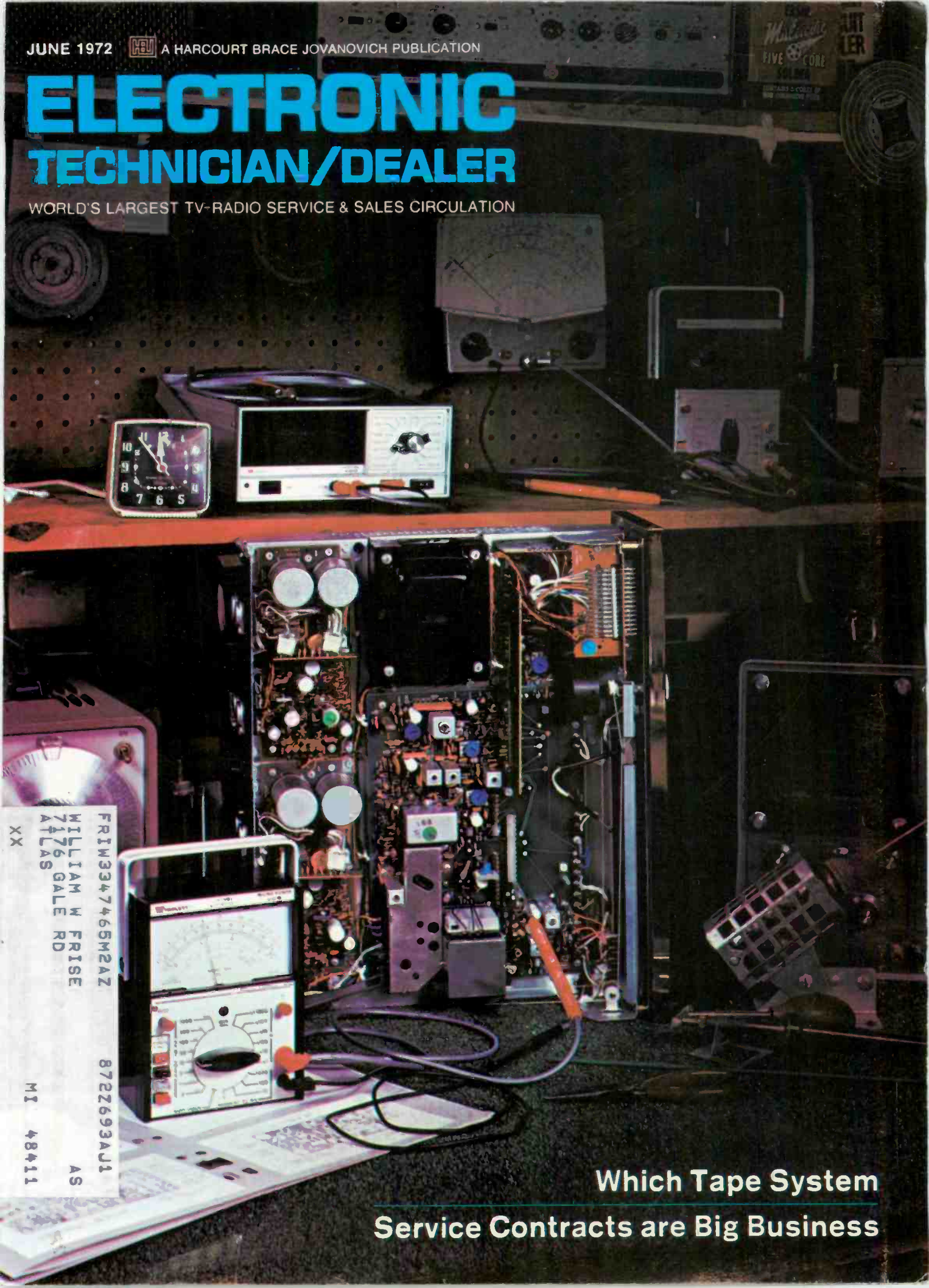
JUNE 1972 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

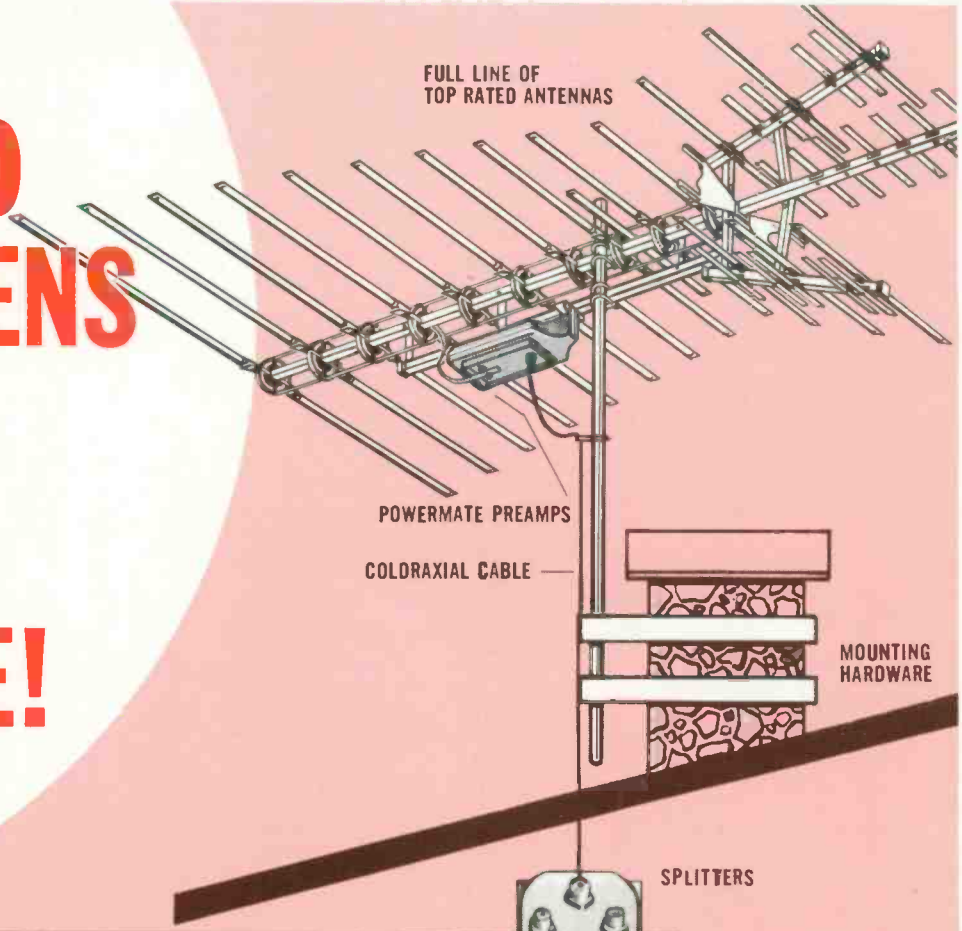
WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



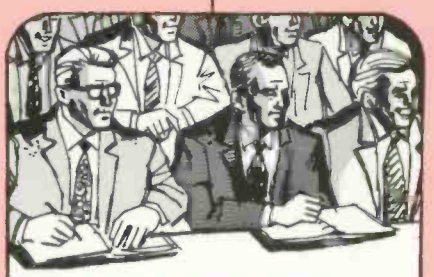
Which Tape System

Service Contracts are Big Business

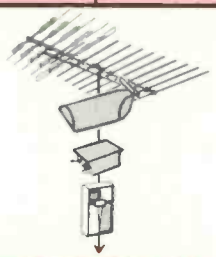
JERROLD BRIGHTENS YOUR PROFIT PICTURE!



