JANUARY 1971 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

Tuned Circuit Signals—Part II

Commercial Two-Way Radio

FREE! YOUR FIRST CAN OF TUN-O-BRITE IS ON US!

We say TUN-O-BRITE is head and shoulders above any other tuner spray you've ever tried. You say you've heard that song before.

It's time for us to put our money where our claims are. Tell you what we're gonna do. Buy a can of TUN-O-BRITE from your favorite distributor — at the regular price.

When you've used the TUN-O-BRITE up, send the empty can to us. We'll send you a new can *OF YOUR FAVORITE TUNER SPRAY FREE!*

There are no strings attached to this offer. If you ask for TUN-O-BRITE, we'll be delighted to send you another can absolutely free. If you ask for a competitive brand, we'll be disappointed, but we'll send it to you anyhow. Either way, you can't lose. You get to try TUN-O-BRITE at our expense because you can swap the empty can for a free can of your favorite tuner spray.

Of course, we're betting that once you try TUN-O-BRITE, you simply won't settle for any other product, no matter how cheap you can buy it. After all, you can tell a professional TV technician by the tools he uses.

ONLY ONE FREE CAN TO A TECHNICIAN.

This offer expires March 15, 1971

CHEMTRONICS INC

CHEMTRONICS

1260 RALPH AVE.
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ELECTRONIC TECHNICIAN/DEALER

TEKFAX

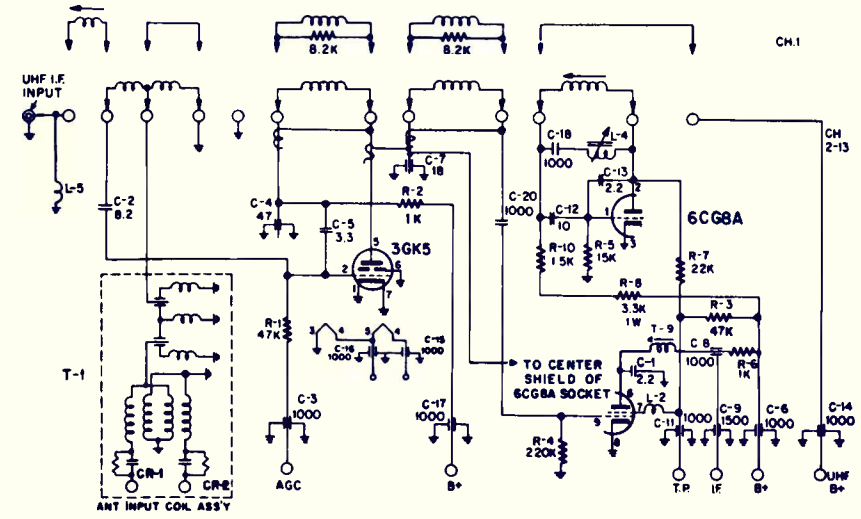
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

GROUP 221

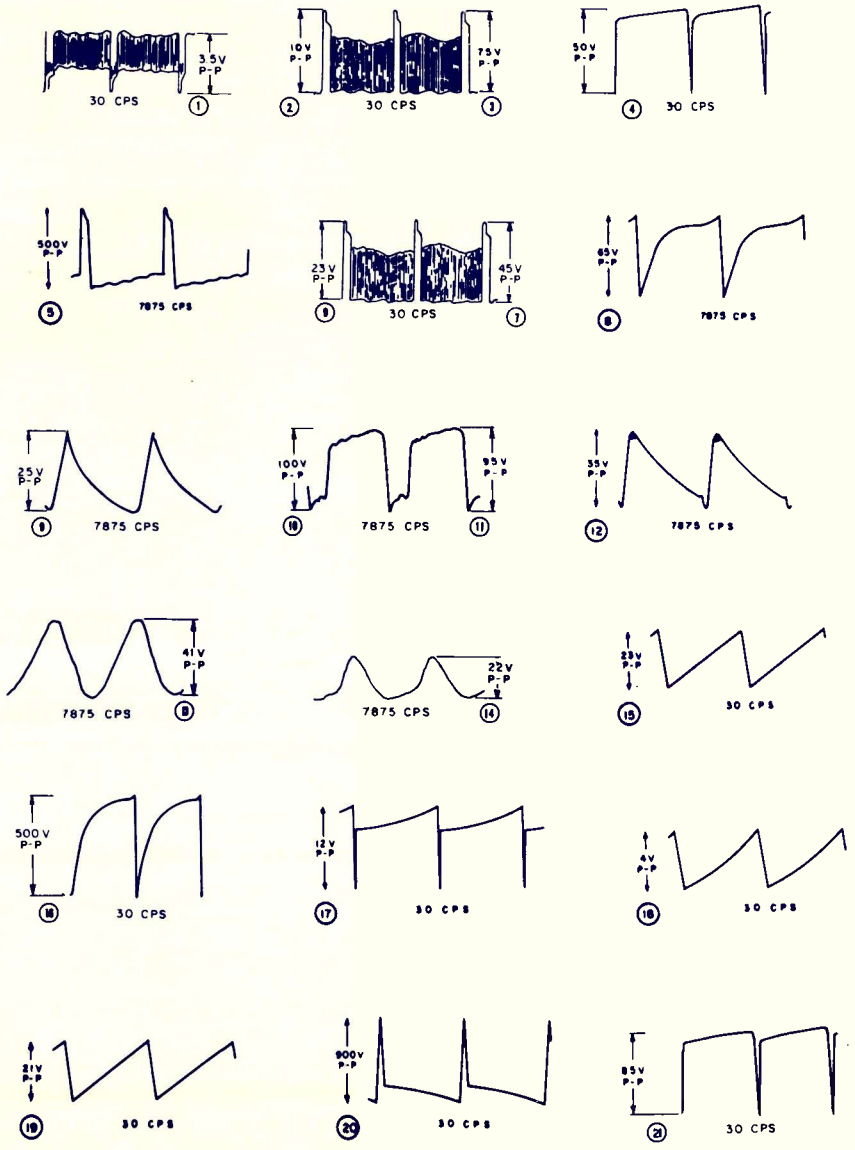
JANUARY • 1971

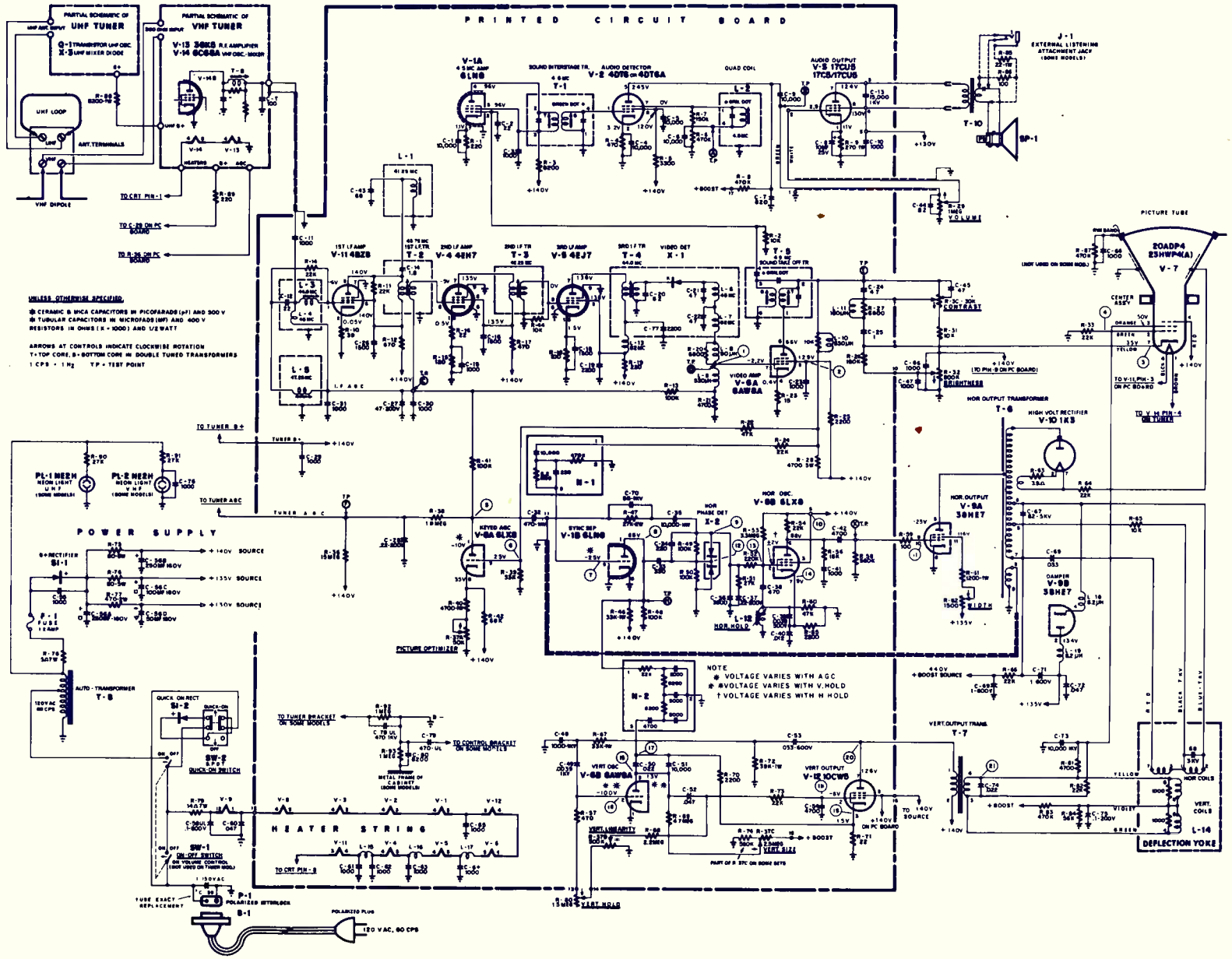
1335
EMERSON
TV Chassis
120962, 120964

	SCHEMATIC NO.
AIRLINE ..... Color TV Model GCI-12460A	1337
EMERSON ..... TV Chassis 120962, 120964	1335
EMERSON ..... Color TV Chassis T10K10-1D, C	1336
RCA SALES CORPORATION ..... TV Chassis KCS185	1339
SYLVANIA ..... Color TV Chassis D16-2	1338



SYMBOL DESCRIPTION	EMERSON PART NO.
R-29—volume/on-off (Ch 120962)	391081
R-29—volume/on-off (Ch 120964)	390912
R-30—contrast	391048
R-32—bright	391046
R-37A—v lin.	391082
R-37B—v size	391082
R-37C—AGC	391082
R-62—width	390993
R-80—vert hold	391047
R-28—4.7K, 5w	397158
R-75, 76—80Ω, 5w	394307
R-78—5Ω, 7w	394216
R-79—14Ω, 7w	394312
C-2, 12—22pf, NPO	928824X
C-14—1.9pf, NPO	928207
C-56A—250/180v, elect	925713
C-56B—250/180v, elect	925713
C-56C—100/180v, elect	925713
C-56D—50/180v, elect	925713
C-81—20 µf, 75v, NP (Ch 120963) elect	925656
T-1—sound interstage xformer	720513
T-2, 3, 4—if interstage xformer	720540
T-5—sound take-off xformer	720512
T-6—horiz output xformer	738210
T-7—vert output xformer	738193
L-2—quadrature coil	720404
L-12—horiz oscillator coil	716165
L-13—choke	705066
L-14—yoke, deflection	708532
N-1—couplate, sync separator	923059
N-2—couplate, vert integrator	923159

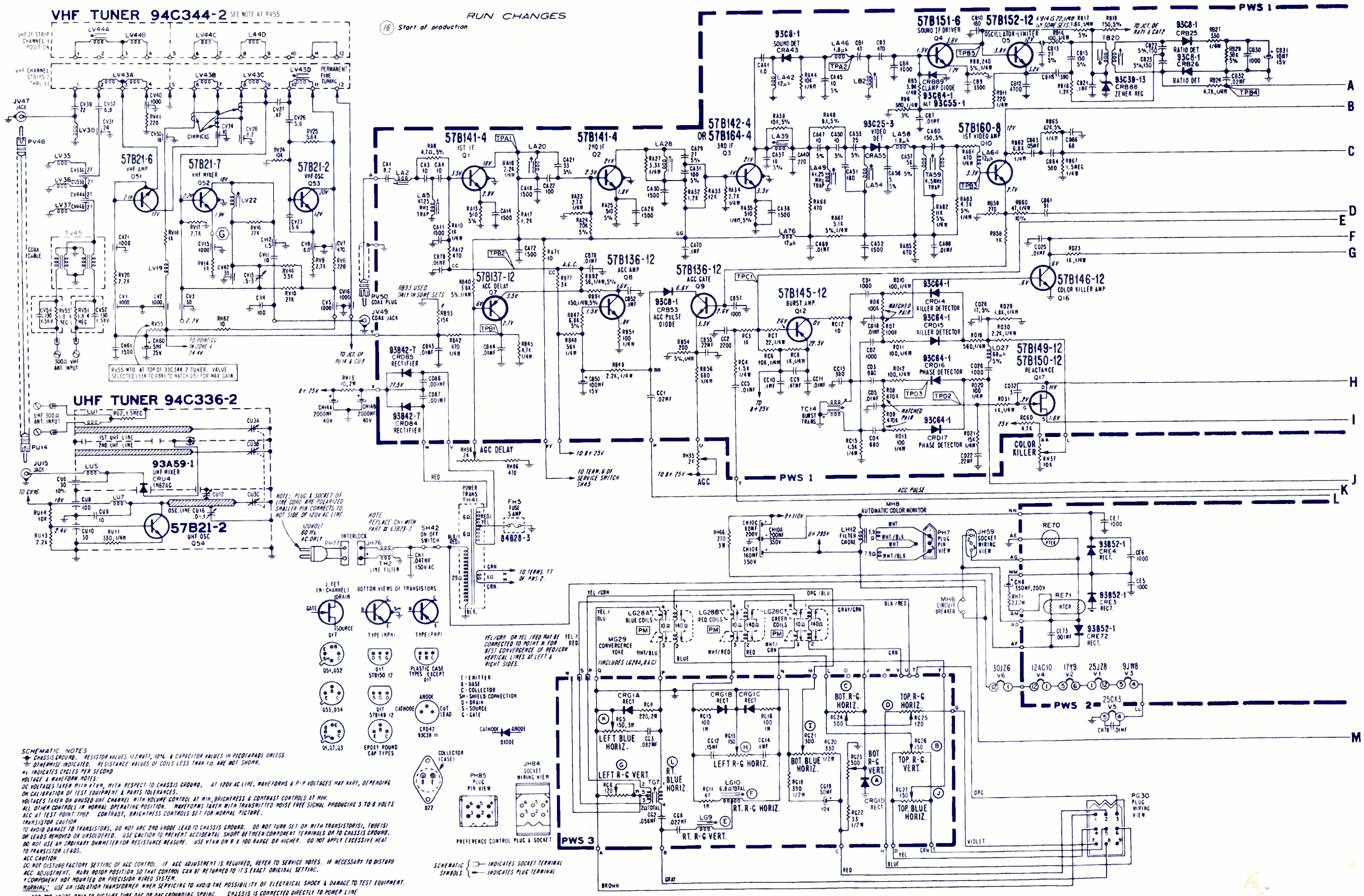




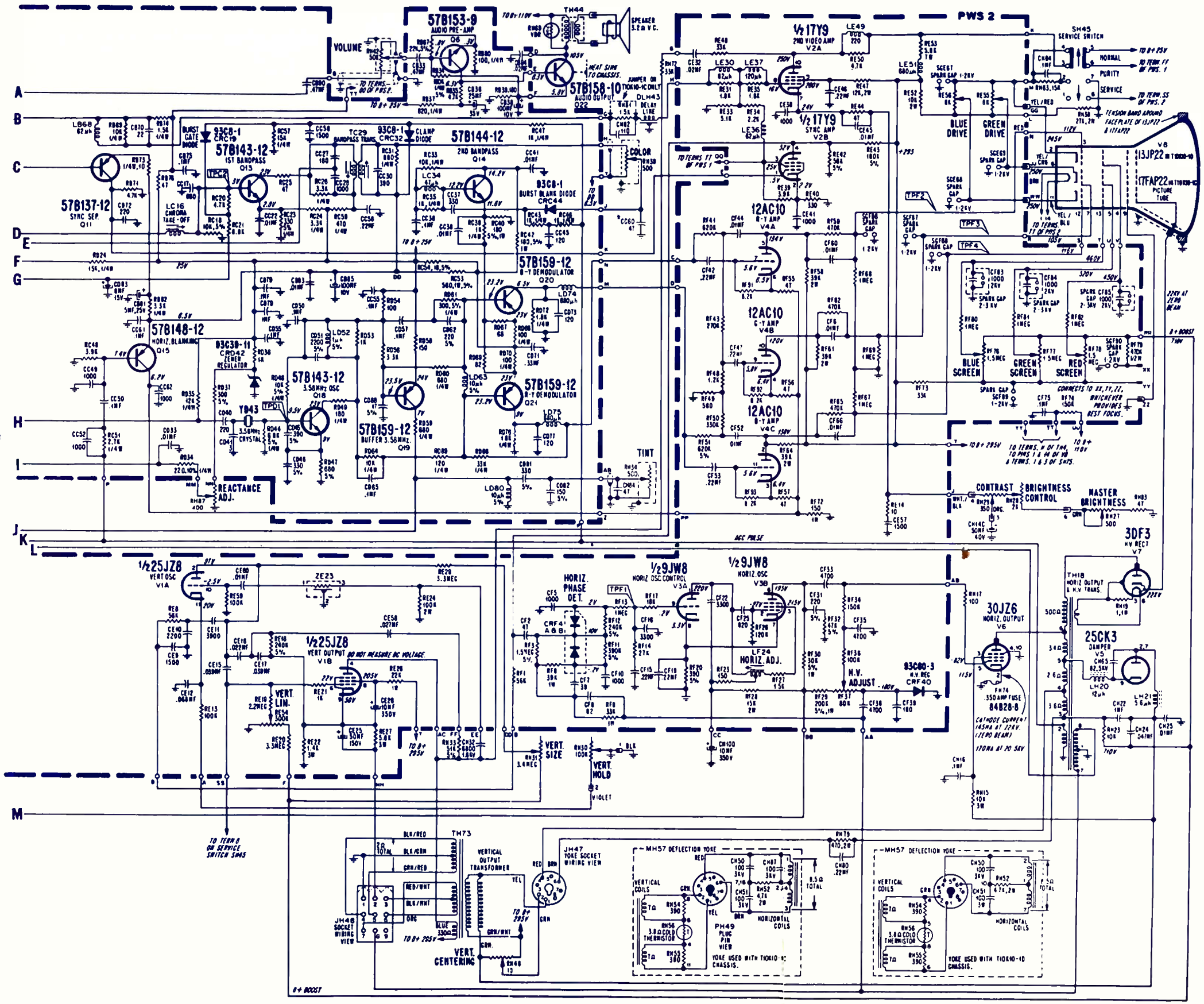
1336
EMERSON
Color TV Chassis
T10K10-1D, C

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**
JANUARY • 1971

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



EMERSON
Color TV Chassis
T10K10-1D, C



SYMBOL	DESCRIPTION	EMERSON PART NO.
RA6	4.7 Ω, ½w, 5% special	970186
RA48	9.1 Ω, ½w, 5% special	60A28-74
RE54	vert lin, triple control	75A95-12
RE55	green drive, triple control	75A95-12
RE56	blue drive, triple control	75A95-12
RE70	Positive Temp. Coef Resistor	61A52-1
RE71	Negative Temp. Coef Resistor	61A53-2
RF37	60K, HV adjust control	75A101-9
RF76	blue screen, triple control	75A95-13
RF77	green screen, triple control	75A95-13
RF78	red screen, triple control	75A95-13
RH19	1 Ω,1w special	60A28-95
RH27	500 Ω, master bright control	970202
RH28	2K, bright control	75A140-1
RH29	350 Ω, contrast control	75A140-3
RH30	100K, vert hold control	75A140-2
RH31	3.4M, vert size control	75A135-6
RH34	500 Ω, tint control	75A141-1
RH35	2K, AGC control	75A135-7
RH36	2K, AGC delay control	970203
RH37	10K, color killer control	970205
RH39	500 Ω, color control	75A141-1
RH42	50K, volume control (includes On-Off Switch)	75A149-2
RH46	10 Ω, vert centering control	75A64-40
RH56	3.8 Ω, cold thermistor	61A27-1
RH69	VDR	61A46-7
RH71	2.7 Ω, 7w	970208
RH87	400 Ω, reactance control	970204
ZE23	vert integrator	63A6-29
CH10A	200 μf, 350v, Multiple Electrolytic	970235
CH10B	160 μf, 350v, Multiple Electrolytic	970235
CH10C	80 μf, 350v, Multiple Electrolytic	970235
CH10D	10 μf, 350v, Multiple Electrolytic	970235
CH14A	2,000 μf, 40v, Multiple Electrolytic	970236
CH14B	2,000 μf, 40v, Multiple Electrolytic	970236
CH14C	50 μf, 40v, Multiple Electrolytic	970236
DLH43	delay line	72A324-3
LA5	47.25MHz trap coil	970240
LA54	video detector coil	970242
LC16	chroma input coil	72A329-1
LC34	47 μh, 2nd bandpass coil	73A55-28
LD52	1 μh, 3.58MHz output coil	73A55-37
LD63	10 μh, demod. phase shift coil	73A55-8
LE30	62 μh, peaking coil	73A55-29
LF24	horiz hold control	94A351-1
LG7	right, blue horiz xformer	94A305-9
LH12	filter choke	74A30-1
TA59	4.5 MHz trap coil	72A216-7
TB20	ratio detector xformer	72A318-1
TC14	burst xformer	72A325-3
TC29	bandpass xformer	72A327-1
TH2	line choke	73A31-16
TH4	power xformer	80A108-5
TH18	horiz output xformer	79A140-1
TH44	audio output xformer	79A141-1
TH73	vert output xformer	79A131-2
CRD42	zener regulator (alt. 93A39-14)	93A39-1
CRF40	diode HV regulator	93A60-3
YD43	3.58MHz crystal	93A22-1
FH5	0.5 amp fuse	84A28-3
FH74	0.35 amp fuse	84A28-8
MH6	circuit breaker	84A17-13
	tuner VHF	94A344-2
	yoke, deflection 16 in. CRT	94A304-1
	yoke, deflection 12 in. CRT	94A353-1

1337

AIRLINE

Color TV Model
GCI-12460A

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

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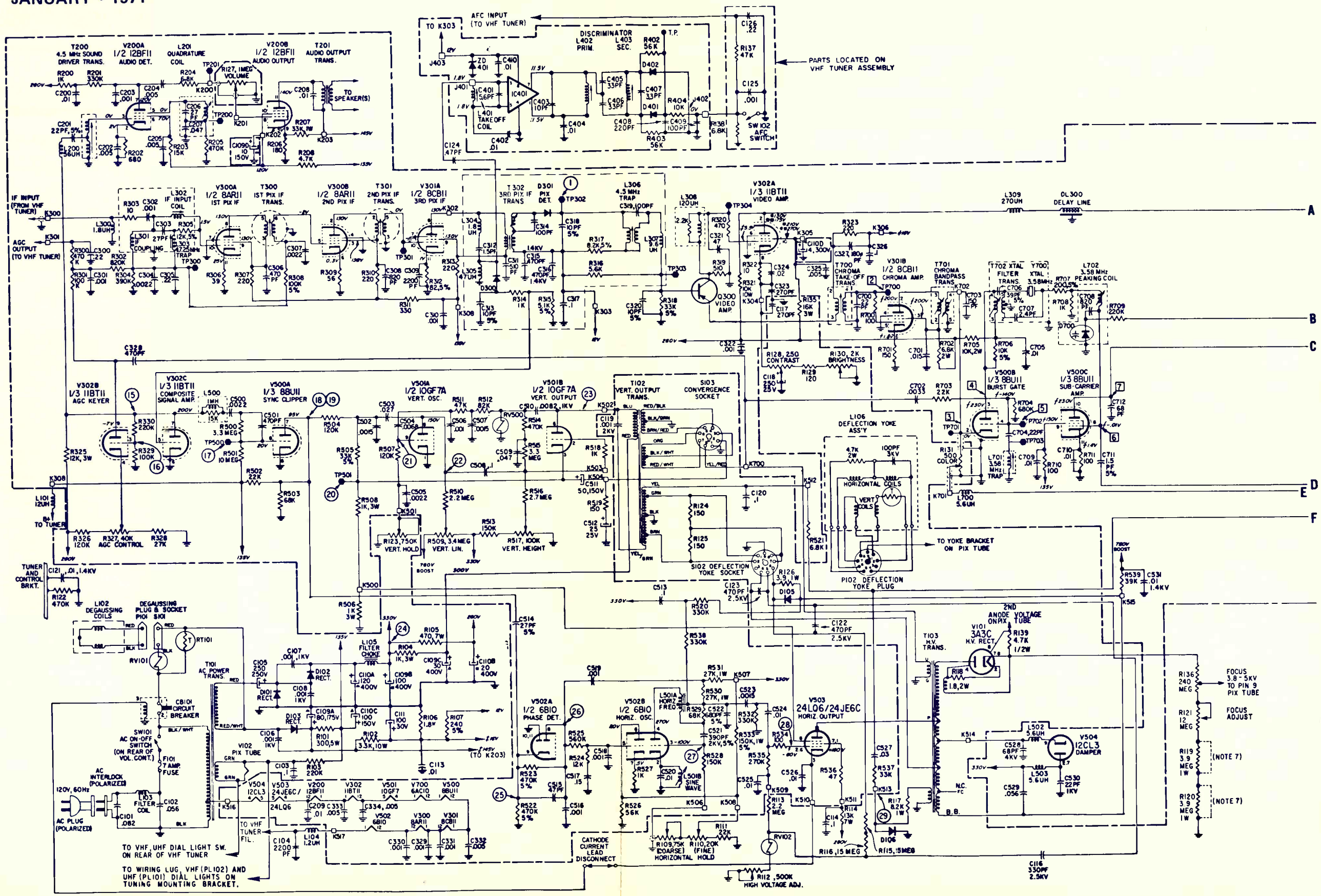
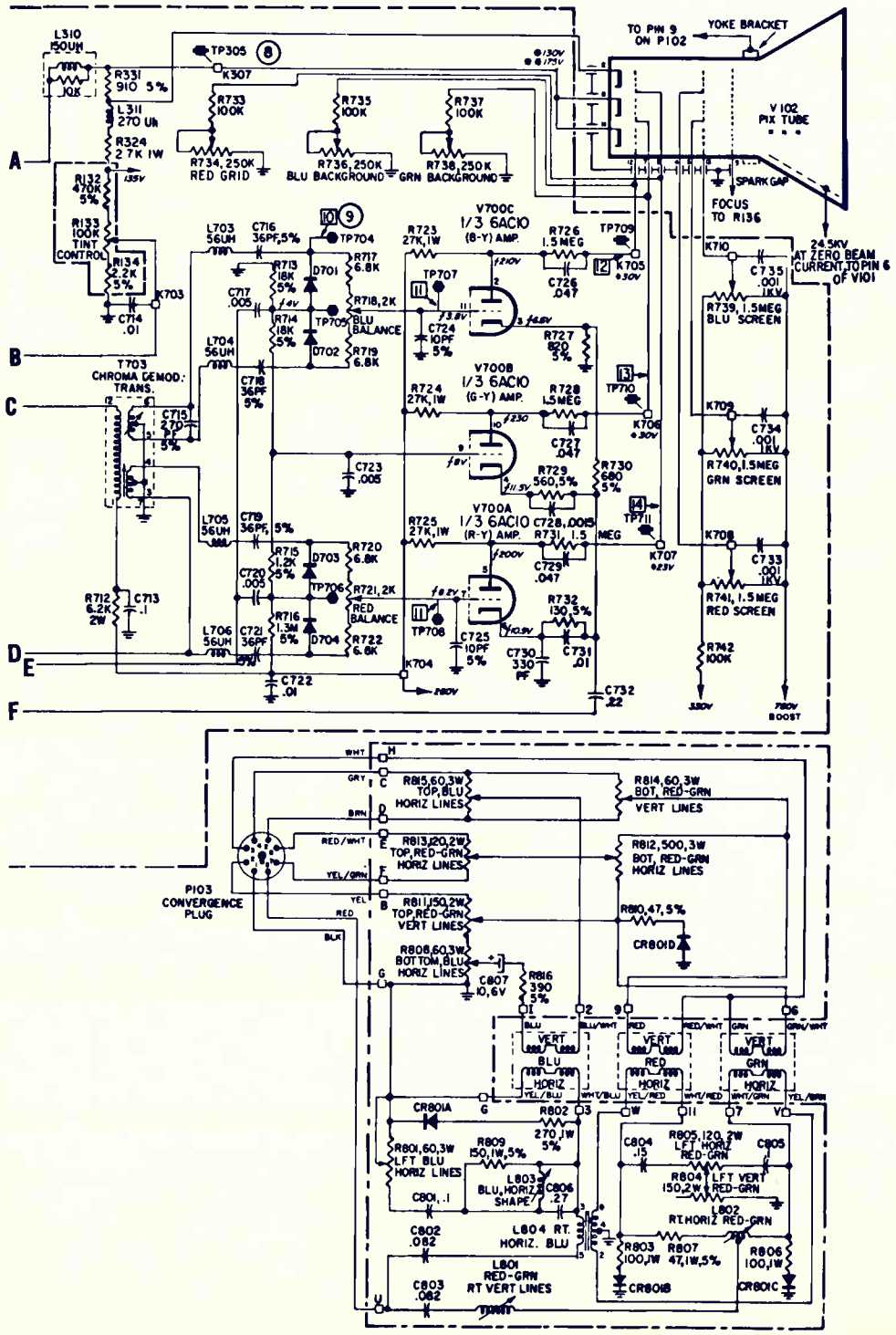


