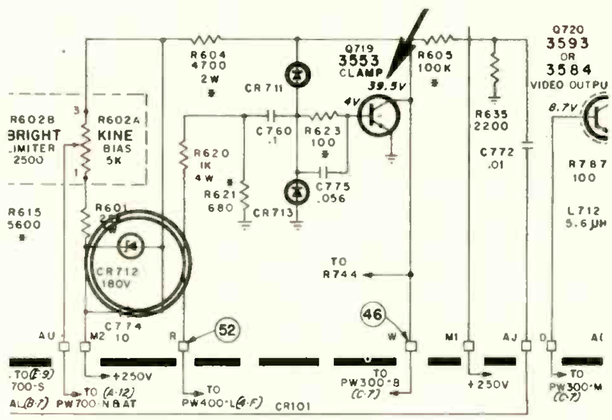
Distorted audio from the TV receiver can be caused by a faulty 0.47μf capacitor (C35 in models 704058 and 704064, C34 in model 704065) located in the collector circuit of the sound mute control transistor (Q19 in models 704058 and 704064, Q20 in model 704065).

RCA SALES CORP.

Color TV Chassis CTC 40, 44, 47—Brightness Problems Caused by Diode CR712

Some brightness symptoms in these chassis, which are generally associated with CRT circuitry, may be caused by a leaky or shorted zener diode, CR712. The symptoms may include—retrace lines in raster—inability to cut off raster

schematic correction
normal reading 139.5V



with brightness control—not possible to extinguish lines with screen and/or kine bias controls during color temperature setup procedure. The collector voltage of the clamp transistor, Q719, should read 139.5v.

ADMIRAL

Color-TV Chassis K16/K17/K18/K20—New HV Rectifier Tube

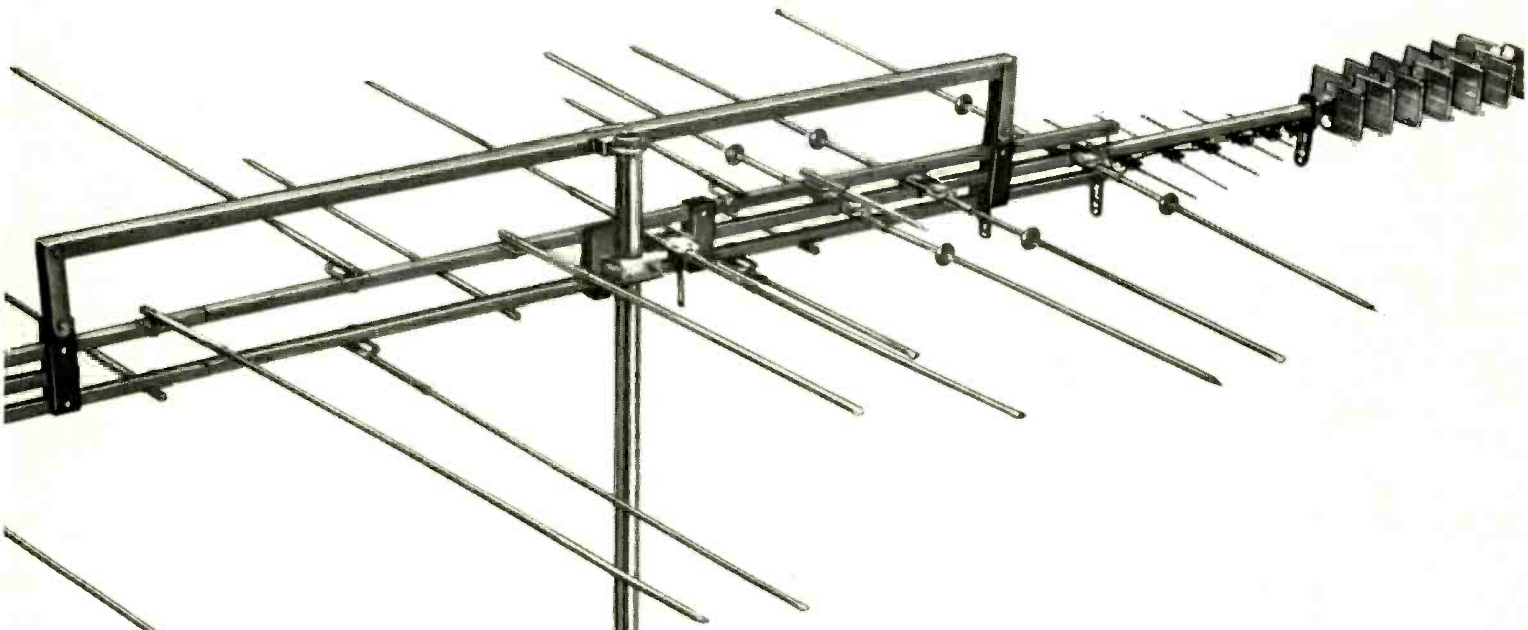
Effective June 1, 1971, TV receivers produced must meet the new X-radiation regulation set forth by the Department of Health, Education and Welfare.

The new regulation requires that the TV receiver may not exceed 0.5 milliroentgen per hour limit under fault conditions; i.e., this limit must not be exceeded even with receiver-component failure.