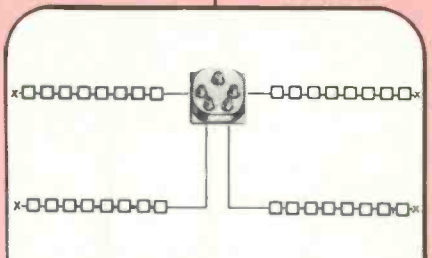
NATIONWIDE NETWORK OF
RECEPTION SPECIALISTS



DEALER TRAINING SCHOOLS



PRODUCTS AND KNOW-HOW TO
SOLVE ANY RECEPTION PROBLEM



THE INDUSTRY'S NO. 1 MATV LINE

JERROLD™
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CALL OR WRITE:
JERROLD ELECTRONICS CORP., P.O. BOX A, 401 WALNUT STREET, PHILADELPHIA, PA.
(215) WA 5-9870, EXT. 261

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

ELECTRONIC TECHNICIAN/DEALER

TEKFAX

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

GROUP 238

	SCHEMATIC NO.		SCHEMATIC NO.
EMERSON Color-TV Chassis 32K1673-32,1686-4,1687-2	1421	PHILCO-FORD Color-TV Chassis 20ST30AV	1422
MAGNAVOX TV Chassis T959	1420	SYLVANIA Color-TV Chassis D18-1, -2, -3	1423
MOTOROLA TV-Chassis TS-467	1424		

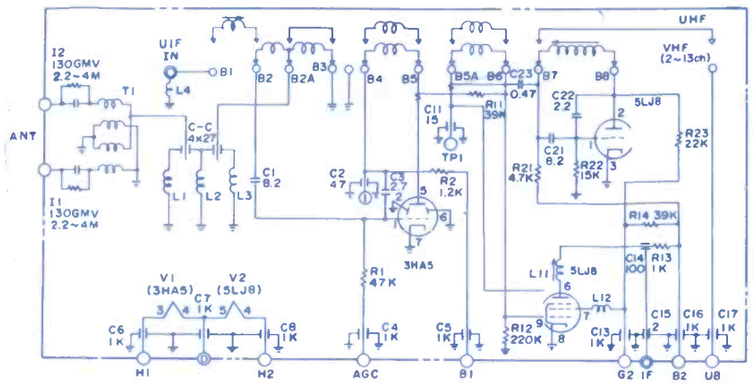
1420

MAGNAVOX

TV Chassis T959

JUNE • 1972

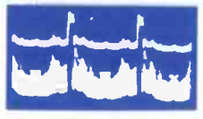
VHF TUNER SCHEMATIC

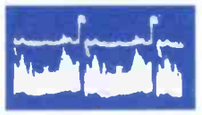


SYMBOL	DESCRIPTION	MAGNAVOX PART NO.
T204	sound take-off xformer & 4.5MHz trap	36A040-26
T301	sound IF xformer	36A040-27
T302	quad coil	36A023-8
T303	audio output xformer	32A021-7
T401	vert output xformer	32A022-1
T501	horiz output xformer	32A021-8
	deflection yoke	36A040-22
VR1	500K, volume on/off	22A012-10
VR2	100K, bright	22A012-9
VR3	500Ω, contrast	22A012-3
VR4	1M, vert hold	22A012-7
VR5	100K, horiz range	22A012-5
VR6	1M, vert height	22A012-5
VR7	500K, vert lin	22A012-5
VR9	2M, CRT bias	22A012-6
F1	fuse 2a, 125v	18A008-1
F2	fuse, 0.35a, 250v	18A019-12
K401	vert retrace pac	25A019-1
	UHF tuner	34A008-4
	VHF tuner	34A008-3

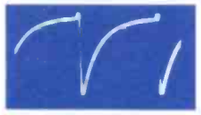

1 TP-1 3V P/P V


2 Pin 7/CR1 60V P/P V


3 Pin 1/V6 57V P/P V


4 TP-3 36V P/P V

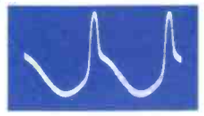

5 Pin 3/V5 33V P/P H


6 Pin 10/V8 100V P/P V


7 Pin 2/V8 65V P/P V


10 Pin 9/V10 80V P/P H


8 Pin 6/V8 30V P/P V


9 Pin 8/V9 18V P/P H

UNLESS OTHERWISE SPECIFIED;
1. ALL VOLTAGE MEASUREMENTS MADE WITH VTVM, NO SIGNAL APPLIED, CONTRAST AT MAXIMUM, AND ALL OTHER CONTROLS SET FOR NORMAL OPERATION.
2. CAPACITANCE VALUES GREATER THAN 1 ARE IN PICOFARADS; LESS THAN 1 IN MICOFARADS.
3. ALL RESISTORS ARE 1/2 W, 10%.
4. ALL CAPACITORS ARE 500V, 10%.
5. EP = EARLY PRODUCTION.
6. ⊙ = TEST POINT.
7. ● = VOLTAGE SOURCE.
8. ■ = COMPONENT LOCATED OFF BOARD.
9. ▲ = COMPONENT LOCATED ON UNDERSIDE OF BOARD (COPPER SIDE).
10. J4 AND J5 MAY BE LABELLED J8 AND J7 RESPECTIVELY, ON COMPONENT SIDE OF BOARD.

