

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



XX
WILLIAM W. FRISE
7176 ATLAS RD
ATLAS MI 48411
FRI W 347465M2AZ
8722693AU1
AS



When you're in a hurry, it's nice to know GTE Sylvania has the parts.

Only 26 tubes and ECG solid-state components will solve practically all of your vertical and horizontal replacement problems.

And they're all available from your Sylvania distributor.

Because tubes are tubes, we can't promise to reduce the number you'll have to carry. But, with the Sylvania line, chances are your distributor will have the tube you need when you need it.

In semiconductors, the story is different. Just 124 ECG solid-state devices including transistors, diodes and integrated circuits will replace over 41,000 different types. In the vertical and horizontal sections alone,

only 6 ECG solid-state devices will take care of almost every job.

And they save a lot of space in your tube caddy. When your distributor is stocked with Sylvania receiving tubes and ECG semiconductors you'll have the parts you need. And you'll get them fast.

It's like having a complete warehouse built into your telephone.

And that should take some of the dog work out of your job.

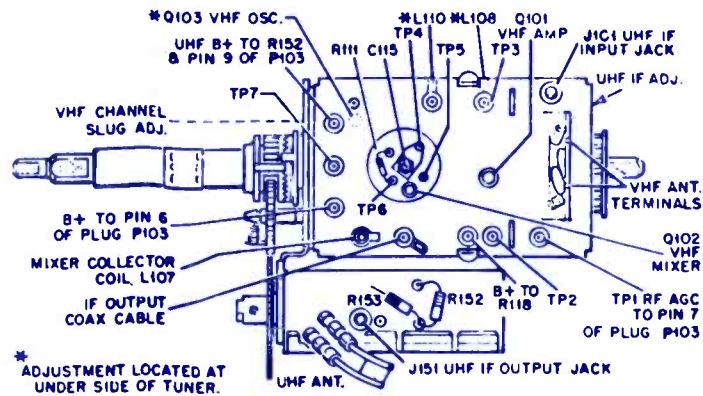
GTE SYLVANIA

SYMBOL DESCRIPTION

AIRLINE PART NO.

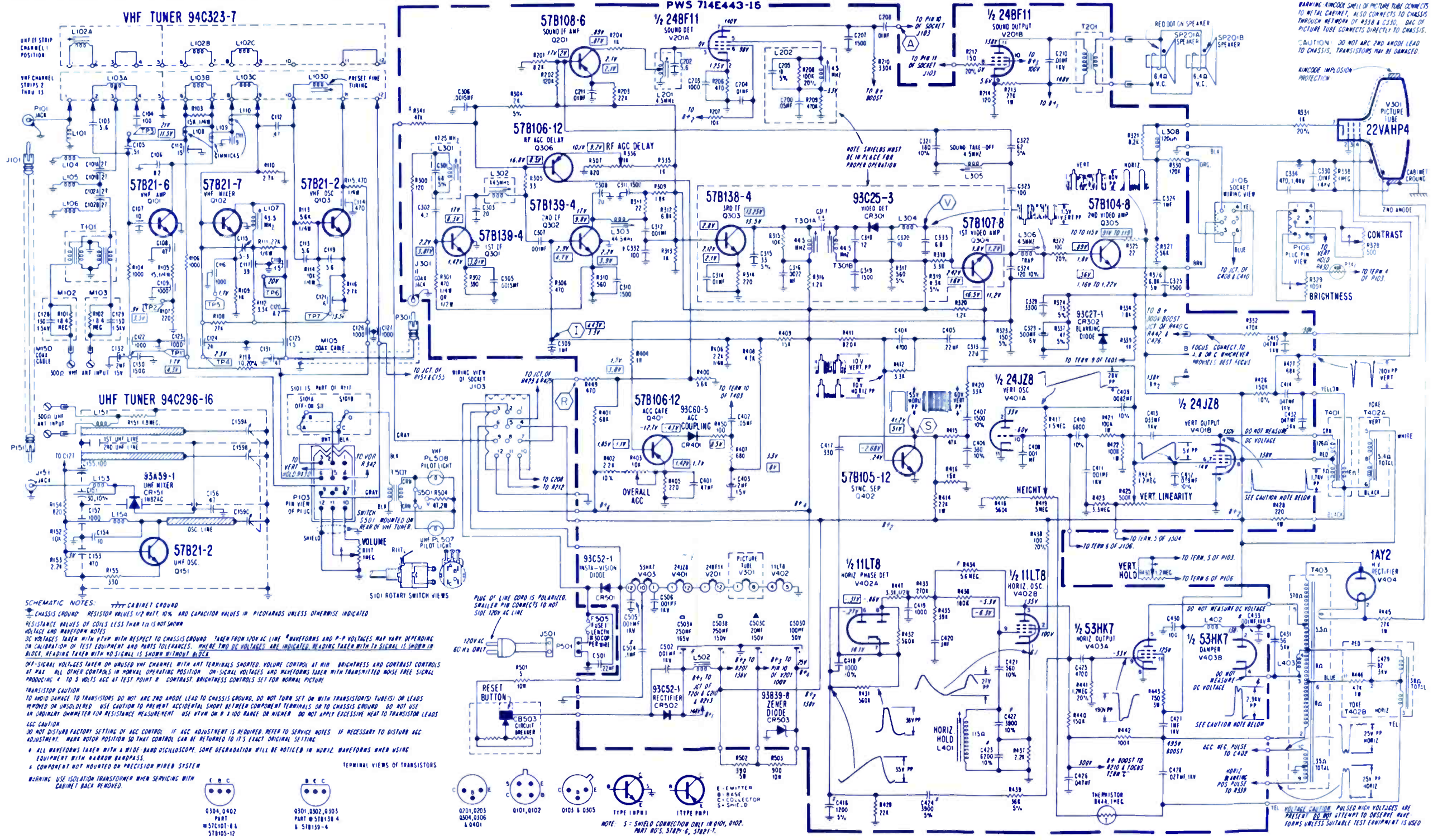
| | |
|---|-----------|
| C503A-250 µf, 165v electrolytic | 67A30-14 |
| C503B-250 µf, 150v electrolytic | 67A30-14 |
| C503C-20 µf, 150v electrolytic | 67A30-14 |
| C503D-100 µf, 50v electrolytic | 67A30-14 |
| R342-voltage dependent resistor, 60v, ±15%, 1ma | 61A46-6 |
| R444-1M thermistor, 20% cold | 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 xfmr | 700A1035-4 |
| T401-vert output xfmr | 79A100-19 |
| T402-deflection yoke assembly | 700A814-8 |
| T403-horiz output assembly xfmr | 750A647-9 |
| C8503-2.2a 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.

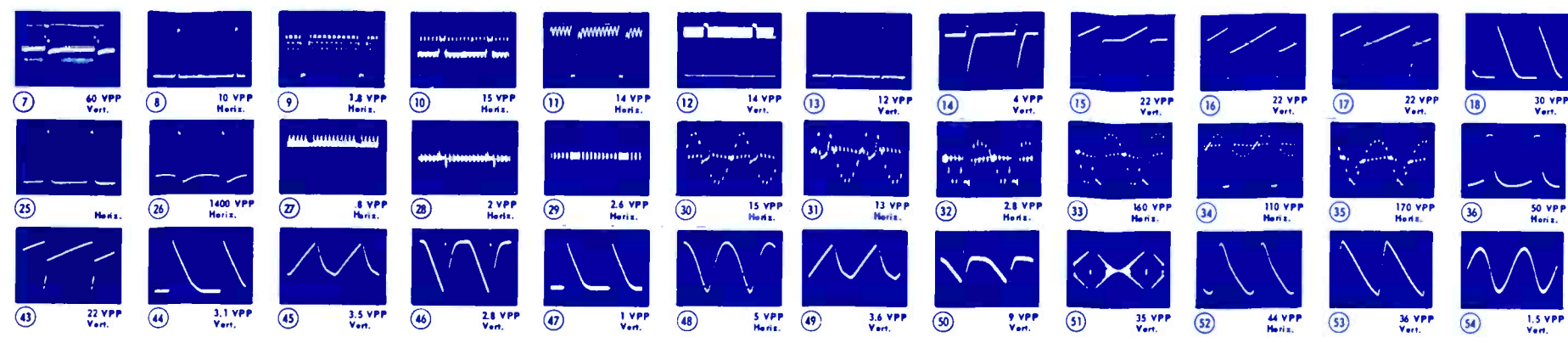
ELECTRONIC TECHNICIAN/DEALER is published monthly by HARCOURT BRACE JOVANOVIICH PUBLICATIONS, INC., 1 East First St., Duluth, Minn. 55802. Subscription rates: One year \$6, two years \$10, three years \$13, in the United States and Canada. Other countries: One year \$15, two years \$24, three years \$30. Single copies 75¢ in the United States, and \$2 in other countries. Second class postage paid at Dansville, New York and at additional mailing offices. Copyright 1971 by HARCOURT BRACE JOVANOVIICH PUBLICATIONS, INC. POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, HARCOURT BRACE JOVANOVIICH PUBLICATIONS, INC., 1 East First St., Duluth, Minn. 55802.



SCHEMATIC NOTES: **TP** 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 REFERENCE 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, MEASURING TAKEN WITH TV SIGNAL IS SHOWN IN BLACK, MEASURING TAKEN WITH NO SIGNAL IS SHOWN WITHOUT BLACK.
 OFF-SIGNAL VOLTAGES TAKEN ON UNLINED 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 GIVEN WITH TRANSMITTED NOISE FREE SIGNAL PRODUCING 4 TO 5 VOLTS ACC 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 TRANSISTORS/TUBES 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 WITH OHM 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 ITS 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.

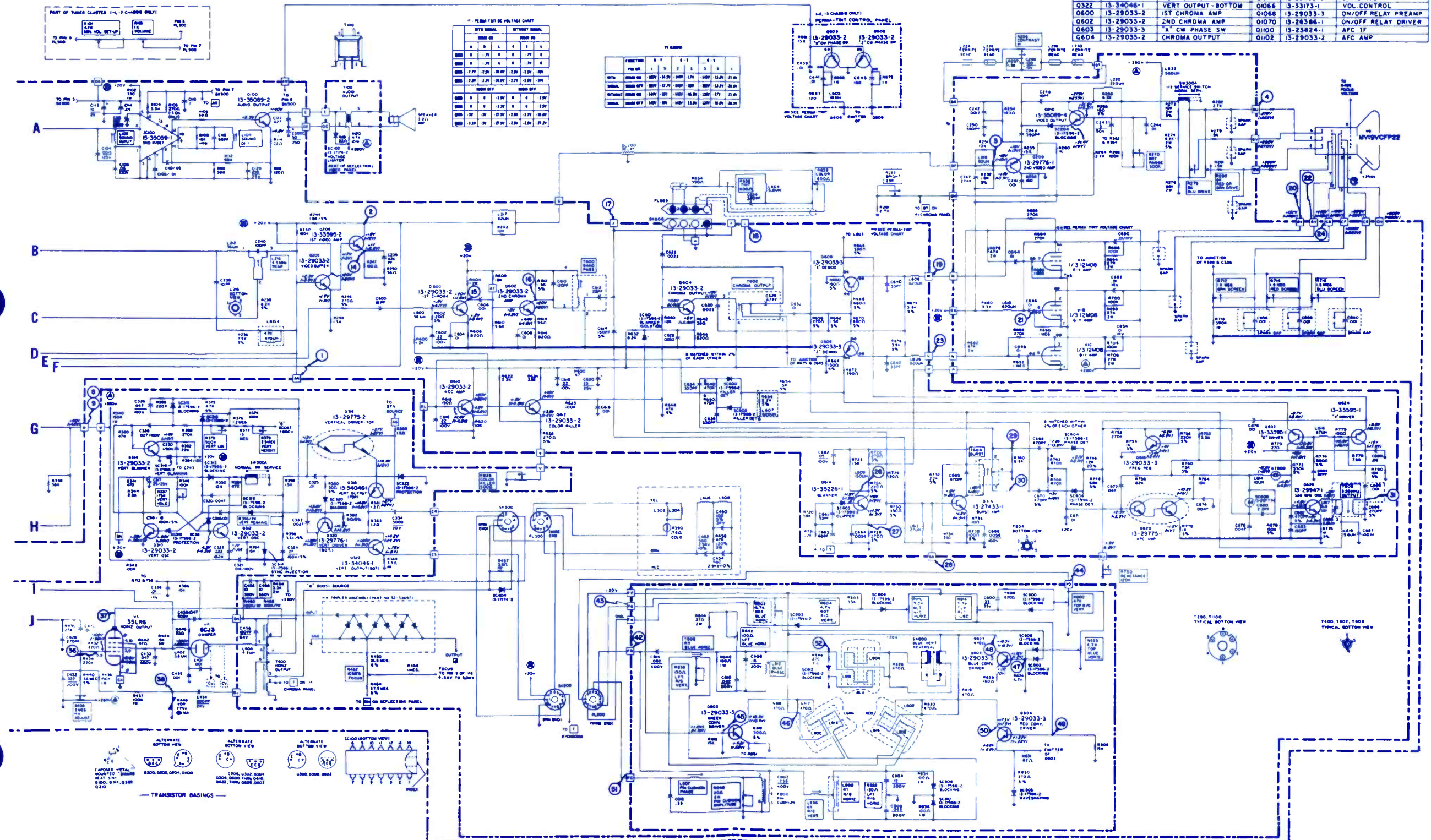


SYLVANIA
Color TV Chassis
D19-1, -2, -3



TRANSISTOR FUNCTION CHART

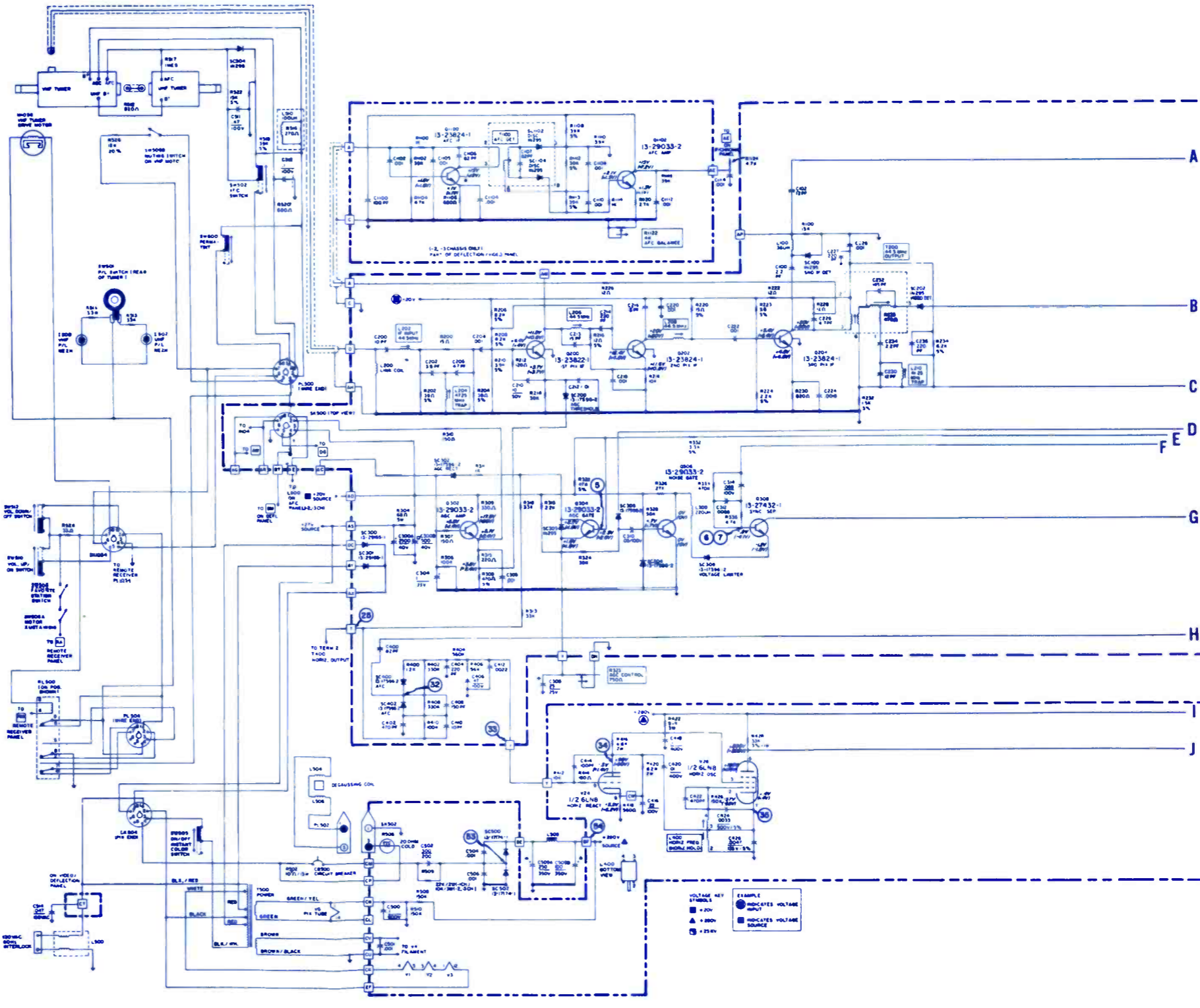
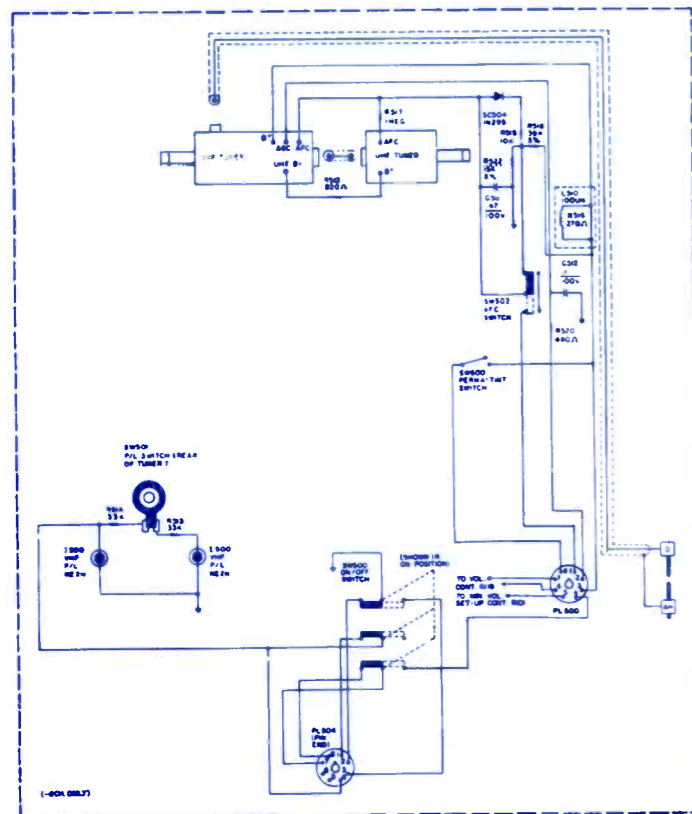
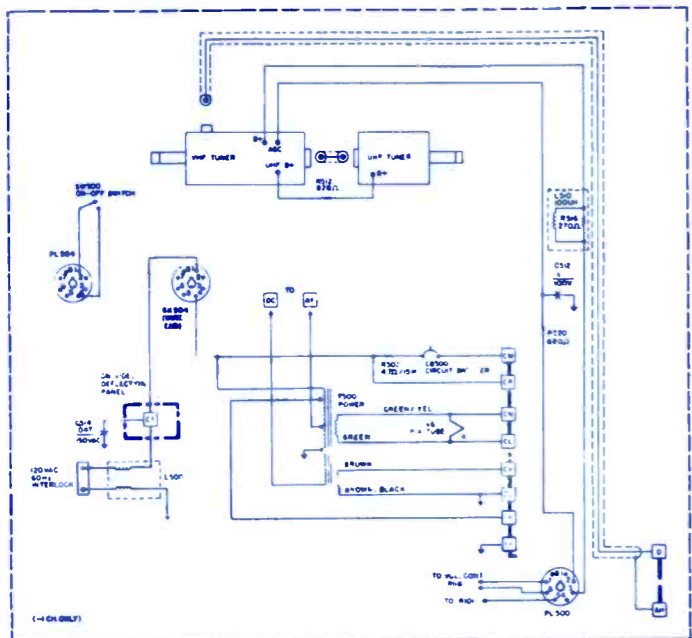
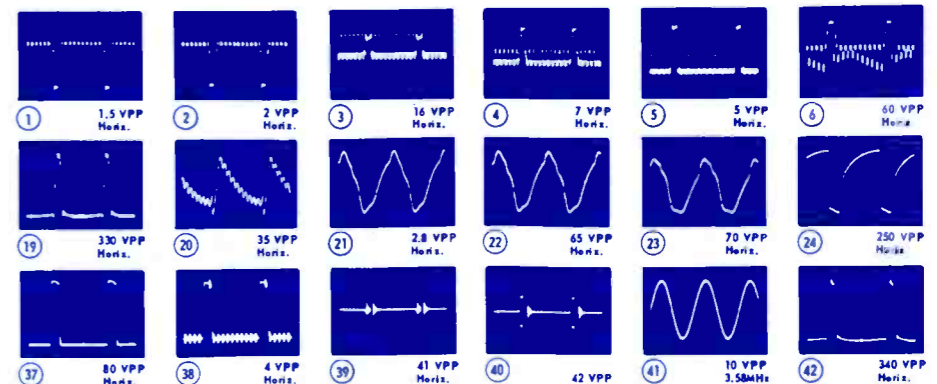
| CODING | SYL. PART NO. | DESCRIPTION | CODING | SYL. PART NO. | DESCRIPTION |
|--------|---------------|--------------------|--------|---------------|---------------------|
| Q100 | 13-35099-1 | SOUND IF/DETECTOR | Q605 | 13-29033-3 | "Z" CW PHASE SW |
| Q100 | 13-35069-2 | AUDIO OUTPUT | Q606 | 13-29033-3 | "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 | 13-35069-4 | VIDEO OUTPUT | Q620 | 13-29775-1 | AFC 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 | Q652 | 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 | CW 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 | 13-28386-1 | ON/OFF RELAY DRIVER |
| Q603 | 13-29033-3 | "X" CW PHASE SW | Q1100 | 13-23824-1 | AFC IF |
| Q604 | 13-29033-2 | CHROMA OUTPUT | Q1102 | 13-29033-2 | AFC AMP |

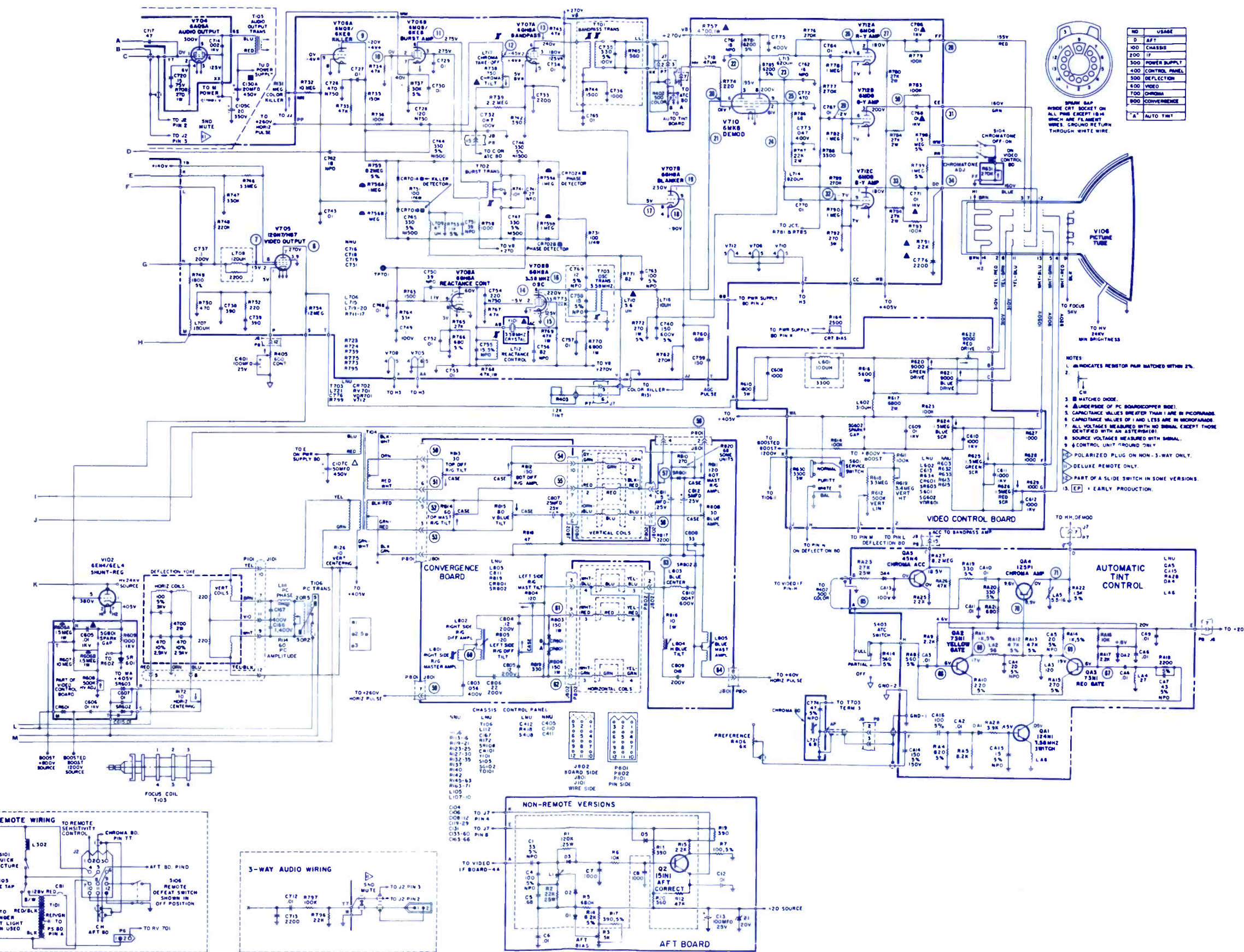


| SYMBOL | DESCRIPTION | SYLVANIA PART NO. |
|--------|-----------------------|-------------------|
| C300A | 2500/40v electrolytic | 41-33942-1 |
| C300B | 500/40v electrolytic | 41-33942-1 |
| C300C | 50/250v electrolytic | 41-33942-1 |
| C509A | 250/350v electrolytic | 41-33943-1 |
| C509B | 100/350v 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 |
| 1500,1502 | pilot lamp, NE2H | 30-33062-3 |
| | HV tripler | 32-33057-3 |
| | deflection yoke | 51-33657-2 |

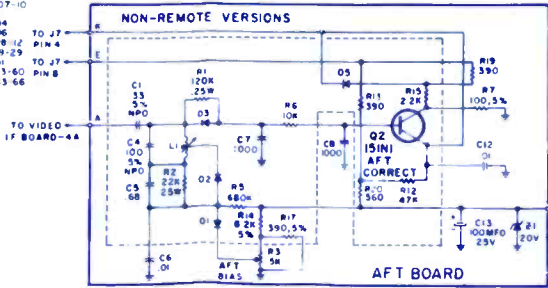
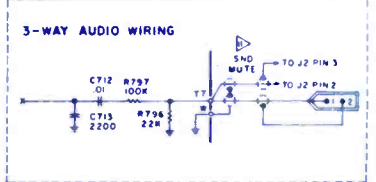
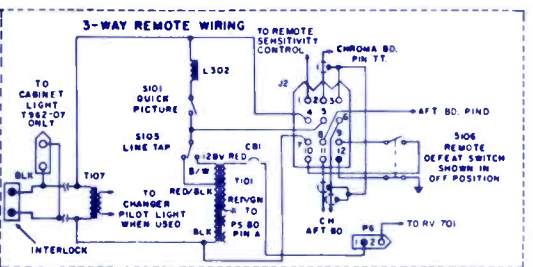




| NO | USAGE |
|-----|---------------|
| D | AFT |
| 100 | CHASSIS |
| 200 | IF |
| 300 | POWER SUPPLY |
| 400 | CONTROL PANEL |
| 500 | DEFLECTION |
| 600 | VIDEO |
| 700 | CHROMA |
| 800 | CONVERGENCE |
| A | AUTO TINT |

SPARE CAP
INSIDE CRT SOCKET ON
ALL PINS EXCEPT 18A
WHICH ARE FLAMEBET
WIRES. GROUND RETURN
THROUGH WHITE WIRE

- NOTES
1. INDICATES RESISTOR PAIR MATCHED WITHIN 2%.
 2. CH
 3. MATCHED DIODE.
 4. UNDER SIDE OF PC BOARD (COPPER SIDE).
 5. CAPACITANCE VALUES GREATER THAN 10 ARE IN MICROFARADS.
 6. CAPACITANCE VALUES OF 1 AND LESS ARE IN PICOFARADS.
 7. ALL VOLTAGES MEASURED WITH NO SIGNAL EXCEPT THOSE IDENTIFIED WITH AN ASTERISK (*).
 8. SOURCE VOLTAGES MEASURED WITH SIGNAL.
 9. CONTROL UNIT GROUND ONLY.
 10. POLARIZED PLUG ON NON-3-WAY ONLY.
 11. DELUXE REMOTE ONLY.
 12. PART OF A SLIDE SWITCH IN SOME VERSIONS.
 13. EP - EARLY PRODUCTION.



