APRIL 1972 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

Satellite TV...Coming Down to Earth

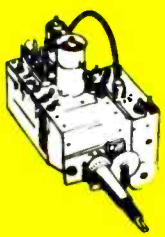
Glad to Meet You, "Slim Jim"

Wideband Distribution Equipment

The Tuner People

Pioneers of TV Tuner Overhauling
Originators of Complete TV Tuner Service

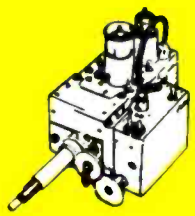
Castle offers the following services to solve ALL your television tuner problems.

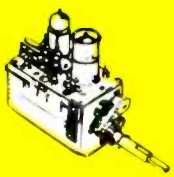


Universal Replacements from $8.95

These universal replacement tuners are all equipped with memory fine tuning and uhf position with plug input for uhf tuner. They come complete with hardware and component kit to adapt for use in thousands of popular TV receivers.

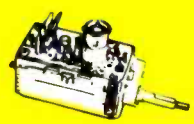
STOCK No.	HEATERS	SHAFT Min.*	SHAFT Max.*	I.F. Snd.	PRICE
CR6P	Parallel 6.3v	1¾"	3"	41.25	8.95
CR7S	Series 600mA	1¾"	3"	41.25	9.50
CR9S	Series 450mA	1¾"	3"	41.25	9.50
CR6XL	Parallel 6.3v	2½"	12"	41.25	10.45
CR7XL	Series 600mA	2½"	12"	41.25	11.00
CR9XL	Series 450mA	2½"	12"	41.25	11.00





Castle Replacements $15.95

Castle custom replacements made to fit in place of original tuner. Purchase outright . . . no exchange needed. Write for current list of Castle replacements, or request the part number you require (use number on ORIGINAL TUNER ONLY; do not use service literature numbers). Available for many of the popular models of following manufacturers: Admiral, Curtis Mathes, Emerson, GE, Heathkit, Magnavox, Motorola, Muntz, Philco, RCA, Sears, Sylvania, Westinghouse, Zenith and many private labels.



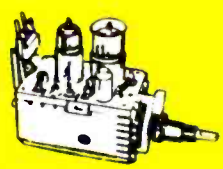
Tandem uhf-vhf replacements NOW $21.95

Available in popular models of: Muntz, Olympic, Philco, Sears, Westinghouse and private labels.

Overhaul Service $9.95

This is the service pioneered by Castle! We are now in our third decade of serving the TV Service Industry

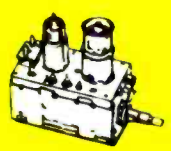
Service on all makes and models, vhf or uhf, including transistor and color tuners . . . one price $9.95 (does not include tuners older than 10 years). Overhaul includes parts, except tubes and transistors.



Simply send us the defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint. Your tuner will be expertly overhauled and returned promptly, performance restored, aligned to original standards and warranted for 90 days.

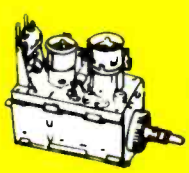
Dismantle tandem uhf and vhf tuners and send in defective unit only. Remove all accessories . . . or dismantling charge may apply.

Custom Exchange Service $17.95



When our inspection reveals that original tuner is unfit for overhaul, and it is not available from our stock of outright replacements, we offer to make a custom replacement on exchange basis. Charge for this service is $15.95 for uhf tuner and $17.95 for vhf tuner.

If custom replacement cannot be made we will custom rebuild the original tuner at the exchange replacement price.



All replacements are new or rebuilt. All prices are f.o.b. our plant. Add shipping and handling of $1.25 on all prepaid orders. We will ship C.O.D.

CASTLE TV TUNER SERVICE, INC.

MAIN PLANT: 5713 N. Western Ave., Chicago, Ill. 60645 • Ph. 312—561-6354
EAST: 130-03 89th Rd., Richmond Hill, N.Y. 11418 • Ph. 212—846-5300

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

1414
ZENITH
TV Chassis
12CB12X

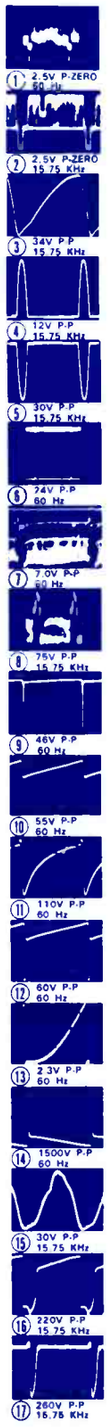
APRIL • 1972

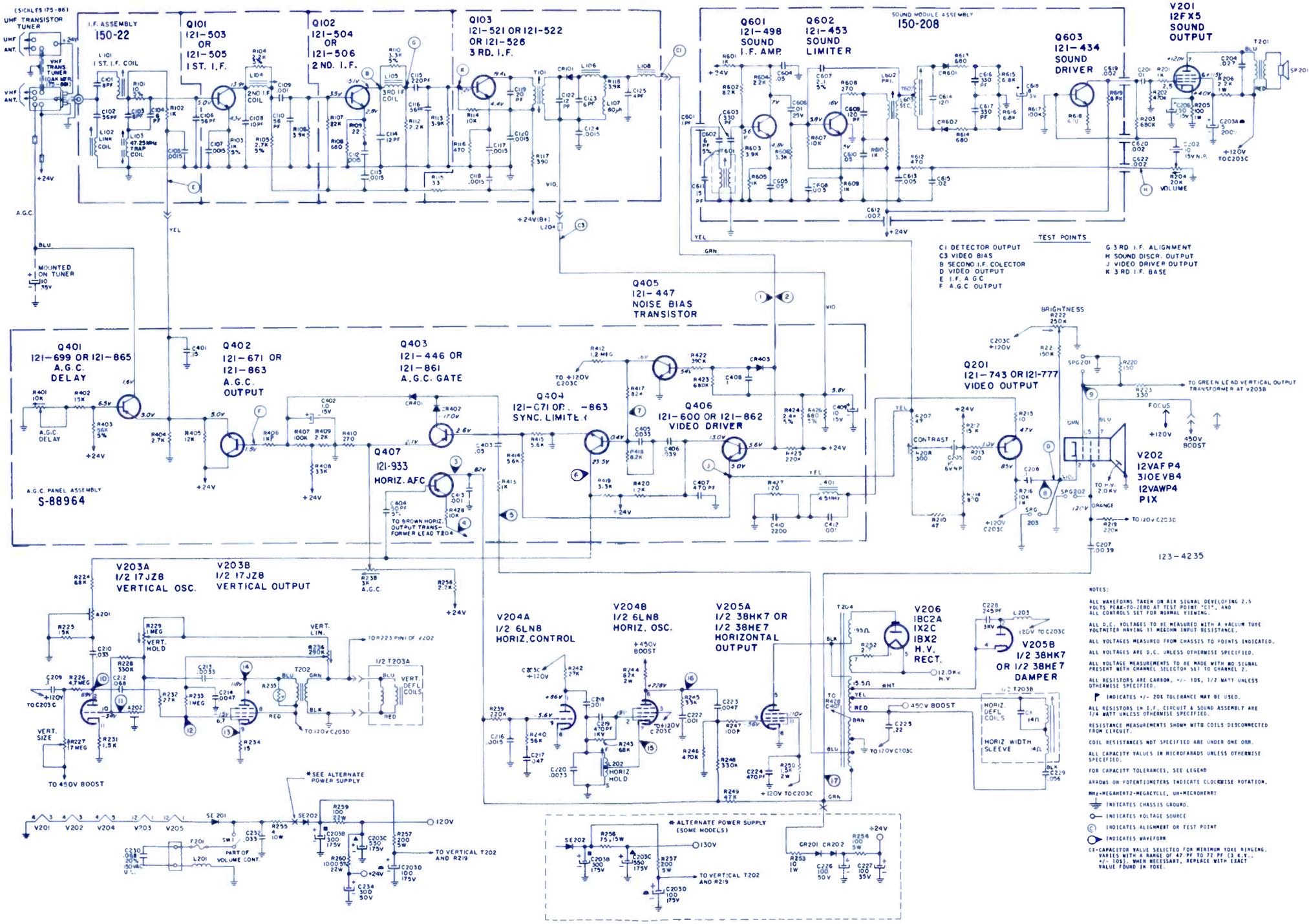
ELECTRONIC TECHNICIAN/DEALER TEKFAX

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

SYMBOL	DESCRIPTION	ZENITH PART NO.
C203	A-5 µf, electrolytic cap, 200v B-300 µf electrolytic cap 175v C-550 µf electrolytic cap 175v D-100 µf, electrolytic cap, 175v	22-6322
R204	20K, volume control	63-8892
R208	300Ω, contrast control	63-8898
R222	250K, bright control	63-8896
R227	7M, vert size control	63-8897
R229	1M vert hold control	63-8895
R235	voltage dependent resistor	63-7447
R236	290K, vert lin control	63-8894
R238	3K, AGC control	63-8893
R401	10K, AGC delay control	63-8791
L103	47.25MHz trap coil	20-3100
L202	horiz hold	S89283
T201	audio output xformer	95-3024
T202	vert output xformer	95-2906
T203	yoke	S-87921
T204	horiz sweep xformer	S-88066
F201	fuse 1.25a (pigtail) or fuse 1.0a (belfuse)	136-79 136-95
A201	integrator	87-11
A202	integrator	87-4

ELECTRONIC TECHNICIAN/DEALER is published monthly by HARCOURT BRACE JOVANOVICH 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.
POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, HARCOURT BRACE JOVANOVICH PUBLICATIONS, INC., 1 East First St., Duluth, Minn. 55802.





NOTES:

ALL WAVEFORMS TAKEN ON AIR SIGNAL DEVELOPING 2.5 VOLTS PEAK-TO-ZERO AT TEST POINT "C1", AND ALL CONTROLS SET FOR NORMAL VIEWING.

ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.

ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT WITH CHANNEL SELECTOR SET TO CHANNEL 2.

ALL RESISTORS ARE CARBON, +/- 10%, 1/2 WATT UNLESS OTHERWISE SPECIFIED.

▶ INDICATES +/- 20% TOLERANCE MAY BE USED.

ALL RESISTORS IN I.F. CIRCUIT & SOUND ASSEMBLY ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

COIL RESISTANCES NOT SPECIFIED ARE UNDER ONE OHM.

ALL CAPACITY VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

FOR CAPACITY TOLERANCES, SEE LEGEND

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

MHz=MEGAHERTZ=MEGACYCLE, UH=MICROHENRY

⏚ INDICATES CHASSIS GROUND.

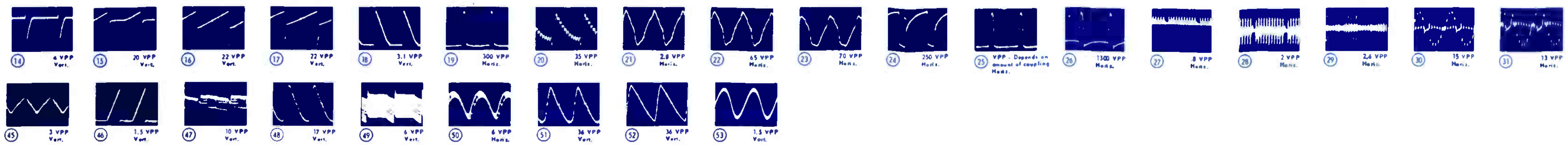
○— INDICATES VOLTAGE SOURCE

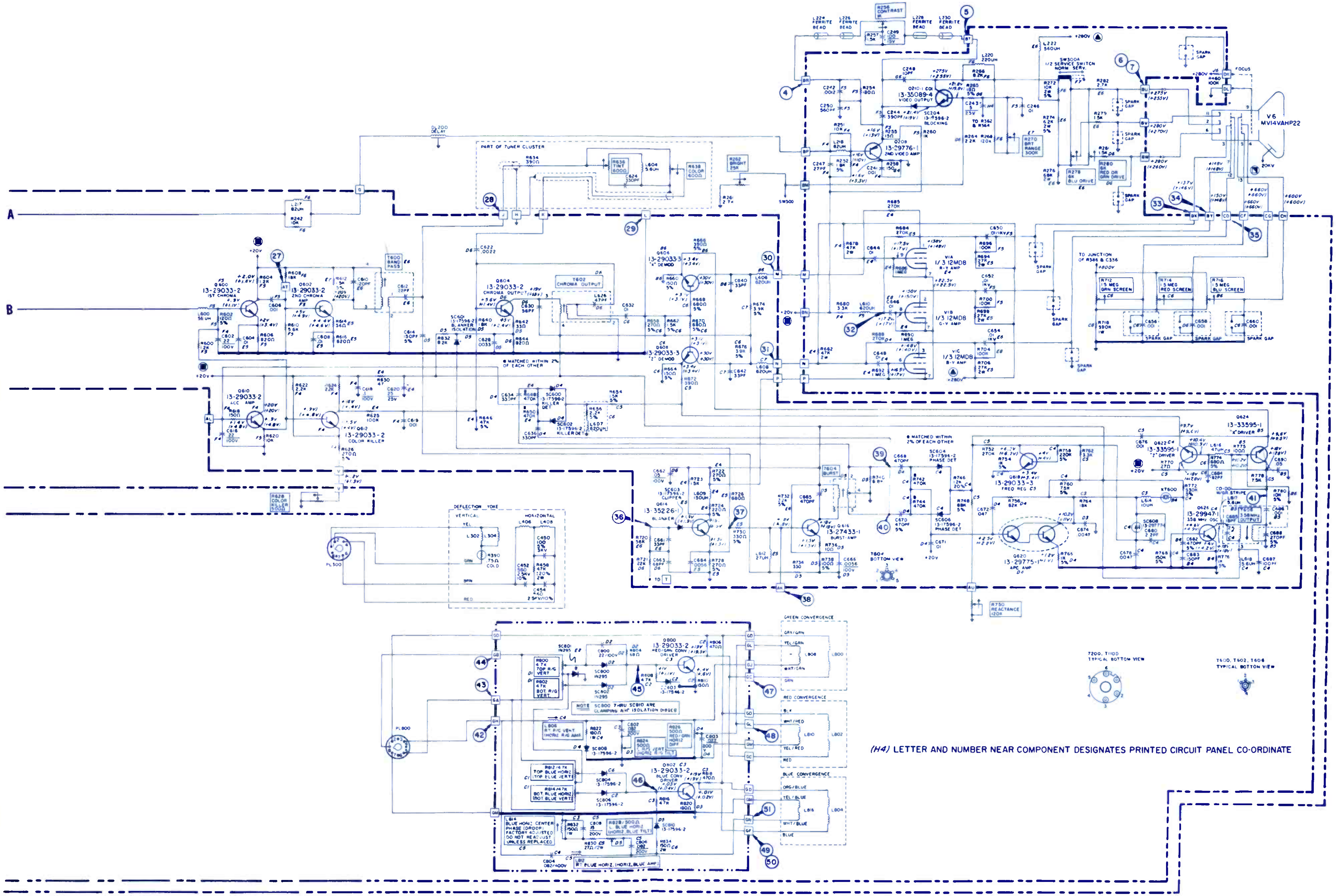
Ⓒ INDICATES ALIGNMENT OR TEST POINT

◯▶ INDICATES WAVEFORM

CK=CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 K.V., +/- 10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.

SYLVANIA
Color-TV Chassis
D17-1-2



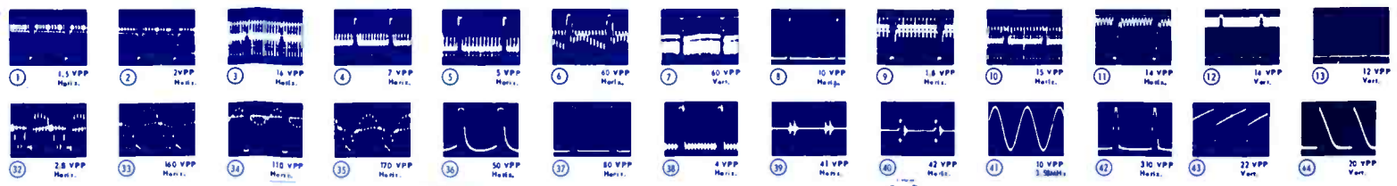


1413
SYLVANIA
Color-TV Chassis
D17-1-2

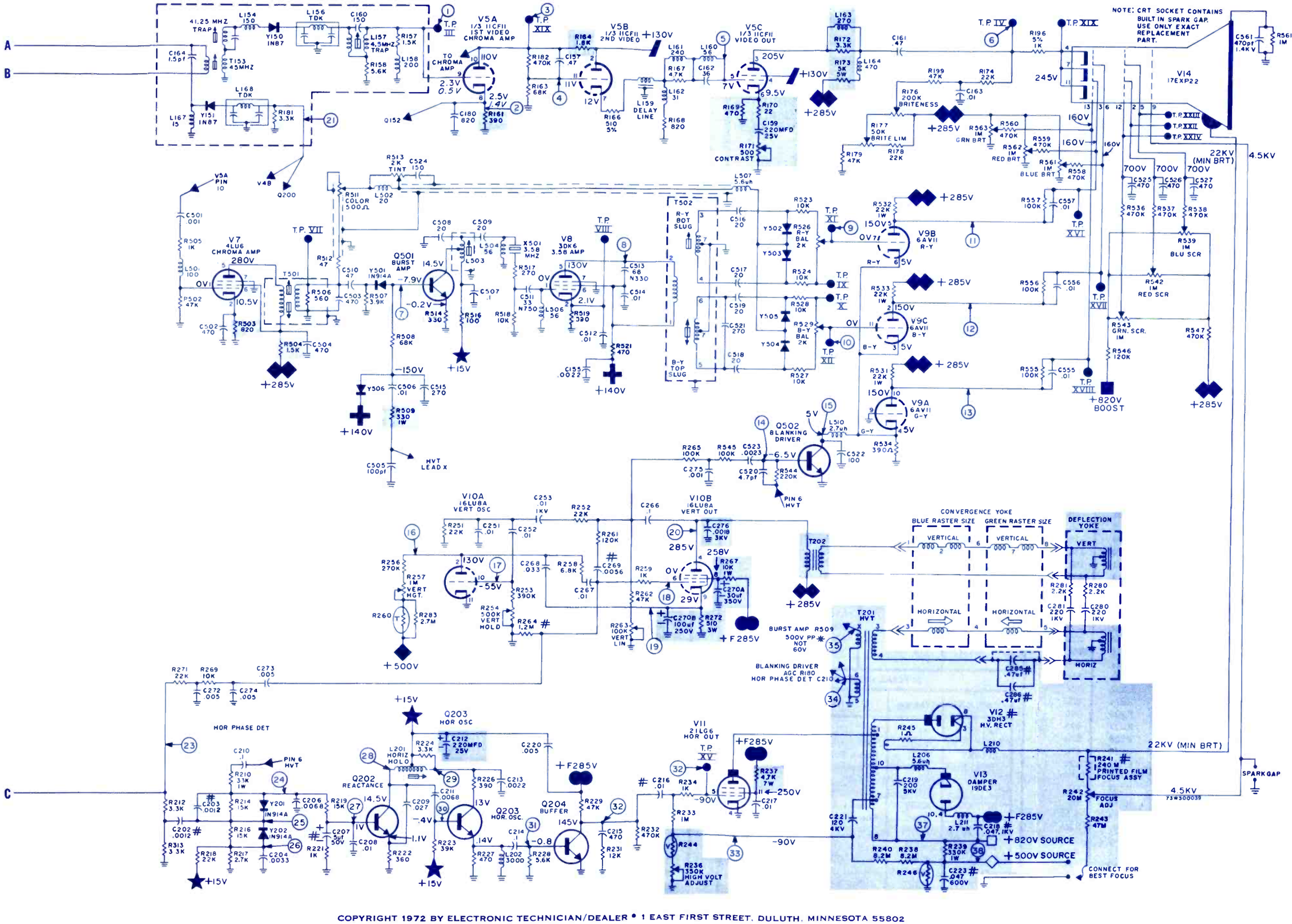
APRIL • 1972

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

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



GENERAL ELECTRIC
Color-TV Chassis
N-1

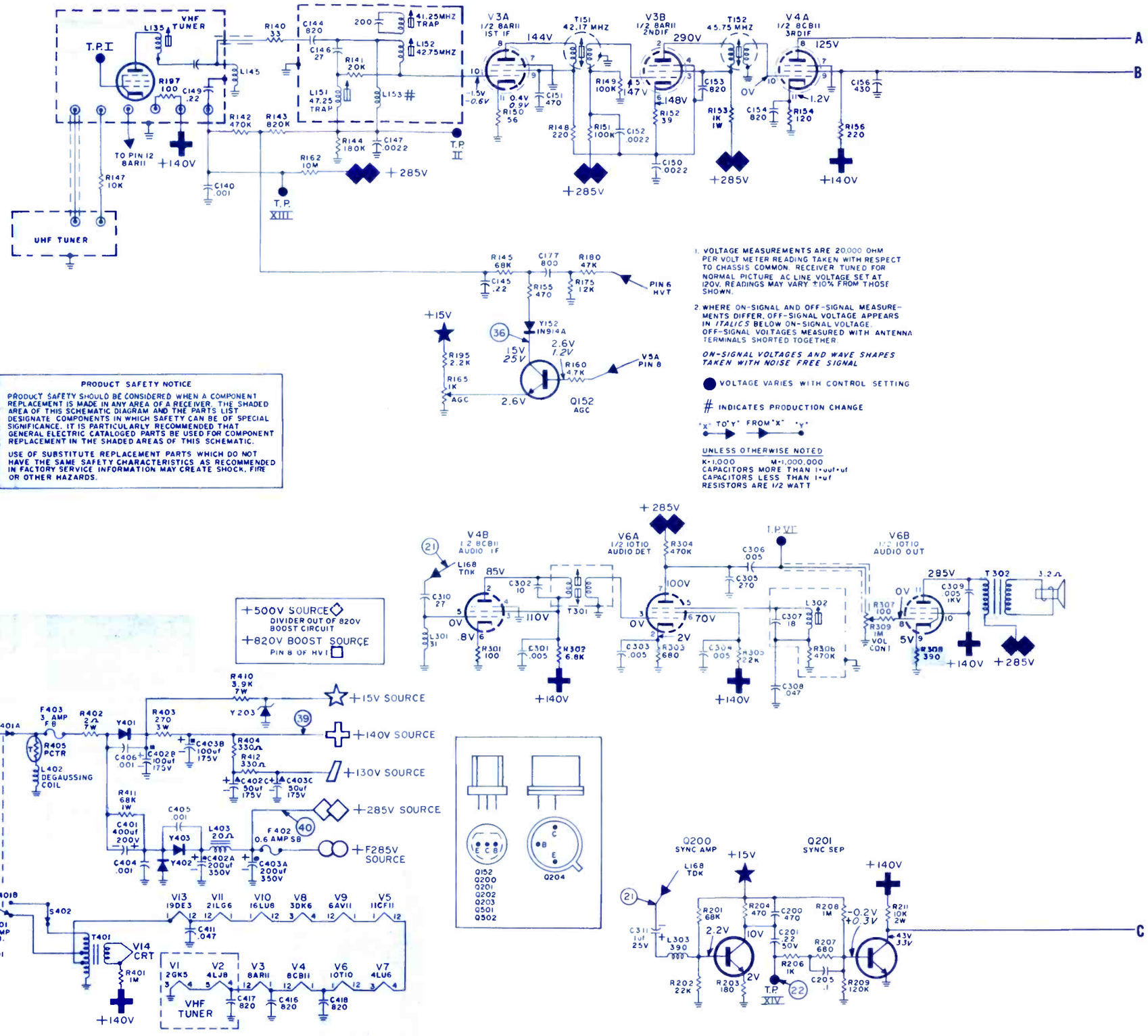


1412
GENERAL ELECTRIC
Color-TV Chassis
N-1

APRIL • 1972

ELECTRONIC TECHNICIAN/DEALER TEKFAX

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



PRODUCT SAFETY NOTICE

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN A COMPONENT REPLACEMENT IS MADE IN ANY AREA OF A RECEIVER. THE SHADED AREA OF THIS SCHEMATIC DIAGRAM AND THE PARTS LIST DESIGNATE COMPONENTS IN WHICH SAFETY CAN BE OF SPECIAL SIGNIFICANCE. IT IS PARTICULARLY RECOMMENDED THAT GENERAL ELECTRIC CATALOGED PARTS BE USED FOR COMPONENT REPLACEMENT IN THE SHADED AREAS OF THIS SCHEMATIC.

USE OF SUBSTITUTE REPLACEMENT PARTS WHICH DO NOT HAVE THE SAME SAFETY CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SHOCK, FIRE OR OTHER HAZARDS.

1. VOLTAGE MEASUREMENTS ARE 20,000 OHM PER VOLT METER READING TAKEN WITH RESPECT TO CHASSIS COMMON. RECEIVER TUNED FOR NORMAL PICTURE. AC LINE VOLTAGE SET AT 120V. READINGS MAY VARY ±10% FROM THOSE SHOWN.
2. WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS DIFFER, OFF-SIGNAL VOLTAGE APPEARS IN *ITALICS* BELOW ON-SIGNAL VOLTAGE. OFF-SIGNAL VOLTAGES MEASURED WITH ANTENNA TERMINALS SHORTED TOGETHER.

ON-SIGNAL VOLTAGES AND WAVE SHAPES TAKEN WITH NOISE FREE SIGNAL

● VOLTAGE VARIES WITH CONTROL SETTING

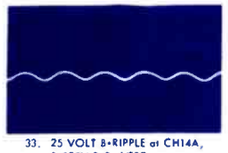
# INDICATES PRODUCTION CHANGE

"X" TO "Y" FROM "X" "Y"

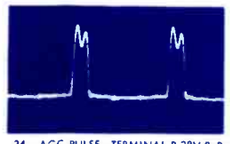
UNLESS OTHERWISE NOTED
K=1,000 M=1,000,000
CAPACITORS MORE THAN 1-uuf-uf
CAPACITORS LESS THAN 1-uf
RESISTORS ARE 1/2 WATT

SYMBOL	DESCRIPTION	GENERAL ELECTRIC PART NO.
R244	varistor, 1ma, ±15%, @850v	EP13X2
R246	varistor, 1ma, ±15%, @575v	EP13X3
R260	thermistor, 500K, ±10%, @25°	EP14X20
R406	klixon, TDR 20Ω cold/5K hot	EP39X4
C402A	200 µf, +100%-10%, 350v, electro	EP31X18
C402B	100 µf, +100%-10%, 175v, electro	EP31X18
C402C	50 µf, +100%-10%, 175v, electro	EP31X18
C403A	200 µf, +100%-10%, 350v, electro	EP31X18
C403B	100 µf, +100%-10%, 175v, electro	EP31X18
C403C	50 µf, +100%-10%, 175v, electro	EP31X18
R165	control, AGC, 1K	EP49X44
R171	control, triple contrast 500K, 20%	EP49X50
R176	control, triple brite, 200K, 30%	EP49X50
R177	control, 50K, brite limit adjust	EP49X52
R236	control, H V adj, 350K	FP49X46
R242	control 20M, focus adj	EP49X51
R254	control, triple, vert hold, 500K, 30%	EP49X50
R257	control, dual vert height, 1M	EP49X45
R263	control, dual, vert lin, 100K	EP49X45
R309	control, on/off vol, 1M	EP49X3
R511	control, color, 500 Ω	EP49X54
R513	control, tint, 2K	EP49X55
R526	control, dual, red balance, 2K	EP49X594
R529	control, dual, blue balance, 2K	EP49X594
Q152	transistor, NPN, silicon AGC keyer	EP15X7
Q200	transistor, NPN, silicon, sync. amp	EP15X3
Q201	transistor, horiz, AFC	EP15X7
Q202	transistor, horiz react	EP15X9
Q203	transistor, horiz osc	EP15X9
Q204	transistor, horiz driver	EP15X10
Q501	transistor, NPN, sllicon, burst amp	EP15X5
Q502	transistor, NPN, silicon, blanking driver	EP15X9
L157	coil, 4.5MHz trap w/core	EP61X3
L159	coil, delay line	EP36X50
L201	coil, horiz osc	EP36X55
L302	coil, quad	EP36X52
L401	line choke, 3.2–4.1MHz	EP36X57
T201	xformer, horiz output	EP77X7
T202	xformer, vert output	EP64X7
T301	xformer, audio interstage	EP36X34
T302	xformer, audio output	EP64X8
T401	xformer, filament	EP64X9
T501	coils, chroma bandpass	EP36X2
T502	xformer, chroma demod	EP36X65
	fuse, 4 amp slow-blo (F401)	EP10X7
	fuse, .6a slow-blo (F402)	EP10X5
	fuse, 3a fast-blo (F403)	EP10X4
	yoke, deflection	EP76X5
	yoke, convergence	EP62X18

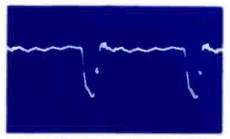
AIRLINE
Color-TV Model
GC1-12102A



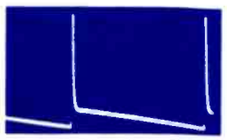
33. 25 VOLT B+RIPPLE at CH14A, 0.025V P-P, VERT. (ON SCHEMATIC)



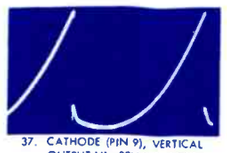
34. AGC PULSE, TERMINAL P, 28V P-P, HORIZ. (PWS1)



