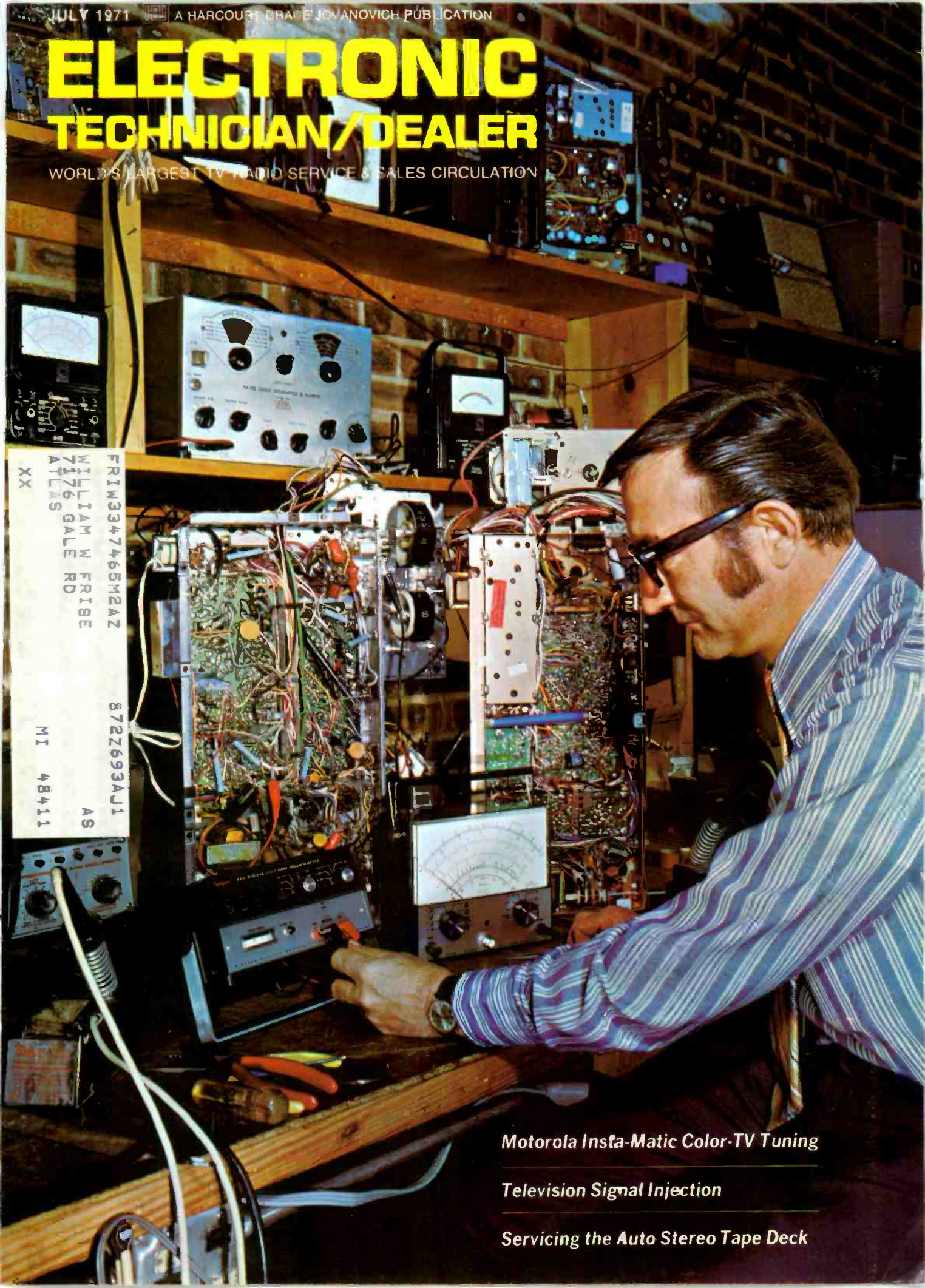
JULY 1971 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



Motorola Insta-Matic Color-TV Tuning

Television Signal Injection

Servicing the Auto Stereo Tape Deck

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

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

TUBE PRODUCTS DEPARTMENT • GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY 42301

GENERAL ELECTRIC

1369
SYLVANIA
TV Chassis
A09-1

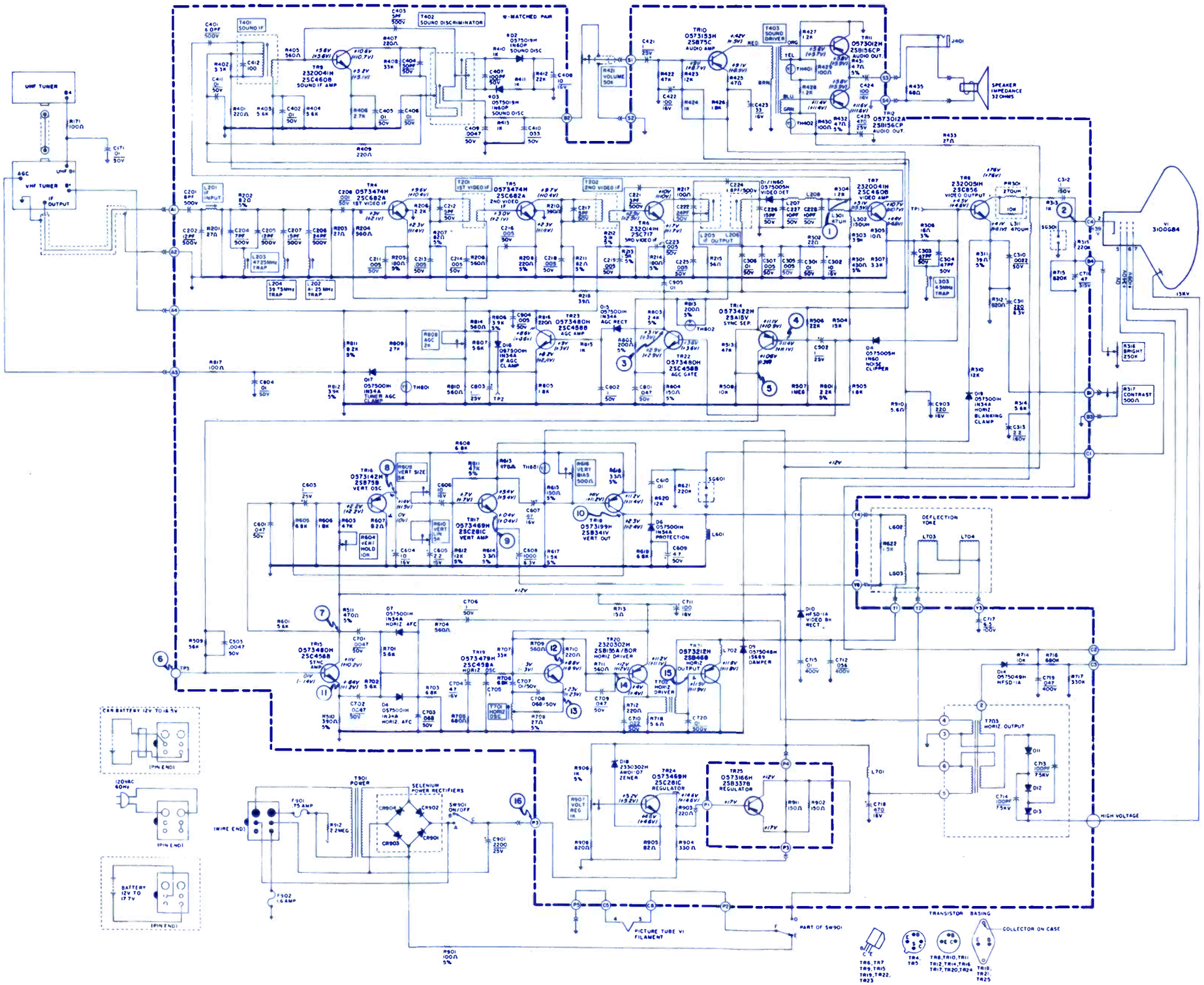
JULY • 1971

ELECTRONIC TECHNICIAN/DEALER TEKFAX

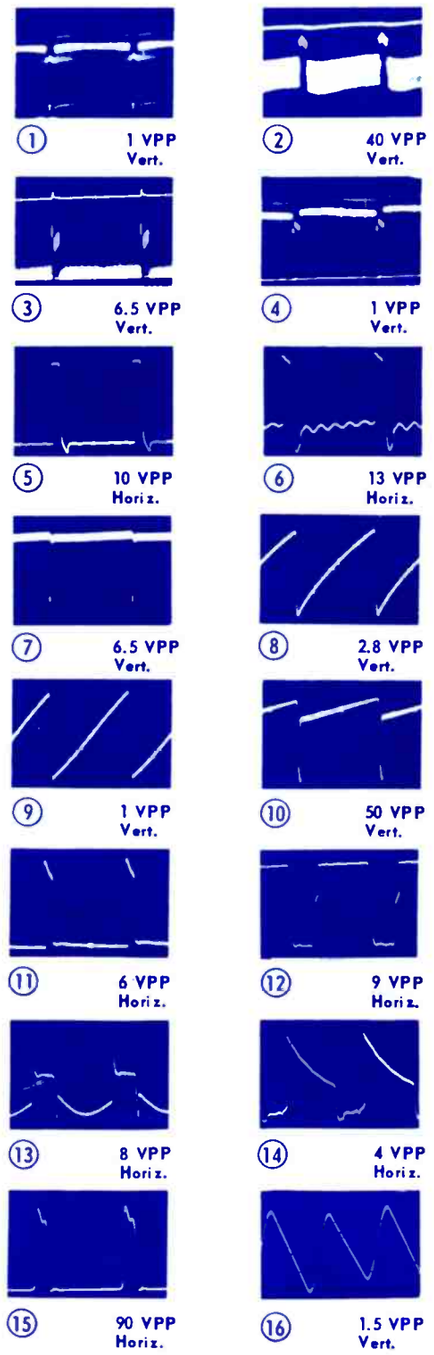
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL	DESCRIPTION	SYLVANIA PART NO.
L303	4.5MHz trap	2120194H
T701	Horiz oscillator xformer	2160231H
T702	horiz driver xformer	0390018H
T703	horiz output xformer	2430161H
T901	power xformer	2210025H
R316	250K bright control	0135668H
R317	500Ω contrast control	0155667H
R421	50K volume control	0153702H
R609	5K vert size control	0151179H
R610	5K vert lin control	0151179H
R616	500Ω vert bias control	0151083H
R808	2K AGC control	0151217H
R907	1K voltage adjust control	0151084H
F901	0.75a fuse	2750052H
R902	1.7a fuse	0591207H
TH401	thermistor	0576057H
TH402	thermistor	0576057H
TH601	thermistor	0576038H
TH801	thermistor	0576038H
TH802	thermistor	0576057H
	yoke - deflection	2440151
	UHF tuner	2420153H
	VHF	2420611H

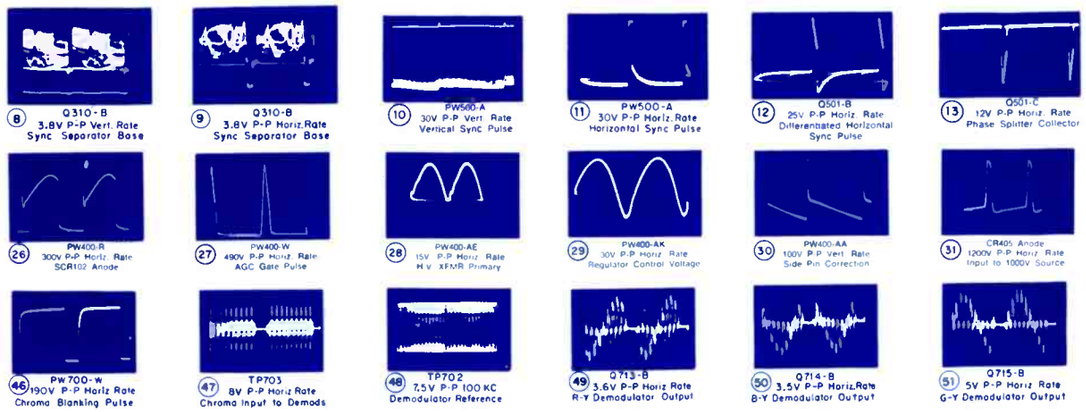
ELECTRONIC TECHNICIAN/DEALER is published monthly by HARCOURT BRACE JOVANOVICH PUBLICATIONS, INC., 1 East First St., Duluth, Minn. 55802. Subscription rates: One year $6, two years $10, three years $13, in the United States and Canada. Other countries: One year $15, two years $24, three years $30. Single 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.



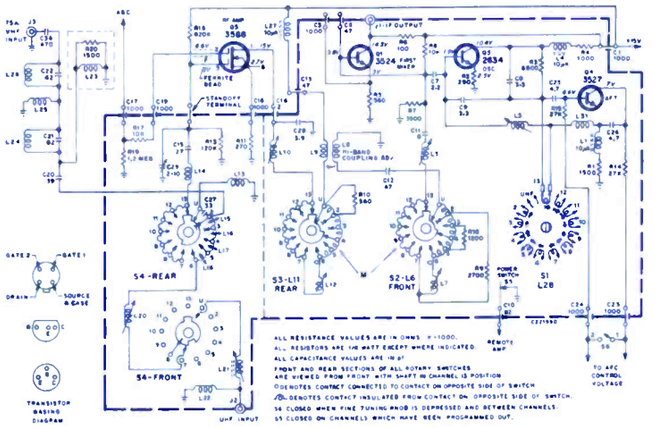
WAVEFORMS

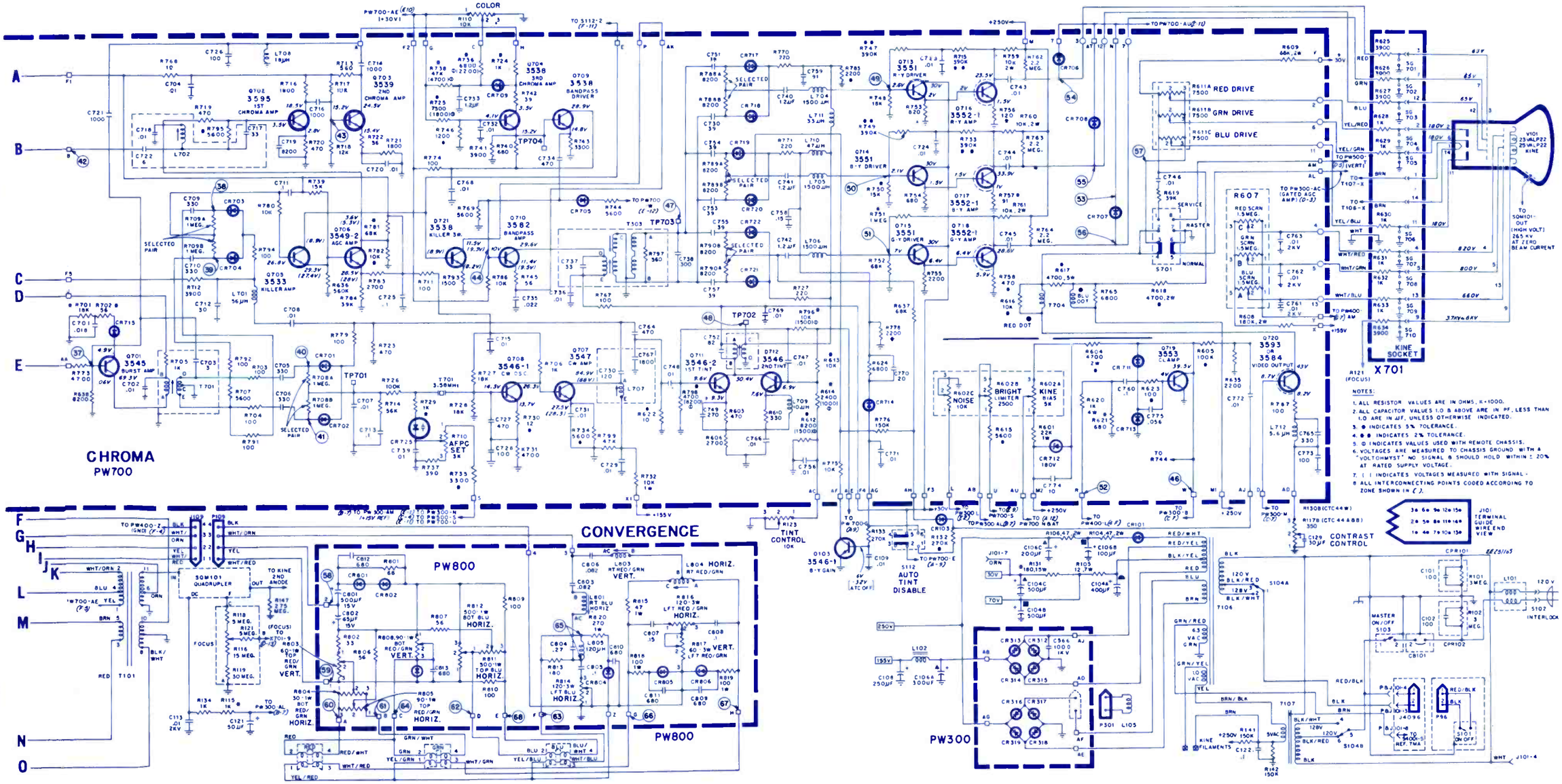


RCA SALES CORP.
Color TV Chassis
CTC 44 Series



SYMBOL	DESCRIPTION	RCA PART NO.
C106A	300 µf, 175v elect	129910
C106B	100 µf, 300v elect	129910
C106C	200 µf, 300v elect	129910
CB101	breaker–circuit protection	127157
L103	width coil	128126
L702	chroma take-off coil	126846
R109	horiz hold control (CTC 44A, B)	128128
R110	color control (CTC 44B)	131342
R110	color control (CTC 44W)	131635
R110	color control (CTC 44AA)	131343
R116	focus control	129925
R117	tone/contrast control (CTC 44A, B)	128127
R123	tint control (CTC 44A)	131341
R123	tint control (CTC 44B)	131339
R123	tint control (CTC 44W)	131649
R125	vert hold control (CTC 44A, B)	128130
R128	sharpness control (CTC 44A, B)	131344
R128	peaking control (CTC 44W)	131233
R129	horiz/tone control (CTC 44W)	131230
R130	vert/contrast control (CTC 44W)	131231
R415	hi voltage adjust control	126782
R517	horiz hold limiter control	129757
R547	vert height control	126772
R602	noise/bright limiter/bias control	130016
RT501	thermistor–50,000Ω cold	116109
RT502	thermistor–100,000Ω cold	126911
S103	master off switch	129895
T101	high voltage xformer	131327
T204	audio output xformer	131370
T105	vert output xformer	129785
T106	power xformer	131325
T301	sound input xformer	119618
T501	horiz osc xformer	126729
T701	burst xformer	126740
T702	tint xformer	130012
T703	bandpass xformer	126736





NOTES:
1. ALL RESISTOR VALUES ARE IN OHMS, K=1000.
2. ALL CAPACITOR VALUES 1.0 & ABOVE ARE IN PF, LESS THAN 1.0 ARE IN µF, UNLESS OTHERWISE INDICATED.
3. ● INDICATES 5% TOLERANCE.
4. ●● INDICATES 2% TOLERANCE.
5. ◇ INDICATES VALUES USED WITH REMOTE CHASSIS.
6. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHMYST" NO SIGNAL B+ SHOULD HOLD WITHIN ± 20% AT RATED SUPPLY VOLTAGE.
7. ( ) INDICATES VOLTAGES MEASURED WITH SIGNAL - B+ ALL INTERCONNECTING POINTS CODED ACCORDING TO ZONE SHOWN IN ( ).

1368

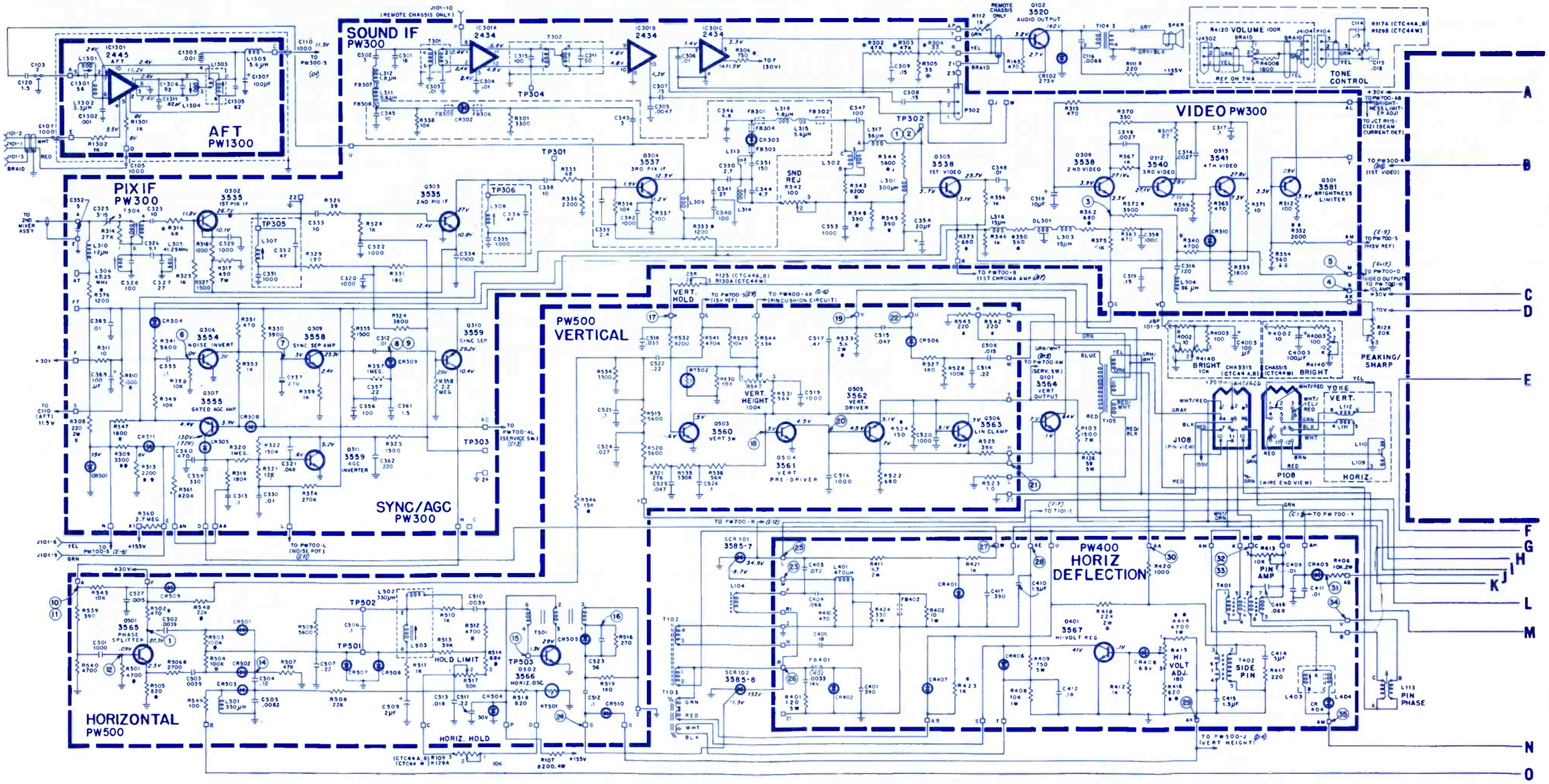
RCA SALES CORP.

Color TV Chassis
CTC 44 Series

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

JULY • 1971

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



PHILCO-FORD
Color TV Chassis
21KT41

I.F. & DETECTOR PANEL

CHROMA & SOUND PANEL

CONVERGENCE PANEL

INTEGRATED CIRCUIT BASINGS

TRANSISTOR BASINGS - BOTTOM VIEW

NOTES:
1. ALL VOLTAGES TAKEN WITH NO SIGNAL UNLESS OTHERWISE INDICATED.
2. ALL VOLTAGES TAKEN WITH B & K MODEL 175 VTVM WITH ALL CONTROLS SET FOR NORMAL.
3. RESISTANCES ARE MEASURED WITH YOKE AND CONVERGENCE PANEL DISCONNECTED.
* MATCHED PAIR OF RESISTORS.
MATCHED PAIR OF RESISTORS.
INDICATES COMPONENTS ON COPPER SIDE OF PANEL.

1367

PHILCO-FORD

Color TV Chassis
21KT41

JULY • 1971

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

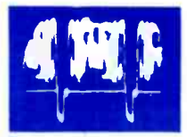
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

LINE VOLTAGE - 120 VAC
AIR SIGNAL - FOR MONOCHROME SIGNALS
COLOR BAR GEN. - B&K 1245 - FOR COLOR SIGNALS
ACTIVE FILTER AT 20 VDC

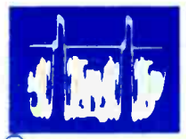
1. 2 VOLTS P/P, 60 HZ (MAX. CONTRAST) M17

2. 2 VOLTS P/P, 15,750 HZ (MAX. CONTRAST) M17

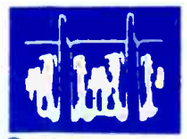
3. 4.2 VOLTS P/P, 15,750 HZ Q93 COLL.



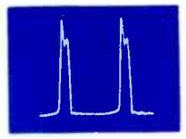
4. 3.8 VOLTS P/P, 15,750 HZ PIN 2 V92



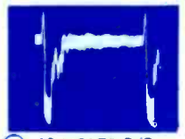
5. 80V. P/P. (cont. at point of start of sync compression) 15,750 HZ Pin 7 V92



6. 65V. P/P. (MIN. CON.) 15,750 HZ PIN 7 V92



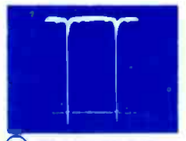
7. 40 VOLTS P/P, 15,750 HZ M10



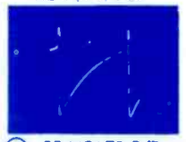
8. 13 VOLTS P/P, 15,750 HZ M11

9. 6.6 VOLTS P/P, 15,750 HZ BASE OF Q41

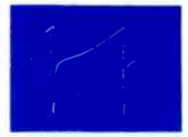
10. 50 VOLTS P/P, 15,750 HZ M49



11. 50 VOLTS P/P, 60 HZ M49

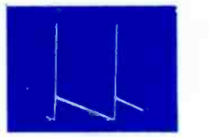


12. 85 VOLTS P/P, 60 HZ PIN 10 V41



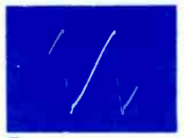
13. 110 VOLTS P/P, 60 HZ PIN 2,6,7 V41

14. 10 VOLTS P/P, 60 HZ PIN 9 V41

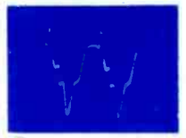


15. 1KV VOLTS P/P, 60 HZ (SPIKE) 200 VOLTS P/P, 60 HZ (SAWTOOTH) M46, OR PIN 4 V41

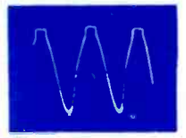
16. 12 VOLTS P/P, 15,750 HZ D41, D42



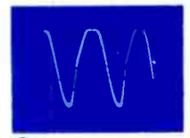
17. 16 VOLTS P/P, 15,750 HZ D41 TOP END



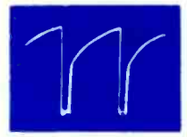
18. 6 VOLTS P/P, 15,750 HZ PIN 9 V42



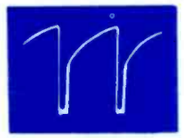
19. 45 VOLTS P/P, 15,750 HZ PIN 1 V42



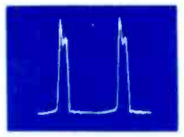
20. 150 VOLTS P/P, 15,750 HZ PIN 2 V42



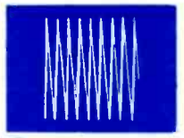
21. 200 VOLTS P/P, 15,750 HZ PIN 6 V42



22. 200 VOLTS P/P, 15,750 HZ M61

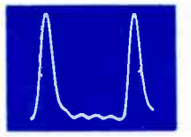


23. 15,750 HZ LOOSE COUPLED V200 PLATE

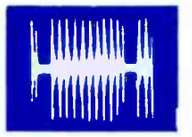


24. 4.0 VOLTS P/P, 3.58 MHZ CR91, D98, R124

25. 0.1 VOLTS P/P, ± .05 15,750 HZ Q96 BASE



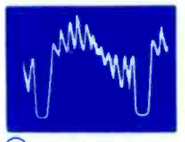
26. 5.5 VOLTS P/P, 15,750 HZ M103



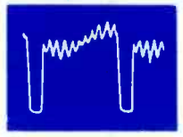
27. .3 VOLTS P/P, 15,750 HZ Q102 BASE R150, R151

28. 7 VOLTS P/P, 15,750 HZ Q100 COLL.