In line with these regulations, a new high-voltage rectifier tube is now being used in some color-TV receivers. A 3DF3A tube is used in place of the 3DF3 tube in the K16, K17, K18, and K20 chassis. This new tube has a lower X-radiation specification.

Any TV receiver coming from the factory with the 3DF3A high-voltage rectifier tube should be replaced with the same tube type.

Engineered for outstanding reception – Zenith outdoor antennas for Color TV!



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- Tapered UHF grid driver on UHF/VHF Zenith antennas.
- Staggered square UHF directors on UHF/VHF Zenith antennas.
- Low-impedance, triple boom construction.
- Gold-color alodized coating (to help antennas look better and last longer, with greater corrosion resistance and electrical conductivity).

Your Zenith Distributor has the complete line of Zenith quality-engineered TV antennas and antenna accessories. His staff has the technical experience and knowledge of your area to recommend the best antenna for any installation.

Why not sell the best

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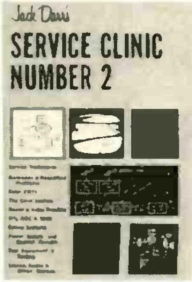
Jack Darr's Service Clinic No. 2



Here's more of the Jack Darr wisdom (and wit!) in book form—a valuable collection of timely service hints and trouble solutions covering color and monochrome TV, radio, stereo, phonos, recorders, CB gear, etc. Discusses the "engineering" servicing approach, efficiency, and how a technician may condition his thinking to produce more in a given time period. Like the first volume, the content was selected on the basis of usefulness to the average technician, covering a wide range of electronics devices. Each of the 10 chapters covers a general category of interest, and in each the subject matter is arranged in logical order to enable you to find what you need quickly. Not only provides a wealth of information, but also hours of enjoyable reading. 176 pps., numerous illus. Hardbound.

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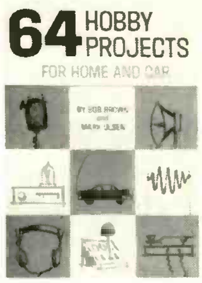
64 Hobby Projects For Home & Car



Here's a variety of gadgets bound to please almost everybody—from the hobbyist and experimenter to the engineer who likes to make things in his home workshop. From an auto ice alarm to a vibrator rejuvenator, from an amazing electric candle that lights with a match to a splash alarm for the swimming pool, there's a host of fun-to-build devices, many of which are quite unique. Some are simple, while others are more involved. Some you can put together in less than an evening; others offer more of a challenge. For the home there are 28 individual projects, for the car a total of 36, each accompanied by a schematic and or pictorial diagram and parts list. If you like to build, here's a fine collection of practical projects with everything worked out for you except the fun! 192 pps. Hardbound.

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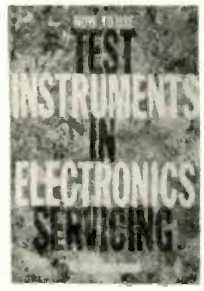
How to Use Test Instruments in Electronics Servicing



A long-needed, practical handbook on test equipment applications — ranging from the use of audio gear to tube and transistor checkers. Just what you need to put your test equipment to work. Not a "how-it-works" treatment, but a "how-to" manual describing specific tests and troubleshooting techniques for the electronic technician. You'll discover new ways to use your scope and several new "tricks" you can perform with multitesters. You'll learn signal-injection troubleshooting, how to measure inductance and capacitance with the help of your signal generator, pointers and pitfalls for using markers, sweeps and pattern generators, shortcuts and special techniques for color TV troubleshooting, how to test audio circuits and FM stereo equipment, and much more. 256 pps., over 200 illus. Hardbound.

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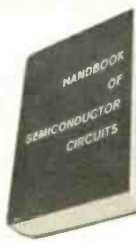
Handbook of Semiconductor Circuits



Contains 124 examples of standard transistor circuits, complete with operational data for amplifiers, oscillators, logic and switching circuits, power supplies, and various nonlinear circuits. The broad range of circuits included were selected on the basis of application and practicality. A design philosophy section is included with each group of circuits, thereby providing a basis for understanding circuits other than those selected as examples. This is not a handbook of "preferred" circuits, but rather a collection of practical circuits which have wide application and exemplifying good engineering design. Each circuit description includes data concerning any unique design or operational data, along with schematic diagrams. Hundreds of illustrations and diagrams. 448 pps., 6" x 9". Hardbound.

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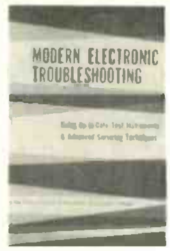

A down-to-earth handbook that deals with today's electronic servicing problems on a practical level, using modern test instruments and advanced troubleshooting procedures to cope with the special problems created by printed boards and solid-state circuitry. It is hard to conceive of a book that encompasses monochrome and color TV, multiband radio receivers, hi-fi equipment, tape recorders, two-way communications equipment, and test instruments for servicing all this equipment. Yet this book does! By getting right to the subject of how to service the equipment without the usual wordy theoretical discussions of how the circuits work. An all-inclusive servicing guidebook service technicians have been asking for. 256 pps., over 100 illus., 5 big sections, 24 chapters.