35. BURST. AMPL., KEYING PULSE, TERMINAL T (PWS1)

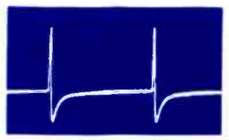


36. PLATE, (PIN 4) VERTICAL OUTPUT (V1)AC, 1150V P-P, VERT. (PWS2)

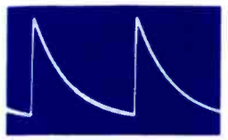


37. CATHODE (PIN 9), VERTICAL OUTPUT V1, 22V P-P, VERT. (PWS2)

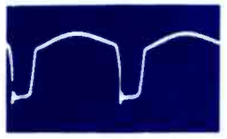
38. PLATE (PIN 2), VERTICAL OSCILLATOR V1, 80V P-P, VERT. (PWS2)



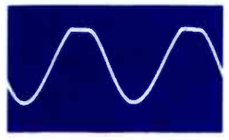
39. GRID (PIN 10), VERTICAL OSCILLATOR V1, 95V P-P, VERT. (PWS2)



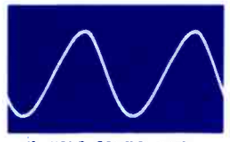
40. CATHODE (PIN 11), VERTICAL OSCILLATOR V1, 60V P-P, VERT. (PWS2)



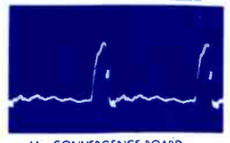
41. HORIZ. SCREEN, (PIN 3) V3, 40 P-P, HORIZ. (PWS2)



42. HORIZ. GRID, (PIN 2) V3, 2.2V P-P, HORIZ. (PWS2)

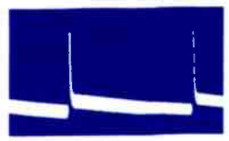


43. HORIZ. CONTROL PLATE, (PIN 1)V3, 57V P-P, HORIZ. (PWS2)

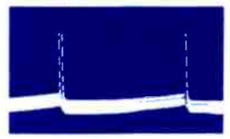


44. CONVERGENCE BOARD, TERMINAL B, 220V P-P, HORIZ. (PWS3)

45. CONVERGENCE BOARD, TERMINAL E, 20V P-P, HORIZ. (PWS3)

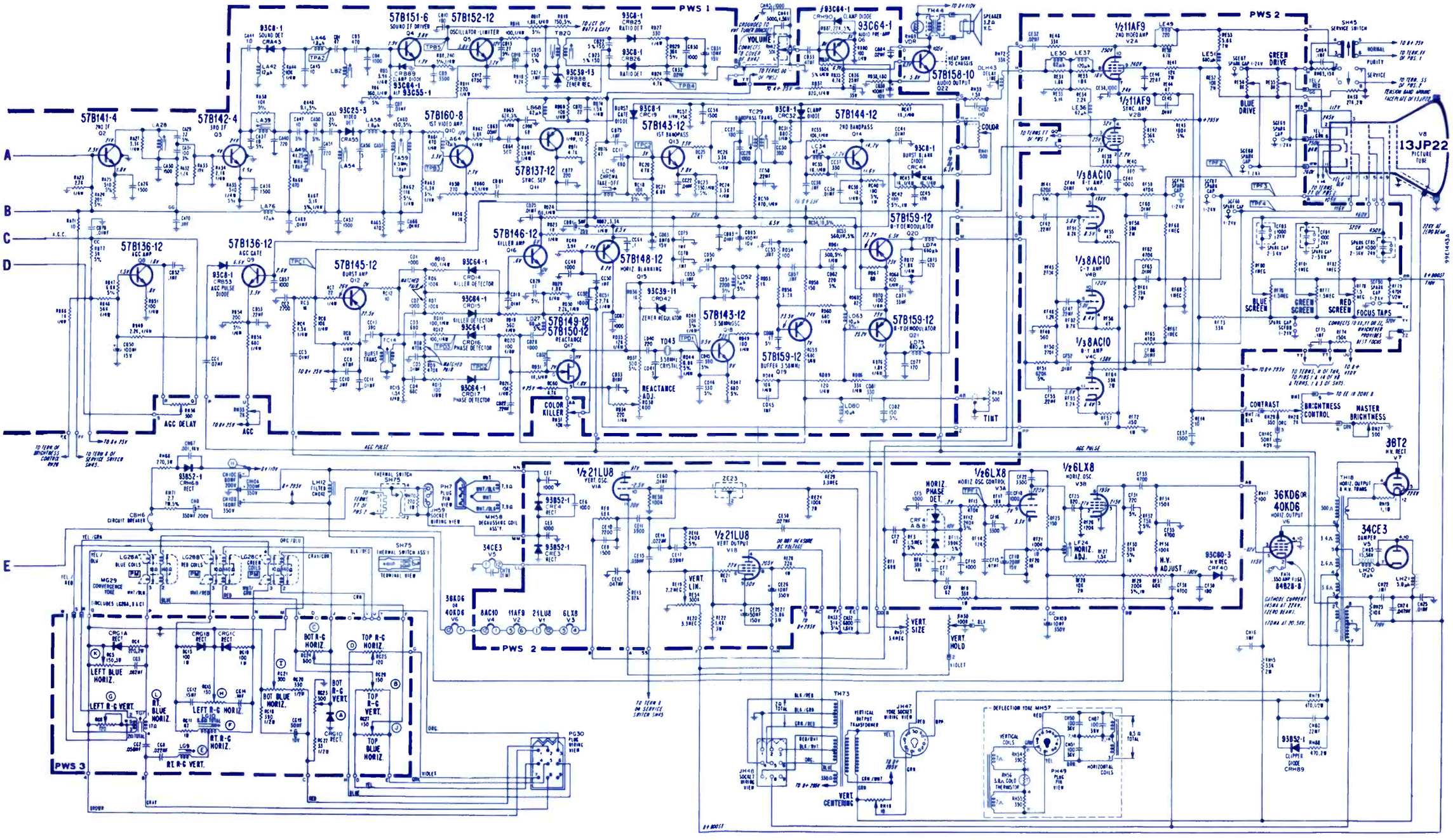


46. CONVERGENCE BOARD TERMINAL D, 10V P-P, HORIZ. (PWS3)



47. CONVERGENCE BOARD, TERMINAL H, 5.5V P-P, HORIZ. (PWS3)

48. CONVERGENCE BOARD TERMINAL V, 4V P-P, HORIZ. (PWS3)



1411

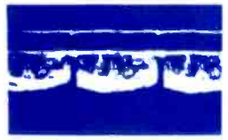
AIRLINE

Color-TV Model
GC1-12102A

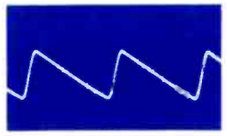
APRIL • 1972

ELECTRONIC TECHNICIAN/DEALER TEKFAX

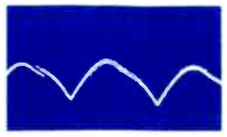
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS



1. BASE, TP83, 1st VIDEO AMPL. (Q10), 2V P-P, VERT. (PWS1)

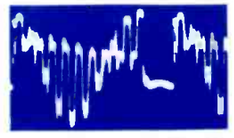


9. RIPPLE at "NN", 18V P-P, VERT. (PWS2)

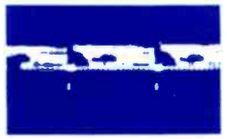


10. RIPPLE at "EE", 1.6V P-P, VERT. (PWS2)

11. RIPPLE at CH 10C, 0.1V P-P, VERT. UNDERSIDE CHASSIS NEAR TH73 (ON SCHEMATIC)



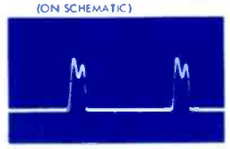
12. COLLECTOR, B-Y DEMODULATOR (Q20), "M", 8.2V P-P, HORIZ. (PWS1)



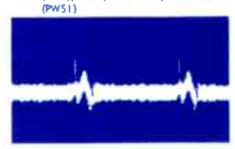
2. TPA2, SOUND DETECTOR 0.25V P-P, VERT. (PWS1)

13. AGC PULSE, BASE, AGC GATE, (Q9), HORIZ. (PWS1)

14. COLLECTOR, 1st BANDPASS AMPL., (Q13), BURST 8V P-P, CHROMA 4V P-P, HORIZ. (PWS1)

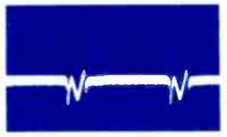


15. JUNCTION RC43 AND CRC 44, 8V P-P, HORIZ. (PWS1)

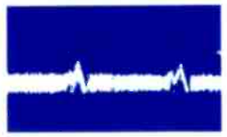


16. BASE, 2nd BANDPASS, (Q14), CHROMA 0.13V P-P, HORIZ. (PWS1)

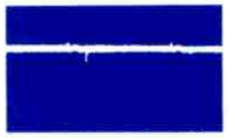
3. COLLECTOR, 1st VIDEO AMPL., (Q10), 8V P-P VERT. (PWS1)



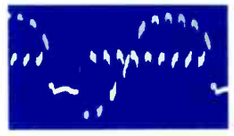
17. COLLECTOR, 2nd BANDPASS, (Q14), 0.22V P-P, HORIZ. (PWS1)



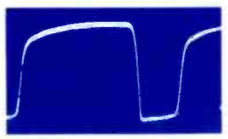
18. EMITTER, 2nd BANDPASS AMPL. (Q14), CHROMA 0.18V P-P, HORIZ. (PWS1)



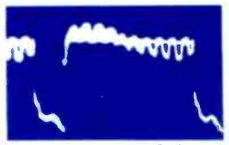
19. EMITTER, B-Y DEMODULATOR (Q20), 0.7V P-P, HORIZ., EMITTER, R-Y DEMODULATOR (Q21), 0.9V P-P, HORIZ.(PWS1)



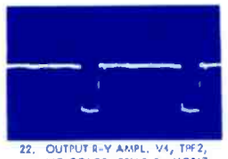
20. COLLECTOR, R-Y DEMODULATOR (Q21), "N", 1.5V P-P, HORIZ. (PWS1)



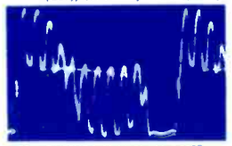
4. GRID, HORIZ. OUTPUT, V6, "AB", 335V P-P HORIZ. (PWS2)



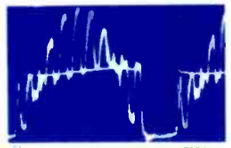
21. JUNCTION RF43 AND RF46, 2.2V P-P, OVERALL, HORIZ. (PWS2)



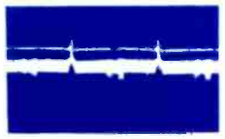
22. OUTPUT R-Y AMPL. V4, TPF2, NO COLOR, 90V P-P, HORIZ. (PWS2)



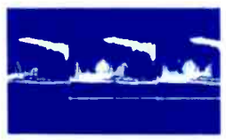
23. OUTPUT R-Y AMPL. V4, TPF2, WITH COLOR, 250V P-P, HORIZ. (PWS2)



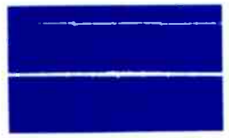
24. OUTPUT B-Y AMPL., V4, TPF4, WITH COLOR, 280V P-P, HORIZ. (PWS2)



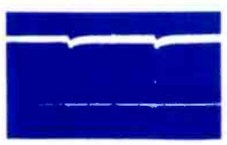
5. PLATE (PIN 10) 2nd VIDEO AMPL., 50% CONTRAST, 100V P-P VIDEO, 150V P-P BLANKING (PWS2)



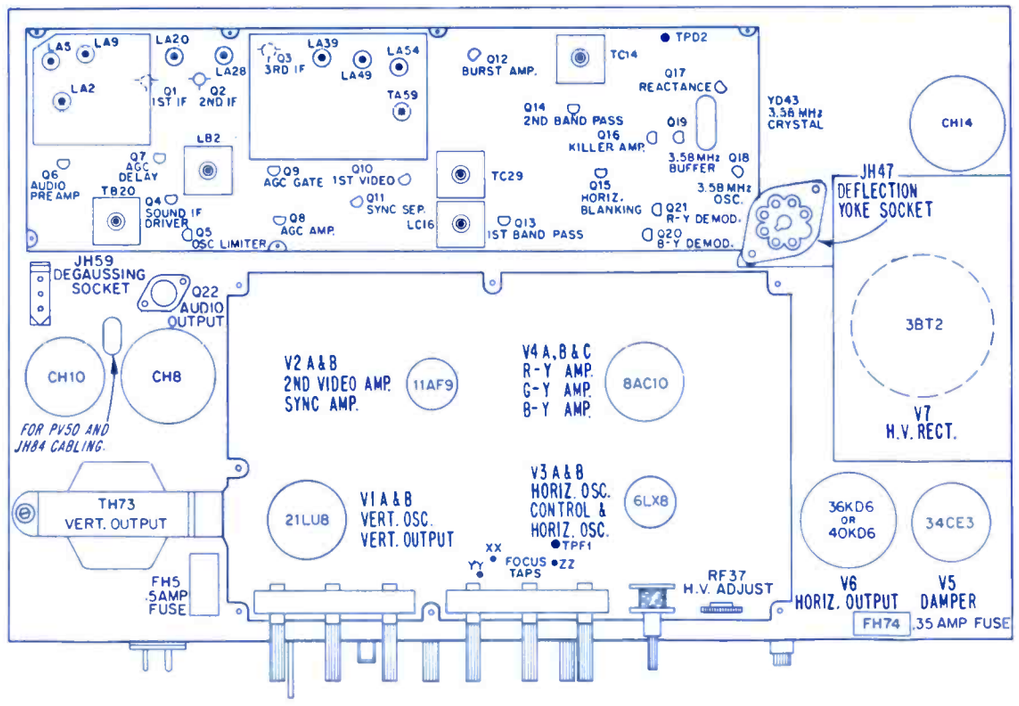
6. BASE, SYNC. SEPARATOR, (Q11), 7V P-P, VERT. (PWS1)



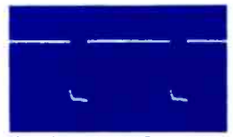
7. COLLECTOR, SYNC. SEPARATOR, (Q 11), 6V P-P, VERT. (PWS1)



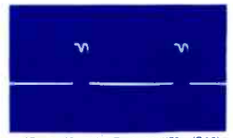
8. PLATE (PIN 4) SYNC. AMPL., (V2), 60V P-P, VERT. (PWS2)



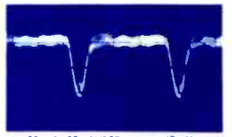
25. OUTPUT G-Y AMPL., V4, TPF3, WITH COLOR, 150V P-P, HORIZ. (PWS2)



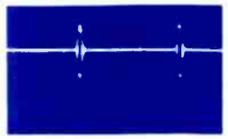
26. COLLECTOR, HORIZ., BLANKER, (Q15), "Z", 3.3V P-P, HORIZ. (PWS1)



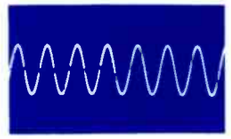
27. BASE, HORIZ. BLANKER, (Q15), 5.8V P-P, HORIZ. (PWS1)



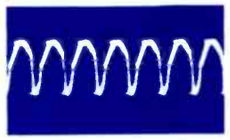
28. BASE, BURST AMPL. (Q12), 6V P-P, HORIZ. (PWS1)



29. COLLECTOR, BURST AMPL. (Q12), 45V P-P, HORIZ. (PWS1)

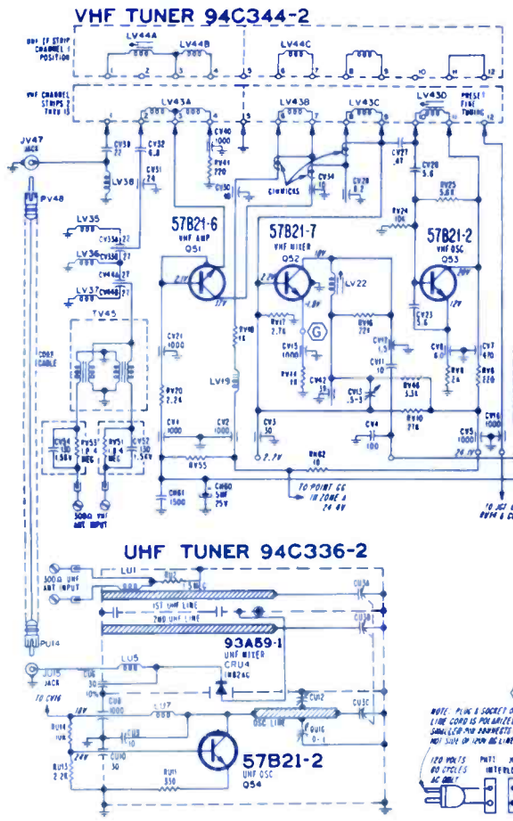


30. COLLECTOR, 3.58 MHz BUFFER, (Q 19), 22V P-P, BASE 2.3V P-P, EMITTER 2.2V P-P, BASE Q20 AND Q21 6V P-P (PWS1)



31. COLLECTOR, 3.58 MHz OSCILLATOR (Q18), 11V P-P (PWS1)

32. CATHODE, BURST GATE DIODE, (CRC 19) 12.5V P-P, HORIZ. (PWS1)



SCHEMATIC NOTES.
⏚ CHASSIS GROUND. RESISTOR VALUES 1/2WATT, 10%. ▲ CAPACITOR VALUES IN MICROFARADS UNLESS ⊕ OTHERWISE INDICATED. RESISTANCE VALUES OF COILS LESS THAN 1Ω ARE NOT SHOWN.
Hz INDICATES CYCLES PER SECOND.
VOLTAGE & WAVEFORM NOTES.
DC VOLTAGES TAKEN WITH VTVM, WITH RESPECT TO CHASSIS GROUND. AT 120V AC LINE, WAVEFORMS & P-P VOLTAGES MAY VARY, DEPENDING ON CALIBRATION OF TEST EQUIPMENT & PARTS TOLERANCES.
VOLTAGES TAKEN ON UNUSED UHF CHANNEL WITH VOLUME CONTROL AT MIN., BRIGHTNESS & CONTRAST CONTROLS AT MID. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION. WAVEFORMS TAKEN WITH TRANSMITTED NOISE FREE SIGNAL PRODUCING 5 TO 6 VOLTS AGC AT TEST POINT TP87. CONTRAST, BRIGHTNESS CONTROLS SET FOR NORMAL PICTURE.
TRANSISTOR CAUTION
TO AVOID DAMAGE TO TRANSISTORS, DO NOT ARC 2ND ANODE LEAD TO CHASSIS GROUND.* DO NOT TURN SET ON WITH TRANSISTOR(S), TRIPLER 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 MEASURE. USE RTVM OR R X 100 RANGE OR HIGHER. DO NOT APPLY EXCESSIVE HEAT TO TRANSISTOR LEADS.
AGC CAUTION
DO NOT DISTURB FACTORY SETTING OF AGC CONTROL. IF AGC ADJUSTMENT IS REQUIRED, REFER TO SERVICE NOTES. IF NECESSARY TO DISTURB AGC ADJUSTMENT, MARK ROTOR POSITION SO THAT CONTROL CAN BE RETURNED TO IT'S EXACT ORIGINAL SETTING.
▽COMPONENT NOT MOUNTED ON PRECISION WIRED SYSTEM. ▽COMPONENT MOUNTED ON OPPOSITE SIDE OF PRECISION WIRED SYSTEM.
CAUTION: USE AN ISOLATION TRANSFORMER WHEN SERVICING TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK & DAMAGE TO TEST EQUIPMENT.
* ARC 2ND ANODE ONLY TO PICTURE TUBE BAG OR DAG GROUNDING SPRING. ⊕ CHASSIS IS CONNECTED DIRECTLY TO POWER LINE.

ELECTRONIC TECHNICIAN/DEALER

TEKFAX

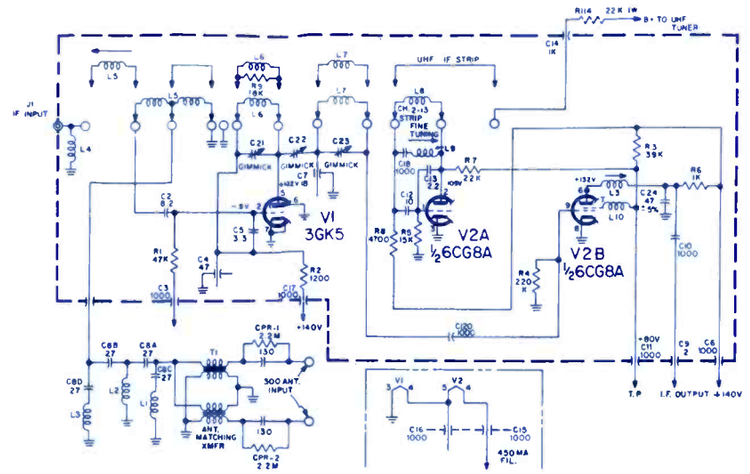
COMPLETE MANUFACTURER S' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

GROUP 236

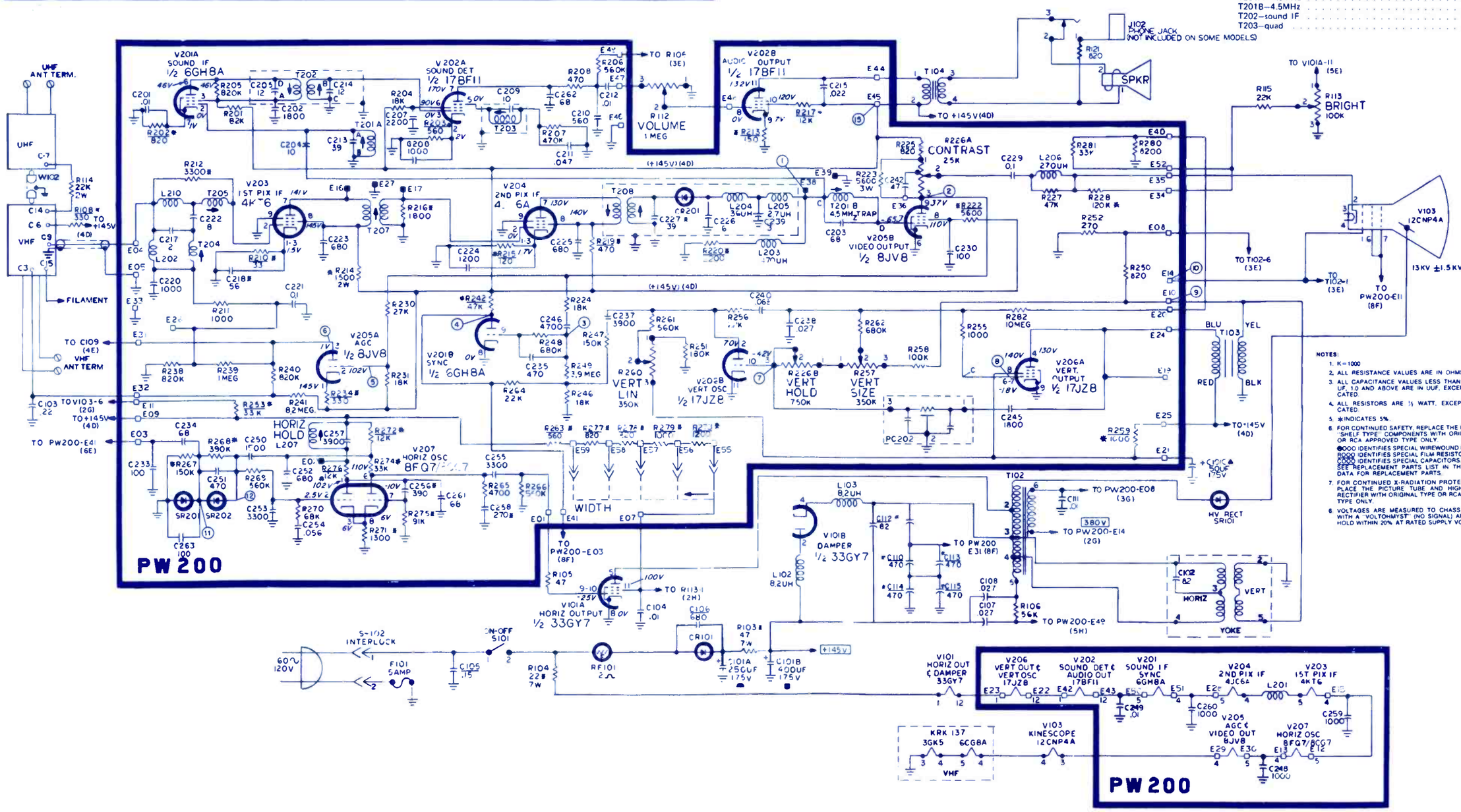
	SCHEMATIC NO.		SCHEMATIC NO.
AIRLINE Color-TV Model GC1-12102A	1411	SYLVANIA Color-TV Chassis D17-1-2	1413
GENERAL ELECTRIC Color-TV Chassis N-1	1412	ZENITH TV Chassis 12CB12X	1414
RCA SALES CORP. TV Chassis KCS188 Series	1410		

1410
RCA SALES CORP.
TV Chassis
KCS188 Series

APRIL • 1972

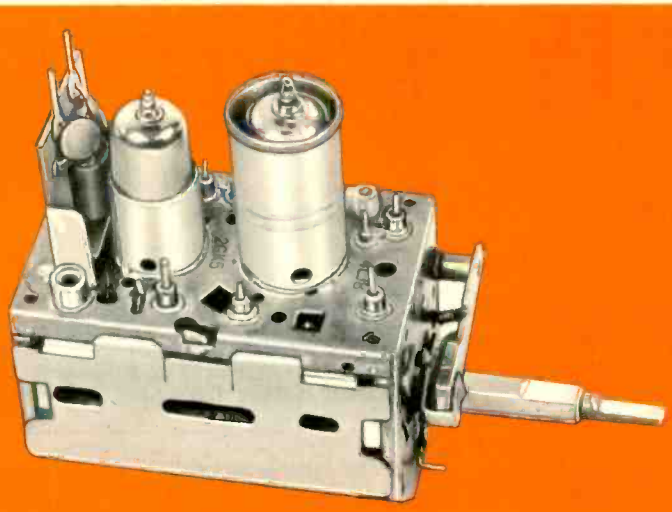


SYMBOL DESCRIPTION	RCA PART NO.
C101—3 section elec	133082
C101A—250 µf/175v	
C101B—400 µf/175v	
C101C—50 µf/175v	
F101—fuse—5a, 150v	118969
R112—control volume	132956
R113—control bright	132957
RF101—fuse resistor, 2K	121086
S101—control, on/off	132956
T102—xformer, high voltage, horiz	132962
T103—xformer, vert output	132970
T104—xformer, audio output	124275
yoke deflection	132971
L207—horiz hold	125129
R226A—control contrast/vert hold	133081
R226B—control contrast/vert hold	133081
R257—control vert size	121223
R260—control vert lin	121223
RV201—varistor	
T201A—4.5MHz	114489
T201B—4.5MHz	114489
T202—sound IF	118411
T203—quad	118410



NOTES:

1. K = 1000
2. ALL RESISTANCE VALUES ARE IN OHMS.
3. ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN UF, 1.0 AND ABOVE ARE IN UUF, EXCEPT AS INDICATED.
4. ALL RESISTORS ARE ½ WATT, EXCEPT AS INDICATED.
5. ✱INDICATES 5%.
6. FOR CONTINUED SAFETY, REPLACE THE FOLLOWING "SHELF TYPE" COMPONENTS WITH ORIGINAL TYPE OR RCA APPROVED TYPE ONLY.
   ✱8000 IDENTIFIES SPECIAL WIREWOUND RESISTORS.
   ✱8000 IDENTIFIES SPECIAL FILM RESISTORS.
   ✱C000 IDENTIFIES SPECIAL CAPACITORS.
   SEE REPLACEMENT PARTS LIST IN THIS SERVICE DATA FOR REPLACEMENT PARTS.
7. FOR CONTINUED X-RADIATION PROTECTION, REPLACE THE PICTURE TUBE AND HIGH VOLTAGE RECTIFIER WITH ORIGINAL TYPE OR RCA APPROVED TYPE ONLY.
8. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHMYST" (NO SIGNAL) AND SHOULD HOLD WITHIN 20% AT RATED SUPPLY VOLTAGE.



$9.75

TUNER SERVICE CORPORATION

PROVIDES YOU WITH A COMPLETE SERVICE FOR ALL YOUR TELEVISION TUNER REQUIREMENTS AT ONE PRICE.

TUNER REPAIR

VHF Or UHF Any Type $9.75.
UHF/VHF Combo $15.00.

In this price all parts are included. Tubes, transistors, diodes, and nuvistors are charged at cost.

Fast efficient service at our four conveniently located service centers.

1 year guarantee backed up by the largest tuner manufacturer in the U.S.—SARKES TARZIAN, INC.

All tuners are cleaned inside and out, repaired, realigned and air tested.

TUNER REPLACEMENT

Replacement Tuner $9.75.

This price buys you a complete new tuner built specifically by SARKES TARZIAN INC. for this purpose.

The price is the same for *every* type of universal replacement tuner.

Specify heater type

Parallel 6.3V
Series 450 mA
Series 600 mA

All shafts have the same length of 12".

Characteristics are:
Memory Fine Tuning
UHF Plug In
Universal Mounting
Hi-Gain Lo-Noise

If you prefer we'll customize this tuner for you. The price will be $18.25. Send in original tuner for comparison purposes to our office in INDIANAPOLIS, INDIANA.