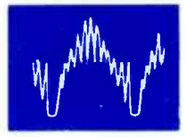
29. 8.5 VOLTS P/P, 15,750 HZ Q101 COLL.



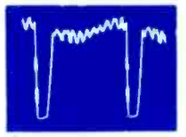
30. 45 VOLTS P/P, (CHROMA) 70 V P/P, (SYNC) 15,750 HZ M126



31. 17 VOLTS P/P, (CHROMA) 70 V. P/P. (SYNC) M125

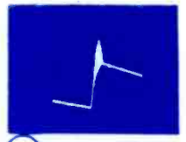


32. 50 VOLTS P/P, (CHROMA) 70 V. P/P. (SYNC) M113



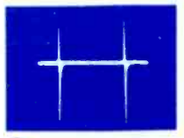
33. 2 VOLTS P/P, (CHROMA) 25 V. P/P. (SYNC) R160, R173 PIN 7 V91

34. 0.7 VOLTS P/P, 15,750 HZ Q95 EMIT.

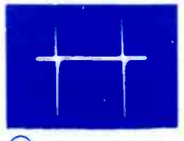


34A. EXPLODED VIEW OF BURST OF VIEW 34

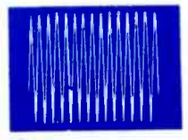
35. 70 VOLTS P/P, 15,750 HZ Q95 COLL.



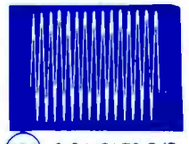
36. 12 VOLTS P/P, 15,750 HZ PIN 5 L95



37. 12 VOLTS P/P, 15,750 HZ PIN 4 L95



38. 6 VOLTS P/P, 3.58 MHZ D93, D94



38A. 0.8 VOLTS P/P, 3.58 MHZ PIN 3 IC91

38B. 16 VOLTS P/P, 3.58 MHZ PIN 7 IC91

39. 1.6 VOLTS P/P, 3.58 MHZ M107

40. 1.0 VOLTS P/P, 3.58 MHZ PIN 4 L97 OR M108

41. 1.0 VOLTS P/P, 3.58 MHZ L98-R139

42. .55 VOLTS P/P, 60 HZ Q97 COLL.

42A. 0.85 VOLTS P/P, 60 HZ M102

43. 12 VOLTS P/P, 15,750 HZ Q103 BASE

44. 3.5 VOLTS P/P, 17,500 HZ Q103 EMIT.

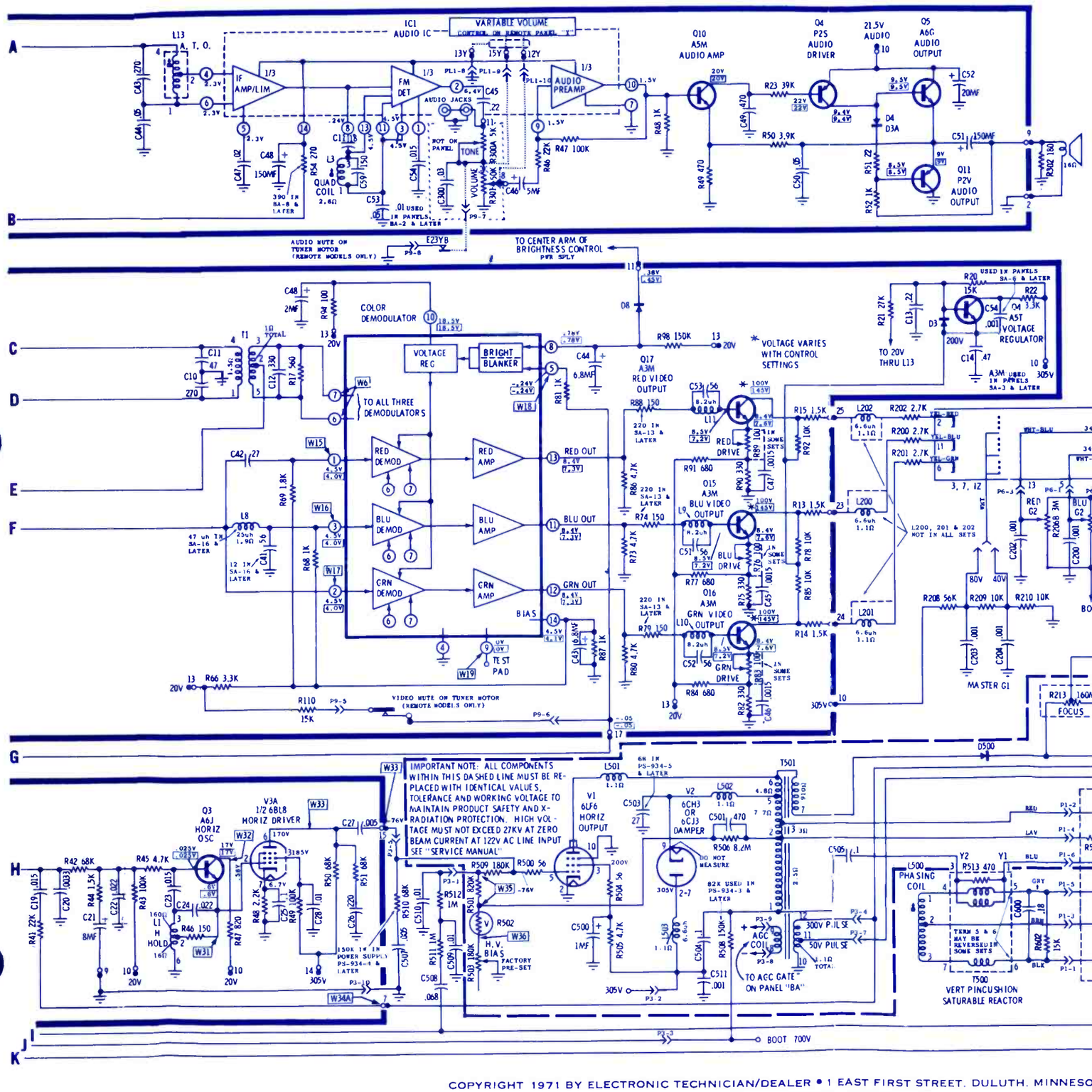
45. 90 VOLTS P/P, 15,750 HZ, CONT SET JUST BELOW POINT OF SYNC COMPRESSION M123

46. 30 VOLTS P/P, 15,750 HZ Q5 COLL.

47. 660 VOLTS P/P, 15,750 HZ M48A

48. 420 VOLTS P/P, 15,750 HZ M48

MOTOROLA
Color TV Chassis
TS-934



IMPORTANT NOTES

PANEL DESCRIPTION & COMPONENT IDENTIFICATION. EACH PANEL IS ASSIGNED A LETTER DESIGNATION (i.e., BA) WHICH IDENTIFIES THE PANEL. SEE CHART BELOW.

PANEL CODING	PANEL FUNCTION	PANEL CODING	PANEL FUNCTION
BA	IF AUDIO	KA	AFC (AFT)
CA	COLOR VIDEO WITH INSTA MATIC PRESET		
DA	DEFLECTION	EA	COLOR VIDEO WITHOUT INSTA MATIC PRESET
FA	CONVER GENCE	JA	H. REGULATOR

EACH COMPONENT IS IDENTIFIED WITH A REFERENCE NUMBER AND A PREFIX LETTER (i.e., L20) WHICH IS RELATED TO LEGEND ON THE PANELS ALL "ON" PANEL COMPONENTS ARE IDENTIFIED BY ONE OR TWO DIGIT NUMBERS (1 THRU 99).

ALL "OFF" PANEL COMPONENTS ARE IDENTIFIED BY A 3 DIGIT NUMBER, WHICH VARIES WITH CIRCUIT ASSOCIATION AS INDICATED BELOW.

ASSOCIATED CIRCUIT	REFERENCE DESIGNATION
IF & VIDEO	100 199
PIX TUBE	200 299
AUDIO	300 399
AGC/SYNC	400 499
HORIZ & HI VOLTAGE	500 599
VERTICAL	600 699
CONVERGENCE	700 799
POWER SUPPLY	800 899
COLOR CIRCUIT	900 999

1. VOLTAGE MEASUREMENTS LISTED ON SCHEMATIC IN ORDER SHOWN.

20V ZERO SIGNAL (TUNER SET BETWEEN CHANNELS)
16V COLOR BAR GENERATOR (GATED RAINBOW TYPE)

CONDITIONS COLOR BAR GENERATOR (RAINBOW TYPE); OUTPUT ADJUSTED FOR 5V DC AND 1.3VPP VIDEO MEASURED AT BASE OF 1ST VIDEO AMP (Q3 BA PANEL).

VOLTAGE MEASUREMENTS TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM (±10%).

AC INPUT TO RECEIVER 122V. VOLTAGE READINGS TAKEN WITH ALL CONTROLS AT THEIR NORMAL SETTING.

VOLTAGE READINGS WILL VARY WITH ASSOCIATED CONTROL SETTINGS AND SIGNAL STRENGTH.

2. WAVEFORM MEASUREMENTS COLOR WAVEFORMS TAKEN WITH A COLOR BAR GENERATOR PROVIDING A SIGNAL OF STANDARD GATED RAINBOW (10 BAR) TYPE COLOR BAR PATTERN. RECEIVER ADJUSTED FOR NORMAL VIEWING AS IN TRANSMITTED AIR SIGNAL AND THE COLOR BAR GENERATOR OUTPUT ADJUSTED FOR APPROXIMATELY 5V DC MEASURED AT BASE OF 1ST VIDEO AMP (Q3 BA PANEL).

NOTE: THE PEAK TO PEAK COLOR SIGNAL AT THE BASE OF Q9 CAN VARY AND IS DEPENDENT ON THE AGC SETTING OF A GIVEN RECEIVER. THE 5V DC READING IS GIVEN AS A REFERENCE. THE PEAK-TO-PEAK WAVEFORM MEASUREMENTS SHOWN ON THE SCHEMATIC ARE RELATED DIRECTLY TO THE 1.3 VOLT P-P MEASURED AT BASE OF Q9.

IF THE COLOR BAR PATTERN ON THE SCREEN IS USED TO DETERMINE THE RANGE OR PROPER SETTING OF THE HUE CONTROL, THE 2ND VISIBLE BAR (FROM LEFT) WILL BE THE CORRECT BAR THAT CORRESPONDS TO RED. THE FIRST BAR (FROM LEFT) IS NOT NORMALLY VISIBLE BECAUSE IT IS PARTIALLY BLANKED AND THE RASTER IS SLIGHTLY OVERSCANNED TO SEE THE FIRST COLOR BAR, ADJUST THE HORIZONTAL HOLD CONTROL IN THE DIRECTION THAT CAUSES THE RASTER TO SHIFT TOWARD THE RIGHT. THEN RE-ADJUST CONTROL TO CENTER OF ITS RANGE.

3. ALL VIDEO AND COLOR WAVEFORMS TAKEN WITH A WIDEBAND SCOPE AND A PROBE WITH LOW INPUT CAPACITY. SHAPE AND PEAK-TO-PEAK AMPLITUDES MAY VARY DEPENDING ON CALIBRATION AND TYPE OF TEST EQUIPMENT USED, AND CONTROL SETTINGS.

4. THE OUTPUT WAVEFORMS OF THE IC COLOR DEMODULATOR CAN BE OBSERVED AT THE COLLECTOR OF THE VIDEO OUTPUT TRANSISTORS Q17SA (RED), Q15SA (GREEN), AND Q16SA (BLUE) OR TERMINALS 25, 24, AND 23 ON PANEL 5A.

CONNECT SCOPE TO TERMINAL 24SA (GREEN). ADJUST HUE CONTROL TO PLACE THE 10TH BAR OF THE COLOR BAR GENERATOR TO MAXIMUM NEGATIVE. DO NOT ADJUST HUE CONTROL FOR SUBSEQUENT READINGS. OBSERVE WAVEFORM AT TERMINAL 23SA (BLUE). THE 6TH BAR SHOULD BE AT MAXIMUM NEGATIVE. OBSERVE WAVEFORM AT TERMINAL 25SA (RED). THE 3RD BAR SHOULD BE AT MAXIMUM NEGATIVE.

UNLESS OTHERWISE SPECIFIED, CAPACITOR VALUES LESS THAN ONE IN MF, ALL OTHERS IN PF. CAPACITANCE VALUES ONLY ARE SHOWN ON SCHEMATIC DIAGRAM. FOR COMPLETE DESCRIPTION OF CAPACITORS, REFER TO PARTS LIST. RESISTORS ARE 10%, 1/2W.

COIL RESISTANCES LESS THAN 1 OHM NOT SHOWN.

V5 CRT NOS.
21HBP22
21VACP22
25BGP22
25BJP22
25BMP22
25VAEP22
25VAFP22

TYPICAL SOCKET & PLUG

PLUG NO.	NUMBER OF PINS
P1	8 PINS
P2	12 PINS
P3	10 PINS
P4	3 PINS
P5	FOCUS PLUG
P6	6 PINS
P7	5 PINS
P8	3 PINS

T15A L7SA L5SA L3BA L11BA
NOTE: SOME COILS DO NOT USE ALL TERMINALS
HOR OSC L1FA
T600 (TOP VIEW) VERT OUTPUT TRANS
T501 (REAR VIEW)

1366

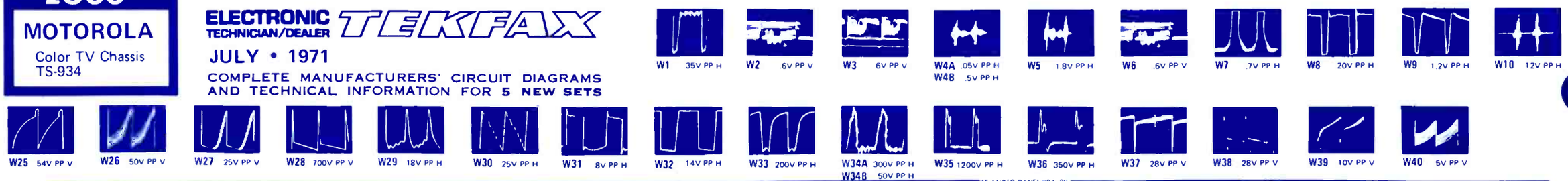
MOTOROLA

Color TV Chassis
TS-934

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

JULY • 1971

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



ELECTRONIC
TECHNICIAN/DEALER

TEKFAX

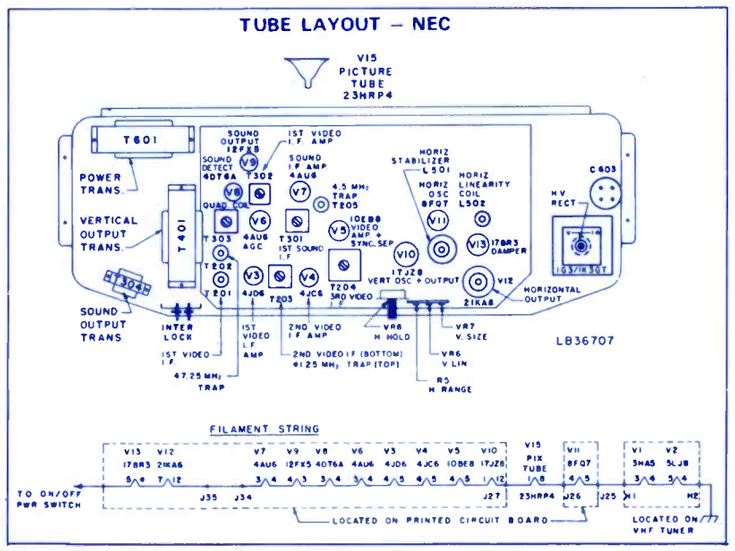
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 5 NEW SETS

GROUP 227

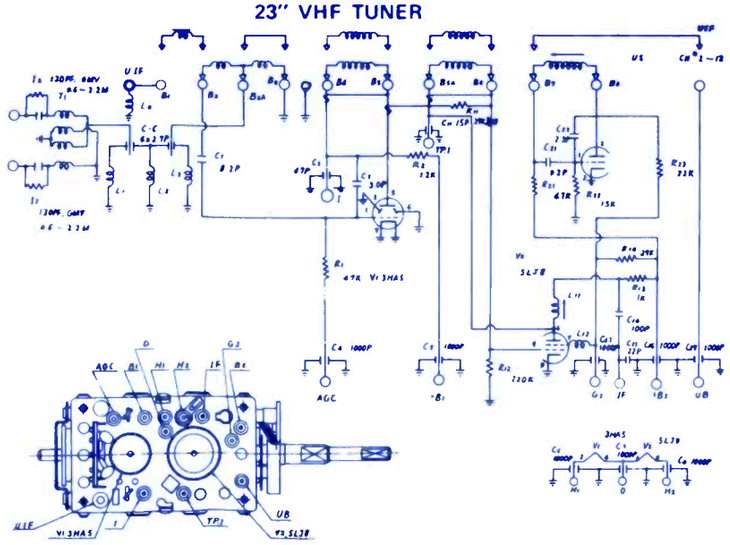
1365
OLYMPIC
TV Chassis NEC

JULY • 1971

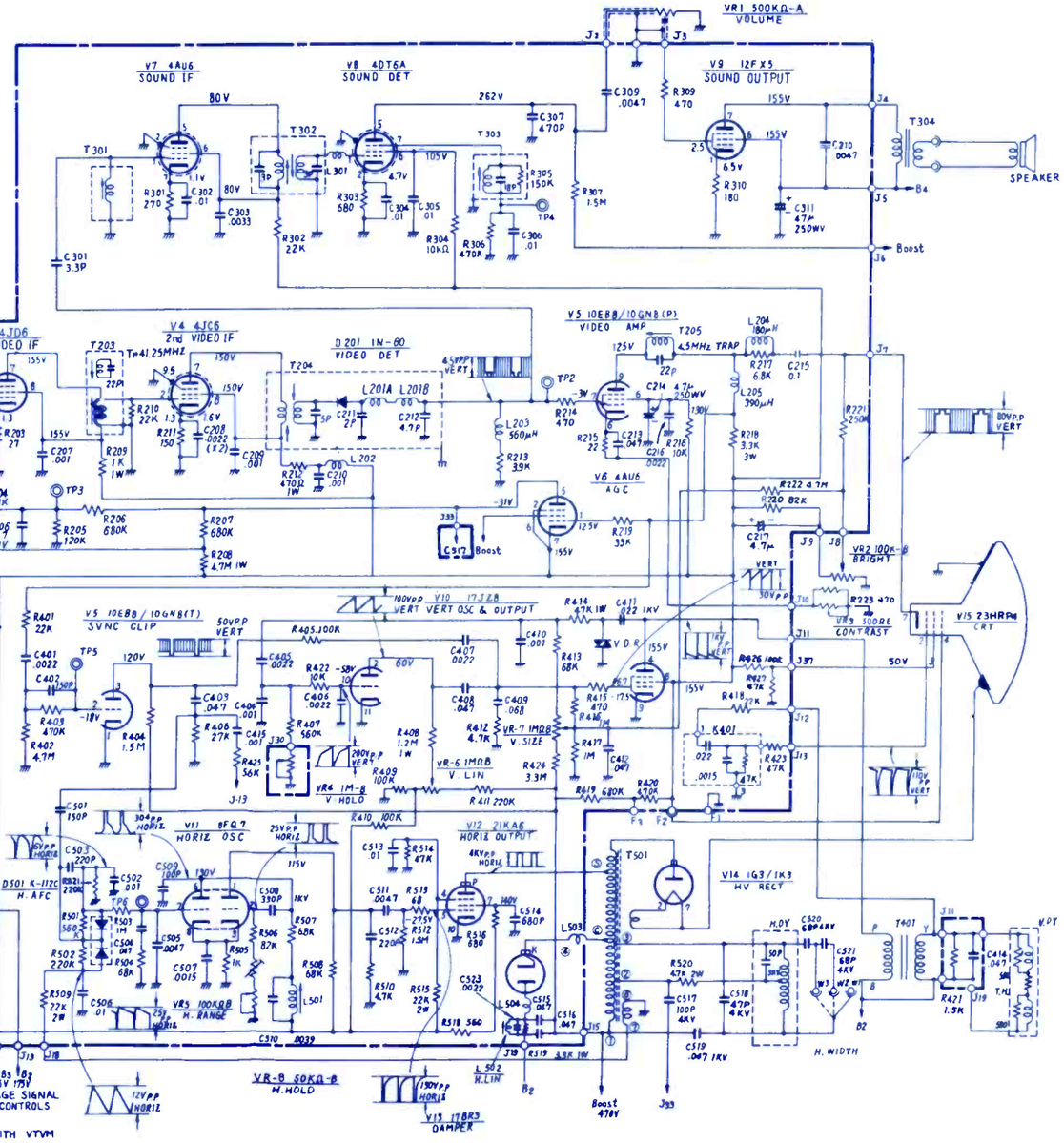
TUBE LAYOUT – NEC



23" VHF TUNER

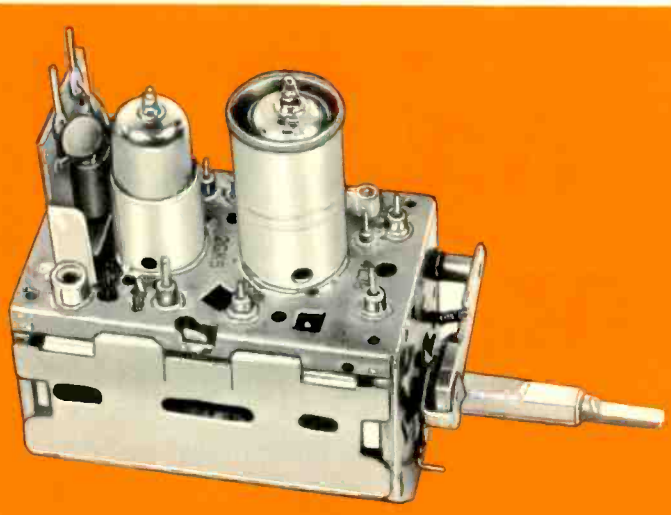


SYMBOL	DESCRIPTION	OLYMPIC PART NO.
VR-1	500K volume on-off control	PTJ70416
VR-2	100K bright control	PTJ70417
VR-3	500Ω contrast control	PTJ70418
VR-4	1M vert hold control	PTJ70419
VR-5	100K horiz range control	
VR-6	1M vert lin control	PTJ70458
VR-7	1M vert size control	
VR-8	50K horiz hold control	PTJ70457
C603A	220 µf, 250v capacitor	COJ70424
C603B	150 µf, 250v capacitor	COJ70424
C603C	220 µf, 250v capacitor	COJ70424
T205	sound trap coil	CLJ70438
T301	audio input xformer	TRJ70439
T302	interstage xformer	TRJ70440
T303	quad xformer	TRJ70437
T304	audio output xformer	TRJ70412
T401	vert output xformer	TRJ70413
T501	high voltage xformer	TRJ70414
T601	power xformer	TRJ70415
L501	horiz stabilizer coil	CLJ70441
L502	horiz lin coil	CLF70442
K401	vert retrace pack	PCJ70451
VDR	varistor	REJ70452
H V DY	deflection yoke	CLJ70409
VHF	VHF tuner	CLJ70410
UHF	UHF tuner	CLJ70411
	fuse, 2a, 125v	FUJ70453



NOTE: VOLTAGES AND WAVEFORMS MEASURED WITH AVERAGE SIGNAL INPUT, CONTRAST CONTROL AT MAXIMUM, ALL OTHER CONTROLS SET FOR NORMAL OPERATION

LINE VOLTAGE 120 VOLT. DC VOLTAGES MEASURED WITH VTVM TO CHASSIS GROUND. TO TOLERANCE OF ±20% NORMAL OF ALL READINGS.



$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-EAST . . 938 GORDON ST., S. W., Atlanta, Georgia . . . . . TEL: 404-758-2232
WEST . . . . . SARKES TARZIAN, Inc. *TUNER SERVICE DIVISION*
10654 MAGNOLIA BLVD., North Hollywood, California . . . TEL: 213-769-2720

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

ELECTRONIC TECHNICIAN/DEALER

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

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

TOM GRENEY
Publishing Director

JOSEPH ZAUHAR
Managing Editor

CAROLYN SAND
Associate Editor

BERNICE GEISERT
Production Manager

BOB ANDRESEN
Graphic Design

LILLIE PEARSON
Circulation Fulfillment

JOHN KESSLER
Manager, Reader Services

MANAGERS

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

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

DONALD D. HOUSTON
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
I.P.O., Box 5056

JULY 1971 • VOLUME 93 NUMBER 7

This month's front cover, courtesy of Simpson Electronic Co., shows a typical bench scene at Novak & Parker, a radio and TV service dealer in Mount Prospect, Ill.

FEATURES

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 and at additional mailing offices.

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

EDITORIAL

The Storm Passes

One of the major social events at this year's NEW Show was the National Electronic Distributors Association Salute to the Electronics Industries Second Century of Progress Gala Banquet held around the ocean-side pool at the Americana Hotel. Each of us in attendance had either forked over $50 per ticket or were guests of manufacturers, who paid $500 per table of 10.

A lot had been invested for this evening of food and entertainment, but the crowd appeared nervous as it watched the waiters complete the final preparations. For out along the eastern horizon burdened clouds were sweeping curtains of water toward us across the choppy sea. Gusty breezes predicted an abrupt end to Florida's drought—directly above our tables.

Our predictions were correct, for during the banquet these clouds did sweep overhead—passing on without relinquishing even a drop on their potential victims.

The banquet was a success, the music excellent and the water show entertaining. And all because we did not let our fears get the best of us in our impulse to "play it safe."

Later we enjoyed visiting with the wife of a Virginia manufacturer who demonstrated an even greater faith. A few weeks prior to the NEW Show our publisher had told her husband that attending the show should help improve the distribution of his product. Unfortunately he had to be admitted to the hospital, but upon his release he asked his wife if she wasn't still planning to attend. She and a girl friend quickly packed some samples, drove the several hundred miles down to Bal Harbour, checked into the Americana Hotel during the second day of the show (without reservations), got a table in one corner of the exhibit area, had a sign made up within an hour and were soon attracting a significant number of distributors.