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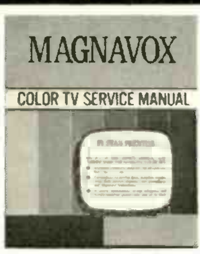
Magnavox Color TV Service Manual



All the data you need to repair Magnavox color TV receivers—from the Series 37 to T940 chassis—including 12 full-size schematic diagrams complete with oscilloscope waveforms. Singled out for special treatment is the Magnavox T936 hybrid chassis. The special servicing data given will enable you to master this unique chassis. Also included are 34 tuner schematics, and a host of case history solutions and factory modifications. You'll find numerous alignment shortcuts and tips on troubleshooting tricky solid-state circuits. In addition, as a bonus there are chapters on general color TV troubleshooting, antennas and transmission lines, and another on test equipment techniques. 160 pps., 8½" x 11", plus 36-page foldout section containing 12 full-size schematic diagrams. Long-life vinyl cover.

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How to Use Vectorscope-Oscilloscopes, Sweep-Marker Generators

At last, a practical guide that tells how to use modern TV test instruments. Scope types and specifications are covered, including DC dual-trace amps, and probes. Thoroughly explains vectorscopes, with details on vector timing charts, demodulated patterns, phase and frequency measurements; practical oscilloscope applications, encompassing how to make peak-to-peak and DC measurements, time-base measurements, video and sync waveform analyses; sine, square, and triangular wave testing; using the new push-button signal & sweep-marker generators; vectorscope trouble-shooting and alignment techniques: how to isolate defective ICs and transistors, using as examples more of the current modular TV circuits. 256 pps., over 225 illus.

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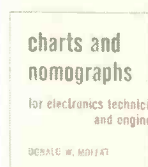
Charts & Nomographs for Electronic Technicians & Engineers



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NEWS . . .

continued from page 32

ISCET Report Describes Its Executive Director

I have been asked several times, "What is the history of the ISCET?" and "What are its goals?" Now, these are good questions, and I didn't know all the answers. But I did know who to ask. And I think you'd enjoy meeting him.

Ron Crow, CET

Ron Crow, CET, is the Executive Director of the International Society of Certified Electronic Technicians (ISCET). He is also past chairman and one of its founders. To give you a thumbnail sketch: He is 37, married and has four children. He now teaches electronics at Iowa State, where he graduated with a BSEE degree in 1961. He is a Phi Delta Kappa. His practical experience has covered three years in electronics repair, six years in industrial electronics, and meanwhile he has been teaching. Like a lot of us, he became interested in electronics in the service—Navy for Ron. He has also been certification director (CET) for the NEA. His message should indicate his dedication:

Going into our second year, the ISCET is off to a big start. Besides an increasing rate of new members, our old members are signing up for their second year promptly on their anniversary date. This loyalty to our society makes me ever more aware of our members' belief that ISCET is beneficial, needed and important in the field of consumer electronics.

I am finding that the group of new officers elected in Portland are gentlemen dedicated to increasing our professional standing. With their leadership and abilities, I look for great strides forward in advancing our goals.

Ron Crow, CET
Executive Director, ISCET

A brief history of ISCET development would have to include names like Mr. O. C. Brown, CET; Emmett Mefford, CET; J. A. "Sam" Wilson, CET; Warren Baker, CET; Les Nesvik, CET; Dick Glass, CET; Lew Russel, CET; Ron Crow, CET; and others. The CET program was initiated in 1966. Naturally, as CET's gathered, discussions about organizing became frequent and the need was obvious.

In December of 1969, inquiry was sent to the CET's requesting their ideas, and resulting in a 95 percent favorable reply for an organization. So, plans were made by the NEA to create the ISCET. By convention time, St. Louis, July, 1970, it had become official. ISCET is a subsidiary organization under the wing of NEA.

The position of the ISCET in the industry is now very clear, and it has had one important accomplishment: a seat on the Electronics Industry Council (EIC), where it has been a professional and respected participant. ISCET's goals are numerous, but "professionalism" for the electronic technician is foremost.

Did you know that the "International" is quite true? The ISCET is represented by members in Canada, Germany, Guam, South Vietnam, Brazil, Argentina, Mexico, etc. The membership is very close to 500 at the time of this writing.

Join the ISCET and see!

For additional information or a membership application, contact Ron Crow, CET, 1306 Douglas, Ames, Iowa 50010 or Ed Schon, CET, 5944 N.E. Sandy Blvd., Portland, Oregon 97213.

Ed Schon, CET
Public Relations Committee, ISCET

Service Dealers Begin Supporting Project TRIP

Although the Television Reception Improvement Program (TRIP) was not scheduled to start until October 1, 1971, a number of aggressive antenna installers and service dealers got on the bandwagon early with TV spots, radio spots and newspaper ads in cooperation with wholesale distributors and manufacturers.

As an example: The Ed Reich Co. of Indianapolis, Ind. has a TRIP program in progress which includes 100 TV ad spots on Channel 13, a half-page Sunday newspaper supplement ad, plus a continuing ad program on radio and in newspapers.