TSC

TUNER SERVICE CORPORATION

FACTORY-SUPERVISED TUNER SERVICE

MIDWEST	817 N. PENNSYLVANIA ST., Indianapolis, Indiana (Home Office)	TEL: 317-632-3493
EAST	547-49 TONNELE AVE., Jersey City, New Jersey	TEL: 201-792-3730
SOUTH	938 GORDON ST., S.W., Atlanta, Georgia	TEL: 404-758-2232
SOUTH-EAST	1505 CYPRESS ST., Tampa, Florida	TEL: 813-253-0324
WEST	SARKES TARZIAN, Inc. *TUNER SERVICE DIVISION* 10654 MAGNOLIA BLVD., North Hollywood, California	TEL: 213-769-2720

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

ELECTRONIC TECHNICIAN/DEALER

APRIL 1972 • VOLUME 94 NUMBER 4

This month's cover photo, supplied through the courtesy of Blonder-Tongue Laboratories, Inc., shows Isaac S. Blonder (left) and Ben H. Tongue (right) explaining the theory of Satellite Telecommunications to George E. Queen, marketing manager of Homestead Enterprises. The diorama shown is a replica of Fairway Townhouse Living at Spring Lake Heights, N.J. More information concerning space-age TV is included in the article beginning on page 64.

3 TEKFAX: Up-to-date schematics for easier servicing.

22 EDITORIAL: Three Brothers.

24 LETTERS: Pertinent comments concerning past issues.

26 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

41 **TEKLAB REPORT**
Part II in our description of interesting features found in Panasonic's Model CT-771 Portable Color-TV Set.

48 **PANASONIC'S MODEL SP-10 TURNTABLE**
Another first-hand report concerning unusual features observed in a new, high-quality audio product.

51 **WIDEBAND DISTRIBUTION EQUIPMENT**
Some basic principles concerning CATV systems that you should know if your customers are to receive the best reception possible from their installation—by D. Lieberman.

60 **GLAD TO MEET YOU "SLIM JIM"**
Our evaluation of a new approach to aerosol containers which should make your servicing job easier.

62 **TEST INSTRUMENT REPORT**
Reviewing specifications for RCA's WR-515A Master Chro-Bar Generator.

64 **GUEST AUTHOR: SATELLITE TV . . . COMING DOWN TO EARTH!**
Isaac S. Blonder—co-founder and chairman of the board of Blonder-Tongue Laboratories—as a member of the EIA Tr-34 Committee for satellite TV, has some exciting information concerning some revolutionary home antenna systems that you may soon be installing for international TV reception.

66 COLORFAX: Tips for easier color-TV set repair.

68 NEW PRODUCTS: Instruments and components to make your job easier.

71 DEALER SHOWCASE: These items may increase your sales revenue.

73 TECHNICAL LITERATURE: Informative material that you may need.

74 ADVERTISER'S INDEX: Manufacturers concerned about you.

75 READER SERVICE: A source of additional information.

A HARCOURT BRACE JOVANOVICH 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.

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

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) 572-4838
(212) 572-4839

TOM GRENEY
Publishing Director

JOSEPH ZAUHAR
Managing Editor

BERNICE GEISERT
Associate Editor

GAYNELLE DAVIDSON
Production Manager

JOHN PASZAK
Graphic Design

LILLIE PEARSON
Circulation Fulfillment

JOHN KESSLER
Manager, Reader Services

MANAGERS

JIM SMITH
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

KEN JORDAN
DONALD D. HOUSTON
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

We're in this business together.

Semiconductors you can depend on for customers who depend on you.

Tube Products Department, Owensboro, Kentucky 42301

GENERAL ELECTRIC

BEST BUY
Our No. 1 Goal

OUR NO. 1 GOAL
TO MAKE
GENERAL ELECTRIC
YOUR BEST BUY

EDITORIAL

Three Brothers

Three brothers were told that within a few years they would be traveling to a foreign country. In preparation for the journey, the first brother obtained several books listing the most commonly used foreign phrases, setting all of these phrases to memory. He then practiced so that after a time he became highly skilled at recognizing the foreign phrases and returning other appropriate phrases.

The second brother did not take the time to memorize as much information as the first. He merely learned the meaning of many of the more commonly used foreign words. And with the time that he saved in not memorizing more, this brother studied techniques for combining the words into useful sentences.

The third brother followed basically the same techniques as the second, except that he spent more time studying—thus learning more words and more effective ways of combining them into sentences.

Upon arriving in the foreign country, the first brother discovered that although his many phrases proved useful, too frequently the people speaking to him failed to use the same phrases that he had learned. He worked hard to memorize more and more phrases, but there was much confusion and frustration—the first brother finally deciding to call it quits and leave the country.

The second brother initially found things even a little more difficult than the first brother. And at the start he even borrowed a few of his first brother's stock phrases. But his preparation did prove helpful and in a short time he was able to understand most foreign sentences and was able to respond in sentences that weren't too awkward.

The third brother also found it helpful to know a few of the stock foreign phrases, but had no basic difficulty in adjusting to the foreign language. Better yet, soon he was so competent that he was even able to confidently address large groups.

As you have probably guessed, the three brothers represent three men with varying electronic backgrounds. The first brother was a semi-skilled technician, who could service some of the more typical problems encountered in a defective circuit, but who became incompetent if the trouble happened to be something out of the ordinary.

The second brother was a technician with some background in theory, and with practice he was able to handle nearly any service problem that he encountered. While the third brother had progressed to the point where he was not only able to service electronic circuitry, he could even design it.

Several years ago a service dealer asked my advice concerning the selection of a new part-time employee. I suggested two high-school students. One had some knowledge of basic electronics and was even able to design simple tube circuits (there weren't any practical transistor circuits at that time). The other had a great deal of practical experience tearing down old radios (a lot of people—including me—started out that way) and could fix some of the more obvious circuit defects.

The service dealer hired the second student, feeling that the first would waste too much time tinkering to make the product even better, while the second would stick to his job of checking tubes and more obvious work—that's where the money was.

I am sorry to report that with the advent of color TV and solid-state circuitry, this service dealer found it progressively more difficult to service the new circuitry encountered and finally entered another profession.

While taking part in one of the discussion groups a year or so ago at a National Service Conference, I got into a rather heated debate with a service dealer who felt that all electronic technicians should disregard theory—since such isn't needed for effectice servicing. To us that is like saying, "You don't have to know how a TV set works merely to fix it." We feel that this is like the philosophy of the first brother, who memorized the service hints in Technical Digest, Colorfax—and all the other sources of service information that he could get his hands on—but who never took the time to learn some of the basic theory

concerning why these service tips worked. If he encountered a new circuit that had not yet been described in a trade journal or service literature, he wasn't able to quickly sketch a portion of the defective circuit; and knowing what should be expected from such an assortment of components, service it.

It is our position that electronic technicians must have an understanding of some basic theory in order that they accomplish effective servicing and maintain their competency with the development of increasingly complex circuitry. Although beautifully designed, how many electronic technicians are now ready to service the portable color-TV set described in this and the previous issue of ELECTRONIC TECHNICIAN/DEALER? The public wants to buy the most advanced electronic products available. Why? Because typically such products cost less and provide better service. Color-TV sets are now less expensive, have better quality pictures, greater stability and last longer than the earlier B/W-TV sets. The technicians that couldn't keep up, that ignored the need for theory, that made their money strictly through tube testing and obvious maintenance, are becoming a rarity—most of them having already been forced out of business.

When speaking of theory, we do not suggest that anyone but the designer (the third brother) be concerned with theory to such depth that it include the valence-electron configurations associated with the doping of semiconductor materials, the use of calculus for determining various factors in the nonlinear operation of basic circuitry, or even some of the complex equivalent circuits derived as an aid in calculating circuit function over various frequency ranges. We would be the first to agree that such use of theory is not yet needed for effective servicing—and hopefully never will be. However, when it comes to determining whether a coil and capacitor combination is being used to trap out interference signals or enhance the signal required, then its the level of theory that the average technician should know.

Other examples of the theory that an electronic technician should know—if he is going to make the grade—are included each month in ELECTRONIC TECHNICIAN/DEALER as we present questions and answers of the same type as those found in the CET examination.

The CET examination is not intended to be a test that all electronic technicians will be able to pass. The test would serve no purpose if the first brother, described earlier, was able to pass it. For he didn't have the background to make a claim to a future in professional electronic servicing. Only the second and third brother should be able to pass the examination. Otherwise, the test would be watered down to the point that one would no longer be able to boast, "I took a CET exam and passed it! I feel confident of my future in electronics!"

We were appalled by one of the resolutions passed by The Western State Conference last January in Sacramento, Calif., stating that the CET Test should be practical and contain less theory questions. That's like saying, "Open the door to Brother One." It might be nice to be a "good guy" and let everyone in, but will the TV-set manufacturers also be good guys and produce obsolete products so that the first brother can service them? And will the public continue to accept the first brother's less effective servicing techniques, giving only easy state licensing examinations—if requiring any exam at all?

We feel that the current CET examination contains the proper balance of theoretical and "practical" questions. (Sections I, II and III covered thus far concentrate a little more on theory than some of the other sections.) There has been a tremendous response to the current CET testing program (note this month's news section), and in some parts of the country virtually the entire membership of some local associations has passed the CET examination (note last month's news section). So why make it a test that anyone can pass?

ELECTRONIC TECHNICIAN/DEALER is dedicated to the task of helping **all** electronic technicians (whether or not they choose to take a CET examination) so that they have the skills required (both practical theory and nut-and-bolts knowledge of past problems) for success in the electronic servicing profession.

Phillip Dahlen

LETTERS

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

Too Much Theory in CET Exam

I have read with concern as well as interest, many of the letters concerning the CET program, but when it came to the example given of the CET test, I just had to write and state my opinion.

It has been about 32 years since I first went to electrical school, and from there to radio school, and then to instruct for about a year. Needless to say, I had all the basic electrical and electronic theory; and so with this background and books, I also learned the repair of TV, color TV, and solid state as they came along.

I have been servicing in my own shop, with the same people in the same location for over 25 years, and never in these 25 years would I have had any occasion to use the questions or answers to questions one, two or four in the Section I, Basic Mathematics test. In fact, I couldn't answer them without looking up the information required. Why should I relearn what I had no occasion to use and have forgotten in the past 30 years? For example, the No. 1 question, "A 0.01μf capacitor has what impedance at 5kHz?" Now think, what on earth would I use this information for in servicing? You might just as well ask an auto mechanic, "What is the friction loss in ft-lb of energy due to ring friction against the cylinder walls at 40 miles per hour?" What I'm getting at is that it's maybe fine to know if you want to impress someone with your math; but certainly to be a good TV technician requires so many things to remember, and think about, that it's foolish to fill your mind with these things. Besides, this is an engineer's problem. I even wonder in most cases, where different type waves, different peaks and even somewhat leaky capacitors are present, that any answer would be very correct. Also, where in any circuit commonly used do you find the capacitor the only thing to take into consideration is the impedance?

With this trend of thought, you can also see the very unimportance of No. 2 and No. 4 in the test. The test should not be like a school test, but a testing of technical servicing ability. Why not make it about things involved with servicing.

There are so many things one has to learn to be good enough and fast enough to earn a living, at reasonable wages, in servicing! Contrary to what S.F.C. Ronald Bromwick says in his letter, I'm sure that with time he will find that besides understanding theory and math, being a "symptoms mechanic" is very important in this. Symptoms are the key to almost every servicing problem. What you see and hear are just as important to a TV radio technician as they are to a doctor in curing the ill.

Getting back to the test, question No. 3 in my opinion from a practical point of view should be put differently. I think the question should give the resistor, in most cases we know this anyway, and ask what the current through it would be. This problem in servicing must be solved many, many times. In servicing you very seldom measure the current because it's not practical, almost all measuring is in voltage and resistance because they can be done more easily without disconnecting, and thus find the current. Also, due to varied frequencies, it would be almost impossible to get accurate meter measured current. What is important, I feel, is that the trend of thought should be strictly in the direction of servicing.

As a whole, I can't help wondering who makes up the questions for the exam? I can hardly believe they are very service minded or service experienced, if this is going to be the trend of all the questions in the exam. As it is, I would see no point in going back to my studies to pass this test. It would not prove a thing as to my capability. Sorry and very sincerely,

CHARLES F. MORRIS
CHUCK'S RADIO & TV

You are not alone in your opinion that there is too much theory in the CET examination. As indicated in my Editor's Memo (which was written prior to our receipt of your letter), even the majority of those voting at The Western State Conference hold your position. However, as also indicated in my memo, there are also others (including myself) who feel otherwise—believing that it is important to have some understanding of the "lighter" theories related to circuitry serviced. ELECTRONIC TECHNICIAN/DEALER *has had no direct influence in the writing of the CET examination, it having been written by a committee of service dealers who have many years of experience in servicing consumer and commercial electronic products.*

I also had to refresh my memory when re-typing CET examination type copy for publication in our news section—but it didn't require a great deal

continued on page 32

SERVICE technicians know that Color TV repair demands more time and effort. That's why Sprague strives to simplify Color TV capacitor selection.

COLOR TV capacitors by Sprague come in the *exact* ratings required to meet the exacting requirements of Color TV.

TV service becomes more demanding as Color TV keeps expanding. That's why *exact* capacitor ratings are important. They help you to restore original set performance.

EASIER selection of replacement capacitors for Color TV is assured when you look to the broad Sprague line. You'll get the capacitor you need—when you need it—every time.

Just off the press! See your Sprague Distributor for a free copy of our new 40-page K-110 Twist-Lok® and Print-Lok® Capacitor Replacement Manual, or write to: Sprague Products Company, 65 Marshall St., North Adams, Mass. 01247

65-1101R1

SPRAGUE®
THE MARK OF RELIABILITY

***THE* BROAD-LINE PRODUCER OF ELECTRONIC PARTS**

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

NEWS OF THE INDUSTRY

Electronics Industry Council Holds Fifth Official Meeting

The fifth official meeting of the Electronics Industry Council was called to order on January 28th by chairman Dick Glass, CET. He welcomed the council members and guests, and thanked the trade press for its help in promoting the council idea and the projects of EIC. He pointed out that the success of any single project of the EIC was not nearly as important as learning to work together for mutual benefit, and the betterment of the industry for the consumer.

Mr. Joe Groves of the Electronic Industries Association Consumer Product Div., and Howard W. Sams Co., reported on parts availability. He mentioned that during the past period the Sams Co. had made efforts to acquire additional information directly from parts distributors and reps on a face-to-face basis. He indicated no great amount of success at this time, but that the program was being implemented and additional work would be done during the next period. Mr. Groves also illustrated the moves that the industry has made during the past few years to standardize replacement parts.

Frank Moch, executive director of NATESA, discussed NATESA's "Town Meeting" program. He reported that manufacturers' reputations for parts service vary widely from place to place. He emphasized the proliferation of "special" parts and the problems of "re-engineering" sometimes needed to use so-called "standard" parts.

Joe Risse of International Correspondence School, representing the Society of Broadcast Engineers, noted that the FCC is investigating the problem of FM interference. It is on their docket No. 19183.

Leo Shumavon, president of NATESA, reported on service association cooperation. He mentioned that cooperation is at an all-time high, and urged better understanding of the problems among manufacturers, distributors, dealers and particularly the news media. He mentioned the upcoming August joint convention between

NATESA president Leo Shumavon makes a presentation on service association cooperation at the all day affair. *Photo courtesy of Dick Glass, CET.*

NATESA, NEA, ETA of Louisiana and ISCET, which all groups were working on. Mr. Shumavon also noted that wider publicity of the importance of service is needed, especially by TV broadcasters and by the commercial press. Some discussion was held concerning the need for expanded service association membership. Gail Carter, executive vice president of NEDA, noted that the service associations had no monopoly on the problem of a few joining and doing the work for the benefit of many.

Morris L. Finneburgh, Sr., EHF, reported that he had contacted 10 antenna manufacturers for support in the Television Reception Improvement Program (TRIP) which we have covered in previous news reports. Of that number, only three manufacturers have responded. Mr. Finneburgh therefore offered to resign his chairmanship of the antenna manufacturers subcommittee of TRIP. Mr. Shumavon made a motion that the EIC *not* accept Mr. Finneburgh's resignation. And although the motion was passed unanimously, Mr. Finneburgh did resign. Mr. Finneburgh then offered his total support to EIC and the TRIP program in the future.

John Norton, acting secretary, clarified the resignation, stating that Mr. Finneburgh has resigned from the committee and the subcommittee; and EIC has accepted the resignation in a desire to increase cooperation by manufacturers other than FINCO, and not because of any feeling that he was not doing an excellent job.

Mr. Groves suggested that Tom Surber of Sams Co. might fill the position vacated by Mr. Finneburgh. Mr. Surber was elected.

George Bartlett of the National Association of Broadcasters reported on progress of the broadcasters regarding TRIP. He said that progress was slow, due to staff problems.

Sid Sabel, chairman of the TRIP program, showed material that has been produced by NEA, consisting of two forms for technicians to use on service calls that provide checklists to show the homeowner just what may be needed to improve reception, as well as the cost. Also mentioned were Blonder-Tongue Co's "Solution" publications which have valuable ideas directed towards dealers for making money and understanding the antenna business.

Emmett Mefford, CET, NEA executive committee chairman (looking toward camera) examining the TRIP booth at the NARDA showcase. *Photo courtesy of Dick Glass, CET.*

Don Martin, editor of ELECTRONIC SERVICE DEALER, reported that no real decision had been made by many of the groups as to possible support of the Hall of Fame. Support is needed before future work can be done.

Sid Sabel presented a program for manufacturers to prepare in-shop training slides or films for technical training, quickly, on new products on a shop by shop basis. Joe Groves was asked to present the program to the EIA for consideration at their next meeting.

Philco-Ford Inaugurates Telephone Hot-Line Service

Under a new ordering plan, a Philco service agent can place his order for parts from anywhere in the country (even the customer's home) by dialing a special toll-free telephone number. The order is then recorded and routed to the nearest Philco-Ford regional parts and service depot in Philadelphia, Chicago, Atlanta, Dallas or Los Angeles, where it is filled within 24 hours. For each call, the service agent is charged $1.00 to cover administrative costs of the program.

John W. Miller, general manager of the parts and service at Philco-Ford, predicted that 98 percent of Philco's 5500 service agents will utilize the new communications network, including several hundred agents who regularly order by phone. At present, about 75 percent of all parts orders are received through the mails.

"By instituting this network, we can offer the same swift, dependable service to the agent in rural Wyoming that we provide his counterpart in New York City or Philadelphia," Mr. Miller said.

Services of P.T.S. Electronics Now Covered by RCA Warranty

Mr. S. Tyra, manager of Commercial Services for RCA, has announced that P.T.S. Electronics, Inc., with its six locations in Bloomington, Ind.; Springfield, Mass.; Longview, Texas; Denver, Colo.; Jacksonville, Fla.; and Sacramento, Calif., is fully authorized to accept and repair any RCA tuner in warranty at no charge under the RCA Warranty Agreement. Mr. Tyra also stated that any dealer may send their defective in-warranty tuners (90 days for B/W-TV sets, one year for color-TV sets) directly to P.T.S. Electronics, Inc. prepaid and with completed return material tag. P.T.S. will repair and return the tuner prepaid at no charge to the dealer—on the same day that it was received.

THE MONEY TREE

ZENITH INTRODUCES

CHROMATENNA™

ANTENNAS

A whole new line of antennas from Zenith built to deliver a peak picture...and peak profits for you.

Zenith's new Chromatenna line incorporates all the electronic knowledge and "know how" of Zenith engineering. 20 different antennas, for color and black & white TV, meet every reception condition. Result: *a superb picture* for your area.

The new line includes 7 antennas for VHF/UHF/FM, 5 for VHF/FM and 8 for UHF/FM. And a complete line of antenna accessories.

The sales skills that helped make Zenith a sales leader have been used to put together a complete merchandising package. Convenient Display Rack. Display Header. Wall Banner. Presentation Catalog. Ad Mats. Result: more antenna sales, *peak profits* for you.

Ask your Zenith Distributor for full information about the new Chromatenna line.

ZENITH®

The quality goes in before the name goes on

SEX

AND THE SINGLE CAN

What happens when male can meets female can?

It's far more than love at first sight... it's a whole new way to use professional chemicals. In terms of convenience. And savings.

Because now, you can take it with you. "It" being the profit-making power of Chemtronics TUN-O-WASH, TUN-O-FOAM and TUN-O-BRITE.

The great "space war"

With all the tubes and parts a serviceman has to carry, he's often at a loss for space to fit in a large can of chemicals as well. Even knowing he can often make $5.00 to $10.00+ more per call.* And when he wants to do an extra-thorough job, degunking with a degreaser before using a cleaner/lubricant, the problem's even worse. Until now.

The world's finest chemicals are now the world's most portable

With a Chemtronics Transfer Kit, you can carry all you need in a shirt-pocket. With the refillable "Slim-Jim" cans in each Transfer Kit (each can, no bigger than the kind you fill a butane lighter from), you can carry a complete tuner service kit in your pocket. And still save money on the "economy-size" cans you re-fill from.

Proof? Ounce-for-ounce, transfer kits can save you up to 25% or more on the world's favorite electronic chemicals. And you get two "Slim-Jim" refillable cans that make them a breeze to take along.

It's the kind of idea only a serviceman would think of

It's simple—no special gadgets. Just half a minute, and the "Slim-Jim" is refilled with enough to service six to ten tuners (and the large cans are still in the shop for bench use!).

Why wait? It's at your local distributor's now

"Sex and the Single Can," more popularly known as the Chemtronics Transfer Kit, comes in three varieties, to meet the needs of knowledgeable technicians:

TCK-1 Double-Degreaser

Two 24 oz. TUN-O-WASH, Two "Slim-Jim" Transfer Cans

TCK-2 Degreaser & Polisher/Lubricant

One each of Bench Size TUN-O-WASH and TUN-O- BRITE, Two "Slim-Jim" Transfer Cans

TCK-3 Degreaser & Cleaner/Lubricant

One each of Bench Size TUN-O-WASH and TUN-O-FOAM, Two "Slim-Jim" Transfer Cans

A PROFIT STORY FOR SERVICEMEN

If you want to make more profits, while you save money, stop by and pick one up today!

CHEMTRONICS INC.
1260 Ralph Avenue
Brooklyn, N.Y. 11236

CHEMTRONICS

*average prices charged by 100 servicemen surveyed for chemical "tuner tuneup"

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

READERS' AID

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

Manual Needed

I have a Solar Exam-eter Model CF, manufactured by the Solar Mfg. Co., New York. The serial number is 93713. I would appreciate a copy of an operating-instruction manual. All cost will gladly be paid by me.

ARLO LUSBY II
324 North Shadyglen Drive
Covina, Calif. 91722

For Sale

I have the following items for sale: Back issues of SERVICE Magazines from May, 1952 to October, 1958 and ELECTRONIC TECHNICIAN/DEALER Magazines from January, 1959 to December, 1971. Make an offer. Also, I have a TV-FM sweep generator for sale.

JAMES C. GRANT
Grant Radio & TV
927 Blackburn Ave.
Ashland, Ky.

Information Needed

Some time ago I purchased a B & K tube tester Model 675, automatic card type. I have discovered that I cannot test any of the newer type tubes. Is there some way to modernize this tester? Many of the later type tubes are similar to the older types with different base arrangements. Any help anyone can give me will be greatly appreciated.

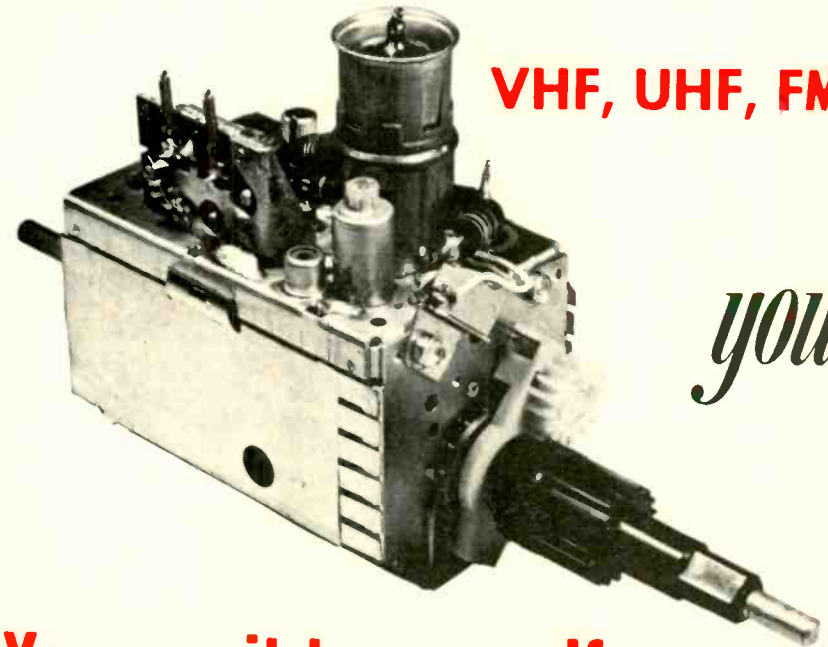
RICHARD WOLF
Wolf's Radio & TV Repair
Box 325
Wishek, N. D. 58495

For Sale or Trade

I have a Nordmende solid-state distortion meter, ranges 0.03% to 100%, 0.1mv to 300v rms. I will sell it or exchange for a CRT tester.

BOB KREJCIK
Audio HiFi Service
228 Norman Ave.
Brooklyn, N. Y. 11222

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...

. . Precision Tuner Service

PTS

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)

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. 303/244-2819
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 127 on Reader Service Card

LETTERS . . .

continued from page 24

of time and was a refreshing mental exercise.

Being able to recognize problem symptoms is certainly the most important skill for effectively servicing defective circuitry (and an understanding of theory, as well as practical experience, can help one increase this skill). At the Portland ISCET convention last year they had a TV set wired to a panel of switches. The TV set was made defective through the use of one set of switches, and the person observing the resulting symptoms was asked to recognize the symptom and correct it through the use of appropriately labeled switches. It was an excellent *demonstration.*

Suppose you are servicing a defective TV set in which heat damage has destroyed a few components, and a schematic is not available for supplying component values. Maybe it is a screen-grid resistor and you know from a tube manual the normal grid voltage and current, then you can easily calculate the required value of the replacement resistor.

Using symptom techniques you may locate a defective circuit only to be in doubt concerning which is the defective component. Most of the newer multimeters can measure voltages relatively accurately at frequencies of 5kHz and even higher (and if you need to make current measurements and do not have a good milliammeter, place a precise 1Ω non-reactive resistor across your voltmeter and the meter scales will even be correct for current measurement). Suppose you have measured 2.5v of 5kHz signal (in a TV set's remote-control unit) across a .01μf ceramic disc coupling capacitor and need to know the amount of ac current passing through it—then knowing whether or not there is adequate current available for another portion of the circuit. Using your knowledge of the information required for Question 1, you will know that the capacitor's impedance (ceramic capacitors have virtually no leakage) is 3.18K. Therefore, the current $I = \frac{E}{X_c} = \frac{2.5v}{3.18K} = .786ma.$ *(You didn't have to open the circuit and insert a sensitive milliammeter to obtain this information.)*

It is surprising the number of "nuts-and-bolts" applications that are possible with the use of a little "theory." Ed.

Questions Accuracy of CET Answer

I just today received this month's issue (Feb.) and as usual I am greatly impressed with the different articles. I am writing concerning the article "News of the Industry" and the section concerning the CET Exam.

Each month you are going to carry one section that will relate to questions on the CET Exam. This first Section I, question No. 1 is why I am writing to you at this time. The first question asks, "A 0.01μf capacitor has what impedance at 5kHz?" I must dispute your answer of 3180Ω. Upon calculating I find the answer to be 3184.7Ω; now granted, 4Ω difference between our answers isn't much, but if our first section is to get off on the right foot, we should know how much of a tolerance we are allowed with our answers.

Please examine my calculation and let me know if I have made the mistake or have you? I do agree with all your other answers right to the digit. I'm looking forward to more of these little quizzes for they bring back items that I have seldom used.

Also, I would appreciate it if you could give me information about the CET Exam, as to where in Florida it is given. Must a person be in the TV profession to take the test or must he be sponsored by a dealer in his area? I do want to thank you for allowing me your time, for I know you receive many letters.

WILLIAM HARTMAN

Attached to the letter were some clearly written calculations which used a value of 3.14 for π and which resulted in an answer of $X_c = 3184.7\Omega$.

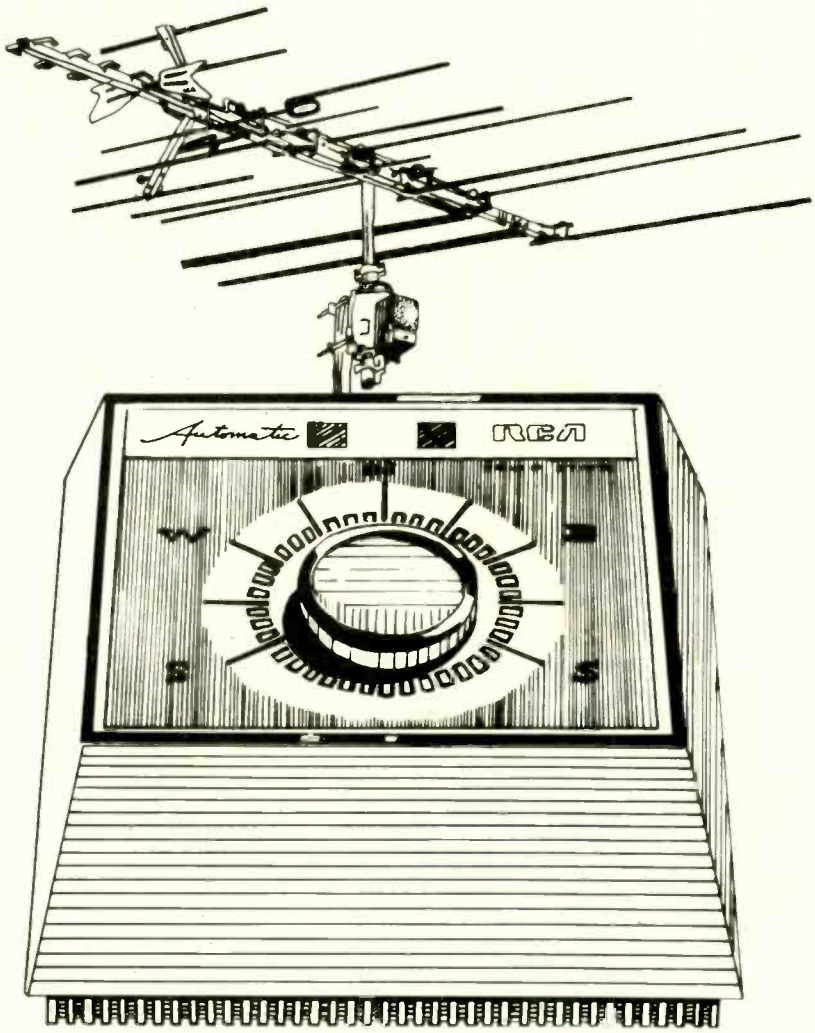
Mr. Hartman's arithmetic is correct, and he would have been permitted the 3184.7Ω answer rather than the 3180Ω answer given in our February issue.