I seriously doubt that there was any other manufacturer that either arrived so unprepared or experienced such unprecedented success. Some of the giants in the industry reported that their attendance was merely a matter of tradition. In many instances their new product announcements no longer coincide with the show, and the number of distributors representing them has about reached the saturation level. One gentleman, representing a southern manufacturer currently serving a regional market, reported that the exhibit was a disappointment, since the show was so far south that he saw few northern distributors. However, a leading test instrument manufacturer, which showed up with several new products and a large sales staff, reported that the show proved very worthwhile and that they had been able to line up some important new distributors in the U.S. and Canada while there.

We spoke with the president of another test instrument company who admitted pulling back during the past several months when seeing how other industries were being affected by the past recession—only to discover that for him there really was no recession. He reports that during the past year his market has been just as strong as it ever was.

The storm clouds have passed and the rain didn't come. Everyone that we met expressed renewed enthusiasm and all spoke of big plans for the fall season. The show was a success and our industry is shifting back into high gear—so grab hold and get with it before you're left behind.

Phillip Dahlen

GTE Sylvania has the lines that lay it on the line.

Only GTE Sylvania gives you a choice of three different price lines in color picture tubes.

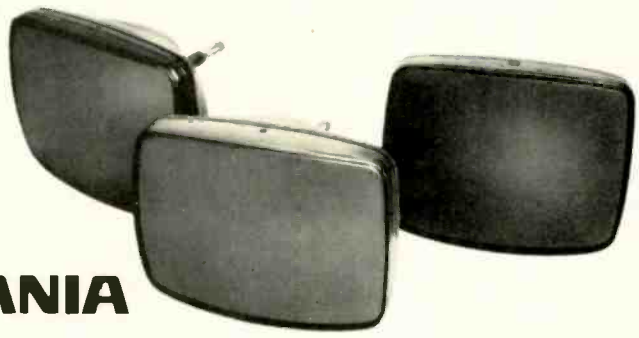
And GTE Sylvania tells you and your customer exactly what you are getting in each line.

That makes Sylvania tubes easier to sell.

You can tell your customers the advantages of the top-line *color bright* 85® XR. You can show them where the savings come from in the economy *color screen* 85 line. And you can tell them exactly what they're getting for their money in the middle-line *color bright* 85® RE.

The way we see it, if we lay it on the line with you, you can lay it on the line with your customers.

Instead of just handing them a line.



GTE SYLVANIA

	color bright 85® XR	color bright 85® RE	color screen 85
Sylvania rare earth red phosphors	yes	yes	yes
Other manufactured rare earth phosphors	no	no	yes
All sulfide phosphors	no	no	no
X-ray inhibiting glass	yes	no	no
New glass	yes	some	some
Reused glass	no	some	some
Regunned	no	no	some
Screen blemish specs	OEM	OEM	slightly wider than OEM
White field uniformity	QEM	slightly wider than OEM	slightly wider than "RE"
Cut off; purity currents; beam shield leakage	OEM	OEM	slightly wider than OEM

April Sales to Dealers Strong In All Categories

U.S. manufacturer sales to dealers in all major consumer electronic areas were ahead in sales in April 1971, over sales in the same month a year ago. Sales of color-TV sets to dealers were up 38.8% during April 1971 over April 1970. Year-to-date sales of color-TV sets were up 21.8% over the number of sets sold in the first four months of 1970. Monochrome-TV set sales in April were 20.7% ahead of sales in the fourth month a year ago, bringing to year-to-date sales up to 8.9% over the first four months of 1970.

CONSUMER ELECTRONICS SALES TO DEALERS

	APRIL 1971	APRIL 1970		YEAR-TO-DATE 1971	YEAR-TO-DATE 1970	
RADIOS						
AM	433,569	289,783	+ 49.6	1,552,999	1,441,961	+ 7.7
FM	335,805	140,679	+138.7	1,049,080	762,703	+37.5
Total Home	769,374	430,462	+ 78.7	2,602,079	2,204,664	+18.0
Automobile	825,580	704,092	+ 17.3	3,627,185	2,956,295	+22.7
TOTAL	1,594,954	1,134,554	+ 40.6	6,229,264	5,160,959	+20.7
TV SETS						
Monochrome	324,428	268,822	+ 20.7	1,488,653	1,367,415	+ 8.9
Color	343,625	247,521	+ 38.8	1,682,542	1,381,831	+21.8
TOTAL	668,053	516,343	+ 29.4	3,171,195	2,749,246	+15.3
PHONOGRAPHS						
Phonograph & Table	193,206	99,852	+ 93.5	949,307	599,923	+58.2
Console	46,405	45,676	+ 1.6	273,789	333,250	−17.8
TOTAL	239,611	145,528	+ 64.6	1,223,096	933,173	+31.1

Source: EIA Marketing Services Department

NATESA Announces Plans For Annual Convention

For the first time, the National Alliance of Television & Electronic Service Associations is planning to hold its national convention outside Chicago. It will be held in the resort city of Hot Springs National Park, Ark., Aug. 26-29, at the Arlington Hotel. The convention committee is going all out to make these days in Hot Springs very memorable ones.

Held in conjunction with the National Service Conference, manufacturers will be present to display the latest developments in electronics. The program includes business meetings, management seminars, the election of officers and the annual Saturday night banquet, with topnotch entertainment.

Tours and entertainment are planned for the ladies and children. There is much to see and do in and near this city, with its lakes and streams for those who wish to fish and swim. Good rental equipment is available. The world famous Bathhouse Row, which is part of downtown Hot Springs, is readily available for visitor use. In fact, there are hot springs right in the hotel. Also a butter factory, alligator farm, zoo, wax museum, auction houses and shops galore are readily accessible from the Arlington Hotel.

The $15.00 advanced registration fee can be sent directly to Mr. Jolly Wilson, 6701 Cantrell Rd., Little Rock, Ark. 72207. All those registering prior to August first have four chances, rather than the usual one, for the drawing when an Amana Radar Range will be given away during the convention. Color-TV sets and other prizes will be awarded as door prizes throughout the convention.

Report Shows Increase In 1971 Electronics Market

First quarter total U.S. sales of all categories of consumer electronic products, including U.S. manufactured and imported items, showed increases over the same period in 1970, according to the EIA Marketing Services Department.

Total U.S. sales of the industry's major product, color-TV sets, was up 32.2% in the first quarter of 1971 over the same quarter of 1970. Monochrome-TV set total U.S. sales of 1,783,025 were up 19.7% from the 1,490,057 sets sold in the first three months of last year.

Total U.S. radio sales were up 4.1% in the first three months of 1971 compared to the same period of last year.

Total U.S. phonograph sales increased 2.3% in the first quarter, 1,147,548 sets to 1,122,150.

Total U.S. sales of tape recorders showed a 2.8% increase over the same period of last year. Total U.S. sales of tape players statistics are incomplete, although tape player imports showed an increase over the same period in 1971.

Courses Designed to Upgrade Technical Competency

Free courses in basic electronics, radio, B/W- and color-TV sets and solid-state devices, sponsored by the New York City Board of Education, will be offered at the William E. Grady Evening Trade School located at 25 Brighton 4th Rd., Brooklyn, N.Y. 11235.

These courses are designed to upgrade the technical competency of adults who are employed in the trade areas for which instruction is offered. Those persons interested in these courses may register at the school on Monday and Tuesday, September 13th and 14th from 7 to 9 p.m.

Service Technician Development Program Includes 1971 Seminars

About 15,000 young men will be introduced to career opportunities in consumer electronics servicing this fall through educational programs developed by the Consumer Electronics Service Committee. At that time, 14 colleges and universities from Massachusetts to California will be hosting 16 two-week EIA sponsored and financed workshops that will attract over 300 high school industrial arts and vocational instructors, who will include consumer product servicing in their school curriculum. Emphasis will be placed on how to diagnose and repair the latest consumer electronic products, including solid-state circuitry. The industry's latest equipment and material will be used for these training sessions.

This is the fourth year that the CEG has conducted workshops under its Service Technician Development Program (STDP). This program has been expanded yearly to accommodate the increasing interest evidenced by educators in this field. It is estimated that each of the more than 300 teachers at-

continued on page 26

Announcing car tape stereo from RCA. The name that means music. And business.

A name that means music to your customers means more business to you. And RCA has meant both since music and electronics got together over 50 years ago.

But we've put more than just our name on our new car tape stereos. We've built in the same quality and fidelity your customers have come to expect from RCA. And we back them with outstanding parts, service data, and warranty programs.

Cassette Play | Record 12R200
Plays all cassettes. Makes recordings with a remote control mike. Fast forward and rewind. Automatic pop-out cassette ejector. Exceeds 18 watts peak power.

Cassette Play Only 12R100
Same as 12R200 less record feature.

Stereo 8 12R300
Plays all 8 track stereo cartridges. Exceeds 18 watts peak power. Automatic channel selection. Fast loading. Dramatic styling. Recessed controls.

Stereo Speaker Kit 12R400
Matched speakers plus hardware. Frequency response 50 to 10,000 Hz. Heat and moisture resistant.

Counter Display MDA-916
This impressive merchandiser demonstrates all the exciting features of these stereos. It's a beautiful reminder that RCA does mean music. And business. Ask your RCA Distributor to show you the complete line of effective promotion material available for your use.

Parts and Accessories | Deptford, N.J.

RCA
Car Tape Stereo
At your RCA Distributor now!

NEWS . . .

continued from page 24

tending the 1971 sessions will present the material to an average of 50 students at their respective schools.

Electronic Industry Council Considers Seven Subjects

The June 7th meeting of the Electronic Industry Council in Chicago was attended by 19 industry leaders. Chaired by Frank J. Moch, the council considered an agenda of seven subjects.

Tom Surber, reporting for EIA, stated that the parts availability problem continues to be researched and urges all associations to participate in surveys.

Robert Flanders reported on FM and educational station interference, particularly with TV channels 6 and 8. He asked that technicians join the action by requesting from set companies filter units to be installed where this problem exists.

A letter from Ralph Johonnot was read which covered several areas of association cooperation.

No report was given or action taken to create a paid post of Executive Officer for EIC which was first proposed by Harold Schulman at the Dallas EIC session.

In the absence of Don Martin, his letter on all industry participation in the Electronic Hall of Fame was read. The subject was returned to Mr. Martin for further details.

Jules Steinberg and John Gooley raised questions on the format of the next National Service Conference which NARDA will host at the NATESA convention to be held in Hot Springs August 26-29. The format was left to their discretion.

Ronald Crow gave a report on CET in the absence of Forest Belt. Richard Glass expounded on the creation of a national service coordinator. NEA has explored HEW financial support of this project which would be directed by Ronald Crow who heads the International Society of CETs. Should this fail, he asked for all industry support. The project bears the acronym JESUP, for Joint Electronic Servicing UPgrading.

The TV Reception Improvement Project was reported by William Mansfield and George Bartlett of NAB. They outlined three plans, one which will need no outside financial support and one with a starting price of $50,000.00. There are legal and implementation problems that must be settled first. It appears that a start may be possible on a modified plan, but the target date for the full plan would coincide with the coming new fall broadcast season. Progress reports will be made. Margaret Dana's recent coverage of this subject, developed with NATESA headquarters, was well received.

The next session of EIC, which will be chaired by M. L. Finneburgh, Sr., will be announced.

Precision Tuner Moves To New Location

The management of Precision Tuner Service announces that they have outgrown the Turlock, Calif., division and have moved to Sacramento, Calif. The new plant, located at 4611 Auburn Blvd., features better repair positions with plans for expansion in the future. Prime factors considered in the move revolved around better distribution and physical plant facilities.

GE is bringing in panels of independent experts to tell us how to make our new products more serviceable.

They tell us. And we listen. And we'll have better products for it. This is just one of the things that GE has been doing to improve the serviceability and parts availability of our television products.

For the last several months we have been paying the transportation on warranty parts. We've also installed direct telephone lines to regional parts centers. And, soon, we'll have three hundred independent parts distributors throughout the country.

We're out to make GE television products as easy and inexpensive to service as possible. We have a little way to go yet. But we're doing something about it.

For additional information about GE service, call collect or write "Dutch" Meyer.

GENERAL ELECTRIC

Television Business Division • Portsmouth, Virginia • (703) 484-3521

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

LETTERS

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

Still Alive and Doing Well

With regard to Howard Adams' letter in the May 1971 issue, I'm sure that PRD will be pretty much surprised to learn that it is no longer in business. Actually Polytechnic Research & Development, or PRD as it is now called, is alive, doing well and living in Westbury, Long Island, N.Y.

The calibration of this instrument (PRD 650B) requires some accurately calibrated, sophisticated test equipment, including a Bolometer Mount and a Thermistor Mount. We do not have a manual for this instrument, but we do have our own in-house written calibration procedure. If we can be of any assistance, Mr. Adams can contact us.

Our library contains thousands of manuals on commercial test equipment manufactured by many reputable firms. We have many duplicates which we will be happy to furnish your readers for a very small charge.

If we can be of any assistance with repair and/or calibration problems, we will be more than happy to help anyone.

WARD MAUE
SERVICE DEPARTMENT
Leger Laboratories Inc.
Hollis St.
East Pepperell, Mass. 01437

Has Precise Schematics

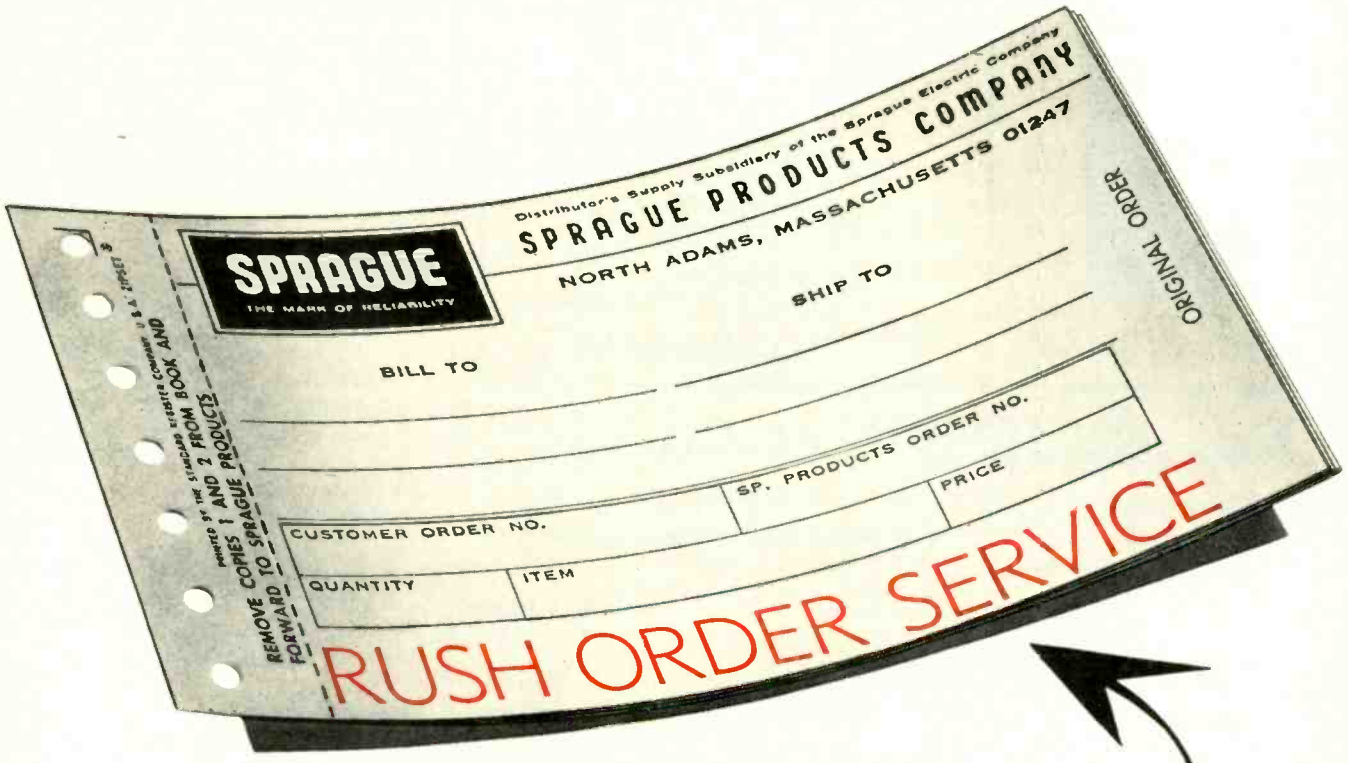
Your Editor's Note on page 26 of the May 1971 issue indicated that a number of readers required schematics for the Model 308 8-in. CRT Oscilloscope and Model 630 Signal Generator and Audio Oscillator.

They can write me and I will make them copies.

HAROLD F. DIETER
143 Wilson Avenue
Long Beach, L.I., N.Y. 11561

"Okay, sir, your picture is no longer upside down."

When you need a Sprague component "yesterday" and our distributor doesn't have it in stock...



...ask him to use this form!

Upon arriving at our factory, the order will bypass normal order entry procedures, assuring same-day shipment by air, UPS, or first-class mail, as distance dictates.

Now there's no need to waste time "shopping" for an exact replacement. Any Sprague distributor can get any factory stock item on its way in 24 hours!

65-0127

SPRAGUE®
THE MARK OF RELIABILITY

'Sprague' and '②' are registered trademarks of the Sprague Electric Co.

THE BROAD-LINE PRODUCER OF ELECTRONIC PARTS

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

READERS' AID

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

Needs Book

Can someone help me in locating "TV Analyzing Simplified" by Milton S. Kiver?

WILLIAMS RADIO & TV SERVICE
106 South Jefferson St.
Lewisburg, W. Va. 24901

Needs Schematic

I need a schematic for an old Thompson Neutrodyne radio, Model S-60, manufactured by the R. E. Thompson Manufacturing Co.

JAMES G. TREADWELL
2235 Mathews St.
Menomonie, Wis. 54751

For Sale

I have several pieces of test equipment for sale. The original instruction manuals, leads and probes can be included with each instrument. More details will be provided upon request.

WILLIAM D. SHEVTCHUK
1 Lois Avenue
Clifton, N.J. 07014

I have 75 old tubes for radio and TV receivers for sale. More information can be obtained upon request.

J. R. RACINE
1291 Williston Road
S. Burlington, Vermont 05401

I have various pieces of test equipment for sale. More information will be available upon request.

ANDREW A. BOLOPH
Technology Unlimited
35 Beekman Ave.
N. Tarrytown, N.Y. 10591

I have for sale the following test equipment: a tube tester, a TV analyst, a scope, a signal generator, color bar generator and other instruments.

C. M. HAYES
24770 Lake St.
Hemet, Calif. 92343

I have saved all issues of ELECTRONIC TECHNICIAN/DEALER with the exception of issues from Sept. 1953 to April 1954. I would like to sell them.

JOHN D. DABOUR, JR.
217-86 Hempstead Avenue
Queens Village, N.Y. 11429

GREATEST TV Schematic Bargain EVER Offered
NOW-Complete TV Schematics for less than 5¢ each

COLOR TV
Covers ALL
Color Sets
1960 - 1968

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

TV TECH/MATICS-8 Giant Volumes

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

Here are FABULOUS savings on nationally-known TV schematic and service data. Here is everything you need to fill your vital service data needs for TV model years 1965 through 1968 . . . plus COLOR TV coverage from 1960 through 1968! What it amounts to is a low, low cost of less than $9.00 per year for your TV service data . . . with an extra 5 years of Color TV coverage thrown in for good measure!
Compare that with the over $100 a year you may now be paying for comparable information.

SERVICE DATA FOR MORE THAN 20 BRANDS

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

EASY TO USE

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

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

HERE'S WHAT YOU GET

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

STREAMLINED AND CONVENIENT

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

MONEY-BACK GUARANTEE

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

-CONTENTS-

CONTENTS 1965 MODELS
Covers all 1965 models for: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Electrohome, Emerson, Firestone, General Electric, Magnavox, Motorola, Muntz, Olympic, Packard-Bell, Philco, RCA Victor, Sears-Silvertone, Setchell-Carlson, Sylvania, Truetone, Westinghouse, and Zenith . . . plus all color sets 1960-1965, at no extra cost!
PUBLISHER'S LIST PRICE $19.90

CONTENTS 1966 MODELS
Covers all 1966 color and B & W models of: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco, RCA Victor, Sears-Silvertone, Setchell-Carlson, Sonora, Sylvania, Truetone, Westinghouse, and Zenith.
PUBLISHER'S LIST PRICE $19.90

CONTENTS 1967 MODELS
Covers all 1967 color and B & W models of: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco-Ford, RCA Victor, Sears-Silvertone, Setchell-Carlson, Truetone, Westinghouse, and Zenith.
PUBLISHER'S LIST PRICE $19.90

CONTENTS 1968 MODELS
Covers all 1968 color and B & W models for: Admiral, Airline, Andrea, Coronado, Curtis-Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco-Ford, RCA Victor, Sears-Silvertone, Setchell-Carlson, Sonora, Sylvania, Truetone, Westinghouse, and Zenith.
PUBLISHER'S LIST PRICE $19.90

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

NO RISK COUPON—MAIL TODAY

TAB Books, Blue Ridge Summit, Pa. 17214

☐ I enclose $34.95 for which please send me your complete 8-Volume Tech/Matics Schematic offer postage prepaid.

☐ Please Invoice me for $34.95 plus postage. Same return privileges.

Name .....

Company .....

Address .....

City ..... State ..... Zip .....

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

ET-71

. . . for more details circle 103 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.

STEREO MULTIPLEX RECEIVER 700

Features switch selected main and remote speaker

The stereo multiplex receiver, Model ASR-100, features switch selected main and remote speaker outputs, high- and low-frequency filters, switchable LOUDNESS control, switchable AFC FM interstation muting and tape monitor. The switch operated interstation muting reportedly eliminates frequency noise when changing stations. In addition, there are inputs for tape recorder, phonograph (magnetic and ceramic) and auxiliary source, plus a MONO/STEREO switch. A stereo headphone jack is located on the front panel. Specifications indicate a power output of 76w ± 1dB with a frequency response of 20Hz to 25kHz. Electronic features include all silicon transistor design, FET front end, and built-in circuit protector. Amperex Corp.

SPEAKER SYSTEM 701

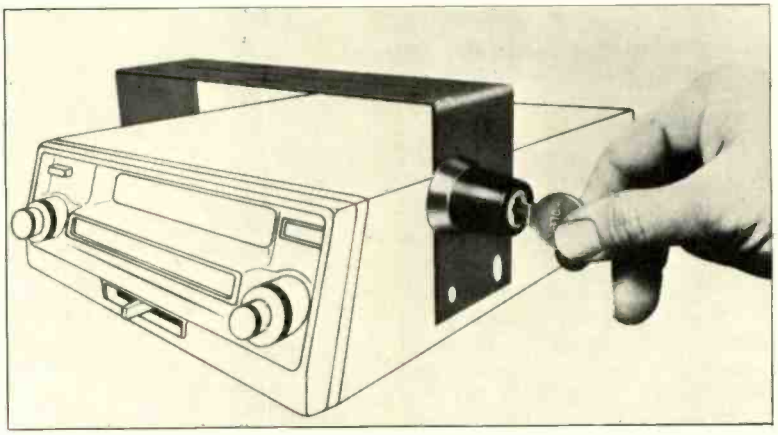
Omni-directional system with 4-in. speaker

The compact, omni-directional speaker system, Model S-130, features a 4-in. speaker and 360° sound dispersion. Specifications indicate 8Ω impedance and a power capacity of up to 15w. The speaker measures 6 in. by 9 in. by 5 in. Price $14.98. Olson Electronics.

AUTO TAPE PLAYER LOCK 702

Locks unit to its mounting bracket

A security lock is designed to protect the tape player from theft by locking the unit securely to its mounting bracket. It reportedly features a top quality tumbler mechanism and resists both prying and forcing with a wrench. Installation is said to take only a few minutes and is done easily by the stereo owner himself. There is no alteration or rewiring of the tape player needed. If the owner wishes to remove his tape unit, he can use his special key to unlock and remove it. Two keys are supplied with each lock. Price $5.95. Bolen.



FOR MORE NEW PRODUCTS SEE PAGE 64

The right replacement, faster with

8 new service kits from your Centralab distributor

KITS AVAILABLE:

- Fastatch II® Controls
- Miniature Wirewound Controls
- Miniature Trimmer Controls
- Axial Lead Electrolytics
- PC Lead Electrolytics
- General Purpose Capacitors
- High Voltage Capacitors
- Packaged Electronic Circuits

KIT FEATURES:

- Rugged steel frames with high impact plastic drawers.
- Stackable or wall mounted.
- Portable, with convenient handles.
- All contain assortment of the most popular and widely used Centralab components.
- All control units (KIT-10F, -20W, -30T) include latest edition of H. W. Sams Replacement Control Guide.
- All components are functionally arranged in drawers by value, type, etc.
- All drawers are pre-labeled clearly showing contents.
- All kits are completely set up, ready to use.

DISTRIBUTOR PRODUCTS

CENTRALAB
Electronics Division
GLOBE-UNION INC.
5757 NORTH GREEN BAY AVENUE
MILWAUKEE, WISCONSIN 53201

By Centralab, your Parts-Time Helper

DS-7114

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

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 $38.80) **. . . 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 $38.80) for only 99¢ each with your Trial Membership.

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

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

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

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

TUBE/TRANSISTOR SUBSTITUTION GUIDE

A completely updated, quick-reference source for popular tube & transistor substitutions.

Regular List Price $4.95

Typical Savings Offered Club Members on Recent Selections

199 TV Tough-Dog Problems Solved	List Price $7.95; Club Price $4.95
Jack Darr's Service Clinic No. 2	List Price $7.95; Club Price $3.95
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
Philco Monochrome TV Service Manual	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
Commercial Radio Operator's License Study Guide	List Price $7.50; Club Price $5.95
FET Applications Handbook-2nd Edition	List Price $14.95; Club Price $9.95
Solid-State Circuit Design & Operation	List Price $9.95; Club Price $7.95
How to Read Electronic Circuit Diagrams	List Price $7.95; Club Price $3.95
Electronic Test & Measurement Handbook	List Price $7.95; Club Price $4.95
Pulse & Switching Circuits	List Price $7.95; Club Price $4.95
Circuit Consultant's Casebook	List Price $9.95; Club Price $5.95
How to Use Vectorscope-Oscilloscopes & Sweep-Marker Generators	List Price $7.95; Club Price $4.95
Computer Technician's Handbook	List Price $10.95; Club Price $7.95
Handbook of Magnetic Recording	List Price $7.95; Club Price $4.95
125 One-Transistor Projects	List Price $7.95; Club Price $4.95
Computer Architecture	List Price $12.50; Club Price $8.95
Servicing Modern Hi-Fi Stereo Systems	List Price $7.95; Club Price $4.95

AN EXTRAORDINARY OFFER...

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".