This project, running from October 1, 1971 to October 1, 1972, is undertaken through the Electronics Industry Council to improve the quality of TV reception by educating the consumer to the need for adequate antennas and accessories. It is to act as a stimulus to all segments of the electronics industry to combine their efforts so that they can jointly work together in bringing about satisfactory TV viewing—thereby improving the home entertainment industry for the benefit of the various segments of it—most importantly, for the consumer.

The TRIP coordinating committee consists of the following men: Sidney Sabel, chairman, 5130 San Felipe, Houston, Texas 77027. Eugene Hill, vice president of engineering, Kaiser Broadcasting, Kaiser Center, 300 Lakeside Dr., Oakland, Calif. 94604. Morris L. Finneburgh, Sr., EHF, chairman of the board, The Finney Co., 34 W. Interstate St., Bedford, Ohio 44146. This committee will oversee the entire TRIP project.

Various segments of this program include: TV Station Promotion, which supplies local TV stations with artwork and audio-visual works designed to show the TV set owner and viewer the advantages of proper reception, adequate antennas and accessories; Speakers Bureau, which will send TV station engineers to dealer and technician meetings and other groups, answering questions concerning specific reception problems; Antenna Manufacturer Involvement, which will work to coordinate their advertising campaigns; Electronics Parts Distributor Involvement, which will encourage all distributors to increase promotion of items associated with the TRIP project; Electronics Sales/Service Dealer Involvement, which will encourage members of the three major trade associations (NARDA, NATESA and NEA) to attend sales and training sessions; Electronics Trade Press Action; and Manufacturer Involvement, which will initiate the development and distribution of consumer pamphlets.

Motorola Initiates Inspection of One Portable Color-TV Model

Motorola has announced an inspection and modification program for a recently introduced 19-in. (diagonally measured) portable color-TV set model which, under certain conditions, could reportedly present a possible shock hazard. About 3000 units are involved, with most believed to be in wholesale distributor and dealer inventories.

Owners of Motorola Model WP581HW are urged by the company to immediately disconnect this color-TV set and phone the retailer from whom the product was purchased or they can phone Motorola collect (312-451-1000) and ask for Ed Gaiden, national service manager.

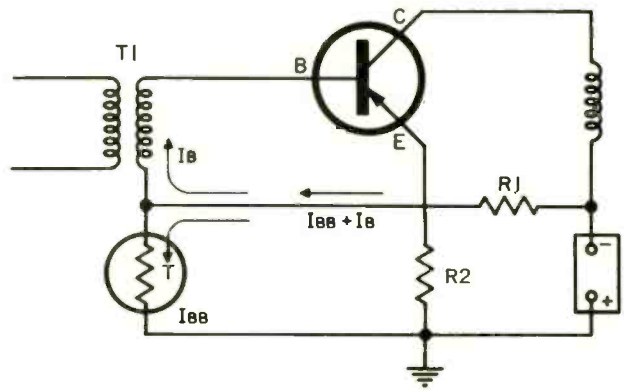
TECHNICAL DIGEST

The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

WESTINGHOUSE

Thermistor Compensating Circuits

A thermistor is a temperature-sensitive element that is used to reduce the effects of temperature changes in the base-to-emitter junction of a transistor. The thermistor is actually a temperature-sensitive resistor that decreases resistance as the temperature rises. It is shown in the illustration as part of a base voltage divider. The thermistor can be used in either the base or the emitter circuit. Its purpose is the same in each case—to slightly reduce the forward bias as the temperature increases, keeping the collector current within limits.



In normal operation there is a base current (I_B) and a base bias current (I_{BB}) which flow through resistor R1. The bias current (I_{BB}) returns to ground through the thermistor, while the base current goes through the base lead to the emitter. The polarity of the voltage drop across the thermistor sets the forward bias. If the temperature rises, the resistance of the transistor's base-to-emitter junction decreases and more collector current is allowed to flow. However, at the same time, the resistance of the thermistor decreases, and more current is allowed to flow through it also. This increased current flows through resistor R1 and causes a larger voltage drop across it. The voltage that is available for forward bias is therefore reduced. And with it, collector current is also reduced to a safe value.

Thermistors are not made of the same material as transistors, so they naturally do not have the ability to change resistance at the same rate as the temperature rises. This tracking characteristic does not prevent the use of thermistors in many circuits, since it does track well enough for most applications. For more critical circuits, diodes are substituted for thermistors.

RCA SALES CORP.

TV-Chassis KCS186—Video Output Transistor Q504 Failure

Video output transistor failure symptoms in this chassis may be similar to those associated with AGC problems—overloaded picture on strong signals, relatively normal on weak signals.

For continued protection of this transistor, make certain that there is a neon bulb mounted on the picture tube socket. The bulb, stock No. 130043, should be connected between the grid (green lead) and ground. The lead attached to the grid must be as short as possible.

continued from page 45

speaker was also connected across the output terminals at the same time. The waveform (Fig. 5) shows only some loss of lower-frequency harmonics.