Unless given a reason for doing otherwise, we can generally assume that an answer will be given to three significant figures. In other words, as in this example, 318 with the appropriate number of zeros and decimal point. Many circuits use resistors with 10 percent tolerances, but few contain resistances with greater than 1 percent tolerances. Tolerances are explained with question No. 5 in that quiz. With 1 percent tolerances, our resistance value might be nearly 32Ω greater or less than the value calculated.

The value of π used in our example answer was given to three significant figures. Actually the value of π is 3.14159 followed by an unending listing of numbers. We must use at least as accurate value of π as the accuracy required for our answer.

Merely as a matter of interest, we find that the answer to question No. 1

continued on page 73



Give them the picture they paid for with RCA antennas and rotators.

A great combination for great reception—*and* great sales. Because you cover all reception requirements...UHF, VHF/FM or UHF-VHF combinations...color or black-and-white...metropolitan or fringe areas...with the full line of RCA Permacolor antennas and RCA rotators. Each Permacolor antenna is precision engineered, easy-to-install—a top quality performer. Every RCA rotator features dynamic turning power and pin-point accuracy. Plus handsome styling for maximum customer appeal. And RCA antennas and rotators were developed with the space age techniques and thorough testing that have made the RCA name famous.

So give your customers the picture they paid for with the name they can rely on...RCA. The extra feature that means more sales for you. At your RCA Parts and Accessories distributor.

RCA

Parts and Accessories, Deptford, New Jersey 08096

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

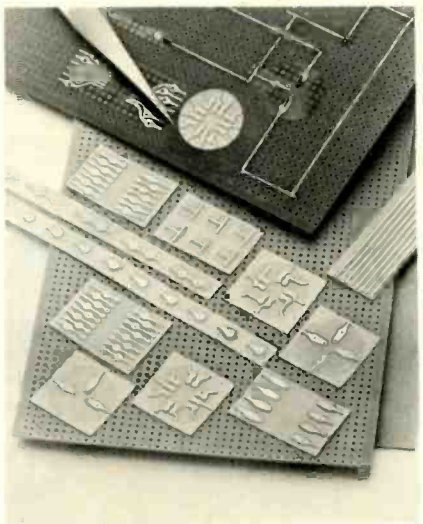
NEW AND NOTEWORTHY

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

TV TUNER SUBBER 700

Solid-state unit operating from two 9v transistor batteries

The TV tuner subber is a testing accessory which reportedly substitutes the VHF tuner in a defective TV receiver to prove if the original tuner is good or bad. It also assists with the analyzing of IF and AGC system defects and the testing of the UHF tuner. Specifications indicate that only two connections have to be made—antenna and IF cable—which in most cases can be accomplished without removing the tuner or chassis from the cabinet. A set of extension cables for IF connection is furnished. The device is solid-state and operates from two self-contained 9v transistor batteries. The unit uses a transistor VHF tuner with external gain control, affording a gain reduction range of 40dB independent of receiver AGC. Housed in a plastic instrument case, it is portable. Kit: $22.95. Factory wired: $29.95. Castle TV Tuner Service, Inc.



CIRCUIT ZAPS 701

Enables technicians to create customized circuit boards

Circuit Zaps are copper component patterns, pads and conductor paths reportedly enabling technicians to create customized circuit boards without the use of chemical, photoprinting, etching and other costly steps associated with such fabrication. It may also be used in the repair of defective circuit boards. Assortment CZ200 contains various quantities of all 15 patterns—a total of 104 pieces. The package includes a prepunched printed circuit board and 25 terminals. Retail price: $15.99. International Rectifier.

12V DC POWER SUPPLY 702

Designed to be fail safe

This 12v dc power supply has an input of 110/220v ac, 50 to 400Hz and a reported output of 12v dc, 3a, 36w with ripples less than 10mv; and its circuit has been designed to be short-circuit proof, or fail safe. It will thus furnish the power requirements needed to operate most automotive or marine stereo, tape decks, CB communications equipment and FM radios. It is packaged in a simulated walnut cabinet, contains an ON/OFF switch, plus pilot light to verify power to the unit. Solitron Devices, Inc.

FOR MORE NEW PRODUCTS SEE PAGE 68

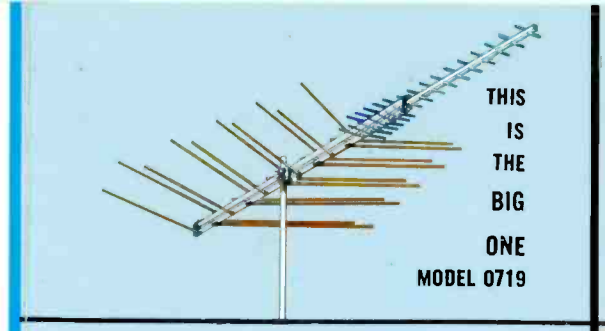
THE BLONDER-TONGUE PRISAMETRIC® GUIDE TO *quality performance.....*

HERE ARE SOME OF OUR HIGH QUALITY DESIGN FEATURES:

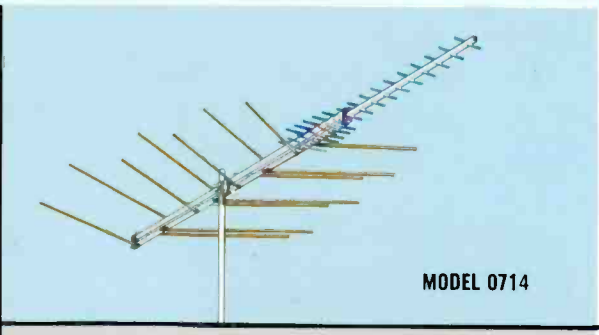
- Gold anodized plating on boom.
- Extra heavy duty NO-SLIP clamp.
- Baked on weather resistant finish on all elements.
- Pattern optimizing, 10 element director assembly.
- Mounting lugs included to make positive contact and act as a strain relief for 300-ohm twinlead.
- High gain dual boom log periodic design.
- Rust resistant mounting hardware assembled on antenna.
- Exclusive mid-boom inductive tuning on UHF.
- Ultra strong reinforced sleeve on VHF elements.
- UHF antennas designed for VHF feed through.
- Patented snap-and-lock elements.
- Plastic twin lead support and polypropylene boom spacers.

TV ANTENNA SELECTOR GUIDE

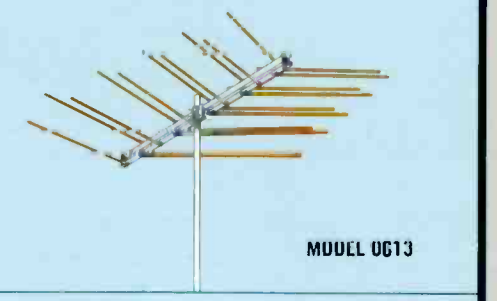
	TYPE	STOCK NO.	DESIGNATION	FEATURES AND APPLICATIONS (ALL ANTENNAS DESIGNED FOR USE WITH 300-OHM TWINLEAD)	LIST PRICE	ACTIVE DIPOLE ELEMENTS	GAIN (AVG.) (RELATIVE TO DIPOLE)	BEAMWIDTH (—3dB)	FRONT-TO-BACK RATIO (AVG.)	BOOM LENGTH	TURNING RADIUS
POPULAR PRICED CL . . . SERIES GHOST REJECTING MODELS FOR SUBURBAN AREAS	UHF/VHF/FM	4736	CL-4V5U	For near fringe and suburban installation, especially for bi-directional reception areas between TV stations. Factory pre-assembled of high strength gold finish aluminum for lifetime protection against corrosion.	$17.95	VHF 2 UHF 5	Low 2.2 dB High 3 dB FM 2 dB u 4.5 dD	Low 73° High 33° FM 64°	Low 5 dB High 6 dB FM 4.25 dD	40 3/4"	48"
		4735	CL-6V5U		$21.95	VHF 3 UHF 5	Low 2.2 dB High 3 dB FM —1 dB u 4.5 dB	Low 72° High 33° FM 85° u 63°	Low 4 dB High 16 dB FM 8 dB u 14 dD	52 5/8"	48"
		4734	CL-8V5U		$26.50	VHF 4 UHF 5	Low 3.25 dB High 4.25 dB FM +1.5 dB u 4.5 dB	Low 72° High 33° FM 73° u 62°	Low 8 dB High 12 dB FM 10 dB u 16 dB	60"	46"
	VHF/FM	4750	CL-4V	Provide sharp, snow-free color TV pictures for suburban and near fringe installations, specially sized for attic installations. CL8V has more elements to give a sharper pickup pattern and higher front-to-back ratio than CL4V and CL6V.	$14.50	VHF 2	Low —1.5 dB High 2.75 dD FM —2 dB	Low 73° High 35° FM 66°	Low 5 dB High 7 dB FM 4 dB	25"	48"
		4751	CL-6V		$16.95	VHF 3	Low —2.0 dB High 3.2 dB FM —1.0 dD	Low 73° High 34° FM 70°	Low 3.5 dB High 12 dB FM 8 dB	36 45/64"	47"
		4752	CL-8V		$19.95	VHF 4	Low 3 dB High 4 dB FM +1 dB	Low 72° High 32° FM 73°	Low 7 dD High 14 dB FM 9 dB	44 9/32"	47"
HIGH PERFORMANCE PRISAMETRIC SERIES COLOR CERTIFIED SUBURBAN AND FRINGE MODELS	UHF/VHF/FM ANTENNAS INCLUDE MODEL 4539 UHF/VHF BAND SEPARATOR	4648	0711	For suburban and near fringe VHF areas. Choose the UHF pattern and gain best suited for your area. Heavy all-weather gold anodized finish and preassembled hardware ensure easy installation. The 0712 is ideal for medium VHF and fringe UHF TV signals.	$31.50	VHF 5 UHF 11	Low 3.5 dB High 3.25 dB FM +1.5 dB u 5 dB	Low 76° High 31° FM 83° u 58°	Low 15 dB High 13 dB FM 6 dB u 19 dB	83"	48"
		4649	0712		$38.95	VHF 5 UHF 11 PLUS 10 ELEMENT UHF DIRECTOR	Low 3.5 dB High 5.5 dB FM 1.5 dB u 7.25 dB	Low 76° High 30° FM 83° u 46°	Low 16 dB High 14 dB FM 7 dB u 16 dB	122"	79"
		4628	0713	Provide improved directivity and smoother response for ghost and interference rejection. The 0714 is a "best buy" with 21 elements for capturing weak UHF signals.	$46.50	VHF 7 UHF 11	Low 3.75 dB High 6.25 dB FM +2.5 dB u 6 dB	Low 70° High 30° FM 76° u 51°	Low 22 dB High 18 dB FM 14 dB u 20 dD	109"	57"
		4627	0714		$55.50	VHF 7 UFH 11 PLUS 10 ELEMENT UHF DIRECTOR	Low 4 dB High 6.75 dB FM 2.5 dB u 7.25 dB	Low 70° High 31° FM 76° u 46°	Low 21 dD High 18 dB FM 15 dB u 16 dB	140"	82"
		4628	0718	Provide super sharp VHF pickup, with high gain and flat response on all channels for top color performance. Model 0719 uses 21 UHF reception elements for ghost and interference-free directivity.	$66.95	VHF 10 UHF 11	Low 4.25 dB High 7.25 dB FM +3 dB u 5.25 dB	Low 69° High 29° FM 75° u 50°	Low 25 dB High 23 dB FM 16 dB u 18 dB	120"	65"
		4629	0719		$78.50	VHF 10 UHF 11 PLUS 10 ELEMENT UHF DIRECTOR	Low 4.25 dB High 7.25 dB FM +3 dB u 8.0 dB	Low 67° High 29° FM 74° u 31°	Low 25 dB High 24 dB FM 16 dB u 21 dD	159"	95"
	VHF/FM	4643	0610	Offer a selection of sizes and prices to match suburban, near fringe, and fringe reception conditions. Model 0613 has unequalled front-to-back ratio and is the choice of professional MATV system installers.	$23.95	VHF 5	Low 3 dB High 5 dB FM +1.75 dB	Low 76° High 31° FM 83°	Low 15 dB High 13 dB FM 6 dB	60"	48"
		4650	0611		$31.50	VHF 7	Low 3.5 dB High 6.5 dB FM +2.5 dB	Low 70° High 30° FM 76°	Low 22 dB High 18 dB FM 14 dB	88"	60"
		4651	0613		$46.95	VHF 10	Low 4 dB High 7 dB FM +2.5 dB	Low 69° High 29° FM 75°	Low 25 dB High 23 dB FM 16 dB	94"	57"
	UHF	4646	0511	Provide higher gain and smoother response than typical narrow band, UHF antennas. No coupling transformer is required when these are connected with B-T VHF CL and Prisametric antennas, ensuring maximum gain. Model 0512 has ultimate gain and directional response for fringe reception areas.	$15.70	UHF 11	UHF 5 dB	UHF 43°	UHF 20 dB	41"	22"
		4647	0512		$46.95	UHF 11 PLUS 10 ELEMENT UHF DIRECTOR	UHF 7.5 dB	UHF 37°	UHF 23 dB	80"	60"

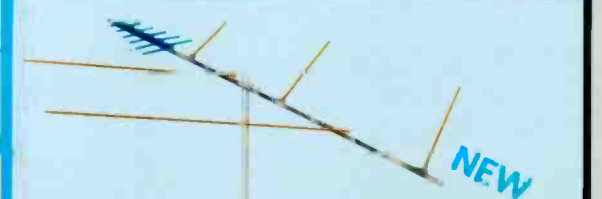


MODEL 0719


MODEL 0714


MODEL 0512


MODEL 0613



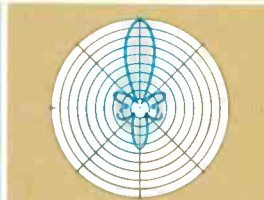
ECONOMY PRICED MODEL CL-8V5U

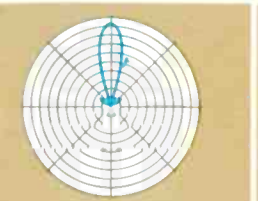

TYPICAL UHF PATTERN MODELS
(A) 0512/0712/0714/0719
(B) 0511/0711/0713/0718
(C) CL-8V5U/CL-6V5U/CL-4V5U

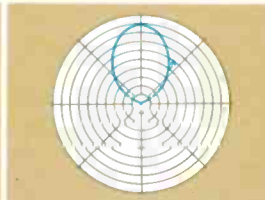

TYPICAL LOW BAND PATTERNS FOR CL . . . SERIES CL-4V/CL-4V5U

TYPICAL LOW BAND PATTERN CL . . . SERIES CH. 2 - 6

TYPICAL HIGH BAND PATTERN CL . . . SERIES CH. 7 - 13


TYPICAL HIGH BAND PATTERN FOR CL . . . SERIES CL-4V/CL-4V5U


TYPICAL LOW BAND VHF PATTERN MODELS (A) 0613/0718/0719


TYPICAL HIGH BAND VHF PATTERN MODELS (A) 0613/0718/0719

The PRESIDENT'S SCRATCHPAD

by B. H. Tongue, President

Antenna specs can be misleading. Take gain, for instance. This indicates how much more signal a particular antenna delivers than a standard reference antenna. What standard antenna? The usual one is a simple dipole, but if a number 2.1 dB greater is desired, one only has to make the standard antenna a theoretical "isotropic" antenna (one which receives signal equally from all directions). Therefore, the same TV antenna can have two different gain numbers, depending upon the manufacturer's measurement reference. Blonder-Tongue uses a tuned dipole as a reference and therefore, shows the smaller number.

Two antennas with the same measured gain may have different apparent gains when used to pick up weak TV stations. Why? For fringe reception, the ultimate measure of picture quality is signal-to-noise ratio at the TV set. This ratio is established by the antenna from the ratio of picture signal picked up to the total noise energy intercepted by the antenna pattern. Here we can find more differences between antennas of the same forward gain. One may have a pickup pattern including more sky (Galactic) noise than the other and therefore, deliver a noisier picture.

Antennas of the same gain but with different pickup patterns may differ in the amount of ghosts shown. Ghosts are caused by a reflected signal from the TV transmitter to the receiver which arrives by a longer path than the direct signal. A narrow antenna pattern can reduce sensitivity in the direction of a ghost and therefore deliver a cleaner picture. Good vertical directivity can reduce the effect of ground reflection ghosts (usually multiple repeated ghosts).

Finally, some antennas exhibit "pattern breakup" into many lobes at certain high band channels. This condition will cause poor, ghosty reception in some locations and good reception in others, on a particular channel.

Blonder-Tongue Prisametric antennas are designed for a smooth, forward main pickup lobe, and minimum side and rear response.

For special reception conditions where TV stations are in different directions, CL Series antennas are designed for multi directional VHF reception and uni-directional reception on UHF.

All Blonder-Tongue antennas are carefully measured on our antenna test range, compared with standard dipoles, and similar priced competitive models. Individual response patterns and channel gain figures are available upon request.

CONTACT YOUR LOCAL BLONDER-TONGUE DISTRIBUTOR FOR CUSTOMIZED APPLICATION ASSISTANCE

BLONDER-TONGUE LABORATORIES INCORPORATED
ONE JAKE BROWN ROAD, OLD BRIDGE, NEW JERSEY 08857 (201) 679-4010

the standard of excellence

MADE IN USA

TEAR ALONG PERFORATED LINE

BLONDER-TONGUE LABORATORIES INCORPORATED
ONE JAKE BROWN ROAD, OLD BRIDGE, NEW JERSEY 08857 (201) 679-4010

PATENT 3,259,904

PATENT 3,365,722

PICTURE POWER

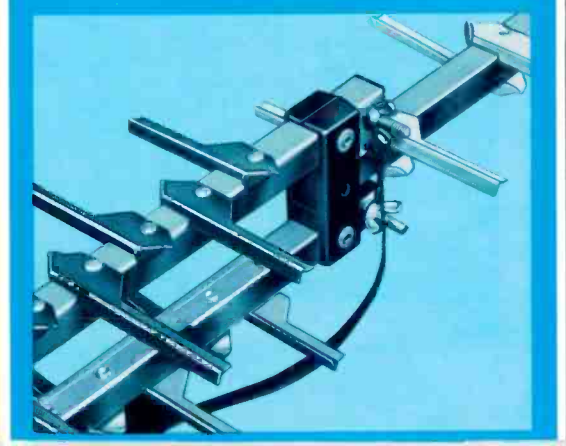
COLOR IT WITH BLONDER-TONGUE

BIG ON QUALITY...
BIG ON PERFORMANCE...

PATENTED COMBINED SUPPORT and LEAD-IN

With its dual boom construction, this UHF antenna with its boom acting as the transmission line (an active circuit element) is used on all BLONDER-TONGUE PRISAMETRIC and economy CL . . . series antennas. It should be noted that with the boom acting as the transmission line, any lead-in wire interfering with the boom will alter the antenna pattern. Covered also in this patent is the assurance that the lead-in wire will not interfere with the antenna field pattern due to the plastic twin lead supports.

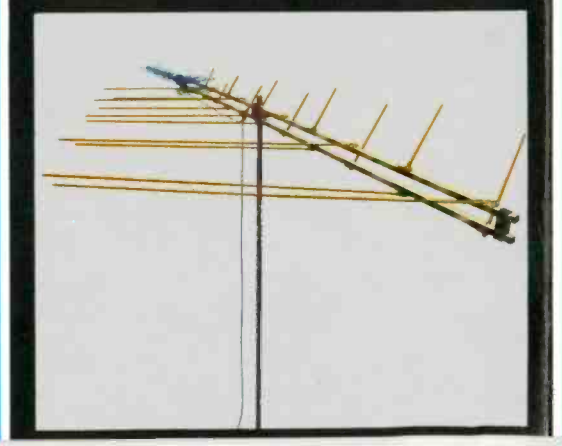
PATENT 3,259,904



COMBINED VHF-UHF * DIPOLE ANTENNA

This combined VHF and UHF antenna structure employs vertical spaced longitudinal conductor members supporting sets of dipole elements of successively increased length. The conductor members of the UHF section converge to a feed-point at one end and also feed the conductor members of the VHF section. This results in more performance power with BLONDER-TONGUE antennas.

PATENT 3,509,574



PATENTED PIVOTED SNAP-and-LOCK MECHANISM

This unique patented locking mechanism introduced by BLONDER-TONGUE Laboratories Inc. incorporates a three-region suspension which prevents loosening in the pivot dipole connections. It also insures electrical contact, presents rattling and resists loosening by vibration. Just snap-and-lock for easy installation.

PATENT 3,365,722

SECONDARY LOBE and GHOST-REDUCTION ANTENNA TRANSMISSION LINE SYSTEM

This novel antenna system embodies a non-radiating transmission line section feeding active dipole elements and operating over a multi-frequency range. A resistive component is used at a critical location across the non-radiating transmission line section enabling the reduction of secondary lobes and interference in antenna reception or similar problems in antenna transmission.

PATENT 3,596,272

NEW TEAR-OUT PRODUCT SELECTOR !

THIS IS THE BIG ONE By BLONDER-TONGUE

TV ANTENNA SELECTOR GUIDE

PATENT 3,596,272

* BLONDER-TONGUE PRISAMETRIC® MODEL 0719

MADE IN USA

TEKLAB REPORT

Panasonic's Model CT-771 Portable Color-TV Set, Part II

By Joseph Zauhar

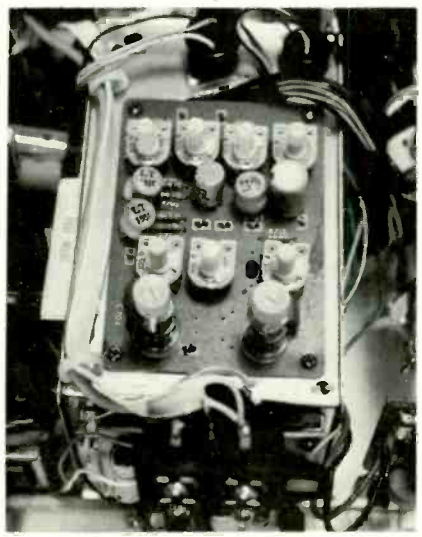
The luminance and chrominance circuits consists of three integrated circuits and four transistors, making the chassis compact without hindering the serviceability and quality of the color-TV set.

■ Last month we reviewed the power supply, horizontal deflection, vertical oscillator and video amplifier circuitry employed in this fully portable, miniature color-TV set; while this month we will cover the color circuitry which is quite similar to most color-TV chassis employing a standard 70° three-gun color picture tube.

The Panasonic Color-TV set, Model CT-771, received for our evaluation was very accurately adjusted at the factory and did not require any additional adjustments. However, minor adjustments may occasionally be required and the following information could prove helpful when called to service the TV set.

The SCREEN and FOCUS controls can be adjusted from outside of the cabinet by removing a small plate. This arrangement prevents the customer from accidentally turning the wrong controls. A manual degaussing system is employed with a degaussing button located on the rear of the set, which is held in for 1 sec to degauss. If the chassis or some part of the cabinet becomes magnetized, the use of an external coil may be required.

As we review more of the important circuits, they can be followed in the integrated circuit block diagrams included in this article, plus TEK-FAX Schematic No. 1402.



The dynamic convergence panel is located above the chassis, simplifying color adjustments.

Luminance and Chrominance Circuitry

The luminance and chrominance circuits in this chassis employ three integrated circuits and four transistors. The transistors are used in an R-G-B direct-drive system which is used to simplify the picture tube drive circuits, while the three integrated circuits perform the following functions: The IC401 (AN234) contains a chrominance signal band-pass amplifier, color killer amplifier, ACC amplifier and a burst gate circuit. The IC402 (AN236) operates as a color process circuit (a CW oscillator with phase and frequency controller, and an ACC drive signal generator). And the IC403 (AN242) functions as a video amplifier and chrominance demodulator.

Chrominance Signal Band-Pass Amplifier

The chrominance signal is applied to Terminal 10 of Color Processing IC401 and amplified by the differential-type chrominance band-pass amplifier (BPA)—the output signal appearing at Terminals 11 and 12 of the IC. The chrominance signal obtained from Terminal 12 is then applied through bandpass transformers T403 and T402 to Terminal 1, which is the input terminal of the Chrominance amplifier—the Chrominance amplifier's output signal appearing at Terminal 3.

By changing the dc bias voltage of one of the Chrominance amplifier transistors—with the COLOR control R447 tied indirectly to terminal 15—we have dc color saturation control.

Horizontal sync pulses obtained at Terminal 16 of the video jungle (IC301) are applied to Terminal 16 of Color Processing IC401 through choke L302, sync pulse gate diode D404, capacitor C407, delay coil L401 and resistor R404. These pulses are shifted in phase by an integral circuit consisting of resistor

R405 and capacitor C408 to form the burst gate pulse. A burst signal is then formed by combining the IC401 chrominance amplifier output signal and the burst gate pulse. The burst signal is available at terminal 14 and is phase controlled by the TINT control, R450.

CW Oscillator

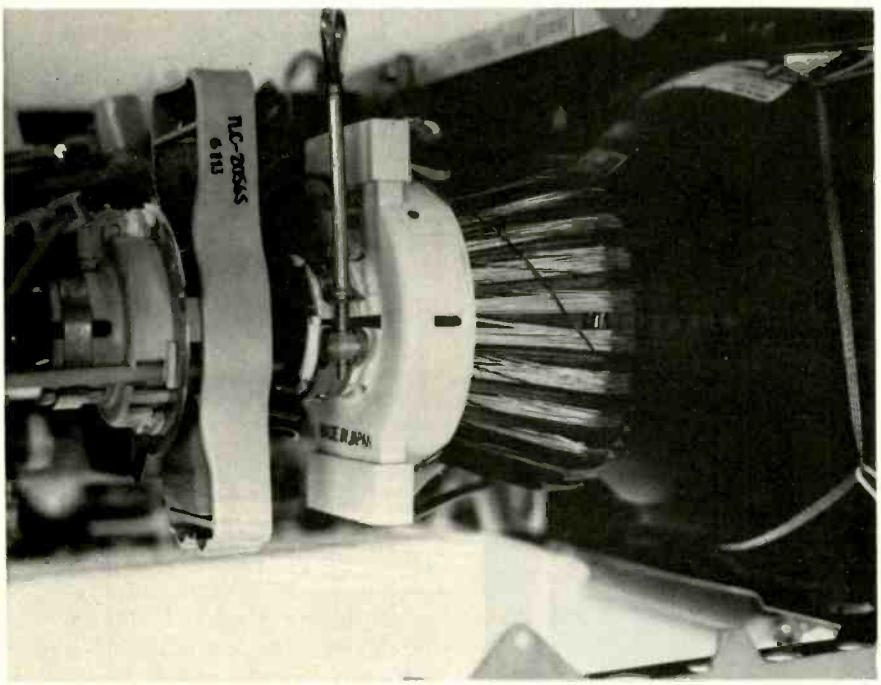
Continuous wave (CW) oscillations are developed in the voltage-controlled oscillator (VCO) in IC402 by a 3.58MHz crystal and controlled in phase and frequency by the burst signal applied at Terminal 6.

This circuit function is called automatic frequency and phase control (AFPC). The VCO output is available at Terminal 14 of the color oscillator (IC402) and is 90° different from the in-phase burst signal. A part of the CW signal output from Terminal 14 is shifted 90° in phase through delay coil L404, capacitor C428 and resistor R421, and then applied to Terminal 3 of IC402 through capacitor C431.

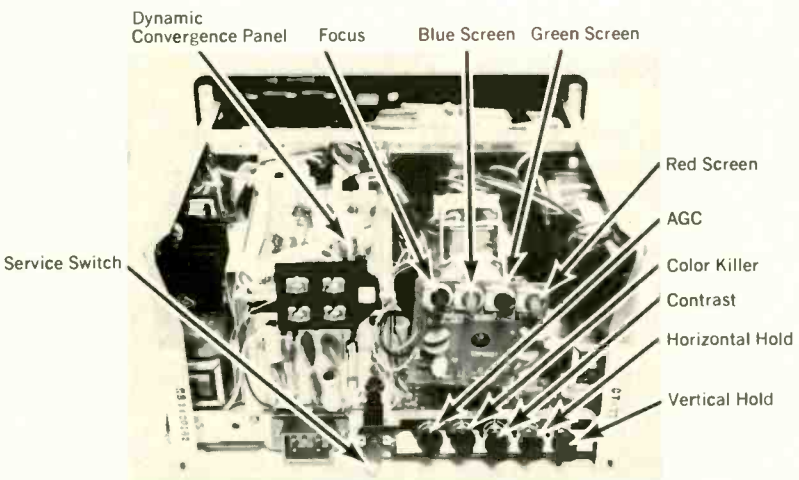
A portion of both the CW output signal from Terminal 3 and the burst signal from Terminal 6 is supplied to the second phase detector circuit, where the phase of both signals are compared.