1387

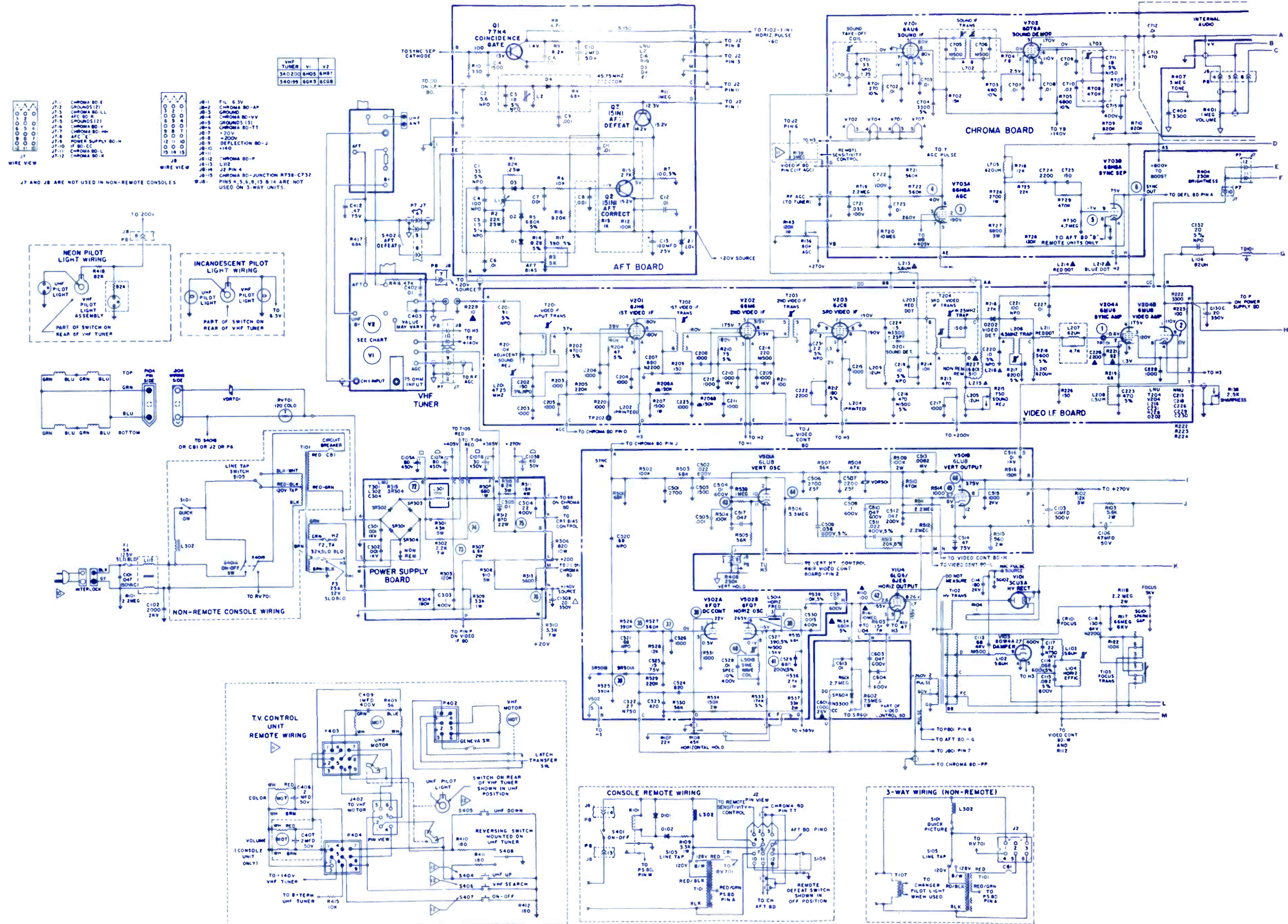
MAGNAVOX

Color TV Chassis
T962 Series

ELECTRONIC TECHNICIAN/DEALER **TEKFAKX**

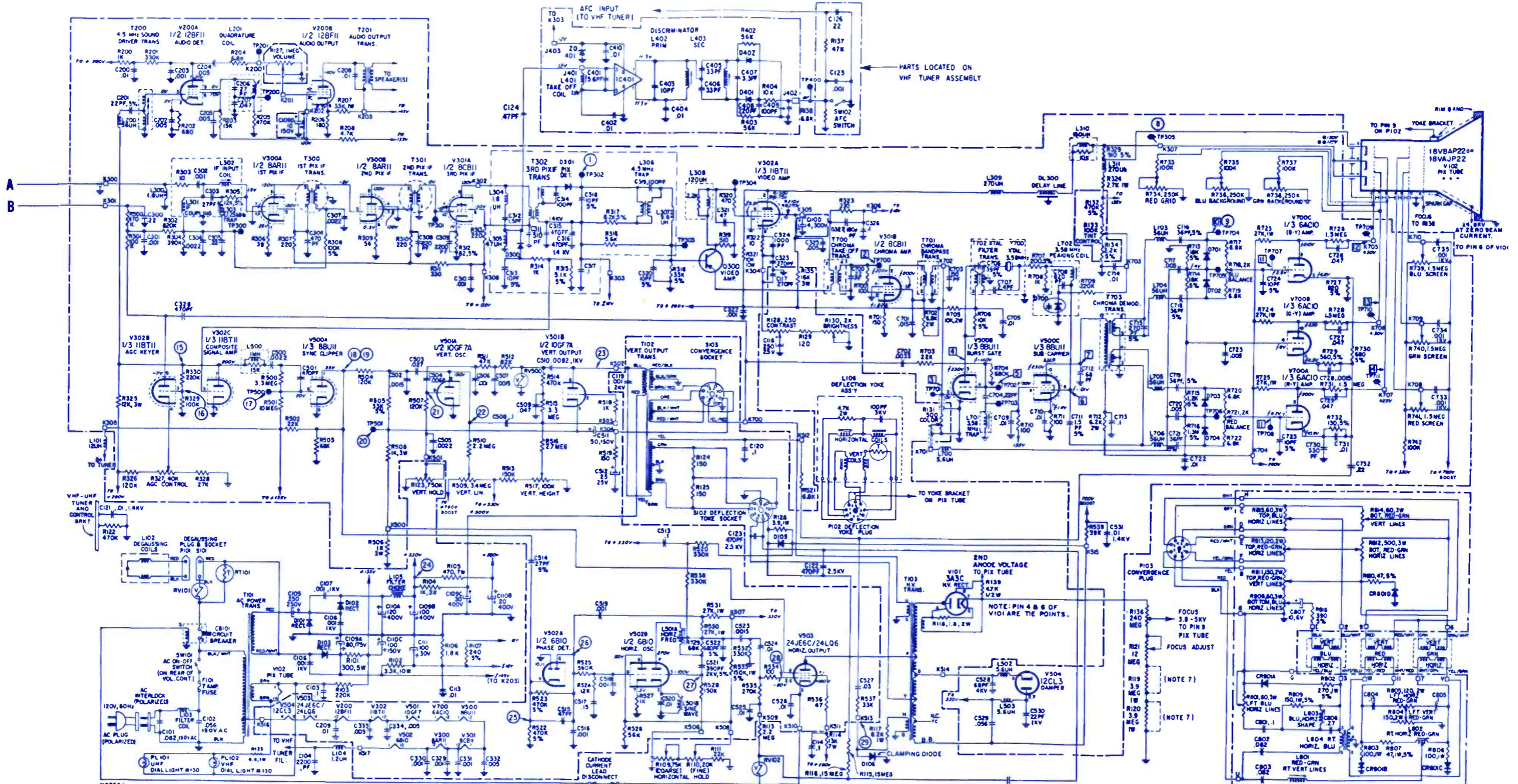
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 5 NEW SETS

NOVEMBER • 1971

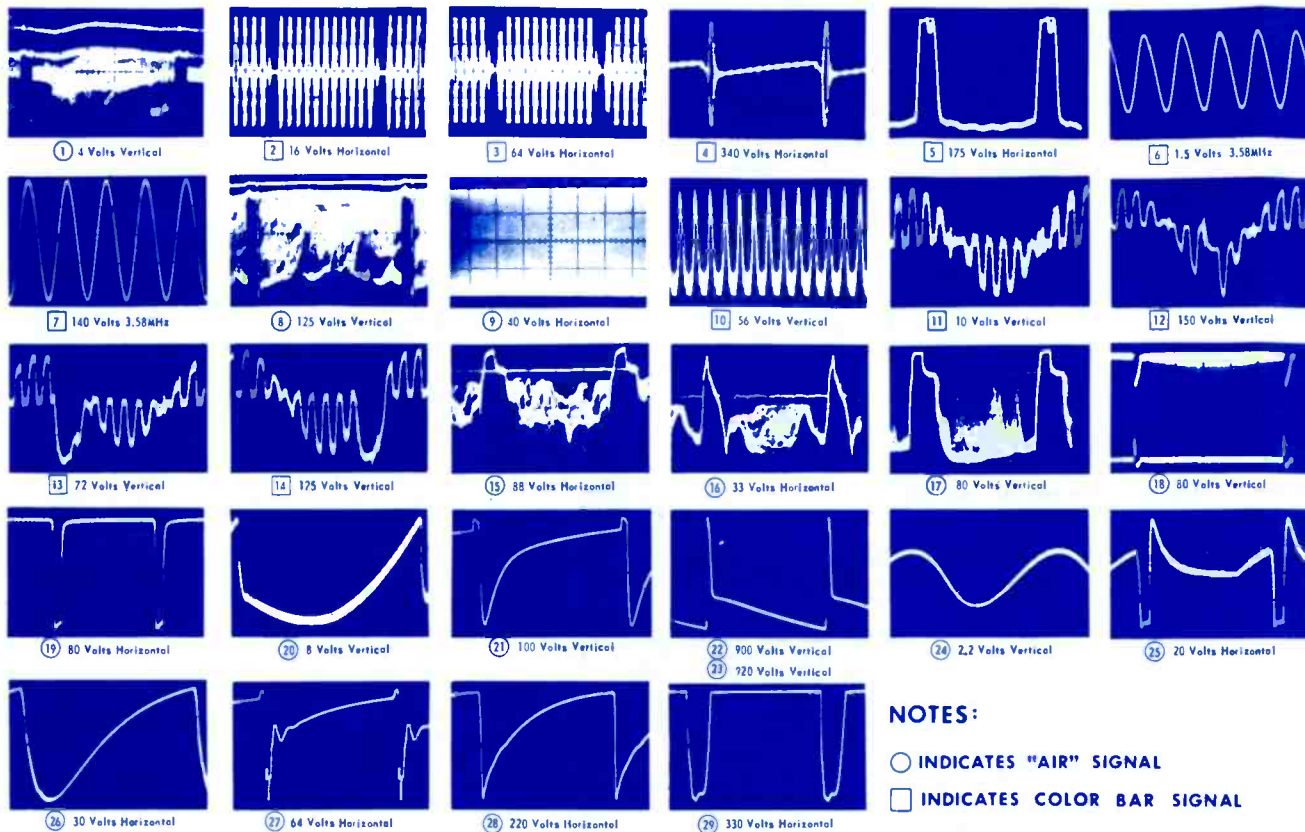


ADMIRAL
Color TV Chassis
930 Series

| SYMBOL | DESCRIPTION | ADMIRAL PART NO. | | | |
|--------|-------------------------------|------------------|---------|-----------------------------|----------|
| R109 | 75K horiz control, coarse | 75A156-1 | R509 | 3.4M vert lin control | 75A155-5 |
| R110 | 20K horiz control, fine | 75A156-1 | R517 | 100K vert height control | 75A155-5 |
| R123 | 750K vert control | 75A156-1 | R734 | 250K red background control | 75A155-5 |
| R121 | 12M focus adj control | 75A157-14 | C109A | 80 μf/175v electrolytic | 67A76-1 |
| R127 | 1M on/off volume control | 75A152-1 | C109B | 100 μf/400v electrolytic | 67A76-1 |
| R128 | 250N contrast control | 75A158-1 | C109C | 30 μf/400v electrolytic | 67A76-1 |
| R130 | 2K bright control | 75A158-1 | C109D | 10 μf/150v electrolytic | 67A76-1 |
| R131 | 500N color control | 75A149-7 | C110A | 120 μf/400v electrolytic | 67A75-1 |
| R133 | 100K tint control | 75A149-6 | C110B | 20 μf/400v electrolytic | 67A75-1 |
| R136 | 240M focus bleeder | 61A63-1 | C110C | 100 μf/150v electrolytic | 67A75-1 |
| R327 | 40K AGC control | 75A155-6 | C110D | 4 μf/400v electrolytic | 67A75-1 |
| R736 | 250K blue background control | 75A155-6 | IC401 | integrated circuit | 56A1-1 |
| R738 | 250K green background control | 75A155-6 | 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 |

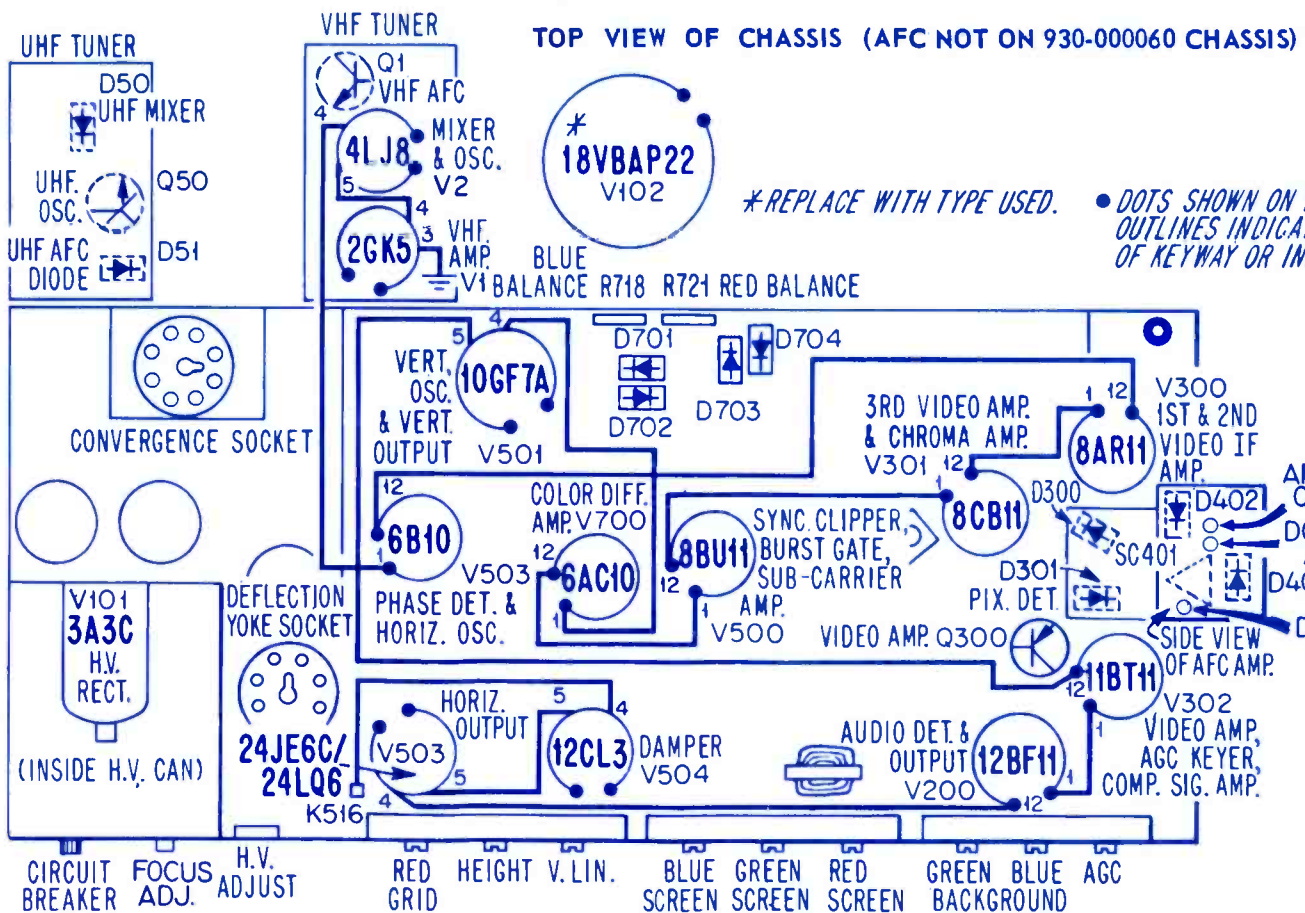


- NOTES:
1. ALL RESISTORS ARE 1/2 WATT, 10% UNLESS OTHERWISE NOTED.
 2. ALL CAPACITORS ARE IN MFD UNLESS OTHERWISE NOTED.
 3. CAUTION: USE ISOLATION TRANS WHEN WORKING ON CHASSIS.
 4. DC VOLTAGES MEASURED WITH "VTVM" PLACED BETWEEN POINTS INDICATED @ CHASSIS GND, WITH NORMAL SIGNAL INPUT.
 - (M) INDICATES VOLTAGE READING TAKEN WITH BRIGHTNESS CONT. AT MAXIMUM ROTATION (FULL CW).
 - (M) INDICATES VOLTAGE READINGS TAKEN WITH BRIGHTNESS CONT. AT MINIMUM ROTATION (FULL CCW).
 - (V) INDICATES VOLTAGE READING TAKEN WITH COLOR SIGNAL.
 - (W) WAVEFORMS ARE TAKEN WITH NORMAL SIGNAL INPUT.
 6. LINE VOLTAGE INPUT SET AT 120VAC
 7. 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.
 - JUMPER REMOVED AT FACTORY IF NECESSARY TO SET FOCUS CONTROL RANGE.
 - (F) INDICATES THE VOLTAGE WILL VARY WITH FINE TUNING SETTING FROM ON TO 3.
 - NUMBERS IN CIRCLES OR SQUARES IDENTIFY WAVEFORM OBSERVATION LOCATIONS. CONDITIONS FOR TAKING WAVEFORM MEASUREMENTS ARE GIVEN WITH WAVEFORM PHOTOGRAPHS.
 - CHASSIS GROUND.



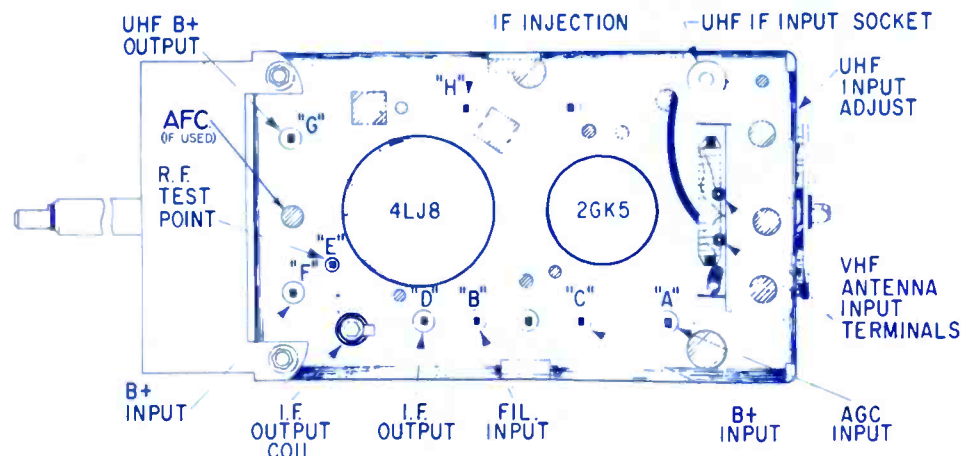
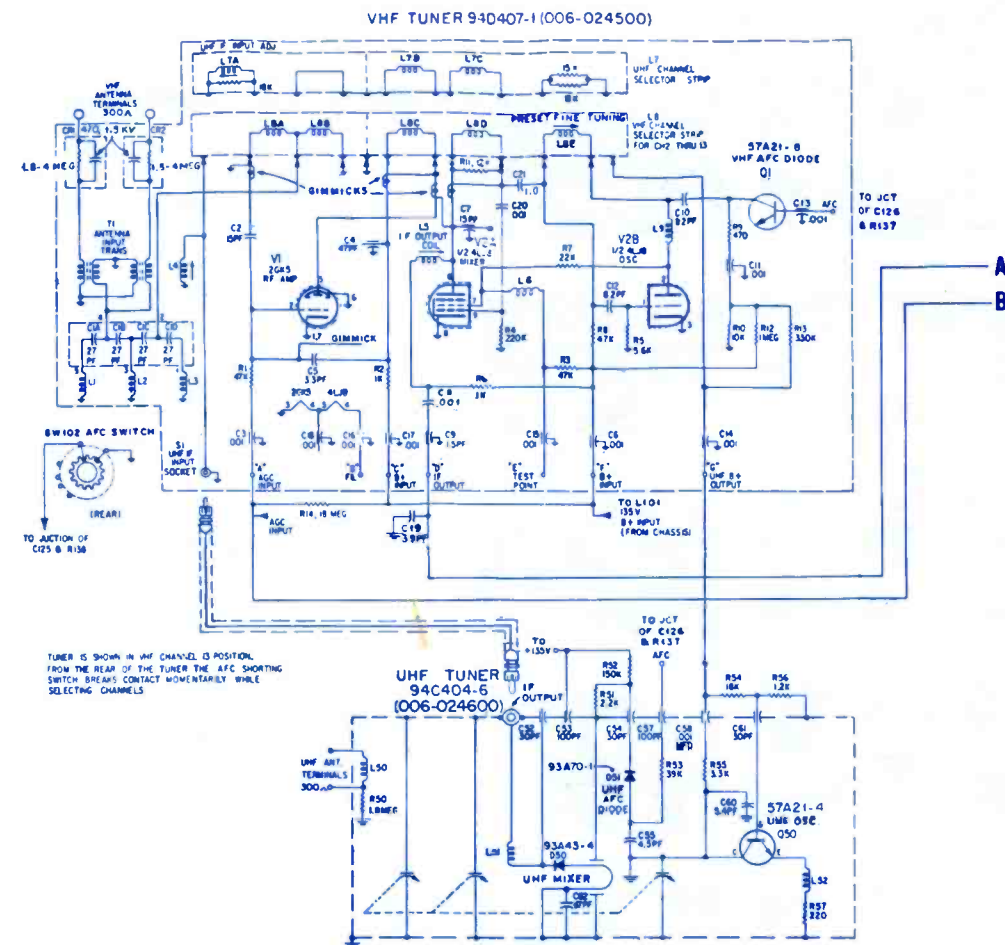
NOTES:

- INDICATES "AIR" SIGNAL
- INDICATES COLOR BAR SIGNAL



| 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.



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

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

NOVEMBER • 1971

GROUP
231

SCHEMATIC NO.

SCHEMATIC NO.

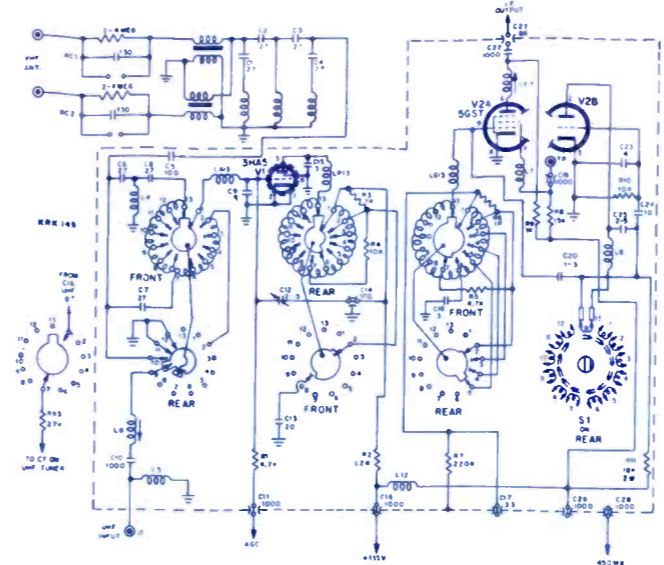
ADMIRAL 1386
Color TV Chassis 930 Series

RCA SALES CORPORATION 1385
TV Chassis KCS172 Series

AIRLINE 1389
TV Models GC1-14821A, 41A, 51A

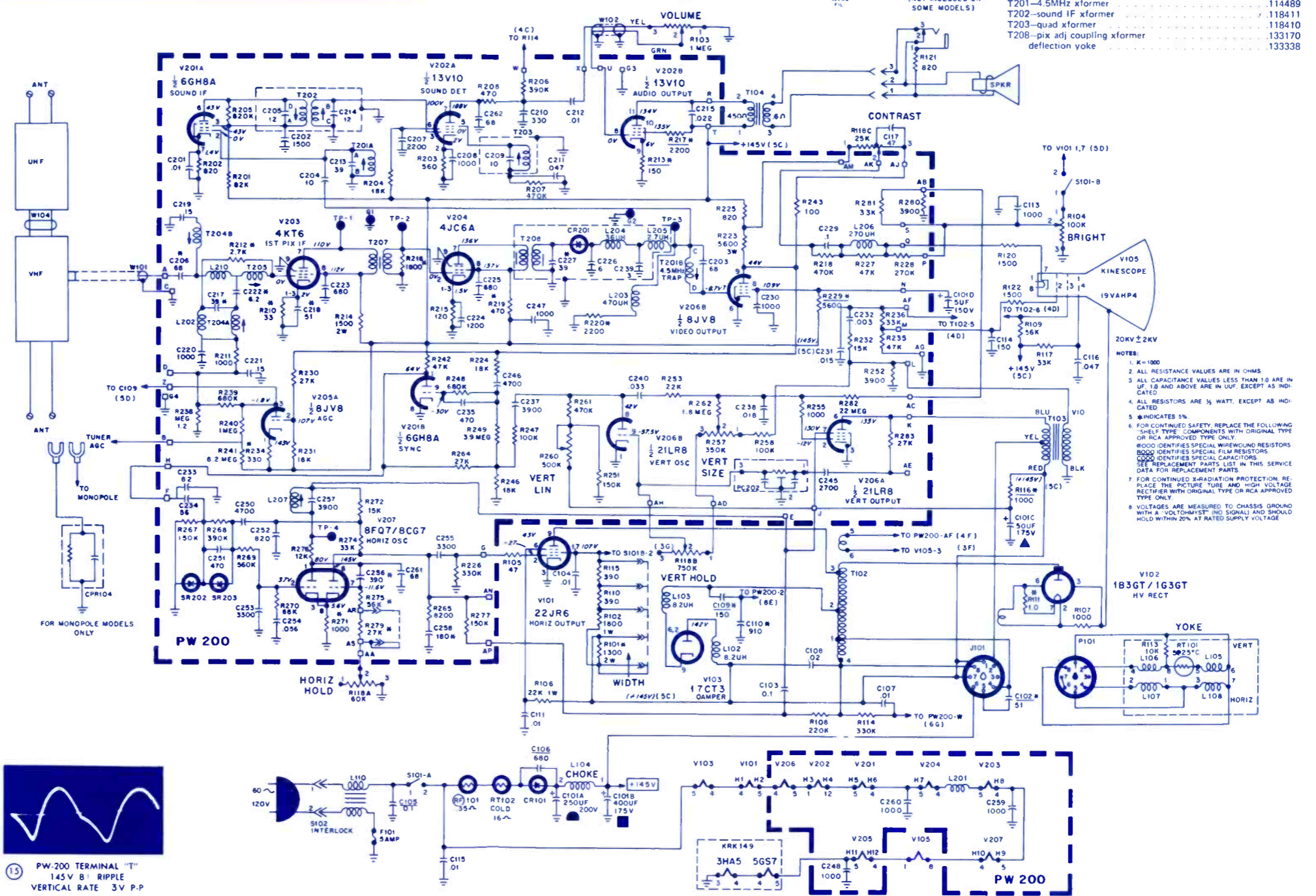
SYLVANIA 1388
Color TV Chassis D19-1, -2, -3

MAGNAVOX 1387
Color TV Chassis T962 Series



| SYMBOL | DESCRIPTION | RCA PART NO. |
|--------|------------------------------------|--------------|
| C101A | 250µf, 200v electrolytic | 114845 |
| C101B | 400µf, 175v electrolytic | 114845 |
| C101C | 50µf, 175v electrolytic | 114845 |
| C101D | 5µf, 150v electrolytic | 114845 |
| C258 | 180pf 5%, 500v mica | 330186 |
| CR201 | video det diode | 112524 |
| F101 | 5a, 250v fuse | 118969 |
| L102 | 8.2µh coil | 107385 |
| L110 | line choke | 114293 |
| L202 | AGC | 114315 |
| L205 | 2.7µh coil | 107466 |
| L206 | 270µh 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 |

- 1 TP-3 SECOND DETECTOR VERTICAL RATE 4V P-P
- 2 V205 PIN 9 VIDEO OUTPUT PLATE VERTICAL RATE 100V P-P
- 3 C246 & C235 JUNCTION INPUT V201B VERTICAL RATE 120V P-P
- 4 V201 PIN 1 SYNC PLATE HORIZONTAL RATE 75V P-P
- 5 V205 PIN 2 AGC GRID HORIZONTAL RATE 40V P-P
- 6 V205A PIN 3 AGC PLATE HORIZONTAL RATE 900V P-P
- 7 V206 PIN 9 VERTICAL OSCILLATOR GRID VERTICAL RATE 200V P-P
- 8 V206 PIN 2 VERTICAL OUTPUT GRID VERTICAL RATE 30V P-P
- 9 PW-200, TERMINAL "L" VERTICAL OUTPUT TRANSFORMER VERTICAL RATE 300V P-P
- 10 V105 PIN 2 PICTURE TUBE GRID VERTICAL RATE 100V P-P
- 11 SR201 CATHODE JUNCTION HORIZONTAL PHASE DETECTOR HORIZONTAL RATE 9V P-P
- 12 SR201 ANODE HORIZONTAL PHASE DETECTOR HORIZONTAL RATE 20V P-P
- 13 TP-4 HORIZONTAL SINE WAVE HORIZONTAL RATE 16V P-P
- 14 V101 PIN 2 HORIZONTAL OUTPUT GRID HORIZONTAL RATE 150V P-P
- 15 PW-200 TERMINAL "T" 145V B₁ RIPPLE VERTICAL RATE 3V P-P



... new ideas for moving electrical energy

134 new stock answers

to keep your wiring
jobs on schedule.