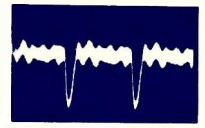
AIRLINE
Color TV Model
GCI-12460A



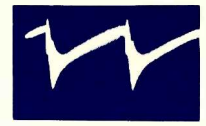
SYMBOL	DESCRIPTION	AIRLINE PART NO.
C109A	80 µf/175v electrolytic	034-030700
C109B	100 µf/400v electrolytic	034-030700
C109C	30 µf/400v electrolytic	034-030700
C109D	10 µf/150v electrolytic	034-030700
C110A	120 µf/400v electrolytic	034-030600
C110B	20 µf/400v electrolytic	034-030600
C110C	100 µf/150v electrolytic	034-030600
C110D	4 µf/400v electrolytic	034-030600
R114	13K, 10%, 7w, fixed film	054-133710
R136	240M, focus bleeder	057-002700
RT101	thermistor, degaussing	057-001200
RV101	VDR, degaussing	057-002600
RV102	VDR	057-002500
RV500	VDR	057-000200
R109	control, horiz hold (coarse), 75K	055-067500
R110	control, horiz hold (fine), 20K	055-067500
R123	control, vert hold, 750K	055-067500
R112	control, HV adjust, 500K	055-36500
R121	control, focus adjust, 12M	055-070400
R127, SW101	control, on-off-volume, 1M	055-068800
R128	control, contrast, 250Ω	055-068700
R130	control, bright, 2K	055-068700
R131	control, color, 500Ω	055-067300
R133	control, tint, 100K	055-068000
R327	control, AGC, 40K	055-069200
R736	control, blue background, 250K	055-069200
R738	control, green background, 250K	055-069200
R509	control, vert linearity, 3.4M	055-064200
R517	control, vert height, 100K	055-064200
R734	control, red background, 250K	055-064200
D401, 402	diode, zener	003-009200
IC401	integrated circuit	181-000100
Q300	transistor, video amp (PNP)	002-012800
ZD401	diode, zener	003-010000
DL300	coil, delay line	111-037400
L106	deflection yoke	027-033200
L201	coil, quadrature	109-040300
L303	coil, 47.25MHz trap	109-037500
L306	coil, 4.5MHz trap	109-040400
L401	coil, video takeoff	109-040600
L402	coil, discriminator primary	109-040700
L403	coil, discriminator secondary	109-040700
L501A, B	coil, horiz freq/sine wave	110-031300
L701	coil, 3.58MHz trap	109-038100
L702	coil, 3.58MHz peaking	109-039500
T101	xformer, power	033-015400
T102	xformer, vert output	033-014300
T103	xformer, HV	033-016200
T200	xformer, 4.5MHz sound driver	109-037800
T201	xformer, audio output	031-010400
T700	xformer, chroma take-off	109-040500
T701	xformer, chroma bandpass	109-037000
T703	xformer, chroma demodulator	109-037100
CB101	circuit breaker	099-003500
F101	fuse, 7a	099-003600
	tuner, UHF	006-022800
	tuner, VHF	006-022700
	yoke, convergence assembly	027-032700

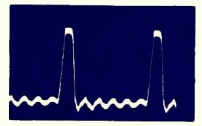
NOTES
1. ALL RESISTORS ARE 1/2 WATT, 10%, UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE IN MFD, UNLESS OTHERWISE NOTED.
3. CAUTION: USE ISOLATION TRANS WHEN WORKING ON CHASSIS.
4. DC VOLTAGES MEASURED WITH "VTVM" PLACED BETWEEN POINTS INDICATED & CHASSIS GND, WITH NORMAL SIGNAL INPUT
(+) INDICATES VOLTAGE READINGS TAKEN WITH BRIGHTNESS CONT. AT MAXIMUM ROTATION (FULLY CW).
(+)(-) INDICATES VOLTAGE READINGS TAKEN WITH BRIGHTNESS CONT. AT MINIMUM ROTATION (FULLY CCW).
ƒ INDICATES VOLTAGE READINGS TAKEN WITH COLOR SIGNAL.
5. WAVEFORMS ARE TAKEN WITH NORMAL SIGNAL INPUT.
6. LINES VOLTAGE INPUT SET AT 120 VAC.
≠ INDICATES THESE VOLTAGES WILL VARY WITH VIDEO CONTENT OF THE PICTURE BEING RECEIVED AND ARE AVERAGE READINGS.
(○) INDICATES THESE VOLTAGES WILL VARY WITH BACKGROUND CONTROL SETTINGS.
7. JUMPER REMOVED AT FACTORY IF NECESSARY TO SET FOCUS CONTROL RANGE.
8. (ƒ) INDICATES THE VOLTAGE WILL VARY WITH FINE TUNING SETTING FROM 0V TO ≅ 3V.

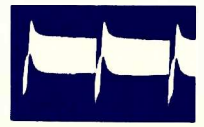

1 3V P-P 60 Hz

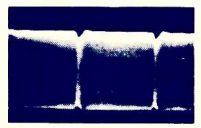

2 10V P-P 15,750 Hz


3 18V P-P 15,750Hz

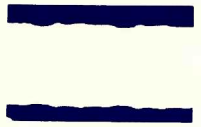

4 40V P-P 15,750 Hz

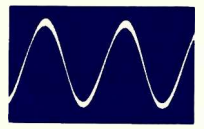

5 85V P-P 15,750 Hz

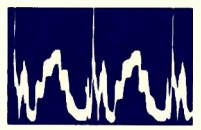

6 3.5V P-P 15,750 Hz

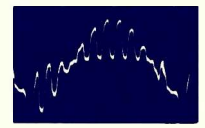

7 85V P-P 15,750Hz

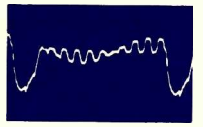

8 105V P-P 60Hz

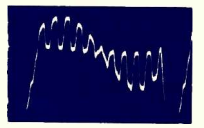

9 10V P-P 15,750 Hz

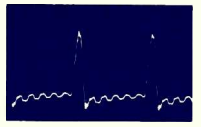

10 10V P-P 3.58 MHz

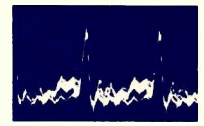

11 2.5V P-P 15,750 Hz

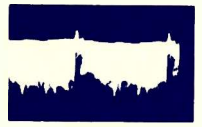

12 78V P-P 15,750 Hz


13 84V P-P 15,750Hz


14 96V P-P 15,750Hz

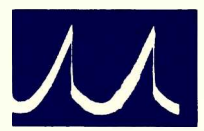

15 250V P-P 15,750Hz

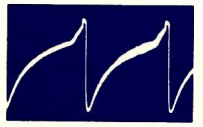

16 22V P-P 15,750Hz


17 50V P-P 60Hz


18 70V P-P [illegible] Hz


19 70V P-P 15,750Hz


20 12V P-P 60Hz

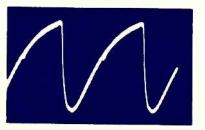

21 100V P-P 15,750Hz

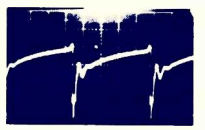

22 150V P-P 15,750Hz

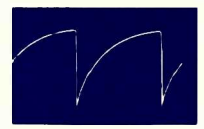

23 160V P-P 60Hz


24 3V P-P 15,750Hz


25 18V P-P 15,750Hz


26 28V P-P 15,750Hz


27 600V P-P 15,750Hz


28 180V P-P 15,750Hz


29 420V P-P 15,750Hz

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

1338

SYLVANIA

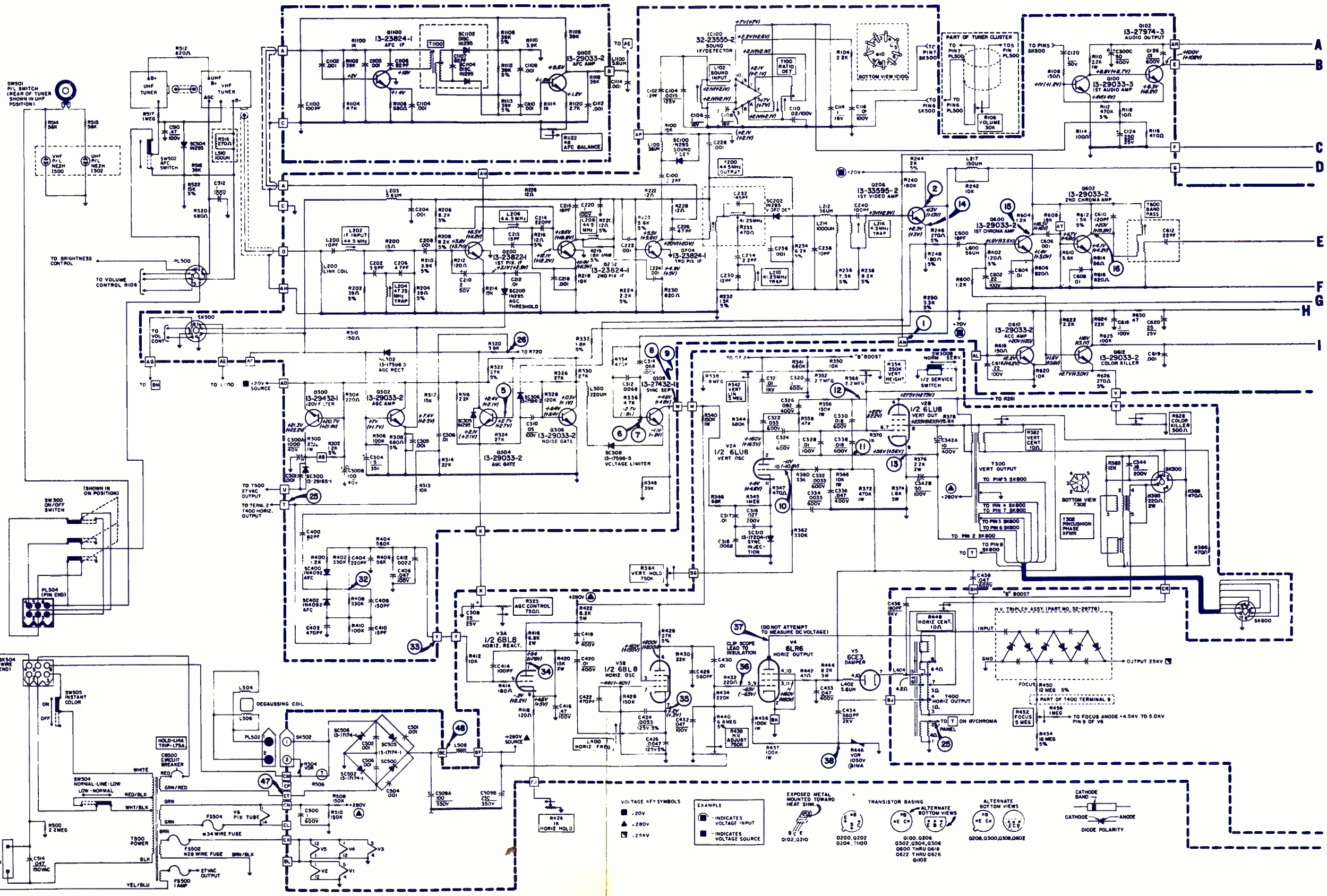
Color TV Chassis
D16-2

JANUARY • 1971

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

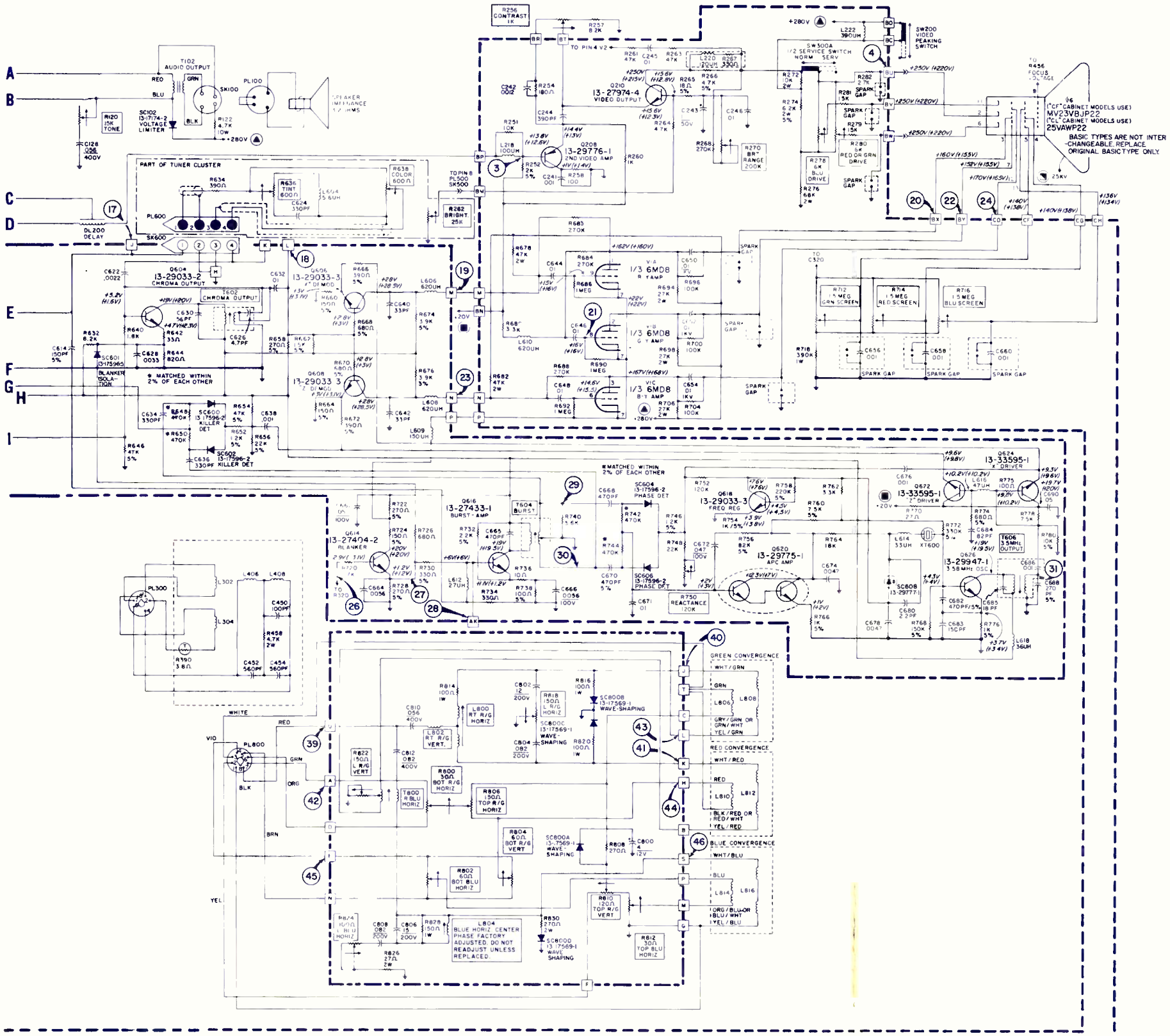
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL	DESCRIPTION	SYLVANIA PART NO.
C300A	1000/40v electrolytic	41-29269-16
C300B	100/40v electrolytic	41-29269-16
C300C	50/400v electrolytic	41-29269-16
C342A	10/400v electrolytic	41-27344-1
C342B	50/100v electrolytic	41-27344-1
C509A	100/350v electrolytic	41-33341-1
C509B	250/350v electrolytic	41-33341-1
R446	VDR 1050v @ 1m	38-29959-1
R504	VDR 67m @ 20v	38-17071-2
R506	thermistor, 120Ω cold 1.25Ω hot	38-17071-4
L400	horiz freq	50-23508-1
L508	filter B+ choke	56-17568-6
T100	ratio detector	57-23547-1
T102	audio output	56-16018-11
T300	vert output	56-29826-1
T400	horiz output	50-29664-1
T500	power	55-33165-2
T600	bandpass	50-27405-1
T602	chroma output	50-29858-1
T604	burst	50-27406-1
T606	3.58MHz output	50-29784-1
R106	30K - volume	37-29779-2
R120	10K - tone	37-27242-24
R256	1K - contrast	37-27242-25
R262	25K - bright	37-29783-8
R270	200K - bright range	37-29755-1
R323	750Ω - AGC	37-29755-2
R342	5M - vert linearity	37-29832-1
R354	250K - vert height	37-29832-1
R364	750K - vert height	37-27242-6
R382	10Ω - vert centering	37-29831-1
R424	1K - horiz hold	37-27242-12

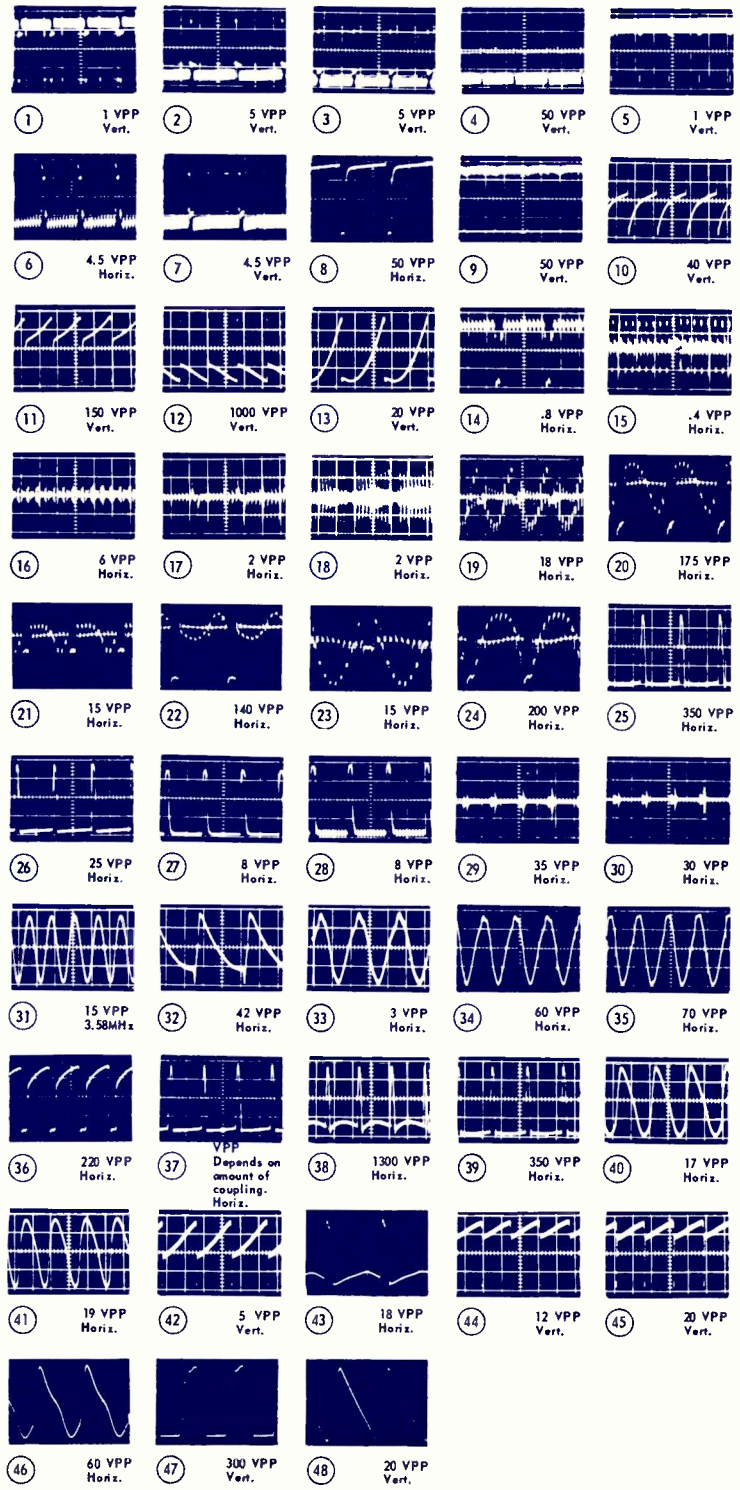


R438—750K · HV adjust 37-29755-2
R448—10 · horiz centering 37-29541-1
R452—5M · focus 37-17320-4
R628—500Ω color killer 37-29755-2
R636—600Ω tint 37-23479-46
R638—600Ω color 37-23479-46
CB500—circuit breaker 29-23918-1
DL200—delay line 32-23216-1
FS500—fuse · 1a pigtail 29-91256-10
yoke-deflection 51-15949-4
VHF tuner 54-29331-5
UHF tuner 54-29184-4

SYLVANIA
Color TV Chassis
D16-2



WAVEFORMS



1339

RCA SALES CORP.

TV Chassis KCS185

ELECTRONIC TECHNICIAN/DEALER TEKFAX

JANUARY • 1971

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

SYMBOL	DESCRIPTION	RCA PART NO.
CR101	diode-horiz damper	119719
F101	fuse-glass, 2 amp	132488
F102	fuse-glass, ¼ amp	132489
L201	coil-horiz hold	125129
L202	coil-width choke	116058
L203	coil-peaking, 8.2 μh	131229
R207	resistor-control contrast	132554
R211	resistor-control, v hold/v size/bias	131794
T101	xformer-power	132557
T201	xformer-vert output	132555
T202	xformer-high voltage	132556
IC301	circuit-integrated sound	126871
T301	xformer, discriminator	126738
T302	xformer, sound take off	129707
CR401	crystal-IN60	112526
L401	coil-47.25 trap	128458
L402	coil-41.25 trap	128458
T402	xformer, IF output	129706
L501	coil-4.5 trap	128457
L502	coil-peaking 250 μh	119742
VR601	diode-zener	132865
RT901	thermister-1000Ω cold	132866
T902	xformer, horiz, driver yoke-deflection	132848 132559

BOARD PIN VOLTAGE MEASUREMENTS

PW300 Pin No.	PW300 In	PW300 Out	PW350 Pin No.	PW350 In	PW350 Out	PW400 Pin No.	PW400 In	PW400 Out	PW500 Pin No.	PW500 In	PW500 Out	PW600 Pin No.	PW600 In	PW600 Out	PW900 Pin No.	PW900 In	PW900 Out
1	2.11v	2.11v	1	0v	0v	1	0v	0v	1	0v	0v	1	11.9v	0v	1	0v	0v
2	2.11v	2.11v	2	5.66v	5.66v	2	0v	0v	2	NC	NC	2	0v	0v	2	20v	5.66v
3	0v	0v	3	NC	NC	3	NC	NC	3	NC	NC	3	20/25v	0v	3	1.36v	NC
4	0v	0v	4	12v	12v	4	NC	NC	4	1.57v	1.56v	4	.78v	NC	4	1.38v	NC
5	5.7v	0v	5	12v	12v	5	11.8v	12v	5	2.36v	2.34v	5	12.1v	0v	5	12.1v	12.5v
6	1.39v	0v	6	.1v	0v	6	0v	0v	6	12.1v	12.1v	6	—3.5v	—2.16v	6	11.8v	12.4v
7	4.65v	NC				7	2.49v	0v	7	0v	0v	7	0v	0v	7	11.9v	12.3v
8	.71v	NC				8	3.16v	13.6v	8	10.5v	NC	8	NC	NC	8	11.9v	12.3v
9	0v	0v				9	0v	0v	9	1.2v	0v	9	.05v	0v	9	7.86v	12.5v
10	0v	0v				10	11.4v	12v	10	20v	46.5v	10	10.3v	0v	10	11.9v	12.5v
11	0v	0v				11	0v	11v	11	99v	109v	11	—.58v	0v	11	11.9v	12.5v
12	11.4	12				12	1.48v	.7v	12	27.8v	28.3v	12	.63v	0v	12	99v	11.8v

Voltages are measured to chassis ground with a "Volt Ohmst" WV500A (No signal). Voltages above are shown with that respective board removed (out) and (in) place. 12v source should measure 12v with 120 VAC applied ±1%. See B+ adjustment).

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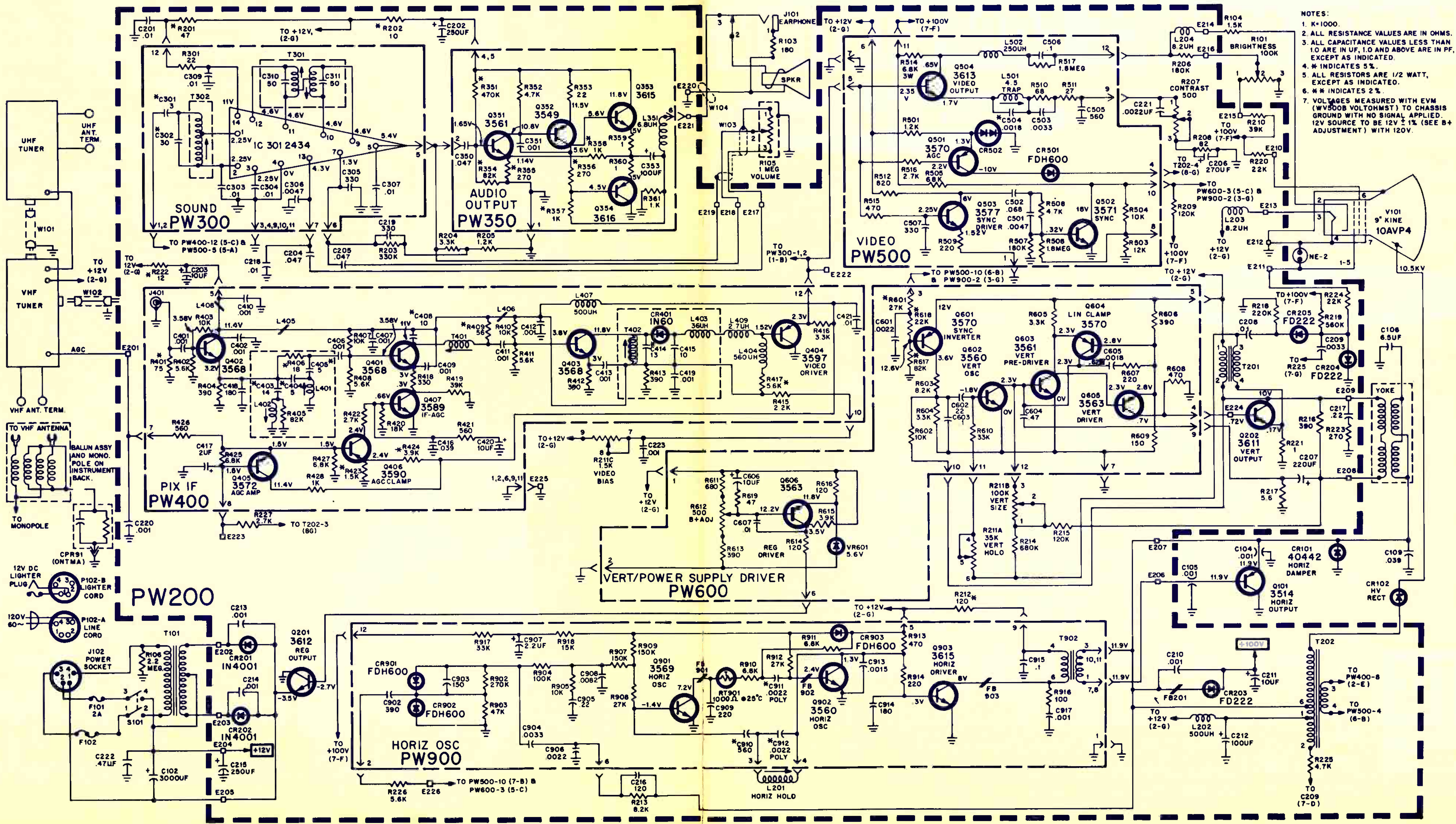
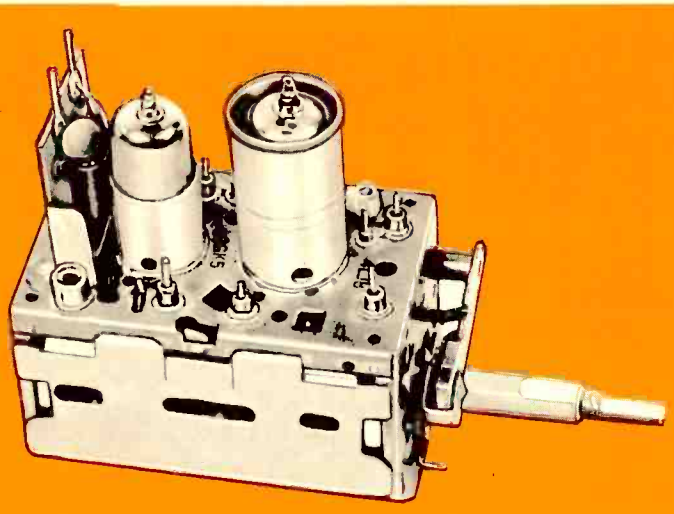


NOTES:
1. K=1000.
2. ALL RESISTANCE VALUES ARE IN OHMS.
3. ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN UF, 1.0 AND ABOVE ARE IN PF, EXCEPT AS INDICATED.
4. * INDICATES 5%.
5. ALL RESISTORS ARE 1/2 WATT, EXCEPT AS INDICATED.
6. ** INDICATES 2%.
7. VOLTAGES MEASURED WITH EVM (WV500B VOLTOHMST) TO CHASSIS GROUND WITH NO SIGNAL APPLIED. 12V SOURCE TO BE 12V ± 1% (SEE B+ ADJUSTMENT) WITH 120V.