The output of this second phase detector is amplified by the second amplifier and available at Terminal 12—where it is smoothed (filtered) and applied to the voltage-controlled oscillator. Also, a part of the output signal from the second amplifier is supplied to the VCO through the second clamp circuit, clamping the signal at the reference level.

The first input signal to the VCO varies from the reference level in accordance with the frequency difference between the burst signal and the CW signal. Therefore, the VCO output signal (CW) is compensated in phase and frequency by both VCO input signals.



Side view of the deflection and convergence yoke.



Rear view of the color-TV chassis with cabinet removed, showing the various color service controls.

ACC and Color-Killer Circuits

A burst signal from Terminal 6 and a CW output signal from Terminals 4 through 14 of IC402 are 90° out of phase when supplied to Phase Detector No. 1. The output of this detector is proportional to the burst amplitude signal and is amplified by Amplifier No. 1. Part of the resulting amplified signal is available at Terminal 8 as the ACC control signal, which is filtered by capacitor C419 and resistor R413. This amplified signal is also fed through Clamp Circuit No. 1, where the amplified signal level is clamped at the reference level and then applied to Terminal 7. This signal at Terminal 7 of IC402 is then fed to the ACC amplifier through Terminal 9 of IC401.

One of ACC amplifier's output signals, which varies in proportion to the burst signal amplitude, controls the chrominance band-pass amplifier gain, while the other ACC amplifier output signal is used for killer action in the chrominance amplifier, through the color-killer amplifier.

Luminance Circuitry

The luminance circuitry consists of chroma demodulator IC403 and video amplifier transistor TR401. The video signal from Terminal 13 of the video jungle (IC301) is fed

to Terminal 5 of the chroma demodulator (IC403) through delay line DL301 and resistor R313. This signal is then amplified by the video amplifier included in IC403, with an output applied to Terminal 8 and then fed to the base of video amplifier transistor TR401 through peaking coil L409. The luminance output signal from the collector of TR401 is fed to the emitters of the R–G–B chrominance output transistors (TR402, TR403 and TR404).

The base of transistor TR401 is also supplied with a vertical blanking pulse through capacitor C435, diode D403 and resistor R425; while the horizontal blanking pulses are supplied to Terminal 6 of IC403 through capacitor C436 and resistor R427. Brightness can be controlled with the BRIGHTNESS control (R317) by varying the dc level of the input video signal at Terminal 5 of IC403.

Chrominance Output Circuitry

The R–G–B direct-drive system is designed to simplify the circuit composition and is said to produce better color reproduction. Transistors TR402, TR403 and TR404 are used in the chrominance output stages. B–Y, R–Y and G–Y signals from IC403 are fed to the base of each transistor and the luminance Y signal from transistor TR401 is fed to their emitters. Therefore, each of the three chrominance outputs is obtained at the corresponding collector of these transistors by mixing in the luminance signal. The resulting R–G–B output signals are supplied to the picture tube cathodes, and resistors R442 and R445 are variable resistors for adjusting the picture tube drive level.

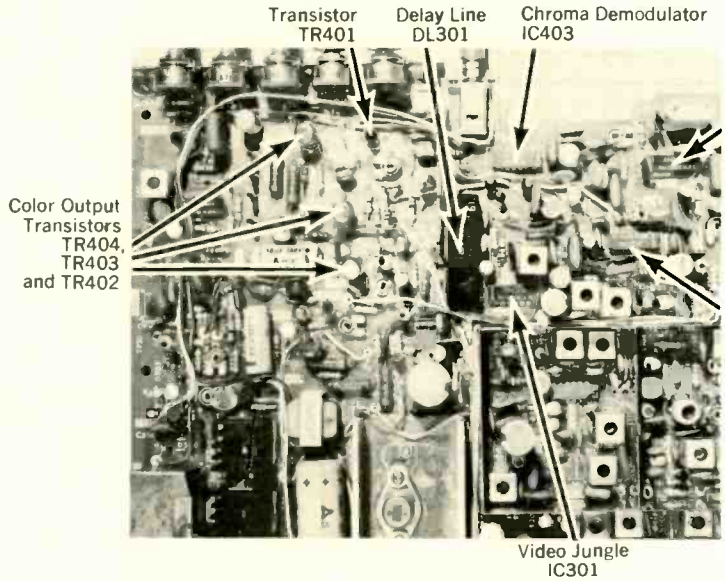
Chrominance demodulation is produced in IC403 using the chrominance signal applied to Terminal 1 from Terminal 3 of IC401 and the CW signals applied to Terminal 4 from several terminals of IC402.

Sound IF and Audio Output Circuitry

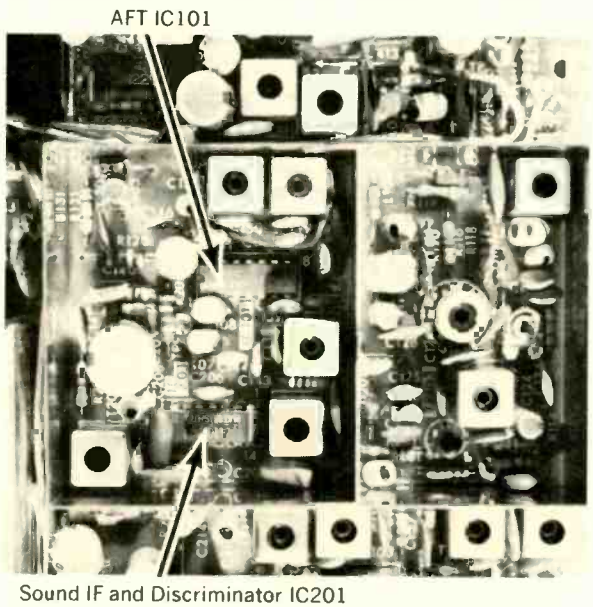
Most of the sound IF and audio output circuits are contained in but two integrated circuits IC201 and IC202. The FM discriminator is a form of a quadrature detector and a dc control is used for the audio amplifier VOLUME control. A Class B complementary single-ended push-pull (SEPP) audio-output circuit eliminates the need for an audio-output transformer.

A part of the third video IF output signal present at transistor TR103 is received through capacitor C125 and detected by diode D201. The 4.5MHz sound IF signal is tuned by transformer T201 and capacitor C203 and then fed to Terminals 1 and 2 of IC201. It is then amplified by the sound IF amplifier. The sound IF amplifier output signal is obtained at Terminal 9 and shifted 90° in phase by the phase shift circuit, consisting of capacitors C209 and C210, plus transformer T202. The sound IF output signal and the phase-shifted sound IF carrier component from Terminal 10 are supplied to the quadrature detector circuit to demodulate the two signals to an audio signal. This audio signal output from the demodulator is fed to the audio amplifier Terminals of IC202.

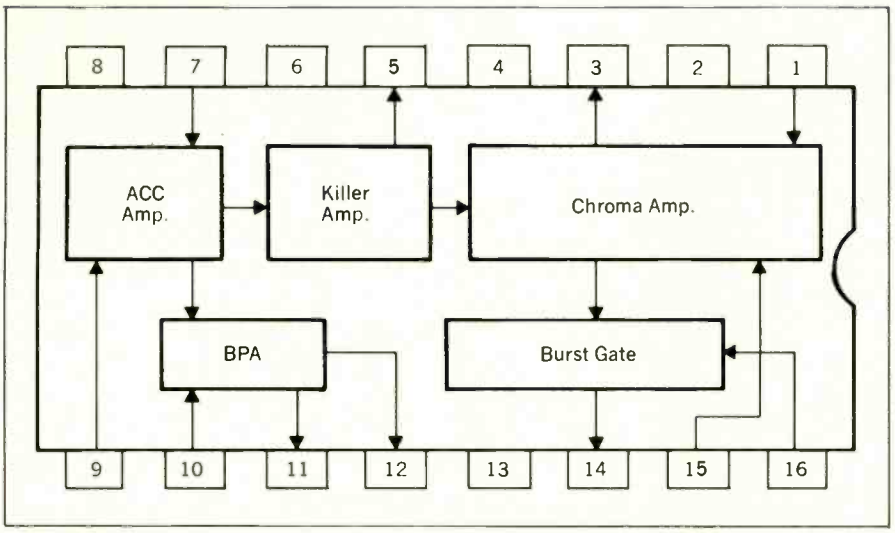
DC volume control is accomplished by changing the dc bias volt-



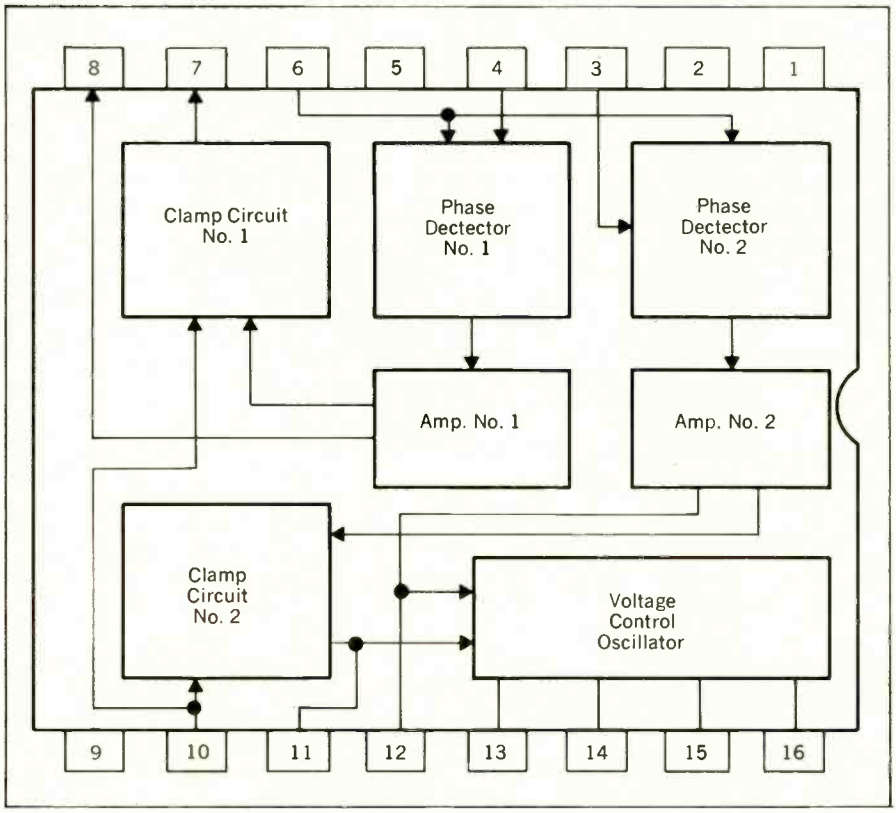
The luminance and chrominance circuits consisting of three IC's and four transistors are located on one panel.



The automatic-fine-tuning integrated circuit, IC101, and the sound IF and discriminator integrated circuit, IC201, are shown with the shield cover removed.



Block diagram of the circuits employed in the color processing integrated circuit, IC401.
Courtesy of Panasonic.



Block diagram of the circuits employed in the color oscillator integrated circuit, IC402.
Courtesy of Panasonic.

age on one of the differential audio amplifiers, making this volume control system different from many conventional types. Capacitor C208, which is connected to Terminal 7 of IC201, deemphasizes the demodulated audio signal to get a normal audio signal from the preemphasized audio signal present at the transmission side.

Within IC202, the driver stage amplified signal is fed to the complementary SEPP output stage and the resulting audio output signal applied to Terminal 9 of IC202 and then connected to a permanent magnet dynamic speaker through capacitor C212. To improve sound quality, negative feed back is also used in IC202.

Automatic Fine Tuning Circuitry

Most of the Automatic Fine Tuning circuitry is contained in IC101. A part of the third video IF output signal at transistor TR103 is supplied to AFT take-off transformer T111, through capacitor C137 and resistor R123. The video carrier frequency included in the video IF signal is also selected by T111 and capacitor C138. The video carrier is then fed to Terminals 4 and 5 of IC101—the input for a two-stage differential amplifier included in the IC, which amplifies the video carrier signal. The resulting signal at Terminal 10 is fed to Terminals 11 and 12 through transformers T112 and T113.

Terminals 11 and 12 are input terminals for a ratio-type discriminator included in the IC. The discriminated dc level is varied in proportion to the video carrier frequency deviation from the nominal center frequency, which is fed to Terminal 13. Terminal 9 is connected to the junction of two diodes within the integrated circuit which form a ratio-type discriminator. But the dc level of the resulting signal is not varied by the video carrier frequency deviation. Terminals 9 and 13 are the input terminals of the differential dc amplifier, and the resulting amplified dc signal is obtained at Terminals 2 and 3. The dc output signal at Terminal 2 is in inverse proportion to the discriminated dc level, while the output level at Ter-

minal 3 is in proportion to the discriminated dc level. The output level from Terminal 2 is supplied to the variable capacitance diodes included in the tuners through a voltage divider composed of resistors R129 and R130 to control the tuner frequency.

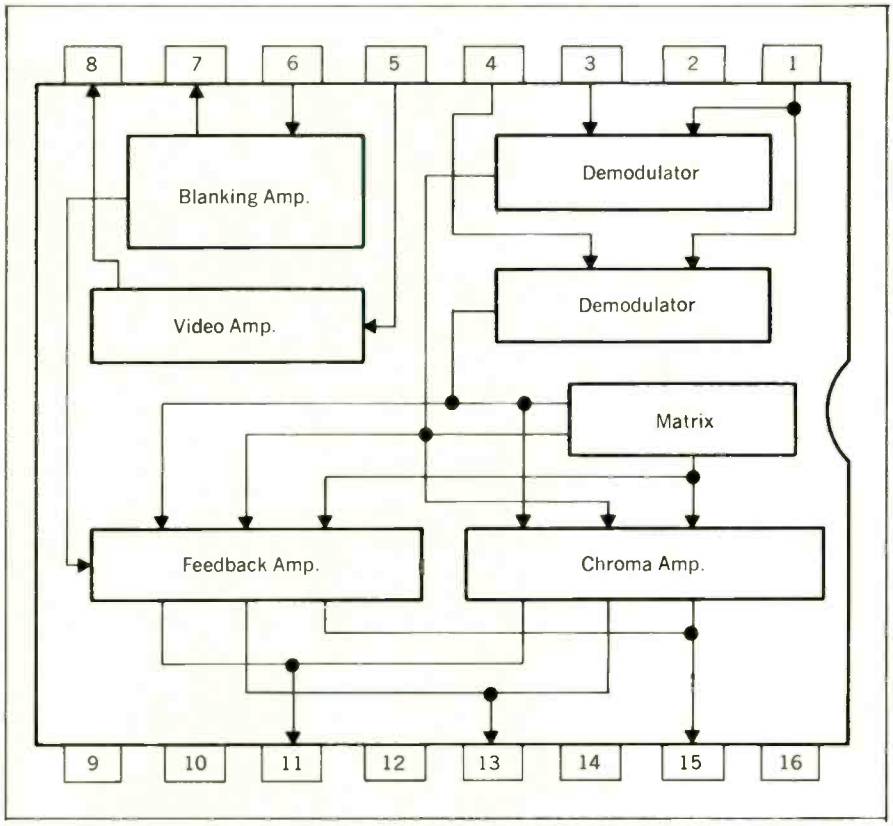
The dc level control output at Terminal 2 varies from 2v to 12v, and a center voltage of 7v appears when there is accurate tuning. Switch SW1, located on the tuner, and SW101, on the front panel, are called the AFT DEFEAT switches and are used to stop the AFT function. When the DEFEAT switch is turned ON by pushing in on the fine tuning knob or the AFT switch is turned OFF, the output level at Terminals 1 and 3 are short circuited and the input voltage of the voltage divider becomes 7v—the voltage fed to the variable capacitance diodes is then clamped to 6v.

Conclusion

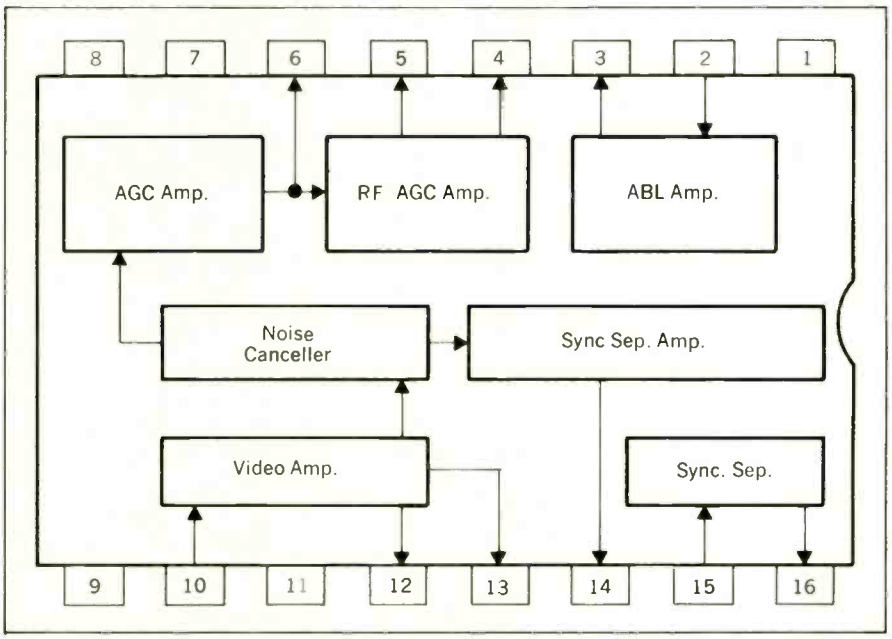
One would suspect that when you squeeze a color picture tube and all related circuitry into a cabinet that measures only 7 15/16 in. high by 12⅝ in. wide by 13 3/16 in. deep that components would be so jammed together that they would be next to impossible to service. However, this 20 lb color-TV set (35 lb with battery) makes such extensive use of integrated circuits that most of the components are secured to but three printed circuit boards, which can be easily unplugged or repositioned for easier servicing. We are of the opinion that it is easier to reach components for servicing in this color-TV set than in even some of the larger B/W-TV portables now on the market.

We were extremely pleased with the TV set's sensitivity. As a matter of interest, we plugged the TV set into a car cigarette lighter, placed the TV set on the back seat, positioned a pair of rabbit ears in the rear window and watched television while traveling from Duluth to Minneapolis. We observed ABC Channel 10 as we left the Duluth area and then switched to ABC Channel 9 as we approached the Minneapolis area. When some distance from either station, reception ceased as we entered valleys and appeared again on hills. When in Hinkley, a traditional half-way point, we observed slightly snowy reception on both channels. In Minneapolis, reception was not affected when making cloverleaf turns.

We also carried the TV set through the various office areas in our building while operating the receiver from its battery pack. And although the weight became a little uncomfortable after a while, the TV set did function remarkably well—amazing everyone that saw it for the first time. The color and picture quality was excellent. ■



Block diagram of the circuits employed in the chroma demodulator integrated circuit IC403. *Courtesy of Panasonic.*



Block diagram of the "video jungle," IC301, containing the noise canceller, sync separator, AGC, and video amplifier circuitry. *Courtesy of Panasonic.*

Now Ford gives you a choice of swinging or sliding doors.

Sales leader for 11 straight years.

Only Ford vans have so many better ideas that make vans easier to drive, to service, to use.

New Econoline Vans now offer you a choice of conventional swinging doors or a new gliding side door for cargo handling in cramped alleys and beside loading docks. Three separate tracks, at top, bottom and center, give bridge-like support for solid, smooth, one-hand operation, tight seal.

Shorter outside, easier to park. Compared to other makes with similar loadspace, Econoline Vans have significantly less overall length. This means easier parking and better maneuverability in city-delivery operations—time saved on every trip.

Easy, out-front servicing. Routine service points are right at hand under hood: water, oil, battery, wiper motor, voltage regulator, plus many others.

Strong, Twin-I-Beam Independent Front Suspension—Ford's exclusive design smooths the going for both load and driver. Two forged steel I-beam axles provide strength and durability; wide wheel stance means stability in cross winds.

Wider at top for built-ins. Body sides are more vertical, wider apart at top than other vans. Built-in units fit better and leave more aisle.

Biggest payload. E-300 Series hauls over two tons of payload; 4,285-lbs. to be exact—biggest of any van.

Engine clear forward. In Ford's clear-deck design, engine is forward—all the way out of cargo area. Over 8½ ft. clear floor space behind driver's seat . . . over 10 ft. in the SuperVan. Driver can easily step from seat into rear cargo area.

FORD ECONOLINE VANS

Ford

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

Why get caught with your pants down because of false shorts? The new B & K Model 607 Dyna-Jet is the first reasonably priced tube tester to give you nothing but positive short indications in every tube you'll ever test.

Why? Because 10 lockout buttons let you create any combination of live pin connections you want. How? By locking out the pin connections you *don't* want.

It's so easy to use too. A shape-coded chart does practically all the thinking for you. And the B & K multiple socket design means you need only 3 or 4 settings to complete a quality check.

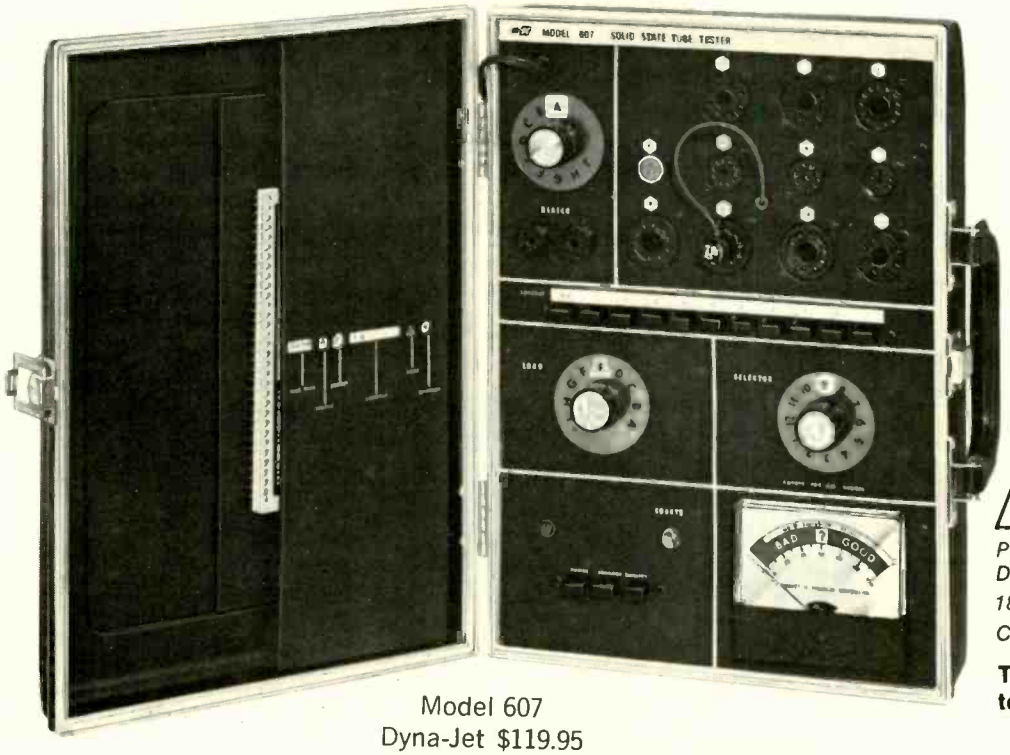
Consider all the advantages:

- Exclusive multiple-pin lockout switches mean *all* tubes now can be tested for shorts. You never get false short indications regardless of pin connections. Reset button clears all lockouts.
- Tube testing speed doubled by (1) exclusive shape-coded symbols that match controls to chart, and (2) minimum number of settings—maximum of 4, and sometimes only 3.
- Checks tubes the accurate way—under simulated load conditions.
- Exclusive grid leakage and gas tests.
- Simplified heater voltage setting.
- Power 'ON' indicator.
- Superior load and plate voltage capability.
- Attractive, attache-type case for professional appearance.

Ask your distributor about the new solid state Model 607 Dyna-Jet from B & K. It's the most modern portable tube tester yet. And you'll never be left in the cold with false shorts. And that's the naked truth!

Put an end to false shorts that leave you naked

...with the new 607 portable tube tester from B&K



Model 607
Dyna-Jet $119.95

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

B&K

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

The *professional* test equipment.

Panasonic's Model SP-10 Turntable

by Phillip Dahlen

Another reason why there will always be a phonograph

■ The phonograph has had a long noteworthy history in the recording of sound, and is a source of fond memories for all of us. I enjoy recalling an old spring-motor driven portable phonograph that I used to lay back and listen to in the tall grass behind my grandmother's house. Occasionally I'd forget a record and return to find it draped over an old sawhorse, nearly melted by the hot sun.

Such a phonograph bears little resemblance to the modern audio instrument recently sent to our lab for evaluation (Fig. 1). This system consists of a Panasonic Model SP-10 turntable; SME Ltd. Model 3009, Series II tone arm (Fig. 2); and Pickering Model XV-15/750E, Series DCF cartridge (Fig. 3).

When testing this system with a Soundcraftsman test record and some sample records produced by James B. Lansing Sound, we obtained excellent clarity of response (Fig. 4). And even more impressive was the absence of background noise or hum—intervals of silence seemed absolute.

Of particular interest was the construction of the turntable, since it uses a direct-drive, brushless, dc motor—eliminating a possible source of ac hum, belt or drive-wheel noise. Electronic circuits determine the rate of rotation and sequence the propelling magnetic fields. Separate SPEED controls are provided for adjusting the 45 rpm and 33⅓rpm rates of rotation by ±2 percent.

Tearing It Down

It was decided that the best way to gain a better understanding of the turntable was to mechanically disassemble it, and then put it back together again. This task was successfully accomplished without the aid of any mechanical drawings. Since

Fig. 1—Panasonic's Model SP-10 turntable complete with tone arm and cartridge.

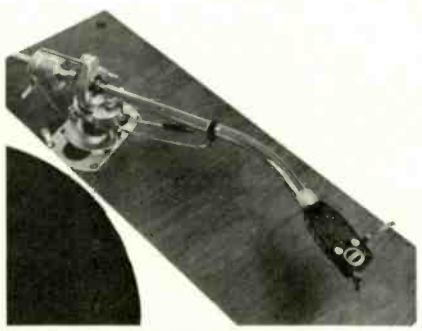


Fig. 2—The SME Ltd. Model 3009 tone arm offers many adjustments for matching the cartridge to the turntable and record.

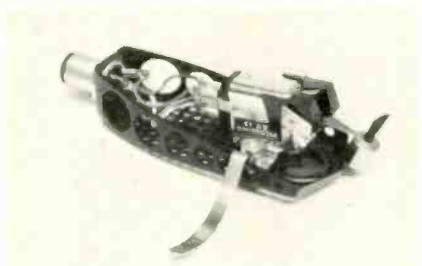


Fig. 3—The Pickering Model XV-15/750E, Series DCF cartridge is easily fitted into the tone-arm head.

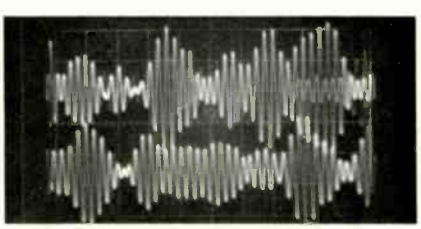


Fig. 4—By connecting the cartridge output directly to a Telequipment Type D54 dual-trace scope, we were able to observe a 15kHz stereo signal reproduced from a Soundcraftsman test record.

Phillips type screws are used almost exclusively in the construction of this unit, we found a ratchet screwdriver kit most helpful in removing screws and later tightening them securely without burring their heads. This was done with the aid of a kit, No. 6320, made by the Chapman Mfg. Co. We happened to have a sample on hand and it proved very useful.

Upon removing the bottom cover of the turntable base (Fig. 5), we noted that the entire assembly (Fig. 6) is supported by a set of four enclosed coil springs. These springs (Fig. 7) are designed to isolate the turntable from other mechanical vibrations present in the room.

In addition to mechanically isolating the turntable assembly from the rest of the room, we note that the power supply (lower left, Fig. 6) is also isolated with rubber cushions to prevent the transfer of any mechanical vibrations from the ac transformer. Shielding is also used to electrically and mechanically isolate the transformer and power supply. This power supply is fused and has a transistor regulated output (Fig. 8).

Another shielded enclosure (upper left, Fig. 6) houses the POWER switch and SPEED-CONTROL switch. Both are mechanical systems (Fig. 9) that activate Micro-type switches.

When depressing the POWER switch, you in-turn move a metal rod (central, left), which in-turn rotates a ratchet-type wheel. Nobs are located on the wheel in such a manner that with alternate strokes of the ratchet mechanism, the Micro-type switch is depressed.

The speed-selector switch mechanism contains a ramp-type bar (lower left), which when moved from one position to another, presses against a second Micro-type

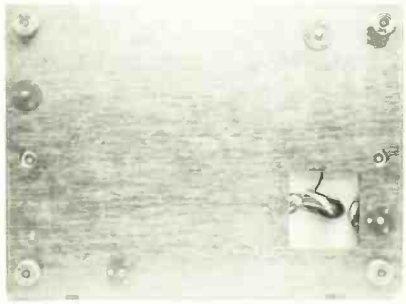


Fig. 5—Bottom cover of the turntable base.

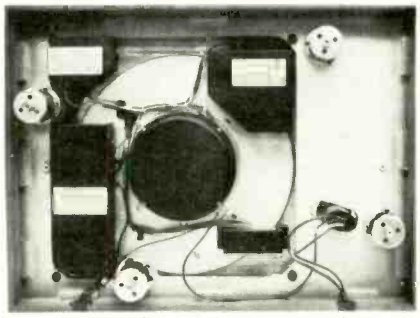


Fig. 6—The inside of the turntable base assembly.