134 new stock cables and cords for: communications •
broadcast audio • sound • data—coax, twinax • controls
• instrumentation • strain gages • CCTV cameras • MATV •
retractile cords for telephones, microphones and power.

BELDEN
Electronic Wire
and cable

They're exceptional items to find in stock. But your Belden Distributor offers them. Over 134 new electronic cable and cord offerings have been added to the continually growing line of Belden standards. We like to keep new standard products coming. To make your critical wiring applications easier to cope with. To keep your projects on schedule. Get a copy of the latest Belden catalog. It identifies and describes all the new items, plus the longest, strongest line of electronic wire/cable around. See your Belden Distributor or write: Electronic Sales Service Dept., Belden Corporation, Richmond, Indiana 47374.

Electronic Sales Service Dept.
Belden Corporation
Richmond, Indiana 47374



* Please send me
the latest Belden Electronics Catalog

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Type of Business _____

8-1-1

... for more details circle 103 on Reader Service Card

The moving sound of moving sound.

The kind you get from Mallory's new light-weight, go everywhere cassette tape recorders.

They're pushbutton simple. And built to fit in with the excitement of living.

We have three solid-state models in three price ranges . . . something for everybody. And

they come with a whisper-sensitive dynamic microphone, automatic recording level circuit, power-packed Duracell® batteries and a full-fidelity Duratape® cassette.

Mallory portable cassette tape recorders . . . when you're going places.

MALLORY

MALLORY DISTRIBUTOR PRODUCTS COMPANY

a division of P. R. MALLORY & CO. INC.
Box 1558, Indianapolis, Indiana 46206; Telephone: 317-636-5353

MCR 1204

Slim, neat, light. Battery operated. 3½" dynamic speaker and dynamic mike. For kids, teenagers . . . even Mr. Businessman.

MCR 1232

Total go-anywhere entertainment. Recorder and superb AM/FM radio. AFC, pop-up cassette ejector, built-in antenna. In a slim, tough case. The music-maker.

MCR 1209

Great everywhere. Batteries or AC plug-in. Pushbutton operation. Slim, easy to carry, pack. Dynamic speaker and mike. The perfect gift.



Batteries • Capacitors • Controls • CRIME ALERT® • DURATAPE® Recorders • Resistors • Semiconductors • SONALERT® • Switches • Timers

. . . for more details circle 124 on Reader Service Card

ELECTRONIC TECHNICIAN/DEALER

PHILLIP DAHLEN

Editor
1 East First Street
Duluth, Minn. 55802
(218) 727-8511

ALFRED A. MENEGUS

Publisher
757 Third Avenue
New York, N.Y. 10017
(212) 572-4829

TOM GRENEY

Publishing Director

JOSEPH ZAUHAR

Managing Editor

BERNICE GEISERT

Production Manager

BOB ANDRESEN

Graphic Design

LILLIE PEARSON

Circulation Fulfillment

JOHN KESSLER

Manager, Reader Services

MANAGERS

DEAN GREENER

43 East Ohio Street
Chicago, Ill. 60611
(312) 467-0670

CHUCK CUMMINGS

Ad Space South/West
613 North O'Connor
Irving, Texas 75060
(214) 253-8678

DONALD D. HOUSTON

KEN JORDAN
1901 West 8th Street
Los Angeles, Calif. 90057
(213) 483-8530

CHARLES S. HARRISON

CY JOBSON
57 Post Street
San Francisco, Calif. 94104
(415) 392-6794

ROBERT UPTON

Tokyo, Japan
C.P.O., Box 1717

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.

-
- 3 **TEKFAX:** Up-to-date schematics for easier servicing.
 - 23 **EDITORIAL:** Those are fighting words!
 - 24 **LETTERS:** Pertinent comments concerning past issues.
 - 28 **NEWS:** Events of interest to our industry.
 - 30 **READER'S AID:** What you need or have for sale.
 - 34 **NEW AND NOTEWORTHY:** Merchandise of special interest.
-

FEATURES

39 **TEKLAB REPORT**

A staff written report of the features found in Magnavox's Total-Automatic Color-TV Chassis T962.

44 **HEATH'S AR-1500 RECEIVER**

The first in a new series of reports concerning the many useful audio products that you should be encountering.

47 **WHAT'S NEW IN TV RECEIVERS FOR 1972—PART II**

The second in a two-part preview of TV sets that will be on the market during the coming months.

52 **UNDERSTANDING TODAY'S CAPACITORS**

Suggestions for stocking a minimum supply of capacitors to meet most of your servicing needs—by Richard Marsh.

56 **GUEST AUTHOR: ADJUSTING TO CHANGING MARKETS**

William Buschmann, vice president of Marketing for the Electronic Components Group of GTE Sylvania, tells of the new challenges facing us as our technology advances.

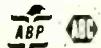
57 **TEST INSTRUMENT REPORT**

Reviewing specifications for Philips' PM 3200 Scope.

-
- 58 **COLORFAX:** Tips for easier color-TV set repair.
 - 66 **TECHNICAL DIGEST:** Hints and shortcuts for more effective servicing.
 - 70 **NEW PRODUCTS:** Instruments and components to make your job easier.
 - 74 **DEALER SHOWCASE:** These items may increase your sales revenue.
 - 78 **ADVERTISER'S INDEX:** Manufacturers concerned about you.
 - 79 **READER SERVICE:** A source of additional information.
-



A HARCOURT BRACE JOVANOVIĆ PUBLICATION

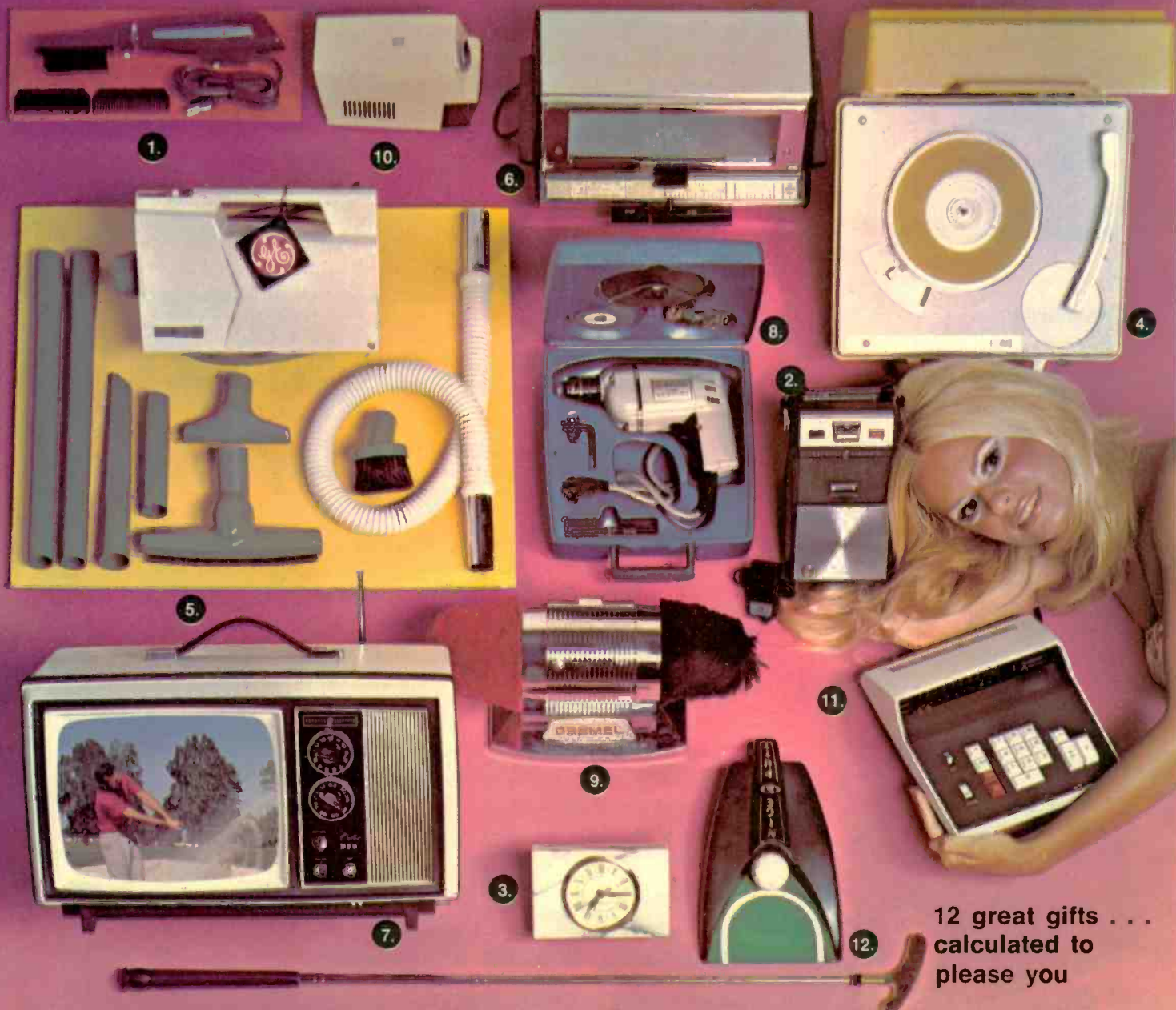


ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate Offices: 757 Third Avenue, New York, New York 10017. Advertising Offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial, Accounting, Ad Production and Circulation Offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: One year \$6, two years \$10, three years \$13, in the United States and Canada. Other countries: one year \$15, two years \$24, three years \$30. Single copies: 75¢ in the U.S. and Canada; all other countries \$2. Second class postage paid at Dansville, New York 14437 and at additional mailing offices. Copyright © 1971 by Harcourt Brace Jovanovich, Inc.

POSTMASTER: Send form 3579 to ELECTRONIC TECHNICIAN/DEALER, P. O. Box 6016, Duluth, Minnesota 55802.

THE ELECTRIC GIFTS

WITH GENERAL
ELECTRIC
TUBES



12 great gifts . . .
calculated to
please you

Save the gift point coupons you'll receive with each General Electric tube purchase from your participating distributor . . . and earn your great electric gifts.

1. GE Styling Comb, 282 Gift Points
2. GE Tape Recorder, 543 Gift Points
3. GE Marble Clock, 265 Gift Points
4. GE Youth Phono, 459 Gift Points
5. GE Portable Vacuum Cleaner, 564 Gift Points
6. GE Toast-R-Oven™, 608 Gift Points
7. GE Porta-Color® Television (reception simulated), 4331 Gift Points
8. Black & Decker® Drill Set, 412 Gift Points
9. Dremel Electric Shoe Polisher, 640 Gift Points
10. Brothers® Electric Pencil Sharpener, 260 Gift Points
11. Brothers® Calculator, 4728 Gift Points
12. Automatic Putting Set, 260 Gift Points

Tube Products Department, Owensboro, Ky.

GENERAL  ELECTRIC

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!

Phillip Dallen



**we've
gone
magnetic!**

**NEW NUTDRIVERS
STOP FUMBLING, SAVE TIME**

Exclusive with Xcelite, 1/4" and 5/16" hex socket magnetic nutdrivers offer the ultimate in convenience for starting, driving, or retrieving screws, bolts, or nuts.

All types: Midget Pocket Clip, Regular, Extra Long, Super Long fixed handle... also interchangeable shanks for Series "99" handles.

Permanent Alnico magnet. Sockets remain demagnetized. Won't attract extraneous matter or deflect against metal surfaces.

New comfort-contour, color-coded handle makes one-hand driving easy, identifies tools as magnetic.

Sockets specially treated and hardened for use with hex head, self-tapping screws. Finished in black oxide for dimensional control and added identification.

REQUEST DESCRIPTIVE LITERATURE

*nationwide availability through
local distributors*



Made in
U.S.A.

XCELITE®

XCELITE, INC., 14 Bank St., Orchard Park, N. Y. 14127
In Canada contact Charles W. Pointon, Ltd.

... for more details circle 141 on Reader Service Card

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

continued on page 26



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

When you use "fits-all" capacitor replacements you leave yourself open for criticism of your work... and you could lose customers. Exact replacements are easier to install, and are less expensive, in most cases.

Don't settle for "nearly-right" substitutes. The Sprague TWIST-LOK® line gives you the exact capacitor you need, when you need it, most every time.

Get your copy of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-110 from your Sprague distributor or write: Sprague Products Company, 65 Marshall St., North Adams, Mass. 01247.

THE BROAD-LINE PRODUCER OF ELECTRONIC PARTS

... for more details circle 136 on Reader Service Card



LETTERS . . .

continued from page 24

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 put-

ting 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.

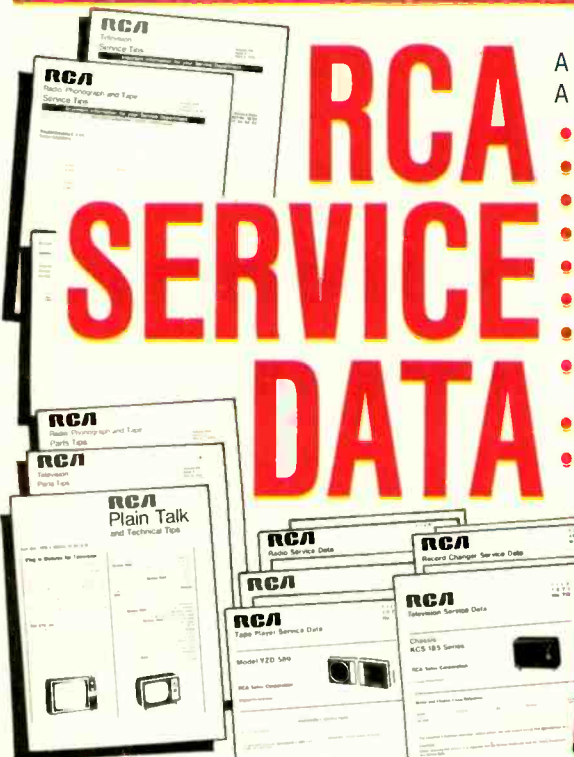
I would appreciate any and all correspondence in rebuttal, approval or disapproval concerning wages and wages alone! I am not interested, at this time, in solving the shop owners’ business problems.

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

continued on page 30

YOU MAY BE MISSING THE MOST VALUABLE TOOL ON YOUR BENCH



RCA SERVICE DATA

A SUBSCRIPTION INCLUDES A COMPLETE “FILE” YEAR OF:

- COLOR TELEVISION DATA
- B & W TELEVISION DATA
- RADIO DATA
- PHONOGRAPH DATA
- TAPE RECORDER DATA
- SERVICE TIPS
- PARTS TIPS
- PERIODICAL ISSUES OF “PLAIN TALK”
- “GOLDENROD” BULLETINS
- SERVICE DATA INDEX



— DON'T DELAY! SUBSCRIBE TODAY! —

Please acknowledge my request for a Service Data Subscription:

- “File—1971” Service Data including 2 binders \$19.95
- “File—1971” Service Data subscription \$14.95
- (Binders available separately—\$2.95 each) Number desired _____

Amount enclosed: \$ _____

NAME _____

STREET ADDRESS _____

CITY _____

STATE _____

ZIP CODE _____

Your order will be processed promptly upon receipt of your check or money order in the amount indicated above. SEND TO:

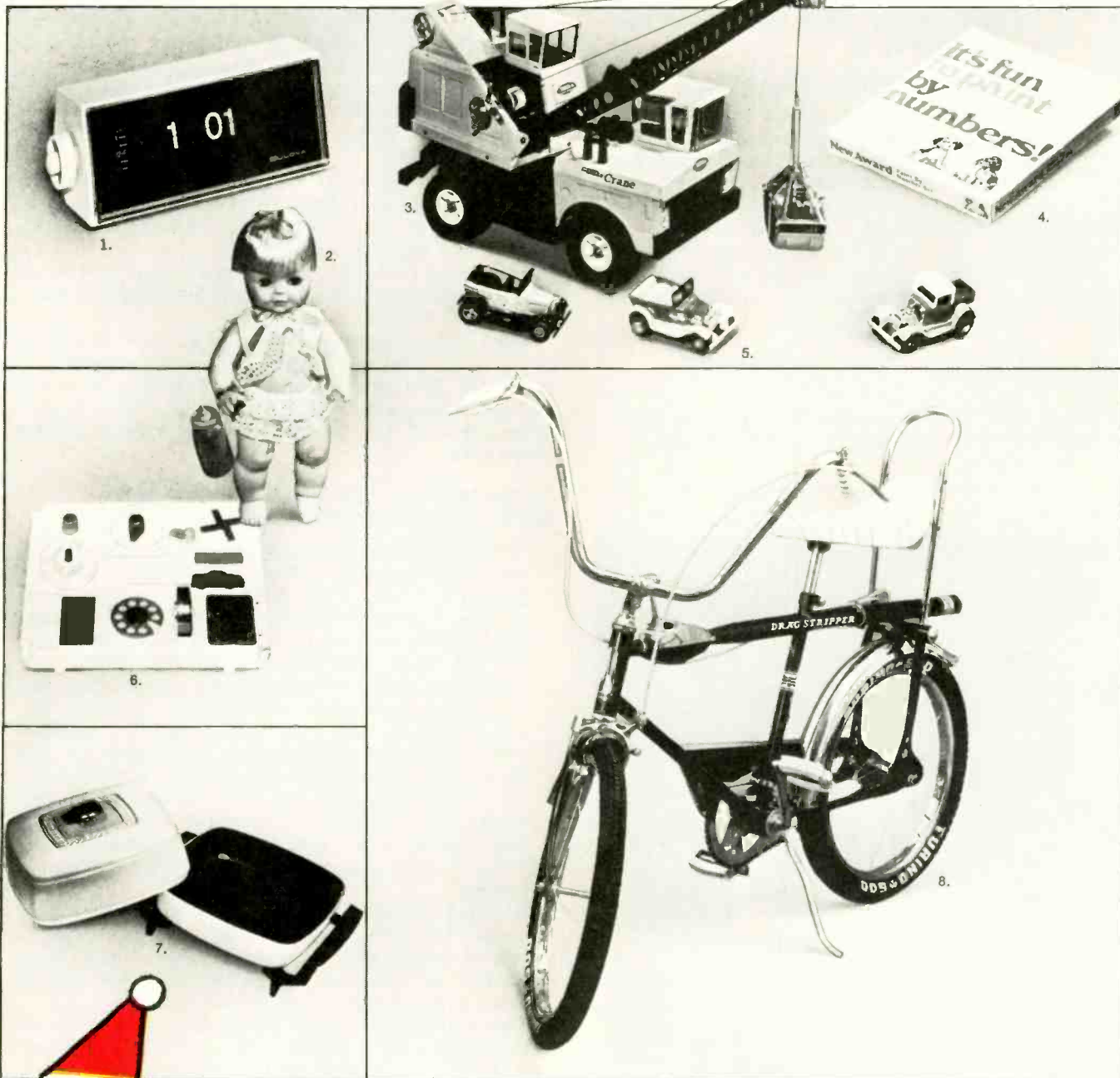
RCA CONSUMER ELECTRONICS, 600 N. Sherman Drive, Indianapolis, Ind. 46201
ATTN: Technical Publications, 8-106. (Or Contact Your Local Distributor)

NOTE: Prices Subject to Change without Notice.

. . . for more details circle 133 on Reader Service Card

Pick a present with RCA...

When you purchase RCA entertainment receiving and picture tubes from your participating RCA Distributor



15 gifts for you and your family

1. Bulova Digital Electric Alarm Clock
2. Love-Me-Baby Doll
3. Mighty Tonka Crane
4. Paint by the Number Set
5. Tiny Tonka Cars

6. Baby's Busy Box
7. Mirro-Matic Buffet Server-Fryer
8. Drag Stripper Boys Bike (Not Shown)
- Tiny Town Doctor Set

- Tiny Town Nurse Set
- Dip-A-Flower Maker
- Easel Peg Chest
- Skittle Pins
- Atlas Train Set
- Mini Miss Girls Drag Stripper Blke

Play Santa Claus with your choice of 15 name-brand high quality gifts for yourself, your home, your children, just in time for the holiday gift-giving season!

See your participating RCA tube distributor for full details.
RCA/Electronic Components/Harrison, N. J. 07029

RCA

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 war-

ranty-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

continued on page 32

NORTRONICS professional recording accessories... your best bet for professional results!

PROFESSIONAL ALIGNMENT TAPES

Industry's Best! Splice-free first-generation masters for reel (Model AT-100) and cassette (Model AT-200) which provide zero reference, azimuth alignment and frequency response tests.



PROFESSIONAL HEAD CLEANER

Specially formulated in spray and liquid form for professional and industrial applications. Completely cleans VTR, audio, digital and instrumentation heads, microwave equipment, white rooms and magnetic tape.



See your Nortronics distributor today!

world's leader in magnetic heads

NORTRONICS
COMPANY, INC.

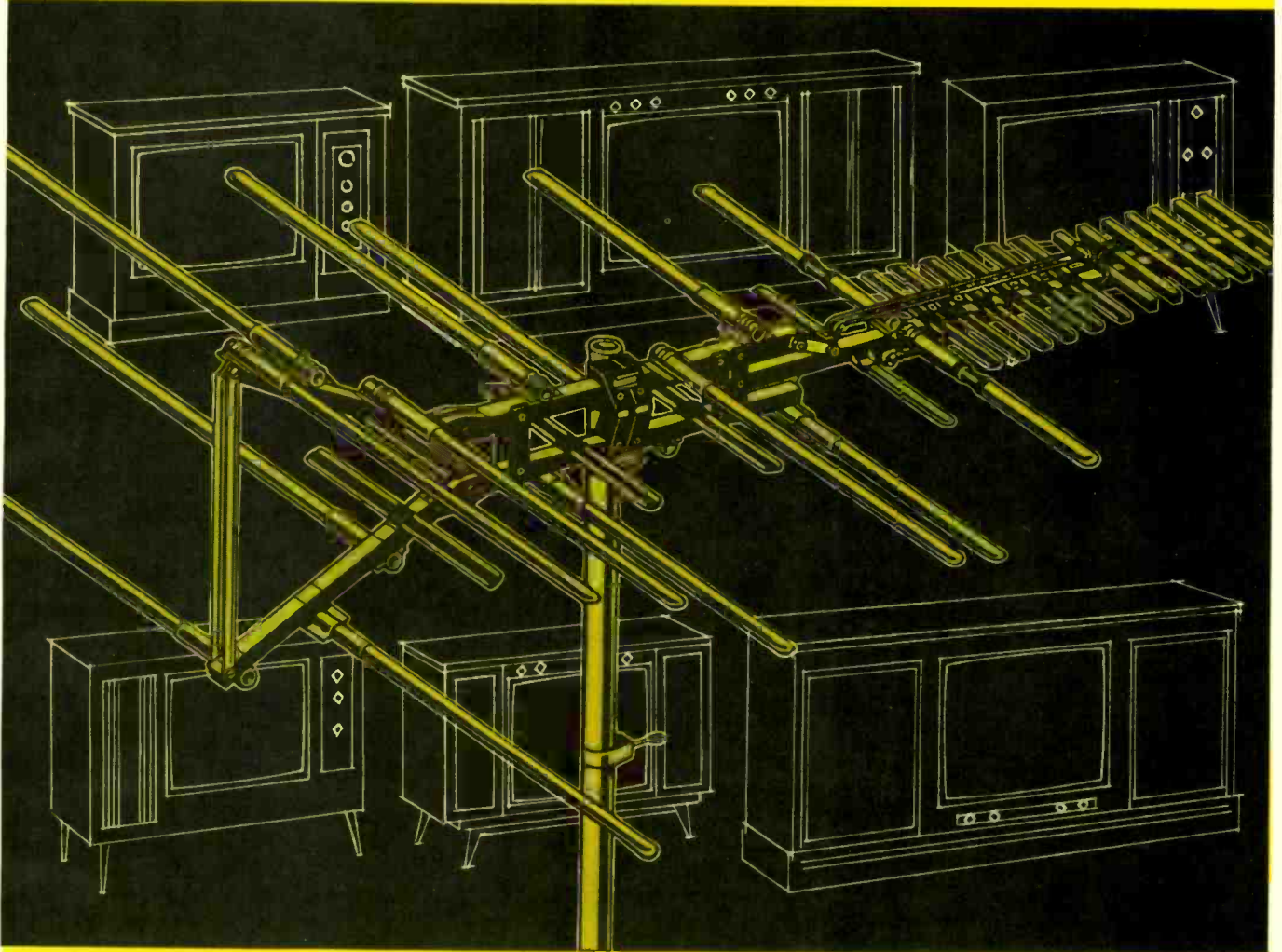
6140 Wayzata Blvd. Minneapolis, Minn. 55416 (612) 544-0381

In Canada

Len Finkler, Ltd. • 25 Toro Rd., Downsview, Ont. • (416) 630-9103

... for more details circle 126 on Reader Service Card

the set choice is yours...



the antenna choice is...

FINCO®

NEW '70 SERIES COLOR SPECTRUM TV ANTENNAS

Send for free Catalog 20-556

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

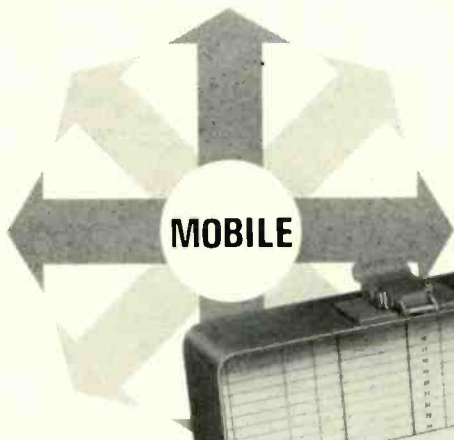


**THE FINNEY
COMPANY**

34 WEST INTERSTATE STREET
DEPT. 110-11
BEDFORD, OHIO 44146

... for more details circle 115 on Reader Service Card

INTERNATIONAL
**frequency
 meter**



- Tests Predetermined Frequencies 25 to 1000 MHz
- Extended Range Covers 950 MHz Band
- Pin Diode Attenuator for Full Range Coverage as Signal Generator
- Measures FM Deviation

FM-2400CH



WRITE FOR CATALOG!

The **FM-2400CH** provides an accurate frequency standard for testing and adjustment of mobile transmitters and receivers at predetermined frequencies.

The **FM-2400CH** with its extended range covers 25 to 1000 MHz. The frequencies can be those of the radio frequency channels of operation and/or the intermediate frequencies of the receiver between 5 MHz and 40 MHz.

Frequency Stability: $\pm .0005\%$ from $+50^\circ$ to $+104^\circ\text{F}$.

Frequency stability with built-in thermometer and temperature corrected charts: $\pm .00025\%$ from $+25^\circ$ to $+125^\circ$ (.000125% special 450 MHz crystals available).

Self-contained in small portable case. Complete solid state circuitry. Rechargeable batteries.

- FM-2400CH (meter only).....\$595.00
- RF crystals (with temperature correction)..... 24.00 ea.
- RF crystals (less temperature correction)..... 18.00 ea.
- IF crystals.....catalog price



... for more details circle 120 on Reader Service Card

READERS' AID

Space contributed to help serve the personal needs of you, our readers.