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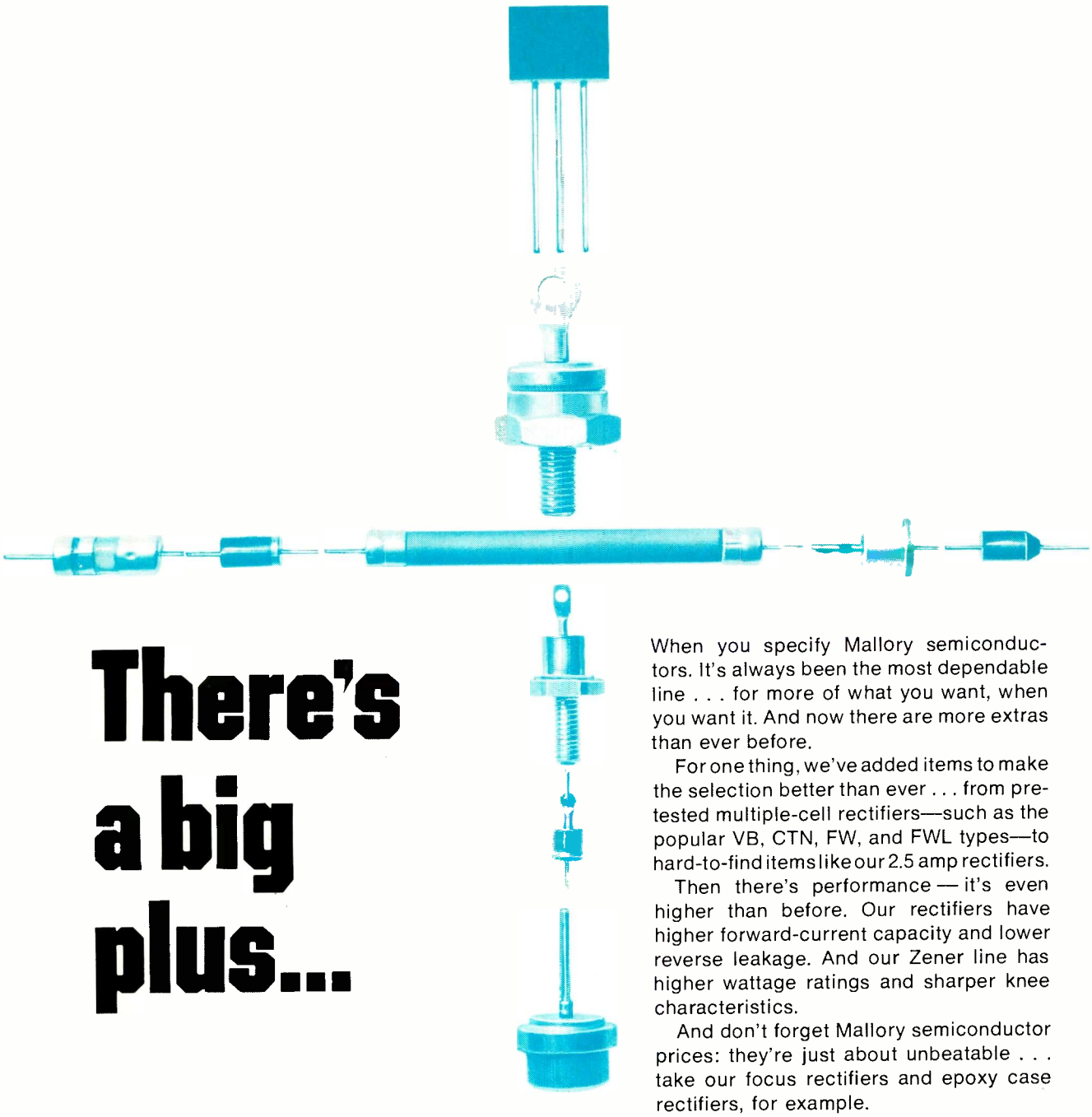

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ELECTRONIC TECHNICIAN/DEALER

JANUARY 1971 • VOLUME 93 NUMBER 1

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

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

JOSEPH ZAUHAR
Managing Editor

CAROLYN SAND
Associate Editor

DEBBIE GOLDBERG
Production Editor

BOB ANDRESEN
Graphic Design

LILLIE PEARSON
Circulation Fulfillment

JOHN KESSLER
Manager, Reader Services

BERNICE GEISERT
Advertising Production

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Publishing Director

MANAGERS

ALFRED A. MENEGUS
757 Third Avenue
New York: (212) 572-4829

DEAN GREENER
43 East Ohio Street
Chicago: (312) 467-0670

DONALD D. HOUSTON
1901 West 8th Street
Los Angeles: (213) 483-8530

CHARLES S. HARRISON
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This month's cover, supplied through the courtesy of Chemtronics, shows a technician at work with his many useful service aids at hand.

FEATURES

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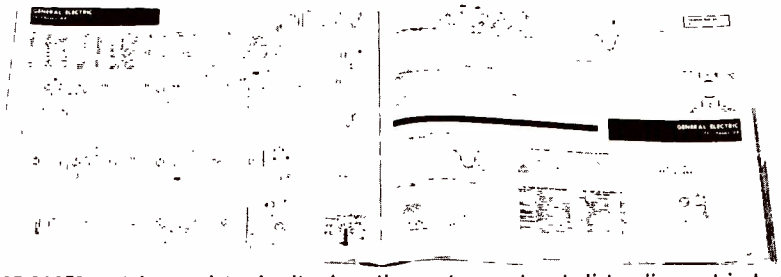

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EDITORIAL

Wired Television Communications

During the past year the National Cable Television Assn. has been conducting informative meetings across the country so that those interested might learn more concerning the current and future status of community antenna (CATV) systems.

While attending one of these meetings I was interested in learning that according to a 1969 Neilson survey CATV served 23.3 percent of TV homes in rural areas, 34.5 percent in small towns and 1.6 percent of the TV homes in major metropolitan areas. The average size of a CATV system was estimated to be about 1900 subscribers while some of the larger systems served nearly 40,999 subscribers and some of the smaller systems served fewer than 100 subscribers. One of the speakers predicted that by the end of this decade CATV systems would serve 80 percent of the TV homes in this country.

During the luncheon an official of one CATV system told me about a very interesting advertising research program that they were hired to take part in. During certain network programs substitute advertisements were dubbed in to replace the network advertisements. Those homes that received the network program with their own antenna saw one advertisement while those watching the same program through the CATV system saw a substitute advertisement by the same sponsor. A telephone survey group, knowing which houses were on the CATV system and which houses were not, then called various homes to see which version of the commercial had the greatest viewer response.

One problem was discussed which complicates both the transmission and retransmission of TV programs. Under certain new FCC rulings, CATV systems must obtain retransmission consent to carry the signals obtained from a distant TV station. In reality such consent is equivalent to copyright clearance. It was indicated that even TV stations that would like their programs carried over CATV systems do not feel free to give such authorization since they do not feel that they have the authority to give copyright clearance. Even for an educational TV station copyright clearance can become quite a problem. One educational TV station representative attending the meeting told me that they would even be unable to provide such clearance for some of the original TV programs that they broadcast. This is due to the fact that although the college professors preparing lectures for these programs write original notes, they frequently use resource material—charts, illustrations, etc.—that are copyrighted. These professors would rather not even be bothered with the program than attempt the difficult task of obtaining clearance to broadcast or redistribute every piece of copyrighted reference material that they use.

Although it was stressed by officials at the meeting that CATV systems should not be considered utilities as new regulations are formulated, since these systems merely offer the option of providing TV signals by wire which might otherwise be received directly with an antenna, they went on to list some of the future developments that would be possible for CATV systems. These included: the facsimile reproduction of newspapers, magazines and documents. Purchasing merchandise from stores through CATV. Educational programs that would offer skills training, health information and college degrees. They referred to one city which was considering downtown surveillance with the aid of a CATV system. Upon completing the list of possible future applications a guest at a neighboring table spoke up saying, "That sounds like a utility to me!"

This does pose a serious question concerning the future development of visual communications. Will future video communications systems evolve from current telephone systems (some phone companies are currently in the process of successfully developing video telephone systems) or from CATV systems (they are considering the construction of two-way communications systems that use your TV set)? This question will probably have to be answered by government legislation or through the courts, rather than through competitive development.

Phillip Dahlen

READERS' AID

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

I have two volumes of the 103 book of schematics and would like to exchange them for the 102 and 104 book of schematics.

AL TATRAULTS
68 Main Street
Northport, New York 11768

I need service information on an old car radio, Zenith Model 8ML692. Perhaps one of your readers can furnish the material. I will gladly pay for it or for making a copy.

THOMAS O. MOREHOUSE
Box 688
Grove. Okla. 74344

I am writing to see who would be interested in buying my TV sales and service business, which has grown 500 percent in the past seven years.

My store is located on the main street in this growing border city, and I do a thriving business with military personnel stationed at the air base only seven miles away as well as with Mexican citizens who shop in our city daily.

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M. E. PIERCE, JR.
Pierce Electronics
P.O. Box 1526, 829 S. Main
Del Rio, Texas 78840

I have in my possession an "All Meter" built by The Superior Instrument Co., Model TV-60. I would like to know if and where I can obtain a circuit diagram for this model.

GREGORY McGIRT
1699 Washington Ave.
Bronx, N.Y. 10457

Can anyone help me in locating a copy of a schematic for a stereo tuner and amplifier made by Stereo Corp. of America, a Prestige Model. A number etched on the chassis is TA920514.

The manufacturer may still be in business but I have not been able to locate them.

HOWARD A. POTVIN
2527 Los Padres Dr.
Rowland Heights, Calif. 91745

I have an RCA TV calibrator, Model WR39A. It has excellent frequency stability and calibration. I would like to use it as a frequency meter, but cannot find a diagram, nor can the RCA distributor supply one. I am wondering if your readers can help.

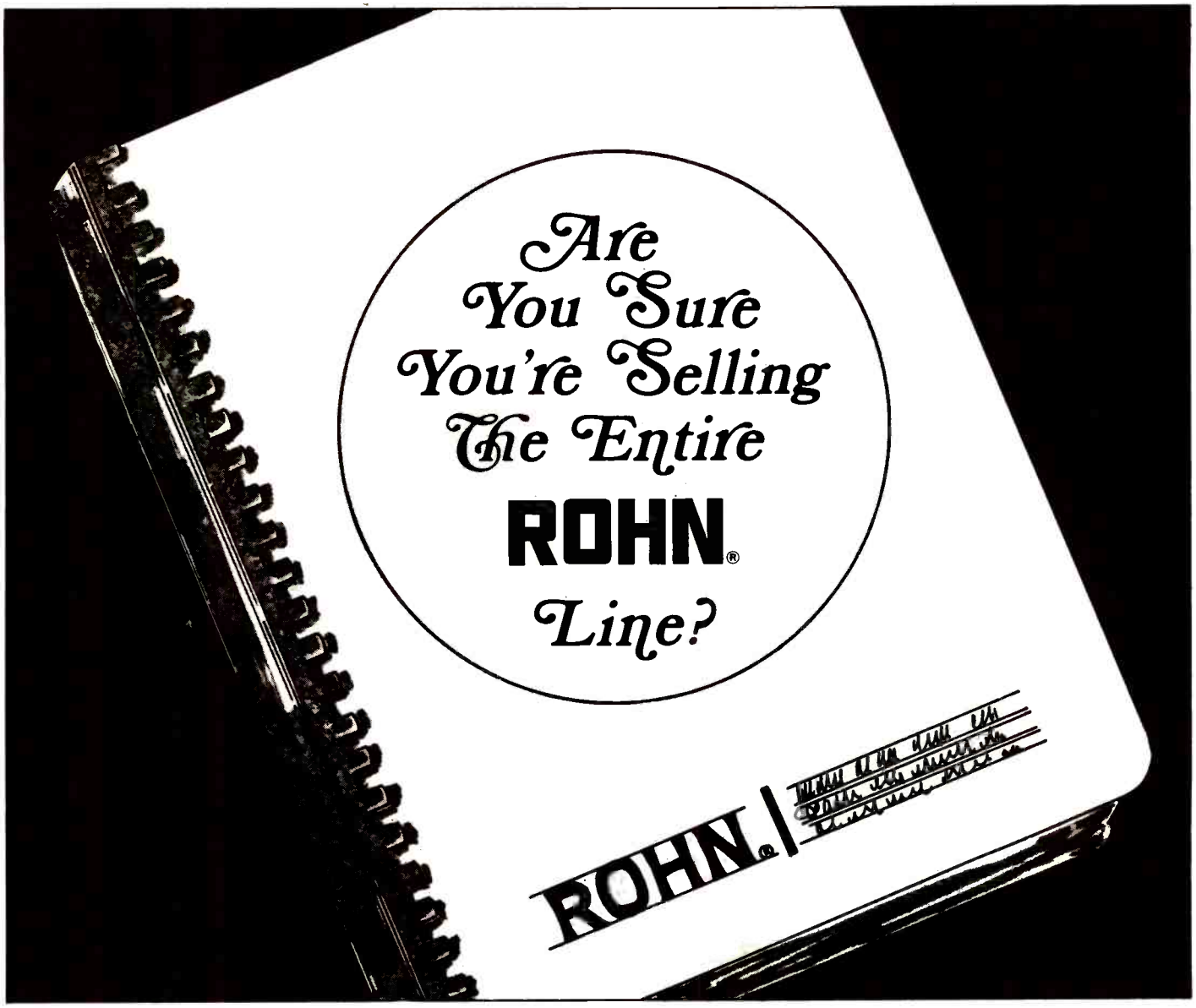
CHARLES A. WILLIAMS
Williams of Henry
417 Edward St., Box 106
Henry, Illinois 61537

We noticed several issues ago that someone requested information on Pentron Stereo Tape Recorder. We, too, need information, schematic, parts list, etc., on Pentron Stereo Recording System, Emperor II, Model NL-4.

ALLAN M. HARD
Hard's Radio & TV Service
Post Office Box 71
Demopolis, Alabama 36732

I have need for the schematic diagram of the Hammarlund Radio Receiver Model AR 91.

MIGUEL ANTONIO DE LA ROSA
Cable and Wireless/Western Union International, Inc.
P.O. Box 1232
San Juan, Puerto Rico 00902



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LETTERS

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

Comments on Articles

What a commendable editorial in your November issue! It clearly states your faith and convictions, unhampered by fearful editorial caution against letting spiritual values stand side by side with material values.

Unfortunately, your editorial page is reflecting a goal not successfully reached in your subsequent pages. The "Quick-Testing Transistors" article text appears not to tally with Figure 2C. The "Transistor Ups and Downs" does not appear to tally properly with its illustration, and ends up to add confusion instead of clarity.

It is only because your publication is usually meticulously accurate and clear, showing close adherence to your stated goal, that I felt the urge to write about the exceptional condition on pages 51 and 52.

BJORN HEYNING
SR. DESIGN ENGINEER
Heath Company
Benton Harbor, Mich. 49022

You are quite correct concerning the error that appears in Fig. 2C. The author correctly showed the circuit containing an NPN transistor in his original sketch but I failed to note that our draftsman reversed the direction of the arrow and added a ground to the transistor emitter lead in addition to showing the correct bias supply. Thank you for bringing this error to my attention. Ed.

That was an interesting article Mr. Sickels wrote about his portable home service lab. I was happy to see that he included B & K equipment in his lab.

Then, we go to page 57 and read about this tremendous probe that Chuck Dotson writes up. What would it have hurt if Mr. Dotson gave the name B & K instead of just saying one manufacturer makes this without identifying it? I wasn't aware that your organization hesitates to mention manufacturer's names in articles.

HAROLD J. SCHULMAN
EXECUTIVE VICE PRESIDENT
Dynascan Corp.
1801 West Belle Plaine Avenue
Chicago, Illinois 60613

Just a word of thanks for the nice feature article on our Mighty Mover in last month's issue [*November issue*]. It was well done and we received several long distance calls from dealers who were interested. We at Griffiths appreciate that kind of cooperation from media people.

MICHAEL JAY DONZIGER
Griffiths Electronics Inc.
2875 Westside Blvd.
Jacksonville, Florida 32209

I read with interest your editorial in the October issue of ELECTRONIC TECHNICIAN/DEALER and having done so I felt that I just had to write you with the hopes that perhaps you would be kind enough to delegate enough space in your magazine to comment and set down some facts.

I cannot help but feel that there is some sort of misunderstanding between the TV station and the dealership. It is a tendency for each to blame the other for problems of which there are a great many. Certainly the FCC sets standards for TV station transmitters. The standards, of course, are adhered to but this is not entirely the problem. I noticed that you stated in your editorial that you do not feel, as has been indicated, that TV sets are to fault for this problem. At the current time the SMPTE has an Ad Hoc committee that is currently investigating the manufacturers of various sets. They are trying to bring these sets into some sort of standardization wherein the problems that you mention would be less likely to occur.

You commented on the fact that you toured a station and was shocked to see only one color monitor. Mr. Dahlen, there is a reason for this. For many, many years there has been a color monitor problem. This problem is still existing today although great strides have been taken to correct the problem areas.

I have found that utilizing one color monitor gives us far greater reliability on color transmission than trying to put a color monitor on each piece of color gear. Until just very recently, monitors with matched phosphors were not available. I should think that you should be able to visualize what would happen with three or four or five color monitors with different matched phosphors on each color transmission system.

I also notice in your editorial where you state that you can watch a color late night movie for two hours, then if you come out of that movie into a live newscast as such, your flesh tones change. We have seen this happen many, many times. In fact, it is still happening. If a television print is not processed for TV use, it does not appear good on your screen. You have the problem of desaturation of the film for color chroma content. If you crank up your local receiver to make that film look acceptable to you and then hit live direct pickup, certainly you are going to be over-saturated.

Until such time as the various committees at work can get all the film houses in accord and all film processed to this new standard, these inadequacies will exist. We know that in the studio with the color cameras, and I am sure you have observed this, you will see a blond-headed girl with green hair. This is caused by polarization of light. Just a few weeks ago there was a new type of cube developed for the color cameras that will prevent polarization of light. There has been a development of new dichroics and new trim filters for less color error. So you see, Mr. Dahlen, continuing work is going on all the time to get a better picture to the TV viewer.

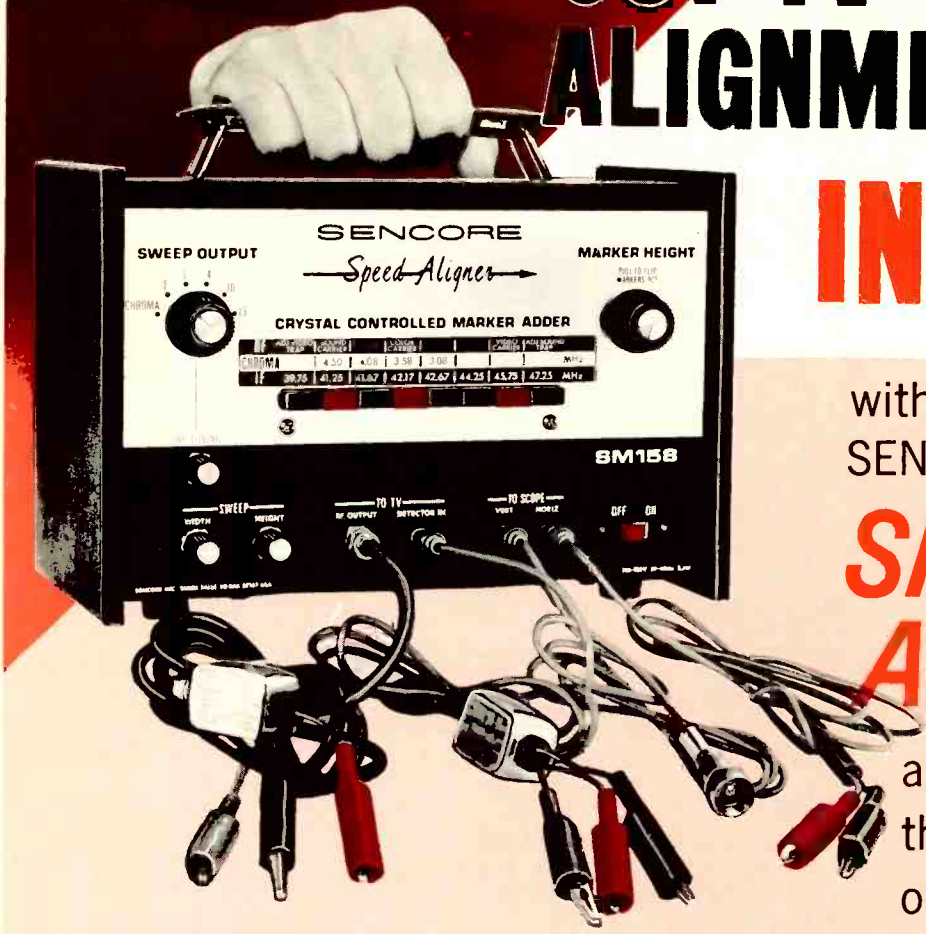
The networks are now sending down a vertical interval color reference signal. The FCC has waned its requirement that the guard band be adhered to since this signal violates the standards. The purpose of this is to eventually be able to digital control a device to make corrections of the color signal and prevent hue and saturation changes.

New encoders are being developed to use input clamping at the matrix to prevent APL changes and ground loops from causing color errors.

I do not think, as your editorial indicates, that a finger can be pointed in only one direction. I would venture to say that if every TV station in the country had the new automatic color camera that your condition would still exist—until such time as all these perimeters can be tied into one common goal, and this includes film processing companies, it includes TV set manufacturers, it includes just about every facet of the industry that you want to enter. Until such time as this happens there will always be color differences. I would hope that you can take some of this information and perhaps delegate a few pages in the next issue so that your TV dealers and the technicians are aware that the problems do not lie solely with the TV stations.

RAY MCMILLAN
DIRECTOR OF ENGINEERING
KENS TV 5
P.O. Box 2171
San Antonio, Texas 78205

CUT TV ALIGNMENT TIME IN HALF!



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SPEED ALIGNER

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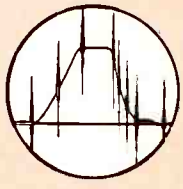
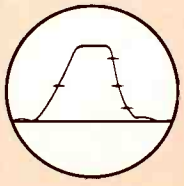
Here are 7 Reasons why we call the SM158 the Speed Aligner

AUTOMATIC ALL CRYSTAL CONTROLLED MARKERS: You will never spend any more time looking up marker frequencies or interpreting them when you own an SM158; they are automatic. For example, want the chroma carrier on any RF curve, IF curve, or chroma curve, simply push the chroma carrier marker button. Want the sound, video, adjacent carrier markers or any other marker on any curve, just push the button as directed on the panel. The SM158 is fast and saves you time . . . that's why we call it the speed aligner.

UNLIMITED MARKER AMPLITUDE: The marker height control is like a powerhouse; crank it up as far as you want, even to the point where the markers are larger than the scope screen, without upsetting the response curve. Each marker is crystal controlled on fundamental frequencies and post-injected so that you may place all markers on the curve at unbelievable heights without affecting the curve in the least. That's why we call the SM158 the speed aligner.

EASY TO CONNECT: Just four connecting cables clearly marked TO TV and TO SCOPE. It takes just seconds to connect . . . that's why we call the SM158 the speed aligner.





TWO EXTRA VHF CHANNELS: Competition has only two VHF channels; the SM158 has an extra high channel and an extra low frequency channel to prevent any co-channel interference. The SM158 is interference-free . . . that's why we call it the speed aligner.

PLENTY OF SWEEP WIDTH: A full 15 megahertz sweep signal, constant on all IF, chroma and RF curves, provides adequate sweep width to cover new solid state IF amplifiers. Competition covers only 12 megahertz. The SM158 gives you the full picture the first time . . . that's why we call it the speed aligner.

GENERATES A ZERO REFERENCE BASE LINE: You know where zero is with the SM158. All alignment instructions show a base line, yet some competitors do not generate a base line. You can follow TV manufacturers' instructions to the "T", easier and faster with the SM158 . . . that's why we call it the speed aligner.

SWITCHABLE HORIZONTAL OR VERTICAL MARKERS: want to tilt markers 90 degrees so you can view markers better in traps or for leveling? Merely pull the MARKER HEIGHT control out and markers appear horizontally — a real plus feature.

THE IDEA PEOPLE

SENCORE

3200 Sencore Drive
Sioux Falls, South Dakota 57107

. . . for more details circle 119 on Reader Service Card

Sylvania Electronic Systems Establishes Electronics School

An electronics school has been established in Waltham, Mass., by Sylvania Electronic Systems, an operating group of Sylvania Electric Products Inc., to train men and women for technical and professional positions in business, industry and government. Sylvania is a subsidiary of General Telephone & Electronics Corp.

Licensed by the Massachusetts Dept. of Education, the Sylvania Technical School offers vocational training in radio and TV, communications, and computer electronics. The school, with day and evening sessions, will also conduct professional and technical seminars in such areas as printed and integrated circuit technology, total digital system and modern logic design, data communications, communications concepts and technology, and industrial pollution control.

The vocational courses, which will provide from 600 to 750 hours of laboratory and lecture instruction, are designed to qualify students for positions ranging from engineering aide to technician in the home entertainment, communications, electronics, and data processing industries. Students in the radio, TV and communications programs will be prepared for state and federal licensing examinations, according to Robert M. Olsson, Manager of Sylvania's Training Services.

Day students can earn a vocational diploma in 25 to 30 weeks. Evening division programs, offered in either two or three sessions weekly, cover 60 to 94 weeks. The 32- and 48-hour professional and technical seminars will be presented evenings over three to six week periods.

Located in a modern facility at 63 Second Ave., Waltham, Mass., the school includes classroom-laboratories, lecture rooms, administrative offices, library and student lounge. It is equipped with audio-visual aids, including a closed circuit TV system, and electronic assembly, test and monitoring equipment.

The school, which will begin classes in January, also will offer placement and counseling services to students.

Jersey Specialty Company Has Moved to Larger Offices

Jersey Specialty Company, Inc., manufacturer of TV transmission wires and cables, has moved to new, larger offices. The enlarged facilities are located in an adjoining building on the same street as the J.S.C. plant. The new location is for management and office personnel while the former offices are being converted to additional manufacturing and storage facilities.

Mailing address for Jersey Specialty Company remains unchanged at P.O. Box 248, Wayne, N.J. 07470.

RCA to Build $4.7 Million Addition to Scranton Plant

Construction of a $4.7 million addition to the RCA color TV picture tube manufacturing plant in Scranton, Pa., was announced by John B. Farese, executive vice-president of RCA Electronic Components.

"The 31,700 ft. addition to the company's newest and most modern color TV picture tube manufacturing facility will increase the plant's present production capability to the level originally planned for the facility," Mr. Farese said. "Building construction has started and is expected to be completed early in 1971."

In addition to the expansion of the Scranton plant, the company also signed a lease agreement with the Key Market Distribution Center for 120,000 sq ft of warehouse space in buildings now under construction adjacent to the RCA property. This leased space will allow greater utilization of production areas in the main plant that are now being used for warehouse purposes.

The 350,000 sq ft Scranton plant, originally built in 1966 with an investment of $26 million, is situated on a 91-acre tract of land in the Keystone Industrial Park in Dunmore, Pa. The building was designed to accommodate an expansion of this nature while production continues at efficient levels.

The RCA Scranton plant presently has 875 employees and manufactures several sizes of color TV picture tubes for the domestic and international markets. The ultimate work force will be built up to about 1000.

TV Set Sales Up in October Over Year Ago

EIA Marketing Services Dept. figures show that monochrome and color TV set distributor sales in October to dealers registered increases over sales in the same month last year according to Jack Wayman, EIA Consumer Electronics Group staff vice-president. Portable and table model phonographs also showed an increase over sales in October 1969.

Total TV set sales—972,230 sets—were up 2.5 percent from the 948,519 sets sold in October 1969. This was the first month this year where both monochrome and color TV set sales increased over a comparable month last year. Color TV set sales of 527,741 sets were up 4.2 percent over the 506,358 sets sold in October a year ago. Monochrome TV set sales for the month were up 0.5 percent over the same month last year.

Portable and table model phonograph sales were up 1.8 percent over sales a year ago. Total phonograph sales were 3.8 percent down, down to 452,379 from 470,005 a year ago.

Total home radio sales, 794,438 sets, were 11.9 percent down from sales a year ago. Auto radio sales were off 44.3 percent.

Precision Tuner Expands Springfield, Mass. Branch

The management of Precision Tuner Service announced that after only four months of operation, the Springfield, Massachusetts branch has outgrown the original location, and has had to secure a larger facility. The new plant covers over 2,000 ft, and is conveniently located in the distribution center of the city.