1421

EMERSON
Color-TV Chassis
32K1673-32, 1686-4, 1687-2

ELECTRONIC TECHNICIAN/DEALER TEKFAX

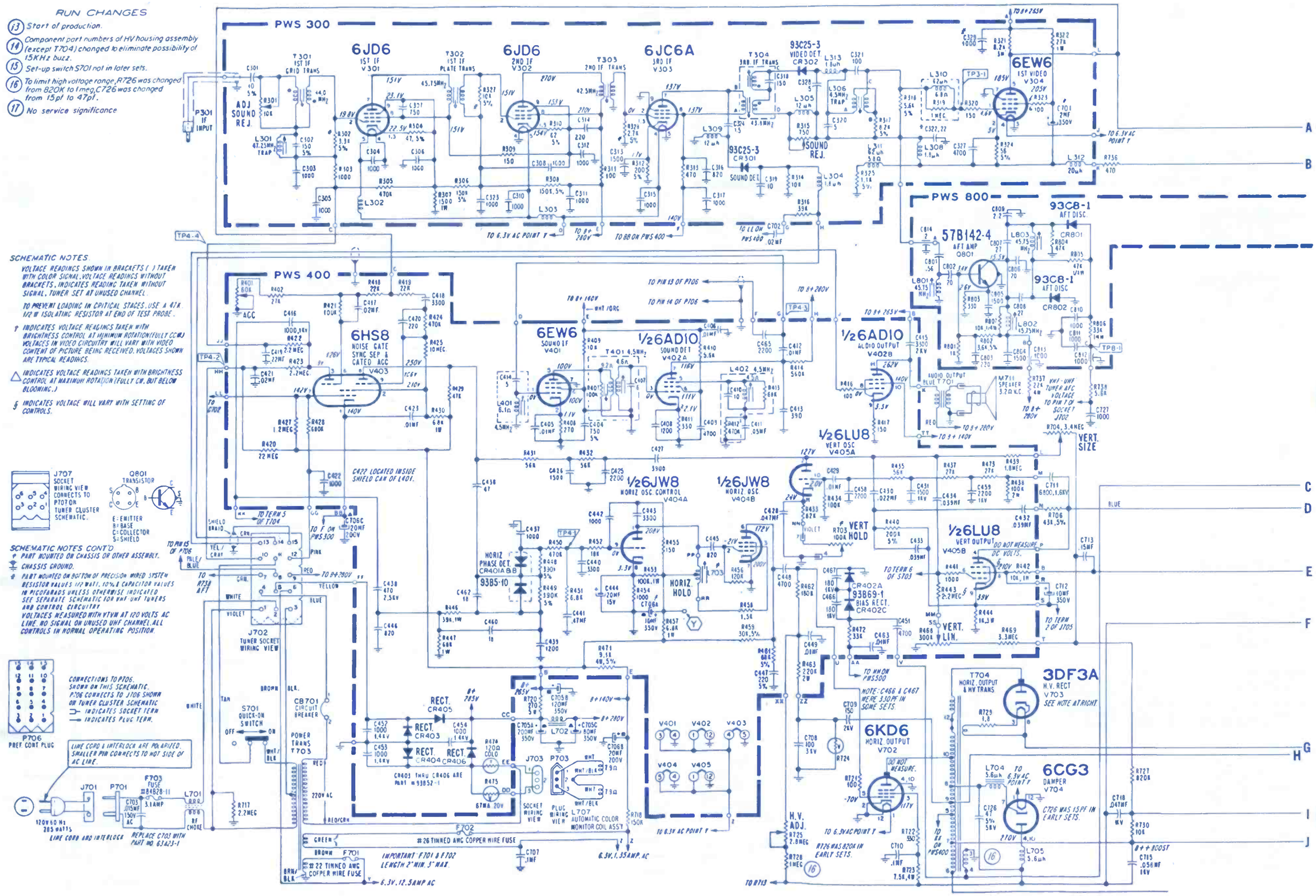
JUNE • 1972

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

SYMBOL	DESCRIPTION	EMERSON PART NO.
R258	1M, volume control	971571
R301	10K, adj, rej, control	75A101-8
R315	750Ω, sound rej. control	75A101-3
R321	8.2K, 3w	970432
R401	60K, AGC control	75A101-9
R468	300K, vert lin control	970435
R474	120Ω, thermistor	61A50-3
R475	67ma, 20v, VDR	61A51-1
R504	1M, color killer control	970436
R701	500Ω, color control	75A149-3
R703	100K, vert hold control in 25-in. picture tube sets	75A134-6
R703	100K, vert hold control in 21-in. picture tube sets	75A127-9
R704	3.4M, vert size control	75A96-20
R707	1.1K, tint control	75A149-4
R708	250K, bright control in 25-in. picture tube sets	75A130-5
R709	250K, bright control in 25-in. picture tube sets	75A127-10
R709	250Ω, contrast control in 25-in. picture tube sets	75A134-4
R709	250Ω, contrast control in 21-in. picture tube sets	970447
R710	3.4M, master bright control	970449
R724	VDR	61A46-13
R725	2.8M, high voltage adj.	970452
R728	10Ω, vert center control	75A64-17
R732	15M, focus control	75A108-2
R739	VDR	61A46-2
R745	3.8Ω, thermistor	61A27-1