For Sale

I have a wide variety of test instruments which I wish to dispose of. Contact me for further details.

HERMAN MARCUS
 4335 44th St.
 Long Island City, N.Y. 11104

Needs Schematic

I have a Precise Model 660 solid-state color generator that is in need of repair. I am in need of a schematic with some voltages, wave forms, etc., or any information on set-up or whatever you have that could be utilized. I will gladly defray any expenses involved with obtaining any or all of the above information.

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

Needs Roll Chart and Handbook

I need help in finding the latest roll chart, supplements, schematic and handbook on a Series 920 Electronamic tube and set tester manufactured by the Precision Apparatus Co. It has an old "80" tube for a rectifier. Since the company is out of business, I would appreciate any assistance possible.

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

Picture Tube Needed

I am in need of a 3KP4 picture tube, either working or a dud. Any assistance in this will be greatly appreciated.

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

LETTERS...

continued from page 26

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.



It takes time to replace a color picture tube...

GE ULTRACOLOR[®]

works to cut back
the need of
replacing the
replacement

sustained brightness and color purity are assured through use of advanced getter material. Gases generated by the tube's operation are removed, providing longer life and sustained color purity.

reliability and quality assurance are built in. Only the highest quality replacement components are used... and they're still expected to prove themselves. First during the manufacturing process, through continuing in-line inspections, and extensive life testing of the finished product, afterwards.

GE ULTRACOLOR[™] picture tubes provide the service and dependability that guarantee customer satisfaction. *(Made by professionals, for professionals)*

TUBE PRODUCTS DEPARTMENT • GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY 42301

GENERAL  ELECTRIC

continued from page 28

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.

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.

continued on page 64

Ways to implement the national training coordinator program

Those attending this conference were reminded of the

RMS DEPENDABLE PRODUCTS FOR PROFITS!

| | | |
|--|---|--|
| <p>"STAR-TRACK"™ the most Advanced Space-Age VHF/UHF/FM Color Antennas ever introduced!</p>  <p>Similar design to antennas used in space program.</p> <p>U.S. Patent No. 3,440,658</p> <ul style="list-style-type: none"> • Corner Reflector Driven Disc Director Array for total UHF coverage! • Multiple Tuned, Cut-to-Channel VHF Elements for total VHF and FM coverage! • Maximum construction for long installation life! • Exclusive Reynolds Aluminum COLORWELD durable baked enamel Gold finish! • Includes RMS SP-332 VHF/UHF Splitter for economical single down-lead installation! |  <p>Best Performing UHF Converters! Solid-State. With Built-in Amplifier for high gain! Improves UHF reception! Top styling! Models retail from \$27.95 to \$49.95.</p> |  <p>Most Complete Line of UHF/VHF/FM Splitters & Matching Transformers! For multi-set home installation, MATV, and CCTV systems. All configurations!</p> |
|  <p>Better Styled Indoor Antennas! Popular Mystic II VHF/UHF Antenna. 12 position swivel-action telescoping dipoles. \$9.95 Retail.</p> |  <p>Better Stereo Headphones and Headphone Accessories! New convenient features and styling! Models retail from \$7.95 to \$49.95.</p> |  <p>Best Performing High Gain UHF/VHF/FM 2-Set and 4-Set Couplers!</p> <p>Finest Line of Cassette and Cartridge Carry Cases and Storage Units! Low retail from \$1.49 to \$21.95.</p> |

Write for FREE Catalog — Dept. S

RMS ELECTRONICS, INC.

50 Antin Place, Bronx, N.Y. 10462 • Tel. (212) 892-6700

... for more details circle 135 on Reader Service Card

There's an Amperex replacement tube for any socket in any set you're likely to service...

TV, HiFi, FM or AM, House Radio, Car Radio, P.A. System or Tape Recorder. Imported or Domestic!

AMPEREX ELECTRONIC CORPORATION, DISTRIBUTOR SALES, HICKSVILLE, NEW YORK 11802

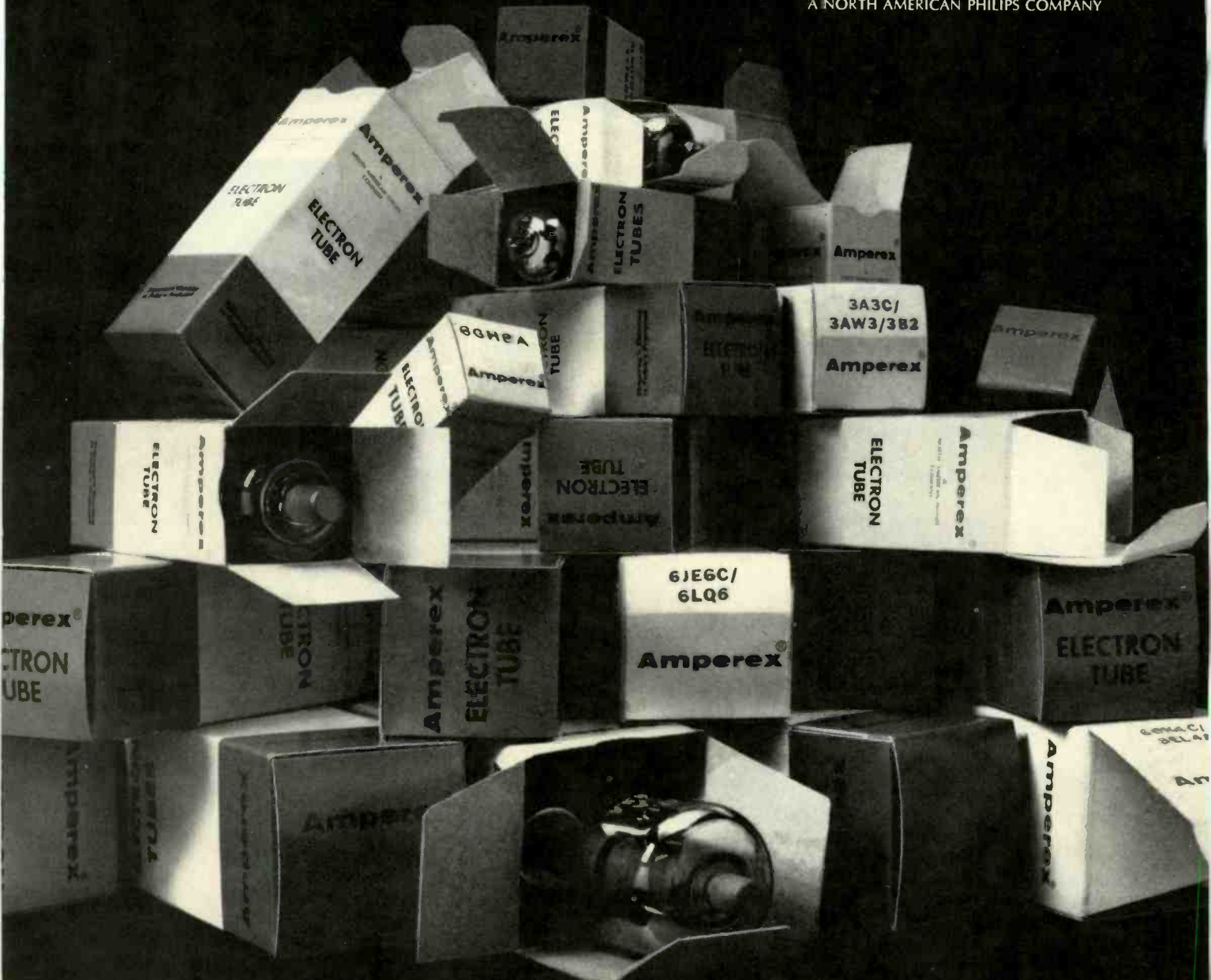


AMPEREX SUPPORTS THE INDEPENDENT SERVICE DEALER

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

A NORTH AMERICAN PHILIPS COMPANY



... for more details circle 101 on Reader Service Card

NEW AND NOTEWORTHY

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.



AUDIO SWEEP GENERATOR 700

Provides a source of audio frequency functions

The Model ASG-200 audio sweep generator is said to provide a source of audio frequency functions: sine, square, triangle, positive sawtooth (with variable negative slope), and negative sawtooth (with variable positive slope). Frequency is variable from 0.02Hz to 20kHz for all functions, and the dial accuracy is reportedly within 2%. It has an output impedance of 50Ω and an output signal of 0.6v p-p. The dimensions are 4¾ in. H by 8¼ in. W by 6½ in. D. Weight is 48 oz. Kit price: \$84.85. Factory assembled: \$108.09. Phase Corp.

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.



FOR MORE
NEW PRODUCTS
SEE PAGE 70



SOLDERING SYSTEM

Emits no chemical fumes 702

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.

You can earn more money if you get a Government FCC License

...and here's our famous **CIE Warranty** that you **will get your License** if you study with us **at home**

NOT SATISFIED with your present income? The most practical thing you can do about it is add to your Electronics know-how, pass the FCC exam and get your Government License.

The demand for licensed men is enormous. Today there are over a million licensed broadcast installations and mobile transmitters on the air, and the number is growing constantly. And according to Federal Law, no one is permitted to operate or service such equipment without a Government FCC License or without being under the direct supervision of a licensed operator.

This has resulted in a gold mine of new business for licensed service technicians. A typical mobile radio service contract pays an average of about \$100 a month. It's possible for one trained technician to maintain eight to ten such mobile systems. Some men cover as many as fifteen systems, each with perhaps a dozen units.

Opportunities in Plants

And there are other exciting opportunities in the aerospace industry, electronics manufacturing, telephone companies, and plants operated by electronic automation. Inside indus-



Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE: "I give CIE credit for my First Class Commercial FCC License. Even though I had only six weeks of high school algebra, CIE's lessons made Electronics easy. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing... and am on my way out."



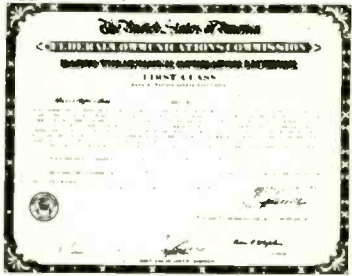
Thomas E. Miller, Jr., Engineer, Indiana Bell Telephone Company: "I completed my CIE course and passed my FCC exam while in the Navy. On my discharge, I was swamped with job offers from all over the country. My only problem was to pick the best one, and I did—engineer with Indiana Bell Telephone. CIE made the difference between just a job and a management position."

Cleveland Institute of Electronics

WARRANTY

**OF SUCCESS IN OBTAINING
A GOVERNMENT FCC LICENSE**

A Cleveland Institute of Electronics FCC License course will quickly prepare you for a Government FCC License. If you don't pass the FCC exam after completing your course, CIE will refund all your tuition. You get an FCC License...or your money back!



[Signature]

trial plants like these, it's the licensed technician who is always considered first for promotion and in-plant training programs. The reason is simple. Passing the Federal Government's FCC exam and getting your License is widely accepted proof that you know the fundamentals of Electronics.

So why doesn't everybody who "tinkers" with electronic components get an FCC License and start cleaning up?

The answer: it's not that simple. The Government's licensing exam is tough. In fact, an average of two out of every three men who take the FCC exam fail.

There is one way, however, of being pretty certain that you will pass the FCC exam. That's to take one of the FCC home study courses offered by the Cleveland Institute of Electronics.

CIE courses are so effective that better than 9 out of every 10 CIE gradu-

ates who take the exam pass it. That's why we can afford to back our courses with the iron-clad Warranty shown above: you get your FCC License or your money back.

Mail Coupon for Two Free Books

Want to know more? Send the coupon below for free copies of our school catalog, "How To Succeed In Electronics," describing opportunities in Electronics, together with our special booklet, "How To Get A Commercial FCC License." If coupon has been removed, just send your name and address to us.

ENROLL UNDER NEW G.I. BILL

All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box in coupon for G.I. Bill information.

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Cleveland Institute of Electronics
1776 E. 17th St., Cleveland, Ohio 44114

Please send me without cost or obligation:

1. Your 40-page book "How To Succeed In Electronics" describing the job opportunities in Electronics today and how your courses can prepare me for them.
2. Your book "How To Get A Commercial FCC License."

Name _____ Age _____
(Please Print)

Address _____

City _____

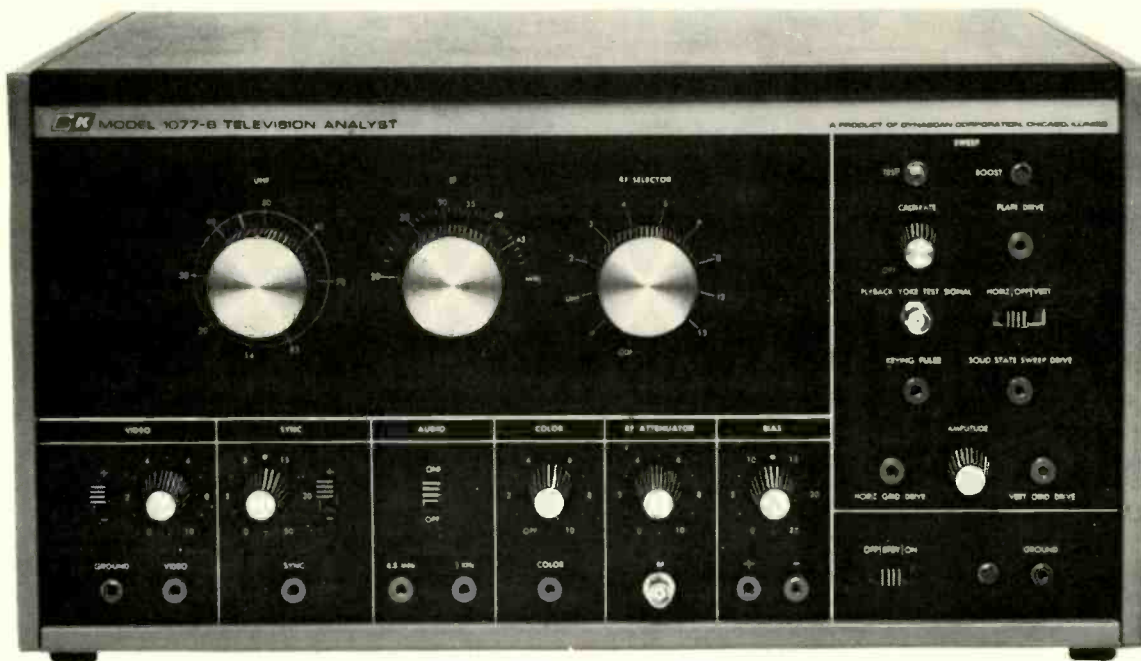
State _____ Zip _____

Check here for G.I. Bill information

Accredited Member National Home Study Council
A Leader in Electronics Training... Since 1934

ET-61

... for more details circle 108 on Reader Service Card



Who said B & K couldn't improve the only complete Television Analyst?

Now there is a new model... the 1077-B, with solid state sweep drive.

The B & K Television Analyst has become standard equipment in repair shops everywhere. And for good reason. It's the quickest, simplest way to test every stage of any TV.

But even classic instruments have to keep up with the times.

That's why we've added a solid state sweep drive in our latest model. It can check any new transistorized color set on the market today.

It's so easy, too. Because the unique B & K signal substitution technique eliminates the need for external scopes or wave-form interpretation.

Whether it's tubes or transistors, VHF or UHF, simply inject the appropriate test pattern or any other known signal. The new Model 1077-B, with its exclusive flying spot scanner, checks everything from the antenna terminals to the input of the picture tube.

Ask your distributor about the new Television Analyst. Only B & K makes it. And now B & K makes it even better.

Model 1077-B \$399.95



Product of DYNASCAN CORPORATION
1801 W. Belle Plaine, Chicago, Illinois 60613

... for more details circle 102 on Reader Service Card

TEKLAB REPORT

Magnavox's Total-Automatic Color-TV Chassis T962

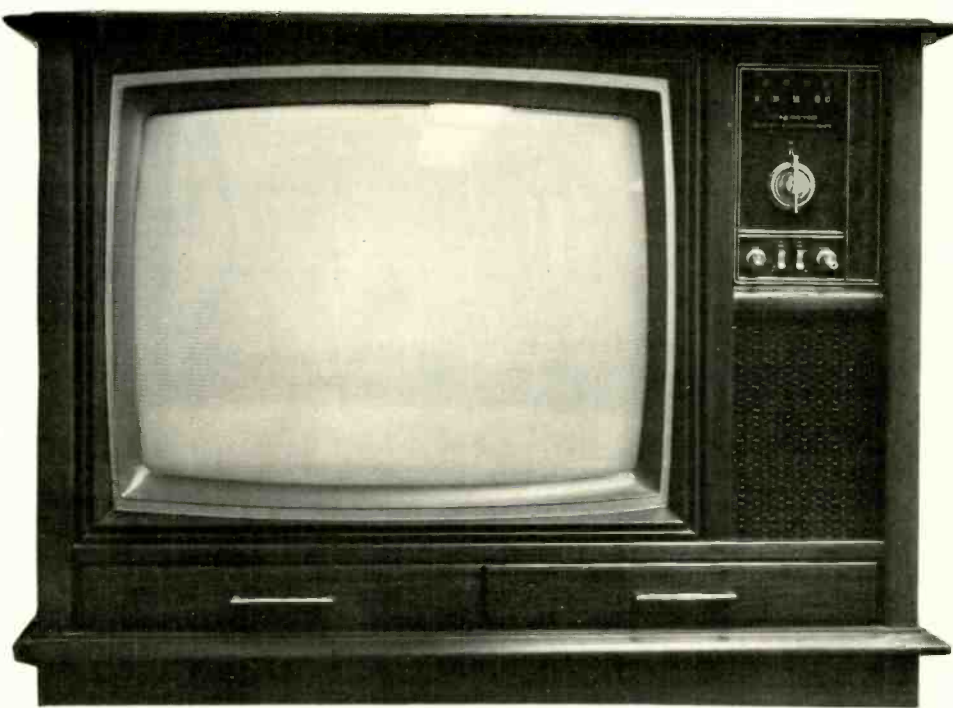
by Joseph Zauhar

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

■ 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/



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

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 balun type input transformer and link connector. When the con-

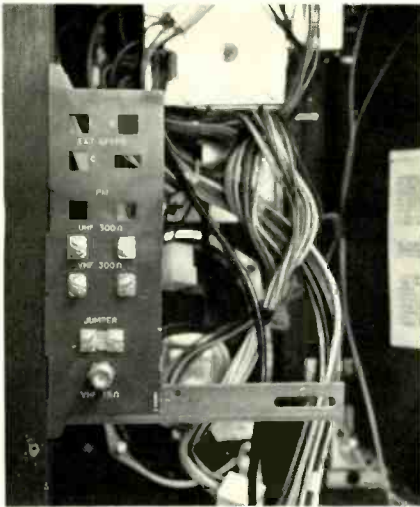


Fig. 1—A special antenna connector block will accept a 75Ω coax cable system or standard 300Ω twin lead. It also includes a permanently mounted balun-type input transformer.

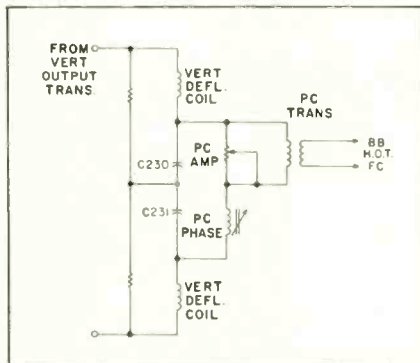


Fig. 2—Simplified schematic of the pincushion correction circuit, which corrects raster distortion at the top, bottom and both sides. Courtesy of Magnavox.

necting link is closed, a 300Ω antenna system can be connected directly to the twin-lead connectors and the balun 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.

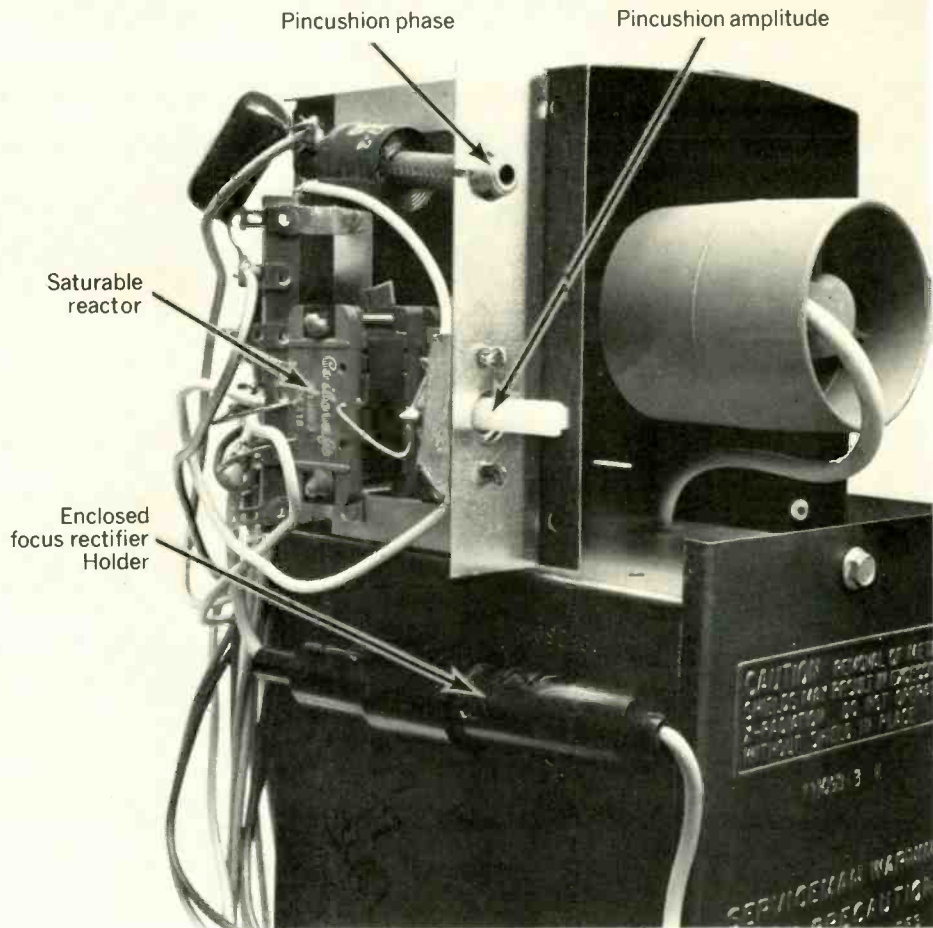


Fig. 3—The saturable reactor, called the pincushion transformer, looks somewhat like a transformer, but is designed and constructed to produce minimum transformer action.

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.

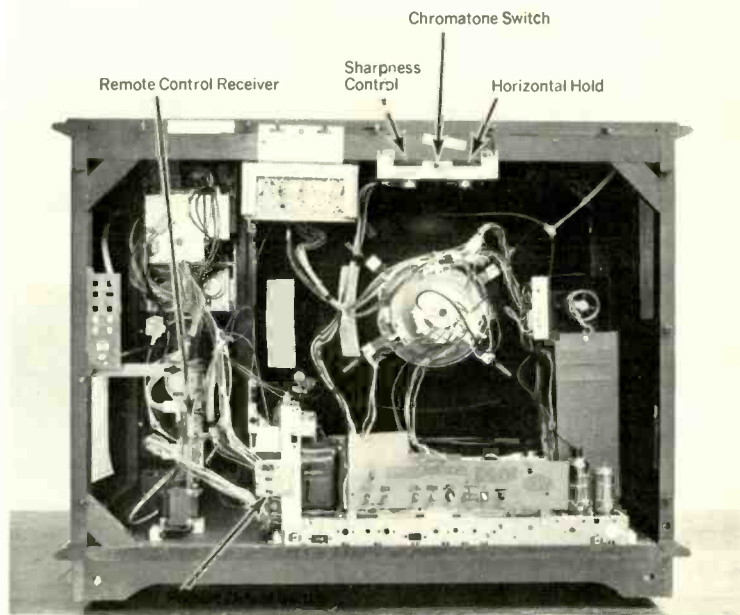
The circuit makes the reproduction of fleshtones less dependent upon the precise setting of the tint. This is accomplished by increasing the phase angle between the two 3.58MHz signals applied to the color demodulator grids whenever the AUTO TINT switch is placed in the ON position.

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.

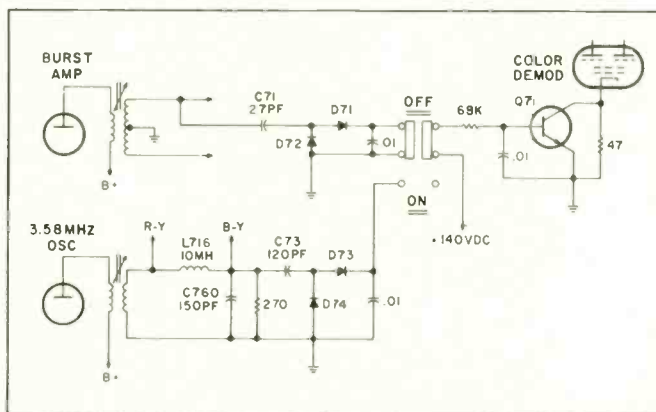
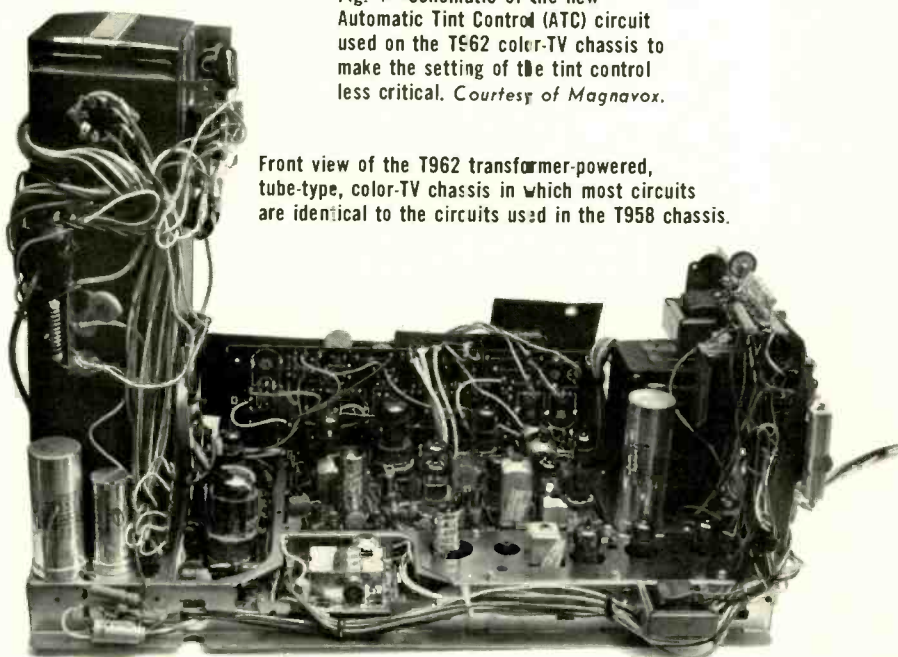


Fig. 4—Schematic of the new Automatic Tint Control (ATC) circuit used on the T962 color-TV chassis to make the setting of the tint control less critical. Courtesy of Magnavox.



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 thyristors 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



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

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



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

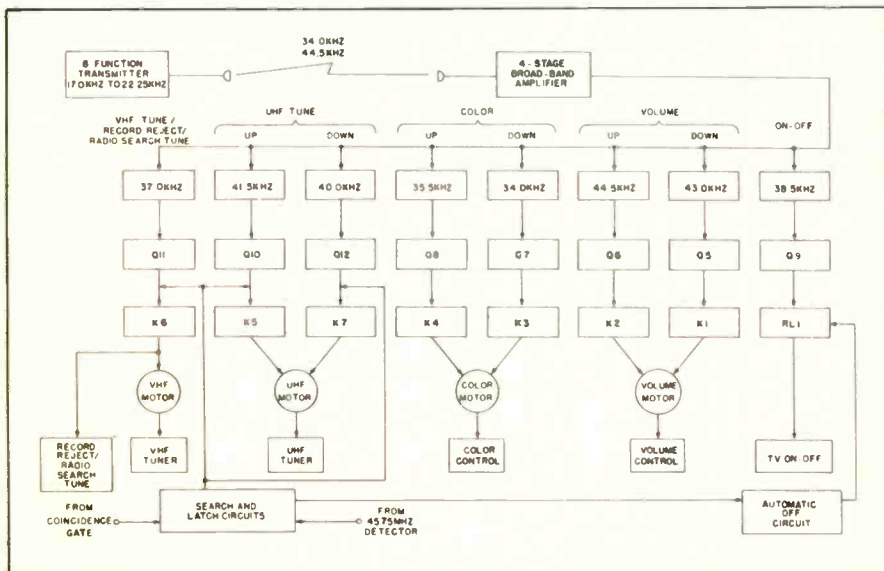


Fig. 5—Block diagram of the Model 704064 eight-function remote-control receiver used with the T962 color-TV chassis. Courtesy of Magnavox.