Initially, five repair positions have been prepared; each well lighted and with generous work space for each technician. More positions can be added, as the need arises. At the present time, about half of the floor space is allotted for spare parts and tuner storage.

Starting with a small one-man shop, Precision Tuner Service now boasts five locations strategically located throughout the United States, with more to come in the future.

NEW AND NOTEWORTHY

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

CB TRANSCEIVER TESTER 700

Checks transceiver performance ten ways

A multi-function tester is designed to check a CB transceiver's performance 10 ways. It reportedly reads true RF power output directly in watts, modulation

directly in percentage, and standing wave ratios (SWR). Specifications indicate that an audio jack permits headphone monitoring of the transmitted signal, while the tester can also be installed to read received "S" units with transceivers that do not have S-meters. Also reportedly featured is instant switching from the antenna to a built-in dummy load. This permits the operator to make tests and adjustments off-the-air and, without changing cables, switch to the antenna to transmit. In this manner transmitter's output can always be kept fully loaded. For making a wide variety of tests, there are said to be built in audio and RF generators, a crystal activity checker, and other functions. A step-by-step illustrated guide is included with the tester. Price $49.95. E. F. Johnson.

VHF MONITOR RECEIVER 701

Covers the low 30MHz to 50MHz and high 152MHz to 174MHz VHF bands

A solid-state VHF Monitor Receiver Model "Cobra PF-1" is designed to cover the police, fire, business and government channels—AM or FM. The monitor reportedly has separate front ends and separate tuning knobs on the front panel, for the low (30MHz to 50MHz) and high (152MHz to 174MHz) VHF bands and tunes manually across these bands. Provision is said to have also been made for crystal controlled operation at a specific frequency in each band. With each band pre-tuned to the crystal-controlled operating frequency, either frequency can be monitored instantly by selecting the desired band. Rated AM sensitivity is typically 1μv for 10dB (S+N)/N ratio, while rated FM sensitivity is typically 1μv for 10dB noise quieting. The monitor reportedly operates on ac or dc; 117vac, 60Hz, for base station use; 12 vdc for mobile use (negative ground.) The unit is housed in a gray case, with brushed aluminum panel and matching knobs, and measures 12 in. by 3¼ in. by 9¼ in. It weighs 11 lb. Price $119.95. Dynascan.

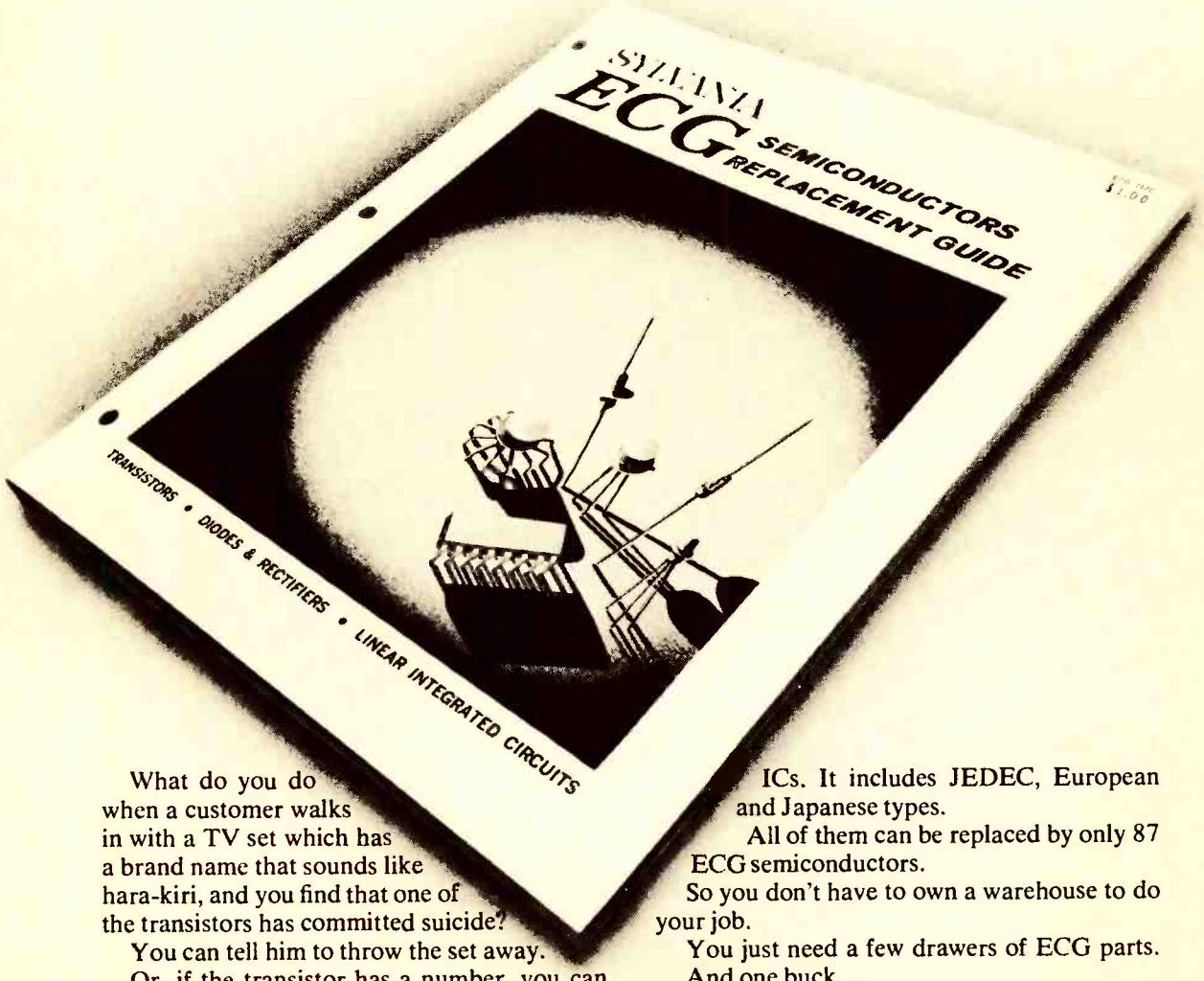
STEREO CAR CASSETTE TAPE RECORDER 702

Dictate, make notes or listen to pre-recorded tapes while driving

A car stereo cassette tape recorder has been developed that lets the driver make the most of the time spent while in his automobile. With this unit it is possible to dictate, make notes, issue memoranda or just listen to pre-recorded stereo cassettes while driving. The Model 1116 tape player reportedly features solid-state circuitry for minimal battery drainage; separate thumbwheel controls for tone volume and balance; easy front insertion loading of the cassette; power indicator light; automatic shut off and eject; and fast forward and rewind. The unit is housed in a low profile metal cabinet that measures 8¾ in. by 2 7/16 in. by 8 3/16 in. It is said to come complete with microphone, cassette and mounting accessories. Webcor.

FOR MORE NEW PRODUCTS SEE PAGE 56

35,000 parts for a dollar.



What do you do when a customer walks in with a TV set which has a brand name that sounds like hara-kiri, and you find that one of the transistors has committed suicide?

You can tell him to throw the set away.

Or, if the transistor has a number, you can look it up in Sylvania's ECG Semiconductor Replacement Guide and pop in an ECG replacement.

The Guide lists over 35,000 transistors, FETs, diodes, rectifiers, Zener diodes and linear ICs. It includes JEDEC, European and Japanese types.

All of them can be replaced by only 87 ECG semiconductors.

So you don't have to own a warehouse to do your job.

You just need a few drawers of ECG parts.

And one buck...

for which your Sylvania Distributor will gladly sell you the Guide. He also has the entire ECG replacement line. Remember: Sylvania supplies you; we don't compete with you.

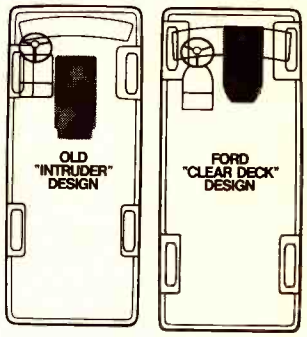
SYLVANIA
GENERAL TELEPHONE & ELECTRONICS

Only one van gives you all these better ideas. Ford Econoline

Sales leader for 10 straight years.

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.

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.

Shorter outside, easier to park.

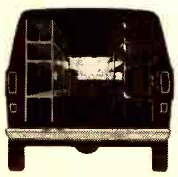
Overall length of Econoline Vans is significantly shorter than other makes. This means easier parking and better maneuverability in city delivery operations—time saved on every trip.

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.

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.

FORD Ford

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

TEKLAB REPORT

The familiar "link circuit" has now been replaced and the color-difference and luminance signals are matrixed before they are fed to the CRT

Introducing RCA's Argosy Portable Color-TV Set

by Joseph Zauhar

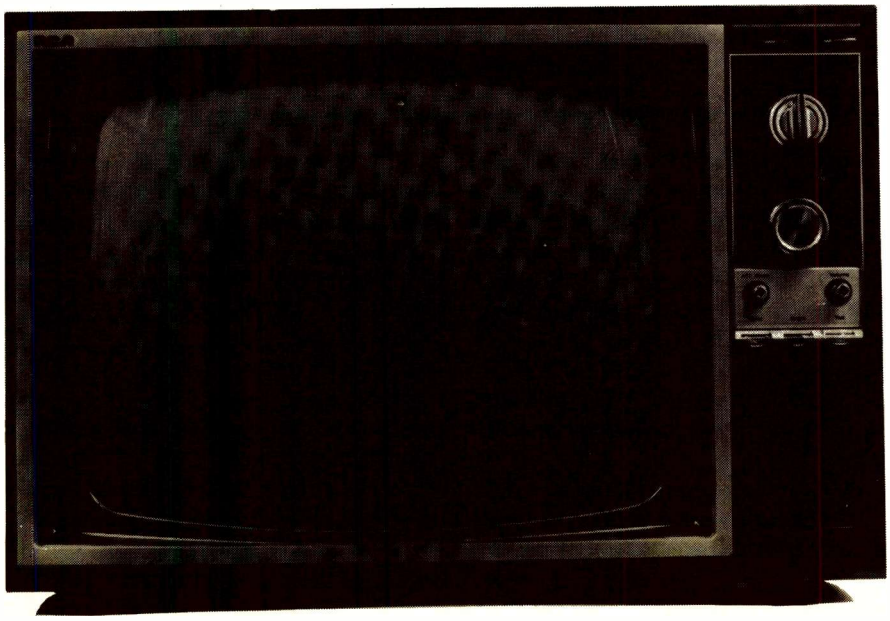
■ The Argosy portable color-TV set, with its CTC49 chassis, takes a large step into the future with a number of radical changes. Two of these important changes include modular construction and extensive use of integrated circuits. The television receiver reportedly employs the first domestic use of the new, slimmer 110° CRT and has 11 separate Accu Circuit modules, including 5 integrated circuits. Other advances include active side-pincushion correction, transformerless vertical output, matrixing of the color-difference and luminance signals before they are fed to the kinescope and changes in the convergence circuits.

Specifications indicate that the tuner may be exchanged without the need for realignment of the coupling circuit to the IF amplifier, while a solid-state high-voltage quadrupler, which essentially is another module, and the use of plug-in transistors makes it possible to correct most failures with very little servicing effort.

After the back cover is removed the complete chassis is exposed for servicing, the modules can be removed from their edge contacts by lifting two retaining clips. The main chassis mounts the power transformer, power-supply filters, audio-output transistor, two vertical-output transistors, high-voltage quadrupler, focus bleeder, and the SCR's and diodes of the horizontal-deflection system.

Some of the circuitry has a close resemblance to earlier RCA chassis —such as the tuner, AFT and horizontal deflection system, which are similar to their counterparts in either the CTC40 or CTC47 chassis; and the sound module which is almost identical to the one used in the CTC41, CTC42 and CTC43 chassis. The integrated circuits used in

RCA Corp.'s Argosy Portable Model EP506W employing the CTC49XA chassis. The compact receiver is 4 in. slimmer than previous 18-in. models.



the IF and chroma circuits are packaged in a single unit and a stage-by-stage review would have very little value to the technician.

Because of space limitations this article reviews only some of the new circuits that should be understood if circuit troubleshooting is required.

RF and IF System

The KRK165VHF tuner used in the CTC49 chassis is the same as the KRK142 tuner of the CTC40 chassis except for a minor change in the biasing of the RF amplifier and revamping of the mixer output to lower its impedance. Both tuners are four-tuned-circuit, wafer-switch tuners using a MOSFET RF amplifier, a cascode-type mixer and an AFT controlled local oscillator.

The familiar "link circuit," which has been used with minor modifications for several years, has been replaced by a terminated coaxial line, which interconnects the tuner and IF amplifier. This coupling method makes the tuning of the mixer and the IF-amplifier input independent of each other; also, the length of the interconnecting cable is no longer critical.

AGC and Noise Control

The AGC and noise control circuit is shown in Fig. 1. There resistor R10 is the collector load resistor of the AGC-amplifier transistor, located inside the IC and connected at terminal four. Depending on the level of the receiver input signal, the voltage at terminal four will vary slightly, above and below +2.7v. As it becomes more positive, the IF gain is increased. This voltage is also applied to the bottom of coil L4, and then to terminal six of the IC along with the IF signal.

When the service switch is in the Normal position, one end of resistor R9 is grounded. In either the Raster or Service position the ground is removed and resistor R9 is connected through resistor R302 to the anode of diode CR301, which has a potential of about —100v. The portion of this voltage that is applied to terminals four and six of the IC cuts OFF the IF amplifier for servicing.

In the CTC49 chassis, the AGC voltage from terminal seven to IC1 is more positive than +6.7v under

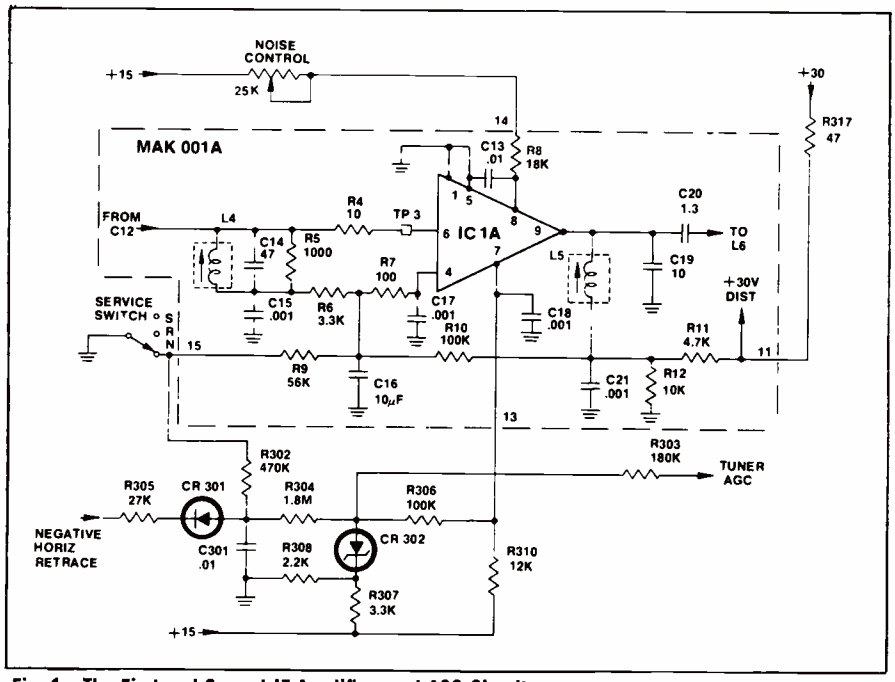


Fig. 1—The First and Second IF Amplifiers and AGC Circuits.

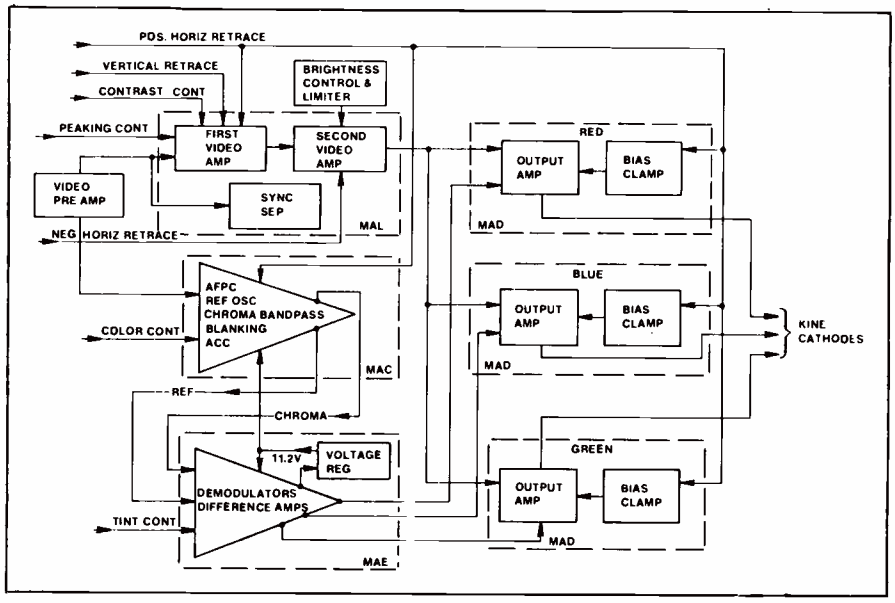


Fig. 2—Functional block diagram of the video system used in the RCA CTC49 color chassis.

no-signal conditions, but the diode action of the zener diode, CR302, clamps the tuner AGC voltage to +6.7v. As signal strength is increased to 1000μv, the terminal seven output voltage drops, falling below 6.7v. However, until this point is reached, the RF tuner is operating at maximum gain and receiver gain is controlled by the IF AGC.

Further increasing the signal beyond 1000μv (nominal) causes the tuner AGC voltage to swing downwards from +6.7v toward a negative maximum. When it reaches —5v, zener diode CR302 conducts in the zener mode, preventing a further negative swing. This is the minimum-gain operating point of the RF amplifier. Beyond the point where the tuner begins operating at minimum gain, the gain-controlled IF amplifier controls overall gain.

The AGC action has three distinct modes of operation, depending on signal strength:

- No signal to about 1000μv—RF gain is maximum to provide the best possible signal-to-noise ratio of the receiver. IF AGC maintains constant video output from the detector.

- About 1000μv to perhaps 100 mv—RF gain is decreased by the AGC voltage to maintain a constant output from the video detector. IF gain is substantially constant.
- Above about 100mv—RF gain is held at a minimum to prevent mixer overload, and IF gain is decreased by the AGC to maintain a constant video-detector output.

The function of the noise control is to allow the service technician to predetermine the amount of signal strength at which the AGC operation shifts from the first to the second mode and from the second mode to the third.

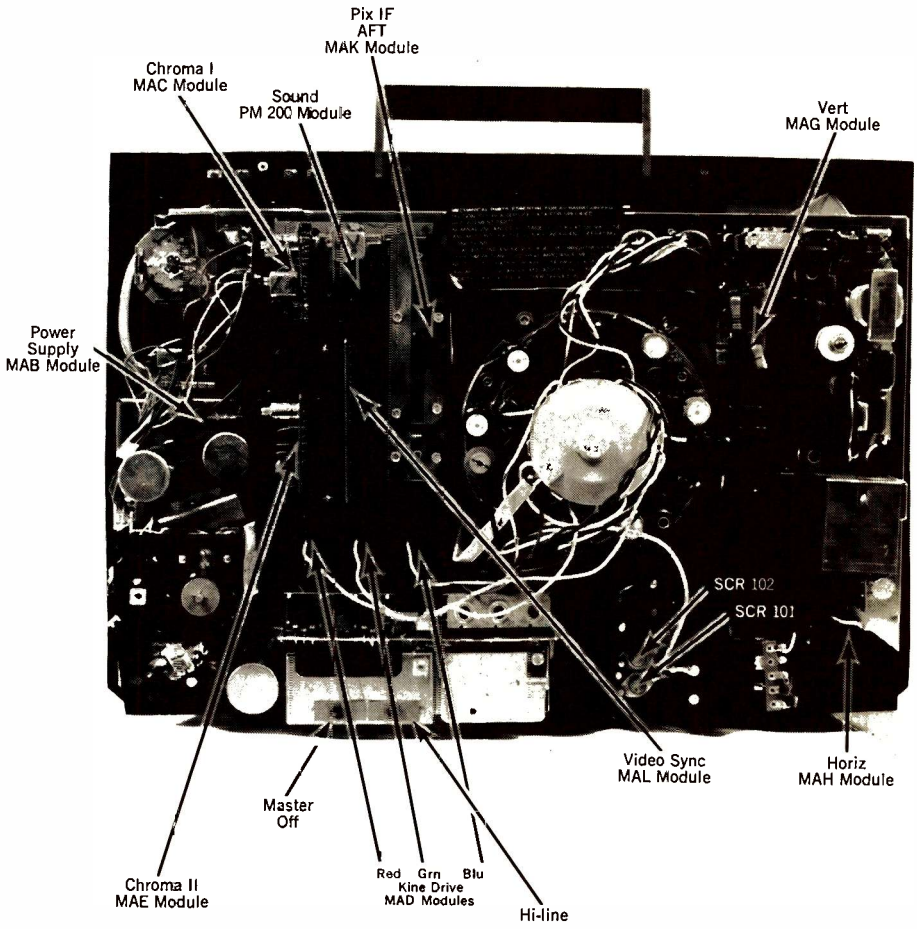
The Video System

From the video preamplifier situated in Module MAK, video is fed to the video/sync module MAL, as shown in the functional diagram in Fig. 2. This diagram shows the first and second video amplifiers as well as the sync separator. The positive sync pulses from the sync separator have a peak amplitude of 30v and are routed from the module without processing.

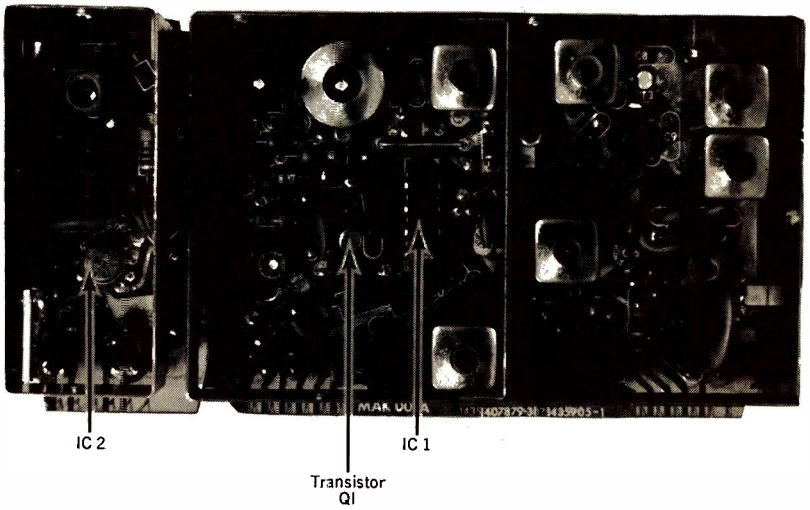
The functions of luminance delay, vertical and horizontal retrace blanking, control of contrast, and control of video peaking are performed in the first video amplifier. Depending on the setting of the contrast control, the stage gain varies from about 0.3 to unity or slightly more. Since the video output is taken from the collector, video polarity is inverted in the stage and the output is positive-going toward the black level. A shunt filter between the first and second video amplifiers attenuates the 3.58MHz video signal.

The second video amplifier is an emitter-follower stage which provides an impedance match between the first video amplifier and the three parallel-driven kine-drive modules, MAD. Bias for the base of the second video amplifier is controlled by the brightness control and the brightness limiter. A negative-going horizontal retrace pulse is fed to the emitter to enhance operation in the vicinity of the black level. Since this is an emitter-follower stage, the polarity of the output is the same as that of the input.

A peaking coil in the video preamplifier restricts the bandpass of the signal fed to the first chroma module, MAC, to frequencies nominally between 3.08MHz and 4.08 MHz. All active devices in this module are contained in a single IC, which serves as a chroma-bandpass amplifier, burst amplifier and reference oscillator. AFPC, ACC, color-level control and burst blanking are also accomplished in this module.



Rear view of the CTC49 color chassis exposing the 11 AccuCircuit modules. With extensive use of modules, the chassis is compact and yet easy to service.



All of the IF amplification and the generation of AGC voltage is accomplished in a single integrated circuit IC1 mounted in the IF Module, MAK.

The 3.58MHz reference signal and the chroma signal are conducted from the first chroma module to the second chroma module, MAE. From there the chroma demodulator and color-difference signals, R-Y, B-Y and G-Y, are conducted to the three kine-driver modules. An 11.2v regulator, which provides voltage for modules MAE and MAC, is lo-

cated in the MAE modu[illegible]as is the tint-control input circuit.

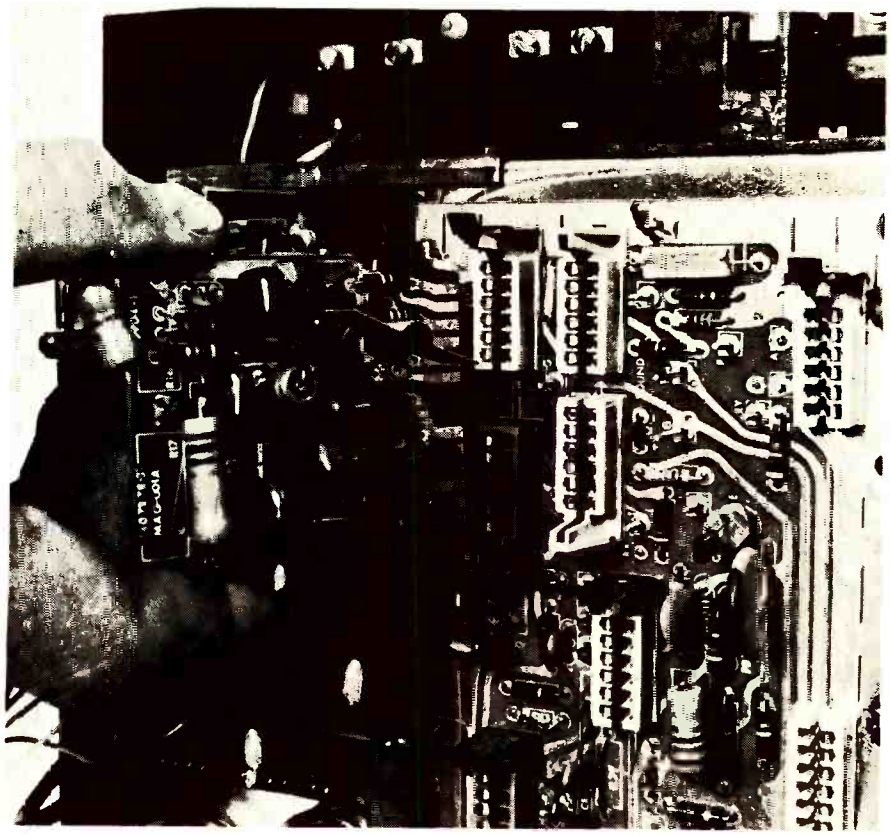
The video system de[illegible]bed is similar to the ones found [illegible] many earlier chassis—the matrixing [illegible] luminance and chrominance video outside the kinescope having not been done in an RCA color receiver since the CTC 2 chassis was discontinued. Although several advantages are realized, the most significant is that the load offered by the three kinescope cathodes may be divided equally among three moderately rated drivers instead of one relatively high-power device, and, of course, the three kine-control-grid drivers are eliminated.

Kine Driver Module, Mad

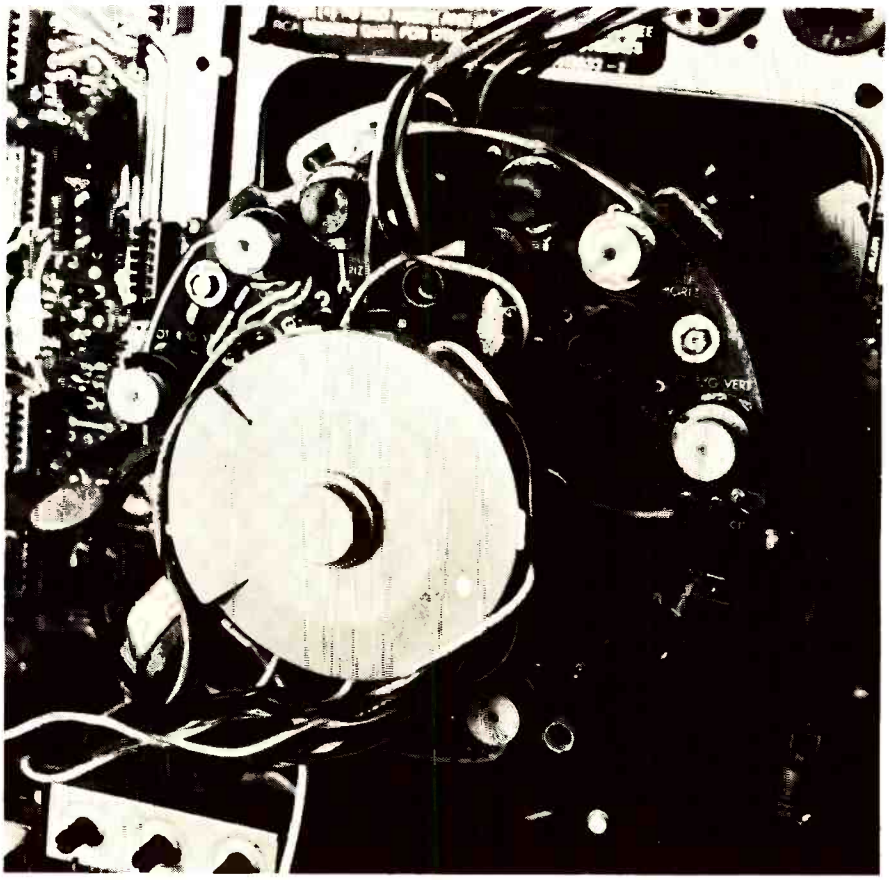
Three identical kine-drive modules, MAD, are used—one for each color of video. In each module the luminance video is combined with one color of the chrominance video (color difference signal); the two bits of information are then amplified and finally fed to the appropriate kine cathode as shown in Fig. 3.