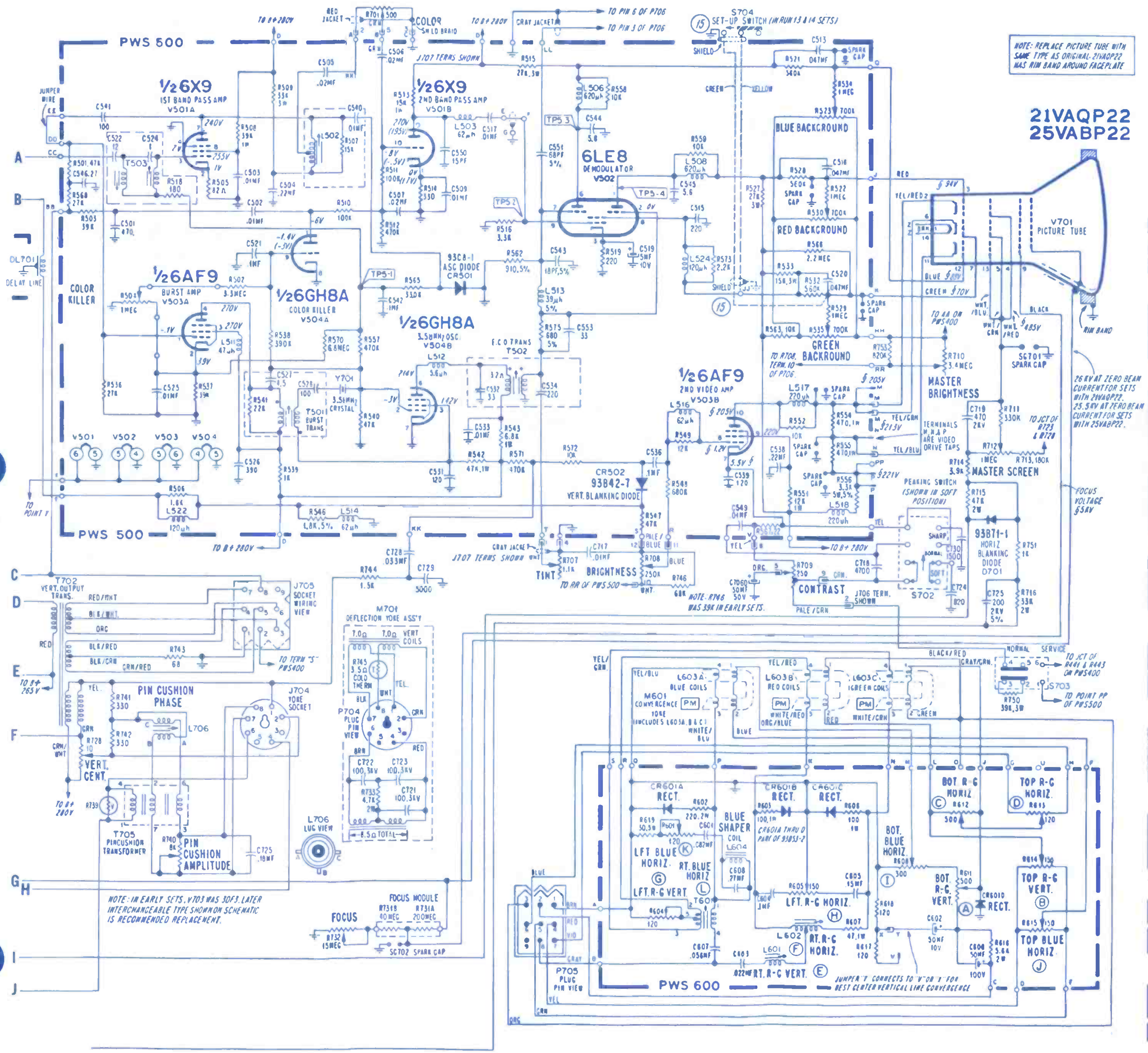
RUN CHANGES

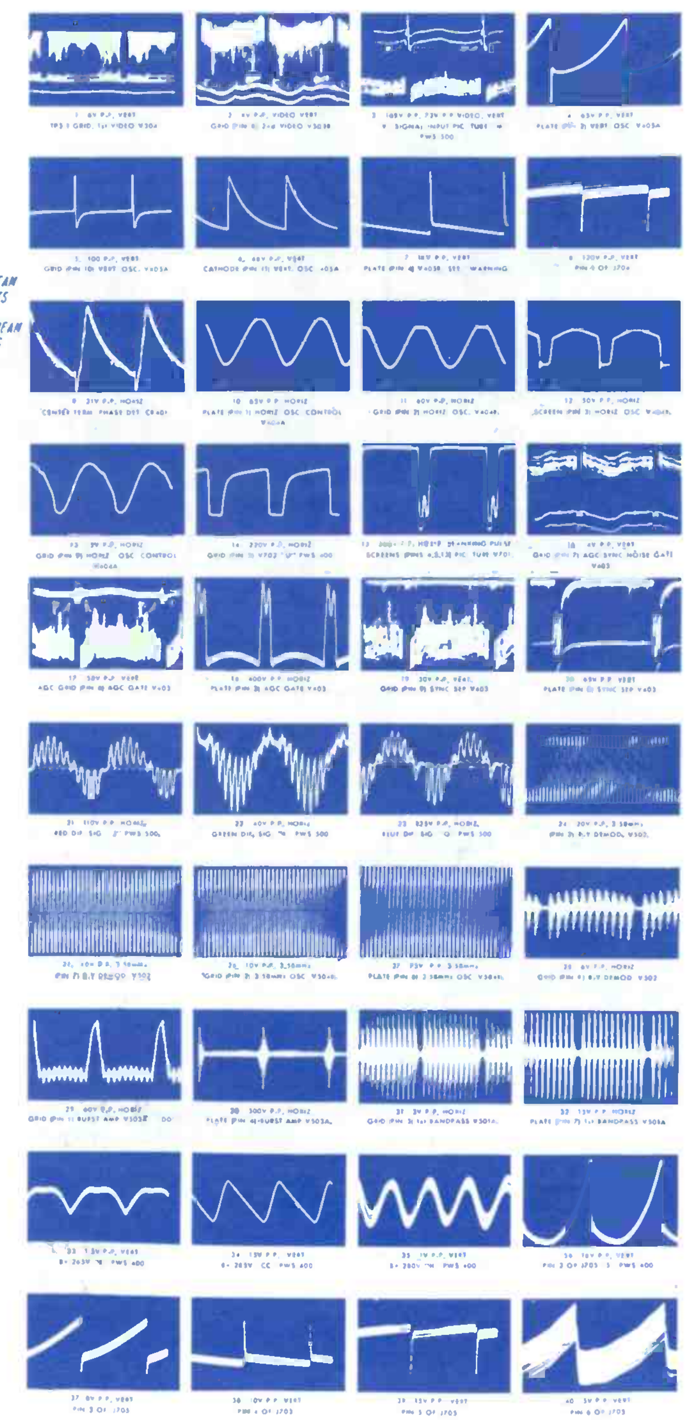
(13) Start of production.
(14) Component part numbers of HV housing assembly (except T704) changed to eliminate possibility of 15KHz buzz.
(15) Set-up switch S701 not in later sets.
(16) To limit high voltage range, R726 was changed from 820K to 1 meg, C726 was changed from 15pf to 47pf.
(17) No service significance



C705A—200 µf, 350v, multiple elect	970475
C705B—120 µf, 350v, multiple elect	970475
C705C—80 µf, 350v, multiple elect	970475
C706A—10 µf, 350v, multiple elect	970476
C706B—20 µf, 200v, multiple elect	970476
C706C—20 µf, 200v, multiple elect	970476
C706D—50 µf, 50v, multiple elect	970476
L401—sound takeoff coil	72A287-4
L402—quadrature coil	72A287-3
L502—bandpass coil	72A269-4
L702—filter choke	74A18-62
L703—horiz osc coil	94A268-4
T303—second IF xformer	72A251-8
T304—third IF xformer	72A220-2
T401—sound IF xformer	72A314-2
T501—burst xformer	72A284-4
T502—ECO xformer	72A285-2
T503—bandpass input coil	72A302-1
T701—audio output xformer	970485
T702—vert output xformer	79A106-5
T703—power xformer	80A104-4
T704—horiz output xformer	79A146-3
M701—deflect yoke for 21-in. picture tube sets	94A377-8
M701—deflect yoke for 25-in. picture tube sets	94A377-4
CB701—curcuit breaker	84A17-11
F703—fuse, 3a	84A28-11