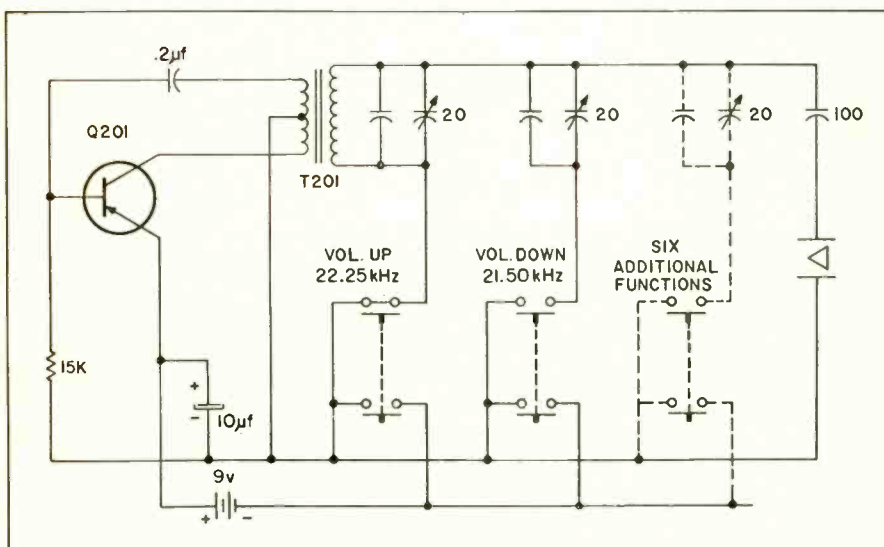
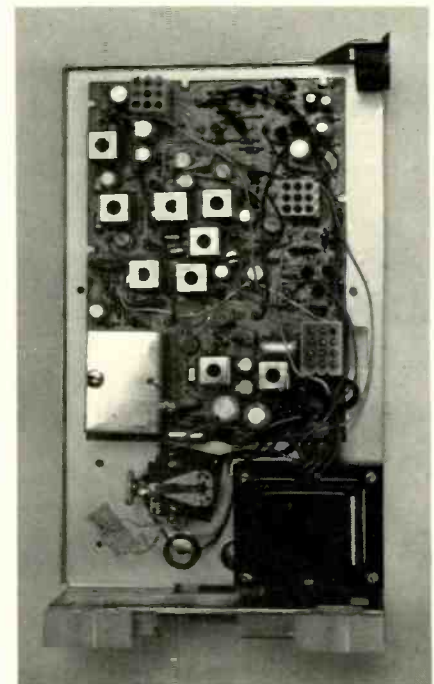
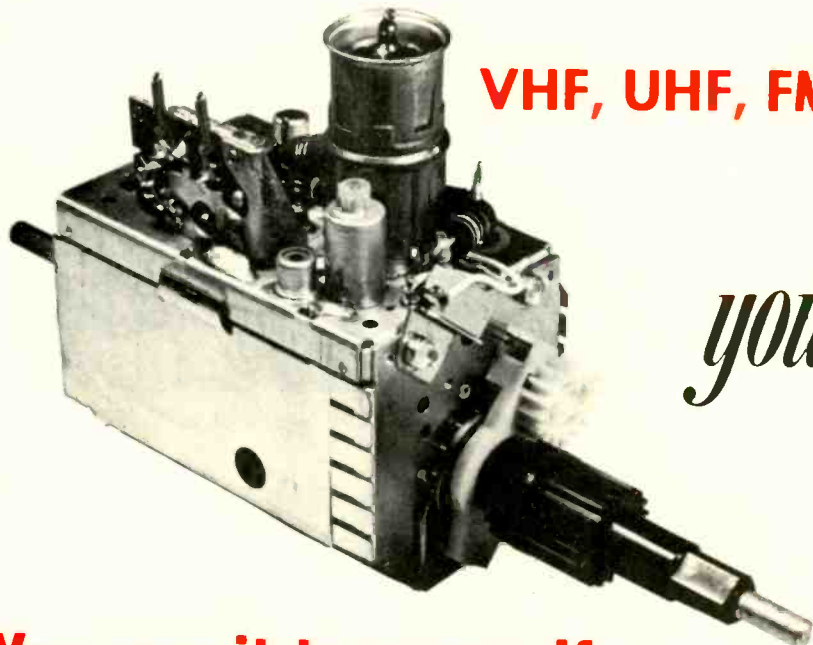


Fig. 6—Schematic of the remote control transmitter. Courtesy of Magnavox.



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

TV TUNER SERVICE



VHF, UHF, FM or IF-Subchassis. . .
 . . . All Makes

you get...

Fast 8 hr. Service!

You owe it to yourself

to try P.T.S. We are the fastest growing, oldest and now the largest tuner service company in the world. Here is what you get:

1. Fastest Service — 8 hr. — in and out the same day. Overnight transit to one of our six plants, for parts, tuners or IF-modules.
2. All tuners cleaned inside and out, repaired, realigned and air tested.
3. On IF-modules all stages checked, all traps set with high calibre test equipment.
4. Fine Quality! Your customers are satisfied and you are not bothered with returning your units for rework!
5. Lower Cost! Up to \$5.50 less than other tuner companies!
6. Friendly, helpful personalized service!

1 YEAR GUARANTEE



FIRST TO OFFER 365-DAY GUARANTEE!
 COLOR—BLACK & WHITE—TRANSISTOR TUNERS—ALL MAKES
 GUARANTEED COLOR ALIGNMENT—NO ADDITIONAL CHARGE

We offer you finer, faster...

| | |
|------------|----------------|
| VHF-UHF-FM | \$ 9.95 |
| UV-COMBO | \$16.95 |
| IF-MODULE | \$12.50 |

Major Parts charged at Net Price

CUSTOMIZED REPLACEMENTS AVAILABLE
 FOR \$12.95 UP (NEW OR REBUILT)

.. Precision
Tuner Service



LIKE TO DO IT YOURSELF?

PTS makes all tuner parts available to you.

Send one dollar (redeemable) for our

TUNER REPLACEMENT GUIDE AND PARTS CATALOG

- 60 pages of top information
- Blow-up of all tuners
- Largest exact tuner replacement guide
- Antenna Coil Replacement Guide
- Multi-fit Replacement Tuner Shaft Guide

For fastest service, send faulty unit with tubes, shields and all broken parts to:

PTS ELECTRONICS, INC.

| | |
|---|-------------------|
| HOME OFFICE—P. O. Box 272—Bloomington, Ind. 47401 | Tel. 812/824-9331 |
| EAST—P. O. Box 3189—Springfield, Mass. 01103 | Tel. 413/734-2737 |
| WEST COAST—P. O. Box 41354—Sacramento, Calif. 95841 | Tel. 916/482-6220 |
| MOUNTAIN—P. O. Box 4145—Denver, Colo. 80204 | Tel. 303/244-2813 |
| SOUTHWEST—P. O. Box 7332—Longview, Tex. 75601 | Tel. 214/753-4334 |
| SOUTHEAST—P. O. Box 6771—Jacksonville, Fla. 32205 | Tel. 904/389-9952 |

... for more details circle 131 on Reader Service Card

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 10 $\frac{7}{8}$ - by 8 $\frac{1}{2}$ - by 11 $\frac{1}{16}$ -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.

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.

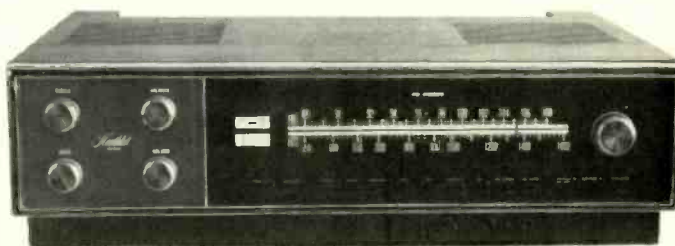
Rabbit ears were used for FM reception, and during the hours of best reception we were able to clearly receive FM multiplex signals from as far south as Minneapolis. In fact, reception was so good that we were even receiving local Iowa news from one unidentified FM station. Of course, during other weather 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.)

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



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



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

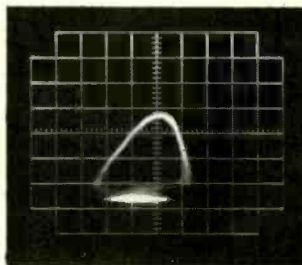


Fig. 1—Time exposure of ac-coupled scope trace as the receiver is tuned from below to above the frequency of a local FM station.

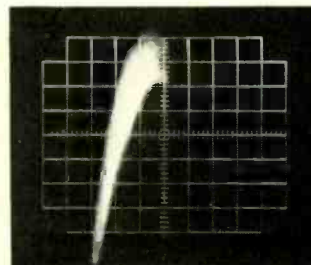


Fig. 2—Pattern formed on ac-coupled scope when the receiver is tuned above the FM station frequency.

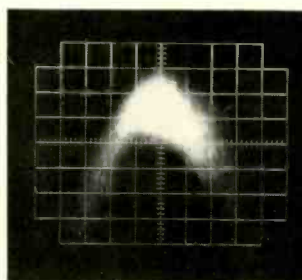


Fig. 3—Pattern formed on ac-coupled scope when the receiver is tuned to the frequency of the FM station.

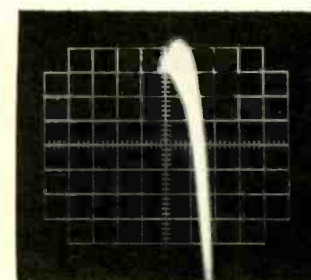


Fig. 4—Pattern formed on ac-coupled scope when the receiver is tuned below the FM station frequency.

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

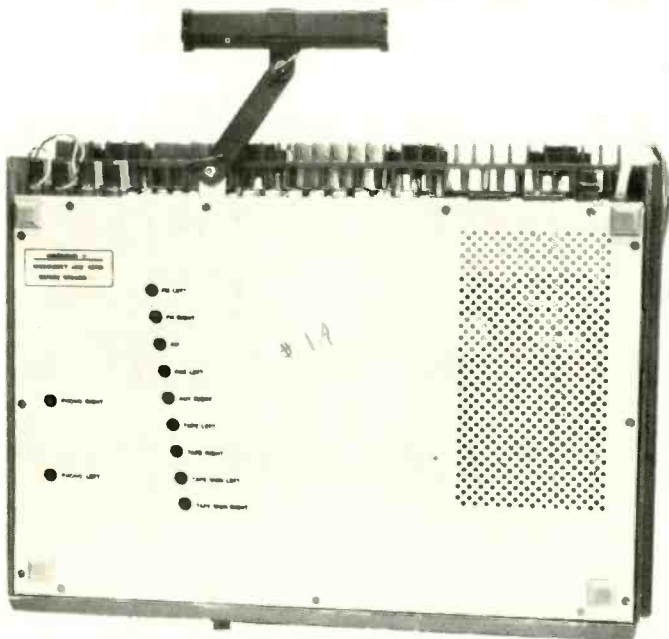
and the right slope represents the below-frequency relative signal strength.

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.

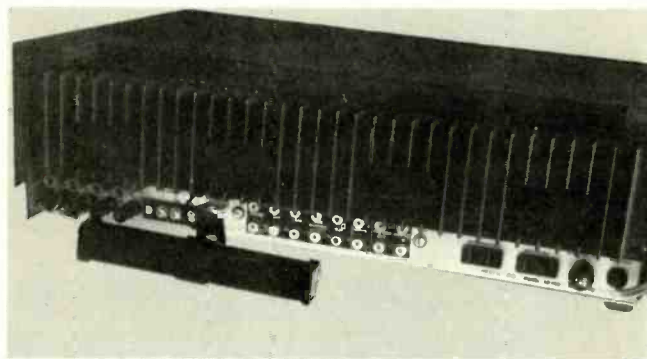
As a matter of interest, we also ac coupled the scope's vertical input and increased its gain while leaving the horizontal input dc coupled. We then took photographs of the pattern formed when the receiver was tuned above the station frequency (Fig. 2), at the station frequency (Fig. 3) and below the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

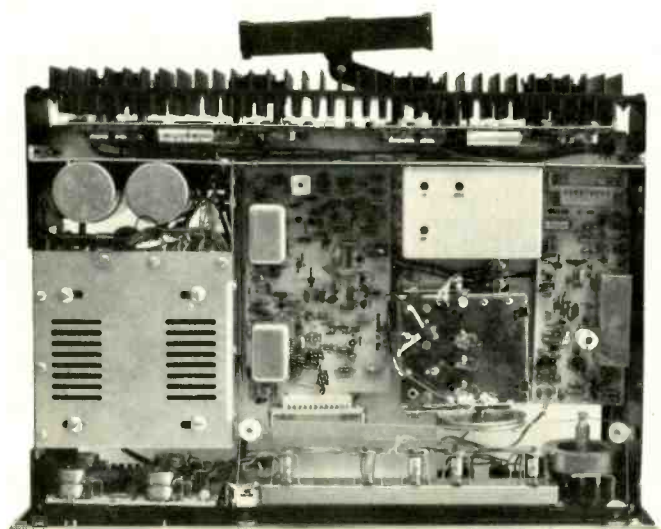
continued on page 67



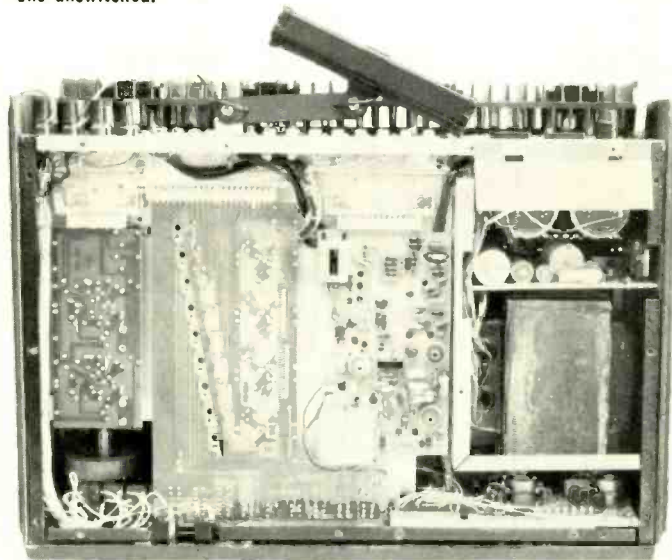
Controls beneath the receiver permit making individual adjustments for every type of signal fed to the receiver amplifier.



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.

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

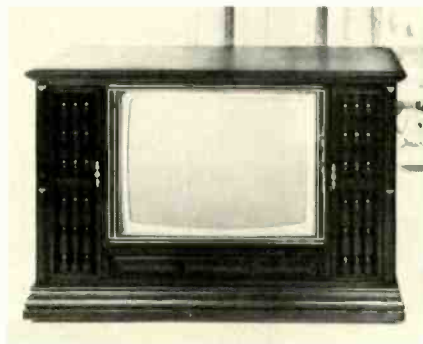
■ More 25-in black-matrix picture tubes, increased use of modular circuits with solid-state components, and prices lowered on some remote control units were some of the highlights in last month's review of TV receivers. The TV sets discussed included Admiral, Electrohome, Magnavox, Motorola and Panasonic.

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.



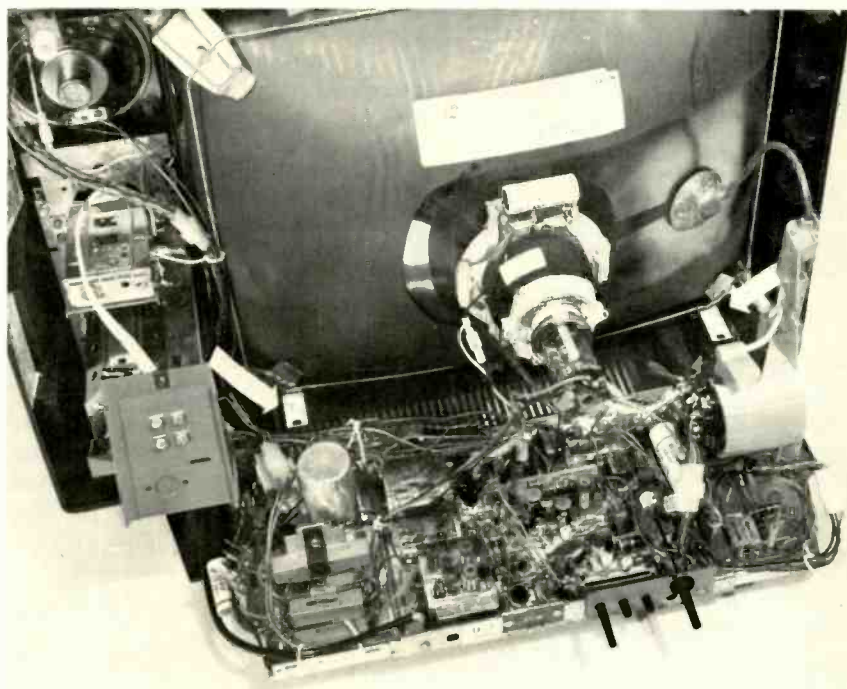
Channel Master's 25-in. (measured diagonally) Model 6123 color-TV receiver. Courtesy of Channel Master.

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



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.



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

with a removable sun screen. A 12-in. B/W-TV personal model is also offered.

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. up-front 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.

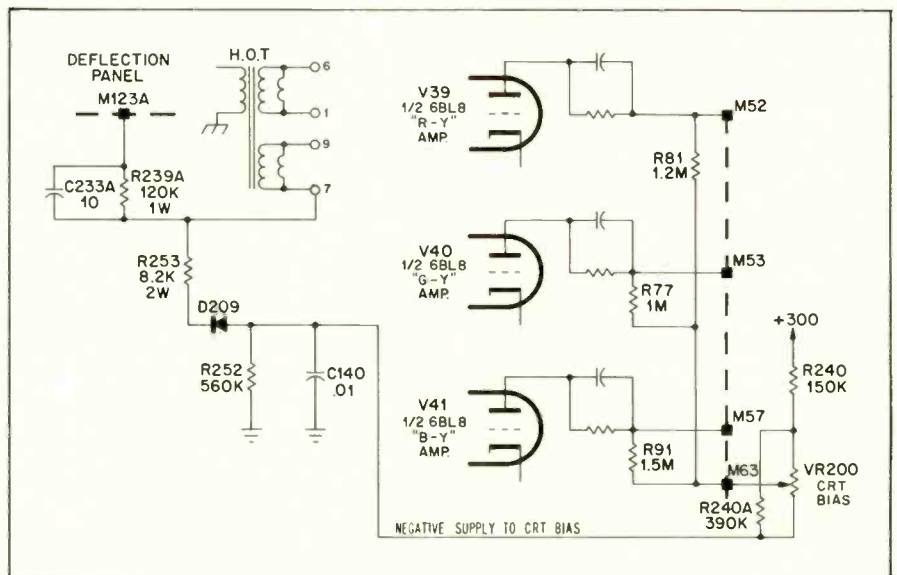
The 19-in. color-TV chassis 22LT45 is in many respects similar to the 20QT76 chassis, but with a few modifications: Chassis 22LT45 employs a new 19-in. picture tube (19VATP22) with a 185-sq.-in. viewable area. This "Kimcode" tube is non-bonded, using a "T" band and formed metallic mask for integral implosion 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 1/2a 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.

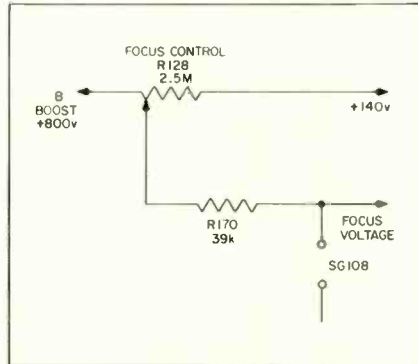
The CTC46 color-TV Chassis introduced in March is a modular chassis, which employs the same modules (except for power supply and first chroma) as the CTC49 introduced last year. One additional module is used for the sound output,



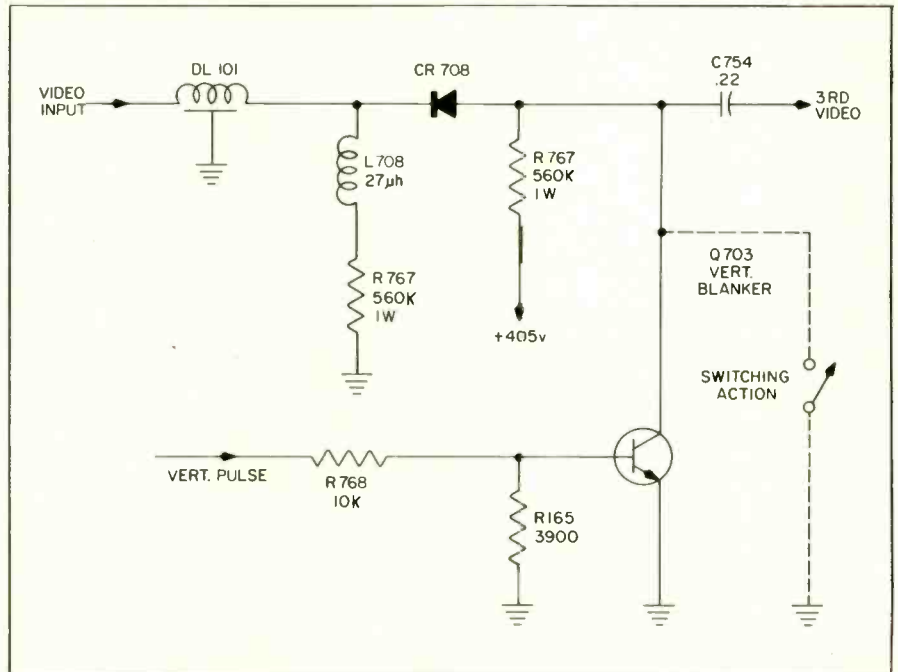
The RCA 25-in. (measured diagonally) Model GQ-829FRTWD color-TV set employing the CTC46 chassis. Courtesy of RCA Sales Corp.

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.



Vertical blanking is now accomplished by a transistor 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-

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.

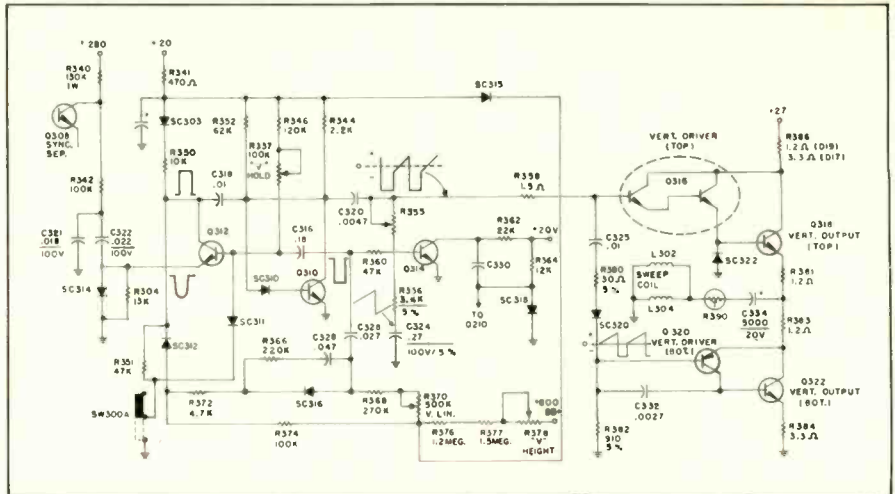
The KCS186 chassis circuitry consists of 19 transistors, 2 integrated circuits and 10 diodes, mostly contained on five plug-in modules. A 19-in. (measured diagonally) 19VAHP4 picture tube is used.

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 push-buttons. Any 11 VHF or UHF



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.

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.

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

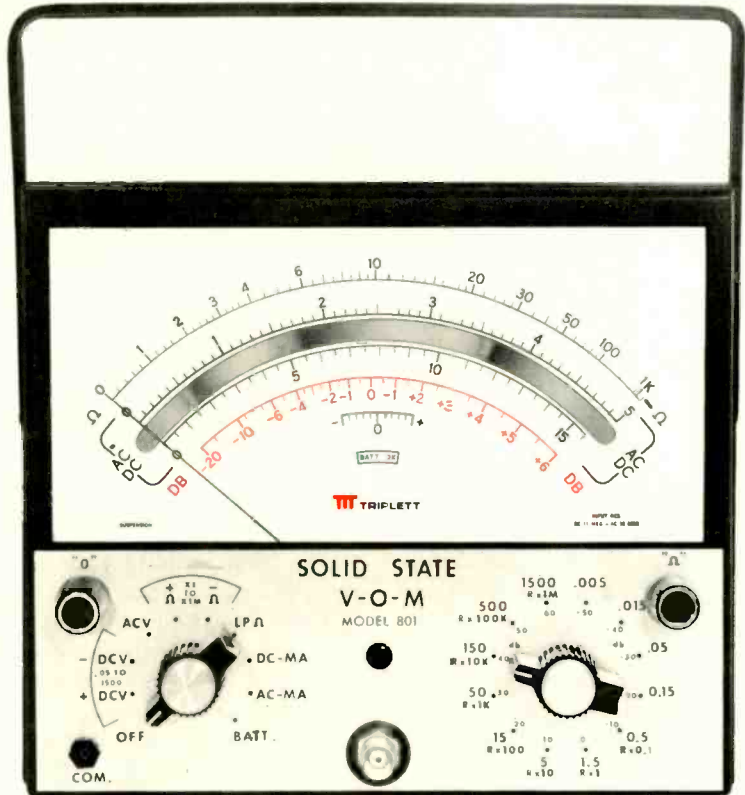
Zenith broadened the use of solid-state devices with the company's first all-solid-state color-TV chassis, the Titan 110. This chassis is introduced in five 25-in. (measured diagonally) Chromacolor consoles and one console combination, employing five Dura-Modules that plug-in for easy removal.

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



Model 801
 \$ 210

1. Lower power ohms — 8 ranges with 35 mV power source and 1 ohm center scale.
2. High sensitivity — 5 mV AC full scale at 10 megohm input impedance; 50 mV DC at 11 megohm input resistance.
3. Simplified scale — 8" meter with only 4 arcs for all 73 ranges.

It offers 73 measurement ranges including 8 low-power resistance ranges that apply only 35 mV to the device under test . . . does not activate or damage solid-state components. With full-scale readings as low as 50 mV DC and 5 mV AC, 5 μA DC and 100 Ohms (1 Ohm center-scale) — plus a 10 megohm input impedance on the AC scales and 11 megohm input resistance

on DC — Triplett's Model 801 V-O-M is ideally suited to in-circuit testing. When you add 2% DC and 3% AC accuracy on the voltage ranges (current: 3% DC and 4% AC) and a 25 μA suspension-type meter with a nearly 7½" scale length, there's no doubt that the Model 801 has no equal among analog V-O-M's in terms of sensitivity and versatility.

See the remarkable Model 801 V-O-M — priced at \$210 — at your Triplett distributor. For more information—or for a free demonstration—call him or your Triplett sales representative right away. Triplett Corporation, Bluffton, Ohio 45817.

TRIPLETT

The World's most complete line of V-O-M's . . .
 choose the one that's just right for you

. . . for more details circle 138 on Reader Service Card

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

The author is distributor market manager of Cornell Dubilier Electronics.

units. Although both 500 μ f, 25v capacitors and 500 μ f, 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 I). 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.