We will first consider the signal paths: Luminance video passes from the service switch to the emitter of transistor Q1 through three parallel paths. These are resistor R7, called the primary path of convenience; resistor R6 and capacitor C2, which provide high-end video peaking; and resistors R335 and R336, which allow control of amplifier gain for gray-scale setup. The color-difference video, R-Y for example, [illegible]ives the base of transistor Q1, and then R-Y is added to Y to produce R, or red. The color-video output is conducted directly from the module to the kine socket without passing through the edge connector; the spark gap and the 3.3K resistor are in the kine socket.

The dc stability of the kine cathodes is provided by the positive horizontal retrace pulse injected at capacitor C309 and conducted to the bias transistor, Q2. Considering only the circuitry within the module, observe that a feedback loop exists from the collector of tra[illegible]sistor Q1, through resistor R2, dio[illegible]CR1, resistor R9, transistor Q2, [illegible]esistor R5 back to the emitter [illegible]nsistor Q1. Assuming that there [illegible]nput signals, it functions as fo[illegible]A rise



By lifting two spring locks the modules can be easily removed from their edge connectors.



The convergence board is placed around the neck of the CRT with spark gaps and resistors placed in the CRT socket.

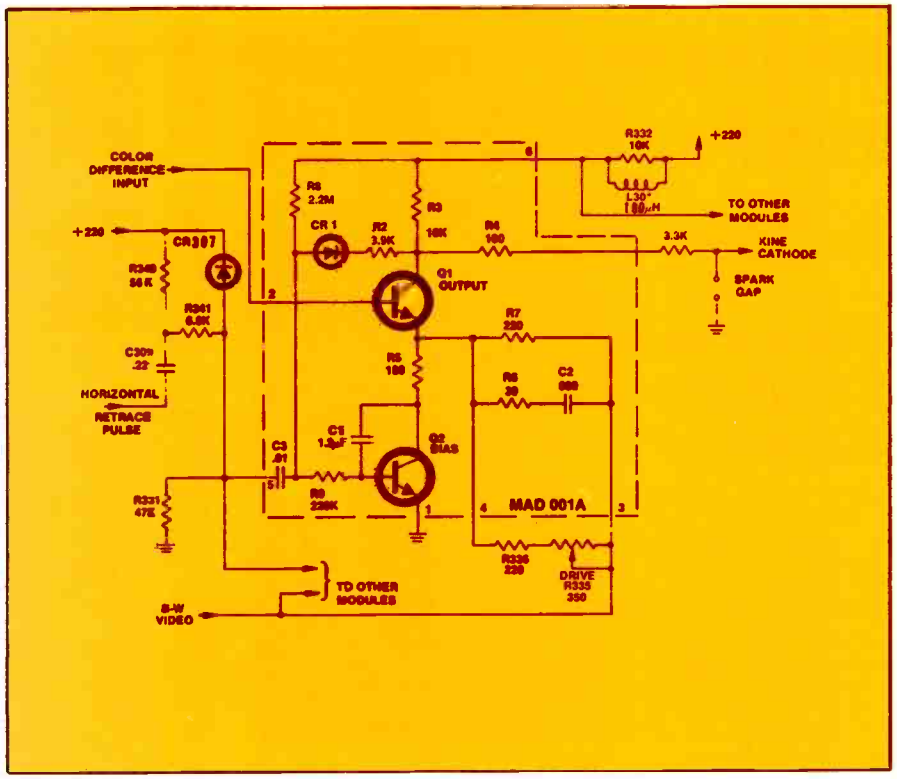


Fig. 3—Schematic of a Module MAD kine driver. The load from the three CRT cathodes is divided equally among three moderately rated drivers instead of one high power device.

Approximately 75 percent of the Argosy's circuitry is contained in these 11 plug-in modules.

in the voltage at the collector of transistor Q1 increases the emitter-to-base current in transistor Q2; this increases the collector current of transistor Q2, which passes through transistor Q1. The increase in transistor Q1 collector current increases the voltage drop across resistor R3 and drives the collector voltage of transistor Q1 back to its former value. Conversely, a drop in collector voltage at transistor Q1 decreases the base forward bias of transistor Q2, reducing the drop across resistor R3 and returning the collector of transistor Q1 to its former potential. Since the loop gain is fairly high (greater than 20) the collector voltage of transistor Q1 is held within very close limits.

This explanation is oversimplified, because it ignores two important facts: Signals are present, so the collector voltage of transistor Q1 must vary; and no reference voltage has been provided to establish the voltage at which the collector of transistor Q1 is stabilized. There is, however, a period when no signals are present —the horizontal-retrace blanking period. If the bias current through transistor Q1 is set to produce kine cutoff during blanking time and sufficient integration is provided, this amount of bias can be maintained until the next blanking interval. This integration is provided by capacitor C1.

The characteristics of the CRT dictate that its cathodes, and the collector of all transistor Q1's, be driven to +160v for blanking. A reference voltage, keyed ON only during blanking, is conveniently derived from the horizontal retrace pulse. This pulse enters the circuit through capacitor C309 and is limited to a peak value of 220v by diode CR307. This limited pulse is fed through capacitor C3 to the stabilizing loop. In any pulse circuit the dc level is equal to the pulse voltage times the duty cycle. (Duty cycle is defined as the product of the pulse width in seconds and the number of pulses per second; e.g., a horizontal-retrace pulse having a width of 5μs has a duty cycle of 0.0787.) The circuit constants in these modules were selected so that the average dc voltage at the junction of diode

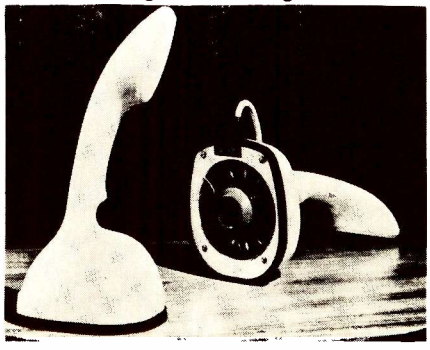
continued on page 49

Practical Aspects of the Carterfone Decision

by Leo G. Sands

New opportunities have been opened up for the sound and mobile radio industries by the momentous FCC decision in favor of Thomas F. Carter.

Ordinarily the telephone subscriber pays extra rent for a telephone like this, plus a monthly charge for using the built-in light bulb.



Exotic telephones such as the Ericofon can be bought for resale to customers.

■ Now telephone subscribers can furnish their own telephones and switchboards instead of renting them from the telephone company. Many people are not aware that the basic monthly telephone service charge includes rental of the telephone. Business users, of course, are very well aware that they pay for the rental of PBX and PABX switchboards.

Both domestic and foreign manufacturers of telephones and switchboards see a tremendous market for their products among telephone users. But, most of them have not yet crystallized their marketing plans. They have customarily sold only to telephone companies and the relatively few industries that buy private in-house telephone systems not interconnected with telephone company lines.

Some manufacturers are moving cautiously because they do not want to offend their telephone company customers. A spokesman for Graybar, the giant telephone equipment supplier, said his company would not even consider selling telephone equipment directly to users, except such private telephone system operators as the railroads and pipe lines.

Foreign manufacturers enjoying essentially no U.S. telephone company business are most anxious to sell to users. Most are still trying to decide whether to employ salesmen, appoint reps or sell through distributors and dealers.

Sound system and mobile radio dealers and distributors are now in a position where they could readily sell and install telephones and switchboards to local businesses and industries, as well as phone patches, teletypewriters, facsimile machines, slow-scan TV equipment, telephone answering machines and data terminals. Most of these companies have electronic technicians capable of designing (or quickly learning how) telephone systems. Equipment manufacturers undoubtedly will be happy to train their dealers and distributors.

Under the terms of the Carterfone Decision, "foreign" equipment may be connected to telephone company circuits. "Foreign" in this case does not refer to country of origin but to equipment not furnished by the telephone company. Mobile radio system base stations may be connected to the national telephone network through a phone patch or radiotelephone interface terminal. So can public address and intercom systems.

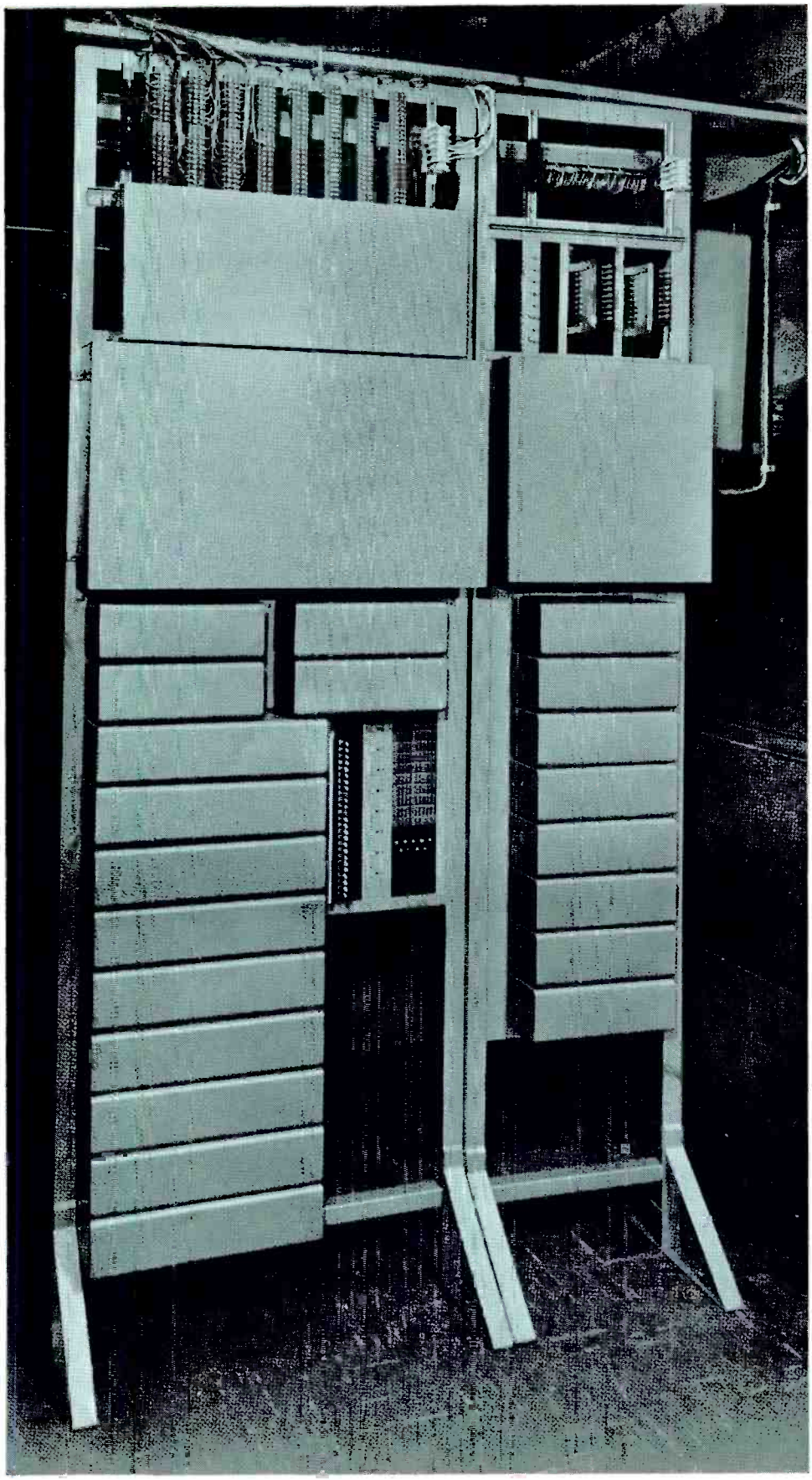
Telephone company technical standards, however, must be met so that the quality of telephone service will not be impaired, and so that cross talk will not be caused. The "foreign" equipment must be compatible with telephone circuits and central offices.

Numerous dealers are selling telephone sets that can be plugged into telephone jacks. They can also be wired directly to a telephone line terminal block. However, some telephone companies insist that customer-furnished equipment must be modified by them to make them compatible with the telephone system. A one-time charge is made for such a modification, but no monthly charge is made for use of the telephone.

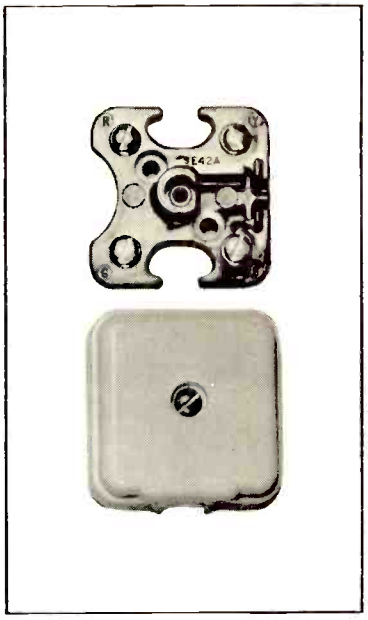
Installation of a "protective block" is required by some telephone companies, for which a monthly rental is charged. Some fear that the decision might be reversed. But, it is doubted that this will happen. Power companies have not been able to force power users to rent their appliances from them, nor have water companies been able to force the public to rent garden hoses from them. Now, telephone subscribers can either rent their equipment from the local telephone company or buy their own.

A survey reveals that most large-scale telephone users are not yet aware of this fact. Some, however, are moving fast to buy their own telephone systems.

Installation involves running multi-connector cable and installing telephones, switchboard and ancillary equipment. Telephone technology, except for switching, is no more complex than sound system engineering. Instead of multi-conductor



An example of an automatic switchboard which can be expanded with the installation of plug-in modules.



Telephone connecting blocks can be used for both telephones and sound system speakers.

cable, some consulting engineers are advocating the use of coaxial cable and frequency-division multiplexing techniques to permit interconnection of telephones and transmission of CCTV and data through a single cable.

Sound and radio communication equipment dealers and distributors can start in this field on a modest basis, expanding as they learn more about the business. A good way to start is to sell, install and service telephone answering machines to local business firms, and phone patches to operators of private mobile radio systems. Also equipment can be sold which will enable access to a public address or paging system from any telephone.

With so many businesses and industries, as well as local government agencies, needing data terminals for feeding data into and out of computers, this is an area worth considering. Also many businesses have need for facsimile and teletypewriter facilities, in-plant and between stores and plants. ■

Revival in Term Selling Urged for TV-Stereo at Retail

Special research project has revealed that the "Truth-in-Lending" laws have caused many dealers and salesmen to back away from the use of "buy now, pay later" selling.

■ Patrick Cocchiaraley, a regional manager for Teledyne Packard Bell, has developed a new sales technique using time-tested step-up selling combined with term offerings. He claims that this is the key to turning people's desires and wants into immediate purchases.

Cocchiaraley funneled his discoveries and home electronic industry experience into a pre-packaged plan, "Step-Up 'N Sell with Teledyne Packard Bell," a program that literally offers everything a dealer needs to logically talk value and terms to prospects.

Noting that the American economy has thrived for years on people purchasing most of their needs on credit, he stresses that times have not significantly changed: the name of the game is selling benefits and terms.

"Terms are as important now as ever. However," Cocchiaraley said, "new Truth-in-Lending laws have changed the method of disclosure, confusing many salesmen to the point they are afraid to use any kind of credit terms."

Merchants who aggressively sell "terms" can get the lion's share of the high-ticket consumer product sales, he emphasizes, especially when terms are combined with an effective set-up feature sales presentation.

"Look at the automobile industry. More new automobiles were sold last year than color TV and stereo consoles combined. They are still selling automobiles in all price ranges loaded with the extras people want, because the sale is made on the appeal of paying just a little bit more a month to have the best.

Bob Edwards, general manager of Teledyne Packard Bell Distributing Co. of Los Angeles, shows showroom hostess Dorothy Mulhaupt stereo features with the firm's new "Step-Up 'N Sell with Teledyne Packard Bell" set-toppers providing additional feature and term pricing information.

"Since the average American consumer wants the best, dealers do not sell many stripped down models. They sell the deluxe models by selling the extra features," Cocchiaraley added.

He paints a graphic description of the prospect who walks into a new car showroom and is placed in the driver's seat for a demonstration. It is there that the prospect begins to subconsciously sell himself on the deluxe features. Until this time, there is no mention of price. He is merely told how he would enjoy the features, he uses them and develops a pride of ownership.

Only then does the prospect ask the price and get the answer: "Only $75 per month." If the prospect asks for extras, the price is quoted in monthly terms, usually a figure he can afford.

Console TV and stereo models can be sold in the same way, Cocchiaraley preaches to his distributors. "Customers can be sold up from the low-priced models to higher-priced models with all the features they want, when dealers show them that it only costs a few dollars more a week."

Individual step-up kits for color TV and console stereo utilize color coordinated information cards, a sort of "tel-tag" and gaily printed set-topper cards. These aid both salesman and customer in pinpointing salient features for any designated set in the store.

Useful for both new and discontinued lines, these feature-benefit, self-prompter cards grab the customer's interest, making the line presentation more believable, with selling points remembered longer.

Packard Bell supplies the unique step-up kits with sample scripts, do-it-yourself easy payment numbers to apply on the set-toppers and information on complying with the basic "Truth-in-Lending" laws. Even handy weekly-payment guides are provided as part of a complete program booklet.

Cocchiaraley feels that his fresh, new "Step-Up 'N Sell" plan gives retailers a modern, logical system to sell more prospects and to overcome buying resistance. That is important these days when value is the keystone to a sale. ■

Commercial Two-Way Radio

by Phillip Dahlen

There is a frequency available for virtually every business activity

■ Considerable attention has been given to the Citizens Band, which permits two-way radio communication by virtually every United States citizen. With the attention given its rapid growth and many useful applications, some of us tend to forget that the FCC has allotted radio frequencies for virtually every ethical business endeavor—if it is not for pleasure, there is an assigned frequency. Whether the prospective two-way radio operator is a prospector, minister or farmer, there are radio frequencies available for his use.

Two-way business radio is not limited to 23 channels (plus a few specific frequency assignments) within a relatively small range of frequencies. There is a much greater range of frequencies available and there are fewer people for each of these frequencies. Therefore, whether he be the butcher, the baker or the candlestick maker, you can sell your customer on the availability of two-way channels that will fill his needs. To give some indication of what this consists of, we have condensed segments of Volume V of the FCC Rules and Regulations. (The complete volume can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)

The first portion of Volume V deals with Aviation Services. These include Airborn Stations, Aeronautical Advisory Stations, Aeronautical Multicommunication Stations, Aeronautical Enroute Stations, Aeronautical Metropolitan Stations, Flight Test Stations, Aviation Instructional Stations, Airdrome Control Stations, Aeronautical Utility Mobile Stations, Aeronautical Search and Rescue Stations, Aeronautical Fixed Stations, Operational Stations (link or control circuits or other aeronautical operations), Radionavigation Land Stations, Civil Air Patrol Stations, Radionavigation Land Test Stations and National Defense Stations. Due to the nature of these stations we elected not to include the range of frequencies available since this information is already known by those dealing with aeronautical radio communications.

Other radio services that can be marketed include the following:

Local Government Radio Service

This service is authorized for territories, possessions, states or other governmental subdivisions including counties, cities, towns and similar governmental entities, including districts and authorities but not including school districts or park authorities. Transmission is permitted on 165 assigned frequencies between 37.1MHz and 458.975MHz, plus a band of frequencies between 72.0 MHz and 76.0MHz and between 154.4525MHz and 154.460MHz.

Police Radio Service

This service is authorized for states, territories, possessions and other governmental subdivisions including counties, cities, towns and similar governmental entities. Transmission is permitted on 337 frequencies between 1610kHz and 465.500 MHz, plus a band of frequencies between 72.02MHz and 76.00MHz.

Fire Radio Service

This service is authorized to the same government bodies as the Police Radio Service, plus persons or organizations charged with specific fire protection activities. Applications from persons or organizations, other than governmental subdivisions, must be accompanied by a statement from the governmental subdivision having legal jurisdiction over the area to be served. For this service, transmission is permitted on 32 frequencies between 1630kHz and 465.625MHz, plus a band of frequencies between 72.02MHz and 76.00MHz.

Highway Maintenance Radio Service

This service is authorized to the same governmental bodies as the Police Radio Service, and transmission is authorized on 106 frequencies between 33.02MHz and 458.-950MHz, plus a band of frequencies between 72.00MHz and 76.00 MHz.

Forestry-Conservation Radio Service

Authorization for use of the radio frequencies assigned to this service may be granted to those meeting requirements similar to the ones made for the Fire Radio Service. Transmission for this service is permitted on 131 frequencies between 2212 kHz and 458.950MHz, plus a band of frequencies between 72.00MHz and 76.00MHz.

Special Emergency Radio Service

Hospitals—Institutions or establishments offering service, facilities and beds for beyond 24 hr when rendering medical service.

Ambulance Operators and Rescue Organizations—Persons or organizations operating an emergency ambulance service or rescue squad are eligible.

Physicians and Veterinarians—Physicians and veterinarians are eligible in this service. As used for this category, the term "physician" or "veterinarian" shall be construed to mean individual physicians or veterinarians or schools of medicine, including schools of veterinary medicine.

Disaster Relief Organizations—Organizations established for disaster relief purposes and which have an emergency communications plan in-

volving the use of radio are eligible.

School Buses—Persons or organizations operating school buses having regular routes into rural areas are eligible in this service.

Beach Patrols—Persons or organizations operating beach patrols having responsibility for life-saving activities.

Establishments in Isolated Areas—Persons or organizations maintaining establishments in isolated areas where public communication facilities are not available and where the use of radio is the only feasible means of establishing communications with a center of population, or other point from which emergency assistance might be obtained if needed.

There are 34 radio frequencies assigned for the Special Emergency Radio Service between 2726kHz and 155.400MHz, plus a band of frequencies between 2000kHz and 3000kHz and between 72.00MHz and 76.00MHz.

State Guard Radio Service

Authorization for use of radio frequencies assigned to this service is issued only to the official state guard or comparable organization of a state, territory, possession or the District of Columbia and only where such an organization has been duly created by law and completely subject to the control of the Governor, or the highest official of the creating governmental entity. This service has been assigned 2726kHz as the primary frequency and 2505kHz to 3500kHz as the second frequency when arrangements can be made with other governmental agencies.

Power Radio Service

Radio frequencies assigned to these services may be authorized for persons engaged primarily in the generation, transmission or distribution of electrical energy; the distribution of manufactured or natural gas by means of pipe line; the distribution of water or steam by means of a pipe line, canal or open ditch (for water)—for use by the general public or by members of a cooperative. There are 409 frequencies allotted for this service between 27.235 MHz and 952.4MHz, 36 paired frequencies between 952.8MHz and 959.9MHz, plus 9 frequency bands between 1.85GHz and 40GHz.

Petroleum Radio Service

This service is authorized for persons engaged in prospecting for, producing, collecting, refining or transporting by means of pipeline, petroleum or petroleum products (including natural gas). There are 8 frequencies assigned to this service between 1614kHz and 4637.5kHz, 426 frequencies between 25.02MHz and 952.4MHz and 36 paired frequencies between 952.8MHz and 959.9MHz, plus 16 frequency bands between 1.85GHz and 40GHz.

Forest Products Radio Service

Frequencies in this service are authorized for persons engaged in tree logging, tree farming or related woods operations, including related hauling activities and persons directly engaged in manufacturing lumber, plywood, hardboard, or pulp and paper products from wood fiber. There are 422 frequencies assigned to this service between 27.235MHz and 952.4MHz, plus 1676kHz, 1700kHz, 2398kHz, 36 paired frequencies between 952.8MHz and 959.9MHz, and a frequency band between 1.85GHz and 1.99GHz.

Motion Picture Radio Service

Radio frequencies in this service are authorized for persons engaged in the production or filming of motion pictures. There are 5 frequencies available between 1628kHz and 4637.5kHz, 87 frequencies between 27.234MHz and 952.4MHz, 36 paired frequencies between 952.8 MHz and 959.9MHz, and 16 frequency bands between 1.85GHz and 40GHz.

Relay Press Radio Service

This service is authorized for persons engaged in the publication of a newspaper or in the operation of an established press association. There are 85 frequencies assigned between 27.234MHz and 952.4MHz, 36 paired frequencies between 952.8 MHz and 959.9MHz, plus 16 frequency bands between 1.85GHz and 40GHz.

Special Industrial Radio Service

Radio frequencies assigned to this service are authorized for persons regularly engaged in the operation of farms or ranches or similar land installations for the quantity production of crops or plants, vines or trees (excluding forestry), or for the keeping, grazing or feeding of livestock for animal products, animal increase or value enhancement; a commercial business regularly engaged in the construction of roads, bridges, sewers, pipelines, airfields, water, oil, gas, or power production, collection or distribution systems; the operation of mines for the recovery of solid fuels, minerals or metals; plowing, soil conditioning, seeding, fertilizing or harvesting for agricultural or forestry activities; spraying or dusting of insecticides, herbicides or fungicides; livestock breeding service; maintaining, patroling and repairing gas or liquid transmission pipelines, tank cars, water or waste disposal wells, industrial storage tanks; acidizing, cementing, logging, perforating or shooting activities; supplying of chemicals, mud, tools, pipe and other materials to the petroleum production industry; delivery of ice or fuel to the consumer in solid, liquid or gaseous form; on delivering and pouring of ready-mixed concrete or hot asphalt mix. This service is assigned 387 frequencies between 27.235MHz and 465.625MHz, 36 paired frequencies between 952.8MHz and 959.9MHz, and 16 frequency bands between 1.85GHz and 40GHz.

Business Radio Service

This service is authorized for any person engaged in a commercial activity; educational or philanthropic institutions; clergymen or ecclesiastical institutions; hospitals, clinics and medical associations. It includes 499 frequencies between 27.235 MHz and 469.975MHz, 36 paired frequencies between 952.8MHz and 959.9MHz, and 9 frequency bands between 2.15GHz and 40GHz.

Industrial Radiolocation Service

This service is designated for persons who have a substantial need, in connection with their various activities, to determine direction, distance or position by means of radiolocation devices, for purposes other than navigation. It includes 6 frequency

bands between 70kHz and 3.400 MHz, plus 230MHz, 250MHz, 310 MHz, and 20 frequency bands between 2.45GHz and 36GHz.

Manufacturers' Radio Service

Frequencies assigned to this service are authorized for manufacturing activities directly involved in the mechanical or chemical transformation of organic or inorganic substances into new products within establishments usually described as plants, factories, shipyards or mills and which employ power-driven machines and material-handling equipment. It is also available for establishments engaged in assembling components of manufactured products in plants, factories, shipyards or mills; or they may be eligible even if the produce is neither a new structure nor other fixed improvement. Also eligible are establishments primarily engaged in the wholesale or retail trade, or in service activities, even though they fabricate or assemble any or all of the products or commodities handled. There are 281 frequencies available for this service between 27.234MHz and 467.525MHz, 36 paired frequencies between 952.8MHz and 959.9MHz, and 16 frequency bands between 1.85GHz and 40GHz.

Telephone Maintenance Radio Service

This service is authorized for communications common carriers primarily engaged in rendering a wire-line or wire-line and radiocommunications service to the public for hire. There are 224 frequencies available from 27.235MHz to 467.525MHz, 36 paired frequencies between 952.8MHz and 959.9MHz, and 16 frequency bands between 1.85GHz and 40GHz.

Motor Carrier Radio Service

This service is authorized for persons primarily engaged in providing a common or contract motor carrier passenger transportation service between urban areas or within a single urban area, property transportation service between urban areas, or for the local distribution or collection of property. Depending upon the location and application, this service is assigned 9 frequencies between 43.70MHz and 43.84MHz, 30 frequencies between 43.86MHz and 44.44MHz, 8 frequencies between 44.46MHz and 44.60MHz, 13 shared frequencies between 30.66 MHz and 31.14MHz, 10 paired frequencies between 44.36 and 43.94 MHz, 68 frequencies between 72.02 MHz and 75.98MHz, 48 base and mobile frequencies between 159.495 MHz and 160.200MHz, and 30 frequencies between 452.325MHz and 457.875MHz.

Railroad Radio Service

Authorization for this service can be granted to railroad common carriers, including railroad express companies, wholly owned by railroad common carriers regularly engaged in the transportation of passengers or property, when such passengers or property are transported over all or part of their route by railroad. For this service there are 68 shared frequencies between 72.02MHz and 75.98MHz, 91 base and mobile frequencies between 160.215MHz and 161.565MHz, 28 fixed relay frequencies between 169.425MHz and 412.775MHz, plus 20 base and mobile or mobile-only frequencies between 452.325 MHz and 457.950MHz.