EMERSON
Color-TV Chassis
32K1673-32, 1686-4, 1687-2





1422

PHILCO-FORD

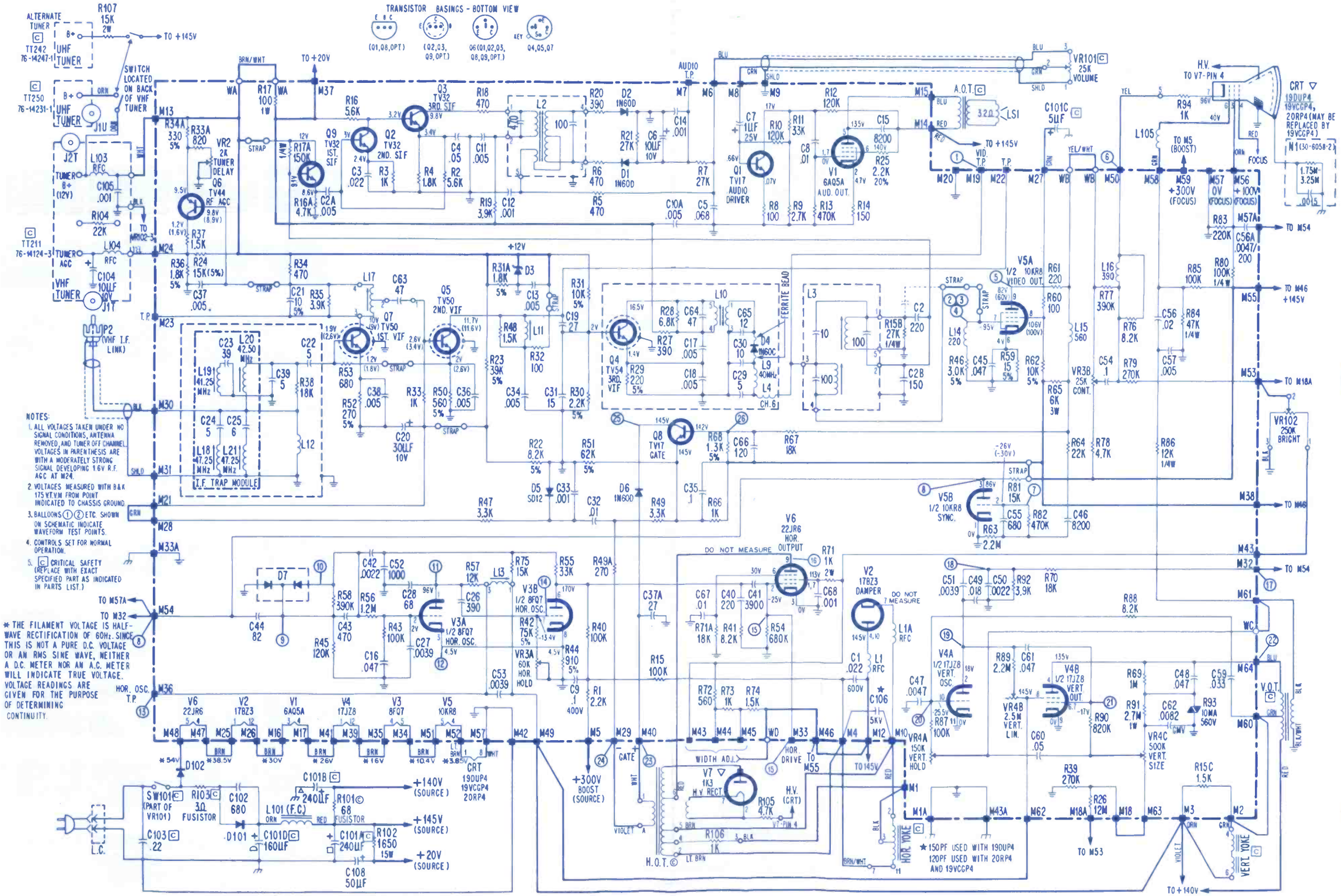
Color-TV Chassis
20ST30AV

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

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

JUNE • 1972

SYMBOL	DESCRIPTION	PART NO.
C101–240/240/5/160µf, @200v, B+ & video output G2		30-2601-33
L2–ratio det coil		32-4906-1
L3–sound take-off & 4.5MHz trap coil		32-4955-2
L13–horiz stabilizer		32-4754-3
N1–CRT network		30-6058-2
R93–varistor, 560v @ 10ma, vert bias		33-1373-6
R103–3Ω, fusistor		33-1381-5
AOT–audio output xformer		32-10161-2
HOT–horiz output xformer		32-10152-1
VOT–vert output xformer		32-10160-3
VR2–2K, tuner delay		33-5628-13
VR3A-B–60K, horiz hold aux 25K contrast		33-5637-4
VR4A-B-C–150K, vert hold, 2.5M, vert lin, 500K, vert size		33-5645-1
VR101–25K, on/off volume, sw		33-5646-8
VR102–250K, bright		33-5445-1
tuner, VHF, TT211		76-14124-2
yoke assembly		76-14309-1



① 2V P/P, 15,750Hz

② 1.9V P/P, 15,750Hz

③ 1.9V P/P, 15,750Hz Expanded View of Hor. Sync. Pulse

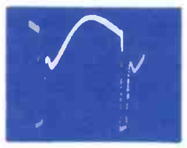
④ 1.9V P/P, 15,750Hz Hor. Sync. Pulse Showing 4.5MHz Trap out of Adj.

⑤ 95V P/P, 15,750Hz

⑥ 14V P/P (min. contrast) 90V P/P (max. contrast) 15,750Hz

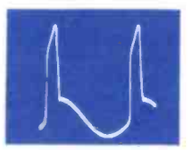
⑦ 75V P/P, 15,750Hz

⑧ 50V P/P, 15,750Hz

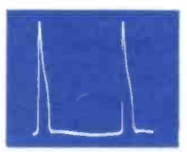


⑨ 12.5V P/P, 15,750Hz

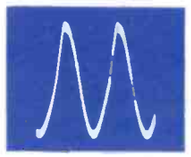
⑩ 17V P/P, 15,750Hz



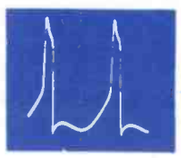
⑪ 36V P/P, 15,750Hz



⑫ 9V P/P, 15,750Hz

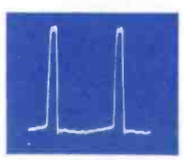


⑬ 17V P/P, 15,750 Hz



⑭ 30V P/P, 15,750 Hz

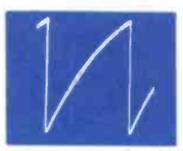
⑮ 130V P/P, 15,750 Hz



⑯ 15,750Hz, Loose coupled to plate lead of 22JR6

⑰ 50V P/P, 60Hz

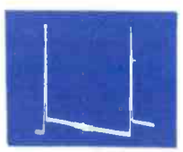
⑱ 16V P/P, 60Hz



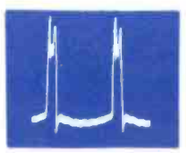
⑲ 30V P/P, 60Hz

⑳ 55V Sawtooth, 80V P/P, 60Hz

㉑ 30V P/P, 60Hz

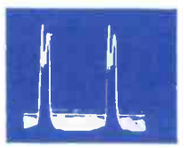


㉒ 1150V P/P, 60Hz

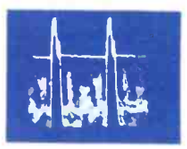


㉓ 34V P/P, 15,750Hz

㉔ 11V P/P, 15,750Hz



㉕ 34V P/P, 15,750 Hz



㉖ 7.5V P/P, 15,750 Hz

TRANSISTOR & TUBE RESISTANCE CHARTS

All measurements are in ohms and taken with a B & K Model 120 volt-ohm-meter with an allowable tolerance of ±20%. DC polarity switch set in "REV" position. Resistance measurements of transistors and tubes taken in circuit with power off.