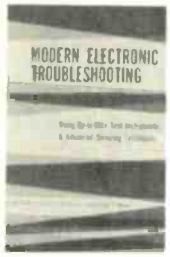
List Price $17.95 ● **Order No. T-101**

Electronic Hobbyist's IC Project Handbook

Here's your chance to become familiar with those fascinating components—integrated circuits — and have fun building some useful devices at the same time. In all, this new book describes 50 different projects, all based on using popular IC's which are inexpensive and available at all parts stores. Some of the devices — such as the 1-watt phono amp and IC power supply—can be built in an evening. More sophisticated projects—like the electronic organ or the RDIAA equalization preamp—offer a greater challenge. You can build practical devices like the tachometer with bulb alert, or the 50-watt amplifier, or some "just for fun" gadgets like the simple memory tester or the miniature adding machine. 160 pages, 50 projects, 100 illus.

List Price $6.95 ● **Order No. 464**

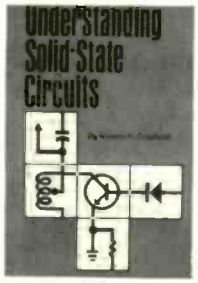
Modern Electronic Troubleshooting



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

List Price $7.95 ● **Order No. 474**

Understanding Solid-State Circuits



This brand-new book truly eliminates the mystery of solid-state circuits and devices. Written to serve the interests of anyone at the sub-engineering level (service technicians, hobbyists, students, etc.), the content thoroughly explains semiconductor circuit operation without delving into electrochemical physics and high-level mathematics. Encompasses amplification, feedback, sinusoidal and non-sinusoidal oscillators, gain control, logic circuits, and integrated circuits. Semiconductors covered include SCRs, FETs, ICs, light-sensitive and voltage-sensitive devices. The perfect text and reference on solid-state devices and basic circuit operation. Even if you have already mastered the important aspects of solid-state electronics, this book will update and add much to what you already know. 192 pps., over 150 illus.

List Price $7.95 ● **Order No. 513**

How To Repair Home & Auto Air Conditioners

You don't have to be a refrigeration expert to get started—it's all here, from the basics on refrigeration to electrical controls and wiring, how to determine what size air conditioner is needed for a given room, how to compute BTU or tonnage needed, and the wiring required to handle the load. The last two chapters deal with auto air conditioners—how they work, and how they are connected both mechanically and electrically in the car. What's more, the book contains over 100 close-up photos to show you, physically, just what all the parts look like and how they go together. Strategically located in appropriate chapters are cause-and-cure tables listing the most common troubles. When confronted with any defect, you simply refer to a table to find out what is most likely the trouble. 208 pps., over 100 illustrations. Hardbound.

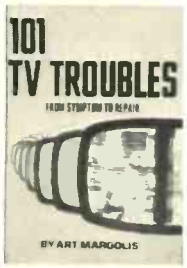
List Price $7.95 ● **Order No. 520**

Admiral Color TV Service Manual

All the vital information necessary to repair any Admiral color receiver—from the large consoles to the 12-inch table models. This manual covers every chassis series from the D11 to the K10 hybrid, with factory - approved service data, plus 12 full-size schematic diagrams and scope waveforms. Begins with instructions on setup and adjustment, then proceeds into tuner and IF circuit designs and schematics of typical tuners (VHF and UHF), video circuit designs, AGC and sync circuits, and chroma circuits. Additional chapters treat sweep system problems, alignment, picture tube problems, sound systems, and low-voltage power supplies. The remaining chapters discuss specific chassis, with trouble case histories and field service modification instructions. 160 pps., 8½" x 11", 36-page foldout section with 12 schematics.

List Price $7.95 ● **Order No. 545**

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**

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**

TV Troubleshooter's Handbook —New 2nd Edition

A completely updated, quick-reference source for scores of tried-and-tested solutions to "tough-dog" TV troubles. This detailed compilation of practical help is the answer to the need for a well-organized file of proven troubles and cures, field factory changes, new and unusual circuits and descriptions of how they work, etc. This brand-new edition represents the only known up-to-date digest of specific TV troubles and cures, for both color and monochrome sets, up to and including 1969 models. Every major brand is included, from Admiral to Zenith, as are such "off" brands as Gamble Skogmo, Packard Bell, and Montgomery Ward. All troubles are categorized by make and model. Included in the color TV section are hints for troubleshooting chroma circuits, making adjustments, etc. 288 pps., over 150 illus.

List Price $7.95 ● **Order No. 521**

SEND NO MONEY! Simply fill in and mail postage-paid Airmail card today!

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

COLORFAX

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

MAGNAVOX

Color TV Chassis T950 with 704059 Remote Control Receiver—Volume ON/OFF Stepping Relay Circuit Modification

Early production of the T950 chassis equipped with the 704059 Remote Receiver has the Volume ON/OFF relay, K401, connected in the rectifier bridge arrangement. The relay, Part No. 160418-6, and the bridge connected rectifiers, Part No. 530082-4, are physically located on the tuner mounting bracket as shown in the illustration (Fig. 1).

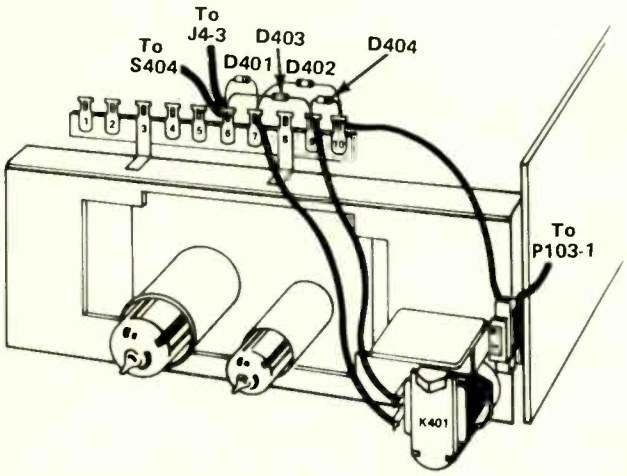


Fig. 1—Tuner assembly removed from cabinet to show component location of early production circuit.

In current production units, the relay circuit has been modified, as shown schematically in the diagram, to provide greater reliability. If it becomes necessary to replace a stepping relay connected in an early production circuit, it is recommended that at the same time the circuit be modified to the later production circuit to reduce the chance of future relay failure. The steps for the field modification are as follows: Fig. 1 illustrates the original parts location

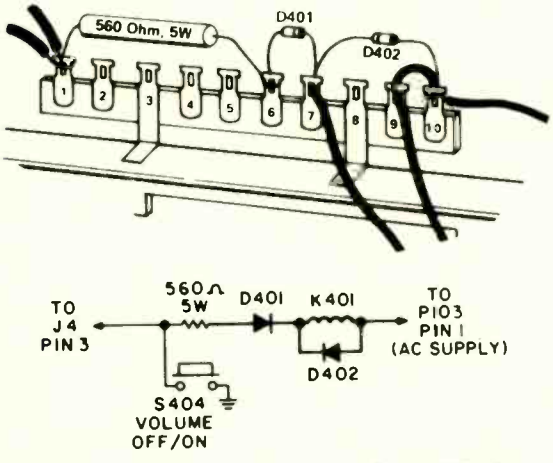


Fig. 2—Circuit and component location after field modification.

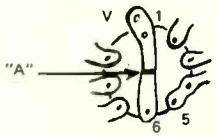
and Fig. 2 illustrates the parts location for the field modification. The terminals of the terminal strip have been numbered sequentially, 1 through 10, with terminal 1 nearest the front of the tuner assembly.

- Remove the discard diodes D403 and D404 (Fig. 1) which are installed between terminals 6 and 9, and between 9 and 10.
- Remove the two wires connected to terminal 6 (Fig. 1) and reconnect them to terminal 1 (Fig. 2).
- Connect an insulated jumper wire between terminals 9 and 10 (Fig. 2).
- Install a 560Ω, 5w resistor between terminals 1 and 6 (Fig. 2).

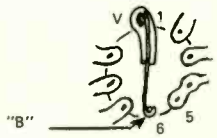
Electrically, the modified circuit should be as shown in the partial schematic in Fig. 2.

Color TV Chassis T931/T933—Arcing Between Pins 5 and 6 of V506 Pin-Cushion Amplifier Tube

During bench service on the Magnavox T931 and T933 chassis, a preventative-maintenance modification is recommended on the deflection board. Pin 6 of tube V506 has a +400v potential and Pin 5 is essentially at ground potential. Over a period of time build-up of dust and other deposits may result in an arcing between these points with possible damage to the PC board. After cleaning off the deposits, it is recommended that the copper pattern connection between Pins 1 and 6 be replaced with a jumper wire as outlined in the following instructions: Lift capacitor C571 out of the way and use a solder sucker to remove the solder from Pin 6. Use a thin bladed knife (or razor blade) to cut the copper pattern at Point A; and then while heating the copper area to be removed with a soldering iron, use the knife to lift the copper pad at Pin 6 and peel it back to the cut point. Add a jumper wire from Terminal "V" (Pin 1) to Pin 6. It is important that the jumper wire be connected at Pin 6 as shown at Point B, to allow maximum possible clearance between Pins 6 and 5. Then return capacitor C571 to its original position.



V506 Underside View Before Modification



V506 Underside View After Modification

Color TV Chassis T936, T950, T951, T952—Convergence Coil Assembly 701280-100

The 701280-100 convergence coil assembly, which is the complete convergence yoke without cable and plug, can be used as a general replacement for the convergence yoke assembly used in receivers using these chassis. An instruction sheet included with the coil assembly provides instructions for removing the cable and plug from the original assembly and wiring it to the new replacement. The individual red, blue and green coils will still be available as replacements in the cases where you need to replace an open or shorted coil. If, however, you have need for a replacement Plastic Holder (Part No. 141487-1), you can order the 701280-100 coil assembly, avoiding the necessity of having to remove the three coils and install them in a new holder.

continued on page 63

TEKLAB REPORT

Motorola Insta-Matic Color-TV Tuning

by Joseph Zauhar

This circuitry should be thoroughly understood before making any adjustments

■ Most electronic technicians know how hard it is to please all customers when it involves color adjustments. What pleases one person or even a large majority of viewers may not satisfy someone else. Also, we find that viewing conditions have an influence on the control settings.

Factory Adjustment of Automatic Controls

Considerable effort has been made to find what balance of adjustments are most acceptable to most viewers and to determine how these controls should be set at the factory. To accomplish these adjustments, special factory procedures are employed to accurately perform the job for all TV receivers. Four meters, sensitive to light and color, are required for adjustment. The meters are placed across the face of the color picture tube, and the gray scale and color controls are adjusted accordingly. The color TV sets with Insta-Matic color tuning are adjusted at the factory for the best overall viewing. Consequently, refrain from readjustment unless it is certain that the factory settings have been altered and adjustment is needed for proper color balance. However, we did slightly readjust these settings on the set used in our lab.

The Insta-Matic switch on one of the many Motorola color-TV sets employing automatic color circuitry. *Courtesy of Motorola Inc.*

Field Readjustment of Automatic Controls

Before readjusting the automatic controls, switch to manual operation and make sure that normal B/W- and color-TV operation is possible. If it is impossible to obtain a normal picture, do not disturb the automatic controls, but proceed with the regular set-up steps for proper gray scale adjustments. After this is done, recheck the Insta-Matic operation. If adjustments are still required, the following suggestions may be helpful. The brightness, contrast and intensity circuits are interactive to a degree that changing one may require a change in one or both of the other adjustments to rebalance the picture for normal viewing.

Then turn to a channel with a B/W picture, or with the color intensity at minimum setting, and adjust for the best balance between brightness and contrast. Next, increase the color intensity to a normal viewing level. A slight readjustment of the brightness and contrast controls may be required, then recheck between the B/W and color pictures on all channels. Remember, ambient light may change the optimum settings if the set is viewed in bright-light areas.

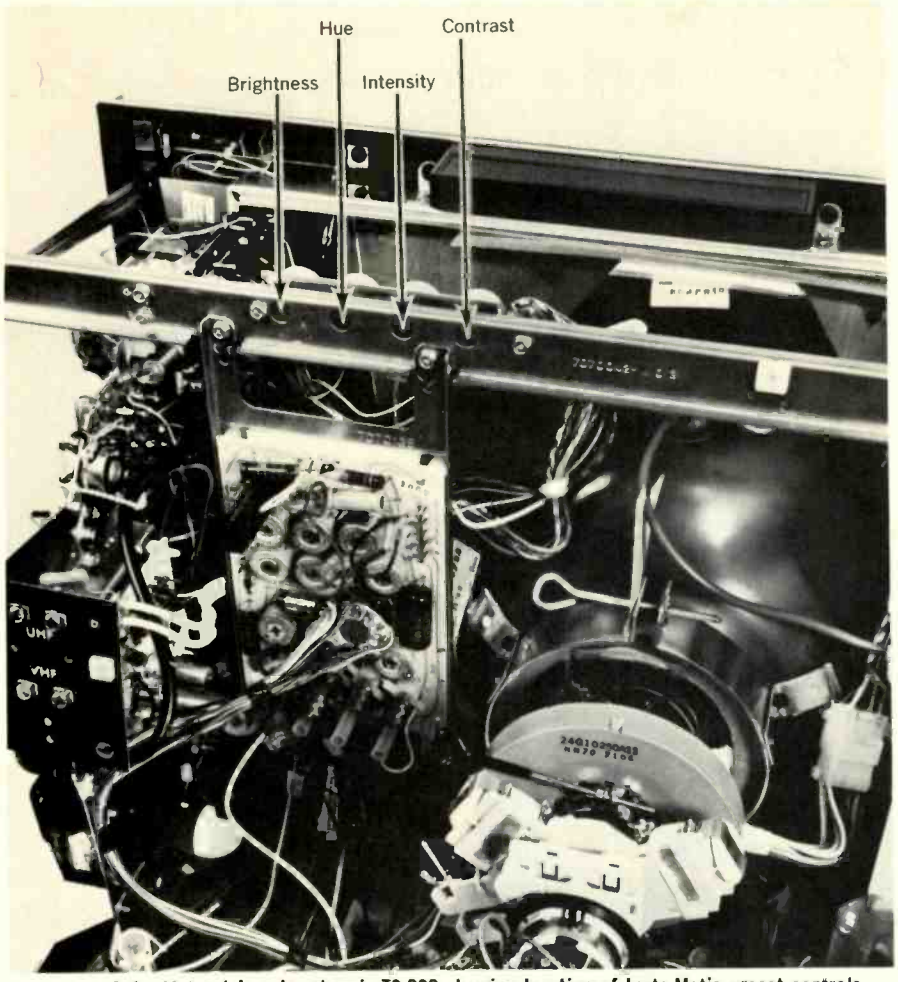
Troubleshooting Insta-Matic Circuit

Most of the troubleshooting is done by comparison on both manual and automatic operation. Compare the brightness, contrast, hue and intensity on both. We are then actually isolating the trouble to the CA panel, the switch, wiring and controls. The CA panel, shown in Fig. 1, contains all of the active components, including the extra circuits for automatic intensity control. Also, included on the CA panel are the circuits for BRIGHTNESS, CONTRAST and HUE controls, which are the same as those provided for manual operation—so any of these problems originating "on the panel" will appear in both the manual and automatic mode of operation.

Hue and Tint Circuit Voltage Check

We made various voltage checks on the solid-state switch (Fig. 2), which functions as an "AND GATE." This circuit shifts the phase angle of the blue demodulator and the CRT red gun current as desired. The voltage checks were made with the receiver during both automatic and manual operation with color- and B/W-TV signals.

In making these measurements, we used Sencore's Model CG159 color generator and Model FE16 field-effect meter in conjunction



Rear view of the Motorola's color chassis TS-929 showing location of Insta-Matic preset controls.

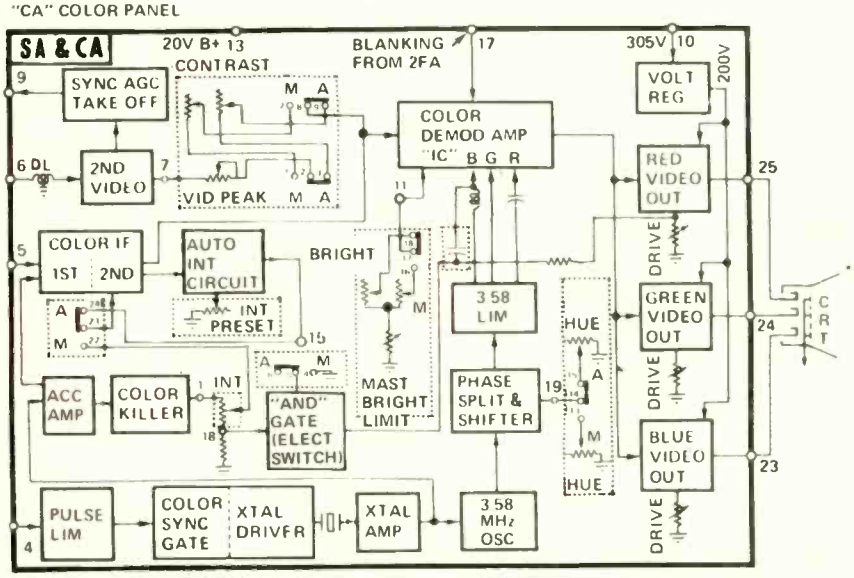


Fig. 1—Basic block diagram of the CA color panel with Insta-Matic color preset feature. *Courtesy of Motorola Inc.*

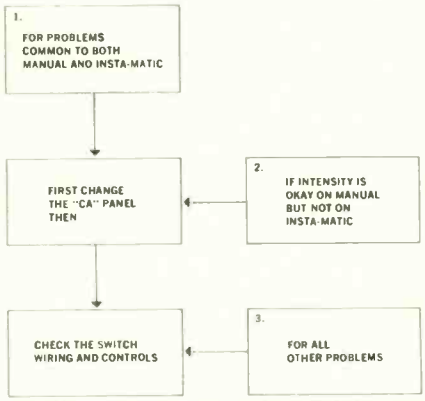
with the Insta-Matic portion of Motorola's Model WP563GWA color-TV set.

First, we measured the bias voltage at the base of transistor Q4 (terminal 18 CA to ground), one of the transistors included in the solid-state switch circuit. In this check we used off-the-air color- and B/W-TV signals, although a color bar generator could have been employed. The bias at the base of Q4 measured 0v with the B/W signal and 0.6v with the color signal.

We then measured the bias voltage at the base of transistor Q3 with the switch on both its MANUAL and AUTOMATIC positions and with a B/W and color signal. During manual operation, we found no base bias voltage on Q3 with either a B/W or color signal, but during automatic operation we had 0.8v with a color signal and 4.6v with no color signal.

Then the collector voltage (to ground) of transistor Q3 was checked during the following conditions:

During manual operation, with either B/W or color signals we measured 8v. We then switched to automatic operation with a color signal and measured 0v at the collector of Q3. This illustrates the fact that the collector of Q3 is now grounded through two transistors. The phase-shifting capacitor, C4, is now in parallel with capacitor C41; and resistor R4 is in parallel with resistor R90. The phase angle of the blue demodulator is shifted and the CRT red gun current is increased, producing a warmer background color. We illustrated this "AND GATE" action with the following procedures: The tuner was turned to a po-



Insta-Matic color circuit troubleshooting chart.

sition between channels to produce a white raster and the collector of Q3 was shorted to ground. This in turn increased the red-gun current, producing the same warmer background or gray scale.

After feeding a gated rainbow pattern from the color-bar generator into the antenna terminals of the TV receiver, we shorted the collector of transistor Q3 to ground and noted that the phase angle shifted, altering the demodulation system to favor flesh tones.

Automatic Fine Tuning (AFT) Circuit

When a station is properly fine tuned, the video carrier is at 45.75 MHz. Some of this signal (applied to the KA panel) is amplified in transistors Q1 and Q2, and applied to a 45.75MHz discriminator circuit (Fig. 3). Under these conditions, the circuit is balanced—no voltage appears at the output, and no correction is applied to the tuner. If the fine tuning is mis-adjusted, the video carrier is no longer at 45.75MHz. As a result, the AFC circuit is unbalanced and develops a (plus or minus) voltage. This voltage—applied to the vari-cap diode in the tuner—changes the capacity in the oscillator, bringing it back on frequency.

To check the operation of the AFT circuit, an ohmmeter is connected between ground and the AFT output terminal on panel KA. The AFT and Insta-Matic controls are then alternately switched. First, the manual AFT switch is placed in the OFF position. Then, the Insta-Matic switch is pressed and the meter indicates that a voltage is present at the AFT output terminal. The presence of this voltage indicates that the AFT circuit is activated and a correction voltage is being applied to the vari-cap diode in the tuner—changing the capacity in the oscillator, and bringing it back on frequency whenever the fine tuning is not properly adjusted.

Automatic Intensity Control

A color bar generator with variable color is required for checking the automatic intensity control, and a NTSC signal is preferred over a

continued on page 60

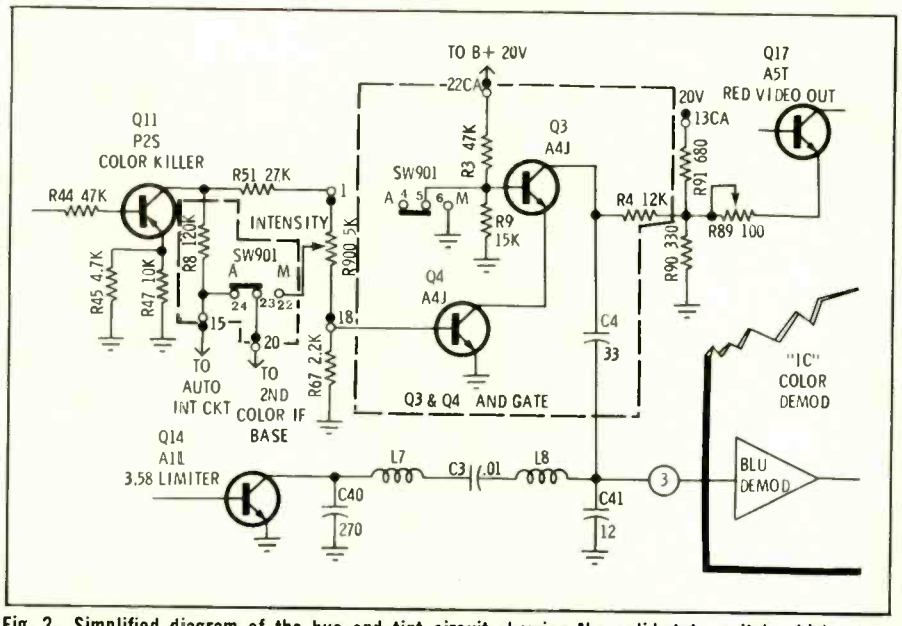


Fig. 2—Simplified diagram of the hue and tint circuit showing the solid-state switch which operates as a "AND GATE." *Courtesy of Motorola Inc.*

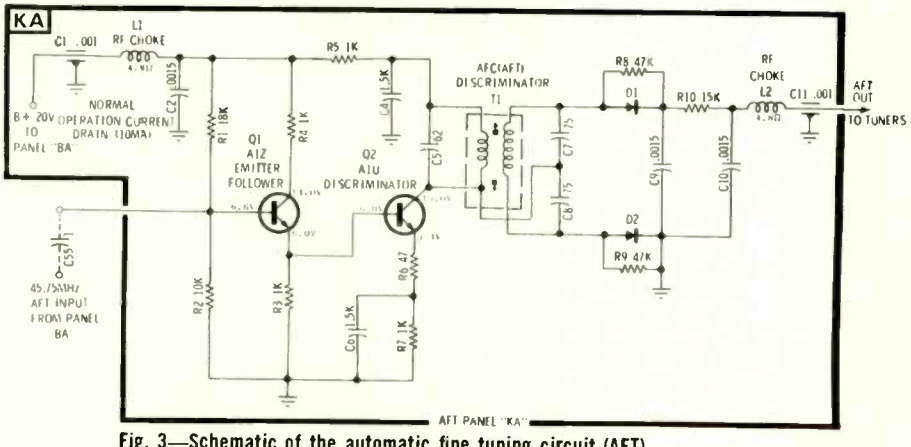


Fig. 3—Schematic of the automatic fine tuning circuit (AFT). *Courtesy of Motorola Inc.*

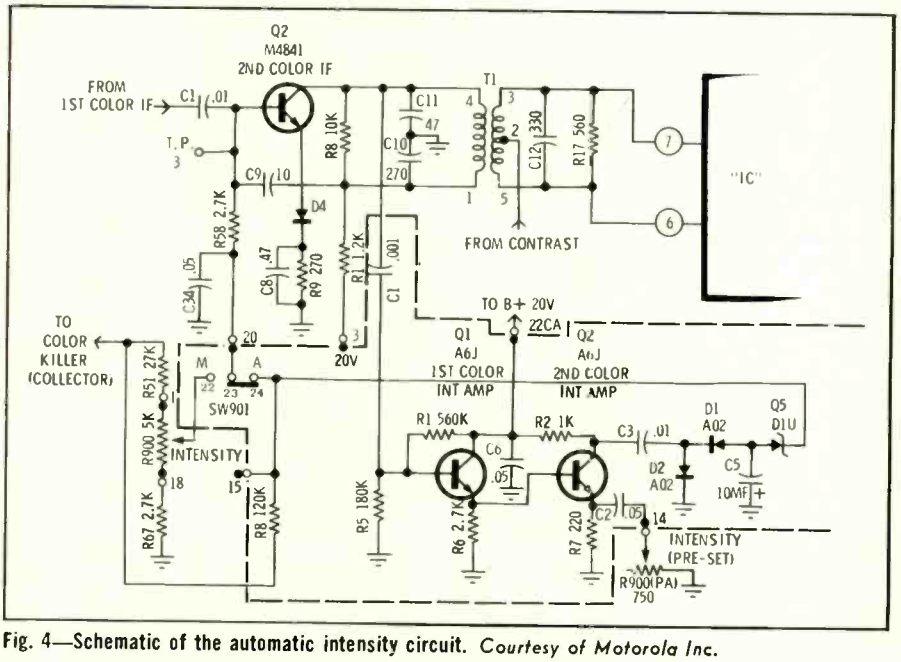


Fig. 4—Schematic of the automatic intensity circuit. *Courtesy of Motorola Inc.*

Servicing the Auto Stereo Tape Deck

by Homer L. Davidson

Helpful hints for entering a growing field that needs your services

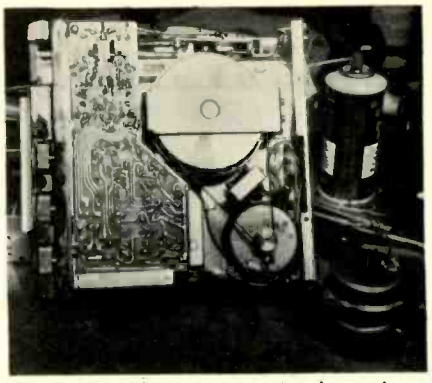


Fig. 1—Installing a new motor in a stereo tape deck.

■ During the last five years, thousands of auto stereo tape players have been sold. Now they are appearing on the service bench. Are you getting your share of this booming cartridge tape player repair business? If you have been servicing auto radios, then these units are right up your alley. If not, now is the time to get in on the bandwagon.