Taxicab Radio Service

This service is authorized for persons regularly engaged in furnishing to the public for hire a nonscheduled passenger land transportation service not operated over a regular route or between established terminals. Such service, where permissible under local laws, may also include the occasional transport of small items of property. The service is also authorized for a nonprofit corporation or association engaged in these same activities. Besides limited use with special rules on 5 frequencies between 27.235MHz and 27.275MHz, there are 14 base and mobile frequencies which range between 152.27MHz and 157.71MHz, and 24 frequencies that are shared between 452.050MHz and 457.500 MHz.

Automobile Emergency Radio Service

Authorization for using this service ranges from associations of private automobile owners who provide a private emergency road service for disabled vehicles, to persons regularly engaged in the business of providing the general public with emergency road service for disabled vehicles, and nonprofit corporations or associations organized for the purpose of furnishing a radio-communications service solely to persons actually engaged in service activities. The radio frequencies for this include 5 frequencies between 27.235MHz and 27.275MHz, 3 frequencies between 150.815MHz and 150.875MHz, 3 frequencies between 150.905MHz and 150.965 MHz, 3 frequencies between 157.470MHz and 157.500MHz and 4 frequencies between 452.525MHz and 452.600MHz.

Other Radio Services

In addition to the extensive list of radio services authorized under Volume V of the FCC Rules and Regulations; Volume II lists Experimental Radio Services, Radio Frequency Devices, and Industrial, Scientific and Medical Equipment; Volume III lists Radio Broadcast Services, Experimental, Auxiliary and Special Broadcast and Other Program Distribution Services; Volume IV lists Stations on Land in the Maritime Services, Stations on Shipboard in the Maritime Services, plus Public Fixed Stations and Stations of the Maritime Services in Alaska; Volume VI lists Citizens Radio Service, Amateur Radio Service and Disaster Communications Service; Volume VII lists Domestic Public Radio Services (other than Maritime Mobile), International Fixed Public Radiocommunication Services and Satellite Communications; Volume VIII lists Uniform System of Accounts for Class A, Class B and Class C Telephone Companies; and Volume IX lists Uniform System of Accounts for Radiotelegraph Carriers, and Uniform System of Accounts for Wire-Telegraph and Ocean-Cable Carriers.

From this article we feel that it is apparent that a two-way radio system can be sold to meet the specific needs of virtually every legal professional endeavor. This is a huge field. Are you actively promoting it? ■

Tuned Circuit Signals--Part II

by Phillip Dahlen

Principles governing the generation of intermediate frequencies with tuned RF circuits

■ Last month's article indicated that technicians seldom observe the RF signals in the tuned circuits that they service. In order that these circuits might be better understood, the article used scope traces to show how tuned circuits function, how harmonic frequencies can be tuned in, and the selective tuning of AM broadcast stations. This month's article continues the general subject by showing how two radio frequency (RF) signals can be mixed to produce an intermediate frequency (IF) signal. For simplification it deals only with the mixing of RF sine waves from two independently tuned signal generators, but the same basic principles also apply to the mixing of an AM broadcast-band station's carrier signal with a tunable oscillator's RF signal to produce a modulated IF signal.

In order to mix the RF signals, a pair of signal generators were connected to coils, which coupled them to a tuned circuit (Fig. 1). The output of this tuned circuit was fed through low-capacitance probes to the vertical inputs of two scopes. One scope was trigger sweeped to produce conventional-type scope traces while the other scope obtained the horizontal portion of its trace from one of the signal generators. To simplify our data, one signal generator produced only 1.0MHz signals while the other was varied.

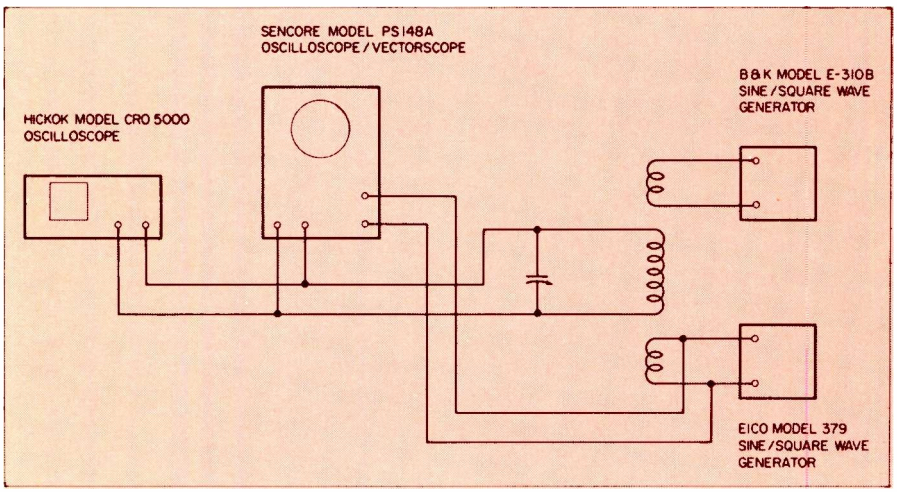


Fig. 1—Schematic of signal resonant circuit used for combining two RF signals.

Low IF Beats

When both signal generators are operating at 1.0MHz, the circuit can be tuned so that the combined RF signal is in phase with the signal from one of the signal generators and a circle appears on the Sencore scope (Fig. 2) while no beat frequencies are apparent on the Hickok scope (Fig. 3).

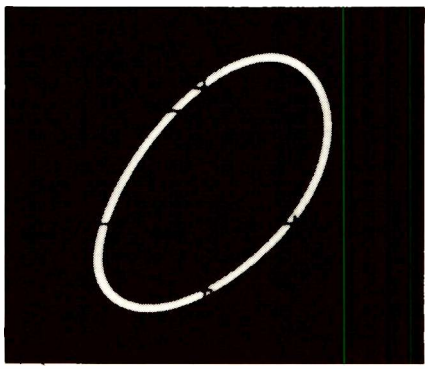


Fig. 2—A circular pattern appeared on the Sencore scope when the two signal generators were both tuned to 1.0MHz.

By leaving the B & K signal generator at 1.0MHz while moving the EICO signal generator to a slightly higher frequency, the first scope no longer showed a circular pattern (Fig. 4) while a beat frequency was apparent on the second scope (Fig. 5). The musical tone, corresponding to that beat frequency, could be heard on the EICO signal tracer. By matching this tone with that produced by a third signal generator, we were able to determine that this was a 1600Hz signal. The EICO signal generator was apparently tuned to a frequency 1600Hz higher than the 1.0MHz produced by the B & K signal generator—it was producing a 1,001,600Hz signal.

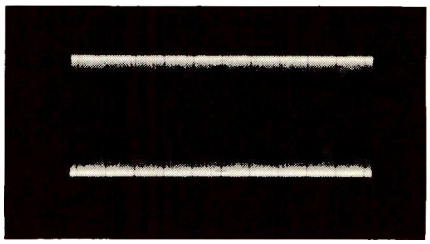


Fig. 3—No beat frequencies were apparent on the Hickok scope when the two signal generators were both tuned to 1.0MHz.

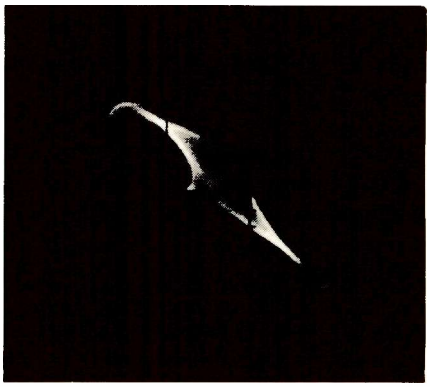


Fig. 4—No phase relationship appeared between the 1.0MHz applied RF signal and the resulting 1.6kHz beat signal.

Another adjustment of the second

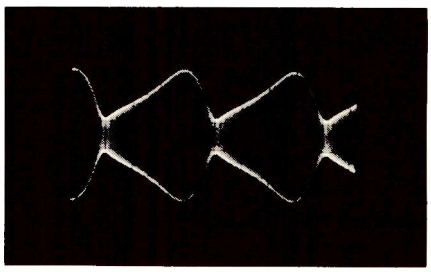
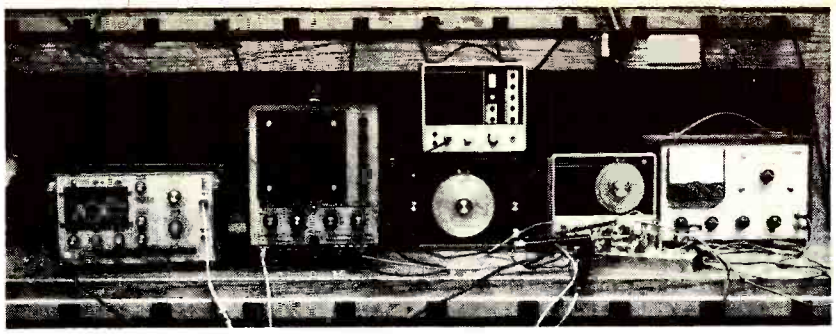


Fig. 5—This beat frequency resulted when a 1.0MHz signal was mixed with another signal having a 1.6kHz higher frequency.



Overall view of the electronic instruments used to produce the desired waveforms.

signal generator resulted in a new beat frequency (Fig. 6) which was ¼th the wave length of the previous

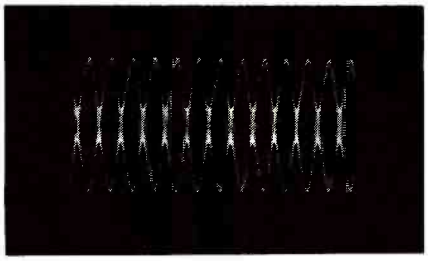


Fig. 6—The higher RF frequency was increased to reduce the resulting IF signal to ¼th its previous wave length or 8.0kHz.

beat frequency (Fig. 5). Since it was one quarter the previous wave length, it was four times that frequency or 8.0kHz. (We selected a fourth harmonic only as a matter of convenience—virtually every frequency between 1.6kHz and 8.0kHz also appearing on the scope as the second signal generator was tuned.) By increasing the scope's sweep rate we noted that the resulting wave pattern (Fig. 7) was more symmet-

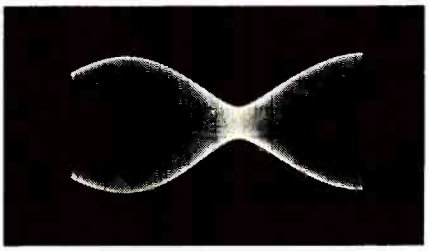


Fig. 7—The 8.0kHz IF signal was more clearly seen by increasing the scope's sweep rate.

rical than before. As before, no phase relationship between the applied RF signal and the output signal could be observed on the other scope (Fig. 8)—there was no relationship to observe.

Making a greater change in the

Fig. 8—There was still no apparent phase relationship between the 8.0kHz beat signal and the applied RF signal.

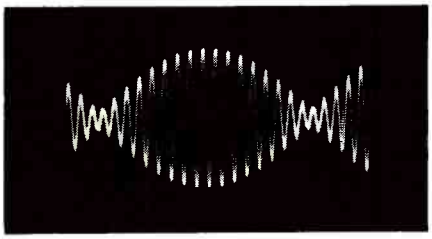


Fig. 9—This IF signal had a wave length 17 times as long as the 1.0MHz applied RF signal, indicating that its frequency was about 63kHz.

output frequency of the second signal generator resulted in a beat frequency (Fig. 9) that was 1/17th that of the RF frequency seen. (The larger waveform contained 17 smaller waves.) For the sake of simplifying the mathematics incorporated in this article, we will instead assume that the beat frequency was 1/16th that of the RF frequency seen. If the higher RF frequency is 1,062,500Hz and the lower RF frequency is 1,000,000Hz, then the beat frequency is 62,500Hz. By dividing 16 into 1,000,000Hz we obtain 62,500Hz —the beat frequency.

High IF Beats

As the frequency of the second signal generator was increased to a point where the beat frequency be-

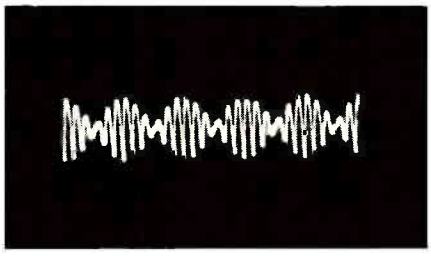
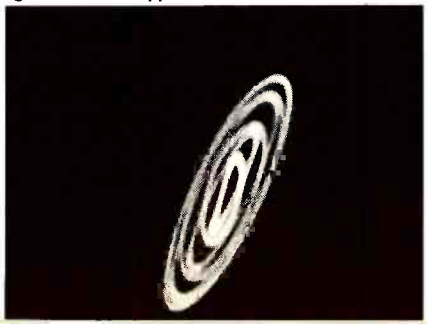


Fig. 10—As the difference between the two applied RF signals becomes greater, the frequency of the resulting beat signal begins to approach the applied RF signal frequency.

Fig. 11—As the beat signal frequency begins to approach the applied RF signal frequency, phase relationships between the two signals again become apparent.



gan to approach that of the applied signal (Fig. 10), signal phase relationships began to appear on the Sencore scope (Fig. 11). As clarified in the sketch (Fig. 12), the pat-

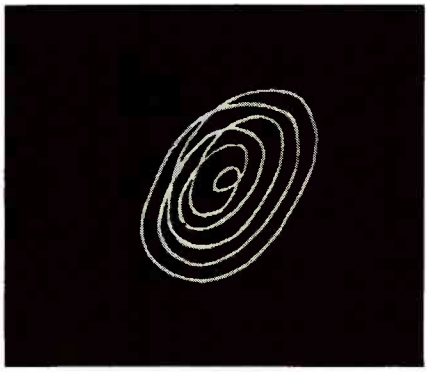


Fig. 12—When the beat frequency is exactly 1/6th the applied RF signal frequency, the phase relationship between the two signals appears as a six-turn spiral.

tern consists of a six-turn spiral—the beat frequency being 1/6th the RF frequency.

As the beat frequency began to approach the RF signal more closely, it became more difficult to observe and was sketched on the photograph for clarification. Fig. 13 shows a beat frequency that is 1/5th the applied RF signal frequency. It takes a little imagination to make

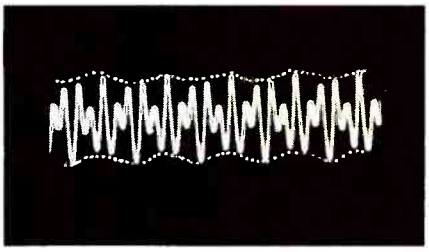


Fig. 13—The wave form that results when the beat frequency is 1/5th the applied RF signal frequency.

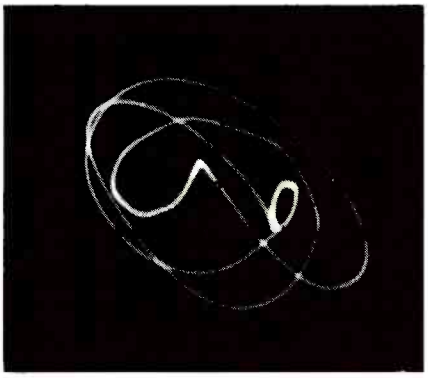


Fig. 14—With a little imagination, the phase relationship between the 1.0MHz applied RF signal and the 200kHz IF signal resembles a five-turn spiral.

out the corresponding five-turn spiral (Fig. 14).

In Fig. 15 we see a beat frequency that is ⅓rd the applied RF signal frequency. And with a little imagination we can see a three-turn spiral reproduced in Fig. 16.

By tuning the EICO signal generator to 1.5MHz, while the B & K signal generator is operating at 1.0 MHz, we see a beat frequency that is only half the applied RF frequency (Fig. 17) and a corresponding two-turn spiral (Fig. 18).

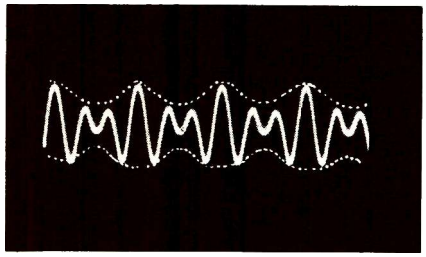


Fig. 15—This beat signal has a frequency ⅓rd that of the applied RF signal.

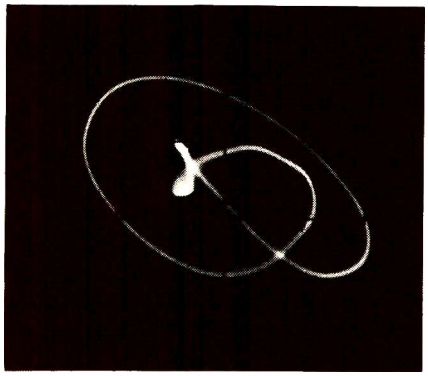


Fig. 16—A little imagination is also required to see the three-turn spiral representing the phase relationship between the applied RF signal and the resulting IF signal.

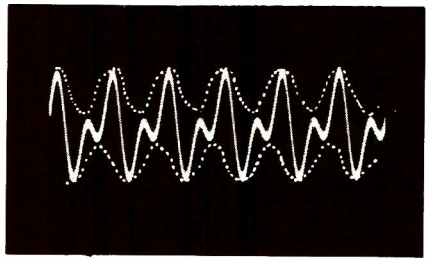


Fig. 17—When one signal generator was operating at 1.5MHz while the other was operating at 1.0MHz, there was a 500kHz resulting beat frequency.

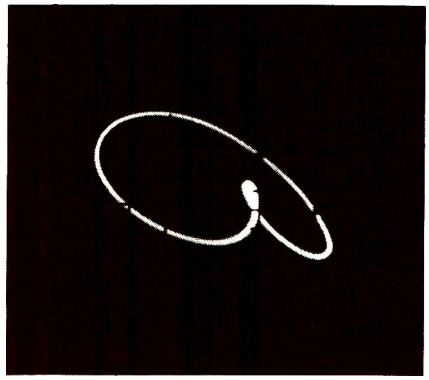


Fig. 18—With the beat frequency being half the applied RF signal frequency, a two-turn spiral was observed.

Secondary IF Beats

As we approached the higher intermediate frequencies the spiral patterns were apparent only when the beat frequencies were a simple fractional part of the lower radio frequency—i.e., 1/16, 1/15, 1/14, . . . , ½. Fig. 19 shows a waveform that appeared when the beat frequency was somewhere between ¼th and ⅓rd the applied radio frequency. At first glance only one beat frequency was apparent, but another lower IF signal can be readily seen as the scope's sweep rate is reduced (Fig. 20).

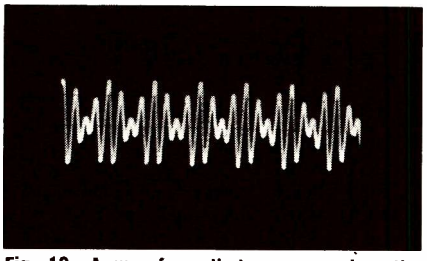


Fig. 19—A waveform that appears when the beat frequency is somewhere between ¼th and ⅓rd the applied radio frequency.

These secondary IF signals can be more clearly observed with the aid of a second resonant circuit (Fig. 21). Since the positive and negative segments of each beat frequency (note that for the IF signal shown in Fig. 9 there is a positive beat wave pattern that is virtually identical to the negative beat wave pattern) tend to cancel each other out, a diode was incorporated in the circuit to allow only the positive portions to pass through the second tuned circuit.

Beginning with the two scopes still attached to the first resonant circuit, as in Fig. 1, the EICO sig-

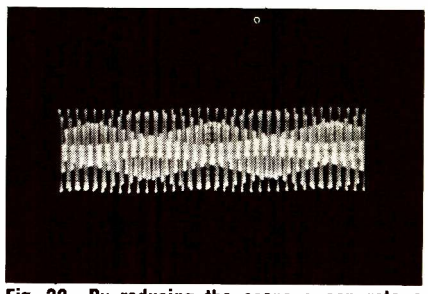


Fig. 20—By reducing the scope sweep rate a secondary IF signal could be observed in addition to the primary IF signal.

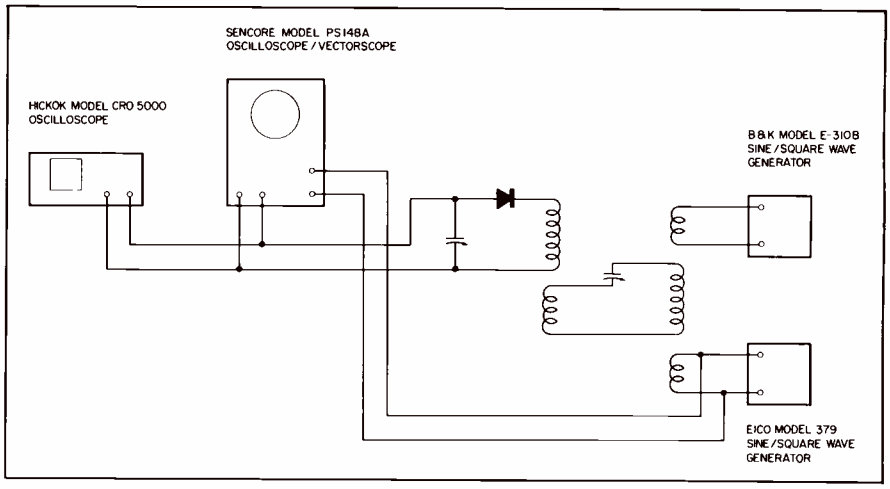


Fig. 21—A second tuned circuit was incorporated in the breadboarded circuit in order that the intermediate frequencies might be more readily observed.

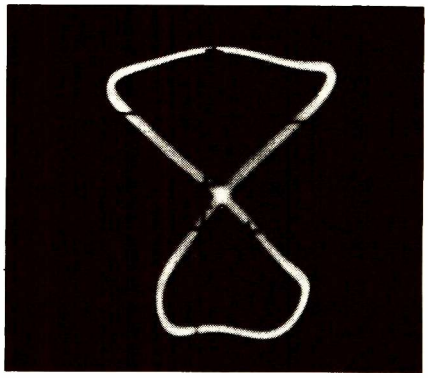


Fig. 22—A figure-eight pattern could be seen on the Sencore scope when the EICO signal generator was tuned to 2.0MHz while the B & K signal generator remained at 1.0MHz.

nal generator was tuned to 2.0MHz while the B & K signal generator remained at 1.0MHz. With one RF signal exactly double the frequency of the other, a figure-eight pattern was formed on the Sencore scope (Fig. 22). This pattern was lost (Fig. 23) as the EICO signal gen-

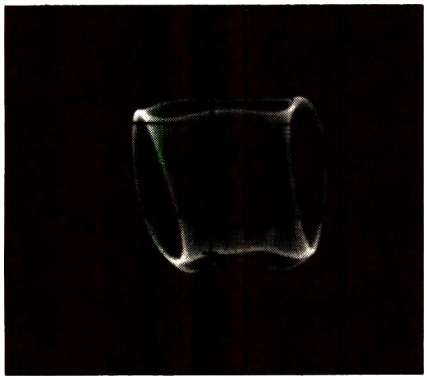


Fig. 23—This phase relationship disappeared when the signal generator was re-tuned to a frequency slightly higher than 2.0MHz.

erator was tuned to a slightly higher frequency and the two applied RF signals no longer remained at exactly a two-to-one ratio (Fig. 24). Al-

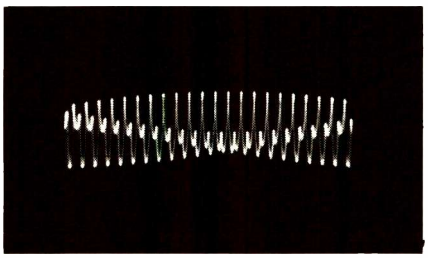


Fig. 24—By combining a 1.0MHz signal with one slightly greater than 2.0MHz, the resulting waveform contained a 1.0MHz beat signal plus some indication of a secondary beat signal.

though a primary IF beat signal could still be observed, a slight kink in the waveform indicated the presence of a secondary IF signal. This signal could be more clearly seen as the scope sweep-rate was reduced

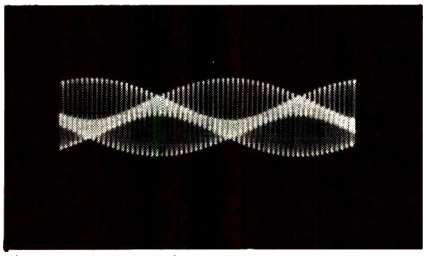


Fig. 25—With a slight reduction in the scope sweep rate it became possible to see that the secondary beat frequency had a wavelength that was 56 times as long as the applied RF signal—indicating that it was a 17.9kHz secondary IF signal.

(Fig. 25). From this photograph we could observe that the secondary IF signal was 1/56th the RF frequency or about 17.9kHz. A further reduction in the scope sweep rate resulted in even a clearer image of this secondary IF signal (Fig. 26).

Keeping the scope at the same sweep rate as was used to produce

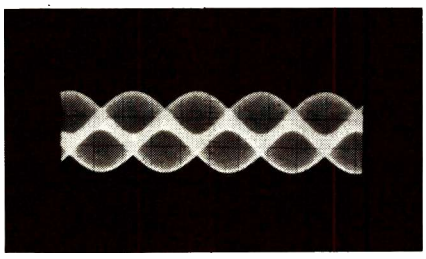


Fig. 26—A further reduction in the scope sweep rate made the secondary beat signal even more apparent.

the waveform shown in Fig. 26, but increasing its vertical gain, the scope leads were switched to the second resonant circuit, as shown in Fig. 21. This resulted in the waveform shown in Fig. 27—a clear image of

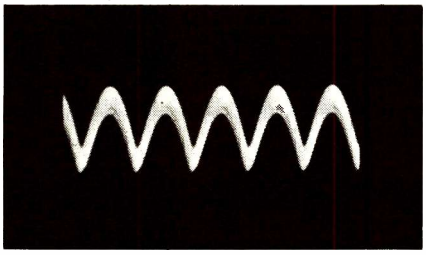


Fig. 27—By transferring the scope leads to the second tuned circuit and increasing the scope's vertical gain, the secondary beat signal became even more apparent.

the secondary IF signal that had been produced when combining two RF signals of extremely different frequencies. By resetting the scope to a higher sweep rate, a trace of the original RF signal could still be seen along with the primary IF signal (Fig. 28). From the Sencore scope (Fig. 29), we noted that there was

Fig. 28—By increasing the scope sweep rate, it was still possible to see a remanent of the applied RF signals and the primary IF signal riding on the secondary IF signal.

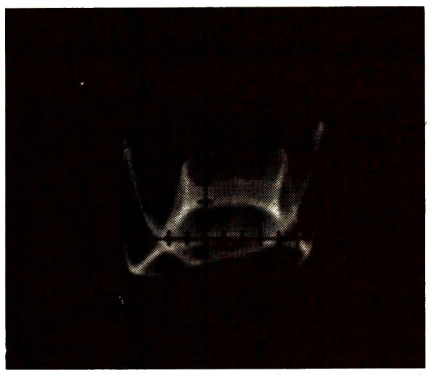


Fig. 29—No phase relationship was apparent between the applied RF signal and the resulting secondary IF signal.

no apparent phase relationship between the secondary IF signal and the RF signal.

Conclusion

After taking the photographs shown in the article, we connected a signal tracer in parallel with the Hickok scope in the circuit shown in Fig. 21. The EICO signal generator was then turned over a range of frequencies between 100kHz and 2.0MHz while the B & K signal generator remained at 1.0MHz. As the frequency of the EICO signal generator was increased, it passed frequencies corresponding to the various mathematical ratios previously mentioned. As each of these frequencies was approached, the resulting secondary IF signal fell within the audio spectrum and could be heard to decrease in pitch until the RF subharmonic was reached and then it increased in pitch as that frequency was passed. A much louder audio signal was heard, resulting from the primary IF signal, as the EICO signal generator approached 1.0MHz—the pitch dropping until 1.0MHz was reached and then increasing after it was passed.

From these observations we can conclude that if a radio station's RF carrier signal is to be mixed with an oscillator signal to produce an IF signal—as in a conventional heterodyne radio—the difference between the two RF signals must be great enough to produce a primary IF signal that is well above the audio spectrum (or frequency range of the information being transmitted), but not such that secondary IF signals are produced that fall into this lower frequency range. ■

GUEST AUTHOR

Citizens' Two-Way Radio -- Big Sound of the 70's

by Henry Kreer

Any individual concerned with CB radio marketing who does not believe that there will be a gigantic, explosive growth of CB radio in the next decade is either a natural born cynic . . . has a weak heart . . . or is a field engineer for the FCC.

■ By 1980 at least 50 percent of America's projected 128 million passenger cars will be equipped with CB two-way radio. I believe that one out of 10 homes in America—anticipated to be 74 million families—will contain CB radios as an integral part of its communication system. And thus, the industry will have sold over 71 million radios in the next decade—24 times as many radios as were sold in the 1960's.

In my business I am counting on and planning for these things to happen. I believe everyone in the industry should count on them and plan for them. Here is why:

Starting from absolute zero, during the past decade nearly 1.5 million CB licenses were granted and over 3.5 million radios were sold, including estimates of unlicensed equipment. Even during the last five years, following the first surge of activity, CB licensing has increased 143 percent.