TRANSISTOR RESISTANCE CHART (USE X100 SCALE)

OHMMETER CONNECTION (NOTE POLARITY)	Q1 AUD. DR. TV17	Q2 2nd SIF TV32	Q3 3rd SIF TV32	Q4 3rd VIF TV54	Q5 2nd VIF TV50	Q6 RF AGC TV44	Q7 1st VIF TV50	Q8 GATE TV17	Q9 1st SIF TV32
Coll. - Gnd. + / −	*22K	3.2K	5.5K	1.2K	800Ω	2.1K	1.2K	*400K	700Ω
Emit. - Gnd. + / −	100Ω	1K	1.8K	220Ω	560Ω	750Ω	270Ω	3.1K	4.7K
Base - Gnd. + / −	1.9K	2.6K	2.6K	1.7K	2.4K	1.2K	1.2K	3.4K	2.7K
Coll. - Emit. (−) (+) / + −	17K 22K	*3.5K *2.3K	5.5K 7K	1.3K 1.3K	1.3K 1.4K	3.7K 2K	1.3K 1.4K	2.5K *400K	5K 2.8K
Coll. - Base (−) (+) / + −	1.7K *70K	1.6K *7K	1.7K *7K	1.6K 2.8K	1.9K 5.5K	4K 1.7K	1.6K 2.4K	1.5K *400K	1.6K *20K
Base - Emit. (−) (+) / + −	*27K 1.7K	8.5K 1.7K	4K 1.8K	2K 1.7K	5.5K 2K	**750 **750	*1.6K *1.2K	2.4K 1.5K	*13K 1.6K

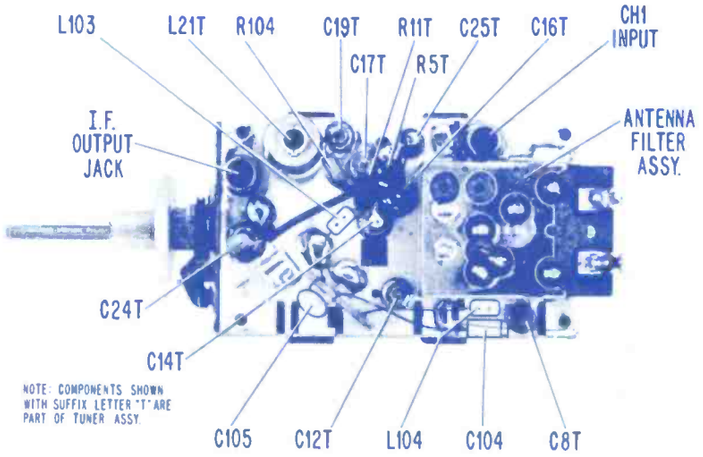
*Use X1000 scale
**VR2 max. clockwise.

TUBE RESISTANCE CHART

SYM-BOL	TUBE	FUNCTION	PIN NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12
V1	6AQ5A	Audio Output	470K	150Ω	19Ω	17Ω	2.5K	4.2K	470K	–	–	–	–	–
V2	17BZ3	Damper	25Ω	25Ω	25Ω	2.1K	INF.	INF.	230K	INF.	INF.	2K	INF.	19Ω
V3	8FQ7A	Horiz. Osc.	14K	1.3M	910Ω	10Ω	7Ω	50K	110K	910Ω	INF.	–	–	–
V4	17JZ8	Vert. Osc. & Out.	17Ω	3M	INF.	2.2K	INF.	1.2M	1.2M	2.1K	0Ω	150K	0Ω	10Ω
V5	10KR8	Sync Sep.	0Ω	2.5M	9.5K	3Ω	7Ω	15Ω	3K*	12K	6K	–	–	–
V6	22JR6	Horiz. Out.	3K	680K	0Ω	25Ω	36Ω	21K	3K	INF.	260K	–	–	–