SPEED PROBLEMS

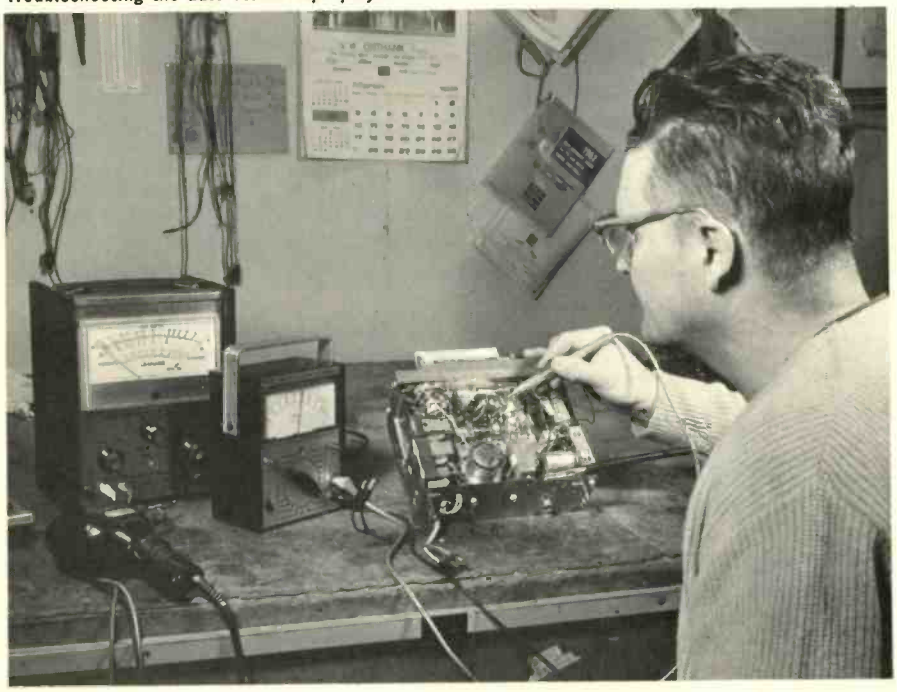
Before attempting to check for slow or irregular speeds, make certain that the supply voltage is between 12v and 13v. If the monitoring voltmeter readings vary a great deal with the speed of the tape player, suspect a dry motor or flywheel bearing. Remove the drive belt and recheck the fluctuating voltage with the motor running. Even in the best electronic speed regulation systems, the voltage may vary 0.25v or more.

If the speed of the tape deck varies, always check the suspected player with a new cartridge. Slow-speed complaints on a given cartridge will indicate a defective cartridge.

Some tape players have a speed disc on the bottom side of the flywheel. The speed of other tape decks can be adjusted by turning a slotted rheostat control.

To adjust the speed of a Lear-Jet Stereo-8 player, remove the knobs on the right side of the player and insert a thin-bladed screwdriver. If the unit is running fast, turn the screwdriver counterclockwise; if it is running slow, turn the screwdriver clockwise.

Troubleshooting the auto stereo tape player.



It is important to determine whether the slow- or high-speed problem is related to mechanical or separate electronic speed control circuits—a mechanical speed governor being found in models that do not have an electronic speed-control circuit. As had been indicated, slow-speed problems are generally caused by dry or dirty motor and flywheel bearings, while high-speed problems are usually the result of a defective electronic speed circuit or motor.

Slow-speed problems can generally be rectified with proper clean up and lubrication procedures. Suspect a defective motor if the flywheel must be started by hand. Remove the capstan drive belt and see if the motor will run by itself. Should the motor run smoothly, suspect a dry capstan flywheel bearing. If the motor does not run smoothly, it should be replaced (Fig. 1).

Sometimes these small motors can be repaired by removing the end cover and checking the mechanical governor. Clean the burned points with a piece of postcard paper. Also, a drop of light oil on the governor mechanism will help. Repairing these motors can be a ticklish and tedious job. It is generally better to replace the defective motor to prevent future speed problems.

Check the motor leads or voltage-dropping resistor for a dead motor. Measure the voltage at the motor wire terminals for proper operating voltage (Fig. 2). A motor can operate intermittently due to poor printed-circuit board connections or a defective governor. Lay the tape player on its side and tap the end of the motor assembly. If the speed changes, the motor is probably defective.

Use a test cartridge for checking low- and fast-speed problems, or select a recording with a vocal singer and listen for the pitch of the known artist's voice. If the pitch is high, the tape player is running too fast. Under these conditions, check for improper speed adjustments, defective transistorized speed circuits or a defective motor. All speed adjustments should be made while the unit is connected to a 12.6v power source.

Remove the transistors and diodes from the speed regulator circuit so that accurate beta and leakage tests can be made. Once out of the circuit, also make accurate resistance readings of the small, low-resistance resistors. Check the spike and transient suppressor diodes with one end removed from the circuit. These diodes will measure 10Ω in one direction and infinity in the reverse direction. When speed adjustments and the transistorized speed circuit are found to be okay, replace the motor—it is probably defective.

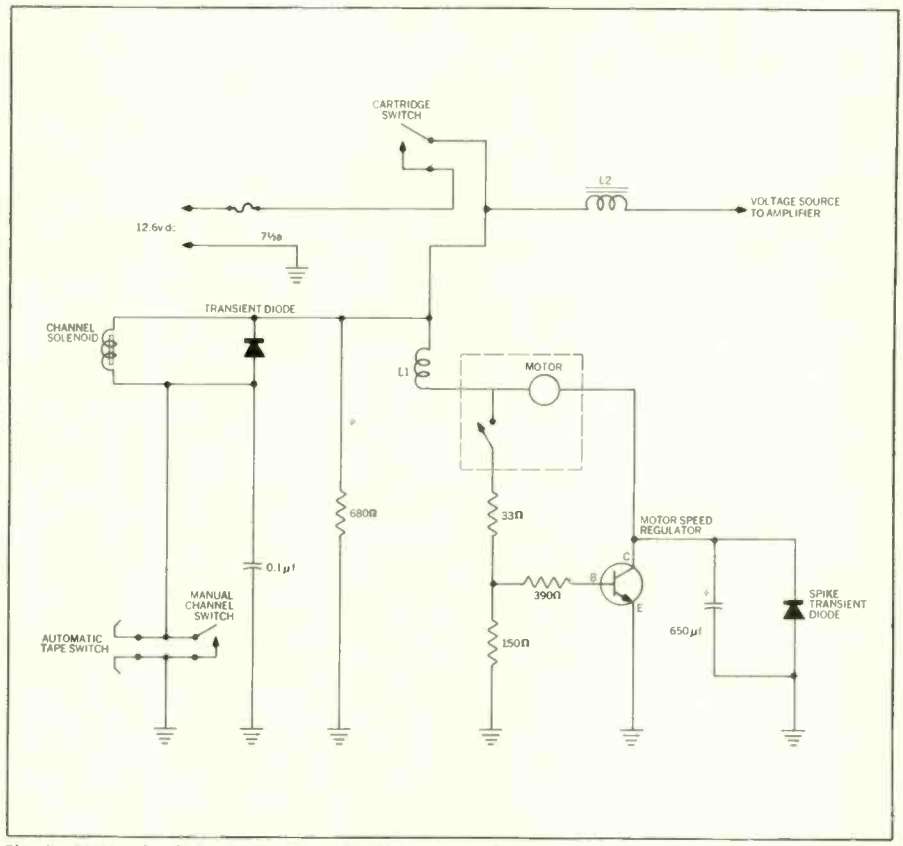
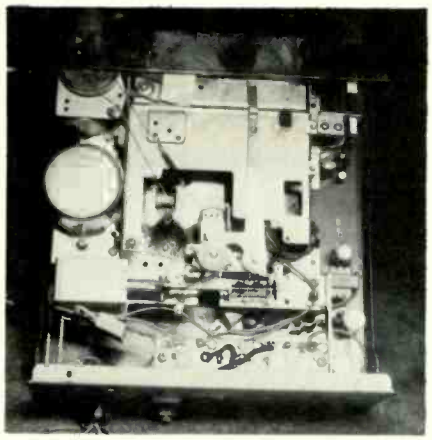


Fig. 2—Motor circuit for Ford Model IFD5003 stereo unit.

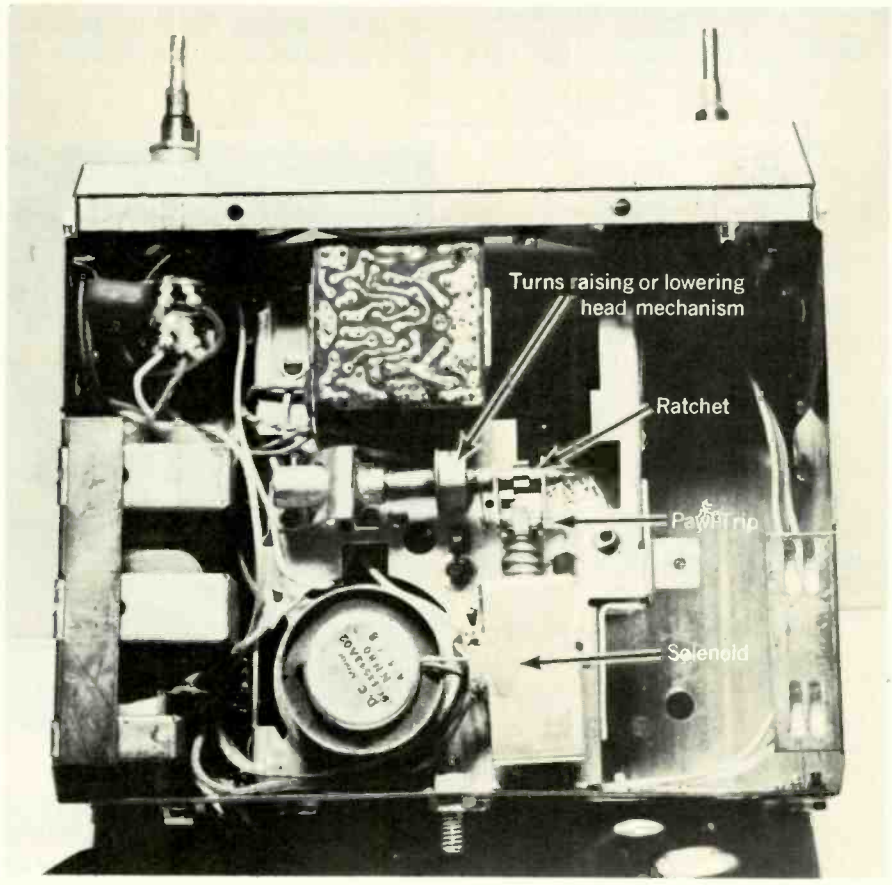
Fig. 3—Clean off all oxide tape dust around the capstan drive.



CLEANING AND LUBRICATION

A complete cleaning and lubrication procedure can solve many tape player problems. When the capstan drive will not rotate, suspect a broken belt or dry capstan bearing. Excessive tape oxide dust around the capstan bearing will cause slow or wow conditions (Fig. 3). Always remove the capstan flywheel and clean off the bearings and drive assembly. Use a small round brush dipped in alcohol to get down into the bronze

Fig. 4—Check the ratchet and arm pawl for indexing the channel mechanism.



bearings. Apply light oil to the capstan bearings and wipe excess oil from the drive shaft. Clean off the bottom of the capstan flywheel and apply grease to the nylon end bearing. Before replacing the flywheel, clean under the head assembly using a cotton swab saturated with alcohol.

When tape oxide dust is packed against the tape head, expect weak and distorted sound. Noisy sound may be caused by a magnetized tape head or defective amplifier. Also clean off the tape guide and program slide switch with a swab.

Wow or slow-speed conditions may be caused by a dirty or worn belt and motor pulley. Check the belt for slippage and clean it with alcohol. Wipe the motor pulley and check closely for small pieces of rubber or oil packed against it. If the flywheel or pulley surfaces are very shiny, suspect a loose belt or dry bearing. Inspect the motor bearing for noisy or dry conditions. If it is noisy or worn, replace the whole motor assembly.

DOESN'T CHANGE CHANNELS

When the tape player will not change channels, suspect a defective automatic program selector switch, bent pawl, dry ratchet or defective solenoid. First, check to see if the channel will change with the manual button. If the manual switch is operating, the trouble lies in the automatic program selector switch. Either the switch contacts are dirty or the metal contacts are not in line with the tape.

In cases where the solenoid is energizing and the tape head remains in one position, see if the trip pawl is moving the small ratchet (Fig. 4). A dry or dirty ratchet may become frozen—the trip pawl sliding past it. See if the trip pawl is bent out of position and does not strike the ratchet assembly. A plastic ratchet with metal bearings will bind quite easily. Proper clean up and oiling of the ratchet assembly can usually restore the channel changing operation. Also, check for gum wrappers or other foreign material lodged under the tape head.

When the solenoid will not pull the trip pawl into position, suspect a poor wiring connection or burned solenoid winding. See if the plunger is being pulled clear into position. In some models an indexing screw is adjusted for starting and stopping the cycling operation. Check for weak or missing springs from the track-shift mechanism. Burned or damaged solenoids should be replaced with original part numbers.

Suspect a shorted transient diode when the supply fuse blows during a channel change (Fig. 5). This diode is located across the solenoid winding.

Most manual and automatic program selector switches are located on the ground side of the solenoid and will not blow fuses unless the switch remains closed. However, it is possible for the top switch blade to ground out through the fiber insulation, causing the solenoid to stay energized (Fig. 6). Also, a binding tape cartridge may blow fuses when the channel is being changed.

Check the tape player for proper fuse protection. Most players are fused from 2.6a to 5a. Tape players that operate with radios are fused up to 9a.

The next article will cover audio circuitry and additional troubleshooting techniques. ■

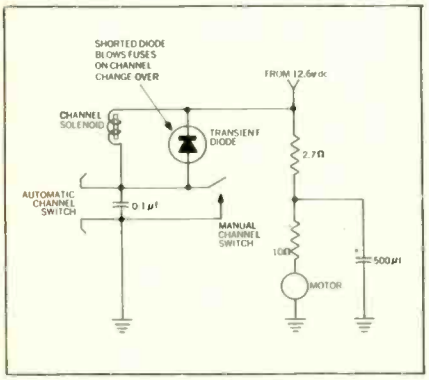


Fig. 5—A shorted transient diode across the solenoid will blow fuses during a channel change.

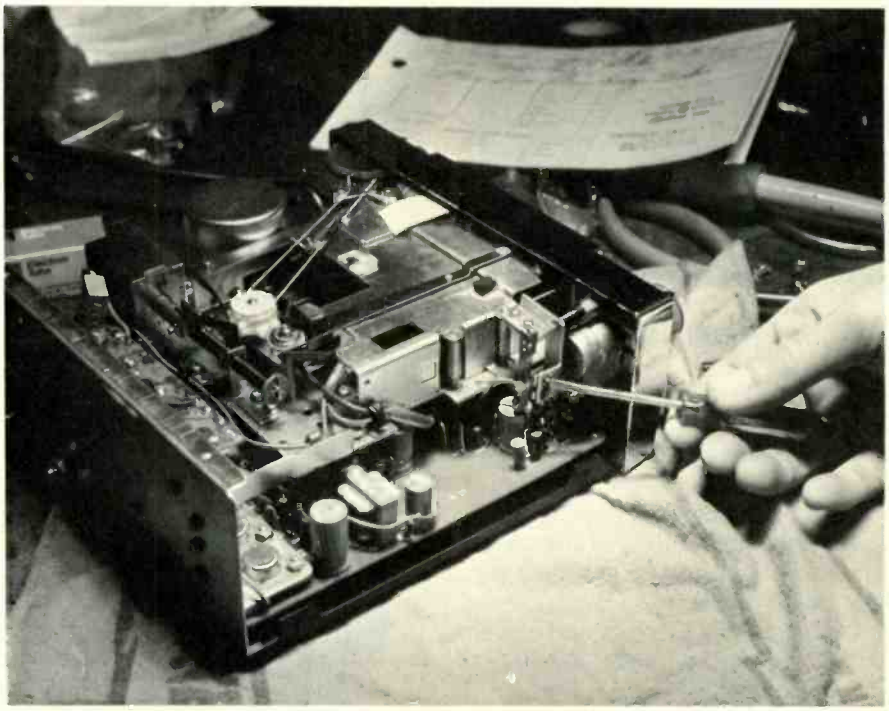


Fig. 6—An automatic channel switch with poor insulation to ground.

Color Television Reception Part III--The Color Section

by William Spero

The function of circuitry which will enable a TV set to produce color pictures

■ The first article in this series described the nature of a color-TV signal and resulting antenna requirements, as compared to that required for monochrome reception. The second article continued this subject with a description of some of the basic circuits that both B/W- and color-TV sets have in common. And this month's article continues the series with a description of the circuits found in the color section (Fig. 2 on the next page).

Composite video signals from the first video amplifier are coupled to the first and second chroma amplifiers (Q610 and Q612). The tint and color controls are at the output of the second chroma amplifier.

The signal sidebands are demodulated in the X and Z demodulators. Synchronous detection takes place using the 3.58MHz reference oscillator injection voltage to key the demodulator transistors ON and OFF.

The demodulated signals are then coupled to the grids of the difference amplifiers (V8A, V8B and V8C). The G−Y signal is derived by matrixing the R−Y and B−Y signals. These color signals are then coupled to their respective R, B and G grids in the color picture tube. The blue, green and red screen controls adjust the CRT grid bias so that proper B/W tracking is obtained when viewing a monochrome picture.

Additional circuitry unique to a color-TV set include convergence, the blanker, burst amplifier, phase detector, reactance control, color killer detector, color killer, automatic color control amplifier and last but not least, the delay line.

The Y or luminance signal from the video amplifier arrives at the cathodes of the CRT at some finite time. Due to the additional circuit path required for the chroma signals (ignoring the luminance delay line), they arrive at the grids of the CRT some time later. In order to have both signals arrive at the CRT at a coincidental time, a delay line is added to the Y signal path.

Now let us explore in greater detail the circuitry just mentioned. Fig. 1 is a block diagram of the chroma circuitry and will serve for circuit orientation, while individual diagrams will be used for each circuit section.

Chroma IF Amplifier

Complete composite video signals from the first video amplifier emitter are applied to the first chroma amplifier (Fig. 3) through capacitor C600 and inductor L614. This L-C network attenuates low-frequency video signals and passes frequencies in the chroma IF band. The first chroma IF will amplify these signals by an amount determined by the ACC (Automatic Chroma Control) bias applied to the base of transistor Q610 through resistor R638.

All signals are then coupled through capacitor C624 to the second chroma amplifier (transistor Q612). The collector load for this stage consists of a resonant circuit consisting of capacitor C626 and the primary winding of the bandpass transformer (T602). Sufficient bandpass is achieved with damping resistor R648 connected in parallel with this resonant circuit.

The bandpass transformer (T602) has an upper and lower slug adjustment so that it can be tuned to 3.1 MHz and 4.1MHz, respectively. When this transformer is properly aligned, it has a 1MHz bandpass with 3.58MHz as its center frequency (Fig. 4). The transformer output is applied to tint control R609 and color control R629 (Fig. 3). The tint control provides selective inductive or capacitive loading of the transformer output. The entire chroma IF signal can therefore be shifted in phase (±30°) to provide full tint control. The color control allows attenuation of the color signals applied to the chroma output stage (transistor Q606).

The base of chroma output transistor Q606 receives killer bias (a voltage which sets the conduction threshold for this transistor) from the collector of the color-killer transistor. The emitter circuit of Q606 receives a blanking pulse via inductor L602 from the emitter of the blanker transistor—thus eliminating

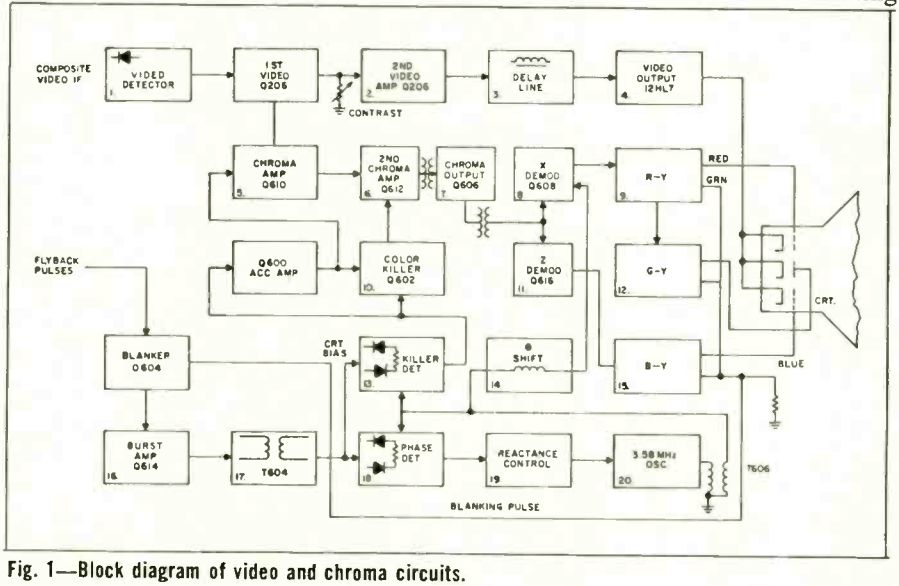


Fig. 1—Block diagram of video and chroma circuits.

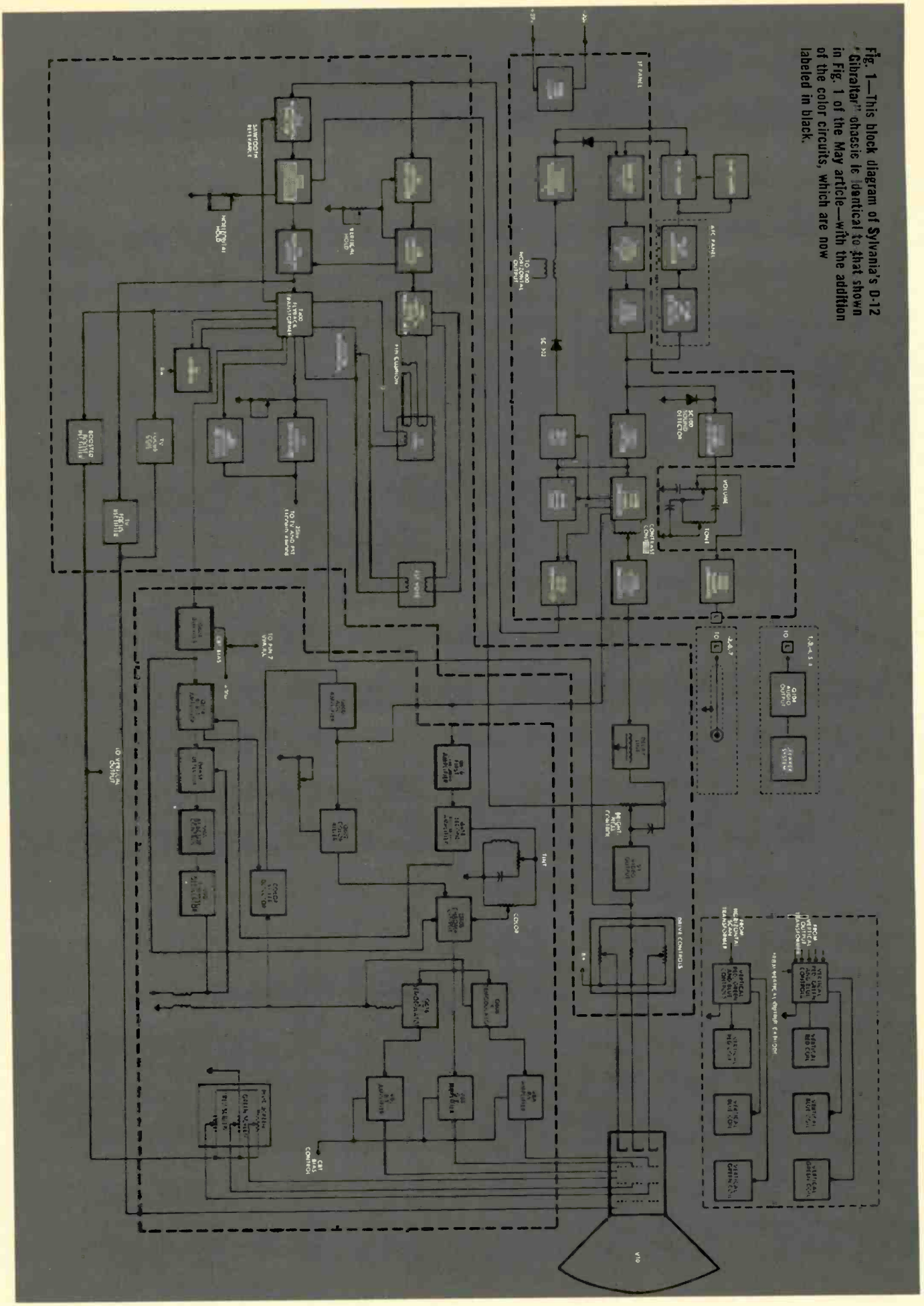


Fig. 1—This block diagram of Sylvania's D-12 "Gibraltar" chassis is identical to that shown in Fig. 1 of the May article—with the addition of the color circuits, which are now labeled in black.

the 3.58MHz burst signals. This allows only true chroma signals to pass through the chroma output transformer (T600) to the "X" and "Z" demodulators.

X and Z Demodulators

In order to demodulate the chroma sidebands, the X and Z demodulators (transistors Q608 and Q616 in Fig. 5) provide synchronous detection of these signals with the 3.58 MHz reference oscillator injection voltage. This voltage is several times that of the chroma signal and provides large amplitude 3.58MHz pulses in the emitter circuits of the demodulators. The phase angle of the 3.58MHz signal applied to the Z demodulator from transformer T606 is shifted approximately 90° by inductor L605 and capacitor C650; while the 3.58MHz signal applied to the X demodulator remains in phase with the transformer. The actual shift is selected to provide the most accurate color presentation.

When chroma signals are applied to the base of the demodulators, the phase and amplitude of these signals will influence the average amplitude of the collector pulses in each demodulator. When the chroma and 3.58MHz signals are in phase, the two signals cause the transistors' conduction to decrease, raising the collector voltage toward B+. The amount of this increase is determined by the phase relationship of the two signals and the amplitude of the chroma signal. [*At this point I wish to stress once again the importance of IF alignment. Poor high frequency response does not allow the chroma information (the 3.58 MHz signal and its sidebands) to have the correct amplitude to properly drive the demodulators. This certainly will produce weak color, or in some cases no color at all.*]

When the chroma drive to the demodulator and 3.58MHz continuous-wave (CW) reference signal are 180° out of phase, the transistor is turned ON—the conduction level increases and the collector voltage drops. For example: When a green chroma signal is fed to the X demodulator, the 3.58MHz signal is *in phase*. The emitter and base (transistor Q616) are driven negative.

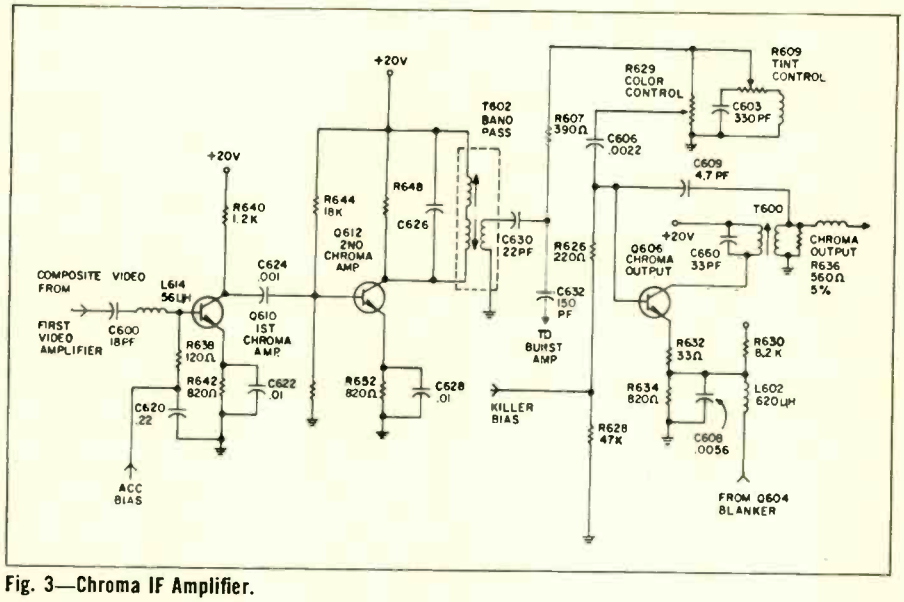


Fig. 3—Chroma IF Amplifier.