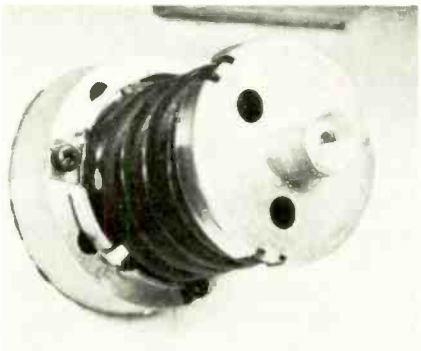


Fig. 7—Four enclosed coil springs, like this one, are used to isolate the turntable from other mechanical vibrations present in the room.

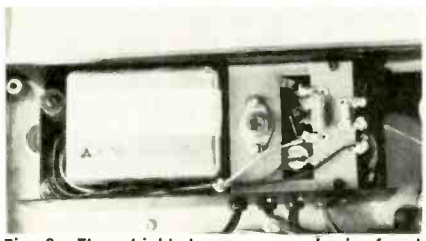


Fig. 8—The shielded power supply is fused and has a transistor regulated output.

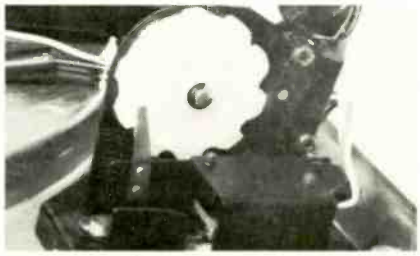


Fig. 9—Side view of the mechanical systems required for the POWER and SPEED-CONTROL switches.

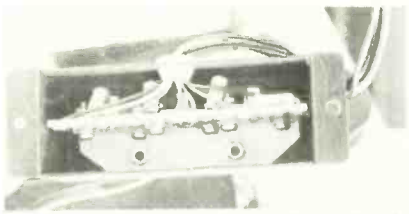


Fig. 10—Additional transistorized circuitry for regulating the motor speed.

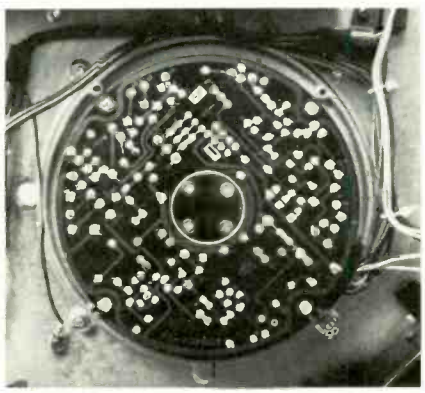


Fig. 11—Bottom of circuit board used for sequencing the stator electromagnets.

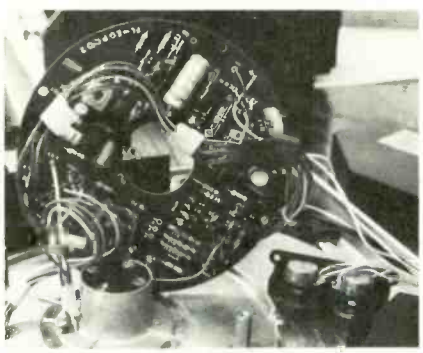


Fig. 12—Top of circuit board used for sequencing the stator electromagnets.

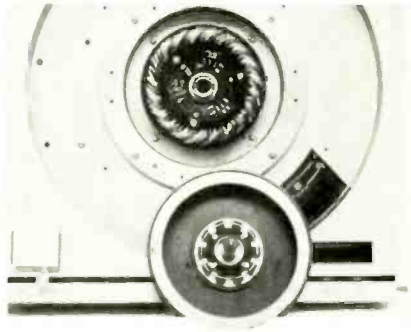


Fig. 13—Top of disassembled dc turntable motor.

Fig. 14—Closeup of stator coils. Each of these three sets of coils (having different color insulation) appears in the picture as a slightly different shade of gray.

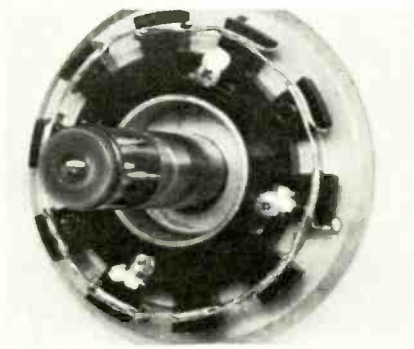


Fig. 15—Closeup of the position-detecting rotor.

Fig. 16—Closeup of a position-detecting coil, one of three used in the motor.

switch (enclosed at the lower right) to modify the circuitry.

A third shielded enclosure (lower right, Fig. 6) contains additional transistorized circuitry (Fig. 10) for regulating the motor speed, while still another (the circular shield) contains solid-state motor circuitry (Fig. 11 and 12).

We have all observed theater lights that appear to travel in a path due to their flashing sequence. In a similar manner, the sequence in which three sets of coils are magnetized can have the same effect as a moving magnet. The sequence determines the direction of rotation, while the rate at which this sequence changes determines the speed at which the turntable rotates.

The rotor (the outer circumference of the wheel shown at the lower right, Fig. 13) contains a manganese-aluminum permanent magnet that follows the change in magnetic flux of the stator core (central portion of Fig. 13, shown in more detail in Fig. 14).

Within the rotor there is a position-detecting rotor (Fig. 15). It, in turn, affects a position detecting coil (Fig. 16)—one to control each of the three armature coils.

Using the components just described, the motor circuitry "knows" the relative position of the magnet rotor, and thus provides the proper magnetic sequence, at the proper rate, to rotate the turntable at the desired speed.

When reassembling the motor, we decided to see what would happen if the position-detecting rotor was not located properly within the outer magnet rotor. By rotating one within the other, with the power ON, we were able to observe that in some positions the motor stalled, in others it could only be manually started, in others it rotated smoothly counterclockwise, and in still others it rotated in the proper clockwise manner. Since four screws secure the position-detector rotor to the magnet rotor (central portion of Fig. 17), there are only four possible relative positions in which the two can be secured together. In two of these positions the motor operates at the proper speed in a forward direction; while in the other two positions it also operates at the proper speed—but in a reverse direction.

Fig. 17—Four screws secure the position-detector rotor to the magnet rotor.

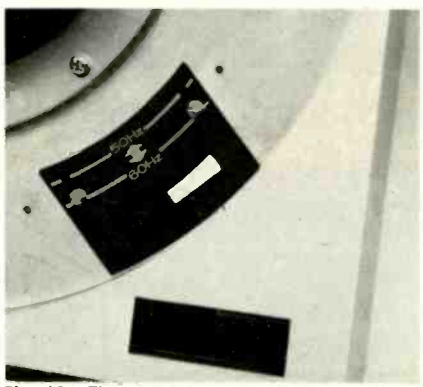


Fig. 18—The speed indicator can be moved to either a 50Hz or 60Hz position, depending on the frequency of the applied ac power.

Fig. 19—The patterns around the circumference of the turntable are used for determining its rate of rotation.

Without the turntable in place, we observed that the motor appears to have a slight quiver as it rotates. This is merely the result of self regulation—internal circuitry which prevents it from rotating faster than desired. However, the inertia of the massive turntable virtually eliminates this effect. No wow could be observed directly with the eye, with the speed indicator or a scope.

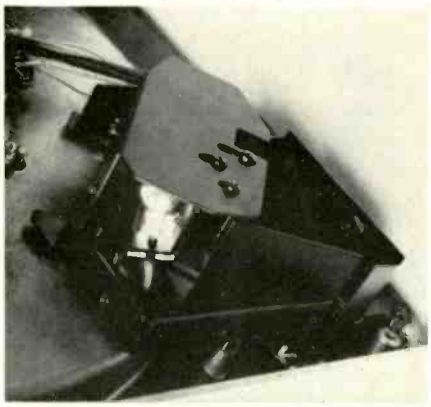


Fig. 20—The relative position of the neon lamp within the optical system.

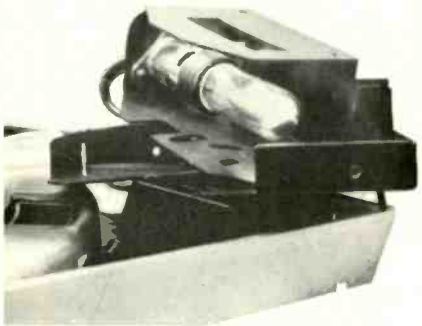


Fig. 21—The optical system has been opened to permit removing the neon lamp.

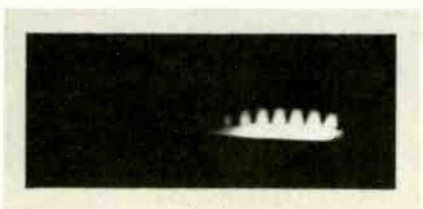


Fig. 22—Image observed in the speed indicator as the turntable rotates at 45 rpm.

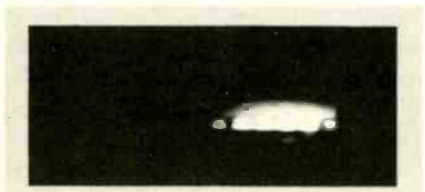


Fig. 23—Image observed in the speed indicator as the turntable rotates at 33⅓ rpm.

Speed Indicator

In Fig. 18 we note arrows pointing to 50Hz and 60Hz positions. With the speed indicator in the 50Hz position, it can be used to observe an image formed by the inner pair of rectangles around the perimeter of the turntable (Fig. 19); while in the 60Hz position, it can be used to observe the outer pair of rectangles.

These rectangles are illuminated by a neon lamp which flickers at 50Hz or 60Hz depending upon your source of power-line voltage. As you know, throughout the United States and Canada it is 60Hz, while in Europe it is 50Hz.

The neon lamp and related optics are housed beneath still another shield (upper right, Fig. 6). Fig. 20 shows the relative position of this bulb within the optical system. Although somewhat difficult to reach (Fig. 21), this should be no problem since such bulbs usually last indefinitely.

We observed the neon lamp functioning as a 60Hz strobe, the strobe-illuminated turntable markings being observed by means of the optical system. With the strobe effect, we are able to precisely adjust the turntable to either 33⅓ rpm (Fig. 22) or 45 rpm (Fig. 23). This is a very accurate method of obtaining precisely the required rate of rotation. And once set, we observed that the circuitry is stable and maintains the desired speed.

Conclusion

After having worked with this unit, we are of the opinion that any electronic technician with a mechanical aptitude should be able to disassemble and reassemble it—should the need ever arise. The only tool required for this job is a high-quality, small-pointed, Phillips screwdriver. This is certainly a rugged unit, designed to withstand many years of use by the most demanding audiophile. ■

Wideband Distribution Equipment

by D. Lieberman

Now that the FCC has lifted its freeze on future CATV systems, it is important that you understand them for proper building MATV applications, and for assuring your customer the best CATV reception possible

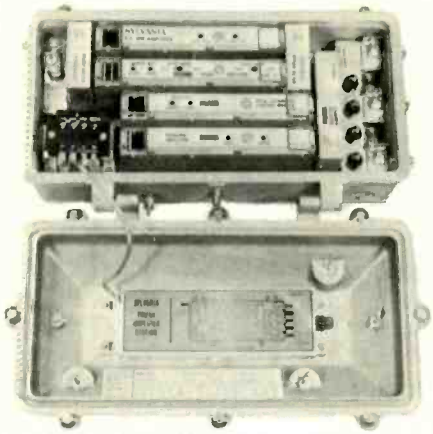


Fig. 2—Trunk amplifier station.

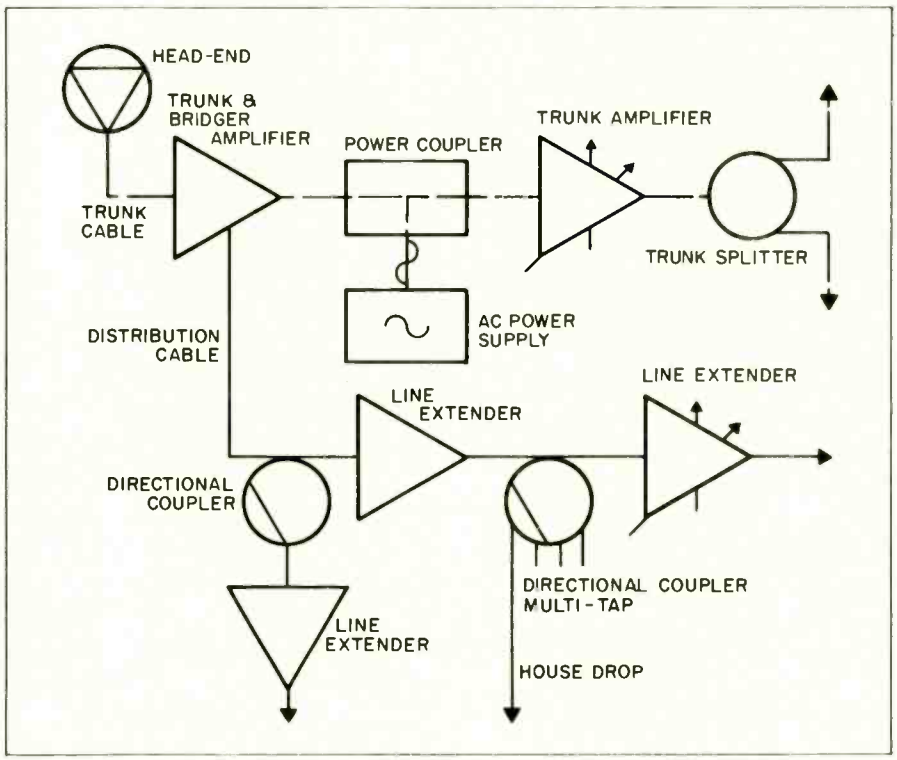


Fig. 1—A typical CATV system.

■ Cable Television (CATV), once a medium for distributing a limited number of TV channels in remote rural locations, is now in some large urban areas the avenue for more than 20 TV channels. This growth has required the continual upgrading of the equipment used in CATV systems; the emphasis here has been to increase: reliability, maintainability, capability and technical performance.

Although several brands of CATV equipment are now on the market, this article will deal with but one such brand—that manufactured by Sylvania.

Typical CATV System

The operation of a CATV system (Fig. 1) can be briefly described as follows:

The antenna receives signals from VHF and UHF TV transmitting stations. These signals may be amplified or converted at the antenna output, and are then individually cabled to the head-end to be processed. This processing consists of setting levels, maintaining video and audio carrier levels by means of AGC, converting channel frequency assignments (if necessary), and combining all channels upon a common trunk. Pilot carrier signals for referencing levels and facilitating the control of levels in the trunk system are introduced at the head-end. Other signals could also be introduced from some form of program origination equipment (studio equipment, weather scanner, etc.) at the head-end.

The combined signals are then carried by the trunk cable. At regular intervals (about 1800 ft), amplifiers are used to raise and equalize the signal levels—which have, of course, been attenuated by the coaxial cable. At convenient points, the trunk line is bridged with another amplifier, which feeds signals to the distribution cable. This cable is then tapped close to the households, and signals are brought from the tap point by cable to the customers' homes. A grounding block at each house entry makes certain that the shield of the coaxial cable is bonded directly to the house grounding system.

Before the cable reaches the TV set, a matching transformer is used to match the unbalanced 75Ω cable impedance with the balanced 300Ω input of the TV set.

Some additional equipment that may be used include: line extenders, when distribution levels require amplification; indoor passives, when signal lines must be further tapped and split; indoor amplifiers, when signals must be further amplified for distribution (as in an apartment house); passive splitters and directional couplers for splitting trunk and feeder lines.

There is also an ac power supply for supplying regulated 30v or 60v ac to the amplifiers through the trunk cable. This ac voltage is multiplexed with the RF signals, and it

is used to supply power to the dc power supplies in the amplifiers.

Equipment Description

Fig. 2 is a photograph of a trunk amplifier station. This is probably the most critical unit in the CATV system, since up to 80 amplifiers may be cascaded. To assure that total cross-modulation distortion, noise, ripples in frequency response, and hum modulation will not become objectionable, each amplifier must perform at a high level of efficiency.

This trunk amplifier station uses plug-in modules for its electronics, and the same housing can be used for a variety of purposes, according to the modules it contains. Thus, technical advances which may obsolete some part of the equipment will not obsolete an entire amplifier—only the affected portion will require replacement. Such a design also makes maintenance easier.

The trunk amplifier station can perform several functions according to the modules used.

Manual Gain Control Trunk Amplifier

A manual gain control trunk amplifier station serves to amplify and equalize signal levels over the complete band in which it operates. It therefore compensates for cable attenuation at one specific temperature (cable RF attenuation is dependent upon temperature) so that cable attenuation plus amplifier gain equals unity gain. For this purpose the station contains, in addition to the standard housing and base plate (the latter contains all connectors and appropriate wiring for distributing signals between modules), the trunk amplifier module and the dc power supply with its isolation transformer. The amplifier module is shown in Fig. 2 as the second module from the top. The dc power supply is contained in the cover of the amplifier, while the isolation transformer occupies the lower left side of the housing. Input and output continuity modules, adjacent to the trunk amplifier module, are also required (their function is explained later).

Equipment for the manual gain operation is part of the basic hardware required for all other operations.

Signal flow is from the RF input on the upper left of the housing, through the continuity module to the trunk amplifier module. The output of the trunk amplifier module is then connected through another continuity module to the output RF connector, located at the upper right of the housing.

Fig. 3 is a block diagram of the essentials of the trunk amplifier module. It consists of plug-in attenuator and equalizer pads before the amplifier input. The attenuator pad is used where cable lengths between amplifiers are very short so that the signal level must be lowered to prevent overload. The equalizer pad is used to partially equalize signal levels over the frequency range, since cable attenuation is approximately proportional to the square root of the operating frequency. Two wide-band common-emitter amplifier stages are then followed by a variable-attenuator stage. The third RF stage uses a variable resistor with compensation in the collector-to-base feedback path to provide variable tilt for further cable equalization. This is followed by an additional variable-attenuator stage and then by two more wide-band common-emitter stages. The use of five amplifier stages with two ganged GAIN controls provides a very flat frequency response (±0.2dB ripple) from 50MHz to 270MHz, with a gain range of from 18dB to 31dB. All stages, including the variable bridge T-attenuators, are matched for 75Ω impedance.

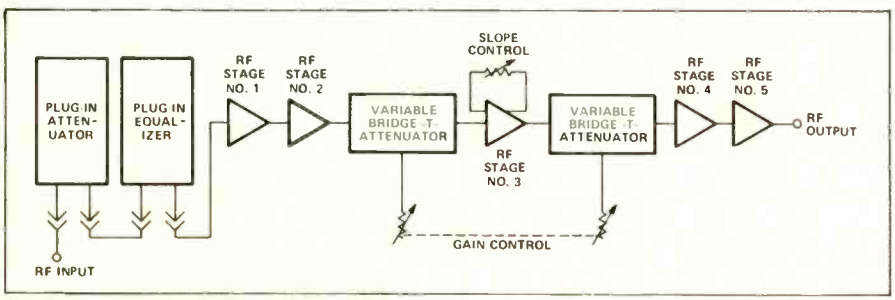


Fig. 3—Essentials of trunk amplifier module.

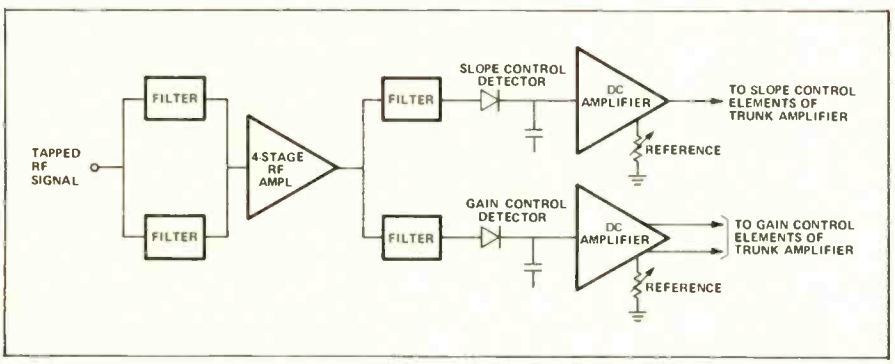


Fig. 4—Total automatic control module (TACM).

Total Automatic Control Trunk Amplifier

In the total automatic control trunk amplifier operation, a module is added for referencing signal levels and for providing control signals to maintain levels close to the reference value. This module seats immediately below the trunk amplifier module.

Fig. 4 is a block diagram of the total automatic control module (TACM). Signals to this module are derived from a 10dB directional tap, which is wired into the baseplate at the output connector from the trunk amplifier module.

The TACM performs its operations by the use of two pilot carriers that are filtered separately from the other signals at the input of the TACM. These carriers are recombined before being amplified by a stable high-gain wideband amplifier —then they are again separately fil-

tered, individually detected and compared to dc reference levels. Any deviation from the reference serves as an error signal, which is amplified by a dc amplifier.

The output signals from the dc amplifiers are routed through the baseplate to the trunk amplifier module. One pair of dc signal levels is used to change the current in PIN diodes of the two variable attenuators so that the PIN diode resistances are changed—this changes the gain of the amplifier in a direction that maintains a constant output level at one of the pilot carrier signals. Another dc signal level is used to vary the resistance of another PIN diode in the feedback path of the third RF stage, so that the amplifier gain is sloped in a direction that maintains a constant level for the other pilot carrier signal.

The TACM is thus used to maintain signal levels over the complete band, although the input levels may not change in a flat manner over the band. Thus, as cable attenuation changes with temperature, and also as a function of frequency, the dual pilot control tends to compensate the amplifier gain and slope so that a constant level and fixed tilt are maintained at the output of the amplifier. (Note: *Slope* is the difference in gain of a network between the ends of a band; *tilt* is the difference in signal level.)

This total automatic control amplifier is designed to maintain output levels to ±0.20dB over a ±8dB input signal change.

Trunk Amplifier with Bridging

The trunk amplifier can be bridged when in either its manual or automatic mode of operation. For this operation, a bridging amplifier module is added to the station. This module seats immediately below the TACM and is available in push-pull or single-ended versions. In addition, a hybrid splitter module, which can split the output of the bridging module into two to four outputs, is also added to the station (at the right side of the housing). Immediately adjacent to it is a fuse complement for individually fusing the bridging output lines against possible shorts to the multiplexed ac power —which these lines could carry to other line extender amplifiers.

The bridging output ports (a total of four) are located at the far right side of the amplifier housing, under the trunk amplifier output port. The bridging amplifier derives its signal from a portion of the signal that goes to the TACM—this is accomplished in the baseplate. This amplifier is similar to the trunk amplifier in that it is also a wideband unit, and encompasses the same frequency range. However, it has more limited gain and tilt control, and it operates at a higher level than the trunk amplifier and therefore has slightly more severe distortion characteristics. Its other requirements—noise figure, frequency response, VSWR (voltage standing wave ratio), etc.—are not as severe as those of the trunk amplifier.

The output of the bridging amplifier is routed through the baseplate to the splitter module and from there to the bridging connector ports for distribution of signals to the feeder lines.

Description of Hardware

The trunk amplifier station is contained, as shown in Fig. 2, in a rugged cast aluminum housing, which is impregnated with polyester to seal its pores against moisture. It is also equipped with a weatherproof O-ring seal. All housings are tested at 20 lb/in.^{2} for an indication of air leakage through the seal.

The standard module case (Fig. 5) is a two-piece die-cast aluminum housing. Printed-circuit boards for each module (all electronics are solid state) are contained between the two pieces, and firm mating of the ground plane of the printed-circuit boards with the module cases insures solid RF grounding with low-inductance ground paths. Covers on the modules enable each module to be well shielded, thereby preventing coupling between modules or radiation to the outside.

Efficient heat sinking between the module case and the stud-type transistors is provided by the direct mechanical mating of pieces between the studs and a plate that is attached to the module case. Part of the bottom of the module case, when it is screwed down into the housing, mates with a long boss that is part of the bottom of the casting. Thus, there is almost direct heat sinking of the RF transistors to the cast aluminum housing (measurements indicate a 25° to 35° gradient from the outside ambient temperature to that of the transistor stud). This efficient sinking, together with the hermetic housing seal (which prevents entry of moisture), and a 50 percent derating in all components used, fulfills the requirement for increased reliability. This has been demonstrated by testing a cascade of 40 amplifiers, running continuously for approximately a year under all extremes of environmental conditions.

Special Features of the Trunk Amplifier Station

It can be noted from Fig. 2 that an additional module, called the "spare module," is seated above the trunk amplifier module. With this plug-in module (which may be one of several types), together with various types of plug-in modules in place of the continuity module, the trunk amplifier can be used for more than the standard CATV transmission. Some of the other services that the station can perform are:

Bi-directional transmission over a single cable. This is accomplished with the use of diplex filters in place of the continuity module, and another amplifier in the "spare" module position. The diplex filters serve to steer bands of signals to the proper amplifier inputs and prevents them from regenerating in the unwanted direction. This method is shown in Fig. 6. Filters and an additional amplifier have been developed which

Fig. 5—The standard module case.

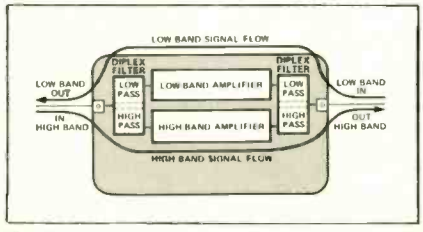


Fig. 6—Bi-directional transmission using diplex filters.

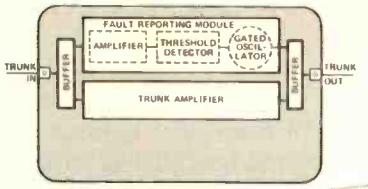


Fig. 7—Trunk amplifier with fault reporting.

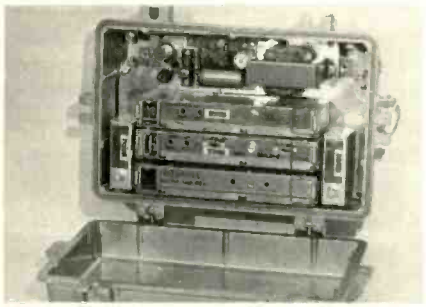


Fig. 8—Multi-purpose amplifier station.

Fig. 9—Directional multi-tap.

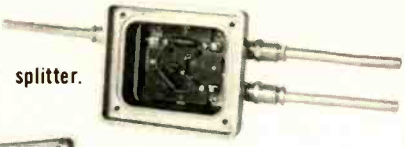


Fig. 10—Outdoor splitter.

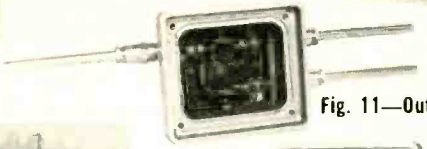


Fig. 11—Outdoor directional coupler.

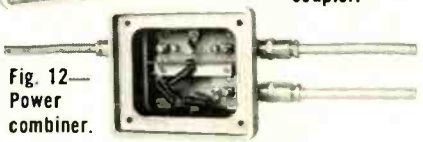


Fig. 12—Power combiner.

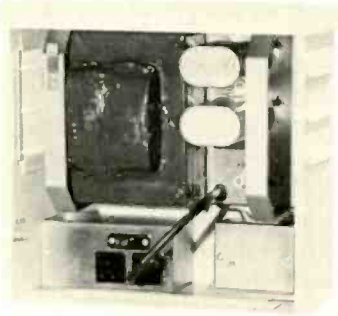


Fig. 13—AC power supply with 720va capacity.

yield a 50MHz to 270MHz band in the forward direction and a 5MHz to 30MHz band in the reverse direction. This mode of operation could be used for forwarding remotely originated programs (studio, remote pick-ups, etc.) to the head end for conversion and retransmission throughout the system. It could also be used for educational TV, instructional TV, or any other transmission which can originate from a point in the trunk line.

Double forward transmission. This is accomplished in a manner similar to bi-directional transmission, except that both amplifiers distribute signals in the same direction. Double forward transmission could be used to carry signals for private lines or special purposes (such as surveillance) or for long transmission at lower VHF frequencies.

Split band operation. This is similar to double forward transmission except that the bands are each split into single octaves (such as 55MHz to 110MHz, and 135MHz to 270 MHz). The use of single-octave bandwidths precludes interferences due to second-order distortions.

Fault reporting. A method of accomplishing this is shown in Fig. 7. Essentially, the input of the station is sensed for the presence of a signal. If the signal is not present (because of a failure in a previous amplifier), a coded signal is sent to a central source. The coded signal indicates which amplifier malfunctioned. For this mode of operation, buffers replace the continuity modules, and the fault reporting module occupies the "spare" module position.

Redundant amplifier. This uses hybrid splitters in place of the continuity modules, and another trunk amplifier in the "spare module" position. It allows for either parallel operation or "push push" operation with complete redundancy. Failure of one amplifier will result in a decrease in level but will not cause the system to fail, since the other amplifier will still carry signals.

Other special features include: Removable surge-arrestors for lightning protection; a highly efficient switching regulator power supply; external directional coupler test point; and 30v ac or 60v ac operation.

Additional Equipment

Additional equipment in production are shown in Fig. 8, 9 and 10. These include:

Multipurpose amplifier. This amplifier (Fig. 8) is contained in a die-cast aluminum housing (360 alloy), completely sealed and watertight. With full modular construction, it can be used as a transportation trunk amplifier, single-output distribution amplifier or as a line extender. Push-pull modules are available for the latter use in both manual and automatic modes of operation. It also has a removable baseplate. One baseplate version permits bi-directional operation, such as in the trunk amplifier station.