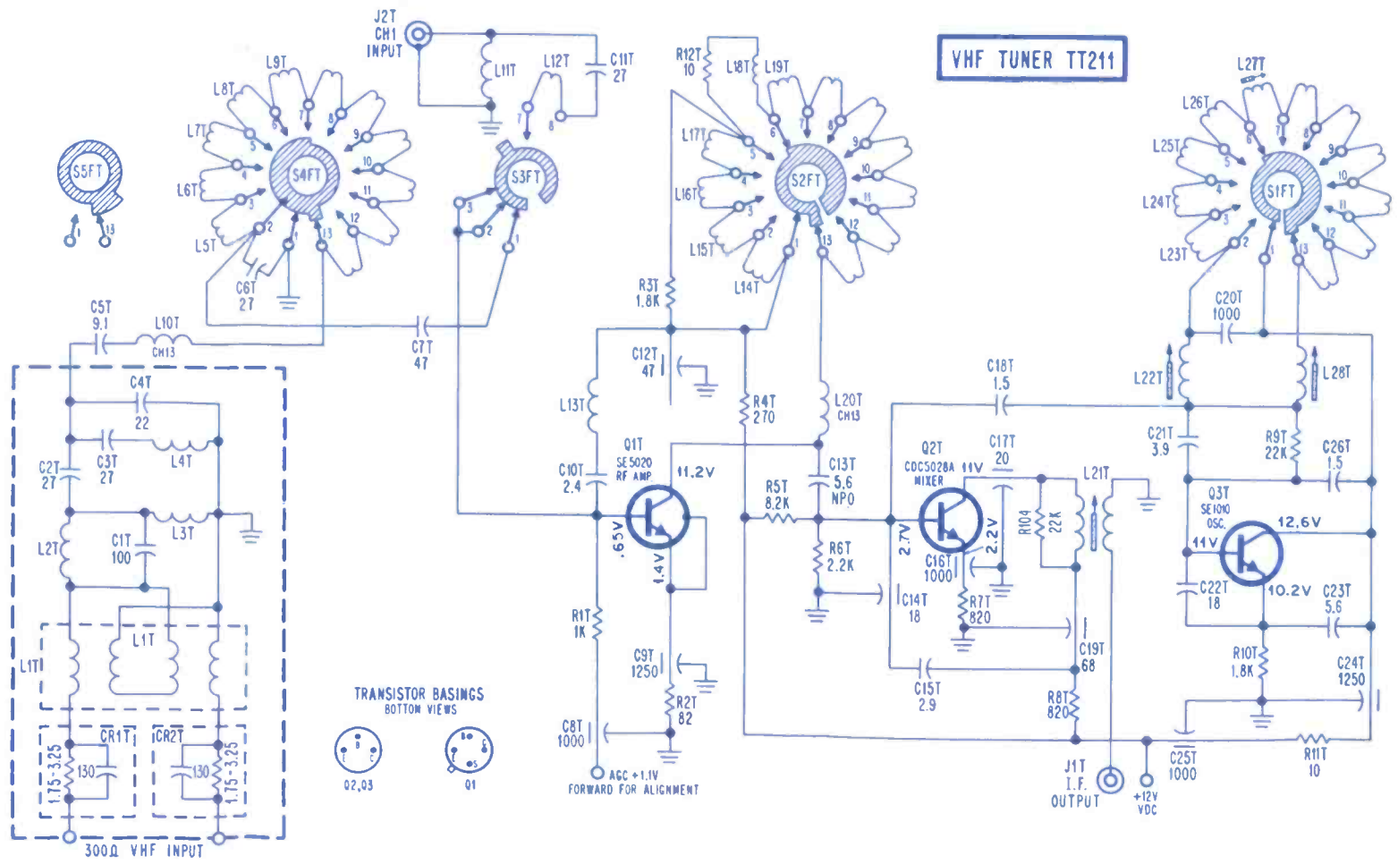
*Depends on meter polarity

PHILCO-FORD
Color-TV Chassis
20ST30AV



NOTE: COMPONENTS SHOWN WITH SUFFIX LETTER "T" ARE PART OF TUNER ASSY.

COMPONENT LAYOUT-TOP VIEW-VHF TUNER



1423

SYLVANIA

Color-TV Chassis
D18-1, -2, -3

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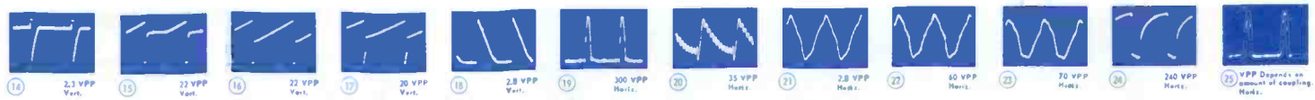
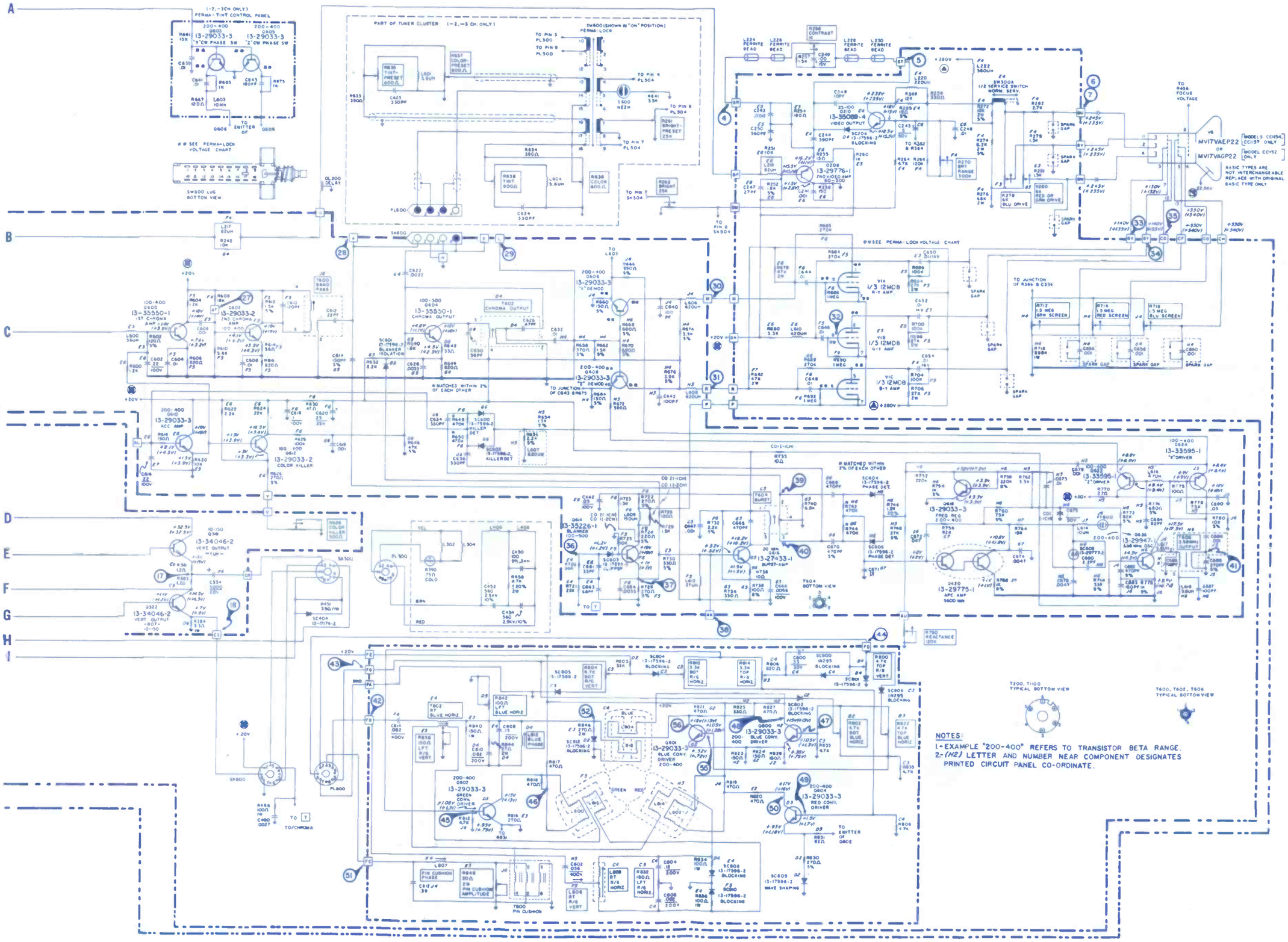


SYLVANIA Color-TV Chassis D18-1, -2, -3



NOTES:
1- EXAMPLE "200-400" REFERS TO TRANSISTOR BETA RANGE.
2- (H2) LETTER AND NUMBER NEAR COMPONENT DESIGNATES PRINTED CIRCUIT PANEL CO-ORDINATE.