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.

| VALUE | RATING | SIZE |
|--------------|---------|--|
| 100 μ f | 35vdcw | $\frac{3}{8}$ by 1 in. |
| 500 μ f | 35vdcw | $\frac{5}{8}$ by 1 7/16 in. |
| 25 μ f | 50vdcw | $\frac{3}{8}$ by $\frac{5}{8}$ in. |
| 60 μ f | 50vdcw | $\frac{3}{8}$ by 1 in. |
| 125 μ f | 50vdcw | $\frac{1}{2}$ by 1 7/16 in. |
| 250 μ f | 50vdcw | $\frac{5}{8}$ by 1 7/16 in. |
| 500 μ f | 50vdcw | $\frac{3}{4}$ by 1 11/16 in. |
| 1000 μ f | 50vdcw | $\frac{7}{8}$ by 2 in. |
| 2000 μ f | 50vdcw | 1 by 2 11/16 in. |
| 5000 μ f | 50vdcw | 1 $\frac{3}{8}$ by 3 $\frac{5}{8}$ in. |
| 5 μ f | 150vdcw | $\frac{3}{8}$ by $\frac{5}{8}$ in. |
| 30 μ f | 150vdcw | $\frac{3}{8}$ by 1 $\frac{1}{2}$ in. |
| 100 μ f | 150vdcw | $\frac{3}{4}$ by 1 11/16 in. |
| 40 μ f | 250vdcw | $\frac{5}{8}$ by 1 11/16 in. |
| 160 μ f | 250vdcw | 1 by 2 3/16 in. |
| 80 μ f | 450vdcw | 1 by 2 11/16 in. |
| 120 μ f | 450vdcw | 1 $\frac{1}{8}$ by 3 in. |
| 10 μ f | 500vdcw | $\frac{5}{8}$ by 1 11/16 in. |
| 30 μ f | 500vdcw | $\frac{7}{8}$ by 1 11/16 in. |
| 60 μ f | 500vdcw | 1 by 2 $\frac{1}{2}$ 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 $\frac{3}{8}$ -in. diameters. For this reason, I have chosen quite a number of 1-in. diameter capacitors that duplicate some of the 1 $\frac{3}{8}$ -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 | VALUE | RATING | SECTIONS | SIZE |
|-----------------------|---------|----------|--|---------------------|---------|----------|--|
| 1250 to 2500 μ f | 20vdcw | 2 | 1 by 3 in. | 350 to 500 μ f | 150vdcw | 4 | 1 $\frac{3}{8}$ by 4 $\frac{1}{2}$ in. |
| 1250 to 2500 μ f | 20vdcw | | | 150 to 250 μ f | 150vdcw | | |
| *100 to 200 μ f | 200vdcw | 2 | 1 by 4 in. | 150 to 250 μ f | 150vdcw | | |
| 100 to 200 μ f | 200vdcw | | | 150 to 250 μ f | 150vdcw | | |
| *70 to 100 μ f | 300vdcw | 2 | 1 by 3 $\frac{1}{2}$ in. | 200 to 250 μ f | 200vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. |
| 70 to 100 μ f | 300vdcw | | | 400 to 650 μ f | 180vdcw | | |
| 40 to 60 μ f | 350vdcw | 2 | 1 by 2 $\frac{1}{2}$ in. | 30 to 50 μ f | 180vdcw | | |
| 30 to 40 μ f | 350vdcw | | | 7 to 10 μ f | 180vdcw | | |
| *250 to 500 μ f | 50vdcw | 3 | 1 by 3 in. | 250 to 400 μ f | 200vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. |
| 250 to 500 μ f | 50vdcw | | | 200 to 300 μ f | 200vdcw | | |
| 250 to 500 μ f | 50vdcw | | | 120 to 200 μ f | 200vdcw | | |
| 250 to 470 μ f | 100vdcw | 3 | 1 $\frac{3}{8}$ by 3 $\frac{1}{2}$ in. | 60 to 100 μ f | 200vdcw | | |
| 150 to 300 μ f | 100vdcw | | | 150 to 250 μ f | 250vdcw | 4 | 1 $\frac{3}{8}$ by 4 $\frac{1}{2}$ in. |
| 120 to 220 μ f | 100vdcw | | | 150 to 250 μ f | 250vdcw | | |
| *60 to 100 μ f | 150vdcw | 3 | 1 by 2 $\frac{1}{2}$ in. | 60 to 80 μ f | 250vdcw | | |
| 60 to 100 μ f | 150vdcw | | | 30 to 50 μ f | 250vdcw | | |
| 60 to 100 μ f | 150vdcw | | | 120 to 200 μ f | 350vdcw | 4 | 1 $\frac{3}{8}$ by 4 $\frac{1}{2}$ in. |
| 40 to 60 μ f | 200vdcw | 3 | 1 by 2 $\frac{1}{2}$ in. | 100 to 150 μ f | 200vdcw | | |
| 40 to 60 μ f | 200vdcw | | | 60 to 100 μ f | 200vdcw | | |
| 30 to 40 μ f | 200vdcw | | | 60 to 100 μ f | 200vdcw | | |
| *100 to 150 μ f | 250vdcw | 3 | 1 by 4 in. | *150 to 250 μ f | 350vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. |
| 60 to 100 μ f | 250vdcw | | | 100 to 150 μ f | 350vdcw | | |
| 30 to 50 μ f | 250vdcw | | | 60 to 100 μ f | 350vdcw | | |
| *20 to 30 μ f | 450vdcw | 3 | 1 by 3 $\frac{1}{2}$ in. | 15 to 25 μ f | 350vdcw | | |
| 20 to 30 μ f | 450vdcw | | | 275 to 350 μ f | 350vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. |
| 30 to 30 μ f | 450vdcw | | | 30 to 50 μ f | 350vdcw | | |
| *15 to 20 μ f | 500vdcw | 3 | 1 by 3 in. | 30 to 50 μ f | 350vdcw | | |
| 15 to 20 μ f | 500vdcw | | | 7 to 10 μ f | 350vdcw | | |
| 15 to 20 μ f | 500vdcw | | | 60 to 80 μ f | 450vdcw | 4 | 1 $\frac{3}{8}$ by 4 $\frac{1}{2}$ in. |
| *1250 to 2500 μ f | 25vdcw | 4 | 1 $\frac{3}{8}$ by 4 in. | 40 to 60 μ f | 450vdcw | | |
| 1250 to 2500 μ f | 25vdcw | | | 60 to 100 μ f | 250vdcw | | |
| 1250 to 2500 μ f | 25vdcw | | | 60 to 100 μ f | 250vdcw | | |
| 1250 to 2500 μ f | 25vdcw | | | *80 to 100 μ f | 450vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. |
| 1500 to 3000 μ f | 40vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. | 80 to 100 μ f | 450vdcw | | |
| 1000 to 2000 μ f | 40vdcw | | | 60 to 80 μ f | 450vdcw | | |
| 750 to 1500 μ f | 40vdcw | | | 30 to 40 μ f | 450vdcw | | |
| 500 to 1000 μ f | 40vdcw | | | 50 to 60 μ f | 500vdcw | 4 | 1 $\frac{3}{8}$ by 4 in. |
| *500 to 1000 μ f | 50vdcw | 4 | 1 $\frac{3}{8}$ by 4 in. | 30 to 40 μ f | 500vdcw | | |
| 500 to 1000 μ f | 50vdcw | | | 30 to 40 μ f | 500vdcw | | |
| 500 to 1000 μ f | 50vdcw | | | 30 to 40 μ f | 500vdcw | | |
| 500 to 1000 μ f | 50vdcw | | | *60 to 80 μ f | 500vdcw | 4 | 1 $\frac{3}{8}$ by 3 $\frac{1}{2}$ in. |
| 300 to 500 μ f | 100vdcw | 4 | 1 $\frac{3}{8}$ by 5 $\frac{1}{8}$ in. | 30 to 40 μ f | 500vdcw | | |
| 300 to 500 μ f | 100vdcw | | | 20 to 30 μ f | 500vdcw | | |
| 300 to 500 μ f | 100vdcw | | | 15 to 20 μ f | 500vdcw | | |
| 300 to 500 μ f | 100vdcw | | | | | | |

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 con-

fronted 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 100 μ f, 450vdc capacitors connected back-to-back will result in a 50 μ f, 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 |
| .0010 μ f | .0050 μ f | .033 μ f |
| .0015 μ f | .0068 μ f | .047 μ f |
| .0020 μ f | .010 μ f | .050 μ f |
| .0022 μ f | .015 μ f | .068 μ f |
| .0030 μ f | .020 μ f | .10 μ f |
| .0039 μ f | .022 μ f | .20 μ f |
| .0047 μ f | .025 μ f | .25 μ f |
| | | .33 μ f |

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.

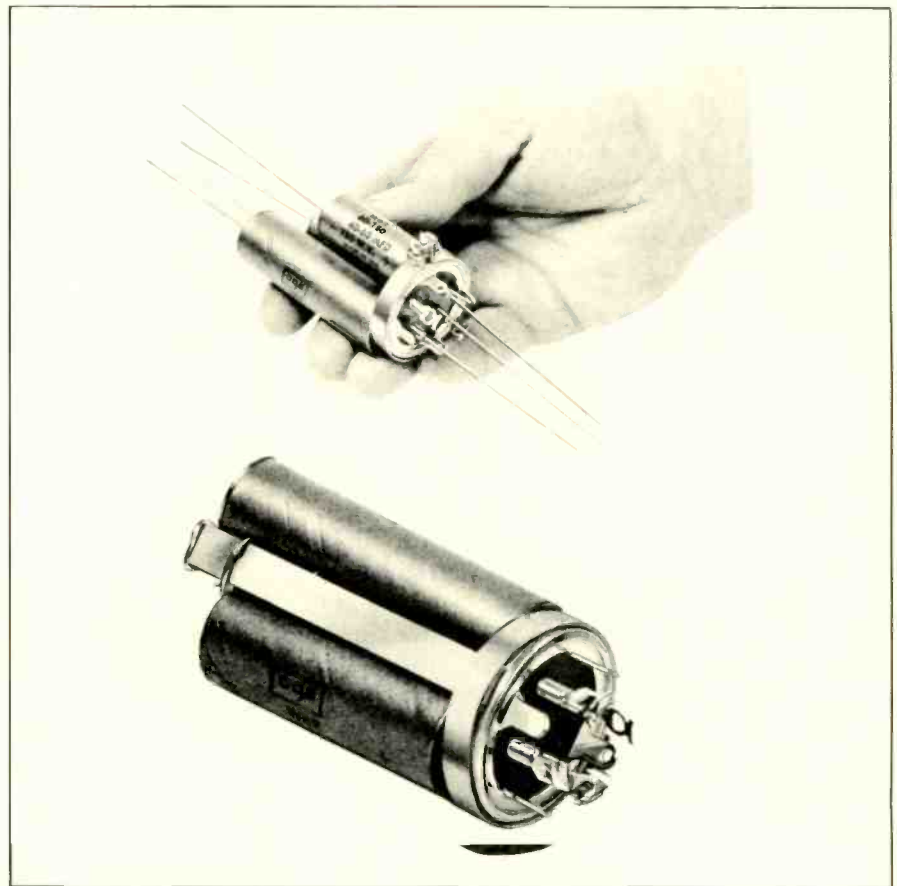
Conclusion

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

Choose from RCA's Parade of Holiday Premiums when you purchase RCA Test Instruments



Do your holiday shopping while you equip your shop

Purchase of any of eleven RCA quality Test Instruments (listed below) entitles you to a choice from among 17 great premiums. There's a wide selection because RCA has a large line of instruments including meters, 'scopes, signal generators, and power supplies.

Get full details from your RCA participating Distributor. But hurry — purchase must be made by December 23, 1971 and warranty cards for proof of purchase postmarked no later than December 31.

RCA/Electronic Components
Harrison, N.J. 07029



RCA holiday gifts

- | | | |
|----------------------------------|---|------------------------------|
| 1 Beautiful Courroc Serving Tray | 7 Three-Tier Black Walnut Tray | 12 Courroc Companion Bowl |
| 2 Royal Dane Grand Circle Tray | 8 Coliseum Server | 13 Royal Dane Circlette Tray |
| 3 Majestic Saladtime Bowl | 9 Stemware monogram glasses | 14 Black Walnut Candy Bowl |
| 4 Coliseum Carrara Marble Susan | 10 Black Walnut Cheese Board | 15 RCA WV-519A VOM |
| 5 Courroc Miniserver | 11 Crystal Cocktail glasses monogrammed | 16 RCA WV-518A VOM |
| 6 Royal Dane Circle Tray | | 17. RCA WV-516A VOM |

RCA Test Instruments

- | | | |
|--|---|--|
| • Stereo Signal Sim. WR-52A | • Senior VoltOhmyst WV-98C | • Dual Solid State Regulated DC Power Supply WP-702A |
| • Sweep Chanalyst WR-514A | • Solid State Volt Ohmyst WV-500B | • 5" Oscilloscope WO-505A |
| • Crystal-calibrated Marker Generator WR-99A | • In-Circuit/Out-of-Circuit Transistor Tester WT-501A | • 3" Oscilloscope WO-33A |
| • Solid State Master Volt Ohmyst WV-510A | | • Color/B&W Picture Tube Tester WT-509A |

RCA

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

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



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.

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-

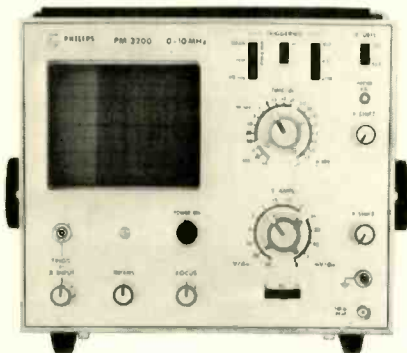
continued on page 76

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.), $\pm 3\%$, 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. $\pm 5\%$, 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.

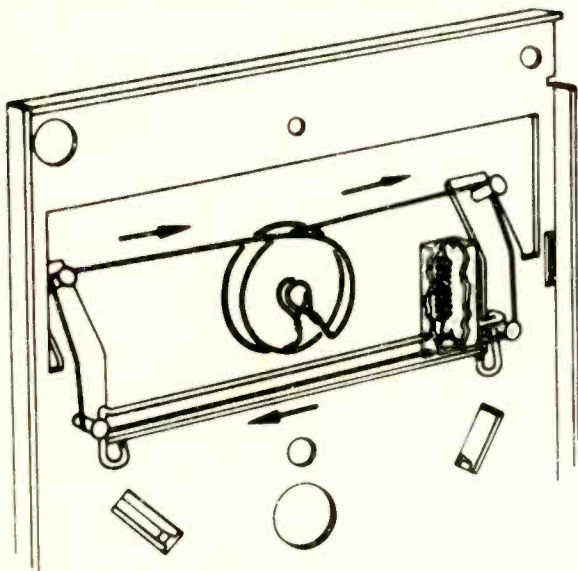
MAGNAVOX

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

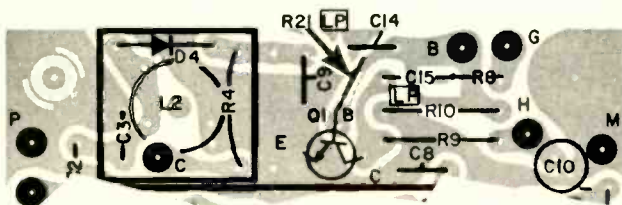


the outer end of the guide flanges, and located between the dial cord and the metal flanges. The Teflon ring will keep the cord from rubbing against the flange edges. These rings can be easily installed and are available from your Magnavox parts center.

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, ½ w 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

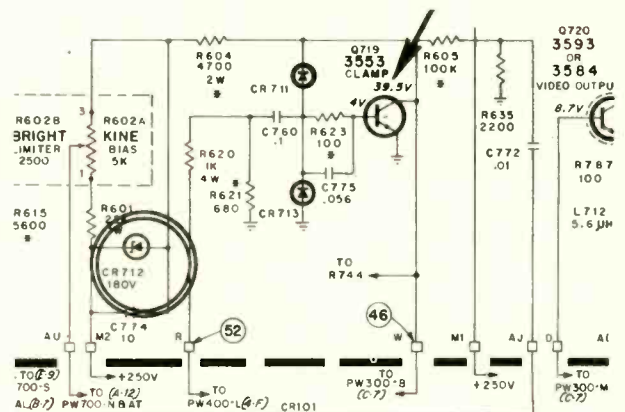
Distorted audio from the TV receiver can be caused by a faulty 0.47μf capacitor (C35 in models 704058 and 704064, C34 in model 704065) located in the collector circuit of the sound mute control transistor (Q19 in models 704058 and 704064, Q20 in model 704065).

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

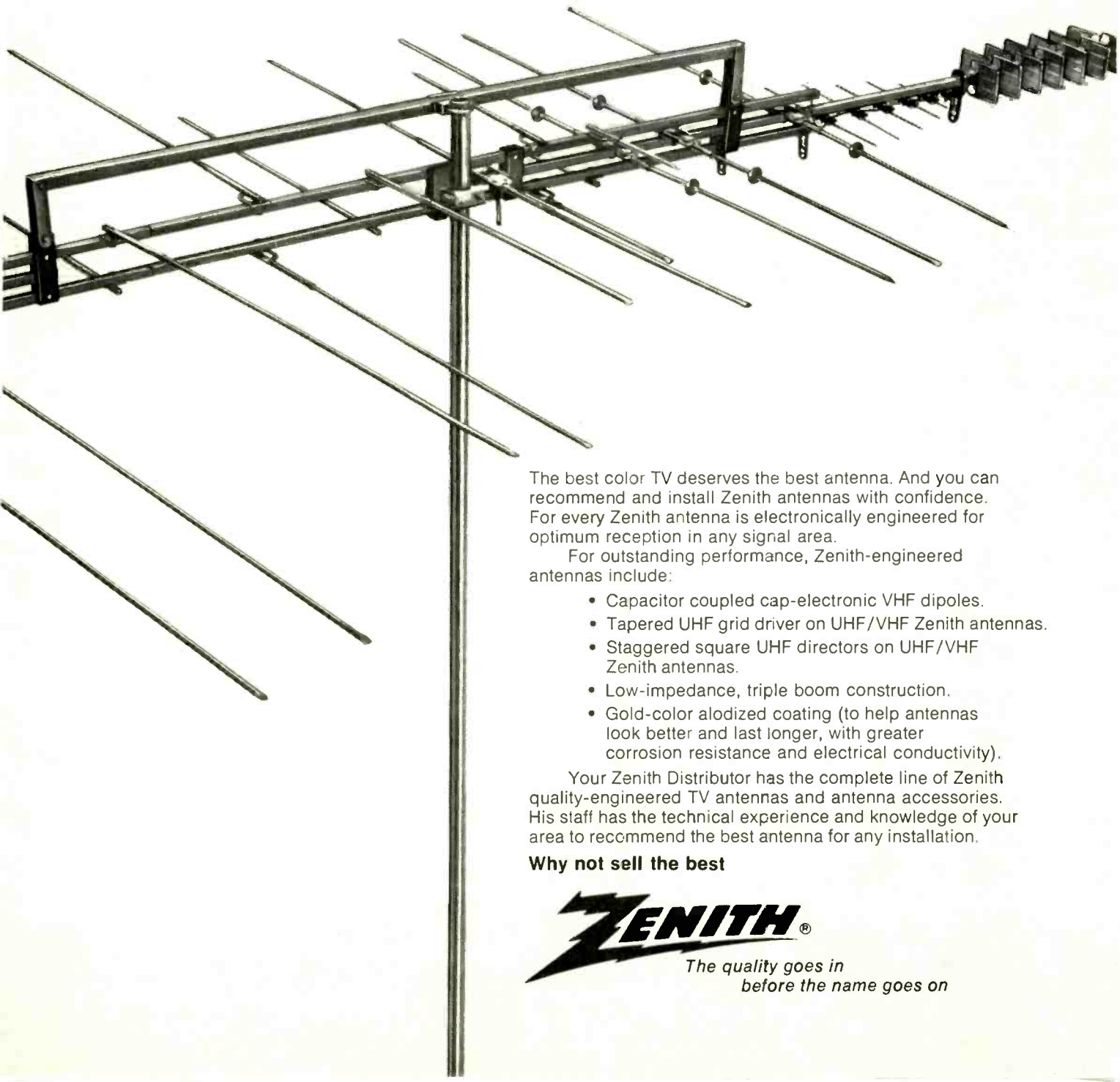
Effective June 1, 1971, TV receivers produced must meet the new X-radiation regulation set forth by the Department of Health, Education and Welfare.

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!



The best color TV deserves the best antenna. And you can recommend and install Zenith antennas with confidence. For every Zenith antenna is electronically engineered for optimum reception in any signal area.

For outstanding performance, Zenith-engineered antennas include:

- Capacitor coupled cap-electronic VHF dipoles.
- 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).

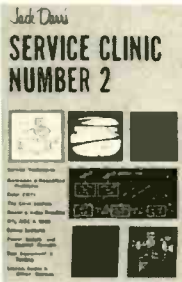
Your Zenith Distributor has the complete line of Zenith quality-engineered TV antennas and antenna accessories. His staff has the technical experience and knowledge of your area to recommend the best antenna for any installation.

Why not sell the best

ZENITH®

*The quality goes in
before the name goes on*

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.

List Price \$7.95

Order No. 566

64 Hobby Projects For Home & Car

64 HOBBY PROJECTS FOR HOME AND 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.

List Price \$6.95

Order No. 487

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 multimeters. 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, shorts 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.

List Price \$7.95

Order No. 485

Electronic Circuit Design Handbook



New Third Edition—A brand-new, enlarged edition of the ever popular circuit designer's "cookbook," now containing over 600 proven circuits, for all types of functions, selected from thousands on the basis of originality and practical application. Now you can have, at your fingertips, this carefully-planned reference source of tried and

tested circuits. Selected from thousands submitted by distinguished engineers, these "thought-starters" are a collection of original circuits selected on the basis of their usefulness. This detailed compilation of practical design data is the answer to the need for an organized gathering of proved circuits... both basic and advanced designs that can easily serve as stepping stones to almost any kind of circuit you might want to build. 384 pps., 19 big sections, over 600 illus., 8½" x 11".

List Price \$17.95

Order No. T-101

Handbook of Semiconductor Circuits



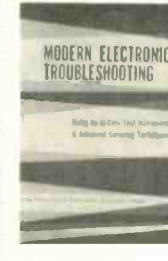
included with each group of circuits, thereby providing a basis for understanding circuits other than those selected as examples. This is not a handbook of "preferred" circuits, but rather a collection of practical circuits which have wide application and exemplifying good engineering design. Each circuit 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.

List Price \$8.95

Order No. G-30

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

Modern Electronic Troubleshooting



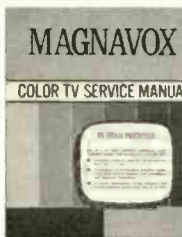
TV, multiband radio receivers, hi-fi equipment, tape recorders, two-way communications equipment, and test instruments for servicing all this equipment. Yet this book does! By getting right to the subject of how to service the equipment without the usual wordy theoretical discussions of how the circuits work. An all-inclusive servicing guidebook service technicians have been asking for. 256 pps., over 100 illus., 5 big sections, 24 chapters.

List Price \$7.95

Order No. 474

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

Magnavox Color TV Service Manual



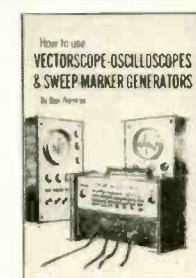
All the data you need to repair Magnavox color TV receivers—from the Series 37 to T940 chassis—including 12 full-size schematic diagrams complete with oscilloscope waveforms. Singled out for special treatment is the Magnavox T936 hybrid chassis. The special servicing data given will enable you to master 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.

List Price \$7.95

Order No. 526

How to Use Vectorscope-Oscilloscopes, Sweep-Marker Generators



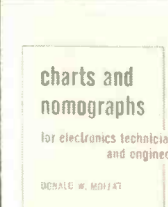
tions, encompassing how to make peak-to-peak and DC measurements, time-base measurements, video and sync waveform analyses; sine, square, and triangular wave testing; using the new push-button signal & sweep-marker generators; vectorscope troubleshooting and alignment techniques; how to isolate defective ICs and transistors, using as examples more of the current modular TV circuits. 256 pps., over 225 illus.

List Price \$7.95

Order No. 550

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 applica-

Charts & Nomographs for Electronic Technicians & Engineers



mine the answer. In most cases the answer is given in its final form and determination of decimal points is unnecessary. Moreover, you can easily determine the effect of changing values just by pivoting the straight edge. What's more, the final Chapter shows you how to solve almost any electronic equation graphically; thus, you can make up your own special nomographs and charts to suit repeated specific needs. Large, easy-to-read scales, BIG 8½" x 11" format. Comb-bound.

List Price \$5.95

Order No. 121

Saves you hours of time and trouble by giving you instant solutions to hundreds of electronic problems. Even if you are highly proficient with a slide rule, finding the solution to everyday problems requires quite a bit of time. With this book, all you do is turn to the appropriate chart and use a straight-edge to deter-

AN EXTRAORDINARY OFFER..

An Extraordinary Offer

to introduce you to the benefits of Membership in

ELECTRONICS BOOK CLUB

for a limited time only you can obtain

ANY 3 OF THESE UNIQUE BOOKS . . . yours for only **99¢** each
(Combined List Price \$41.80) Club Membership . . . with Trial

May we send you your choice of any three books on the facing page as part of an unusual offer of a Trial Membership in Electronics Book Club?

Here are quality hardbound volumes, each especially designed to help you increase your know-how, earning power, and enjoyment of electronics.

These handsome, hardbound books are indicative of the many other fine offerings made to Members . . . important books to read and keep . . . volumes with your specialized interests in mind.

Whatever your interest in electronics—radio and TV servicing, audio and hi-fi, industrial electronics, communications, engineering—you will find that Electronics Book Club will help you.

With the Club providing you with top quality books, you may broaden your knowledge and skills to build your income and increase your understanding of electronics, too.

How You Profit From Club Membership

This special offer is just a sample of the help and generous savings the Club offers you. For here is a Club devoted exclusively to seeking out only those titles of direct interest to you. Membership in the Club offers you several advantages.

1. Charter Bonus: Take any three of the books shown (combined values up to \$41.80) for only 99¢ each with your Trial Membership.

2. Guaranteed Savings: The Club guarantees to save you 15% to 75% on all books offered.

3. Continuing Bonus: If you continue after this trial Membership, you will earn a Dividend Certificate for every book you purchase. Three Certificates, plus payment of the nominal sum of \$1.99, will entitle you to a valuable Book Dividend which you may choose from a special list provided members.

4. Wide Selection: Members are annually offered over 50 authoritative books on all phases of electronics.

5. Bonus Books: If you continue in the Club after fulfilling your Trial Membership, you will receive a Bonus Dividend Certificate with each addi-

SPECIAL FREE BONUS

. . . if you act now!

Yes, if you fill in and mail the membership application card today, you'll also get this Bonus Book, FREE!

TV TROUBLESHOOTER'S HANDBOOK
Revised Second Edition

A completely updated quick-reference source for solutions to hundreds of tough-dog troubles.

Regular List Price \$7.95

tional Club Selection you purchase. For the small charge of only \$1.99, plus three (3) Certificates, you may select a book of your choice from a special list of quality books periodically sent to Members.

6. Prevents You From Missing New Books: The Club's FREE monthly *News* gives you advance notice of important new books . . . books vital to your continued advancement.

This extraordinary offer is intended to prove to you, through your own experience, that these very real advantages can be yours . . . that it is possible to keep up with the literature published in your areas of interest . . . and to save substantially while so doing.

How the Club Works

Forthcoming selections are described in the FREE monthly *Club News*. Thus, you are among the first to know about, and to own if you desire, significant new books. You choose only the main or alternate selection you want (or advise if you wish no book at all) by means of a handy form and return envelope enclosed with the *News*. As part of your Trial Membership, you need purchase as few as four books during the coming 12 months. You would probably buy at least this many anyway . . . without the substantial savings offered through Club Membership.

Limited Time Offer!

Here, then, is an interesting opportunity to enroll on a trial basis . . . to prove to yourself, in a short time, the advantages of belonging to Electronics Book Club. We urge you, if this unique offer is appealing, to act

promptly, for we've reserved only a limited number of books for new Members.

To start your Membership on these attractive terms, simply fill out and mail the postage-paid airmail card today. You will receive the three books of your choice for 10-day inspection. **SEND NO MONEY!** If you are not delighted, return them within 10 days and your Trial Membership will be cancelled without cost or obligation. Electronics Book Club, Blue Ridge Summit, Pa. 17214.

Typical Savings Offered Club Members on Recent Selections

| | |
|---|---------------------------------------|
| How to Use Color TV Test Instruments | List Price \$7.95; Club Price \$4.95 |
| FET Applications Handbook | List Price \$14.95; Club Price \$9.95 |
| Fire & Theft Security Systems | List Price \$7.95; Club Price \$3.95 |
| TV, Radio & Hi-Fi Hints & Kinks | List Price \$7.95; Club Price \$4.95 |
| Beginner's Guide to Computer Programming | List Price \$9.95; Club Price \$6.95 |
| 199 TV Tough-Dog Problems Solved | List Price \$7.95; Club Price \$4.95 |
| Zenith Color TV Service Manual—Vol. 2 | List Price \$7.95; Club Price \$4.95 |
| Transistor Projects for Hobbyists & Students | List Price \$7.95; Club Price \$4.95 |
| Electronic Musical Instruments | List Price \$7.95; Club Price \$4.95 |
| Electronic Designer's Handbook | List Price \$9.95; Club Price \$5.95 |
| Dictionary of Electronics | List Price \$6.95; Club Price \$5.50 |
| Computer Circuits & How They Work | List Price \$7.95; Club Price \$4.95 |
| Japanese Color TV Service Manual | List Price \$7.95; Club Price \$4.95 |
| Solid-State Circuit Design & Operation | List Price \$9.95; Club Price \$7.95 |
| How to Read Electronic Circuit Diagrams | List Price \$7.95; Club Price \$3.95 |
| Electronic Test & Measurement Handbook | List Price \$7.95; Club Price \$4.95 |
| Pulse & Switching Circuits | List Price \$7.95; Club Price \$4.95 |
| Circuit Consultant's Casebook | List Price \$9.95; Club Price \$5.95 |
| Computer Technician's Handbook | List Price \$10.95; Club Price \$7.95 |
| Handbook of Magnetic Recording | List Price \$7.95; Club Price \$4.95 |
| 125 One-Transistor Projects | List Price \$7.95; Club Price \$4.95 |
| Servicing Modern Hi-Fi Stereo Systems | List Price \$7.95; Club Price \$4.95 |

SEND NO MONEY!