Passive equipment. All passive equipment is specified for operation from 5MHz to 300MHz. Fig. 9 is a photograph of the multi-tap, which contains a directional coupler for tapping the distribution line. The tapped signal is then split to further taps by a hybrid splitter, which is contained in a cover plate that mates with the tapped output of the directional coupler. This cover plate can be conveniently changed, thus permitting the number of output taps to be changed without removing the housing from the line.

Fig. 10 shows the outdoor splitter. It contains circuitry for splitting equally the trunk or distribution signals to separate lines. It also contains, when required, power-passing chokes which permit ac power to be outed down the line.

The outdoor directional coupler (Fig. 11) performs like the outdoor splitter, except that the signal power is not split equally. It features high directivity from output to tap.

The power combiner (Fig. 12) multiplexes the ac power, which is derived from the ac power supply, with the RF signal. It performs this combining without loading the RF path.

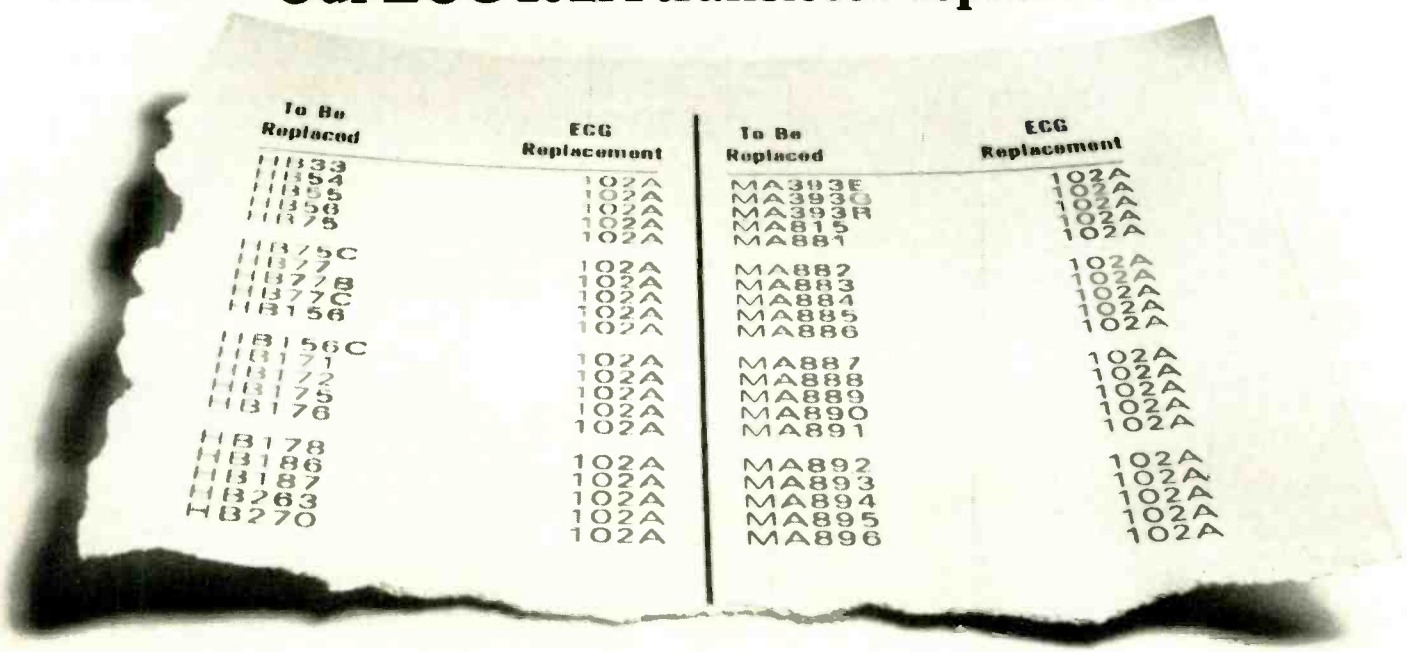
Passive elements are contained in well shielded, cast aluminum housings with "drip lip" protection against moisture.

One example of the ac power supplies used is shown in Fig. 13. It contains a regulating transformer that maintains a 60v ac clipped sine-wave output with an input excursion from 90v to 130v ac. The ac supply is contained in a sheet-metal housing.

Summary

The full potential of a wideband communications link, such as a CATV system, can only be realized with trunk and distribution equipment capable of performing to the exacting demands of a multichannel, multiservice system. This emphasis has resulted in the development of equipment that will meet the needs of the CATV industry for many years to come. ■

Our ECG 102A transistor replaces...



To Be Replaced	ECG Replacement
HB33	102A
HB54	102A
HB55	102A
HB56	102A
HB75	102A
HB75C	102A
HB77B	102A
HB77C	102A
HB156	102A
HB156C	102A
HB171	102A
HB172	102A
HB175	102A
HB176	102A
HB178	102A
HB186	102A
HB187	102A
HB263	102A
HB270	102A

To Be Replaced	ECG Replacement
MA393E	102A
MA393G	102A
MA393R	102A
MA815	102A
MA881	102A
MA882	102A
MA883	102A
MA884	102A
MA885	102A
MA886	102A
MA887	102A
MA888	102A
MA889	102A
MA890	102A
MA891	102A
MA892	102A
MA893	102A
MA894	102A
MA895	102A
MA896	102A

and hundreds more.

The 102A is only one big part of our very small line.

Just 124 Sylvania ECG semiconductor parts will replace over 41,000 manufacturer's part numbers and JEDEC types.

Our new ECG semiconductor replacement guide makes it easy for you to find out exactly which one of ours is the one you need.

With our guide and our 124 replacements, you can service practically any solid-state entertainment product on the market.

No more lugging sets back to the shop because you couldn't carry all the parts you needed.

With Sylvania's 124 semiconductors you can handle almost all of your repair jobs right in your customer's home.

Stock up on Sylvania ECG semiconductors now.

It's just another small thing from GTE Sylvania that can take a big load off your back.

Sylvania Electronic Components, Waltham, Mass. 02154

GTE SYLVANIA

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 (Combined List Price $33.85) . . . yours for only 99¢ each ...with Trial Club Membership

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 $33.85) 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 additional 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.

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.

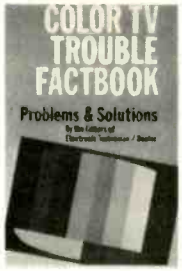
Regular List Price $7.95

Typical Savings Offered Club Members on Recent Selections

Commercial FCC License Handbook	List Price $8.95; Club Price $5.95
RCA Color TV Service Manual—Vol. 2	List Price $7.95; Club Price $4.95
Citizens Band Radio Service Manual	List Price $7.95; Club Price $4.95
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
Modern Radio Repair Techniques	List Price $7.95; Club Price $4.95
Beginner's Guide to Computer Programming	List Price $9.95; Club Price $6.95
199 Electronic Test & Alignment Techniques	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
Computer Technician's Handbook	List Price $10.95; Club Price $7.95
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!

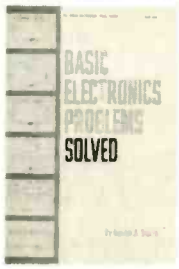
Color TV Trouble Factbook



Here's a complete guide to color TV troubles and solutions, arranged by make and model, a low-cost, all-in-one reference handbook every TV service technician should own. The information it contains may easily save you hours of time repairing a "tough-dog" color TV. Included are details concerning repetitive troubles, field-factory changes, new and unusual circuits and descriptions of how they work, special adjustment procedures and other such pertinent service information. The content is arranged by brand names, covering every major make of color TV receiver produced in the past several years. Models and chassis covered are arranged in alpha-numerical order. 176-pps. Hardbound.

List Price $6.95 ● **Order No. 519**

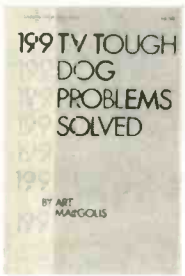
Basic Electronics Problems Solved



Here are easy step-by-step solutions to basic electronics problems in a convenient one-stop source dealing with both solid-state and tube-type circuits. The content not only presents a detailed explanation of each point, but also provides many actual examples on how to work out problems. Then, to firmly fix the information in your mind, there are numerous example problems for you to solve; answers to these are included in one Appendix, and worked out solutions in another. Covers DC circuits, AC circuits, powers of ten, semiconductors, power supplies, and receiver circuits. A final chapter shows how to use a slide rule to speed calculations. 192 pps., over 100 illus. Hardbound.

List Price $7.95 ● **Order No. 530**

199 TV Tough-Dog Problems Solved



Here is a master collection of actual case-history solutions—answers to the most challenging tough-dog TV problems on both color and B & W sets—covering all popular makes from Admiral to Zenith. This new book is organized so that you can quickly find the solution to particular problems—toughies that required the best efforts of top technicians to solve. To enable you to find information relative to a particular problem in a specific set, a cross-reference of troubles by brand name and chassis is included. The content is organized into trouble symptom sections. Several different circuits are included; thus, the information provided will apply to similar circuits in other models. 256 pps., 199 illus. Hardbound.

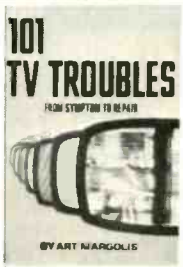
List Price $7.95 ● **Order No. 559**

Philco Color TV Service Manual

An all-in-one service guide for Philco color sets, with 12 complete schematic diagrams for chassis 15M90/91 to 20QT88. Here in one manual is complete service data for all the color models produced by Philco and Philco Ford (thru 1970), from the all-tube to the latest hybrid solid-state chassis, including the small-screen portable Model T5062WA. The unique 36-page foldout section contains 12 complete schematic diagrams, representing all the chassis covered. The profusely illustrated text delves into each section (video, chroma, vertical, horizontal, etc.), and points out specific problems based on the author's extensive experience. Included are complete alignment and setup instructions, detailed in step-by-step form. 160 pps., plus 36-page schematic foldout section. Long-life vinyl cover.

List Price $7.95 ● **Order No. 522**

101 TV Troubles: From Symptom to Repair



An invaluable "cause and cure" guide to the practical, easy solution for virtually any TV trouble—color or B&W. All you do is analyze what you see and hear, look up the symptoms in the book, and follow the clear and simple steps to a speedy trouble cure. To show how and why certain troubles occur in specific types of circuits, schematics and other illustrations are included for every major manufacturer—Admiral to Zenith. TV troubles are broken down into five basic categories: Brightness, Contrast, Sweep, Color, and Sound. Each category lists specific troubles relating to that symptom. For example, under "Contrast" are 22 causes of actual picture problems. With the categorized trouble list and index, you can quickly and easily find the exact symptom—and the trouble cure—for virtually any TV circuit defect you might encounter. 224 pps. Hardbound.

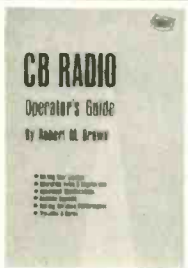
List Price $7.95 ● **Order No. 507**

TV, Radio, Hi-Fi Hints & Kinks

If you want to get the best performance out of consumer electronics equipment, you'll find this to be the most informative and useful handbook ever published. Over 150 ideas suggest ways to customize and add accessories to any equipment setup—how to connect single and multiple accessory speakers, how to add remote controls to TV's, radios, hi-fi systems, how to connect microphones, etc. Also includes many tips on hi-fi equipment, CB and 2-way radio equipment, antenna systems, remote monitoring techniques, intercoms, a wireless baby sitter, telephone amplifier, moisture, fire and other alarm accessories for any existing amplifier. 256 pps., over 150 illustrations. Hardbound.

List Price $7.95 ● **Order No. 561**

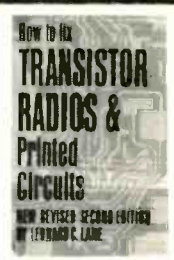
CB Radio Operator's Guide



An all-in-one handbook on Citizens Band radio, and how to make the best use of available equipment. Tells you everything you must know to get on the air, with complete details on what you can and can't do right down to the "nitty gritty" rules and regulations! What's more, you receive expert advice on the type of equipment to buy, and how to get the best performance out of your "system." The information contained in this book will save you time and money in short order! With this one book, you can become an expert on CB Radio, and how to use the service most successfully. You'll learn about antenna systems, including how they are used in CB. 224 pps. Hardbound.

List Price $7.95 ● **Order No. 499**

How To Fix Transistor Radios & Printed Circuits



Here it is! Just off the press—a completely updated, revised edition of Leonard Lane's best-selling classic on transistor radio repair. In addition to extensive enrichment of the first edition, the author brings FETs, zener diodes, FM radios — in fact, everything related to the current state of the art—into the picture. Here's the perfect reference and guide for electronic technicians who need to understand and repair semiconductor circuits efficiently. For those interested in transistor physics, fundamentals are emphasized in the first two chapters. The real "meat" begins in Chapter 3 which will thoroughly familiarize you with amplifier fundamentals, basic circuit configurations, biasing, FETs, JFETs, and IGFETs. The next two chapters will acquaint you with RF and IF amplifiers. 256 pps., over 150 illus., 12 Chapters.

List Price $7.95 ● **Order No. 504**

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**

AN EXTRAORDINARY OFFER...

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

Glad to Meet You, "Slim Jim"

by Phillip Dahlen

Caddy-size, refillable, aerosol cans offer new convenience when making service calls

■ During the past several years chemicals have played a far greater role in the electronic technician's servicing work. In addition to aerosols formulated for efficient cooling of suspect intermittent circuitry, chemicals have been developed to simplify the once troublesome task of cleaning and lubricating bad TV tuner contacts. These electronic chemicals have, in fact, become "tools of the trade," in the same manner as a screwdriver or soldering iron.

However, with the vast assortment of replacement components required for servicing in the field, electronic technicians are now forced to carry tube caddies which are just about heavy enough to give any inexperienced technician a hernia. Add to this three or four 1½ lb aerosol cans and you might just as well drive the truck straight into the customer's living room.

One partial solution to this problem of weight and excess bulk is the use of smaller aerosol cans. However, until recently such a solution has not always proven economically practical. (It is just like at the grocery store where six-packs of tomato juice may actually be more expensive than the single large-size cans having far greater total fluid content.) The additional cost goes into the fabrication of the extra cans, plus the expense of stocking more individual items on the supplier's shelf.

But why discard a perfectly good aerosol can merely because it is empty? Chemtronics decided that you shouldn't, and they are now marketing a caddy size aerosol can that is refillable. There is no longer any need to purchase a new container each time you need more aerosol. They have come out with a refillable transfer kit consisting of the large, economy-size Tun-O-Wash (tuner cleaner and degreaser), Tun-O-Brite (tuner cleaner, lubricator and polisher) or Tun-O-Foam (tuner cleaner and lubricant) together with a caddy size, refillable aerosol can (the Slim Jim).

We received a number of sample transfer kits containing the Tun-O-Wash and Tun-O-Brite for evaluation purposes. These samples were taken to another building, where outgoing mail is processed, so that a scale would be available for making measurements.

Using one of the mail room's smaller scales, we noted that the empty Slim Jim can weighs just slightly over 1½ oz. To fill it, all that you need do is remove the spray heads from both the Slim Jim and the larger aerosol can, insert the

Chemtronics has come out with a refillable transfer kit consisting of the large, economy-size Tun-O-Wash, Tun-O-Brite or Tun-O-Foam together with a caddy-size, refillable aerosol can (the Slim Jim).

The relative size of Chemtronics' large, medium and Slim Jim aerosol cans.

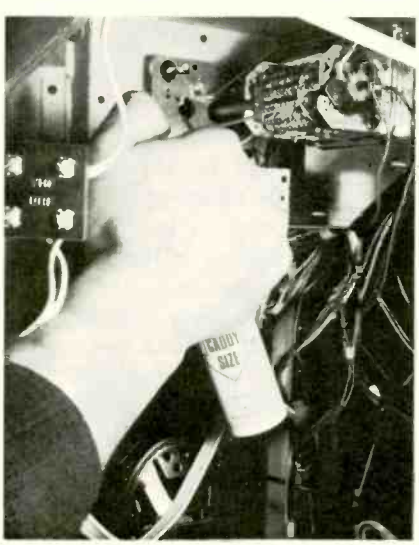
The Slim Jim is conveniently sized for carrying either in a pocket or tube caddy.

Using a mail-room scale, we found that the empty Slim Jim weighed only slightly more than 1½ oz.

To fill the Slim Jim, all that you need do is remove the spray heads from both it and the larger aerosol can, insert the stem of the Slim Jim into the larger can and press down for about 30 sec.

With our scale we noted that when filled with the Tun-O-Brite we were able to increase the weight of the Slim Jim by about 5 oz, while when filled with the Tun-O-Wash the weight of the can increased about 4 oz.

Even with the valve wide open, we found that it took us over 40 sec to completely discharge the Tun-O-Brite from the Slim Jim, it taking over 30 sec to completely discharge the Tun-O-Wash. (Except for this investigation, we consider these chemicals too valuable to have otherwise been wasted in this box of shredded paper.)



Being a smaller aerosol can, the Slim Jim can be used in otherwise hard-to-reach locations.

stem of the Slim Jim into the larger can and press down for about 30 sec. The Slim Jim is then filled, and can be filled and refilled again and again. With our scale we noted that when filled with the Tun-O-Brite we were able to increase the weight of the can by about 5 oz, while when filled with the Tun-O-Wash the weight of the can increased about 4 oz. And with the few initial fillings from the larger aerosol cans we found that it took over 40 sec to completely discharge the Tun-O-Brite from the Slim Jim, it taking over 30 sec to completely discharge the Tun-O-Wash (with the valve wide open). This relatively rapid rate of discharge should facilitate effective tuner servicing by providing the pressure needed to blast loose corrosion and dirt. Nevertheless, Chemtronics estimates that you will be able to service 6 to 10 tuners with every full charge.

We recommend that 40 sec be allowed for the second refill from the same new large aerosol can, 50 sec for the third refill and 60 sec for the fourth refill. Although additional refills can be obtained (even if the Slim Jim is fully discharged between refills, as we did), we feel that it would be more practical to then restrict the use of the larger can to bench work—where it can still be used to clean many more tuners—obtaining additional Slim Jim refills from another new large aerosol can. However, if you are a technician who instead prefers to recharge the Slim Jim every evening, having maybe discharged only half its contents, then you might find it practical to obtain seven refills before restricting the larger can to bench use. (There is still a significant amount of aerosol left in the large can; but with additional charges from the same can, we find that the Slim Jim may not be quite fully charged.)

We were very pleased with the results of our experiments with the Slim Jim and feel that it is an excellent addition to Chemtronics' product line. We only hope that they decide to sell the Slim Jim separately so that several in-the-field technicians will be able to recharge their servicing chemical supply from but a single large aerosol can. ■

TEST INSTRUMENT REPORT

RCA's WR-515A Color Bar Generator

Simplifies both alignment and servicing

RCA's Type WR-515A Master Chro-Bar IC Color Bar Generator/Signalyst. For more details, circle 900 on the Reader Service Card.

■ RCA has developed a Master Chro-Bar IC Color Bar Generator/Signalyst that is designed to be used for aligning color-TV sets, servicing TV-set circuitry and maintaining MATV systems. The instrument is said to utilize integrated circuits throughout to provide solid, stable patterns over a temperature range of 5°F to 145°F without flickering or weaving. All signals are derived from crystal-controlled oscillators and the instrument has no counter-alignment controls that require adjustment.

RCA indicates that the instrument provides the test signals required for adjusting convergence, color-phasing, gray-scale tracking, purity and linearity of color-TV sets. Patterns include color bars, dots, crosshatch, horizontal and vertical lines, blank raster and an output called "Superpulse." This latter output signal provides a white rectangle, which is horizontally centered on the screen.

Manufacturer specifications include many applications for the Superpulse—drive and screen control adjustments; plus checking for smearing, ringing and improper video peaking.

The color-bar pattern provides 10 bars simultaneously, including R−Y, B−Y, G−Y, I and Q signals, spaced at 30° phase intervals. The pattern is for use in checking color phase and matrixing circuits, and adjusting automatic frequency phase controls (AFPC). Narrow brightness pulses are added at the edges of each color bar to aid in checking the "fit" or registration of the brightness and color signals.

A special color-bar "mark" function places a brightness line on the third, sixth and ninth bars (red, blue and bluish green) for identification of these bars in a color-bar pattern. This is said to be extremely helpful for performing AFPC alignment in servicing overscanned TV sets and in setting the TINT control.

The output for all test signals is provided not only at RF but also at IF and video frequencies. The instrument can therefore be used in stage-by-stage TV-set troubleshooting. By applying the appropriate signals at various points throughout the TV set, the defective stage can be localized or isolated for more efficient servicing.

The instrument is housed in a metal case with a rugged aluminum panel and carrying handle. Pushbuttons are used for all switch functions. The instrument measures 4 in. by 10 in. by 8 in. and weighs approximately 6 lb.

Accessories supplied include a shielded output cable, a 300Ω matching transformer for RF output, and a direct output accessory for IF and video applications. Leads are also provided for connection to picture tube control grids for use with the grid-shorting switches. A bracket is located at the rear of the instrument for convenient storage of the test leads.

General Electric introduces a new idea in tv communications.

When we set out to make GE tv the sets you like to service, we recognized the importance of establishing good communications with independent service technicians. One of the ways we're doing this is with our quarterly newsletter, Television Service News. Right on the front of each issue of TSN is a list of local telephone numbers of GE people to call for information you need in a hurry. Things like: parts information; placing parts orders; technical help; service manuals; and credit information. Inside of every issue of TSN, we're putting the kind of advance news you need to more easily service GE b & w and color models. If your tv service company is not receiving GE's Television Service News, send us this coupon and we'll see that you get it.

"Dutch" Meyer
General Electric Company • TRPD
1 College Blvd. • Portsmouth, Va. 23705
Please send me GE's Television Service News.

Name_____

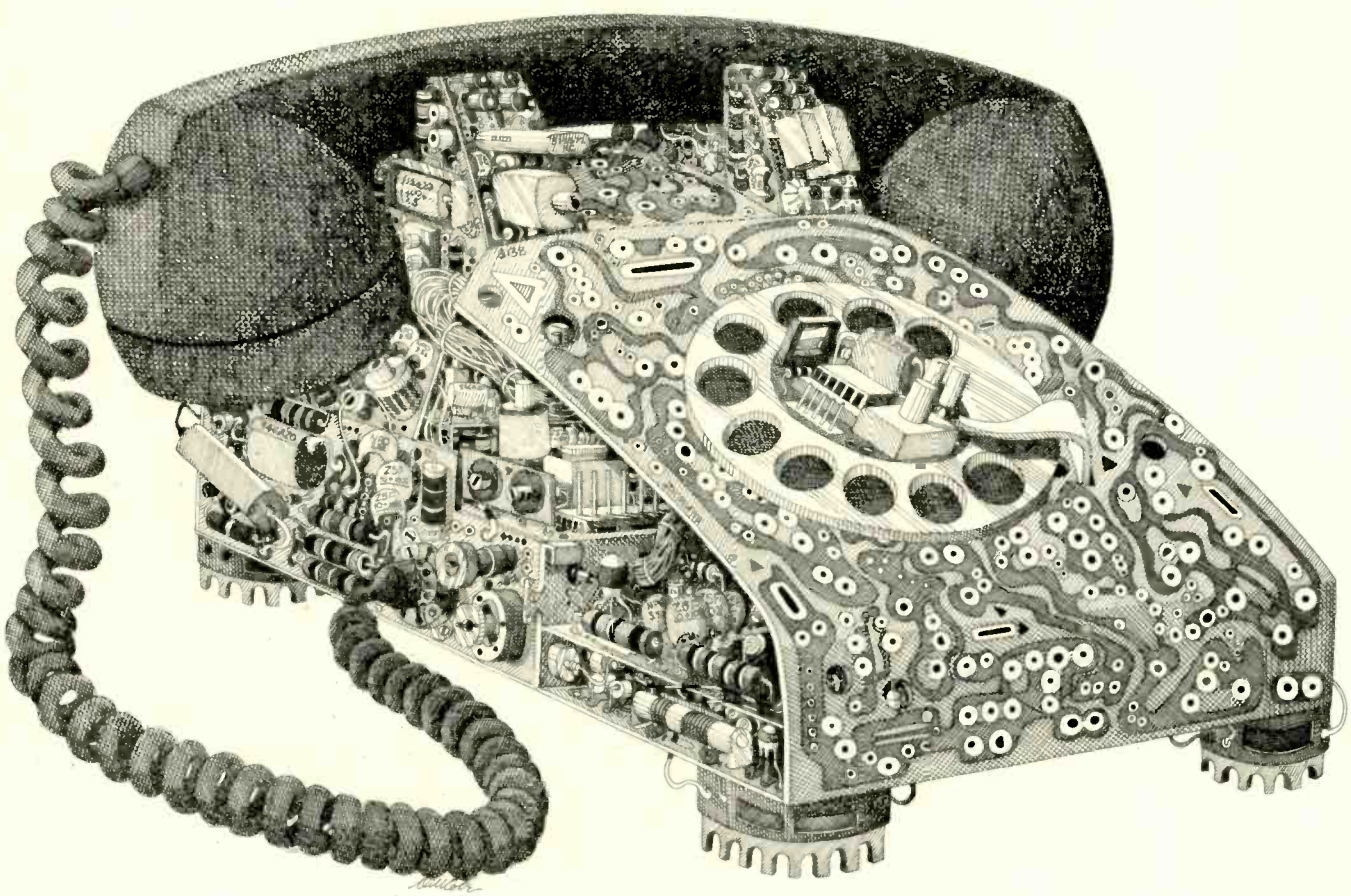
Service Company_____

Address_____

City_____ State_____ Zip_____

We build every television as if we were going to use it ourselves.

GENERAL ELECTRIC



Satellite TV ...Coming Down to Earth!

by Isaac S. Blonder

The advent of radio in the '20s and the introduction of commercial television in the '40s have been major milestones in the growth of electronic communications. Now, we are on the eve of another and even greater step forward in the development of this vital industry. The birth of satellite telecommunications. Electronic communications will literally undergo a global explosion which will affect each of us and our way of life. Let us explore the how, why and when of satellite TV and see what direct effect its onslaught will have on those of us in and out of the communications field.

■ Of all the potential satellite orbits suitable for the distribution of television, the geo-stationary orbit will be the most popular. In this mode, a satellite is held in a stationary position relative to the earth's surface at an altitude of 22,300 miles above the equator. Since at this altitude the centrifugal and centripetal (gravitational) forces acting on the satellite are balanced, only small gas jets are needed to maintain its position—enabling high-gain antennas to be directed toward a single spot on the surface below.

Three satellites in a geo-stationary orbit could provide communications for the entire earth. Or, satellites may be spaced as close as 5° apart and utilize the same frequencies without causing interference. If they use differing frequencies, these satellites may be positioned in the same relative location. Thus, hundreds of satellites, operating between the UHF band and up into the Gigahertz range, may be employed to cover the needs of every conceivable communications media without interference.

We have already seen the dramatic results of such geo-stationary satellites in the relaying of the moon shots, international sporting events, and important international political affairs. The quality of such transmission has proven to be superior to the ground-based microwave system since there is only one hop to introduce distortion.

Although the United States has the most advanced technology in the world for satellite TV distribution, it is also unique in its ability to deliver three television networks to virtually 95 percent of its population with excellent quality through conventional ground-based techniques. Thus, the interest in the potentials of domestic TV satellites has not been as great as in the rest of the world, including Europe, where such comprehensive ground-based microwave networks are nonexistent.

In June 1971, a world administrative radio conference for space telecommunications was convened in Geneva. There standards and frequencies were established for the use of geo-stationary satellites to distribute TV. Prior to this conference, the 4MHz to 6MHz band was utilized for the down and up links to satellites. Since these frequencies are also used for ground-based microwave communications, the strength of the satellite transmitters had to be limited to avoid interference.

The most exciting new regulations adopted concerned the use of the 12GHz to 13GHz band. Since there are virtually no domestic services on these frequencies that could be interfered with, the satellite transmitters need not be limited in their power output and could deliver usable signals directly to the viewer. It now appears likely that in the European area, at least, an attempt will soon be made to distribute TV from satellites directly to the viewer at his TV set at 13GHz, with individual home receivers employing a 2-ft dish antenna and integrated electronics costing less than $200!

The FCC has been conducting an inquiry in recent months on the subject of domestic satellite systems for use within the United States and its territories. These would be privately owned systems, designed entirely for use by the American consumer—either for business or entertainment. To date, eight firms have applied for licensing of domestic satellite systems—covering a variety of proposed services including TV networking, computer links, picture-phone, educational TV, CATV, and business facsimile transmission. The firms are ATT/Comsat, Comsat, Fairchild Hiller Corp., Hughes Aircraft, MCI Lockheed Satellite Corp., RCA, Western Telecommunications, and Western Union. All have submitted detailed, technically feasible, well financed programs. Although only some are competing for overlapping segments of a number of markets, all are competing openly with no guarantees of receiving large monopolistic segments of the communications field.

The largest potential customer for a communications satellite system will be the TV networks, now spending in excess of $55 million annually for their connections to the Bell Telephone System. Long-line telephone users are an important secondary market for a satellite system, and AT&T fully intends to meet the demands of this market through the use of its own satellites. A spokesman for AT&T recently mentioned the prospect of a 50¢ phone call from any point within the United States to any other domestic location once their system is operational.

Isaac "Ike" Blonder has an extensive history of involvement in the telecommunications field. As co-founder and chairman of the board of Blonder-Tongue Laboratories, Inc.—manufacturer of a complete range of American-made antennas, rotators, UHF converters, MATV and CATV equipment—he has helped pioneer many new developments in the area of antenna design and signal conditioning. His current responsibilities as president of Com-Cable TV, Inc., a CATV company having more than 5500 subscribers, and president of the B-T Broadcasting Co., Channel 68, Newark, N.J., give him a greater insight into the problems and future of these dynamic segments of the communications market.

Educational TV, although presently inadequately financed, may someday become a major user of satellite TV.