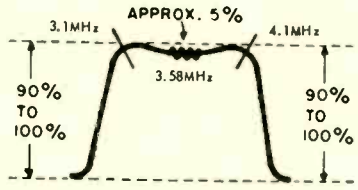


Fig. 4—Signal present at secondary winding of properly aligned bandpass transformer (T602).

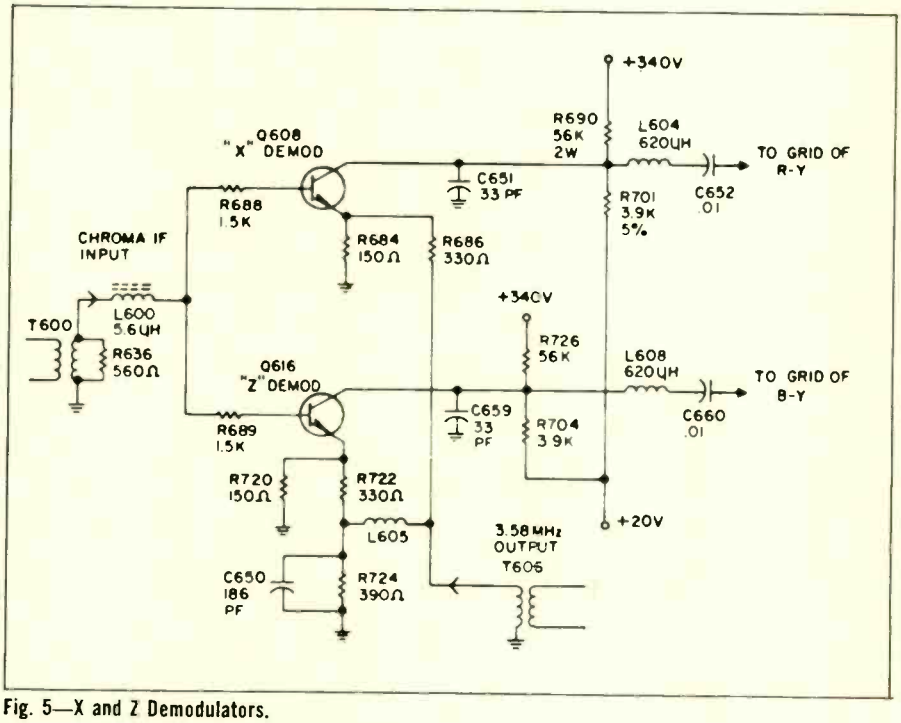


Fig. 5—X and Z Demodulators.

When the CW signal to the emitter turns ON the demodulators, it sees a negative going chroma signal at the base. The transistor is then turned OFF, causing the collector voltage to rise toward B+. The demodulator collector voltage is coupled to the color-difference amplifier through a 0.01mfd capacitor; and this rising voltage turns ON the R−Y amplifier, dropping the amplifier plate voltage and the CRT's

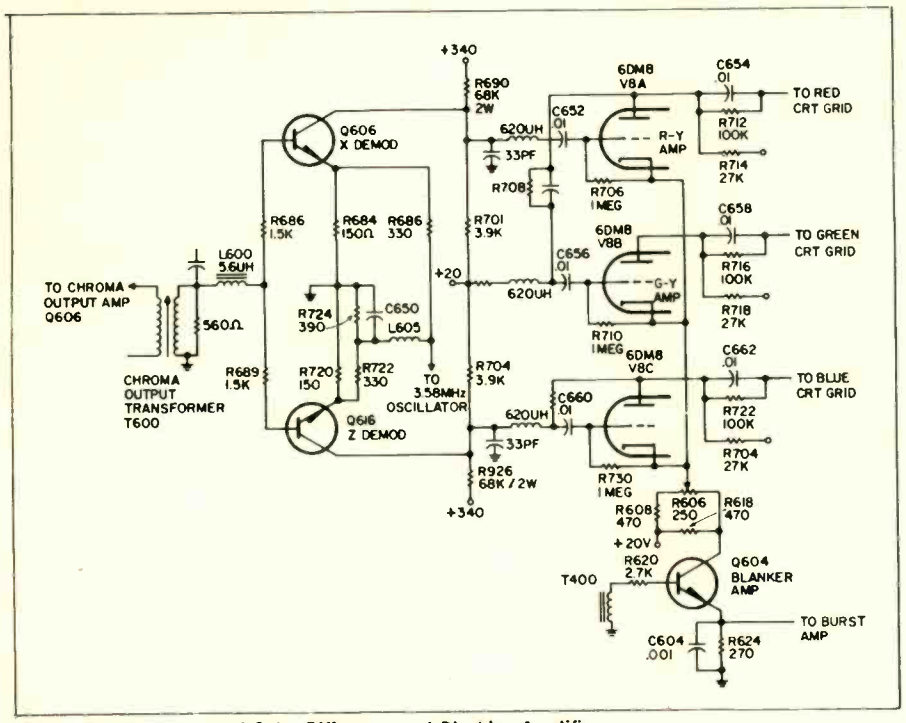


Fig. 6—Demodulators, and Color Difference and Blanking Amplifiers.

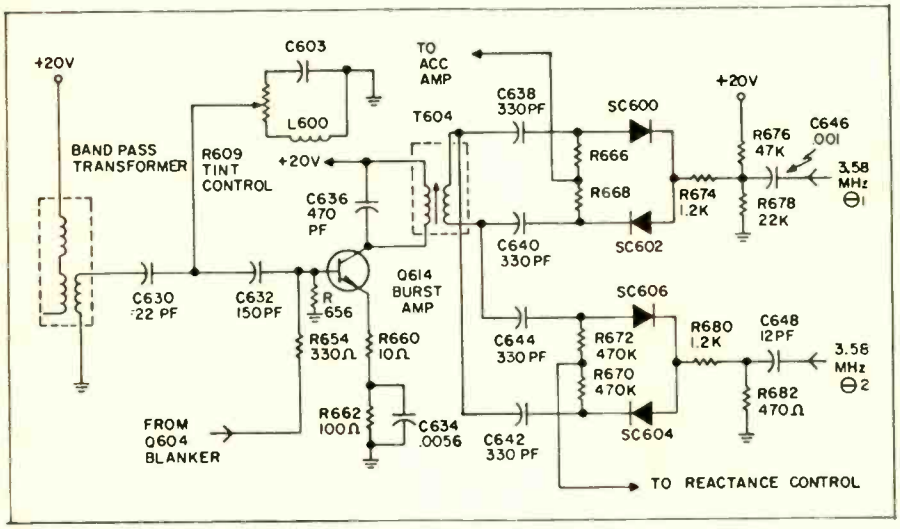


Fig. 7—Burst Amplifier and Phase Detectors.

red-grid voltage—cutting OFF the red gun. This can be more clearly seen in Fig. 6.

The drop in the R−Y plate voltage is coupled to the grid of the G−Y amplifier (cutting it OFF), thus causing the plate voltage of the G−Y amplifier to rise toward B+. This voltage rise turns ON the CRT's green gun.

Now, when an out-of-phase chroma signal places a negative going voltage at the grid of the R−Y amplifier, this signal decreases the conduction of that amplifier. Its plate voltage rises and biases the red CRT grid ON.

The collector pulses are averaged by a low-pass filter before being applied to the R−Y and B−Y amplifiers. Each filter network consists of a 620μh choke and a 33pf capacitor in the R−Y and B−Y difference amplifier grid circuit. These filters remove the 3.58MHz energy and only color-video signals remain, which are coupled to the difference amplifiers through capacitors C652 and C660.

Burst Amplifier

Chroma and burst information from the second chroma amplifier is applied to the burst amplifier (transistor Q614 in Fig. 7). This stage is biased OFF under normal conditions with resistor R656, which keeps the base near the emitter potential. During the burst interval, a positive pulse from the blanker transistor (Q604) biases the burst amplifier ON and only the burst signal is allowed to pass (during the blanking interval when the CRT is cut OFF).

The burst amplifier therefore passes only color sync bursts, which are amplified and applied to burst transformer T604. This waveform contains all the phase and frequency information of the original transmitted signal.

The blanker, burst amplifier, phase detector, killer detector, color killer and ACC amplifier are in a feedback type of loop control to provide for the proper processing of the chroma signals (refer to Fig. 1). These circuits depend, in part, on the 3.58MHz oscillator for proper operation.

3.58MHz Oscillator

The purpose of the 3.58MHz oscillator (Fig. 1) is to provide a local carrier which will enable the receiver to demodulate the chroma subcarrier sidebands. This re-inserted signal must be of the same phase and frequency as the original subcarrier, which was suppressed at the transmitter. The oscillator is crystal controlled and employs a reactance control circuit to adjust the frequency of the receiver oscillator so that it keeps in step with the transmitter 3.58MHz signal—this being the burst signal appearing on "the back porch" of the horizontal-sync pulse. The 3.58MHz output transformer (T606) provides for two quadrature outputs: One phase is coupled to the killer detector and demodulators. The other phase is coupled to the phase detector. (The dc feedback to the reactance tube is also from the phase detector.)

ACC and Color Killer Circuits

When the color burst signal is received, it is gated by the blanker transistor and then fed through the burst amplifier (transistor Q614 in Fig. 7). After amplification, it is coupled through burst transformer T604 to the phase detector, and

ACC and killer detector circuit. Opposite phases of the burst signal are coupled to the cathode and anode diodes (SC600, SC602, SC604 and SC606).

The burst signal appears only when a color telecast is being made. The lower phase detector circuit controls the 3.58MHz oscillator. The upper circuit goes to the automatic color control amplifier and color killer circuitry. These circuits are connected in parallel with the output of the burst transformer.

In the phase detector, two signals of opposite phase angles are compared in amplitude with a 3.58MHz reference signal. The reference signal is applied to the opposite anode and cathode of the diodes at all times.

During the presence of a burst signal, one diode conducts more than the other and produces a less positive voltage at the junction of resistors R666 and R668 (Fig. 8). This less positive voltage is used to bias OFF the ACC amplifier (transistor Q600) to produce a reduced output bias voltage at its emitter. The less positive voltage at the emitter is used for two purposes—it serves as an ACC voltage for the first chroma amplifier and as "turn OFF" bias for the color killer stage.

When the burst signal is absent, only the reference signal is applied to the ACC detector diodes and the voltage at the resistor junction is more positive—4v to 6v. This voltage will bias ON the ACC and color killer transistors, which causes the collector of the color killer transistor (Q602) to drop from +20v to about +5v. This provides about +1v to the base of the chroma output stage, which biases it OFF completely and blocks spurious color channel signals. (It should be noted that a +1v bias applied to the base of the chroma output stage is able to cut it OFF, because the emitter already has a positive bias due to the divider action of emitter resistors R630 and R634 connected between the +20v line and ground.)

The color killer adjustment is usually a control at the rear of the TV set. The base of the blanker stage transistor (Q604 in Fig. 9) receives a positive flyback pulse from a tapped winding of transformer

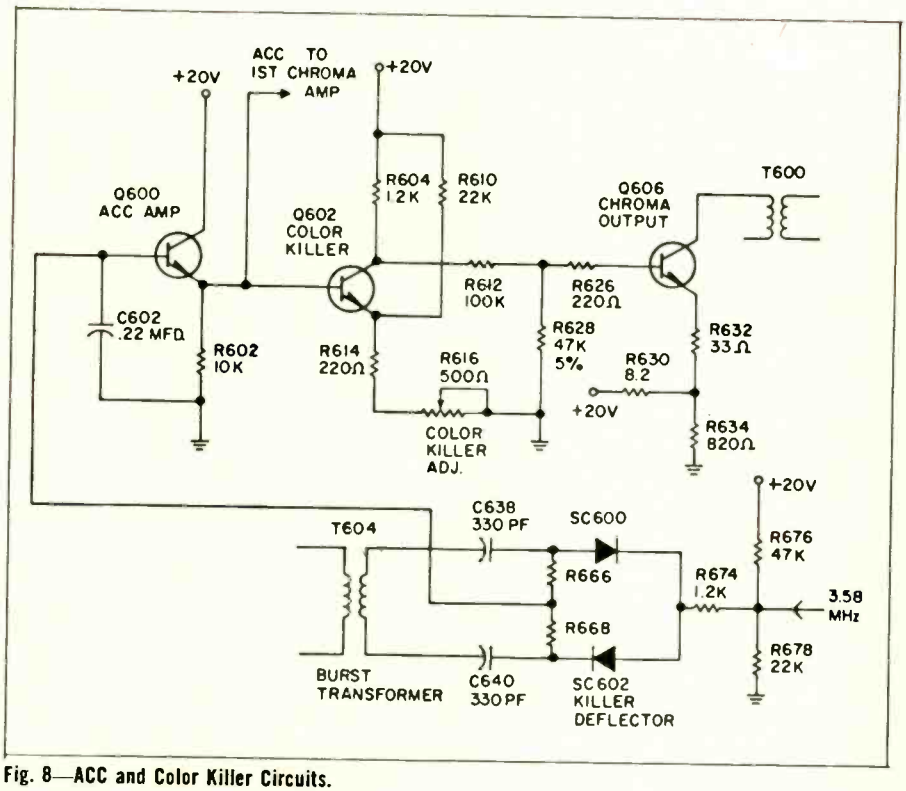


Fig. 8—ACC and Color Killer Circuits.

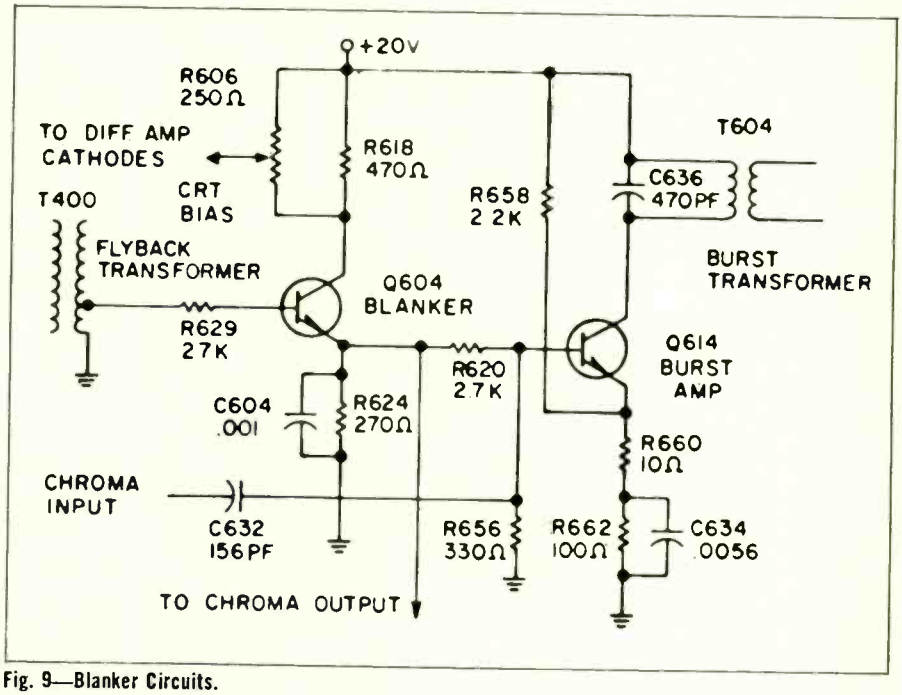


Fig. 9—Blanker Circuits.

T400. These pulses are inverted to establish negative gating pulses in the collector circuit of the blanker transistor (Q604). This provides for blanking of the CRT during the horizontal retrace and grid-leak bias for the color-difference amplifiers (Fig. 6). CRT bias control R606 (the 250Ω control at the collector of transistor Q604) establishes the magnitude of these pulses and therefore the amount of grid-leak bias developed at the difference-amplifier grids. The conductivity of the difference amplifiers, and therefore their plate voltage, will control the average CRT grid bias.

The blanker-stage transistor (Q604 in Fig. 9), as previously mentioned, also serves as an emitter follower to supply positive pulses to

continued on page 69

Television Signal Injection

by Phillip Dahlen

Defective circuits can be located by injecting appropriate television signals into the TV set being serviced

■ When a TV set functions properly, the television signals fed to its antenna terminals are broken down into color, video, horizontal and vertical signals, which eventually result in a corresponding picture on the face of the CRT. Should the TV set's circuitry malfunction and cease to permit all of these component signals to carry out their appropriate functions, the set most obviously cannot produce the desired CRT picture.

An earlier article ("Television Signal Injection" on page 46 of the April 1971 issue) is concerned with injecting TV radio frequency (either VHF or UHF) signals through the tuners, TV intermediate frequency signals through the IF stages, and TV video signals through the first and second video amplifiers to provide the desired test pattern. Whatever stage of the TV set is made inoperative for the article, we can still obtain the desired test pattern on the CRT by going to an even higher stage within the set and injecting an appropriate signal. In each instance, a test pattern can be reproduced, since the sync amplifier continues to function properly to obtain the appropriate horizontal and vertical signals from the second video amplifier. (Fig. 14 through 19 in that article contain scope photographs showing the presence of these sync signals.)

But suppose the circuits covered in the April article function properly and the malfunction occurs within the horizontal or vertical circuitry? This month's article covers that subject by using the same B & K Model 1077B Television Analyst to apply a TV RF signal to the antenna terminals of the Admiral T7K10-1C Chassis, and horizontal and vertical signals in place of those normally produced in TV-set circuits made inoperative. (As for the other article, the related circuit diagrams can be found in the March 1971 issue as TEKFAX Schematic No. 1346.) Since the test pattern is produced from a transparency placed within the analyst, the horizontal and vertical signals supplied by the analyst are synchronized with those of the test pattern transmitted through the TV set's antenna RF terminals. (They will not be synchronized with those received from any TV station.)

Horizontal Circuitry

By disconnecting capacitor CF2, which normally applies signals from the sync amplifier (pin 4 of the 17Y9) to the horizontal phase detector (dual-diode CRF4), we are able to deactivate the sync portion of the horizontal circuitry. Horizontal stability is regained by attaching an analyst lead to the disconnected capacitor lead (Fig. 1) and passing an equivalent sync signal through the capacitor to the horizontal phase detector—the dual diode shown just to the right of the probe. Although stable, the test pattern obtained upon readjusting the HORIZONTAL-HOLD control (Fig. 2) appears a little ragged, since the injected sync signal differs slightly from that normally obtained by the TV set from its video circuitry.

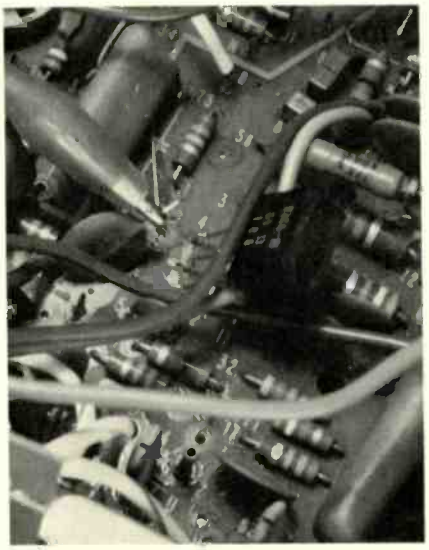


Fig. 1—Capacitor leading to horizontal phase detector is disconnected from TV set's sync amplifier and fed sync signal from analyst.

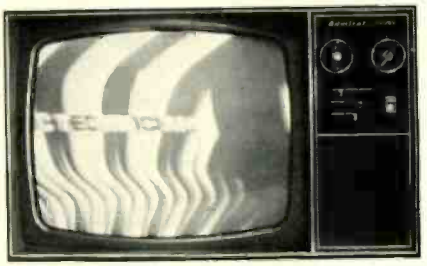


Fig. 2—TV picture produced when analyst sync signal is fed through capacitor to horizontal phase detector.

From the TEKFAX schematic of the TV set, we see that it contains hybrid circuitry—using both tubes and semiconductors. And B & K's instrument manual warns that when attaching this analyst to solid-state circuits, the amplitude of the injected sync signal should never exceed 10v—a point marked by an asterisk on the instrument's sync output control. This applies to diodes as well, for we find that when injecting the sync signal across capacitor CF5 and "cranking up" the analyst output well above the maximum recommended voltage, the dual diode (CRF4) does break down and require replacement.

Upon making the necessary repairs, we can proceed to the grid of the horizontal-oscillator control tube (pin 9 of the 9JW8—Fig. 3). With a negative analyst sync signal applied to this grid, we are able to produce a distorted, though more satisfactory test pattern (Fig. 4). A similar test pattern is produced (Fig. 5) by applying a positive analyst sync signal to the grid of the horizontal-oscillator tube (pin 2 of the 9JW8). However, both pictures are far superior to what appears on the CRT with no injected sync signal and the same HORIZONTAL-HOLD control setting (Fig. 6).

The oscillator is the last stage of

horizontal circuitry that can be driven by the analyst's sync signal. However, since this is the stage that converts the horizontal-sync signal into the horizontal-sweep signal, a test pattern is also produced when

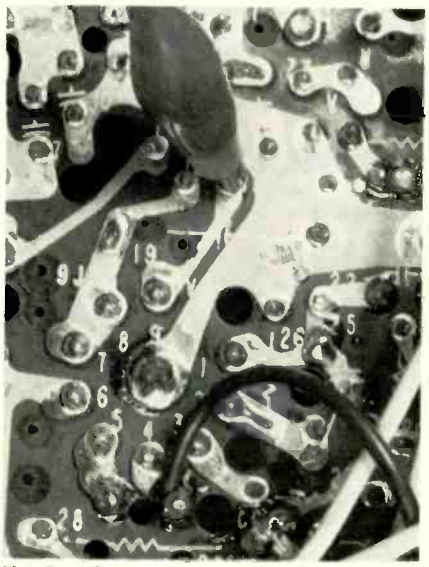


Fig. 3—Injecting analyst sync signal to grid of horizontal-oscillator-control tube.

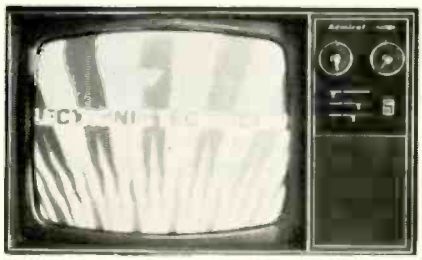


Fig. 4—TV picture produced when analyst sync signal is fed to grid of horizontal-oscillator-control tube.

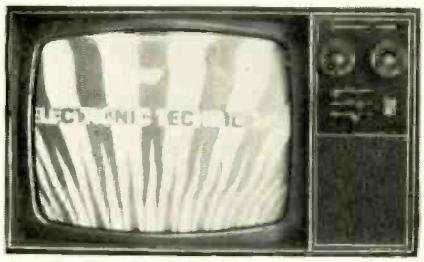


Fig. 5—TV picture produced when analyst sync signal is fed to grid of horizontal-oscillator tube.

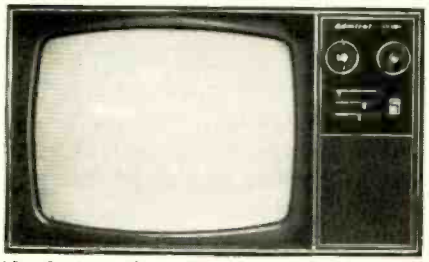


Fig. 6—Removing analyst sync signal results in loss of TV picture.

substituting the analyst's horizontal grid drive for the sync signal injected at the grid of the oscillator tube. Unfortunately, in this stage the phase angle of the injected grid-drive signal is such that a split test pattern appears on the TV set (Fig. 7).

Upon transferring the analyst's horizontal-grid-drive signal from the grid of the horizontal-oscillator tube to the grid of the horizontal-output tube (pin 5 of the 30JZ5), we find

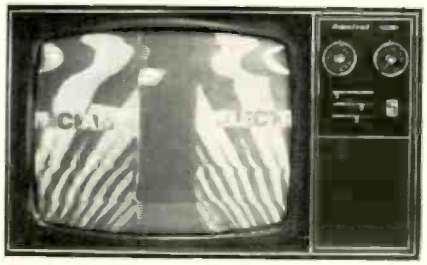


Fig. 7—TV picture produced when analyst horizontal-grid-drive signal is fed to grid of horizontal-oscillator tube.

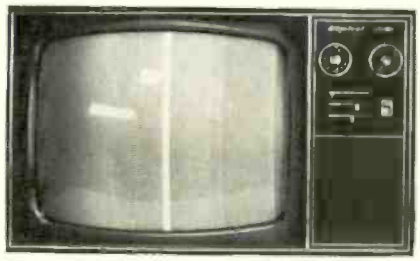


Fig. 8—Beat signal appears on CRT when both TV set's horizontal-oscillator signal and analyst's horizontal-grid-drive signal are applied to horizontal-output tube.

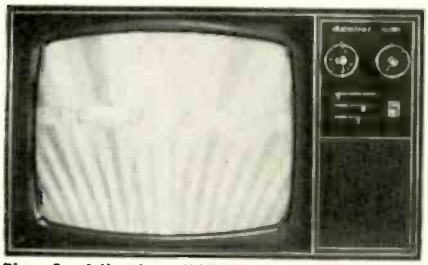


Fig. 9—Adjusting HORIZONTAL-HOLD control reduces beat signal shown on CRT.

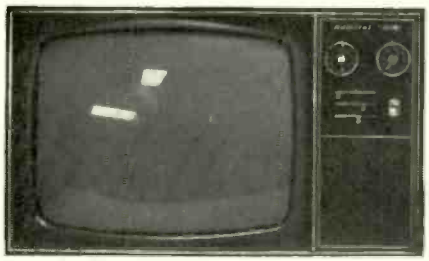


Fig. 10—Upon removing resistor RH17 from grid of horizontal-output tube, roster no longer appears on CRT. (This condition cannot be permitted to exist for more than a few moments without damaging TV set.)

that a beat signal is produced which tends to form vertical lines and eliminate any trace of the test pattern (Fig. 8). Adjusting the HORIZONTAL-HOLD control helps synchronize the free-running horizontal oscillator with the injected grid-drive signal, but the central vertical line is still apparent (Fig. 9).

By disconnecting resistor RH17 from the grid of the horizontal-output tube, we prevent it from conducting the horizontal-oscillator signal to this tube, and no roster appears on the TV set (Fig. 10). We are now able to inject the analyst's horizontal-grid-drive signal through pin 5 of the horizontal-output tube (Fig. 11) and produce the desired test pattern without any beat signal becoming apparent (Fig. 12).