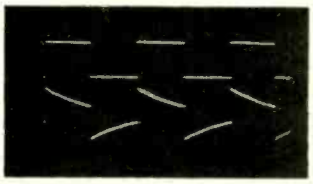


Fig. 5—Upper scope trace shows 20Hz square-wave signal applied to receiver auxiliary input and resulting waveform (lower trace) across loaded speaker terminals. The volume was kept comfortably low, but there was still a slight smell of smoke from the 8Ω speaker.

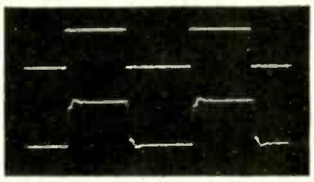
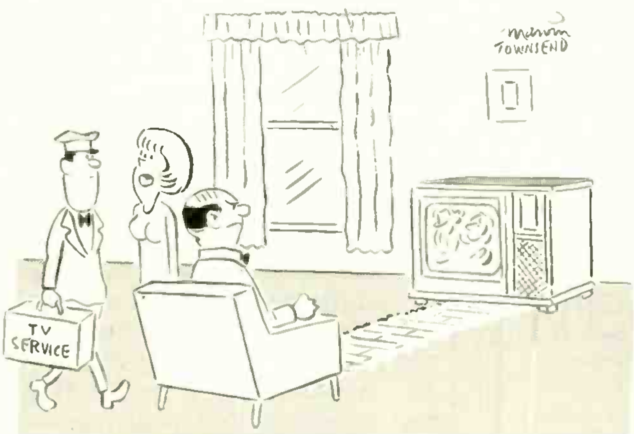


Fig. 6—Upper scope trace shows 20kHz square-wave signal applied to receiver auxiliary input and resulting waveform (lower trace) across loaded speaker terminals. The volume was again kept comfortably low.

When applying a 20kHz square wave, with the speaker still connected, the resulting waveform (Fig. 6) is even more impressive, there being but a slight shift and loss of higher-frequency harmonics.

Next month's continuation of this article shows how some of the circuit boards can be hinged away from the chassis, and includes top and bottom views of the chassis with the boards removed. Also shown are the nine individual circuit boards after they have been removed. The article tells of the unique and interesting features found in this receiver and includes many of the manufacturers' specifications. ■



"It has to be constantly adjusted."

TEKLAB ...

continued from page 42

receiver, in the frequency range of 34.0kHz to 44.5kHz. The signal is received by the microphone, amplified by a four stage broadband amplifier, and coupled to eight tuned circuits. Each circuit is resonant to a specific frequency, and a driver transistor is associated with each tuned circuit. The signal is coupled through only the one tuned circuit which is resonant to the signal frequency. The signal then turns ON a driver transistor, which, in turn energizes a Triac. All eight channels operate in this manner, only the frequency to which their input circuit is tuned is different.

For instance, if we press the COLOR DOWN button on the transmitter, the frequency of the radiated signal is 34.0kHz, and only one tuned circuit is resonant at this frequency. The signal is coupled to driver transistor Q7, which energizes Triac K3, applying ac power to the COLOR control motor, which rotates and turns the COLOR control down.

If the COLOR UP button is pressed, the radiated signal frequency is 35.5 kHz. Transistor Q8 will turn ON and energize Triac K4, which will apply ac power to the COLOR control motor, which rotates and turns the COLOR control up.

Each time the ON/OFF circuit is activated, the TV receiver will change its operating state. When a signal frequency of 38.5kHz is received, transistor Q9 energizes relay RL1 and ac is applied to a control relay on the TV chassis, which turns the TV set ON or OFF. If the switch function is used again, the TV receiver will change its operational state again.

The Automatic-Off circuit is of special interest to viewers who fall asleep during the late movie, and it is associated with the ON/OFF circuit. The operation of this circuit depends upon the presence or absence of sync pulses in the TV chassis. The circuit is held inactive when sync pulses are present, but when the sync pulses are absent, as when a station signs off the air, the circuit is allowed to become active. There is a time delay associated with the circuit to allow a time interval between loss of station signal and set turn-off.

The remote control receiver also employs a VHF search tune circuit. When the VHF tune button is depressed, the 37.0kHz signal activates Triac K6, which applies power to the VHF motor. The motor rotates the tuner until a station is received and then stops automatically. Search circuits are used to stop the tuner motor when the presence of a station is indicated by the appearance of composite sync pulses and the 45.75MHz IF picture carrier in the TV chassis.

Remote-Control Transmitter

The remote-control transmitter (Fig. 6) consists of an oscillator switching arrangement for changing the oscillator frequency, transducer to radiate the signal, and a 9v battery. When any of the buttons are actuated, the negative side of the battery is connected to PNP transistor Q201.

Collector current flows through a portion of the primary winding of the transformer and induces a current into the tuned secondary winding. A negative feedback pulse is coupled through a 0.2μf capacitor to the base of transistor Q201. Base current then flows, charging the capacitor. When the feedback pulse passes, the charge on the capacitor places a reverse-bias on the base-emitter junction. The transistor then remains cut off until a negative pulse is supplied by the oscillating current in the tank circuit. The transistor conducts again, repeating the cycle.

The transformer secondary winding is tuned to 22.25kHz, which is the highest frequency produced by the oscillator. When the 21.5kHz button is depressed, additional capacity is placed across the tank circuit, which lowers the frequency to 21.5kHz. The six other functions add still more capacity to produce six lower frequencies. Each switch adds capacity across the tank circuit and completes the battery circuit.