National and international business communications, including data transmission and collection, will be appreciably accelerated—communications costs being reduced by the ease with which signals can be transmitted on a wide-band basis around the globe.

Finally, the burgeoning CATV industry, researching for new programming strength to enable it to move into the urban areas, is already planning to establish its own entertainment networks through the use of satellite communications.

While the only direct-to-the-home system that has been proposed thus far is for the European market, Canada has apparently performed a technological coup over its southern neighbor with the development of a combined satellite/ground-base system due to be operational in 1973. Designated, Telesat, the system operates at up frequencies of 6GHz and down frequencies of 4GHz. The systems spacecraft, called Annex One, will be lifted into space orbit early in 1973 by a Thor Delta rocket. By the end of the year there will be 36 earth stations receiving the satellite TV signals and rebroadcasting them by conventional ground-based UHF and VHF transmitter. There will be 12 TV channels available.

Since the satellite transmitting beam width of 3½° by 7½° must approach the earth at a relatively low angle to strike the Canadian territory from an equatorial satellite, the signals will also be present in the United States. No official government policy has been set regarding the reception of the Canadian TV signals by U.S. ground-based satellite receivers. Numerous conferences have been held to delineate copyright for such airborne channels, but no decision has been announced. It remains a distinct possibility that these Canadian TV programs could be made available through the use of satellite receivers at CATV headends within the United States.

If we make the reasonable assumption that anyone may purchase his own TV satellite receiver and the signal is not sold to a second party in violation of the copyright laws, then the TV electronic technician will truly reach the pot of gold at the end of the TV rainbow! The projected cost of $200 for a satellite receiver is certainly within the reach of a large segment of the population. Even with an initial introductory price that might reach $500, the market will be broad and the price will be more than reasonable to those requiring resolution of the reception problems in any or all of the following areas:

- True fringe areas not served by cable TV.
- Islands and valleys.
- Hotels and motels in poor reception conditions—even in the heart of a city!
- Shipboard reception.
- Schools.
- For those wanting foreign programming.

The potential equipment market will be more than enough to replace the antenna system business now being lost to CATV.

Perhaps far, far in the future lies one of the most exciting potentials of satellite telecommunications of all—mail delivery through satellite transmission. A recent General Electric study came up with the astonishing figures for a soft copy delivery of a standard message from the terminal to the home at 1¢, and even on a hard copy basis, no more than 10¢. The GE proposal employed the use of store and forward computer centers, which could deliver via a standard TV cable system approximately 40 percent of our present mail with only a few minutes delay.

Thus far, we have only considered the utilization of domestic satellite systems in Western Europe, Canada and the United States. There is reason to believe that Asian and African nations will place a high priority on TV and communications services to advance the educational development of their people. Satellite systems will play a very important role in the future of these new and developing nations.

The Soviet Union's views on satellite TV are quite explicit. Not having developed a viable geo-stationary satellite, they use a system known as the Molnyia Communications Satellite, which has an elliptical orbit with a circling time of around 12 hours and an apogee of 4000 kilometers (approximately 2500 miles). The receiving station must use a tracking mount, and of course, is blacked out during the time the satellite is circling the other side of the earth. Perhaps this accounts for the article, "Law and Order in Space, a Vital Necessity" by G. P. Zukov, 1966. In this paper, the Soviet Union proposes that a clause be included in international space agreements that activities in outer space be conducted only by smaller states. This, the paper says, will prevent the "nefarious" plans of establishing U.S. rule in space characterized by "imperialist propaganda such as the notorious freedom of press broadcast by the Voice of America and Radio Free Europe."

Apparently, politics and satellites are inseparable! ■

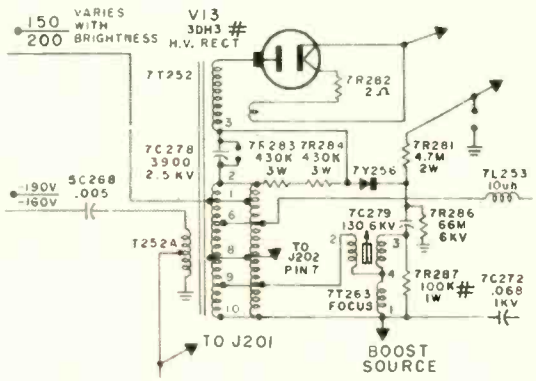
COLORFAX

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

GENERAL ELECTRIC

Color-TV Chassis C1/L1—Blooming—Excessive High Voltage and Poor Color Sync

To correct this problem, check for a cold solder joint at the ground end of the high-voltage pulse winding. (The pulse winding is located on the high-voltage transformer



core at the rear of the high-voltage cage.) The ground wire is bare and is connected to a lug on the inside of the high-voltage can, forward and slightly below the pulse winding.

RCA SALES CORPORATION

Color-TV Chassis CTC50 Series—Chassis-to-Test Fixture Adaptation

The CTC50 chassis can be operated with the CTC38/39 test fixture by modifying the existing extension cables. These modifications compensate for differences in the yoke assembly and the picture-tube focus requirements. It was generally felt that the convergence assembly is not absolutely necessary for bench servicing and is therefore omitted from the adaptation procedure.

Yoke Extension Cable Modification

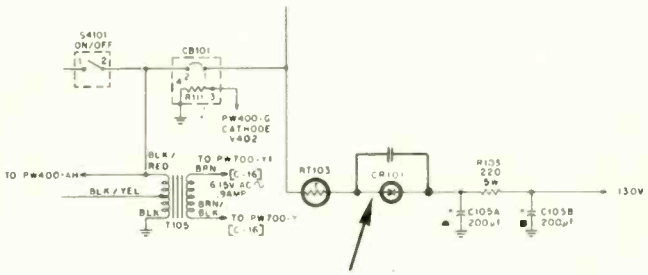
The deflecting yoke extension cable, No. 221-X-1, is used in the following modification procedures. However, the existing CTC38 color-TV chassis yoke extension cables can be modified in the same manner. (The modified extension cable cannot be used with the CTC38 or 39 chassis). No change is required to the chassis yoke socket or the test fixture yoke plug.

- Remove the connecting wires from Pins 3 and 7 of the extension cable plug and socket.
- Cutoff Pins 3 and 7 of the extension cable plug.
- Leaving a 2-in. length of wire at Lug 8 of the socket, cut the Pin 8 connecting wire.
- Connect the loose end of the wire on Pin 8 of the plug to Pin 1 of the plug.
- Connect the loose end of the wire on Lug 8 of the socket to Lug 7 of the socket.

The connecting wires from Pins 1, 2, 4, 5 and 6 remain as originally connected between plug and socket. To make this adaptation, it is necessary to eliminate the pin cushion circuitry, resulting in no pin cushion correction when using the test fixture.

Color-TV Chassis CTC51 Series—Diode CR101 Protection

Premature failure of the 130v B+ supply diode (CR101) in early production TV sets using this chassis may in some instances be the result of a picture tube arc damaging the



Parallel replacement diode with a 680pf, 1kv capacitor.

diode. To prevent such failures, make certain a 680pf, 1kv capacitor, Stock No. 113165, is connected in parallel with the diode replacement.

MAGNAVOX

Color-TV Models 7322,24,26—Elimination of Static Electricity Build-Up on Controls

In early production units, the metal band around the picture tube does not contact the picture tube ground circuit. Because of this, a static electrical charge can accumulate on the metallic trim on the mask and control knobs. This static charge can be eliminated by grounding the picture tube band.

A simple method of grounding the picture tube band consists of inserting a spring clip, Magnavox Part No. 171192-1, between the picture tube and the metal support rail, which is located between the upper and lower picture tube mounting brackets on the tuner side of the tube. The clip must be so oriented that its straight, longest side contacts the picture tube metal band and the clip portion fits over the edge of the support rail.

SPRING CLIP

The spring clip can be inserted without removing any hardware. At the area of the lower mounting bracket, near the speaker, work the straight, longest side of the clip under the edge of the purity shield.

Before pressing the clip into place, move it toward the center of the support rail. Then, press the clip portion over the edge of the support rail, fully seating the clip; and, using a screwdriver or other sturdy tool, slide the clip another inch or so toward the center of the support rail. This sliding of the clip causes the clip to score the metal finish of both the support rail and the picture tube band, providing a good electrical contact on both areas.

In late production units, the band is grounded during production. Whether or not the band is grounded in any particular instrument can be determined by measuring the resistance between the picture tube band and the ground circuit.

The spring clips, Part No. 171192-1, are available at no charge from your district service center.

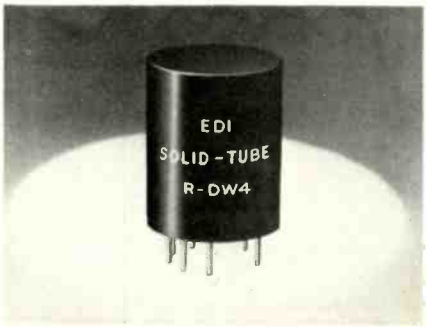
NEW PRODUCTS

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

DAMPER DIODE 703

For replacement of damper tube in color-TV sets

The R-DW4 solid tube is a new solid-state damper diode for direct, plug-in replacement of damper tubes



in color-TV sets. Peak inverse voltage of the diode is 6kv, peak repetitive forward current is 1300ma and average forward current is 250ma. Voltage drop is 10v at 350ma. Electronic Devices, Inc.

COMPACT DRIVER SET 704

See-through case has positive snap-lock

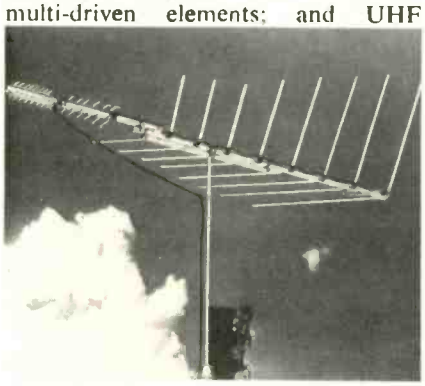
The new PS-140 all-purpose screwdriver/nutdriver set consists of an

assortment of color-coded midget tools and a piggyback torque amplifier handle which enlarges the gripping surface, extends reach and increases driving power. Also featured is a new see-through container with a positive snap-lock. Optically clear for easy set identification, the injection-molded cover of the case is said to stay closed even when tossed into a tool box, while opening quickly with slight finger pressure on the sides of the base, and is designed to hold tools upright on a bench for easy selection. Contents of the set includes drivers for No. 0, 1 and 2 Phillips screws; 3/32-in., ⅛-in, 3/16-in. and ¼-in. slotted screws; and ¼-in., 5/16 and ⅜-in. hex nuts. Xcelite, Inc.

ANTENNA 705

Features super-swept V element system

The Colorfinder antenna features a super-swept V element system for stronger signal pick-up and superior transfer. Additional features include new heavy-duty square double booms for increased strength and rigidity; an attractive new bonded gold acrylic finish that resists weather, rust and corrosion; new low-silhouette cradle mount for superior wind resistance; multi-driven elements; and UHF



drive, for stronger UHF channel performance. Gavin Electronics, Inc., Div. of Antennacraft.

DESOLDERING TOOL 706

Lightweight and slim for ease of handling

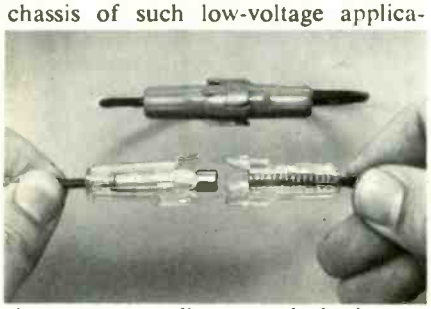
A new desoldering tool called Deluxe Soldavac has been developed. Molten solder is quickly removed from solder joints by a thumb release of the

high-capacity, spring-loaded plunger. The low inertia plunger and shaft is fully enclosed to prevent contact with the user. The barrel is molded from high impact clear cycolac for quick inspection of the plunger and solder trap chamber. The barrel can be removed from the main housing by a disconnect bayonet lock for plunger cleaning. Cost: $7.95. Edsyn Inc.

IN-LINE/PANEL MOUNTED FUSEHOLDER 707

Has twist lock protection for electronics applications

An in-line fuseholder designed with a twist lock permits rapid opening and positive closing of the holder for easy fuse extraction and replacement. Approximately 2 3/16-in. long by 7/16-in. diameter, the fuseholder is made for holding a fuse in a cable or in the chassis of such low-voltage applica-

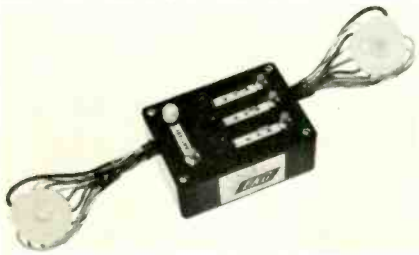


tions as auto radios, tape deck players, stereo speaker systems and communications equipment. The Model No. 155100 fuseholder is molded in seven basic colors plus transparent and can be adapted to any circuit color coding desired. The transparent fuseholder lets the user readily see the fuse. For fixed panel mount installations, the fuseholder is available with a spring type lock nut for easy mounting. A standard catalogued version of the fuseholder with twist lock consists of a two-part thermo-plastic molded fuseholder, plus an 8-in. loop of 14-gauge vinyl-cover lead wire. Each end of the lead wire has a cold-headed rivet contact fastened firmly to it. Two different spring lengths are furnished to accommodate the different lengths of fuses. This universal in-line fuseholder will reportedly accept all 1½-in. by ½-in. fuses and the SFE range through 20a. Littelfuse, Inc.

COLOR TUBE TESTER 708

Predicts if rejuvenation will last for at least six months

A new test instrument, the EKG, reportedly predicts if a rejuvenated color tube will last for at least 6 months. The compact unit connects between the color tube and any standard CRT tester/rejuvenator. There are no dials to turn, switches to throw or meters to read. The EKG



automatically checks all three cathodes simultaneously and reportedly indicates in 60 sec whether the rejuvenation was good enough to provide at least 6 months additional operating life. Price: $39.95. EKU, Inc.

continued on page 70

NEW PRODUCTS . . .

continued from page 69

INSULATING SPRAY 709

Designed to prevent valve clogging

The No-Arc spray reportedly is a concentrated, red acrylic with special ingredients to prevent valve clogging. It is said to leave a tough, smooth, protective coating to restore insulation, and is also recommended for potting components as well as waterproofing and insulating circuit boards and exposed wiring. Price: $1.98 dealer net. Chemtronics, Inc.

DESOLDERING SYSTEM 710

Self-contained portable system incorporates pump

Identified as the Sodr-X-Traction system, the Model SX-230 is a self-contained, portable system that incorporates its own vacuum pump. It weighs only 12 lb and requires a single phase, 115v ac, 50 to 60Hz

supply. Controls on the front panel of the power source permit controlling the temperature to any desired level up to 1000°F. Solder joints are melted with a coaxial tubular tip. Then, the foot pedal, connected directly to the power source, can be depressed to provide an instantaneous continuous vacuum. The continuous vacuum removes the molten solder and then cools the solder joint area to prevent the resweating of component leads to hole and pad areas. Price: $249.00. Pace Inc.

DEALER SHOWCASE

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

CONTINUOUS-LOOP CASSETTE 711

Repeats same message at timed intervals

The six-minute continuous-loop cassette enables users to repeat the same message at planned intervals. Among applications for the continuous-loop cassettes are alarm systems, point-of-purchase messages, in-store advertising, telephone answering, control devices and sleep learning. Norelco.

14-IN. PORTABLE TV 712

Has solid-state VHF remote control

Now changing channels across most rooms in the average home is made easier by the use of a solid-state VHF remote control. One flick of the button changes channels and even turns the set on and off in this 14-in. (measured diagonally) personal portable B/W-TV set. Other features of model AP406HW include: a pre-set button for both brightness and contrast, automatic circuitry that shuts OFF the set

when the station signal goes off the air, instant picture and sound, private listening earphones and the use of solid-state components. The cabinet is of high impact plastic with a walnut grain finish. Motorola.

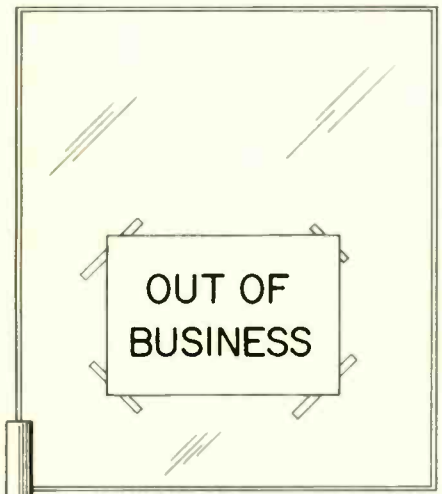
SPEAKER SYSTEM 713

Incorporates three-way linear suspension

The Model 25 speaker system is a three-way linear suspension system featuring a 14-in. woofer, a 2-in. hemispheric dome mid-range and a 1-in.

hemispheric dome tweeter. Reportedly the woofer cones are mold-shaped to produce optimum absorption characteristics. Specifications include: Frequency range—30Hz to 20kHz; maximum power handling capacity—60w; minimum amplifier power—10w rms per channel; impedance—8Ω; woofer free-air resonance frequency—19Hz; level controls—high and mid-range in five steps each ±2dB; and crossover

continued on next page



The only shop in town that didn't attend the joint convention.

Don't be the only one not to benefit from the first joint convention. NATESA will be working on an even bigger trade show, booths, etc. . . . than they had last year in Hot Springs. They will also sponsor the National Electronics Service Conference that you can take in along with the convention. NEA will be putting out an even bigger and better joint NATESA/NEA yearbook. They will also sponsor a a half-day business management school. ISCET will have all the technical seminars you or your technicians ever wanted. Even the Electronics Industry Council will meet. And ETA of Louisiana will have a Crawfish and Shrimp Fais Do Do that you will never forget.

DEALER SHOWCASE . . .

continued from page 71

frequencies—700Hz, 7kHz. The dimensions are 25½ by 14¾ by 11⅝-in. and the weight is 54½ lb. Price: $249.95. Mitsubishi International Corp.

6V TO 12V DC CONVERTER 714

Will step up a 6v dc source to 12v dc

The 6v to 12v dc converter is for use with vehicles having a 6v negative ground system. The converter will step up a 6v dc source to 12v dc for use with the newer electronic accessories

now available for the higher voltages. The converter reportedly can be used to supply 12v dc for powering AM/FM radios, auto stereos, tape deck equipment and CB communications equipment. Features are: 6a output (continuous), a switch and pilot light to insure that the converter is working, plus a power output of 72w. Solitron Devices, Inc.

8-TRACK TAPE PLAYER 715

Operates from 12v auto or boat battery

The CS-1050 automotive or marine cartridge player is said to have 16w of audio output, plus a switched bass booster circuit to provide a richer, more lifelike stereophonic reproduction of 8-track recorded tapes. Installation is simple, and all mounting

hardware is provided. The player operates from any 12v auto or boat battery, or other 12v dc source. It is equipped with a pushbutton channel selector coupled to a channel indicator. VOLUME, TONE and BALANCE controls are designed to adjust tonal output and intensity to user's preference. The size is 5¼ W by 2⅞ H by 6⅝ D. Suggested list price: $64.95. Hitachi Sales Corp. of America.

TECHNICAL LITERATURE

Phono and Tape Replacement Catalog

An updated line of replacement rubber drives and belts is detailed in the new cross-reference catalog. Included are thousands of possible replacement items—comprised of a variety of phono and recorder drive wheels and pulleys, pinch rollers, round rubber belts, square cross-section rubber belts, spring belts and fabric drive belts. The catalog, No. FR-135-W, contains an enlarged cross-reference section with replacement part numbers listed for equipment made by 194 manufacturers —both domestic and foreign. Special charts are included to help in choosing the proper size belt for unusual machine types not in the cross-reference listings. GC Electronics, 400 South Wyman St., Rockford, Ill. 61101.

Component Catalog

A 12-page two-color catalog is available which describes components, grid dip meters, transmatches and a new solid-state dipper. James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass. 02148.

Test Instrument Catalog

This 1972 catalog contains information on a full line of test instruments and repair services. Tucker Electronics Co., P.O. Box 1050, Garland, Texas 75040.

Product Folder

The Pf-45 is a presentation folder describing a complete line of snap-around volt-ohm-ammeters, master electrical kits, multitesters and accessories. A. W. Sperry Instruments Inc.

LETTERS . . .

continued from page 32

can be simplified to $X_C = \frac{1 \times 10^4}{\pi}$. *By referring to a set of tables that give a value for* $\frac{1}{\pi}$, *we can find that a more exact answer is 3183.09886183-7906715377675 (plus an unending listing of numbers)* Ω. *Yours is a very valid question which we should have clarified in the February issue.*

We will forward your other question directly to the ISCET, which will contact you shortly. Ed.

READERS SERVICE INDEX

ADVERTISER'S INDEX

101	Advanced Applied Electronics Co.	72
102	Arrow Fastener Co., Inc.	32
103	B&K Div., Dynascan Corp.	47
104	Blonder-Tongue Laboratories, Inc.	35-40
105	Book Club-Tab Books	56-59
106	Castle TV Tuner Service	2nd Cover
107	Centralab Distributor Products	74
108	Chemtronics, Inc.	29
109	Cornell Electronics Co.	69
110	CRC-Electrical Products Div. C. J. Webb, Inc.	69
111	Dictaphone	26
112	Edsyn	66
113	Eico Electronic Instruments Co., Inc.	66
114	Fordham Radio Supply Co., Inc.	68
115	Ford Marketing Corp.	46
116	GC Electronics Company	27
	General Electric Co. Tube Products Div.	21
	General Electric Co. TV Business Div.	63
138	Grantham School of Engineering	30
	GTE Sylvania, Electronic Components	55, 4th Cover
117	Heath Company, The	70
118	International Rectifier Corp.	73
119	Jensen Tools & Alloys	74
120	Keithley Instruments, Inc.	30
121	Lakeside Industries	69
122	LPS Research Labs, Inc.	67
123	Mountain West Alarm Supply Co.	74
124	North American Liquidators	74
125	Pennwood Numechron Co.	72
126	Perma-Power Company	68
127	Precision Tuner Service	31
128	Quietrole Co.	74
129	RCA Parts & Accessories	33
130	RMS Electronics, Inc.	72
131	South River Metal Products	67
132	Sprague Products Company	25
133	Systomation, Inc.	24
134	Triplett Corporation	3rd Cover
135	Tuner Service Corporation	19
136	TV Tech Aid	71
137	Workman Electronic Products, Inc.	72
	Zenith Radio Corporation	28

NEW PRODUCTS

700	TV Tuner Subber	34
701	Circuit Zaps	34
702	12V DC Power Supply	34
703	Damper Diode	68
704	Compact Driver Set	68
705	Antenna	68
706	Desoldering Tool	69
707	In-Line/Panel Mounted Fuseholder	69
708	Color Tube Tester	69
709	Insulating Spray	70
710	Desoldering System	70
711	Continuous-Loop Cassette	71
712	14-In. Portable TV	71
713	Speaker System	71
714	6V to 12V DC Converter	72
715	8-Track Tape Player	72

TEST INSTRUMENT

900	RCA's WR-515A Color Bar Generator	62

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

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 July 5, 1972. **4/72**

NAME_____ POSITION_____

COMPANY_____ STREET_____

CITY_____ STATE_____ ZIP CODE_____

GET MORE FACTS
NO POSTAGE NECESSARY

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

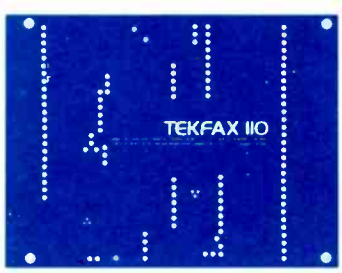
Reader Service Department
ELECTRONIC TECHNICIAN/DEALER
POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

Your own personal copy for only pennies per issue

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 TEKFAX 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
☐ Service/repair firm with some retail
☐ Service/repair firm with no retail
☐ Industrial electronics service firm
☐ Manufacturer
☐ 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 TEKFAX 110 as your free bonus.

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

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 July 5, 1972.

4/72

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

FIRST CLASS
PERMIT NO. 665
DULUTH, MINNESOTA

POSTAGE WILL BE PAID BY

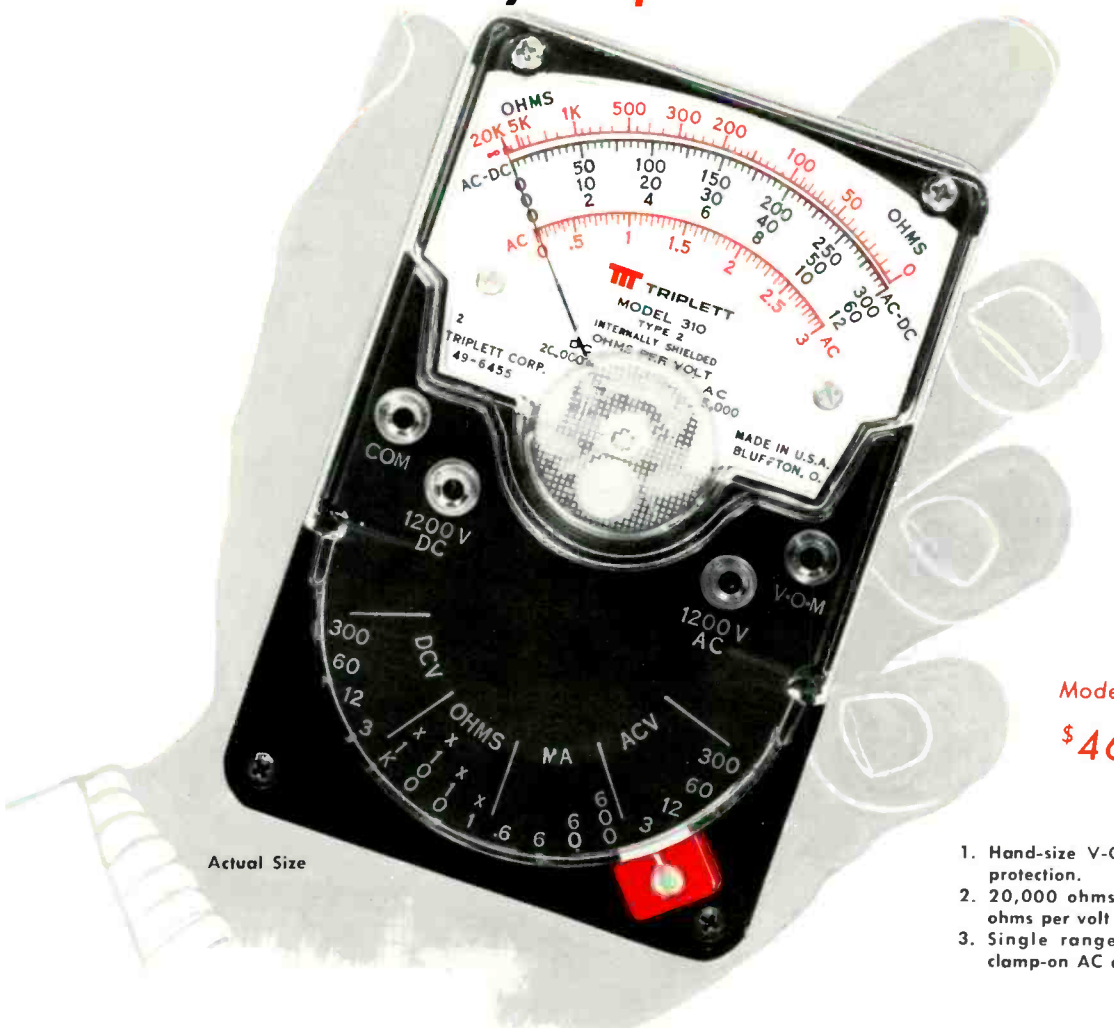
Circulation Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

Your own personal copy for only pennies per issue

If you want the World's most popular hand-sized V-O-M... Buy Triplett's 310



Actual Size

Model 310

$46

1. Hand-size V-O-M with diode overload protection.
2. 20,000 ohms per volt DC and 5,000 ohms per volt AC.
3. Single range switch; provision for clamp-on AC ammeter.

Handy by virtue of its operating convenience and its small size, Triplett's Model 310 V-O-M is no miniature when it comes to rugged capability on the job.

With outstanding readability, 18 ranges, 20,000 Ohms per Volt DC sensitivity (5,000 Ohms per Volt AC) and diode overload protection, the 310 can handle practically every electrical measurement you'll need to make. Accuracy on DC is 3%; 4% on AC. Most popular V-O-M of its type, Triplett's Model 310 is a real value at $46.

If you'd prefer the extra ruggedness of a suspension movement, the extra sensitivity of 15,000 Ohms per Volt on AC, the extra reliability of an enclosed range-switch and the extra convenience of a DC polarity-reversing switch, ask for Triplett's Model 310-C at $59.

Or, if you need the additional sensitivity of an FET V-O-M with 10 megohm DC input, the additional ruggedness of a suspension movement and the convenience of a polarity-reversing switch, insist on Triplett's Model 310-FET at $78.

See them all at your local Triplett distributor or, for a free demonstration, see him or your Triplett sales representative. 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 134 on Reader Service Card

You can make more money selling the Sylvania color bright 85XR.

And Olive Oyl will look just as beautiful.

Beauty is in the eye of the beholder.

And the beauty of the *color bright* 85XR is that its picture is in the same league as the more expensive "black surround" and "black matrix" color tubes.

Our bright phosphors make the *color bright* 85XR real competition for any picture tube on the market.

And our simplified manufacturing process lets us sell it to you at a lower price than any "black surround" tube.

The picture will look beautiful to your customer.

The profit will look beautiful in your cash register.

If that isn't beauty, what is?

GTE SYLVANIA