We find that we are even able to bypass the horizontal-output tube by applying the analyst's horizontal-

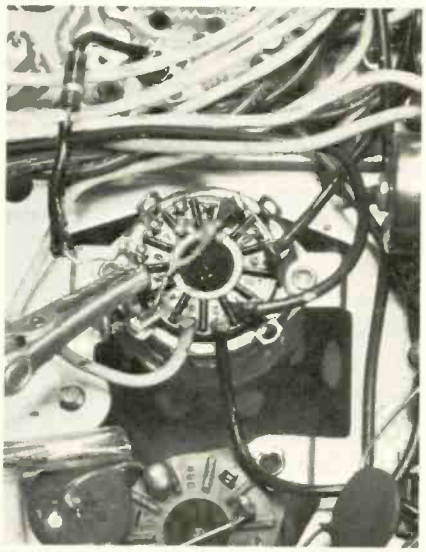


Fig. 11—Horizontal beat signals are eliminated by disconnecting horizontal oscillator from grid of horizontal-output tube (removing a resistor from pin 5 of tube socket) and injecting analyst horizontal grid-drive signal in its place.

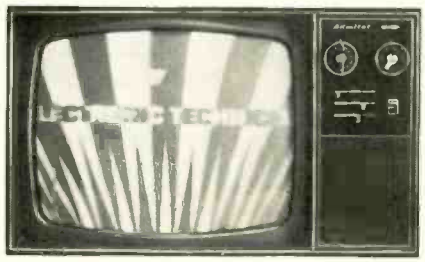


Fig. 12—With horizontal oscillator disconnected from horizontal-output circuit, injecting analyst's horizontal-grid-drive signal at grid of output tube results in a test pattern containing no beat signal.

plate-drive signal directly to the horizontal-output and high-voltage transformer (TH18). This change in connections is made while the TV set is unplugged; and before again turning the set ON, the fuse (FH74) is unplugged to prevent current conditions which might otherwise destroy the tube (Fig. 13). Thus, having bypassed virtually all of the TV set's horizontal circuitry, we are still able to produce the desired test pattern on the CRT (Fig. 14).

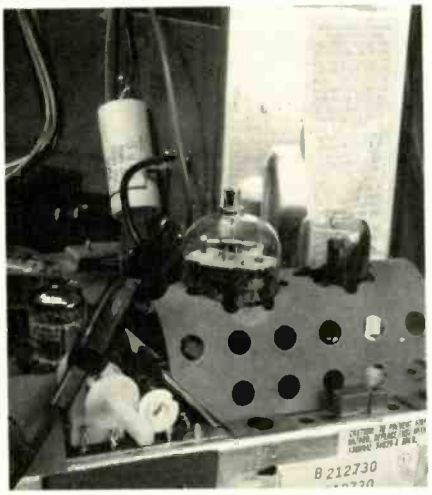


Fig. 13—By applying analyst's horizontal-plate-drive signal to cap of horizontal-output tube, while protecting this tube by removing its cathode fuse (lower right), TV set functions even though virtually its entire horizontal circuitry is bypassed.

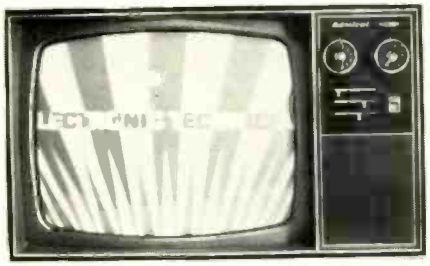


Fig. 14—Although virtually entire horizontal circuitry within TV set is bypassed by analyst, desired test pattern is still produced on CRT.

Other circuit changes would permit us to use the analyst to horizontally drive the CRT directly at the yoke to produce the desired test pattern, but we feel that enough horizontal circuitry has already been bypassed to prove the analyst's effectiveness.

Vertical Circuitry

Although Admiral has labeled half of the 25JZ8 as the vertical "oscillator tube" (V1A) and the other half as the vertical "output tube" (V1B), both halves of the tube actually function as the oscillator. The output of V1B passes back to V1A, where it is inverted and then combined with the sync signal for reamplification in V1B—thus oscillating in sync with the video signal. By disconnecting capacitor CE11, which normally applies signals from the sync amplifier (pin 4 of the 17Y9) to the vertical oscillator circuit, the vertical circuit loses stability, but a test pattern can still be obtained with appropriate adjustment of the VERTICAL-HOLD control (Fig. 15).

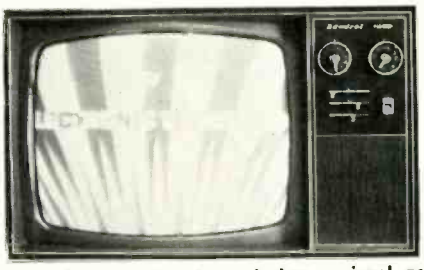


Fig. 15—Even though vertical-sync signal no longer functions, critical adjustments of VERTICAL-HOLD control still permit formation of desired test pattern.

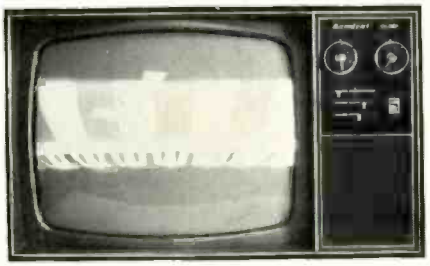


Fig. 16—TV picture produced when analyst sync signal is fed to grid of vertical "oscillator tube."

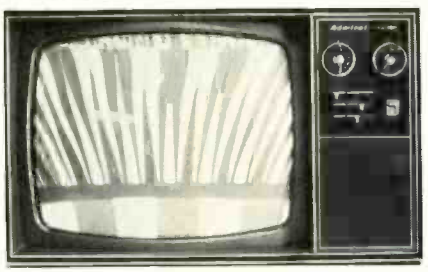


Fig. 17—TV picture produced when analyst vertical-grid-drive signal is fed to grid of vertical "oscillator tube."

Injecting sync signals from the analyst to the grid of the "oscillator tube" (pin 10 of the 25JZ8) regains stable vertical sync, but at the same time reduces the vertical output, distorting it to produce the test pattern shown in Fig. 16. A more satisfactory test pattern is produced (Fig. 17) by applying the analyst's vertical-grid-drive signal to this grid in place of the instrument's sync signal. From this test pattern, we see that the TV set's resulting vertical-output signal is not of quite the proper phase angle, but at least it is stable.

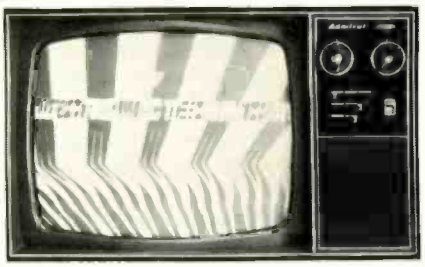


Fig. 18—TV picture produced when analyst sync signal is fed to cathode of vertical "oscillator tube."

Fig. 19—TV picture produced when analyst vertical-grid-drive signal is fed to plate of vertical "oscillator tube."

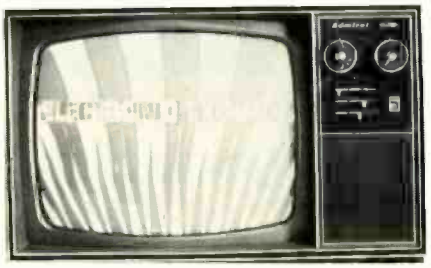


Fig. 20—TV picture produced when analyst vertical-grid-drive signal is fed to grid of vertical "output tube."

Vertical-sync stability can also be regained by applying the analyst's negative sync signal to the cathode of the "oscillator tube" (Fig. 18) or by even applying the instrument's vertical-grid-drive signal to the plate of this tube (Fig. 19). In both instances, the resulting vertical-output signal is of the proper phase angle, though some horizontal "tearing" is apparent. Since the output of the "oscillator tube" is fed to the grid of the "output tube," there is no apparent change in test patterns when moving the test lead of the analyst's vertical-grid-drive signal to this new location (Fig. 20). And we can be certain that it is this injected signal

continued on page 59

How to get into one of today's hottest money-making fields—*servicing 2-way radios!*

More than 5 million two-way transmitters have skyrocketed the demand for service men and field, system, and R & D engineers. Topnotch licensed experts can earn $12,000 a year or more. You can be your own boss, build your own company. And you don't need a college education to break in.

HOW WOULD YOU LIKE to earn $5 to $7 an hour... $200 to $300 a week ... $10,000 to $15,000 a year? One of your best chances today, especially if you don't have a college education, is in the field of two-way radio.

Two-way radio is booming. Today there are more than *five million* two-way transmitters for police cars, fire trucks, taxis, planes, etc. and Citizen's Band uses—and the number is growing at the rate of 80,000 per month.

This wildfire boom presents a solid gold opportunity for trained two-way radio service experts. Most of them are earning between $5,000 and $10,000 a year *more* than the average radio-TV repair man.

Why You'll Earn Top Pay

The reason is that the U.S. doesn't permit anyone to service two-way radio systems unless he is *licensed* by the FCC (Federal Communications Commission). And there aren't enough licensed experts to go around.

This means that the available licensed expert can "write his own ticket" when it comes to earnings. Some work by the hour and usually charge at least $5.00 per hour, $7.50 on evenings and Sundays, plus travel expenses. Others charge each customer a monthly retainer fee, such as $20 a month for a base station and $7.50 for each mobile station. A survey showed that one man can easily maintain at least 15 base stations and 85 mobiles. This would add up to at least $12,000 a year.

How to Get Started

How do you break into the ranks of the big-money earners in two-way radio? This is probably the best way:

1. Without quitting your present job, learn enough about electronics fundamentals to pass the Government FCC License. Then get a job in a two-way radio service shop and "learn the ropes" of the business.

2. As soon as you've earned a reputation as an expert, there are several ways you can go. You can move out, and start signing up your own customers. You might become a franchised service representative of a big manufacturer and then start getting into two-way radio sales, where one sales contract might net you $5,000. Or you may be invited to move *up* into a high-prestige salaried job with one of the same manufacturers.

The first step—mastering the fundamentals of Electronics in your spare time and getting your FCC License—can be easier than you think.

Cleveland Institute of Electronics has been successfully teaching Electronics by mail for over thirty years. Right at home, in your spare time, you learn Electronics step by step. Our AUTO-PROGRAMMED® lessons and coaching by expert instructors make everything clear and easy, even for men who thought they were "poor learners."

Your FCC License... or Your Money Back!

By the time you've finished your CIE course, you'll be able to pass the FCC License Exam with ease. Better than nine out of ten CIE graduates are able to pass the FCC Exam, even though two out of three non-CIE men fail. This startling record of achievement makes possible our famous FCC License Warranty: you'll pass the FCC Exam upon completion of your course or your tuition will be refunded in full.

Find out more. Mail the bound-in post-paid card for two FREE books, "How To Succeed In Electronics" and "How To Get A Commercial FCC License." If card has been detached, use coupon below.

ENROLL UNDER NEW G.I. BILL

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

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

Please send me without cost or obligation:

1. Your 44-page book "How To Succeed In Electronics" describing the job opportunities in Electronics today, and how your courses can prepare me for them.
2. Your book on "How To Get A Commercial FCC License."

Name _____ Age _____
(PLEASE PRINT)

Address _____

City _____ State _____ Zip _____

Accredited Member National Home Study Council ET-60

He's flying high. Before he got his CIE training and FCC License, Ed Dulaney's only professional skill was as a commercial pilot engaged in crop dusting. Today he has his own two-way radio company, with seven full-time employees. "I am much better off financially, and really enjoy my work," he says. "I found my electronics lessons thorough and easy to understand. The CIE course was the best investment I ever made."

Business is booming. August Gibbemeyer was in radio-TV repair work before studying with CIE. Now, he says, "we are in the marine and two-way radio business. Our trade has grown by leaps and bounds."

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

Form System Cuts Paperwork, Reduces Costs, Improves Control

Preparing the necessary records to control the repair and servicing of equipment usually requires two or more records which involve duplicate writings. This is not only costly and time consuming, it frequently leads to errors in copying information from one form to another.

■ Audio Consultants of Evanston, Ill. eliminated the problem of copying records by adopting an all-in-one form set that combines all records needed to control these operations. The new form replaces a separate repair order, claim check, identification tag and post card notice—all of which had to be prepared separately, requiring an undue amount of time and considerable duplication of information.

Audio Consultants started out just a little more than two years ago as a one-man stereo consulting firm. In that short space of time, their services have grown rapidly and their staff has expanded to 10. They now also sell and service a full line of stereo equipment.

To control service operations in the past, four separate records had to be prepared—a repair order, a customer claim check, an identification tag for the equipment and a post card notice to advise the customer when the equipment was ready. Each had to be written out individually and some of the written data was the same on all records.

Owner Simon Zrecny and Manager John A. Jameson decided that there must be a better way to handle these functions with less paperwork —thus conserving time and money. To assist them with the project, they called in Robert J. Collins, forms system specialist of Moore Business Forms, Inc.

The New System

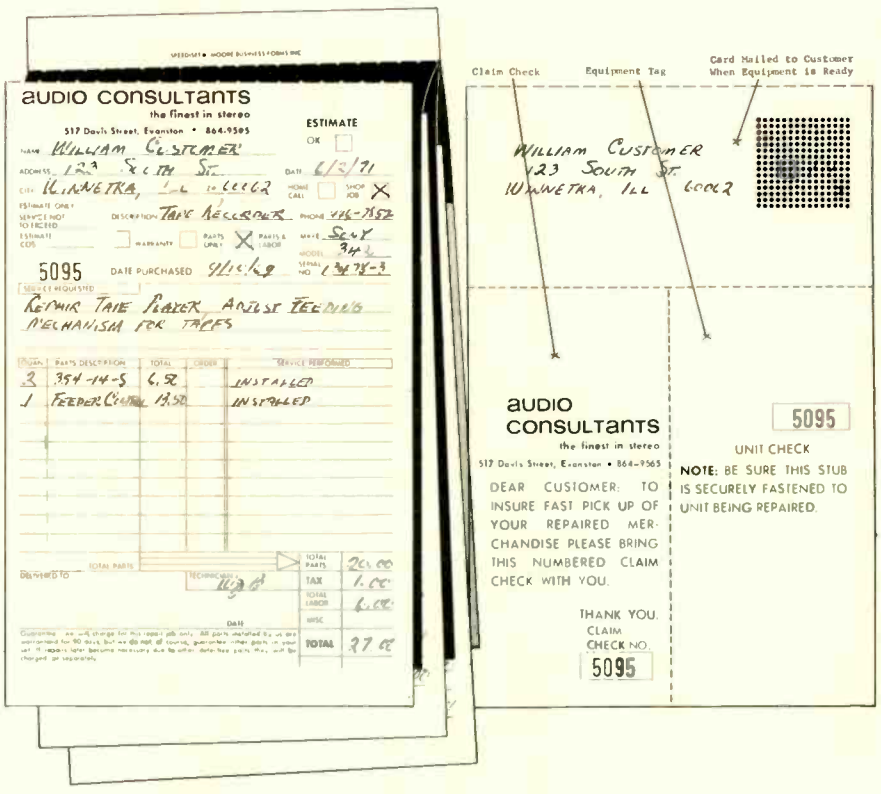
To meet their requirements, a four-part Moore Speediset form was developed. It includes all the previous records and, in addition, provides for the added feature of parts control.

Part four is made of card stock and has a series of horizontal and vertical perforations so that it may be separated into three sections. Strip-coated carbon between the last two parts permits only the customer's name and address to copy through on the upper portion of the last part.

When equipment is brought in for service, a form set is prepared. Only the top portion (down through the "service requested" area) is completed at this time. The first three parts are folded back and the bottom portion of part four is detached at the horizontal perforations. This is then separated into two parts at the vertical perforations—the left section given to the customer as a claim check, and the right section attached to the equipment as an identification tag. The balance of the form set is filed in the work-in progress file.

During servicing, any parts or supplies required are recorded in the appropriate columns on the lower portion of the form. Upon com-

continued on page 59

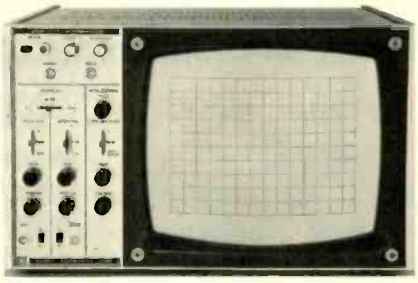


Repair order developed by Audio Consultants is an all-in-one four-part form which replaces four individually prepared records previously required.

TEST INSTRUMENT REPORT

Kikusui Model 5122 Dual-Trace Alignment Scope

by Phillip Dahlen



Kikusui's Model 5122 dual-trace alignment scope. For more details circle 900 on Reader Service Card.

Virtually solid-state scope incorporates TV-type CRT for easier viewing

■ We have recently witnessed an increased industry emphasis on the development of new scopes that have sophisticated triggered-sweep circuitry and relatively flat frequency responses, even high in the megahertz range. Last year, in an article entitled "Why a Triggered Sweep Scope" we attempted to show—using a high-quality, relatively expensive scope and an effectively designed, relatively inexpensive scope—that the factor of greatest importance is not the relative price or the relative sophistication, but rather understanding your needs and then selecting an instrument accordingly. Know what your scope is capable of doing and be certain that it meets your needs! Although in two distinctly different price categories, neither manufacturer had a product that needed to be apologized for.

The scope described in this month's report has a rather limited frequency response as compared to many others previously covered in this column. However, its response is quite adequate for alignment applications (with the use of demodulating probes or other accessory instrumentation, it is possible to observe the characteristics of circuits tuned to frequencies well beyond this scope's capabilities) and that is the function for which it is primarily intended. By limiting the scope's input to lower frequencies, the manufacturer is successfully able to incorporate a 12-in. electro-magnetic-deflection TV-type CRT—rather than being restricted to the 5-in. electrostatic-deflection CRTs found in most scopes. Thus by foregoing a frequency response greater than that required for the job, you are able to have the convenience of a TV-size screen.

Manufacturer specifications for this interesting scope include the following:

Vertical Amplifier

Sensitivity	greater than 2mv/cm (1-to-10 attenuation)
DC frequency response	dc to 10kHz —3dB
AC frequency response	3Hz to 10kHz —3dB
Input impedance	200K
Polarity	normal or inverted (switch on rear panel)
Channel selection	Channel 1 only, Channel 2 only, or alternate sweep of both channels (operating with either line sweep or external sweep)
AC clamp circuit	activated by either line or external sweep signals (ON-OFF switch on rear panel)

Horizontal Amplifier

Sensitivity	greater than 100mv/cm (1-to-10 attenuation)
Frequency response	dc to 1kHz —3dB
Input impedance	500K
Polarity	normal or inverted (switch on rear panel)
Phase control	approximately 130° shift range
External sweep waveform selector	sawtooth, triangular or sine waves (switch on rear panel)

Calibration Voltage

Signal	10mv square wave

Intensity Modulation

Z axis	0.5v, 5μs minimum

Deflection

Distortion and linearity	5% or less on horizontal or vertical axis
Angle between vertical and horizontal axis	90° ±2°

Power Requirements

150va

Dimensions

10⅝ in. H by 16⅞ in. W by 20¾ in. D

GUEST AUTHOR

Let Your Reputation Sell

by Harry R. Ashley

How your professional competence can help you tap new markets for additional income

■ You, as a businessman in the electronic technician profession, know how important your reputation for competence and integrity is. It is the bedrock of your professional existence and you are right in guarding it zealously and enhancing it every way possible.

Of course, you know that the primary way to do so is by keeping your technical knowledge and equipment up-to-date and rendering the best service you and your associates are capable of.

The idea that I wish to express here is that by being alert and sensitive to your customers' needs, you have another way to build your reputation—and it will help you make more money too.

Harry Ashley, president of EICO Electronic Instrument Co., was formerly a radio serviceman and insurance salesman. Having founded the company in 1945 in a 10 ft by 20 ft Brooklyn factory store, he has been responsible for its becoming a significant international corporation.

Let us look at things from the consumer's point of view. Today, if he goes to take care of a fault in his car, he soon finds that the so-called official dealer either does not know servicing, charges too much, or both. So he "shops around" for the competent auto serviceman. If he is lucky enough to find one, how does the customer behave? His basic emotion is appreciation and the desire to show it to the competent guy. For example, he will go out of his way to buy his gasoline, or tires, etc. from him. [*As an extreme example, the editor of this publication drives 260 miles—each way—to reach a dealer that he really trusts when purchasing a new car and having any major work done on it. He feels that this is worth his while, since he is then certain that he is being treated honestly, the job is done right and the price is fair.*] What does this mean to you?

You, as a recognized reputable technician, generate a lot of goodwill and appreciation for your service. But you are probably not tapping it for sales.

What should you do?

Use your place of business and your trips into the customers' homes to expose your customers to the idea that you are a good source for related electronic merchandise, such as the following examples:

- Professional home security protection systems.
- Extending music systems to include color organs.
- Introduce their children to electronic science project kits.

Obtain literature concerning these and other products to keep on your counters, mail out to your customers, and make your community aware of the fact that when it comes to professional electronic competence and products related thereto, you are the center.

Summing up, let us be as alert as the automotive technician, the barber, the beauty parlor, etc. Let us give people a chance to show how much they appreciate your competence and you will make additional revenue at the same time. ■

SIGNAL INJECTION...

continued from page 52

that results in these test patterns, since discontinuing signal injection causes the picture to disappear (Fig. 21).

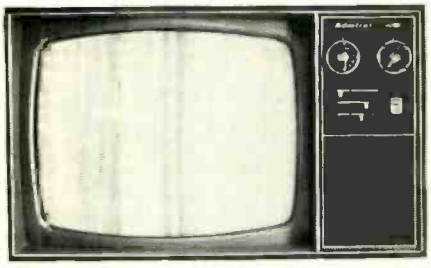


Fig. 21—Discontinuing injection of analyst vertical signal results in loss of test pattern.

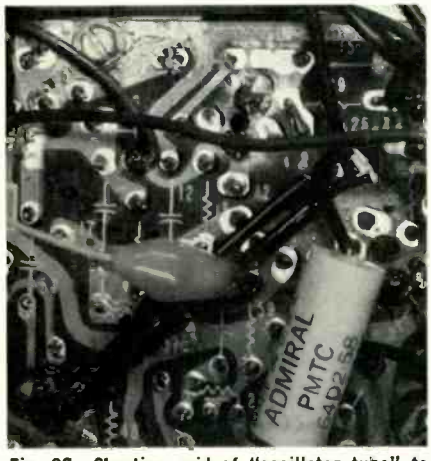


Fig. 22—Shorting grid of "oscillator tube" to ground (pin 10 of 25JZ8), prevents TV set from generating vertical scan signals. (Vertical sync coupling capacitor, CE11, is disconnected from printed circuit shown in upper central portion of photo.)

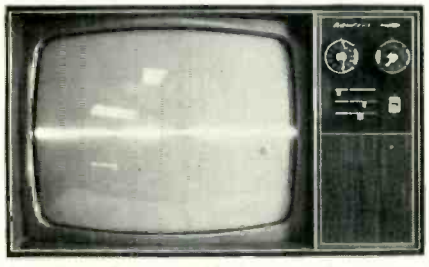


Fig. 23—Without vertical scan signal, only horizontal line appears on CRT.

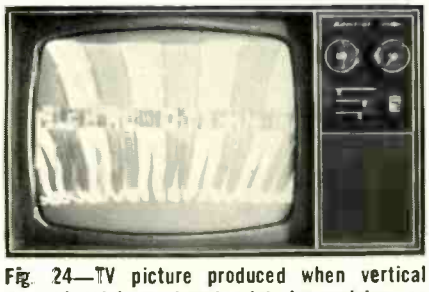


Fig. 24—TV picture produced when vertical scan signal is produced solely by applying analyst vertical-grid-drive signal to grid of vertical "output tube."

The test patterns that we produce confirm the fact that the output of the horizontal oscillator is not influenced by signals applied to the horizontal-output amplifier (with the resulting beat signals appearing in the test pattern—Fig. 8), while the vertical oscillator is subject to such an influence (remaining in phase with signals applied to its output amplifier—Fig. 20). By shorting the grid of the horizontal "oscillator tube" to ground (pin 10 of the 25JZ8—Fig. 22), the TV set's generation of vertical-output signals is stopped (Fig. 23). However, again applying the analyst's vertical-grid-drive signal to the grid of the vertical "output tube" under these new conditions still results in at least a distorted form of the desired test pattern (Fig. 24).

By disconnecting a total of nine leads that are connected to either the plate or cathode of the vertical "output tube," this tube could also have been safely deactivated (as was the horizontal-output tube), and the analyst's vertical plate-drive signal used to replace it and produce the desired test pattern. And by disconnecting a pair of other leads, it would also have been possible to drive the vertical-deflection yoke directly to produce the desired test pattern—virtually eliminating all TV-set vertical circuitry. However, the production of these additional test patterns does not warrant such extreme dismemberment of the TV set. (Since tube filaments are connected in series in this set, the removal of tubes from this set would not provide a satisfactory alternate technique for deactivating circuitry.) Thus, only a few circuit corrections are required for returning the set to normal.

These two articles show that it is possible to operate a color-TV set even when bypassing virtually all of its video, horizontal and vertical circuitry with a television analyst. And with this instrument it is even possible to inject all three types of signals simultaneously. In such a manner, defective components—that might otherwise be difficult to trace—can be located by the process of elimination. ■

Errata

B & K has advised us of an error that was made in the April article. There we inadvertently used a 300Ω/75Ω probe, which belongs with their Model 415 Sweep/Marker Generator. The Model 1077B Television Analyst is not sold with this probe and operates very well without it. The proper RF probe, provided with this instrument, was used for all photos taken for this month's article.

FORM SYSTEM...

continued from page 56

pletion of this work, all charges for parts, taxes, labor and miscellaneous items are recorded and totalled. The remaining upper (post card) portion of part four is then detached, the amount entered on the reverse side, and mailed to the owner to notify him that his equipment is ready.

When the owner calls for his equipment, the date is entered in the lower part of the form and the owner signs in the space marked "Deliver to."

The parts are then detached with a quick snap of the stub, and the stub (with used carbons) is discarded. The remaining parts are distributed as follows:

Part 1 (white) is given to the customer as his receipt of payment and record of warranty.

Part 2 (yellow) is filed alphabetically by customer name.

Part 3 (pink) is the store control copy, which is filed numerically. This also serves as a parts control record.

DEAR CUSTOMER,

YOUR REPAIR #5095 HAS BEEN COMPLETED.
THE REPAIR CHARGES ARE $27.00
NOT RESPONSIBLE FOR MERCHANDISE LEFT OVER 30 DAYS.

THANK YOU
AUDIO CONSULTANTS

Reverse side of post card notice (top portion of part four) informs customer that equipment has been repaired and indicates cost.

continued on page 69

TEKLAB REPORT...

continued from page 41

gated rainbow. At times the color control makes a change in color sync, causing the ACC circuit to operate, and the results are not as effective. If desired, the ACC circuit can be clamped, and this will hold the bias of the first color IF constant.

We made visual checks with the TV receiver tuned to a local channel and observed intensity variations on program material and camera shots—on both manual and Insta-Matic operation. We noted a great amount of intensity difference between the various channels in manual operation, but when switching to Insta-Matic operation the variations were drastically reduced, providing a satisfactory color picture on most channels.