The transducer employs metalized mylar plates and the signal voltage causes the plates to vibrate, converting the electrical signal to a sound signal. The radiated sound signal now becomes twice the frequency of the oscillator signal.

Next month we will review the new circuits employed in the Admiral IK 18-1A Color-TV Chassis. ■

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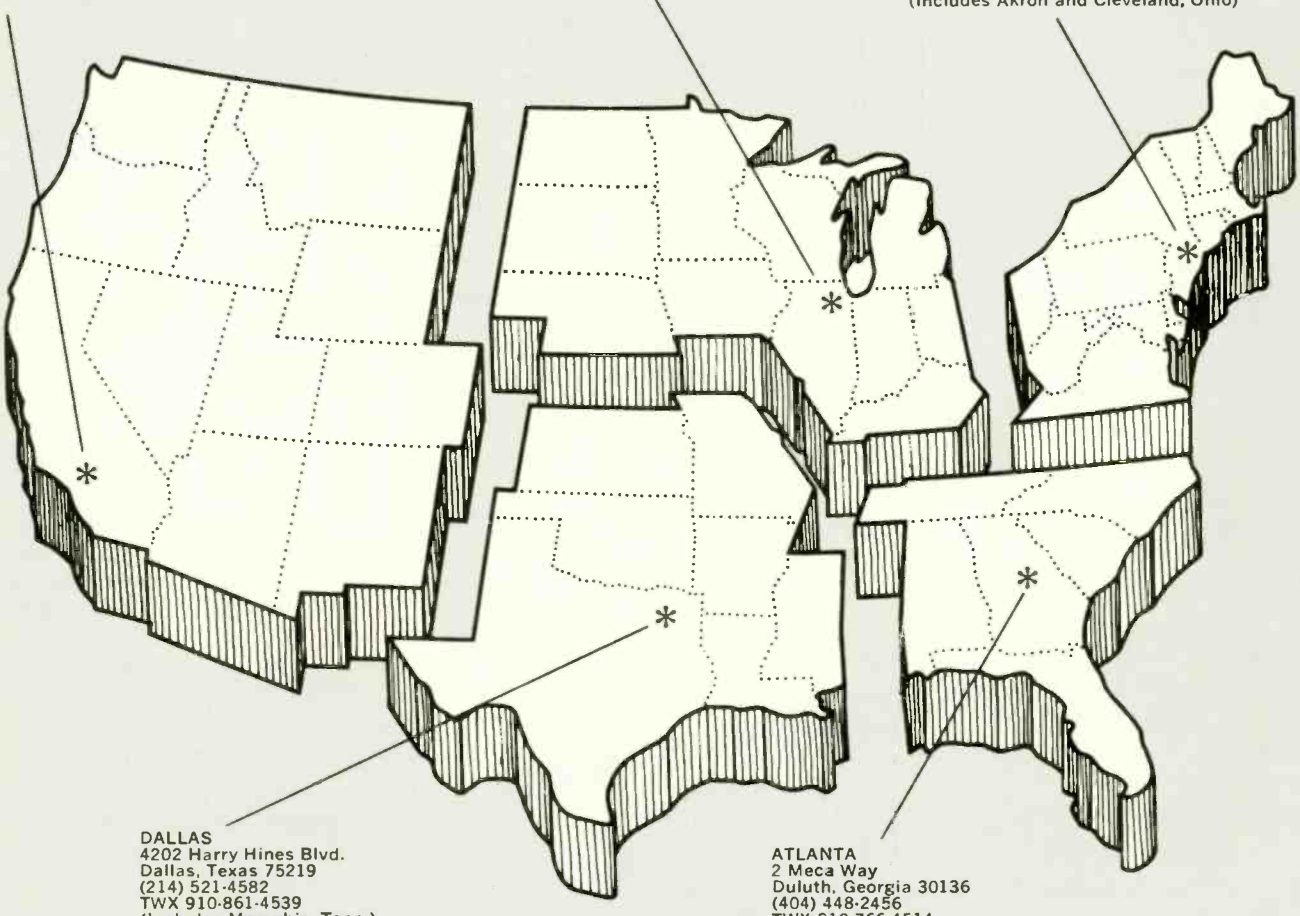

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NEW PRODUCTS

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SOLDERING TOOL 703

Designed for difficult space-restricted areas

The Model KL3000 "One Hander" soldering tool is reportedly especially designed for difficult, space-restricted areas. It weighs 4 oz. and is 7-in. long.

Specifications indicate that savings in time and material are affected by a self-contained, self-feeding solder source and the highly manipulative handling of the tool. Tip tinning is no longer necessary through the adoption of a special alloy tip. The tools are designed for continuous use. Reportedly cold solder or resin joints are eliminated and the impact-resistant handle cuts replacement costs. Bilectro, Inc.