There are estimated to be 990,000 CB radios in nonautomotive situations today—that's nearly 1½ percent of American households—and 1.5 million CB radios in vehicles—or one car out of 60. Furthermore, new installations (at 2.5 radios per license) currently are being projected at more than 40,000 per month.

Although what *has* happened has been exciting and profitable to everyone in the industry, what is *currently* happening is an exciting harbinger of big things to come. Important major influences are at work that will have a tremendous effect on future sales, particularly in the field of highway safety.

Public and police officials are increasingly aware of the fact that large numbers of personal vehicles are already equipped with CB and that millions of emergencies effecting highway safety and security are

Henry B. Kreer has been concerned with marketing, planning and advertising CB radio equipment for 10 years, almost since the first CB radio came into the marketplace. He is president of Stevens, Kirkland, Kreer, Inc., a Chicago based advertising agency which developed and continues to administer the CB radio educational program of the Electronic Industries Assn. Besides being chairman of the FCC's National Industry Advisory Subcommittee for CB radio, for seven years he has been the National director of REACT, a 50,000 member national volunteer organization of CB radio operators. And, most important of all, he has been an active personal user of CB radio for more than 10 years.

being served by organized CB groups. For example, REACT alone has over 40,000 members monitoring CB Channel 9 24 hours a day. An estimated 1000 independent groups and many more thousands of individual CB operators also offer motorist assistance. And over 500 police and fire departments are known to be now monitoring 27MHz for emergencies.

One project that has received national attention is the Detroit, Mich. CB Driver Aid Network, originally sponsored by General Motors Research Laboratories and now an ongoing regular program administered by the Bureau of Roads and Streets.

In this system a central monitor, linked to strategically placed transceivers by land-line, receives calls on CB Channel 9 and responds with the appropriate service required.

Incoming calls are automatically displayed on an illuminated map above the console, and the location is automatically pinpointed. Reports are tabulated and computerized. Since January 1969, over 1200 emergency calls per month have been logged, 74 percent of which involved either accidents, stalled vehicles, road construction or faulty traffic devices.

In March 1969, General Motors Research Laboratories turned the Detroit program over to the city and undertook an even more significant continuing research program when it assumed national sponsorship of the REACT organization. In addition to supporting and strengthening this national program, it authorized a massive research program in the state of Ohio.

Among other reasons, Ohio was selected since 23 of the state's 57 highway patrol posts were already monitoring CB Channel 9 in cooperation with REACT teams.

In the Ohio Test, a State Director was appointed to work directly with state agencies, including the Highway Patrol which is officially sponsoring and participating in the two-year test program. Under the joint control of the state agencies and state REACT director, REACT teams function within rigid guidelines on monitoring and communication for emergencies. The REACT emergency system is designed to cover more than 50 percent of Ohio's land area and 75 percent of its primary roads. As in the Detroit test, all emergency communications are logged on IBM cards and tabulated by computer for future study and publication.

All of these factors . . . the very healthy growth of CB radio in the 60's . . . the widespread and growing interest by responsible authorities in CB for emergencies . . . the increasing interest of major retailers with the tremendous merchandising power available to them . . . all are indicators to me that we truly are on the threshold of an explosion. To bring into focus the character of this explosion . . . the what it is and why it is going to occur . . . let me explore some of the basic marketing factors involved.

We know that at present, despite a lot of emphasis on the business and professional applications for CB, the fact remains that nearly 73 percent of all licensees are using their equipment *primarily* for personal and safety applications.

Looking at this segment of the market today, it is obvious—to anyone with ears—that a fair percentage of these personal users are concerned with hobby applications. I am convinced—and this is a view shared by many responsible people—that the adverse impact of hobby activity will rapidly decline in the 70's, through increased monitoring, through the sheer weight of growth by other types of users and through the rapid decline of sunspot activity anticipated from mid-1971 through the 70's.

There will be a substantial increase in the importance and effectiveness of organized citizens radio groups such as REACT monitors, due to much greater participation by public agencies (as in Ohio) and the designation of Channel 9 strictly for emergencies.

But the real market—marginal today, but the *name of the game* in the future—is the American public, using CB radio the way it was intended by the FCC—for necessary personal communication. It is this market that we are counting upon for numbers like 64 million auto installations . . . and 7 million home installations. ■

TEKLAB . . .

continued from page 37

CR1, resistor R8 and capacitor C3 is 160v less positive than the peak voltage at that point.

Under ideal conditions, the voltage at the collector of transistor Q1 would always return to +160v during retrace blanking. The 220v retrace pulse at the anode of diode CR307, coupled through capacitor C3, would be clamped at the transistor Q1 collector voltage by diode CR1, and a constant dc bias voltage at the base of transistor Q2 would be developed.

In practice the blanking-level voltage at the collector of transistor Q1 may tend either to increase or decrease. If it should tend to increase, the retrace pulse is clamped to a higher potential, the bias at the base of transistor Q2 increases conduction of this semiconductor and the collector voltage of transistor Q1 is driven back to 160v. Conversely, a tendency toward a drop in transistor Q1 collector voltage decreases the bias current of transistor Q2, boosting the transistor Q1 collector voltage back to 160v.

The process just described fulfills the requirements for voltage stabilization. Sampling of kine cathode voltage occurs during blanking time when no signal voltage is present, and the bias current established is maintained constant throughout the scanning interval by virtue of the integration in the base-collector circuit of transistor Q2.

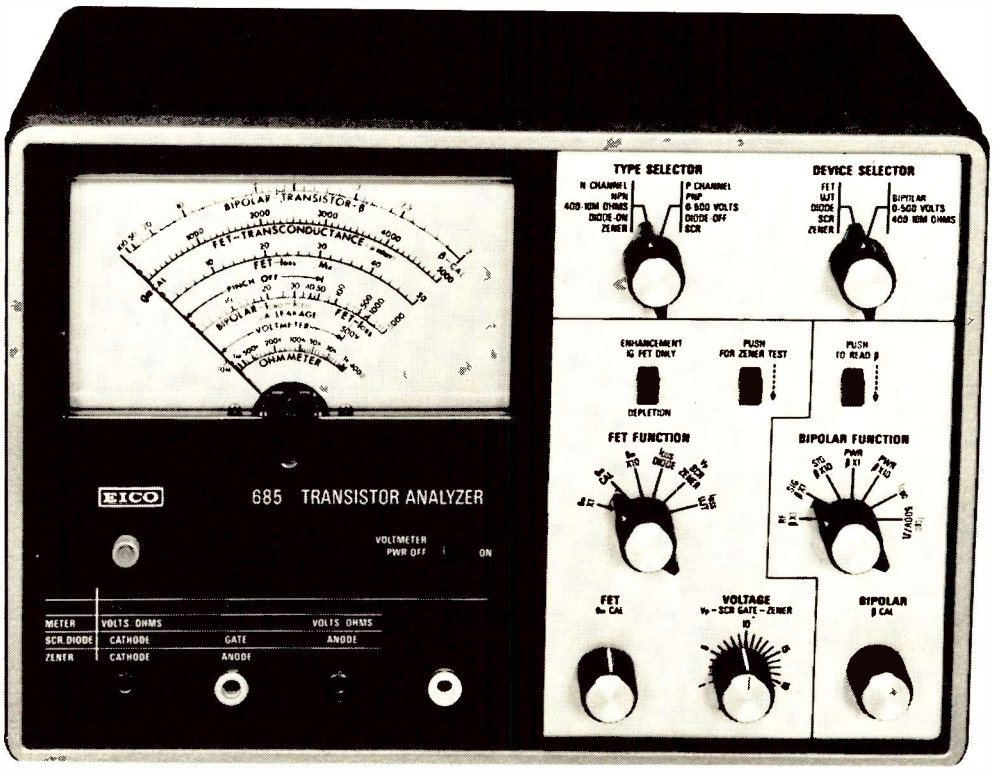
Next month we will cover other important circuits of this TV set, including the low voltage power supply, the active side-pincushion correction circuit and the transformerless vertical output circuit.

Some of the information used is based on the material supplied through the courtesy of RCA Sales Corp. ■

EICO 685 Transistor Analyzer

by Phillip Dahlen

Permits dynamic semiconductor testing both in and out of circuit.



EICO Model 685 Transistor Analyzer. . . . for more details circle 900 on Reader Service Card

■ A single instrument has been designed to perform four basic tests on all types of FETs including those with pinch-off characteristics, three basic tests of all types of bipolar transistors, plus measuring zener voltage and testing silicon controlled rectifiers, TRIACs and unijunction transistors.

The manufacturer indicates that multiple tests on bipolar transistors include an ac beta test with readings from 2 to 1000 on power and small signal transistors and from 2 to 100 on RF transistors. The ohmmeter-voltmeter meter scale has been compressed so that low resistance or voltage readings are made over a longer segment of the scale than are high readings. This is said to provide accuracy where it is most needed, plus the convenience of using but a single scale for all voltage and resistance readings.

Additional manufacturer specifications are as follows: Bipolar Transistor Test: AC Beta (in and out of circuit) 2 to 100 (readings to 1000) at I_c = 0.2ma for RF semiconductors, 2 to 100 and 2 to 1000 (readings to 1000 and 10,000 respectively) at I_c = 2ma for small signal semiconductors, 2 to 100 and 2 to 1000 (readings to 1000 and 10,000 respectively) at I_c = 20ma for power devices; I_{CBO} 0 to 5ma (30μa center scale); I_{CEO} 0 to 5ma (30μa center scale); I_{CES} 0 to 5ma (30μa center scale). FET Test: AC Transconductance (in and out of circuit) 0 to 5000μmho and 0 to 50,000μmho at V_{DS} = 5v and V_{GS} = 0; I_{DSS} 0 to 50ma, linear scale; I_{GSS} 0 to 5ma; V_P 0 to 20v at V_{DS} = 5v. Unijunction Transistor Test: Determine condition of semiconductor. Silicon Control Rectifier and Triode Test: Turn-on voltage (can measure turn-on current using external resistor and meter); determine condition of semiconductor. Signal Diode and Rectifier Test: Determine condition of semiconductor from forward and reverse current tests. Zener Diode: 0 to 20v. Voltmeter 0 to 500v (30v center scale), 1M resistance. Ohmmeter: 400Ω to 10M (140K center scale). Semiconductors incorporated in instrument: two 2N5172, one IN3600 (selected), one 1N34, five 100 PIV 500ma rectifiers, one 6.8v zener diode, one 9.1v zener diode and one 24v zener diode. Meter movement: 50μa, 2% Taut Band. Power Requirements: domestic 120vac, 50/60Hz, 10w. Size: 12½ in. H by 8½ in. W by 6 in. D. Weight: 10 lb. ■

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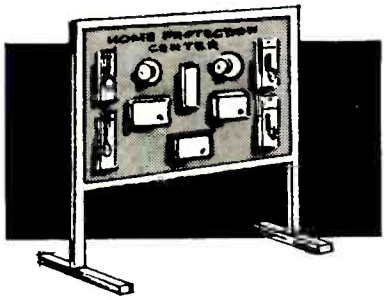

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MODEL
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MODEL C-7530

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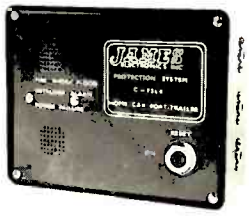

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USES ONLY .08 VOLTS TO POWER OHMMETER TO PREVENT TRANSISTORS FROM CONDUCTING AND UPSETTING READINGS

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- 9 DC current ranges from 100 microamps to 1 amp
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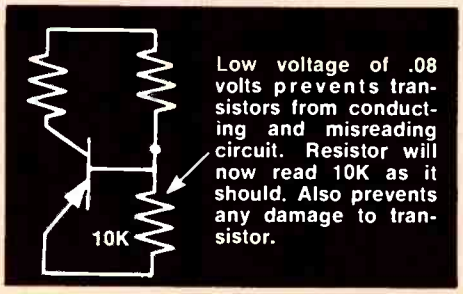
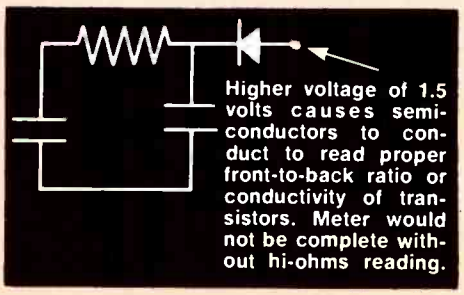
- Special probe with 100K isolation resistor in probe to prevent AC pickup or to prevent loading oscillator circuits. Leave in normal position for most tests.



Low voltage of .08 volts prevents transistors from conducting and misreading circuit. Resistor will now read 10K as it should. Also prevents any damage to transistor.

Here is why you should have both Hi and Lo battery voltages for correct in-circuit resistance measurements in solid state circuits:



Higher voltage of 1.5 volts causes semiconductors to conduct to read proper front-to-back ratio or conductivity of transistors. Meter would not be complete without hi-ohms reading.

SENCORE INC. 3200 Sencore Drive • Sioux Falls, South Dakota 57107

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TECHNICAL DIGEST

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RCA SALES CORP.

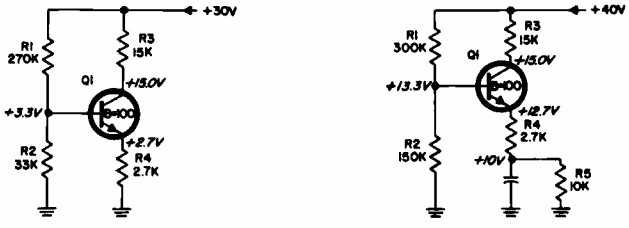
Darlington Transistors

Unlike vacuum tubes, which are voltage operated devices showing extremely high input resistance at the grid, transistors are current operated devices. Hence they require a definite base current. The ratio between collector current and base current is known as "beta," and it is expressed as follows:

$$\frac{\text{Collector Current } (I_C)}{\text{Base Current } (I_B)} = (\beta) \text{ beta}$$

Transistors of the type used in radio and TV receivers display betas ranging from somewhere around 30 to perhaps as high as 400. The base current of the highest beta transistor described will be about 1/400th of the collector current or more. The base voltage of a transistor is determined by the base-to-emitter junction barrier voltage. In the case of silicon transistors the junction voltage will be about 0.6v to 0.7v unless external circuitry is used to raise the base voltage above ground. Ohm's law reveals that the low base voltage equated with a typical value of base current yields a rather low input resistance, making it necessary in many cases for the circuit designer to provide some external means of matching the low input resistance of the transistor to the signal source. In the early days of transistor technology this was often done with interstage or coupling transformers. These transformers contributed to the size, weight and expense of transistor circuits of that day.

One way to raise the input resistance of the transistor circuit is to use an unbypassed emitter resistor, which is often done at the expense of stage gain. When an unbypassed emitter resistor is used, the base resistance of the transistor is approximately beta times the value of the emitter resistor. Unfortunately the increased input resistance afforded by the unbypassed emitter resistor is not realized because the actual input resistance of the stage is mainly determined by the parallel combination of the base bias resistors (for example, R1 and R2 in Fig. 1A) which must be substantially lower than the base resistance of the transistor in order to satisfy stability requirements. In other words, the input resistance is somewhat less than the 33K value of R2, rather than 270K calculated by multiplying R4 (2.7K) times β (100). Obviously a higher beta transistor would be of little advantage in raising the input resistance of this circuit.

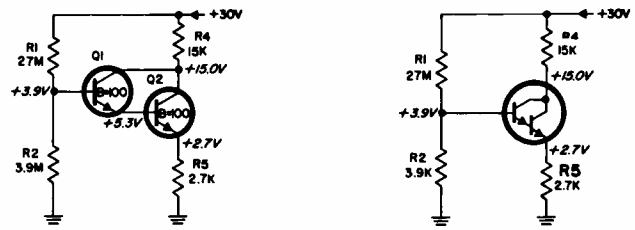


A.—Unbypassed Emitter **B.—Elevated Emitter**

Fig. 1—Common emitter stages.

Where higher supply voltages are available, the circuit shown in Fig. 1B may be used to furnish increased input resistance. This stage incorporates the same value of unbypassed emitter resistance; but an additional bypassed emitter resistor is used to elevate the dc voltage of the base higher above ground, increasing the value of resistors R1 and R2 so that their paralleling effect is reduced.

Another way of achieving higher input resistance is to drive the transistor stage with an emitter follower, as illustrated in Fig. 2. The circuitry of transistor Q2 is identical to that used in the simple circuit shown in Fig. 1A insofar as the collector and emitter resistances, and supply voltages are concerned. The stage furnishes the same collector output signal characteristics as that of the simple circuit. The emitter follower, containing transistor Q1, only provides signal and dc bias to the base of transistor Q2. Consequently it operates at a relatively low collector current and so requires a lower base bias current. This permits base bias resistors R1 and R2 to be correspondingly larger. Analyzing the circuit of transistors Q1 and Q2, it is evident that transistor Q2 requires the same base voltage and current drive as it did in the simple circuit; however, this is now provided by emitter follower transistor Q1. The dc operating point of transistor Q1 is determined by the emitter current necessary to develop the required base bias for transistor Q2 across resistor R3. The value of resistor R3 has been determined to establish an emitter current equal to approximately 10 times the base current required by transistor Q2—in this example resistor R3 is 33K. This value is chosen, as it was in the previous examples, to provide sufficient bias stability when the stage is subjected to extremes of operating conditions. The value of resistor R3 will prevent an excessive change in collector current when transistors of different betas, or when higher temperatures, are encountered. With these factors in mind, the designer develops the required circuitry for transistor Q1 to satisfy the voltage/current conditions of resistor R3. Once the base bias requirements for transistor Q2 are known, the operating point (collector current of transistor Q1) is chosen to establish the correct biasing voltage drop across resistor R3. This is done by setting the base voltage of transistor Q2 with voltage divider resistors R1 and R2. As illustrated in Fig. 2, the value of resistor R3 is substantially higher than the emitter resistor of the simple circuit, and the resistance values of R1 and R2 are also considerably higher. It is evident that the two stages combined act as one with the added advantage of a much higher input resistance.



A.—Transistor Darlington Connected **B.—The Darlington Transistor**

Fig. 3—Darlington common-emitter stages.

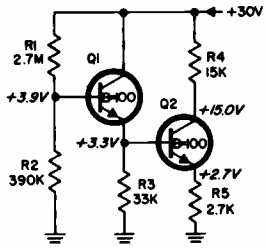


Fig. 2—Emitter-follower driving emitter stage.

With the advent of silicon transistors, which have lower

continued on page 67

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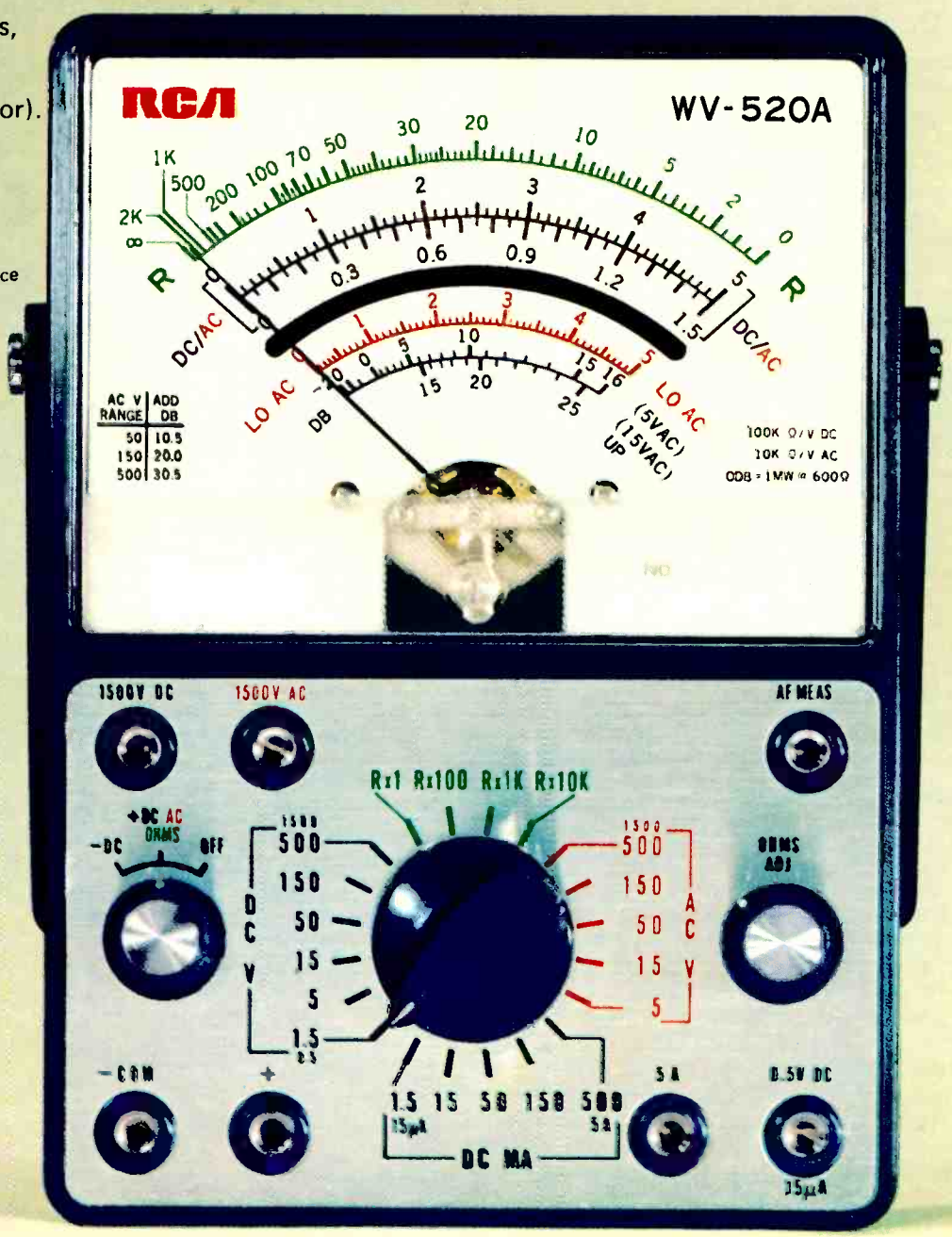

RCA

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COLORFAX

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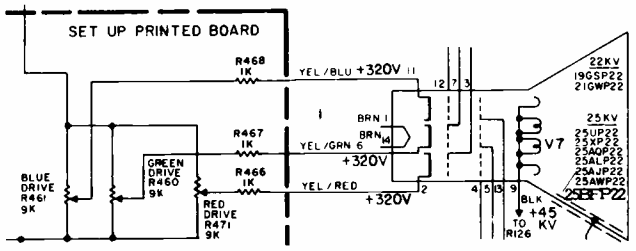
GENERAL ELECTRIC

Color TV Chassis KE—Red Drive Control on Set-up Board

Beginning with KE Chassis Serial Number OTIG, a 9K Red Drive Control, R471, was added to the set-up board. At the same time, Green Drive Control, R460, and Blue Drive Control, R461, were changed to 9K.

Potentiometer, R471, was added to provide a drive control for the red gun of the new picture tube, Type



25BFP22. Each control has a value of 9K so that the three controls in parallel provide a 3K load on the video output tube.

To make gray scale drive control adjustments in KE chassis models using picture tube types other than 25BFP22, rotate the Red Drive Control, R471, fully clockwise and leave it in this position. Now make the usual gray scale adjustments using the Green and Blue Drive Controls just as if the Red Drive Control were not present.

In chassis using picture tube type 25BFP22, rotate the Green Drive Control, R460, fully clockwise. Advance the Red Drive Control, R471, to produce a yellow background. If yellow cannot be attained with the Red Drive Control at its maximum clockwise position, then leave the Red Drive Control at maximum clockwise and retard the Green Drive Control (counterclockwise) to produce yellow. Adjust the Blue Drive Control, R461, to produce gray. At the end of the gray scale adjustment procedure, either the green drive control or red drive control must be at its maximum clockwise position.

MAGNAVOX

Chassis T-936—Elimination of Vertical Jitter

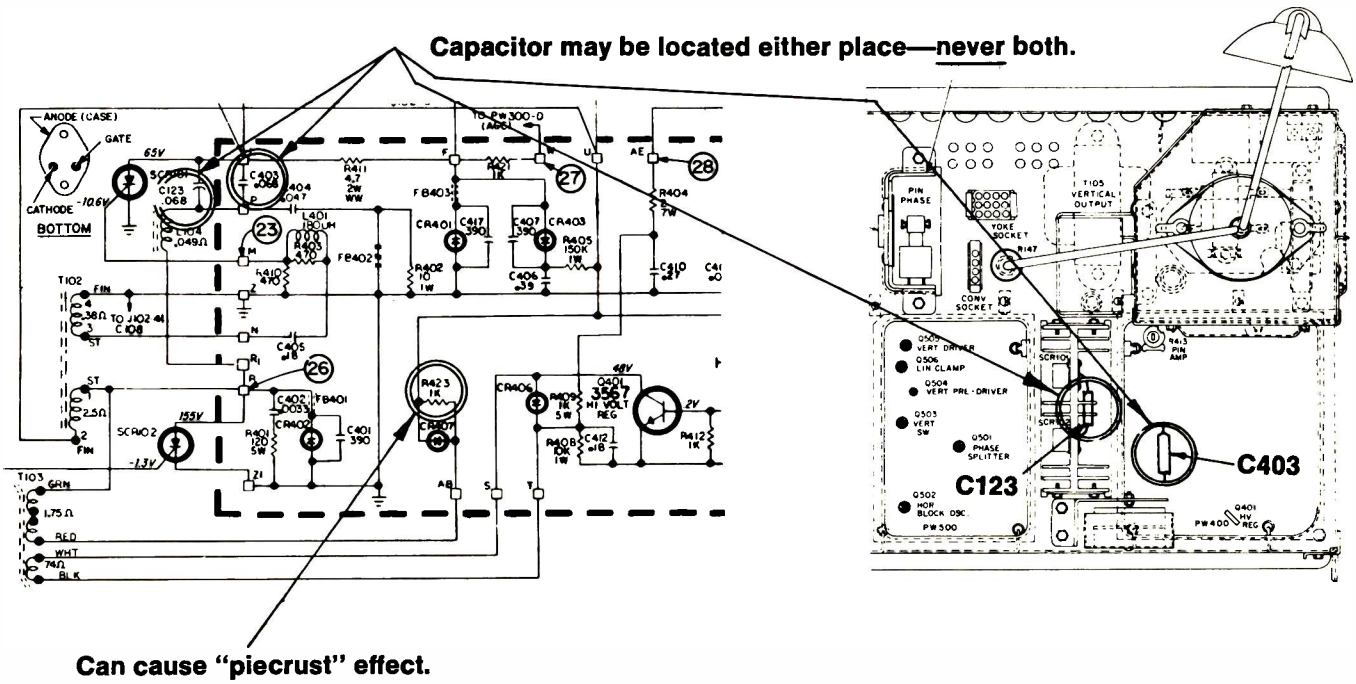
Vertical jitter in instruments utilizing this chassis can be corrected by removing capacitor C54 (4μf, 25v), located on the horizontal circuit board, and reinstalling it on the VHF tuner directly between the RF AGC terminal and ground. Install a 4μf, 24v capacitor on the VHF tuner directly between the +18vdc terminal and ground. Install a 1000μh choke, Magnavox Part No. 361324-102, in series with the +18vdc terminal of the VHF tuner.

RCA SALES CORP.

Color TV Chassis CTC40, 47—Servicing SCR Sweep System

The 0.068μf commutator capacitor used in the horizontal deflection circuit of this chassis is located either on the PW300 board or on a terminal board under the SCR heat sink. Two capacitors in parallel are never used. If the capacitor is on PW400, it is C403; off the board, it is C123. In either case, the capacitor is the same type and the replacement stock number is 165437.

A "piecrust" or "geartooth" effect in the raster (scalloped edges) at different brightness levels may be the result of resistor R423 opening. Under these conditions the high voltage and brightness limiter operation appear to be normal, while in some instances the symptom may be accompanied by a high-pitched squeal.



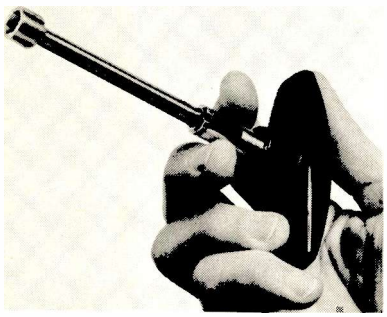
NEW PRODUCTS

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

RATCHET HANDLES 703

Will accommodate more than 60 blades

The Model 99-1R and Tee type, Model 99-4R, plastic handles are developed to incorporate a reversible ratchet mechanism. Both handles will

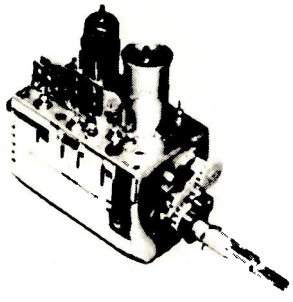


reportedly accommodate more than 60 individually available "99" nutdriver, screwdriver and special-purpose snap-in blades. A patented spring chuck holds the blades firmly. The ratchet mechanism is said to be fully enclosed to keep out dirt and grit. Specifications indicate that the recessed reversing shift is easily operated by a flick of the thumb but cannot be accidentally tripped by the palm while driving. Xcelite.