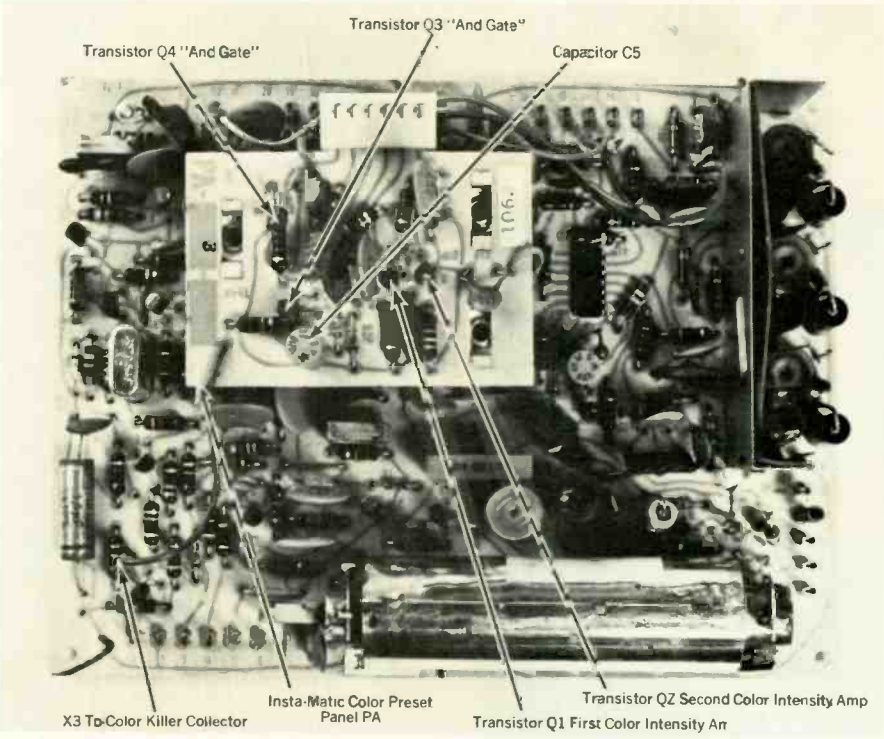
Next, the RF output cable of the color bar generator was connected to the antenna terminals of the TV receiver. And with the TV set in its manual mode, the color control of the generator was turned from minimum to maximum—a great variation in intensity being observed on the TV screen. We then switched to Insta-Matic operation, and again the color level of the generator was increased and lowered—but this time with very little effect on intensity. Small color-signal-level changes—such as increased color signal with the color sync remaining constant, or when a camera level is high or low—will be automatically adjusted by the automatic intensity circuit.

During Insta-Matic operation, the automatic intensity circuit (Fig. 4) samples the color IF level and controls the gain of the second color IF. The intensity level is determined by the control in this automatic circuit and during manual operation the intensity is established by the control in the color killer output.

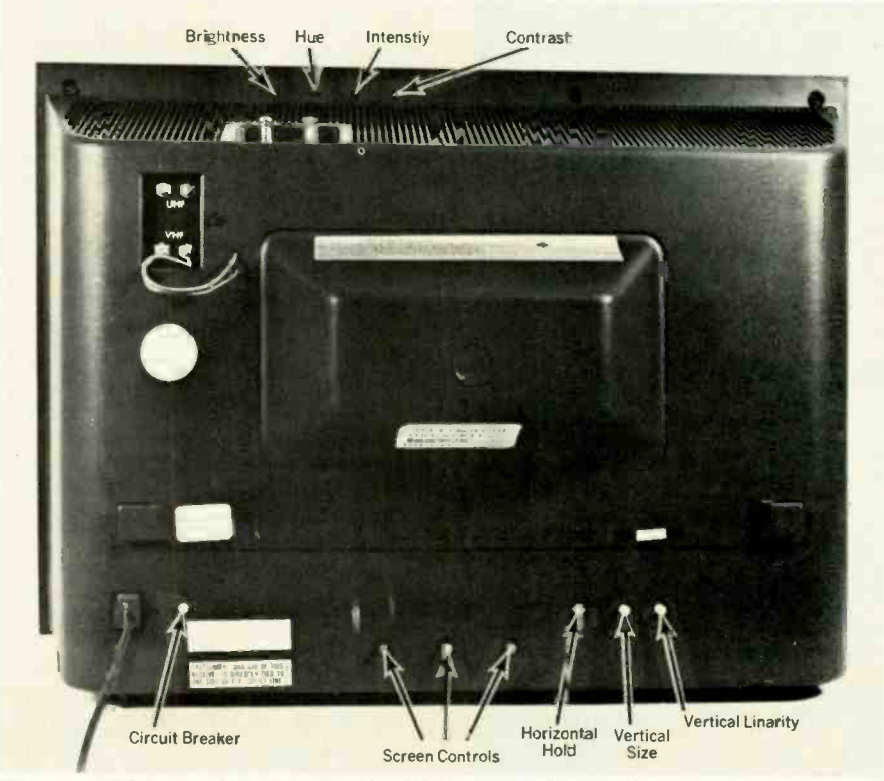
We made a few voltage checks on the automatic intensity circuit to find out what actually takes place on a B/W- and color-TV signal.

With the Insta-Matic control switched to manual operation, we found no color killer voltage at the upper end of resistor R51. But when we switched to automatic color operation, on a color transmission we measured 14v at this same point.

After reviewing the voltage and circuit functions of the various Insta-Matic circuits you will likely agree they are capable of correcting the color signals for a satisfactory picture on your TV receiver. ■



Location of some components on the color circuit panel CA and the color preset panel PA.



Rear view of Motorola's Model WP563GWA color-TV set, showing locations of service controls. The Insta-Matic preset controls can be adjusted with back cover in place.

TECHNICAL DIGEST

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

WESTINGHOUSE

Tape Recorder Speed Controls

One of the requisites of good tape recording is that the speed of the tape recorder motor be fairly constant. This is accomplished by circuitry designed in the tape recorder.

Erratic speed, wow or flutter in the sound output indicates a maladjustment of the tape recorder speed. Before any testing or adjusting is done, it is essential to install new batteries, clean the heads and rollers and use a new or good tape.

For testing there is a special cassette test strobe on the market with a built-in neon lamp for checking tape speed. An alternate method is to use a standard 3000Hz test tape with the tape player output connected to a frequency counter. When the tape speed adjustment is correct, the counter will indicate 3000Hz. This must be held within a ±10% tolerance.

Centrifugal Switch Type Control

Models TMC8000, TMC8010 and TMC8014 use a centrifugal type of motor speed control that requires a special test jig to adjust the motor speed. The test jig must represent a specific load for a predetermined speed, similar to the tape transport that the motor will be used in. The adjustment can only be made at the factory prior to final assembly as the centrifugal contact assembly is mounted onto the motor shaft completely enclosed within the motor case (see Fig. 1).

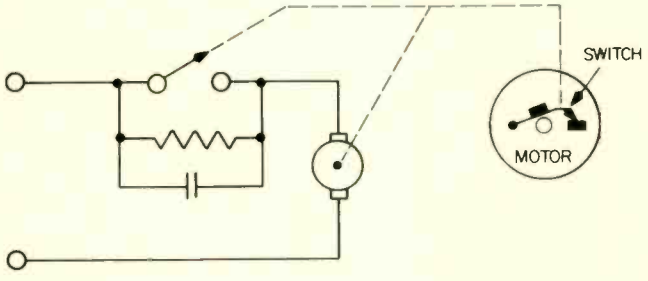


Fig. 1—Diagram of Centrifugal Switch

The dc motor control employs a centrifugal force to actuate a switch which opens a pair of contacts when the speed of the motor increases above a certain pre-set speed. As the centrifugally controlled contacts open, the current or voltage is reduced at the input of the motor, thereby slowing the speed below the controlled rate—the contacts then close and full power is resumed at the input of the motor. By careful design and adjustment, this make-and-break governor can be made to act within a very narrow range of speed variation and at a frequent rate.

Motor-Generator Type Control

Models T40CC, T40CCA, TMC2010A, TMC2020A/B, TMC2030A and TSC4030A use a motor generator and a transistor direct-coupled speed control amplifier (see Fig. 2).

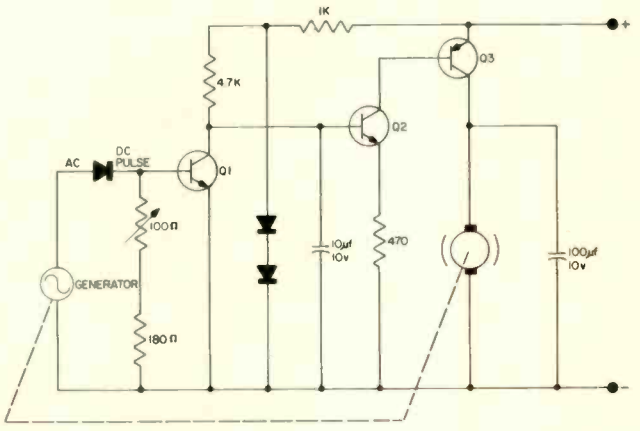


Fig. 2—Motor Generator Type Control

The permanent magnet field motor is well suited for use with a solid-state speed control system to provide smooth control. The speed of the permanent magnet motor is inherently reasonably constant with changes in torque (load), this permitting speed control to be achieved by controlling the voltage applied to the armature. A small amount of feedback from the generator into the transistor amplifier circuit, that controls current and voltage to the armature, will maintain the pre-set speed. The generator ac output is rectified and a pulsed dc bias is applied to the input transistor, Q1. This bias is related to the motor speed and the pre-set adjustment. If the speed slows, the bias will be less, the output to the armature will increase and the motor will speed up. If the motor speed is increasing over the pre-set speed, the forward bias will become greater and the output to the armature will become less, causing the motor to slow down.

Counter EMF Type Control

Models TMC2030B, TMC8030A, TSC4030B and TSC-8020A use a motor and a transistor direct-coupled speed control amplifier (see Fig. 3).

In a permanent-magnet-field motor, the counter EMF is directly proportional to the speed of the motor. The counter EMF is used to feed speed information back to the emitter

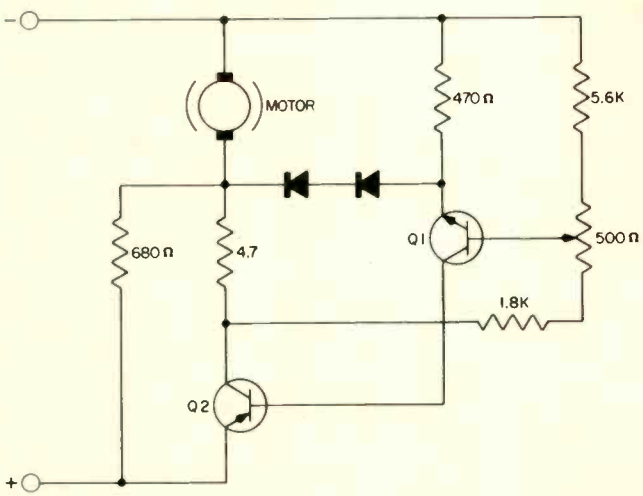


Fig. 3—Counter EMF Control Type Control

continued on page 62

TECHNICAL DIGEST . . .

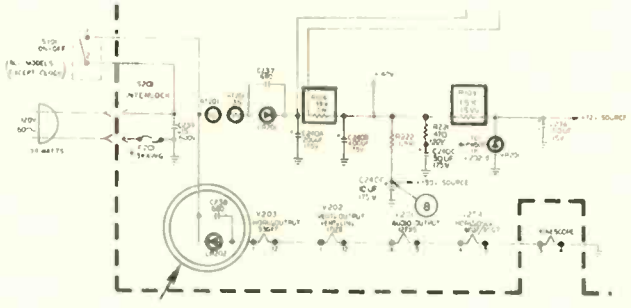
continued from page 61

of transistor Q1. The base of Q1 has a forward bias that has been adjusted for the correct speed. If the motor speed increases, the counter EMF to emitter Q1 becomes higher and the emitter collector current becomes less, resulting in lower current and voltage from transistor Q2 and causing the motor to slow down. If the motor slows down because of torque (load), the counter EMF feedback to emitter of Q1 becomes less, and Q1 will cause Q2 to conduct more current to the motor. The motor speed will then increase until it reaches the pre-set speed. The point of equilibrium is reached when the feedback and pre-set bias are balanced.

RCA SALES CORP.

TV Chassis KCS169, "L," "M," "P" Line Models KCS176, 177, "M" Line Models—Hum Bar in Raster and/or Loss of Sync

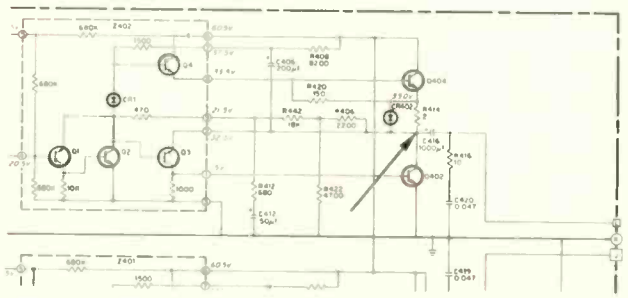
These chassis use a half-wave rectifier for filament power. Should the diode (or the capacitor across it) short, the filament string will be operating on full line voltage (120v ac) rather than the normal half-wave rectifier output.



The tube filaments will glow brighter than normal and may result in reduced tube life. In addition, a hum bar in the raster and/or poor vertical sync may be evident.

Amplifier Models RS252, 253, 266—Coupling Capacitor, Quasi-Complementary Symmetry Output

Normal dc readings at the output coupling capacitor (C416 or C417 in the illustration) in this type of amplifier is approximately one-half the full B+ voltage. Certain component failures can result in near B+ at this point and in turn damage the coupling capacitor.



Before replacing a defective coupling capacitor, be sure the voltage at this point is correct. Possible causes of increased voltage include: shorted capacitor C411 or C412 (in illustration); open printed circuit; defective Z401 or Z402 board.

BELLOW SYRINGE 706

Accurately dispenses epoxies, glues and lubricants

An all plastic syringe is designed to dispense epoxies, glue and lubricants. The design creates a series of 10 flutes that each contain 3CC of material. The syringe reportedly provides a "no-drip" or "suck-back" action for dispensing light viscosity liquids. A long, tapered, all plastic tip is said to be provided for deep component potting.

Filling of the syringe is accomplished by the plunger seal back, making the syringe suitable as a container for two-part material. Techni-Tool.

TUNER CLEANER 707

Applied directly to tuner contacts

A tuner cleaner, Lubra Clean, is not a spray—therefore it is applied directly to the tuner contacts. The cleaner is

said to not only clean and polish the contacts but stick to metal and withstand high temperature without drying out. It reportedly cleans and polishes the contacts as the channel selector is rotated, then fills in over the cleaned area, preventing the return of high-resistance film on the contacts. Price $2.98. Lubra Clean Co.

VOM 708

Blister packed for easier identification

Designed to provide easier identification and customer self-service, the Model NH-65 Multitester is now blister packed. Specifications indicate that this 20,000Ω/v instrument is compact and rugged, yet sensitive. Its features are said to include a wide 21-range multicolored mirrored scale for precise readings, sensitive 0.44μa

D'Arsonval movement, diode overload protection to prevent burnout and 50μa 0.25vdc full scale deflection. The VOM reportedly contains an advanced design printed circuit and 1 percent wire-wound resistors throughout. Price $15.95 user net including batteries, test leads and operating instructions. Mura.

DEALER SHOWCASE

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

AIRCRAFT RADIO 709

Tunable range of 108MHz to 140MHz

A pen-size "Sky Spy," Model A982, reportedly picks up aircraft signals from up to 25 miles away and tower signals from up to 5 miles. The unit

has a tunable range of 108MHz to 140MHz and works inside the aircraft without an outside antenna. The unit operates on two silver oxide hearing aid batteries which are included. Battery life is said to be approximately 25 hours. Price $18.95. Saxton Products, Inc.

CAPACITOR SERVICENTER 710

Makes 795 disc ceramics available

An assortment of 795 disc ceramic capacitors is said to be designed to offer 78 different capacitance and voltage ratings in general application types, high-K types, temperature-stable types and ultra-miniature units for transistorized circuits. The assortment

is reportedly housed in a heavy-gauge two-drawer steel cabinet, measuring 30¾ in. W by 11½ in. D by 5½ in. H. Specifications indicate that they are packaged in plastic in compartmented drawers outfitted with pre-printed index cards. Price $184.25. Sprague.

AUTO STEREO TAPE PLAYER 711

Mounts under any vehicle dashboard

An eight-track car stereo tape player with FM multiplex, Model CQ-909, reportedly mounts under any vehicle dashboard. The eight-track portion of the unit is said to feature flush cartridge fit for safety, an ejector button, and a repeat switch that enables replaying the channel instantly. The FM receiver section contains an AFC circuit, a stereo/mono switch and a distant/local switch for more selectivity. The controls include a slide-rule control for balance and separate thumb-wheel

controls for volume and bass/treble ratio. The unit is styled with a blackout face and chromium trim. Price $119.99. Panasonic.

SPEAKERS 712

Available in visual packaging

A series of speakers is now available in visual packaging with magnet weights from 1.47 oz to 10.0 oz and impedances of 3.2Ω and 8Ω, plus multiple-impedance models of 8 to 10Ω, 20Ω and 40Ω. The speakers are reportedly shipped in heavily constructed master cartons for completely se-

cure cartage and distributor storage. They are said to be available for vir-

tually all applications and are full-range, including dual-cone models. Jensen.

PORTABLE TV SET 713

With sun shield for outdoor viewing

The Model 9P257 B/W portable TV set is said to feature a built-in sun shield for improved outdoor viewing, a new pedestal base and instant play.

It reportedly has 44 sq in. of viewing area, front mounted controls and speaker, polarized power plug, monopole antenna, and built-in jack for private listening and earphone. This model, in walnut grained finish, has an open list price. Admiral.

MEGAPHONE 714

Rugged water tight construction

A self-powered megaphone, Model

S-231, is said to be water tight, compact, ruggedly constructed and specifically manufactured for the professional user. It is rated at 125dB at 5 ft, 45w and reportedly operates off the 12v electrical system of the user's vehicle. Said to be equipped with a detachable hand microphone, this feature is designed to enable the user to operate up to 35 ft away from the unit. Specifications indicate that the megaphone has a square, swivel bell that rotates 360° and may be directed up or down as usage may require. Other features reportedly include a reverse polarity light and a master fuse. Audio Equipment.

TECHNICAL LITERATURE

For a free copy of the literature described in this section, write directly to the address provided, so that the manufacturer can promptly handle your request.

Microwave Products

A 12-page catalog No. 71A, describes a line of microwave relay links, transmitters, receivers and components. It contains detailed specifications on models of microwave FM transmitters, receivers, linear and log amplifiers, discriminators, mixers and mixer preamplifiers. Also included are descriptions and illustrations of FM microwave relay equipment including air-to-air and air-to-ground relay links and portable and fixed ground stations. Photos and technical specifications describe the various models and their combinations. RHG Electronics Laboratory, 94 Milbar Blvd., Farmingdale, N.Y. 11735.

Electronic Components

A short form catalog contains numerical-alphabetical indexes. The 36-page book covers jacks, plugs, switches, connectors, molded cable assemblies and audio accessories. Switchcraft, 5555 N. Elston Ave., Chicago, Ill. 60630.

Tools

A 32-page catalog lists hundreds of unusual and extremely useful hard-to-find tools. These include: glass pliers, carbide saber saw blades, plumb and level inclinometers, hand vises, magnetic work lamps, woodbits and special rotary wire brushes. Also included are glass drills, step blocks, carbide faced wire cutters, jewelers' screwdrivers, miniature lever wrench, watchmakers' loupes, optical comparator and a spring winder. Brookstone Co., 1610R Brookstone Bldg., Peterborough, N.H. 03458.

Tape Head Replacement Guide

A tape head replacement guide contains replacements for over 2800 domestic and foreign recorder models. There is a cross-reference to both model and head part numbers for reel-to-reel and cartridge recorders. A head conversion guide is included for modifying recorders to other track configuration and quadrasonic sound. Specifications on their tape heads and recorder accessories have been added. Nortronics Co., Inc., 6140 Wayzata Blvd., Minneapolis, Minn. 55418.

Digital Panel Meters

A six-page catalog featuring its line of 2-, 2½- 2¾-, 3- and 3½-digit, digital panel meters not only gives electrical, physical and mounting specifications, but also provides a comprehensive specification selection guide and prices subject to quantity discounts. Triplett Corp., Harmon Rd., Bluffton, Ohio 45817.

Parts Catalog

A catalog is available which includes TV and radio tubes, technical books, recording tapes, headphones, cassettes plus many other items. Cornell Electronics Co., 4213 N. University Ave., San Diego, Calif. 92105.

Hook-Up and Lead Wire

A 20-page illustrated catalog, No. CEC-HU-770, contains information in tabular form about hook-up and lead wire for internal wiring of electronic and electrical equipment. The catalog illustrates both Teflon and plastic insulated wires. For quick reference, conductor sizes, conductor stranding, insulation types and thicknesses, voltage and temperature ratings, applications and similar data are listed by type designations. Columbia Electronic Cables, P.O. Box 231, Woonsocket, R.I. 02895.

Tuner Parts

A tuner parts catalog includes a cross-reference list of antennas coils and shafts for all makes of tuners. Precision Tuner Service, 1210 S. Walnut, Bloomington, Ind. 47401.

CATV

This illustrated brochure covers transmission system equipment and accessories, plus descriptions and electrical characteristics tables for each product. The brochure also reviews the principal features of each piece of equipment and explains how the modular construction employed allows CATV system operators many options, including future expansion of services. Sylvania, 70 Empire Dr., West Seneca, N.Y. 14224.

Antenna

A 32-page catalog of TV and FM antennas and accessories features five lines of outdoor VHF, UHF, FM and combination broadband antennas, single channel yagis, and 15 types of UHF-only antennas. A wide variety of indoor antennas are shown, including the new amplified Chroma 1 and three UHF-only models. Also included are antenna rotators, UHF converters and all types of miscellaneous antenna hardware. For antenna mounting, masts, push-up towers, chimney mounts, tripod mounts, base mounts, wall and eave mounts are shown, along with aluminum, steel and vinyl clad guy wires. The catalog shows twin-lead and coaxial transmission lines, rotator wire, and standoff insulators for all kinds of installation. Channel Master Corp., Napanock Rd., Ellenville, N.Y. 12428.

New Product Supplement

A 16-page product supplement describes the new products added since the latter part of 1970. New products included are solid-state switches, push-button switches, and rotary switches. Grayhill, P.O. Box 373, 561 Hillgrove Ave., LaGrange, Ill. 60525.

Two-Way Radio

A four-page brochure describes a 30w all solid-state designed "Porta-Command," Model PC-230, FM 2-way radio. It provides the complete mechanical and general specifications of the radio, including the full line of accessories to expand the radio's versatility. The literature is designed for the communications user requiring exacting FM area coverage in law enforcement, fire protection, security, construction projects, railroads, airports, oil fields, educational institutions, harbor protection and other business services. Hallicrafter Co., 600 Hicks Rd., Rolling Meadows, Ill. 60008.

Test Instruments

A 20-page catalog lists more than 50 test instruments and accessories. It features color-bar generators, a number of solid-state oscilloscopes/vectorscopes, sweep markers, sine-wave and RF wideband signal generators, voltmeters, FET multimeters, field-strength meters, CRT high-voltage probes and meters, transistor-checker/tracers, grid dip meters and assorted new accessories. Leader Instrument Corp., 37-27 27th St., Long Island City, N.Y. 11101.

Aerosol Coolant

A pocket-size booklet describes typical thermal intermittents and how they can be located by using an aerosol coolant. Easy to follow step by step service procedures are outlined. In addition, the booklet describes how this aerosol spray coolant can be used for other servicing. Chemtronics, Inc., 1260 Ralph Ave., Brooklyn, N.Y. 11236.

FORM SYSTEM...

continued from page 59

Advantages

Audio Consultants has gained a number of advantages with their new system. Among the major benefits are:

- One form set replaces four individual forms previously required.
- Savings in form costs and clerical time.
- Errors in copying duplicate data from one form to another have been eliminated.
- Consecutive numbering assures positive numerical identification and control.
- Better parts control.

"Our new form system has streamlined our paperwork," reports Mr. Jameson. "Form costs have been substantially reduced, clerical time has been cut, transcribing errors have been eliminated and we have established positive parts control." ■

COLOR RECEPTION...

continued from page 49

the base of the burst-amplifier transistor (Q614). These pulses serve a gating function to allow only transmitted color sync bursts to pass through the burst transformer. The blanker amplifier, therefore, serves a three-fold purpose:

- Blanks OFF the chroma amplifier so that no burst signal is passed on to the demodulators.
- Keys ON the burst amplifier during the burst signal.
- Blanks the color-difference amplifiers, setting the dc level operating point.

The next article in this series will tell how the signals that have been described are applied to a color picture tube, and the adjustments necessary for producing a good color picture. ■

READERS SERVICE INDEX

ADVERTISER'S INDEX

NEW PRODUCTS

TEST INSTRUMENT

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 October 5, 1971. **7/71**

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 October 5, 1971. 7/71

NAME_____ POSITION_____

COMPANY_____ STREET_____

CITY_____ STATE_____ ZIP CODE_____

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

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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

Only the best-selling van gives you all these better ideas

Engine clear forward.
The engine is moved forward in Ford's clear-deck van—all the way out of the cargo area. Clear floor space behind driver's seat measures over 8½ ft. in Econoline Van . . . over 10 ft. in the Supervan.

Easy, out-front servicing.
Simply raise the convenient outside hood and your routine service points are right at hand: radiator, oil level, battery, windshield washer reservoir, voltage regulator, wiper motor, brake master cylinder. Better ideas make servicing fast, easy.

Sales leader for 10 straight years.

Strong, smooth-riding Twin-I-Beam. The independent front suspension that has revolutionized truck riding qualities. Two forged steel I-beam axles give it strength . . . big coil springs give it a smoother ride.

Biggest payload of all. Husky construction and high capacity axles allow you to carry a heavier load than any other van. Maximum payload of 4320 lbs. is largest in industry.

Model	Max. Payload	Max. GVW
E-300	4320 lbs.	8300 lbs.
E-200	1800 lbs.	5400 lbs.
E-100	1120 lbs.	4500 lbs.

Shorter outside, easier to park.
Overall length of Econoline Vans is significantly shorter than other makes. This means easier parking and better maneuverability in city delivery operations —time saved on every trip.

Wider at top for built-ins.
Body sides are more vertical, wider apart at top than other vans. So built-in units fit better and leave more aisle. Modular units, designed to fit and work together allow you to custom design almost any interior you need. Job packages, such as insulated florist's van, are also available.

Driver's "walk-thru" to rear.
Econoline's forward engine position clears the deck for the driver, too. He can easily step from his seat into the rear load area and exit through side or rear doors. See your Ford Dealer and see all the better ideas in America's best-selling van—Ford Econoline.

A better idea for safety: Buckle up.

FORD ECONOLINE VANS

Ford

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

Now, your choice- 1 or 2 year warranty on all RCA color picture tubes

A big business builder for you with the industry's most complete line.

1. RCA offers an extended warranty, for a second year, on all Hi-Lite and Colorama color replacement tubes.

2. The second year is optional. You can still offer the customer RCA's one year warranty. Or for a modest extra charge there's a whole additional year of protection. It's your choice!

3. This extra protection will help you sell many customers on replacing the tube instead of the set.

4. It will keep them coming back to you for service on their TV sets and other equipment.

5. You can sell with extra confidence. There's added protection on the quality name picture tube line designed to enhance your professional reputation.

That's why the RCA extended warranty is your most powerful new sales tool for 1971! Get full details from your local RCA Distributor.
RCA | Electronic Components | Harrison, N.J. 07029

RCA