Simply fill in and mail postage-paid Airmail card today!

. . . for more details circle 104 on Reader Service Card

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

electronic, 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.

“I put a radio in a racing car for a Yellow Pages customer!”

“I don’t think he turns it on when he’s racing, but I guess he uses his racer around town,” says Stephen Nyikos, owner of Ra-dis-co, Inc., Indianapolis Indiana. “He found me in the Yellow Pages, where a lot of my customers do. I’ve been advertising with the Yellow Pages for about thirty years now, and it sure pays off. It’s a constant reminder to past customers, and it’s a great way to get new customers. I advertise in three local



directories, and I take full advantage of the multiple listings. So no matter where a customer looks for me, he’s bound to find me.”

Let the Yellow Pages do your talking. People will listen.



An effective way to build business.

NEW!

INSTANT CONTACT CLEANER



NO RESIDUE • NON-FLAMMABLE
NON-TOXIC • NON-CONDUCTOR

A CHEMICALLY PURE CLEANING AGENT
WITH:

- 1. SELECTIVE CLEANING POWER** — removes greases, oils, dirt and organic soils with no effect on the article being cleaned.
- 2. EXCELLENT PENETRATING AND WETTING ACTION** — Its high density and low surface tension permits maximum penetration of most minute crevices where its superior wetting action then cleans even most difficult materials.
- 3. PURITY** — evaporates completely — leaves NO residue.
- 4. SAFETY** — Non-explosive, non-flammable, non-toxic.
- 5. STABILITY** — does not react chemically with other materials.

SEND FOR
FREE SAMPLE

Available in 7 & 16 oz. aerosols
with "Snorkel Tubes"

LPS RESEARCH LABORATORIES, INC.

2050 COTNER AVENUE, LOS ANGELES, CALIFORNIA 90025
PHONE: (213) 478-0095

... for more details circle 123 on Reader Service Card

AT LAST! PROFESSIONAL HOME PROTECTION EVERYONE CAN INSTALL AND AFFORD.

Model FC-100
\$34.95
WIRED

- Start your custom Burglar/Hold-up/Fire Alarm System with the FC-100. Add on Sensors, Alarms and Accessories to suit your own needs.
- "Do-it-Yourself" Installers Handbook included. No technical knowledge needed — No soldering.
- 100% Professional in Design, Reliability, Performance.



'Fail Safe'-SYSTEM BY EICO

A New Concept in "Do-it-Yourself" Home Protection

FREE 32 PAGE EICO CATALOG

For latest catalog on EICO Test Instruments, Stereo, EICOCRAFT Projects, Environmental Lighting, Burglar/Fire Alarm Systems, and name of nearest EICO Distributor, check Reader Service Card or send 25¢ for First Class mail service.

EICO, 283 Malta Street, Brooklyn, N.Y. 11207



... for more details circle 111 on Reader Service Card

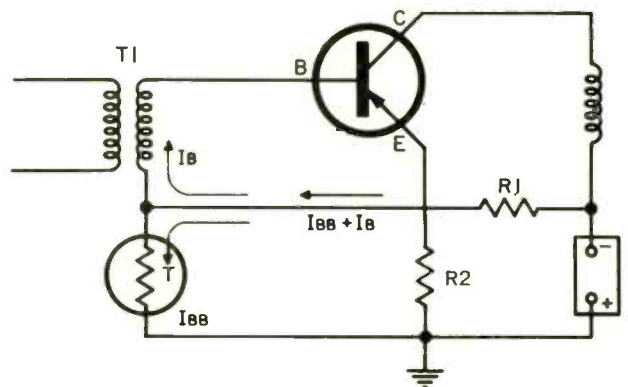
TECHNICAL DIGEST

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 R_1 . 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 R_1 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.

HEATH...

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.

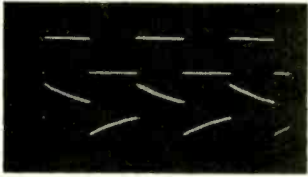


Fig. 5—Upper scope trace shows 20kHz square-wave signal applied to receiver auxiliary input and resulting waveform (lower trace) across loaded speaker terminals. The volume was kept comfortably low, but there was still a slight smell of smoke from the 8Ω speaker.

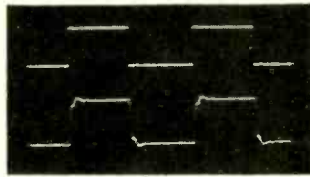
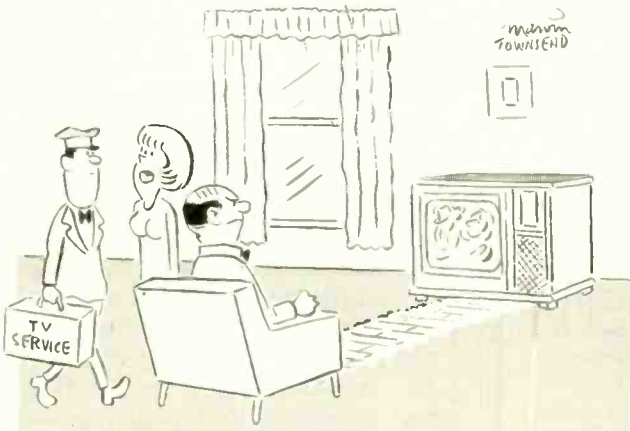


Fig. 6—Upper scope trace shows 20kHz square-wave signal applied to receiver auxiliary input and resulting waveform (lower trace) across loaded speaker terminals. The volume was again kept comfortably low.

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."

TOOL KITS

FIELD ENGINEER TOOL KIT JTK-17



Includes more than 100 fine tools. For servicing business machines and all kinds of electronic equipment in the field. Tools are housed in a deluxe attache case with two pallets and three roomy compartments in the bottom. Only the finest professional tools are used in this kit. Write for complete list of included items.

JTK-17.... \$179.00
(less meter)

Free Catalog
ELECTRONIC ASSEMBLY TOOLS

JENSEN TOOLS and ALLOYS
4117 N. 44th Street, Phoenix, Arizona 85018

... for more details circle 121 on Reader Service Card

Why pay an answering service when you can own your own?



Dictaphone has a machine to make sure you never lose an other cent through a missed phone call or a garbled message. In fact, we have a whole line of them.

They're called Ansafones. You can buy one outright or possibly lease it for about what you're paying your answering service now. And it works for you 24 hours a day, 7 days a week.

For a free brochure describing how much an Ansafone can help you, mail this coupon now.

▶ Dictaphone

Box L24, 120 Old Post Road, Rye, New York 10580
Please send me full details of the Ansafone line.

Name _____
Company _____ Phone _____
Address _____
City _____ State _____ Zip Code _____

Ansafone and Dictaphone are registered trademarks of Dictaphone Corp.

... for more details circle 110 on Reader Service Card

3 Instruments in One!



**NEW EICO
TRANSISTOR
ANALYZER**

**Model 685
\$99.95
KIT**

FACTORY WIRED \$149.95

Nobody but Eico makes the troubleshooting of solid state equipment so quick, easy, versatile and precise for the professional electronics technician and engineer—and at such low cost!

- Dynamically tests transistors in and out of circuit.
- Performs the 4 basic tests on all types of FETs including pinch-off.
- Performs the 3 basic tests on all types of bipolar transistors.
- Tests for true transconductance and AC Beta, in and out of circuit.
- Tests all types of diodes and measures zener voltage.
- Tests SCRs, TRIACs, and UJTs.
- Incorporates easy-to-use DC Voltmeter and Ohmmeter.
- 50 uA taut band meter movement.

FREE 32 PAGE EICO CATALOG

For latest catalog on EICO Test Instruments, Stereo, EICOCRAFT Projects, Environmental Lighting, Burglar/Fire Alarm Systems, and name of nearest EICO Distributor, check Reader Service Card or send 25¢ for First Class mail service.

EICO, 283 Malta Street, Brooklyn, N.Y. 11207



... for more details circle 111 on Reader Service Card

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 be-

tween 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 0.2 μ f 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. ■

NOW... ONE PERMA-POWER BRITENER SOLVES BOTH KINDS OF COLOR TV PICTURE PROBLEMS...

NEW **COLOR BRITE** HAS BOTH...
ISOLATION AND BOOST!

This efficient new Britener corrects for cathode-to-filament shorts causing loss of black and white video drive... isolates the short, restores the black and white information necessary for color picture quality.



When needed later, sliding the boost switch raises electron emission, restores full contrast and sharpness to fading picture.

Model C-503 for round tubes
Model C-513 for rectangular tubes
Dealer Net \$7.75

PERMA POWER

PERMA POWER DIVISION OF
CHAMBERLAIN MANUFACTURING CORPORATION

5740 North Tripp Avenue, Chicago, Illinois 60646 (312) 539-7171

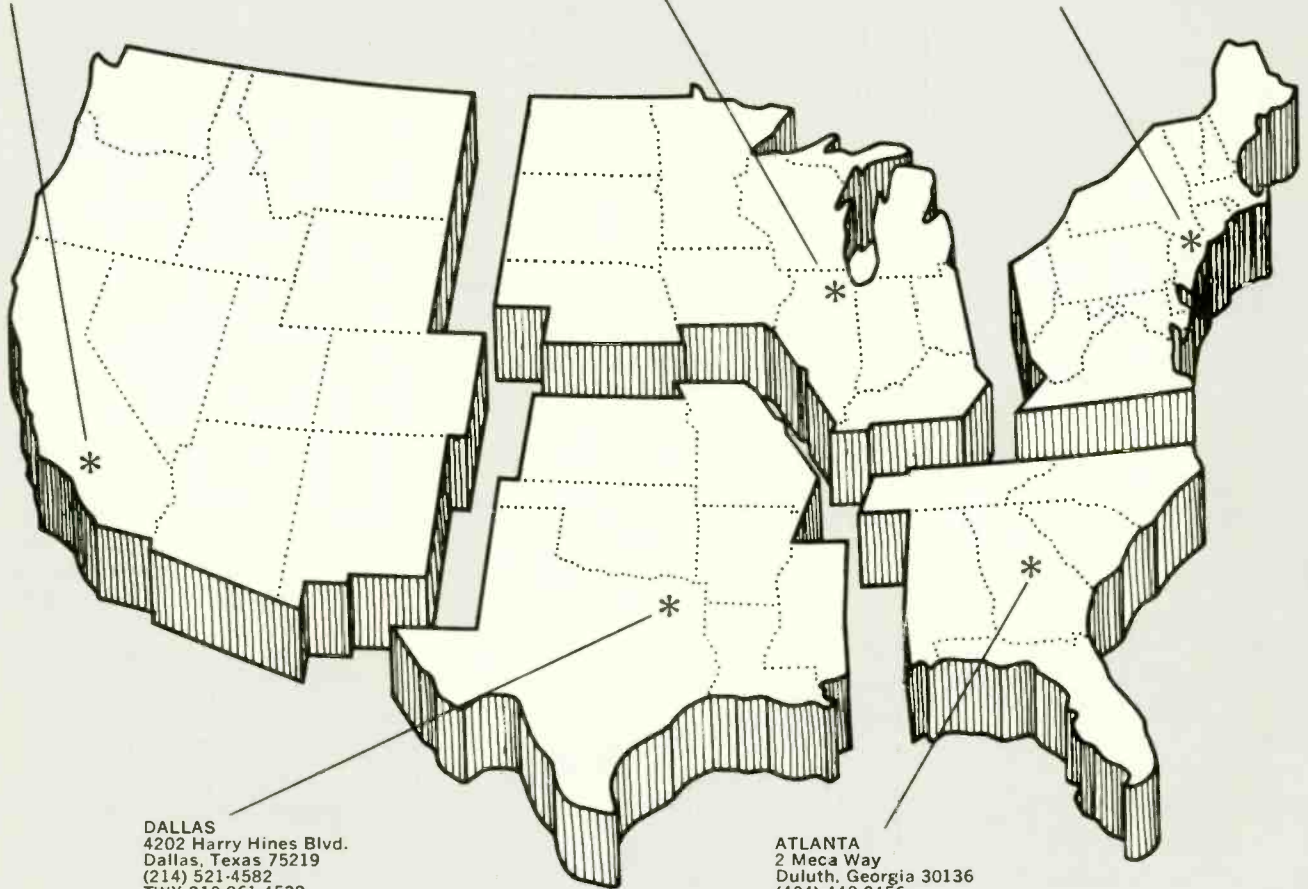
... for more details circle 130 on Reader Service Card

Panasonic parts for Panasonic products. It makes sense.

LOS ANGELES
2121 Yates Avenue
City of Commerce, Calif. 90040
(213) 723-6271
TWX 910-580-1960

CHICAGO
3201 Tollview Drive
Rolling Meadows, Illinois 60008
(312) 394-8010
TWX 910-233-2641

NEW YORK
30 30 60th Street
Woodside, N.Y. 11377
(212) 973-8966
TWX 710-582-2555
(Includes Akron and Cleveland, Ohio)



DALLAS
4202 Harry Hines Blvd.
Dallas, Texas 75219
(214) 521-4582
TWX 910-861-4539
(Includes Memphis, Tenn.)

ATLANTA
2 Meca Way
Duluth, Georgia 30136
(404) 448-2456
TWX 810-766 4514

Panasonic
just slightly ahead of our time

Panasonic Service Division
10-16 44th Drive
Long Island City, N.Y. 11101

FREE ALARM CATALOG

Branch out with our
off-the-shelf
alarm equipment



64 pages with 350 alarm systems, components, parts. Shipping paid.

mountain west
alarm supply co.

4215 NORTH 16th STREET
PHOENIX, ARIZONA 85016

... for more details circle 125 on Reader Service Card

'No-Noise' Products Work Like Magic!

For Color
and B/W

SUPER - LUBE

Concentrated formula
for heavy duty jobs.
Foams away corrosion,
dirt, oxidation and
polishes all tuners with-
out drift or detuning.
Avoid call-backs.

"No-Noise"
products are
guaranteed non-
flammable, no carbon
tet, non-
toxic, safe
for plastics.

Volume Control & Contact Restorer

Cleans, lubricates, re-
stores volume controls,
push button assemblies,
band switches, relays
and other electri-
cal contacts.

Manufacturers of These Other
Famous "NO-NOISE" Products:
Tuner-Tonic • EC-44 • Super Spray Bath
Frigid-Air • Tape-Reco Head Cleaner

Often imitated but never duplicated
ELECTRONIC CHEMICAL CORP.
813 Communipaw Avenue Jersey City, N. J. 07304

... for more details circle 112 on Reader Service Card

NEW PRODUCTS

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

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 provid-

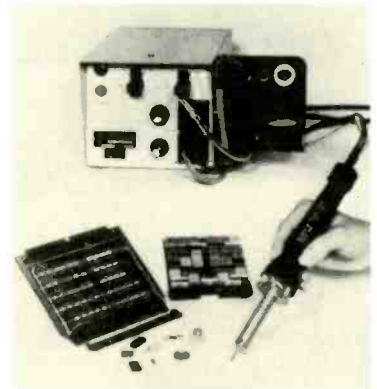


ing either ac or dc test voltages. It is said to accurately test capacitors for leakage or shorts with the dc voltage
continued on page 72

SOLDER DESOLDER SOLDER DESOLDER

It's That Easy

... with PACE's Sodr-x-tractor®: the system that removes any soldered-in parts without damage. The Sodr-x-tractor applies three distinct modes of operation — pressure, vacuum, or hot air jet — through a tip with controlled heating capacities to 1000°F. Yes, you can



perform Sodr-x-traction and part replacement cleanly and efficiently with one integrated system. Solder, desolder, solder, desolder . . . but don't get carried away.

PAGE

INCORPORATED

9329 Fraser Street
Silver Spring, Md. 20910
301/587-1696

SOLDER DESOLDER SOLDER DESOLDER

... for more details circle 142 on Reader Service Card



When people
turn to you
to make things
right again . . .



use **GE ULTRACOLOR** picture tubes
(made by professionals for professionals)

TUBE PRODUCTS DEPARTMENT • GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY 42301

GENERAL  ELECTRIC



Chemtronics Introduces the "Slim-Jim" Transfer Tuner Spray



Pull sprayheads off from both cans



Insert stem of "Slim-Jim" into large can and press down



Withdraw "Slim-Jim" replace sprayheads

A "Slim-Jim," pocket-size tuner spray that fits conveniently almost anywhere. Shirt pocket. Service Caddy. You name it.

The ideal size and shape for service calls. Handy to use. Handy to store. Handy to carry around. Lets you add to your caddy those extra tubes you sometimes wish you had.

But that's not all. The "Slim-Jim" is refillable. Fills completely to service as many as 6 to 10 sets each time.

You save by buying economy, bench-size 24-oz. cans of Tun-O-Wash, Tun-O-Foam and/or Tun-O-Brite to fill and refill the "Slim-Jim." Best of all, there are no special gadgets for transferring either. Takes just half a minute and is so simple, you're bound to wonder, "Why didn't someone think of this before?"

You asked for it. Chemtronics listens.



Available at your local distributor in the Transfer Kit

KIT 1 Two 24 oz. Tun-O-Wash
Two "Slim-Jim" Transfer cans

KIT 2 One each of Tun-O-Wash and Tun-O-Brite
Two "Slim-Jim" Transfer cans

KIT 3 One each of Tun-O-Wash and Tun-O-Foam
Two "Slim-Jim" Transfer cans

CHEMTRONICS INC.

1260 Ralph Avenue, Brooklyn, N.Y. 11236

... for more details circle 107 on Reader Service Card

NEW PRODUCTS...

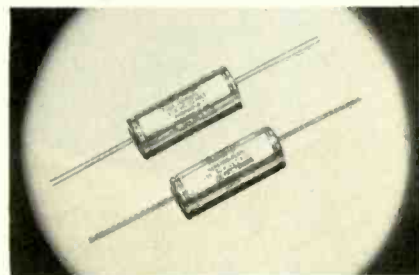
continued from page 70

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

ALUMINUM ELECTROLYTIC 705 CAPACITOR

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 $+221^{\circ}\text{F}$. The

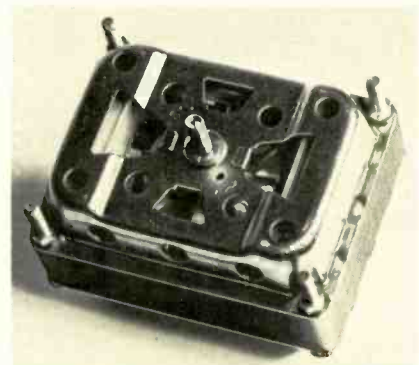


unique feature of this unit is its four terminal construction. The impedance of the UFT is said to decrease with an increase in frequency above 10kHz. Cornell-Dubilier Electronics.

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...

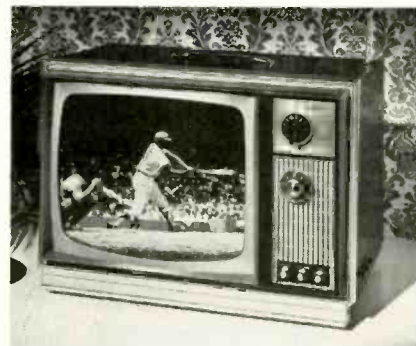
continued from page 50

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-

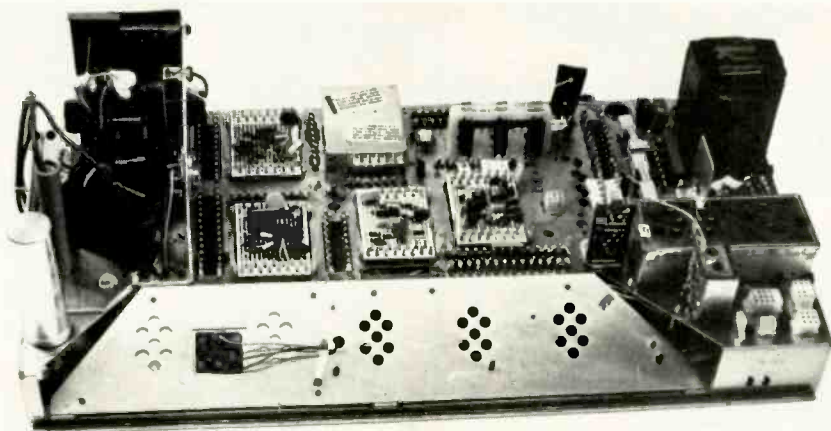
line indicator is in the 12 o'clock position.

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.

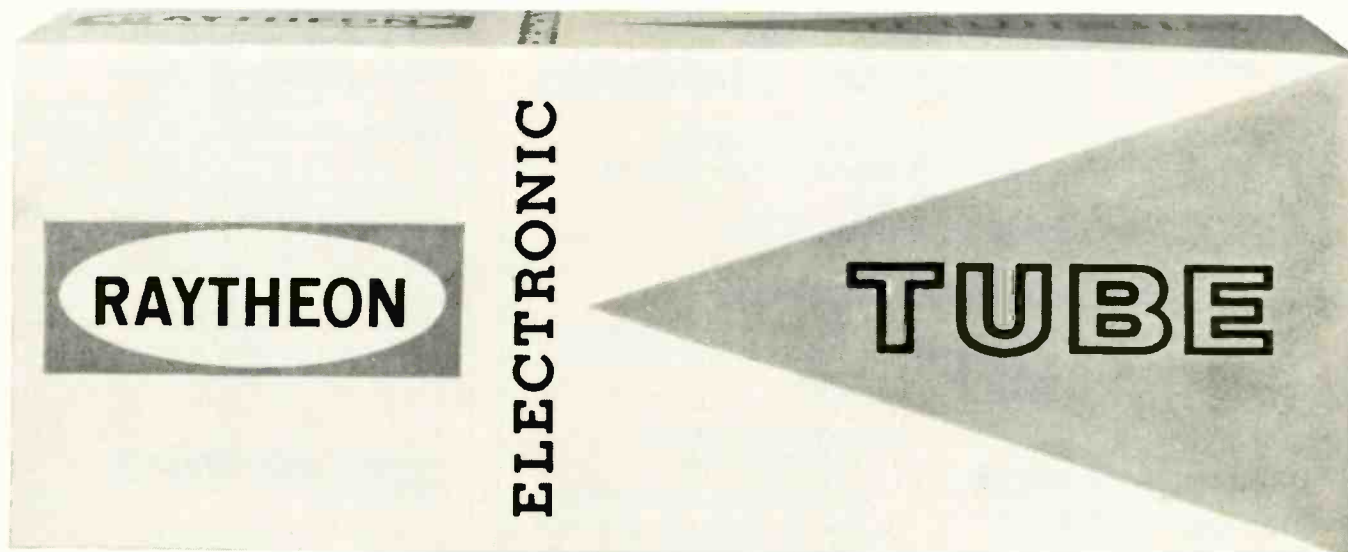


The Zenith Titan 110 all solid-state color-TV chassis employing five Dura-Modules, which plug in for easy removal.

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. ■

MOVING?

Be sure to let us know your new address. Please enclose a complete address label from one of your recent issues.



your silent partner

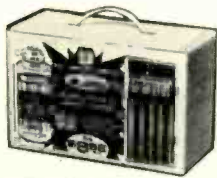
You and our tubes make a great team. Great because it's a close sales partnership. So close that you, the independent serviceman, are our only outlet.

We don't compete with service trucks. Or captive business. That's helped you make us the largest independent tube supplier in the business.

Together we've come a long way. You've found it's good business to do business with us. And because your business is good, ours is.

Let's keep it growing together.

... for more details circle 132 on Reader Service Card



8 PACK VALUE



- NEW** 8 Packs of chemicals with box of 5 precision tools
- NEW** Valve for easy insertion of extension tube
- NEW** Ultra Wissh formula for Color TV. 6 oz. aerosol

- **MODEL SC6A-8** ULTRA WISSH with precision screwdrivers.
- **MODEL HL6-8** LUBRITE with precision nut driver.
- **MODEL HG6A-8** MIRACLE BATH with precision wrenches.

ONLY **WORKMAN** *Electronic* **\$8.88**
FROM SARASOTA, FLORIDA PRODUCTS, INC. Dlr. Net

... for more details circle 140 on Reader Service Card

DEALER SHOWCASE

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

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, table-top 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 con-

CORNELL ELECTRONICS COMPANY
4213 N. UNIVERSITY AVE. SAN DIEGO CALIF. 92105

THE ORIGINAL HOME OF

36¢ PER TUBE
UNLESS OTHERWISE PRICED
100 TUBES OR MORE **33¢** PER TUBE

Same Low Price East or West Coast!

- ★ Bargain Tools
- ★ Transistor Tester
- ★ Technician's Library

SEND FOR FREE NEW 48 PAGE COLOR CATALOG

- ★ Dumont Picture Tubes
- ★ Diodes—Transistors—Kits
- ★ Tube Cartons

SPECIAL OFFER
ON ALL ORDERS OVER \$10.00
25¢ PER TUBE (NO LIMIT) FROM THIS LIST
6AG5 6CB6
6AU6 6J6
6AX4 6SN7

ONE YEAR GUARANTEE
INDIVIDUALLY BOXED
5 DAY MONEY BACK OFFER

Your Order FREE if Not Shipped in 24 Hours

... for more details circle 109 on Reader Service Card

\$795 TV TUNER SERVICE

VHF, UHF MAJOR PARTS, TUBES, TRANSISTORS charged at Net Price

1 YEAR WARRANTY
Same Day Service

TRANSISTOR OR COLOR NO EXTRA CHARGE
COMBO \$14.00

- WE CLEAN YOUR TUNER
- LUBRICATE WHERE REQUIRED
- Q.C. CHECK ALL UNITS
- REPAIR AND REPLACE NECESSARY PARTS
- RF ALIGNMENT ALL CHANNELS
- SET OSC RANGE ALL CHANNELS

FINAL ALIGNMENT WITH COVER You must include all broken parts, tubes, and shield covers. No mounting brackets.

UPS DELIVERY—if available

SHIP TO:
ELITE Tuner Service
5202 EAST TERRACE AVE.
INDIANAPOLIS, IND. 46203
PHONE: (317) 359-6616

... for more details circle 113 on Reader Service Card

tinuous 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.

STATEMENT REQUIRED BY THE ACT OF OCTOBER 23, 1962 (39 U.S. Code, 4369) SHOWING THE OWNERSHIP, MANAGEMENT AND CIRCULATION OF ELECTRONIC TECHNICIAN/DEALER published by Harcourt Brace Jovanovich Publications, Inc., for November 1971.

1. The names and addresses of the publisher, editor and managing editor are: Publisher, Alfred A. Menegus, 757 Third Avenue, New York 10017; Editor, Phillip Dahlen, 1 East First Street, Duluth, Minnesota 55802; Managing Editor, Joseph Zauhar, 1 East First Street, Duluth, Minnesota 55802.

2. The owner is: Harcourt Brace Jovanovich, Inc., 757 Third Avenue, New York, New York 10017. Holders of One Per Cent (1.0%) or more of the outstanding shares of Harcourt Brace Jovanovich, Inc., as of August 20, 1971: Donald H. Harcourt, 2444 Brinkerhoff Avenue, Santa Ynez, California 93450; Ellen Knowles Harcourt, William J. Jovanovich & Peter J. Ryan as Trustees u/t/a dated 5/23/66, c/o First National City Bank, 20 Exchange Place, New York, New York 10015; Hastings Harcourt, 835 Laguna Street, Santa Barbara, California 93101; William Jovanovich, P.O. Box 295, Briarcliff Manor, New York 10510; King & Co., 22 William Street, New York, New York 10005; Shaw & Co., P.O. Box 1426, Church Street Station, New York, New York 10015; Sigler & Co., c/o Manufacturers Hanover Trust Company, New York, New York 10015; Emp & Co., Harris Trust & Savings Bank, 111 West Monroe Street, Chicago, Illinois 60603; Harwood and Co., c/o State Street Bank and Trust Company, Boston, Massachusetts; Live & Co., c/o The Central Trust Co., Trust Department, Cincinnati 1, Ohio; Cede & Co., Box 20, Bowling Green Station, New York, New York 10004; Cudd & Co., P.O. Box 1508, New York, New York; Kane & Co., c/o Chase Manhattan Bank, 1 Chase Manhattan Plaza, New York, New York 10005; Katherine Brace Cummings, c/o Ernst Cane Berner & Gitlin, 5 West 45th Street, New York, New York 10036; Walter J. Johnson, 111 Fifth Avenue, New York, New York 10003; Thekla E. Johnson, 19 Hewitt Avenue, Bronxville, New York 10708; Finabob Co., c/o First National Bank, P.O. Box 1061, Bradenton, Florida 33505; Perc & Co., c/o Trust Department, Safekeeping Division, Northwestern National Bank, Minneapolis, Minnesota 55440; Comptroller of the State of New York in Trust for the Common Retirement Fund, c/o Director of the Retirement Accounts, Governor Alfred E. Smith Building, Albany, New York 12225.