REPLACEMENT TV TUNERS 704

Universal replacement tuners for color or B/W receivers

A complete line of TV tuners has been developed as replacements in color or B/W receivers containing 40MHz IF systems. They are available with heater circuits for 6.3v, 600ma, 450ma, and 300ma supplies. The B+ supply requirement is 135v with resistors furnished for connection to



supplies up to 280v. The tuners have short and long shaft styles enabling the technician to cut and match the original tuner shaft up to a maximum of 12 in. All models are aligned for 41.25MHz sound IF and 45.75MHz video IF. They are said to be equipped with memory fine tuning and a UHF position with plug input for amplifying the UHF tuner output. A hardware kit reportedly allows the tuner to be adapted to fit numerous mounting configurations, overcoming a major problem when substituting tuners. Available in eight models, they are said to come complete with instructions. Dealer price is $8.95 to $11.00 depending on the model. A special package of six popular units is available at $57.50, including a kit of replacement tuner knobs. Castle.

DESOLDERING TOOL 705

High vacuum from a spring loaded piston

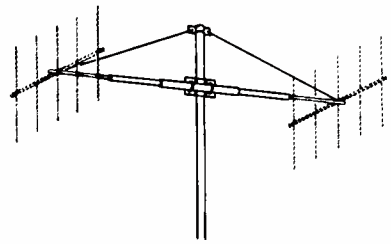
A desoldering tool has been designed to facilitate component replacement through the rapid removal of solder from solder joints. Molten solder is reportedly drawn into the receiving

chamber with a high impulse vacuum stroke by a simple thumb release of the spring loaded piston. The manufacturer indicates that this tool has recently been improved with the addition of a plastic sleeve to shield the exhaust ports from the user. A larger and lighter loading knob has also been incorporated to provide easier loading and to reduce recoil. Price $5.95. Edsyn, Inc.

ANTENNA STACKING KIT 706

Doubles effective radiated power of the transceiver

A universal stacking kit, Model M-205, is used with a pair of 3, 4 or 5 element beams or quads for an additional gain of 3dB (the equivalent of doubling the transceiver's power output). The stacking arrangements results in a narrowed beam path which allows the operator to "zero in" on the received signal and also eliminates many interfering signals that are off the beam path. The stacking kit has special seamless aluminum alloy support arms which reportedly take effective wind loads of up to 100 mph. Their telescopic design is said to per-

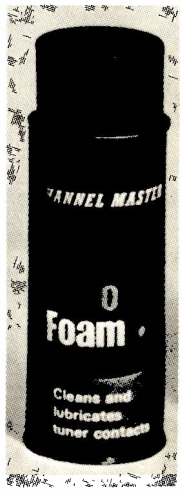


mit them to be extended to optimum spacing. A phasing harness is supplied with the stacking kit. Price $49.95. Antenna Specialists Co.

TV TUNER CLEANER 707

Meets the needs of color-TV tuners

A new combination cleaner and lubricant for color-TV tuners is called Chroma Foam. It is said to feature an unusual foaming cleaning agent that removes all built-up grease, dirt and corrosion from tuner contacts. The cleaner reportedly dries away, leaving a heavy-duty lubricant that protects the contacts from further corrosion, keeps detent action smooth, and recleans the contacts each time the channel is changed. The tuner cleaner reportedly clings to contact surfaces without dripping or running. Specifications indicate that it will not dry out or cake up. And it is guaranteed not to cause detuning, even of sensitive color-TV tuners. The tuner spray is available in 8 oz and 16 oz aerosol cans. Channel Master.



DYNAMIC IN-CIRCUIT TRANSISTOR CURVE TRACER 708

Trouble shoot any transistorized circuit regardless of impedance or type

The Model A curve tracer has been developed to dynamically test transistors—both in circuit and out of circuit. A new technique reportedly allows a technician to use the curve tracer to trouble shoot any type of tran-

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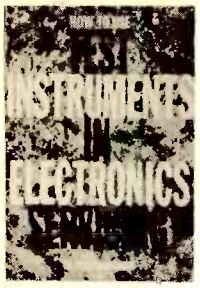

A long-needed, practical handbook on test equipment applications — ranging from the use of audio gear to tube and transistor checkers. Just what you need to put your test equipment to work. Not a "how-it-works" treatment, but a "how-to" manual describing specific tests and troubleshooting techniques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

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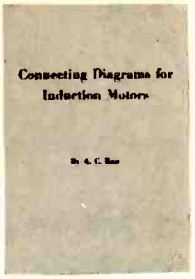
Connecting Diagrams For Induction Motors



Anyone who works on electric motors will appreciate the value of this selection. Not only does it contain wiring diagrams for all types of induction motors, but it explains how to change connections for 110-220 to 220-440 supply voltages. Dual voltage diagrams are provided for two and four parallel 4-pole, three and six parallel 6-pole, two and four parallel 8-pole, and four and eight parallel 8-pole connections. Connections for both two-phase and three-phase (star and delta) designs are included. In addition, connecting diagrams for 10- and 12-pole three-phase motors are illustrated, with instructions for changing from star to delta or delta to star, in accordance with available power line voltages. Chuck full of practical data on rewinding and reconnecting induction motors. 132 pps., 99 illus. and charts. Combbound.

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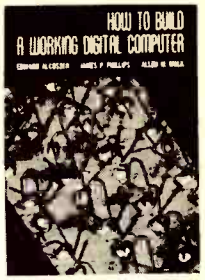

A "non-engineering" level book on how digital computers work, with step-by-step instructions on how to build—and learn from—your own working model! You "learn by doing"—by actually constructing a working model digital computer using inexpensive, readily-available components. And your computer will be much more than a mere gadget—it will add, subtract, multiply, and perform many other complicated functions. You'll also learn computer programming and how to run the programs you develop. Specifically written for those who want or need to understand computers, but with no formal training or education in computer technology. Will provide many pleasurable hours from your computer—both during construction and actual operation. 184 pps. Hardbound.

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Home-Call TV Repair Guide

With this handy, quick-reference home-call trouble guide, you'll increase your ability to complete more service calls per day. It's arranged in logical reference sections—covering raster, video, chrominance, and other circuit troubles—to guide you right to the cause. By simply comparing the symptoms in each case with the handy charts, you'll be guided, step by step, through quick checks for the most logical causes of any malfunction. In minutes you'll know whether the set can be repaired on the spot or if it's a bench job because you'll have your own portable "memory jogger" right at your fingertips! Specifically planned to serve as an on-the-spot TV repair guide, with numerous quick-reference charts for use by the home-call service technician. 144 pps., 14 quick-reference charts. Hardbound.

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How to Use Signal Generators . . . in Radio, Color TV, Hi-Fi Servicing

GIANT "2-Volumes-in-One" coverage — ALL the know-how required to use any type of signal generator in your troubleshooting work. Covers the use of RF, audio, sweep, marker, stereo FM, keyed rainbow, NTSC, and video generators of all types, and is devoted strictly to signal generators used in service shops; written specifically to provide guidance in the use of such equipment for troubleshooting and aligning all types of home-entertainment receivers. A variety of test procedures, using specified generators as the basic tool, are clearly detailed in step-by-step form. Shows how the various instruments work, and how to test and calibrate your own instruments. Everything you need to know about signal generators for servicing radio and TV sets, hi-fi sets, audio amplifiers, and antenna systems. 240 pps., 182 illus., 16 chapters.

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Digital Computer Theory

Whether you are a technician or engineer who needs comprehensive knowledge of computer operation, or simply a hobbyist with a passing interest in the subject, this outstanding text is for you. In the first section you are acquainted with basic computer technology, including computer codes and language programming. The second section presents a detailed study of modern computer logic circuits, such as AND, OR, NAND, and NOR gates. In addition, thorough explanations of basic circuit blocks are discussed—bistable, monostable, and astable multivibrators, Schmitt trigger circuits, etc. Finally, the third section covers memory, control, arithmetic, and input-output units. An exceptional, easy-to-understand reference and self-study text, complete with example problems. 320 pps. Hardbound.

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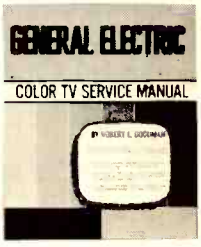
G. E. Color TV Service Manual



Provides complete service and repair data for all G.E. color sets using CA through KE chassis. Included are 12 full-size schematic diagrams, with waveforms, plus complete factory-authorized service and alignment data. Also, the numerous case-histories data will lead you directly to the cause of many tough-dog problems. The content begins with a look at the Porta-Color Series, featuring extensive troubleshooting data. Eight Chapters are devoted to a specific chassis series, featuring alignment and setup data, plus helpful servicing information. The last four Chapters include trouble case histories and factory-issued field-modification instructions. 160 pps. 8½" x 11", plus 36-page fold-out section containing 12 full-size schematic diagrams. Long-life vinyl cover.

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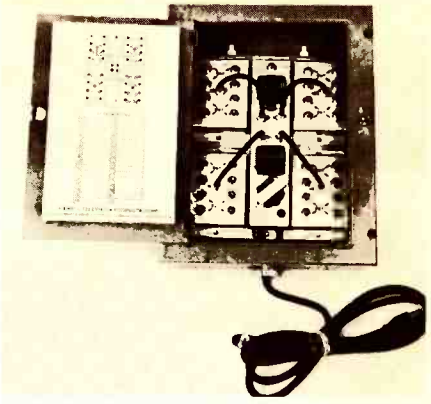
sistorized circuit regardless of impedance or type of circuit being tested. The curve tracer is used with a monitor oscilloscope to display the patterns

which are developed when a circuit under test is checked with a special probe included with the instrument. The curve tracer produces two signals: a 120Hz pulsating dc voltage variable from 0 to 80v, which appears across the collector-to-emitter portion of the transistor under test; and a synchronous staircase generator, which applies six steps of current to the base of the transistor. This current is variable from 10μa/step to 1ma/step in a 1-2-5 sequence. The two signals act to "turn ON" the transistor under test, displaying the results on the oscilloscope monitor as a family of curves. An open transistor appears as a single horizontal line while a shorted transistor appears as a single vertical line. This technique for testing transistors in circuit is reportedly performed without endangering the transistor under test. Inadvertent lead reversal is said to merely result in a false reading without damage to either the transistor or its circuitry. When used for out of circuit testing the curve tracer displays a conventional family of characteristic curves on a monitor oscilloscope. The horizontal axis of the scope measures the collector-to-emitter voltage while the vertical axis of the scope measures the collector current of the transistor under test. The display of characteristic curves indicates the polarity, gain, leakage and cut off voltage of a transistor. By switching between the two sockets, transistors may be compared. Jud Williams.

DISTRIBUTION CENTER 709

Feeds up to 32 TV sets from a single drop

An active distribution center has been designed to feed up to 32 TV sets from a single drop. The plug-in amplifier has its gain adjusted to compensate for the splitter insertion losses.

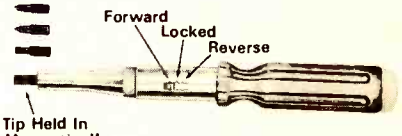


The distribution center is said to also come with a spare amplifier. The electronics is housed in a lockable, electrical box. View-All.

MAGNETIC DRIVER 710

Features three-way ratchet

A magnetic screwdriver, Model 70081, features a ratchet design which allows the operator to continue driving without releasing the hand grip and keeps the bit squarely placed in screw slot. This feature reportedly allows faster and more accurate driving of all regular and cross slot screws.



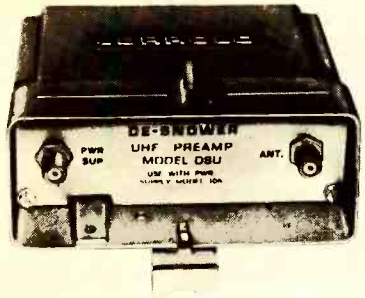
The tool is magnetized to provide a screw holding driver for starting screws in inaccessible places. The screwdriver also works as a pick-up tool for retrieving screws or bolts that have dropped into tight quarters. The four bits can reportedly be stored in the blue Comfordome handle when not in use. The tool is said to include No. 1 and No. 2 Phillips bits plus 3/16-in. and 9/32-in. regular straight slot bits. Price $5.95. Vaco Products Co.

UHF PREAMPLIFIER 711

Housed in a mast-mounted aluminum casting

A de-snower, Model DSU-105 for channels 14 through 83, is a high-gain, low-noise, 75Ω (in and out) preamplifier which reportedly employs stripline constructed transistors having low radial lead inductance to reduce the noise figure over the entire 470 to 890 MHz UHF band. Housed in a mast-

mounted aluminum casting, it is said to be radiation-proof and ready for immediate installation. The preamplifier is relatively small, measuring 5½ in. by 5¼ in. by 2 in. and weighs 2 lb. An indoor mounting power supply, Model 105, is reportedly also supplied for base station use. Specifications: gain—470 to 800MHz 26dB, 800 to

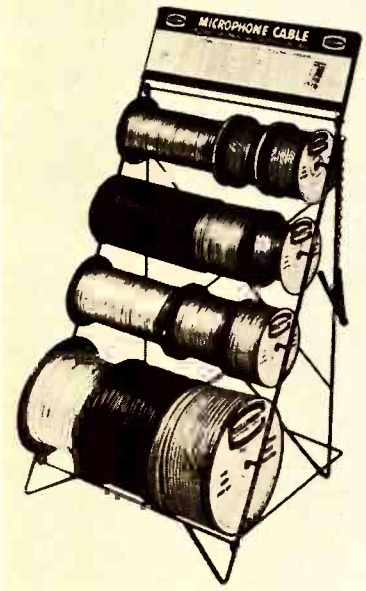


890MHz 23dB; Flatness of response —±1.25dB; noise figure—470MHz, 6.5dB, 800MHz, 7dB, 890MHz, 7.5dB. Jerrold.

WIRE AND CABLE MERCHANDISER RACK 712

Serves as a complete, compact wire department

This wire and cable merchandiser rack is said to come complete with a display header, measuring ruler, cable cutter and a complete microphone cable assortment or a complete



electronic cable assortment. Both assortments serve as complete, compact wire departments and are reportedly ideal for one- or two-step operations. The rack's rigid metal frame is 42 in. high by 22 in. wide by 18 in. deep and requires only 3 sq ft of floor space. The colorful header card is included to give specific applications for all items displayed. Columbia Electronic Cables.

DEALER SHOWCASE

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CASSETTE RECORDER 713

Solid-state with a frequency response of 50 to 10,000Hz

The MILOVAC Model No. CR-202, a vertically-styled monaural cassette recorder, plays instantly by inserting a cassette—the cassette popping out automatically at the conclusion of the program material. Its features are said to include single lever control for fast forward, rewind, play and stop, a fully solid-state circuit and a 3- by 5-in. full-range speaker. The recorder reportedly has a frequency response of 50 to 10,000Hz and is provided with a remote control, a highly sensitive dynamic microphone, a VU meter and a pause control. The ac line cord is self-storing and a full complement of auxiliary jacks reportedly include input, output and earphone. The carrying handle retracts when not in use, and

the unit is provided with a blank cassette and earphone for private enjoyment. Retail priced at $69.96. Selectron International.

TAPE CASSETTES 714

Popular-priced blister packed unrecorded tape cassettes

The Vibrant, a line of popular-priced unrecorded tape cassettes, reportedly offers a tensilized polyester, silicone lubricated, splice-free tape in 30, 60, and 90 min cassettes. Color-coded according to playing time, the

cassettes are said to be blister packed for maximum sales appeal, display-carded to minimize pilferage, pre-priced to save selling time, and colorfully packaged to create point-of-purchase attention. A money-saving consumer premium tape caddy offer is featured on the reverse side of the blister card to help dealers develop repeat customers. Prices $1.39, $1.69 and $2.49 each. RCA.

MULTIMETER DISPLAY 715

Displays six models of the line

A line of multimeters is now available with a convenient eye-catching counter/wall display to hold all six models. Measuring 18 in. H by 18 in.

DEALER SHOWCASE

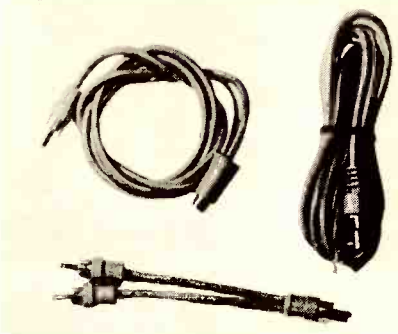
W by 3½ in. D, it consumes minimum space on counter or wall. The multimeters are said to offer professional versatility at lowest cost and range from the 1,000Ω/v Model 1A1

at $6.95 to the 100,000Ω/v Model 100A4 for $34.95. All models are complete with test leads and batteries. EICO.

PHONO CABLES 716

Variable configurations for ease of adaptation

A series of "Y" jumper cables are available with molded ends and variable configurations for ease of adaptation. Also available are RCA type

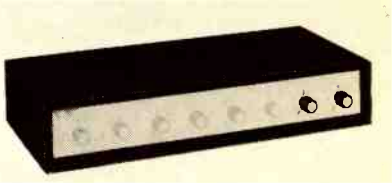


open-end plugs with tinned ends in 72 in. lengths, and RCA type female connectors at the other end of the plugs. All items are packaged individually for peg rack impulse sales. Weltron.

MIXER/PREAMPLIFIER 717

Permits custom design with up to six inputs

The "Mixable Mixer," Model MIX-6, is developed to permit custom design of a mixer/preamp with up to six inputs. The modular construction reportedly also permits the integration of telephone, microphone and program preamps with signaling or alarm tone generator. Control functions such as priority paging, remote volume control, or volume limiting are also said to be available as standard plug-in modules. Among the functions available in the modules are: high and low impedance microphone preamplifier; 600Ω balance input preamplifier; remote volume control; volume limiter; and siren, chime or yelp tone generator. The basic unit consists of one power supply module and one 600Ω unbalanced output module. A 600Ω balanced output module is an available option, if required. Any combination of one to six preamplifiers, generators, or control modules may be ordered. This flexibility provides the systems engineer with design freedom to create exactly the input/output configuration required, or to change the configuration as the need dictates. The complete unit measures 16 in. by 3 in. by 8½ in. List price $87.50. Bell P/A.



TECHNICAL DIGEST...

continued from page 53

leakage currents than germanium transistors, even higher input resistances may be realized by using a configuration known as a Darlington circuit. When comparing Fig. 2 and 3 we see that resistor R3 has been eliminated from the Darlington circuit so that transistor Q1 need only supply the base current for transistor Q2. Also, the collector of transistor Q2 is connected to the collector of transistor Q1 to furnish a negative feedback path, which provides the required bias stability at higher temperatures. Considering that transistor Q1 needs only supply base bias for transistor Q2, the conditions are such that the actual input resistance is determined by the compounded beta of the two transistors. For example, beta times resistance R5 yields a base input resistance of 270K. Using 270K as the emitter resistance for transistor Q1 and multiplying this figure by the beta of transistor Q1 results in a 27M base input resistance for transistor Q1. This high resistance is still subject to the shunting effects of paralleled resistors R1 and R2. These resistances can, in practice, be quite high because of the inherent stability of the silicon devices and the extremely low base bias current of transistor Q1. Thus, the input resistance of this Darlington circuit is about 3.1M.

With the advent of integrated-circuit technology it became practical to put two transistors on a single silicon wafer, making fabrication of the Darlington circuit rather simple. This single package Darlington, Fig. 3B, is thought of as a single transistor having a beta equal to the product of the individual betas of the compounded transistors. The beta of a typical Darlington transistor may range upwards to the neighborhood of 16,000.

Darlington transistors are being used today in many circuits. One use of the Darlington transistor is the integrated circuit impedance matching device that is part of the cartridge in some RCA RP 228 record changers. In this application, the Darlington matches the output of a high-compliance, low-capacitance, ceramic pickup to the relatively low input impedance of a solid-state stereophonic amplifier. More recently Darlington transistors have been used for function keyer circuits in RCA color-TV remote control systems. It is evident from these two applications that the Darlington transistor is a versatile component. For this reason, Darlington transistors will find increasing use in the products of the future.

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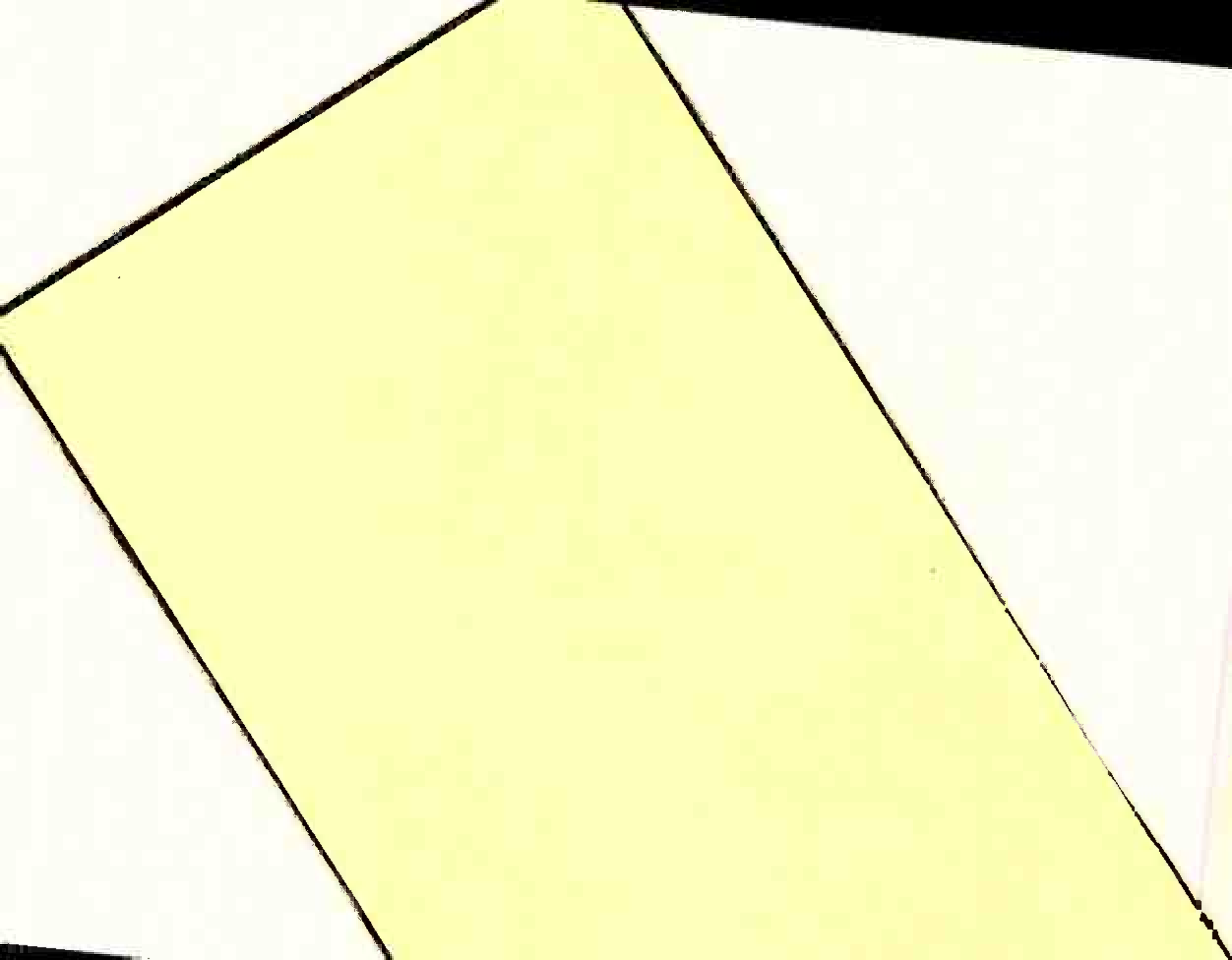

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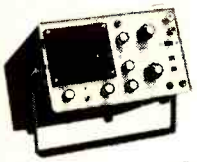

LBO-301 Here's the only 3" Portable Triggered Scope with vertical and horizontal calibration! All solid state, it features highest sensitivity, wide bandwidth and an easy-to-use, horizontal panel design for testing under all conditions. Great for servicing color TV and computer circuitry. It's compact, it's portable, it's remarkably low-priced. $334.50

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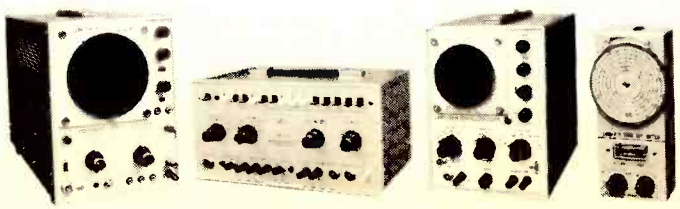

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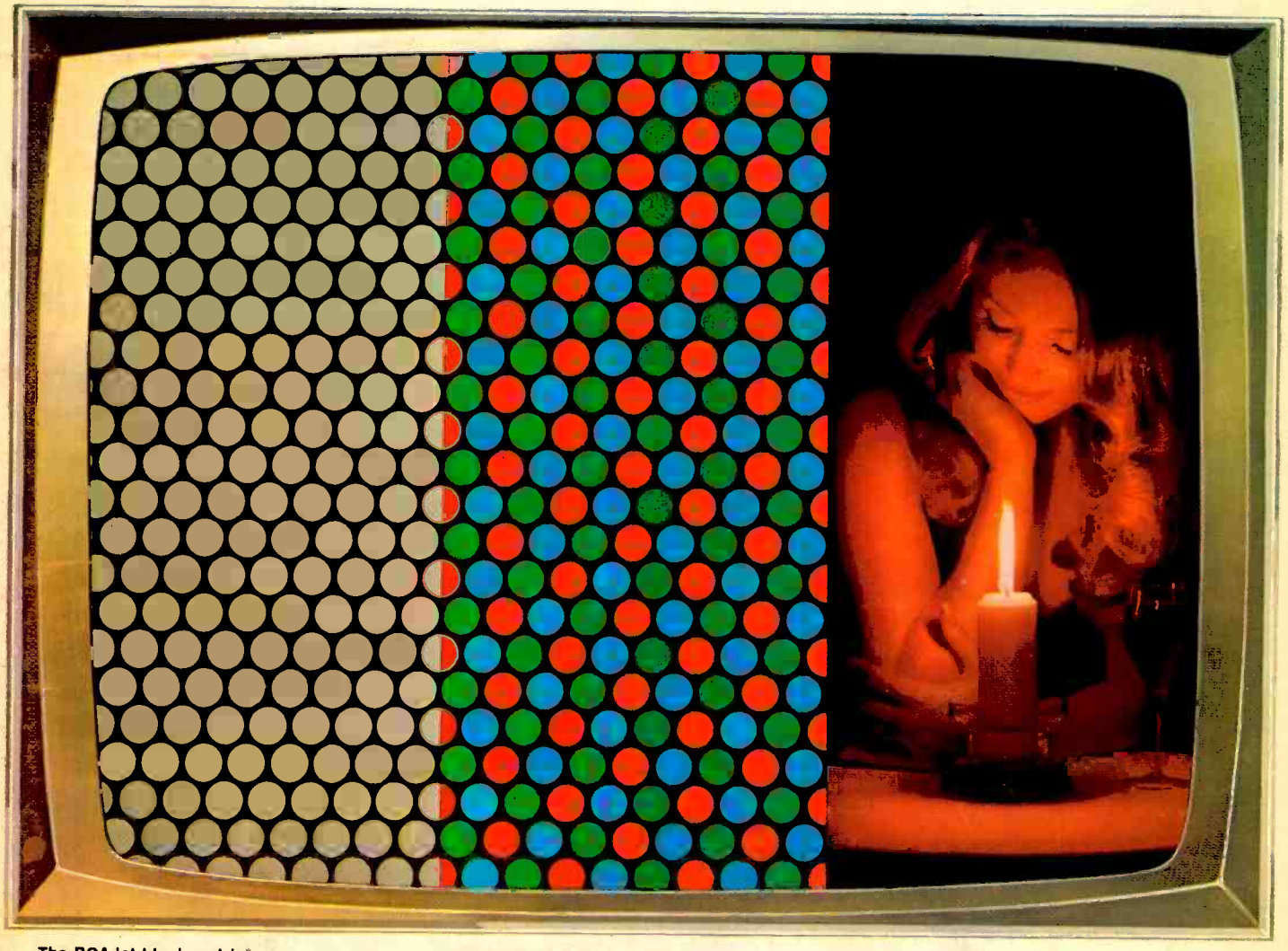
MATRIX is the brightest and sharpest color picture tube in RCA history!

Here's why:



The RCA jet-black matrix*
It soaks up room-light normally reflected back at the viewer from the face of the tube. Result: brighter pictures because now there's no need to "filter out" brightness to maintain contrast under strong room-light conditions.

The RCA MATRIX phosphor-dot process*
First, we developed brilliant new phosphors and a unique screening process incorporating a jet-black matrix. Then we deposited the 1,200,000 red, green, and blue high-intensity phosphor dots precisely within the black matrix. Result: brightness doubled with dramatic improvement in contrast and clarity.

The RCA MATRIX picture**
Spectacular! In operation, a new, unique high-resolution gun "shoots" the phosphors with more energy than any other gun previously available. Result: black matrix + phosphors + high-resolution gun = maximum sharpness over the entire brightness range, truer colors under all viewing conditions.

New 4-color consumer flyer on MATRIX is available from your RCA Distributor.
RCA | Electronic Components | Harrison, N. J. 07029

*Magnified drawing **Simulated

RCA