CAPACITOR TESTER 704

Designed to dynamically test all types of capacitors

The Model CT-1 tester is said to feature a built-in power supply providing either ac or dc test voltages. It is said to accurately test capacitors for leakage or shorts with the dc voltage

continued on page 72

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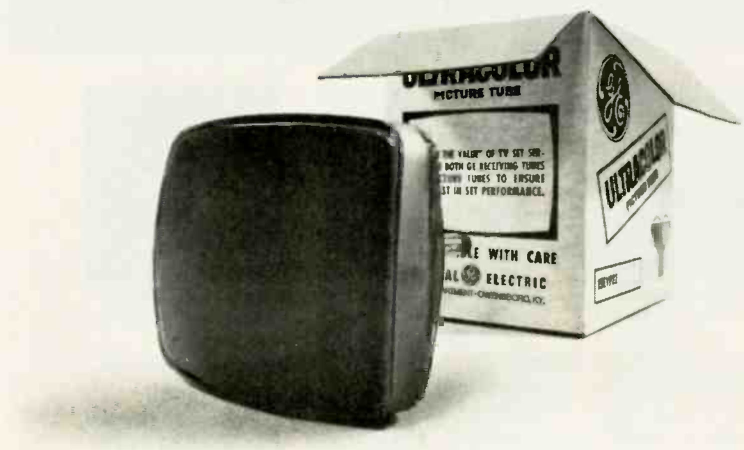

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GENERAL ELECTRIC

NEW PRODUCTS . . .

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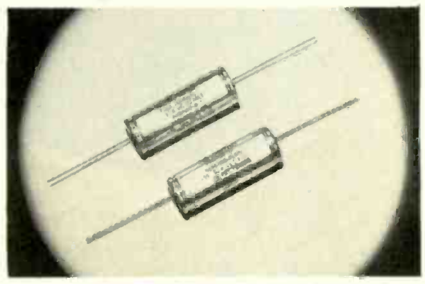
applied and indicate intermittent open capacitors with the ac voltage applied. Internal circuitry is designed to reform and polarize electrolytic and tantalytic capacitors under test. Specifications indicate that it has 200M sensitivity and is effective for capacitors that have values ranging between 250pf and 1000μf. Lee Electronic Labs.

ALUMINUM ELECTROLYTIC CAPACITOR 705

Features low inductance and broad temperature range

The aluminum electrolytic capacitor, Type UFT, is said to have extremely low inductance and a broad temperature range, −67°F to +221°F. The

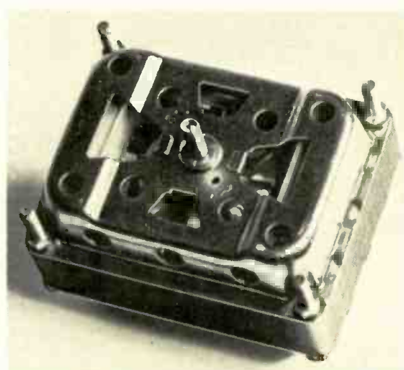


unique feature of this unit is its four terminal construction. The impedance of the UFT is said to decrease with an increase in frequency above 10kHz. Cornell-Dubilier Electronics.

FOUR-POLE MOTOR 706

Features minimum vibration and noise

The new ac hysteresis synchronous four-pole motor is reportedly designed for use in record players, cooling fans and tape recorders. The motor features



minimum vibration and noise, plus stable speed, despite small load fluctuations. Specifications indicate that the motor runs at 1800 rpm when connected to a 60Hz power source. Normal current is 160ma. Price: $16.45. Weltron Co.

WHAT'S NEW...

continued from page 50

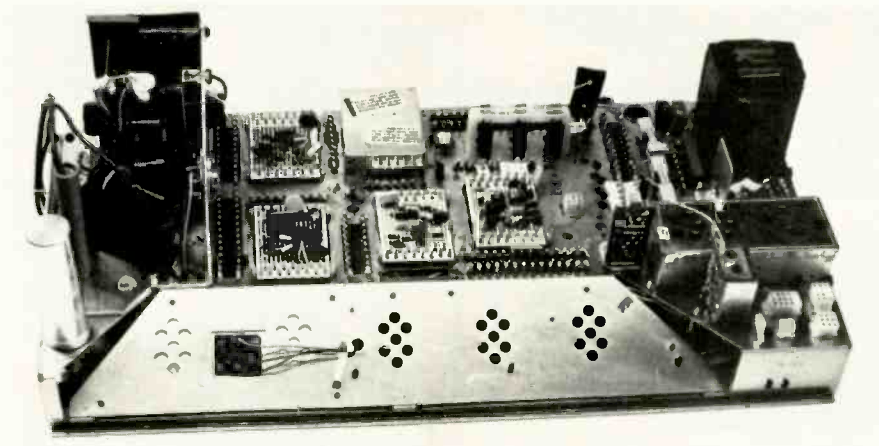
Customized tuning, a new feature, is used on all 23- and 25-in. screen sizes (measured diagonally). This feature enables the viewer to make a quick, easy, one-step adjustment of the TINT, COLOR LEVEL, BRIGHTNESS, CONTRAST and VERTICAL HOLD controls. This is accomplished by turning each control until its red-line indicator is in the 12 o'clock position.

Two solid-state consoles feature a new electronic varactor tuning system to simplify channel selection by programming any sequence of channel selection in the area. Other features available in many models include the Gold Video Guard tuner and Automatic Tint Guard which regulates flesh tones to overcome TV station transmission variations.