3. The known bondholders, mortgagees and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

4. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was 73,601. Free Distribution by mail, carrier or other media: 1,001. Total distribution: 74,602.



New Heathkit Digital Multimeter... lab precision for only 229.95!*

- 3½ digits for 100 uV resolution on 200 mV range, 1 V on 1000 V
- 10 voltage ranges (5 AC, 5 DC)
- 10 current ranges (5 AC, 5 DC)
- 6 resistance ranges to 20 megohm
- Furnished, assembled DC calibrator permits 0.2% accuracy DCV (can be lab calibrated to 0.1%)

A breakthrough in instrumentation! The new Heathkit IM-102 brings you a true Digital Multimeter (circuitry and readout) meeting lab-quality specs for about half the price of comparable wired DMMs. The unit accurately measures AC and DC voltages and currents, and resistance, with no need to change probes or switch meter for changes in DC polarity. It automatically displays positive or negative DC voltage and current, indicating correct amplitude and polarity. Five overlapping ranges measure voltage from 100 uV to 1000 V on DC (either polarity); 5 ranges cover 100 uV to 500 V on AC; 10 ranges measure 100 nA to 2 A on AC or DC; and 6 ranges measure resistance from 0.1 ohm to 20 megohms. Input impedance is approx. 1000 megohms on 2 V range (10 megohms on higher ranges), with overload protection on all ranges. Decimal point automatically placed with range selection. Overrange indicated by front panel light. A preassembled precision DC calibrator is furnished. And an internal circuit plus a unique transfer method provides accurate AC voltage calibration. Other deluxe features included at this low price are: all solid-state design with cold cathode readout tubes and a "memory" circuit to assure stable, non-blinking operation; detachable 3-wire line cord (no batteries needed); dual primary power transformer; isolated floating ground; aluminum cabinet with die-cast zinc front panel and tinted window. Standard banana jack connectors and test leads included. Kit assembles in about 10 hours. For lab spec. performance at half the cost...order your IM-102 today!

Kit IM-102, 9 lbs. 229.95*

Kit ID-1041, 30 kV high-voltage probe, 1 lb. 6.95*



FREE
1972
Heathkit
Catalog
Over
300 kits!

HEATH COMPANY, Dept. 24-11
Benton Harbor, Michigan 49022

Please send FREE Heathkit Catalog.

Enclosed is \$ _____, plus shipping.
Please send model(s) _____.

Name _____

Address _____

City _____ State _____ Zip _____

Prices & specifications subject to change without notice.
*Mail order prices; F.O.B. factory. TE-251

... for more details circle 118 on Reader Service Card

T & T VALUE SALE

- AUTO CAR ALARM \$14.95
- Y105 YOKE FOR ZENITH \$4.95
- Y109—OY95AC 2 for \$12
- 20 ASSORTED CONTROLS \$2
- 15 IN60 DIODES \$1
- 6500 PIV FOCUS RECTIFIERS . . . 4 for \$2
- 500 ft., 300 OHM, COLOR FOAM . . . \$10
- 100 ASSORTED RESISTORS \$1
- STEREO HEAD PHONES 2 for \$6
- BOOST DIODES 4 for \$1
- MAESTRO CHANGER \$15
 - BASE \$3
 - COVER \$3
- RAYTHEON, IEC, RCA, G.E., up to 80%
SYLVANIA, ETC. TUBES off list

EFFECTIVE IMMEDIATELY

With every receiving tube sold, T & T will give you, at no charge, a 750 MA—1000 PIV RECTIFIER. List 79¢ . . . Net 27¢. For example, buy 100 tubes—get 100 FREE RECTIFIERS.

• Minimum Order \$20. — F.O.B. Brooklyn

T & T SALES CO.

4802 AVENUE K
BROOKLYN, N. Y. 11234
Phone: (212) 241-5940

... for more details circle 137 on Reader Service Card

REPLACEMENT PARTS & ACCESSORIES WELTRON'S GOT 'EM! DO YOU?

plugs & jacks * stereo switches *
universal replacement antennas &
bases * volt meters * cables * mi-
crophones * power supplies * auto
stereo accessories * high precision
motors * synchronous motors *
shaded 4-pole motors *

COMPLETE CATALOG AVAILABLE.
CALL YOUR DISTRIBUTOR NOW!

Weltron[®]
COMPANY, INC.

514 EAST PEABODY STREET, DURHAM, N.C. 27702
919-682-0333

... for more details circle 139 on Reader Service Card

GUEST AUTHOR...

continued from page 56

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.

**Give Happiness
The United Way**

NEW ENDECO Desoldering Kits

MODEL
300-K
KIT
SHOWN



All you need to handle almost any desoldering and resoldering job!

Kit 300K includes the famous Endeco pencil desoldering iron Model 300, six different size tips (.038 to .090) for any job, tip cleaning tool, and metal stand for iron . . . all in a handy lifetime steel storage box. \$19.90 net. Model 300K-3 with a 3-wire cord \$20.90. Also a similar kit for military users. Kit 100K with large Endeco iron (Model 100A) is \$27.40, and 3-wire Kit 100AD-3 \$28.40.

SEE YOUR DISTRIBUTOR OR WRITE



**ENTERPRISE
DEVELOPMENT
CORPORATION**

5127 East 65th St., Indianapolis, Ind. 46320

... for more details circle 114 on Reader Service Card

INJECTORALL'S HEAVY DUTY TUNER CARE KIT CLEANS TUNERS "the professional way"

INJECTORALL's new heavy duty TUNER CARE KIT has a double punch. It is a two-part system. Part one, ROYAL CLEAN Tuner Degreaser, pressure cleans contacts and part two, ROYAL LUBE Heavy Duty Lubricant, lubricates and keeps them clean. It works better because ROYAL CLEAN dissolves dirt and grease instantly leaving no gum or residue. It is safe for plastics and leaves contacts shining new. ROYAL LUBE, the extra thick lubricant, protects, lubricates, and cleans contacts as the tuner is used. INJECTORALL's two part system in one package is called "TUNER CARE KIT."



Cat. no. 700-701 TUNER CARE KIT \$4.98 dealer net.



INJECTORALL ELECTRONICS CORP.
Glen Cove, N.Y. 11542

In Canada: Dominion Tire and Radio Co., Brandon, Manitoba
... for more details circle 119 on Reader Service Card

GREATEST TV Schematic Bargain EVER Offered

NOW-Complete TV Schematics for less than 5¢ each

COLOR TV
Covers ALL
Color Sets
1960 - 1968

BLACK & WHITE
Coverage for
23 U.S. Brands
1965 - 1968

TV TECH / MATICS - 8 Giant Volumes

Cover 99% of Color TV-4 Years B&W!

Here are FABULOUS savings on nationally-known TV schematic and service data. Here is everything you need to fill your vital service data needs for TV model years 1965 through 1968 . . . plus COLOR TV coverage from 1960 through 1968! What it amounts to is a low, low cost of less than \$9.00 per year for your TV service data . . . with an extra 5 years of Color TV coverage thrown in for good measure!

Compare that with the over \$100 a year you may now be paying for comparable information.

SERVICE DATA FOR MORE THAN 20 BRANDS

TV TECH/MATICS is the ideal Service Data package for today's modern technician. It includes complete schematic diagrams and vital servicing data for every TV receiver produced by more than 20 leading American Manufacturers for 1965, 1966, 1967, and 1968. All diagrams and servicing details are completely authentic, based on information provided by the original equipment manufacturers. Each year's coverage is permanently bound into two convenient-to-use volumes which open flat to 11" x 29½", ready to provide you with instant service data at your workbench. Some of the diagrams are as large as 58" x 22".

EASY TO USE

TV TECH/MATICS is easy to use. Brand names are arranged alphabetically by model year. No more hunting through several file drawers to find the schematic you need! And at the special low price, think of the savings you will enjoy on your schematic needs . . . think of the time you'll save by having the schematics you need right at your fingertips in handy, permanently-bound form!

TV TECH/MATICS is the ideal way to cut down your schematic expenses, and to enjoy the convenience of having all your data needs right at your fingertips.

8 BIG Volumes
Regular Price **\$79.60**
... NOW YOURS
for only **\$34.95**

HERE'S WHAT YOU GET

You receive 8 BIG volumes in all, two for each year from 1965 through 1968. Included is a clearly detailed and annotated TV schematic diagram for each specific model. You also get complete replacement parts lists, alignment instructions, tube and component location diagrams, plus key waveforms and voltage readings . . . all the information you need to service over 90% of the TV receivers you'll encounter!

STREAMLINED AND CONVENIENT

All the information for a given model is contained on two facing sheets. The special bound-leaf format allows pages to lie flat when open. Each volume is organized alphabetically by manufacturer, then numerically by model number. In addition, a handy Chassis/Model Finder is bound into each volume. Regular list price for each year's coverage — 2 BIG volumes — is \$19.90. All 8 volumes normally sell for \$79.60. Your price is ONLY \$34.95 . . . a savings of nearly \$45.00!

MONEY-BACK GUARANTEE

You MUST be satisfied that TV TECH/MATICS is the greatest bargain in TV Schematics ever offered. Order at our risk for FREE 10-day examination. Prove to yourself they are worth many times the price. You can return them in 10 days for full refund or cancellation of invoice. No need to send money. But, the supply is limited, so fill-in and mail the NO-RISK coupon today to obtain these time-saving, money-making manuals.

-CONTENTS-

CONTENTS 1965 MODELS

Covers all 1965 models for: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Electrohme, Emerson, Firestone, General Electric, Magnavox, Motorola, Muntz, Olympic, Packard-Bell, Philco, RCA Victor, Sears-Silvertone, Satchell-Carlson, Sylvania, Truetone, Westinghouse, and Zenith . . . plus all color sets 1960-1965, at no extra cost!

PUBLISHER'S LIST PRICE \$19.90

CONTENTS 1966 MODELS

Covers all 1966 color and B & W models of: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco, RCA Victor, Sears-Silvertone, Satchell-Carlson, Sonora, Sylvania, Truetone, Westinghouse, and Zenith.

PUBLISHER'S LIST PRICE \$19.90

CONTENTS 1967 MODELS

Covers all 1967 color and B & W models of: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco-Ford, RCA Victor, Sears-Silvertone, Satchell-Carlson, Truetone, Westinghouse, and Zenith.

PUBLISHER'S LIST PRICE \$19.90

CONTENTS 1968 MODELS

Covers all 1968 color and B & W models for: Admiral, Airline, Andrea, Coronado, Curtis-Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco-Ford, RCA Victor, Sears-Silvertone, Satchell-Carlson, Sonora, Sylvania, Truetone, Westinghouse, and Zenith.

PUBLISHER'S LIST PRICE \$19.90



LARGE PAGES contain complete circuit schematics, replacement parts lists, alignment instructions, critical part locations, important waveforms and voltage readings.

NO RISK COUPON—MAIL TODAY

TAB Books, Blue Ridge Summit, Pa. 17214

- I enclose \$34.95 for which please send me your complete 8-Volume Tech/Matics Schematic offer postage prepaid.
- Please invoice me for \$34.95 plus postage. Same return privileges.

Name

Company

Address

City State Zip

(Paid orders shipped prepaid. Pa. resident add 6% Sales Tax. Outside USA 10% extra.)

ET-111

... for more details circle 105 on Reader Service Card

AKTRON

When quality makes the difference



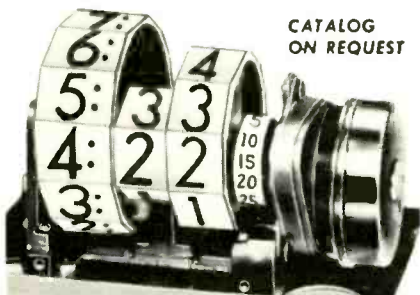
Auto Stereo Kits and Speakers

Whether you need replacement speakers, grills, or a complete stereo kit, Oaktron gives you the ultimate in auto sound performance. Kits are available with 4½", 5", 5¼", or 3" x 5" speakers with chrome plated or black painted grills. For AM, FM, or tapes, you get living room fidelity right in your car. Write for complete information.

AKTRON INDUSTRIES, INC.

1000-30th St., Monroe, Wisconsin

... for more details circle 127 on Reader Service Card



CATALOG ON REQUEST



DIGITAL CLOCK MOVEMENTS

DIGITS RESETTABLE INDIVIDUALLY

Available in 50, 60 cy., all voltages, AC. UL approved motor, cord. One Year Guarantee.



#100-24H
24 Hour
CLOCK

Made in U.S.A.

Complete Line: Delay, Interval and Cycle Timers, Digital Computers

PENNWOOD NUMECHRON CO. TYMETER ELECTRONICS

7249 FRANKSTOWN AVE., PITTSBURGH, PA. 15208

... for more details circle 129 on Reader Service Card

READERS SERVICE INDEX

ADVERTISER'S INDEX

| | |
|---|-----------|
| American Telephone & Telegraph Co. | 65 |
| 101 Amperex Electronic Corp. | 33 |
| 102 B & K Division, Dynascan Corp. | 38 |
| 103 Belden Corp. | 19 |
| 104 Book Club—Tab Books | 60-63 |
| 105 Book Club—Schematics | 77 |
| 106 CeCo Communications, Inc. | 78 |
| 107 Chemtronics, Inc. | 72 |
| 108 Cleveland Institute of Electronics | 35-37 |
| 109 Cornell Electronics Co. | 74 |
| 110 Dictaphone | 67 |
| 111 EICO Electronic Instruments Co., Inc. | 66-67 |
| 112 Electronic Chemical Corp. | 70 |
| 113 Elite Tuner Service | 74 |
| 114 Enterprise Development Corp. | 76 |
| 115 The Finney Company | 29 |
| 116 Fordham Radio Supply Co., Inc. | 78 |
| General Electric Picture Tubes | 22 |
| General Electric Tube Product Dept. | 31, 71 |
| 117 Grantham School of Engineering | 78 |
| GTE Sylvania Electronic Components | 2nd Cover |
| 118 Heath Company, The | 75 |
| 119 Injectorall Electronics Corp. | 76 |
| 120 International Crystal Mfg. Co. | 30 |
| 121 Jensen Tools & Alloys | 67 |
| 122 Leader Instruments Corp. | 3rd Cover |
| 123 LPS Research Labs | 66 |
| 124 Mallory Distributor Products Co. | 20 |
| 125 Mountain West Alarm Supply Co. | 70 |
| 126 Nortronics, Inc. | 28 |
| 127 Oaktron Industries, Inc. | 78 |
| 142 Pace, Inc. | 70 |
| 128 Panasonic | 69 |
| 129 Pennwood Numechron Co. | 78 |
| 130 Perma-Power Company | 68 |
| 131 Precision Tuner Service | 43 |
| 132 Raytheon Company | 73 |
| 133 RCA Consumer Electronics Technical Publications | 26 |
| RCA Entertainment Tubes | 27 |
| RCA Picture Tubes | 4th Cover |
| RCA Semiconductor Dist. Prod. | 46 |
| 134 RCA Test Equipment | 55 |
| 135 RMS Electronics, Inc. | 32 |
| 136 Sprague Products Company | 25 |
| 137 T & T Sales Company | 76 |
| 138 Triplett Corporation | 51 |
| 139 Weltron Co., Inc. | 76 |
| 140 Workman Electronic Products, Inc. | 74 |
| 141 Xcelite, Inc. | 24 |
| Zenith Radio Corporation | 59 |

NEW PRODUCTS

| | |
|-------------------------------------|----|
| 700 Audio Sweep Generator | 34 |
| 701 Stereo 8-Track Tape Deck | 34 |
| 702 Soldering System | 34 |
| 703 Soldering Tool | 70 |
| 704 Capacitor Tester | 70 |
| 705 Aluminum Electrolytic Capacitor | 72 |
| 706 Four-Pole Motor | 72 |
| 707 Scanning Receiver | 74 |
| 708 Time-Weather-Message Channel | 74 |

TEST INSTRUMENT

| | |
|---------------------------|----|
| 900 Philips PM 3200 Scope | 57 |
|---------------------------|----|

TEST EQUIPMENT at Discount Prices



SENCORE

Equipment by Other Manufacturers also Available

Catalog & Prices on Request

FORDHAM Radio Supply Co., Inc.



265 E. 149 Street, Bronx, N.Y. 10451
Tel: (212) 585-0330



DISTRIBUTORS OF ELECTRONIC SUPPLIES

... for more details circle 116 on Reader Service Card

Technicians, Earn Your Associate

DEGREE

mostly by correspondence

Accredited by the Accred. Comm. of National Home Study Council. G.E. Bill Approved. Free catalog. Write: Dept. T

Grantham School of Engineering
1505 N. Western, Hollywood, Calif. 90027

... for more details circle 117 on Reader Service Card

85% Off Current List Price

NEW, TOP QUALITY ELECTRON TUBES

- Ideal Plan for Servicemen
- Top Savings for Distributors
- Large Inventories for Mfg. Needs
- Full One Year Guarantee
- Send for FREE Wholesale Catalog •

CeCo Communications, Inc.

2624 Avenue "V" Brooklyn, N.Y. 11229

... for more details circle 106 on Reader Service Card



"I'm glad you're back, Ma'am! Your little boy hid my cheater cord and voltage tester from me about \$8.00 ago."

READER SERVICE INFORMATION CARD

For more information on products or services mentioned in this issue, simply circle the appropriate numbers below, type or print your name and address and drop in the mail.

ADVERTISED PRODUCTS

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| 101 | 110 | 119 | 128 | 137 | 146 |
| 102 | 111 | 120 | 129 | 138 | 147 |
| 103 | 112 | 121 | 130 | 139 | 148 |
| 104 | 113 | 122 | 131 | 140 | 149 |
| 105 | 114 | 123 | 132 | 141 | 150 |
| 106 | 115 | 124 | 133 | 142 | 151 |
| 107 | 116 | 125 | 134 | 143 | 152 |
| 108 | 117 | 126 | 135 | 144 | 153 |
| 109 | 118 | 127 | 136 | 145 | 154 |

TEST INSTRUMENTS

| | |
|-----|-----|
| 900 | 909 |
| 901 | 910 |
| 902 | 911 |
| 903 | 912 |
| 904 | 913 |
| 905 | 914 |
| 906 | 915 |
| 907 | 916 |
| 908 | 917 |

NEW PRODUCTS

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| 700 | 709 | 718 | 727 | 736 | 745 |
| 701 | 710 | 719 | 728 | 737 | 746 |
| 702 | 711 | 720 | 729 | 738 | 747 |
| 703 | 712 | 721 | 730 | 739 | 748 |
| 704 | 713 | 722 | 731 | 740 | 749 |
| 705 | 714 | 723 | 732 | 741 | 750 |
| 706 | 715 | 724 | 733 | 742 | 751 |
| 707 | 716 | 725 | 734 | 743 | 752 |
| 708 | 717 | 726 | 735 | 744 | 753 |

This card is usable until February 5, 1972.

11/71

NAME _____ POSITION _____
 COMPANY _____ STREET _____
 CITY _____ STATE _____ ZIP CODE _____

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS

PERMIT NO. 665

DULUTH, MINNESOTA

POSTAGE WILL BE PAID BY

Reader Service Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

GET
MORE
FACTS

NO POSTAGE
NECESSARY

PERSONAL SUBSCRIPTION CARD

GET THIS FREE BONUS WITH YOUR PERSONAL
SUBSCRIPTION TO ELECTRONIC TECHNICIAN/DEALER!

Enter your subscription for a two- or three-year term and
we'll send you the new TEKFAQ 110 Book of Schematics—FREE!

One Year \$6 (no free schematics or bonus) Two Years \$10

Three Years \$13 Payment Enclosed Bill Me Later

PLEASE CHECK BELOW:

1. In the TV, Radio and other consumer products fields, is your firm
PRIMARILY a: (please check most descriptive item)

- Retailer with service department Industrial electronics service firm
 Service/repair firm with some retail Manufacturer
 Service/repair firm with no retail Other (please describe)

2. Title: (please check one)

- Owner, manager, buyer, other executive
 Service manager
 Service repairman or other employee



NAME _____ STREET _____
 FIRM _____ TITLE _____
 CITY _____ STATE _____ ZIP _____

If you are renewing your subscription, check here and attach your address label. If you renew your subscription for 2 to 3 years, you are still eligible to receive the TEKFAQ 110 as your free bonus.

Circle
the
Reader
Service
numbers
of those
items of
interest
to you.

Your own
personal
copy
for
only
pennies
per issue

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY

Reader Service Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

FIRST CLASS

PERMIT NO. 665

DULUTH, MINNESOTA

GET MORE FACTS

NO POSTAGE
NECESSARY

READER SERVICE INFORMATION CARD

For more information on products or services mentioned in this issue, simply circle the appropriate numbers below, type or print your name and address and drop in the mail.

ADVERTISED PRODUCTS

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| 101 | 110 | 119 | 128 | 137 | 146 |
| 102 | 111 | 120 | 129 | 138 | 147 |
| 103 | 112 | 121 | 130 | 139 | 148 |
| 104 | 113 | 122 | 131 | 140 | 149 |
| 105 | 114 | 123 | 132 | 141 | 150 |
| 106 | 115 | 124 | 133 | 142 | 151 |
| 107 | 116 | 125 | 134 | 143 | 152 |
| 108 | 117 | 126 | 135 | 144 | 153 |
| 109 | 118 | 127 | 136 | 145 | 154 |

TEST INSTRUMENTS

| | |
|-----|-----|
| 900 | 909 |
| 901 | 910 |
| 902 | 911 |
| 903 | 912 |
| 904 | 913 |
| 905 | 914 |
| 906 | 915 |
| 907 | 916 |
| 908 | 917 |

NEW PRODUCTS

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| 700 | 709 | 718 | 727 | 736 | 745 |
| 701 | 710 | 719 | 728 | 737 | 746 |
| 702 | 711 | 720 | 729 | 738 | 747 |
| 703 | 712 | 721 | 730 | 739 | 748 |
| 704 | 713 | 722 | 731 | 740 | 749 |
| 705 | 714 | 723 | 732 | 741 | 750 |
| 706 | 715 | 724 | 733 | 742 | 751 |
| 707 | 716 | 725 | 734 | 743 | 752 |
| 708 | 717 | 726 | 735 | 744 | 753 |

This card is usable until February 5, 1972.

11/71

NAME _____ POSITION _____
COMPANY _____ STREET _____
CITY _____ STATE _____ ZIP CODE _____

Circle
the
Reader
Service
numbers
of those
items of
interest
to you.

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY

Circulation Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

FIRST CLASS

PERMIT NO. 665

DULUTH, MINNESOTA

Your own
personal
copy
for
only
pennies
per issue

THE NEWER LEADER

LCT-910

Cathode Ray Tube
Tester/Rejuvenator

\$129.50



All the quality and features you want . . . a sturdy, wear-tough carry case . . . and a price that's unbeatable . . . That's the LCT-910 for you! Check these plus features: Compares color gun emissions and grid cut-off characteristics; rejuvenates picture tube to proper emission and brightness; "Super-Rejuvenates" for added tube life; Repairs shorts, opens and between element leakage; Predicts useful tube life via meter readings; Has continuously adjustable element voltages for "as needed" settings; automatic rejuvenator rate control; RC timer; easy, quick color tracking check; 117V/60 Hz operation; Equipped with plug-in sockets to facilitate all test procedures; Has 8 rubber bumpers for vertical or horizontal use. See your distributor. Send for catalog.

Another "Instrument to Believe In"

Leader INSTRUMENTS CORP.

37-27 Twenty-Seventh Street, Long Island City, N.Y. 11101 (212) 729-7410

. . . for more details circle 122 on Reader Service Card

Now—Just 3 RCA Hi-Lite “V” Type Color Picture Tubes Replace **185** Types



Replaces **92** types

| | | |
|----------|-----------|----------|
| 18VABP22 | 19HCP22/ | 490ASB22 |
| 18VACP22 | 19HKP22 | 490BAB22 |
| 18VADP22 | 19HFP22 | 490BCB22 |
| 18VAHP22 | 19HJP22 | 490BDB22 |
| 18VAJP22 | 19HKP22 | 490BGB22 |
| 18VAQP22 | 19HQP22 | 490BHB22 |
| 18VARP22 | 19HRP22 | 490BRB22 |
| 18VASP22 | 19HXP22 | 490CB22 |
| 18VATP22 | 19JBP22 | 490CHB22 |
| 18VBAP22 | 19JDP22 | 490CUB22 |
| 18VBCP22 | 19JHP22 | 490DB22 |
| 19EXP22 | 19JKP22 | 490EB22 |
| 19EXP22/ | 19JNP22 | 490EB22A |
| 19GVP22 | 19JQP22 | 490FB22 |
| 19EYP22 | 19JYP22 | 490GB22 |
| 19EYP22/ | 19JZP22 | 490HB22 |
| 19GWP22 | 19KEP22 | 490JB22 |
| 19FMP22 | 19KFP22 | 490JB22A |
| 19FXP22 | 490AB22 | 490KB22 |
| 19GLP22 | 490ACB22 | 490KB22A |
| 19GSP22 | 490ADB22 | 490LB22 |
| 19GVP22 | 490AEB22 | 490MB22 |
| 19GVP22/ | 490AFB22 | 490NB22 |
| 19EXP22 | 490AGB22 | 490RB22 |
| 19GWP22 | 490AHB22 | 490SB22 |
| 19GWP22/ | 490AHB22A | 490TB22 |
| 19EYP22 | 490AJB22 | 490UB22 |
| 19GXP22 | 490AJB22A | 490VB22 |
| 19GYP22 | 490AKB22 | 490WB22 |
| 19GZP22 | 490ALB22 | 490XB22 |
| 19HBP22 | 490AMB22 | 490YB22 |
| 19HCP22 | 490ANB22 | 490ZB22 |
| | 490ARB22 | |

Replaces **22** types

| | |
|-----------|-----------|
| 19VABP22 | 21FJP22A/ |
| 19VACP22 | 21GVP22 |
| 21AXP22 | 21FKP22 |
| 21AXP22A | 21GUP22 |
| 21AXP22A/ | 21GUP22/ |
| 21AXP22 | 21FBP22A |
| 21CYP22 | 21GVP22 |
| 21CYP22A | 21GVP22/ |
| 21FBP22 | 21FJP22A |
| 21FBP22A | 21GXP22 |
| 21FBP22A/ | 21GYP22 |
| 21GUP22 | 21GZP22 |
| 21FJP22 | 21HAP22 |
| 21FJP22A | |

Replaces **71** types

| | | |
|----------|----------|---------|
| 23VACP22 | 25AEP22 | 25BRP22 |
| 23VADP22 | 25AFP22 | 25BSP22 |
| 23VAHP22 | 26AGP22 | 25BVP22 |
| 23VALP22 | 25AJP22 | 25BWP22 |
| 23VAMP22 | 25ANP22 | 25BXP22 |
| 23VANP22 | 25AP22 | 25BZP22 |
| 23VAQP22 | 25AP22A | 25CBP22 |
| 23VARP22 | 25AP22A/ | 25CP22 |
| 23VASP22 | 25XP22 | 25CP22A |
| 23VATP22 | 25AQP22 | 25FP22 |
| 23VAUP22 | 25ASP22 | 25FP22A |
| 23VAWP22 | 25AWP22 | 25GP22 |
| 23VAXP22 | 25AXP22 | 25GP22A |
| 23VAYP22 | 25AZP22 | 25RP22 |
| 23VAZP22 | 25BAP22 | 25SP22 |
| 23VBAP22 | 25BCP22 | 25VP22 |
| 23VBCP22 | 25BDP22 | 25WVP22 |
| 23VBDP22 | 25BFP22 | 25XP22 |
| 23VBEP22 | 25BGP22 | 25XP22/ |
| 23VBGP22 | 25BHP22 | 25AP22A |
| 23VBHP22 | 25BJP22 | 25YP22 |
| 23VBJP22 | 25BMP22 | 25YP22/ |
| 23VBRP22 | 25BP22 | 25BP22A |
| 25ABP22 | 25BP22A | 25ZP22 |
| 25ADP22 | 25BP22A/ | |
| | 25YP22 | |

Here's the way to save yourself time, give your customers faster service and improve your profit. Stock these three RCA Hi-Lite color picture tubes and have immediate replacements for the fastest moving industry types — 185 of them.

RCA Hi-Lite types are all new, made to OEM specifications and contain the newest RCA manufacturing technology, including Perma-Chrome and the latest X-ray attenuating glass.

It adds up to a big plus for you. Order these three RCA Hi-Lite tubes, and other types you may need, from your RCA Distributor. He also has the complete RCA Interchangeability Guide, available free of charge.

RCA | Electronic Components | Harrison, N.J. 07029

RCA Electronic Components