The 39 models include five portables, with 14-in. and 16-in. screens;

Zenith's Bonnard Model C3510C 14-in. (measured diagonally) personal portable color-TV receiver. *Courtesy of Zenith Radio Corp.*

10 table models with 18-, 19-, 20-, 23-, and 25-in. screens; 22 consoles with 23- and 25-in. screens; and two console combinations with 25-in. (measured diagonally) screens. ■



The Zenith Titan 110 all solid-state color-TV chassis employing five Dura-Modules, which plug in for easy removal.

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DEALER SHOWCASE

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SCANNING RECEIVER 707

Covers any two or three Public Safety/Business bands

The Bearcat III is a scanning monitor receiver designed to meet present and future needs in any locality. It reportedly features interchangeable plug-in RF modules to cover any of the three Public Safety/Business bands (high, low and UHF), or single band. With two-band operation, specifications indicate any combination of eight channels in the two bands may be monitored. Placement of up to eight plug-in crystals by the user in a crystal

socket automatically determines the band of operation for each channel when two bands are used, eliminating the need for complex wiring changes. Features include complete band coverage, quartz-crystal IF filters, solid-state LED channel indicator lights, and built-in 3-in. by 5-in. front-mounted speaker. The receiver is 3½-in. H by 9-in. W by 6-in. D. The cabinet is of heavy-duty vinyl with a polished chrome bezel. Electra Corp.

TIME-WEATHER-MESSAGE CHANNEL 708

Provides continuous digital time and weather display

Self-contained in a compact, tabletop case, the Model TMW-5 reportedly shows the exact time, temperature, wind direction and wind velocity, plus a changeable message card. If more than one message is desired, the TMW-5 can be adapted to a Kodak Carousel slide projector. The unit is said to use an optical scanning system of special mirrors and solid-state lamp switching to virtually eliminate moving parts and noise. It provides a continuous digital display of time—except when the message is being televised. Temperature from an outdoor transistor thermometer is displayed for 5 sec.; wind speed from a roof top anemometer is displayed for 5 sec.; wind direction from a roof top windvane is displayed for 5 sec.; and the message time is adjustable from 5 to 15 sec.

Messages are prepared by drawing, writing or typing on a 3 in. by 5 in. transparent card. The message can be changed by pulling the message board up and replacing the message card. Automobile type bulbs are used to illuminate the displays. Price: $1450.00. Jerrold Electronics Corp.

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GUEST AUTHOR...

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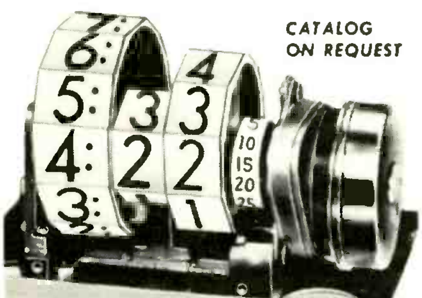
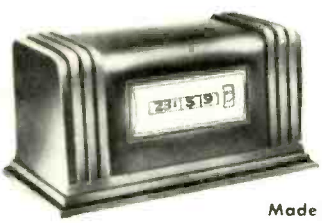
scribe to the leading technical publications in your field; support your trade associations and attend their meetings and seminars; take advantage of training courses, data manuals and other materials offered by manufacturers and their representatives; be aware of your competitors' activities; and be prepared to make sound decisions regarding new ventures that offer the best chance for your business to grow and become more profitable.

The changing nature of our business is not new to us. We've experienced it in the past and we're living through it right now. Progress has never been achieved without change and we must be ready to meet these challenges with new understanding and marketing philosophies. Personally, I'm looking forward to the exciting period that lies ahead for I believe it will be a prosperous and successful one for all of us. As independent businessmen, you can help insure that success because you have responsibility for the consumers' confidence in and respect for a product. It's your service to him that keeps the customer coming back. With your assistance, I'm sure our industry will continue to thrive. ■

ERATTA

Lambert Huneault, author of the September 1971 CAT Game, has advised us of a few errors that had crept into his well-written quiz. He is supervisor of the Electronics Dept., Adult Retraining Div., not of the Audio Retraining Div. The schematic used with his article is of a Zenith B/W-TV chassis, not a color-TV chassis. In answer No. 17 on page 45, the second sentence should read, "Without it, transistor TR16 will still drive the vertical output transistor, TR16 and TR17 forming a Darlington amplifier." The original sentence had said, ". . . vertical output-transistors TR16 and TR17 forming. . . ." The last sentence on page 45 refers to the PNP noise gate. It is actually an NPN noise gate.





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25BDP22
25BFP22
25BGP22
25BHP22
25BJP22
25BMP22
25BP22
25BP22A
25BP22A/ 25YP22
25BRP22
25BSP22
25BVP22
25BWP22
25BXP22
25BZP22
25CBP22
25CP22
25CP22A
25FP22
25FP22A
25GP22
25GP22A
25RP22
25SP22
25VP22
25WP22
25XP22
25XP22/ 25AP22A
25YP22
25YP22/ 25BP22A
25ZP22

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