1424

MOTOROLA

TV Chassis

TS-467

JUNE • 1972

ELECTRONIC TECHNICIAN/DEALER TEKFAX

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

SYMBOL	DESCRIPTION	MOTOROLA PART NO.
C-803	2000 µf/40v, 1000 µf/35v 1000 µf/20v lytic	*23C69772A04
F-800	fuse, 3/4a - 125v	.65S136038
L-111	4.5MHz trap, incls core	*24D70374A01
L-500	horiz osc, incls core	*24D68130A05
L-700	yoke, deflect 114° (C12TS-467)	
L-801	choke, line	*24D69978A04
R-112	video bias, 50K	*18D66401A43
R125	contrast, 1K	*18D69773A02
R-126	brightness, 500K	18D69773A02
R-306	volume, 50K	18D69773A02
R-602	vert hold, 250K	*18D67678B12
R-605	vert size, 25K	18D67678B12
R-608	vert lin, 10K	18D67678B12
R-615	varistor	*6C66263A21
T-100	audio takeoff, incls cores	*24D68822A09
T-300	4.5MHz ratio detector	*24D68822A10
T-301	audio output	*25D67552A26
T-500	horiz driver	*25D67440A10
T-501	H.V. xformer, complete	*24D69828A04
T-800	power (C12TS-467)	*25D68499A05

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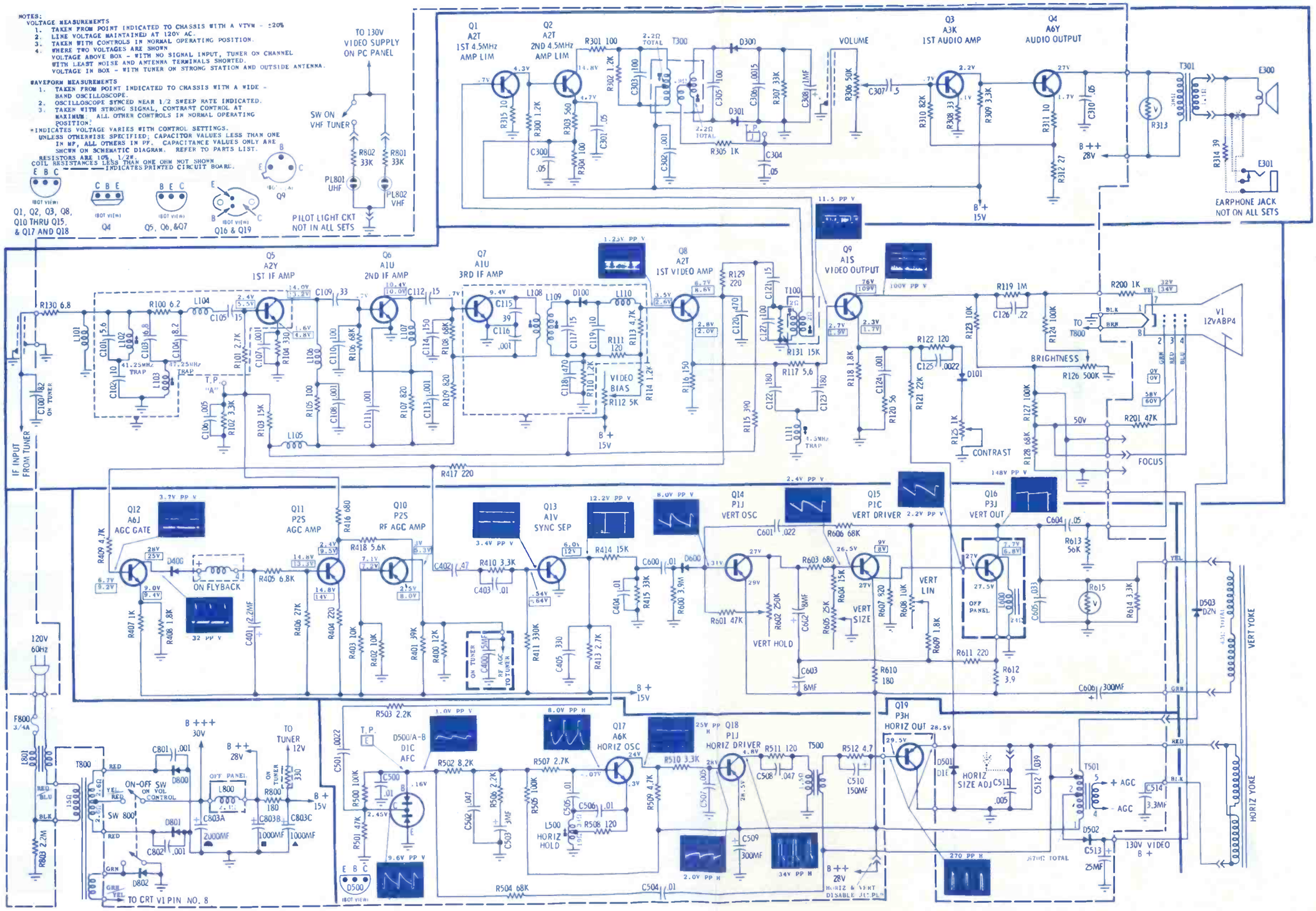

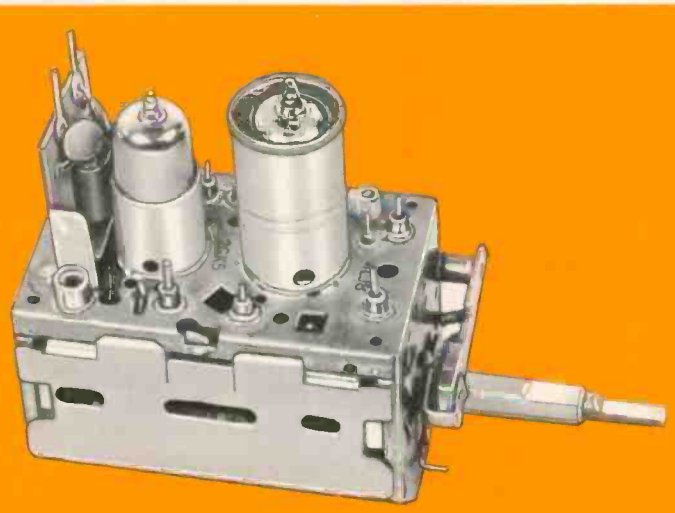

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VHF Or UHF Any Type $9.75.
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In this price all parts are included. Tubes, transistors, diodes, and nuvistors are charged at cost.

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WEST	SARKES TARZIAN, Inc. *TUNER SERVICE DIVISION* 10654 MAGNOLIA BLVD., North Hollywood, California	TEL: 213-769-2720

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

Our ECG 102A transistor replaces...

To Be Replaced	ECG Replacement
HB33	102A
HB54	102A
HB55	102A
HB56	102A
HB75	102A
HB75C	102A
HB77	102A
HB77B	102A
HB77C	102A
HB156	102A
HB156C	102A
HB171	102A
HB172	102A
HB175	102A
HB176	102A
HB178	102A
HB186	102A
HB187	102A
HB263	102A
HB270	102A

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

and hundreds more.

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

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

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

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

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

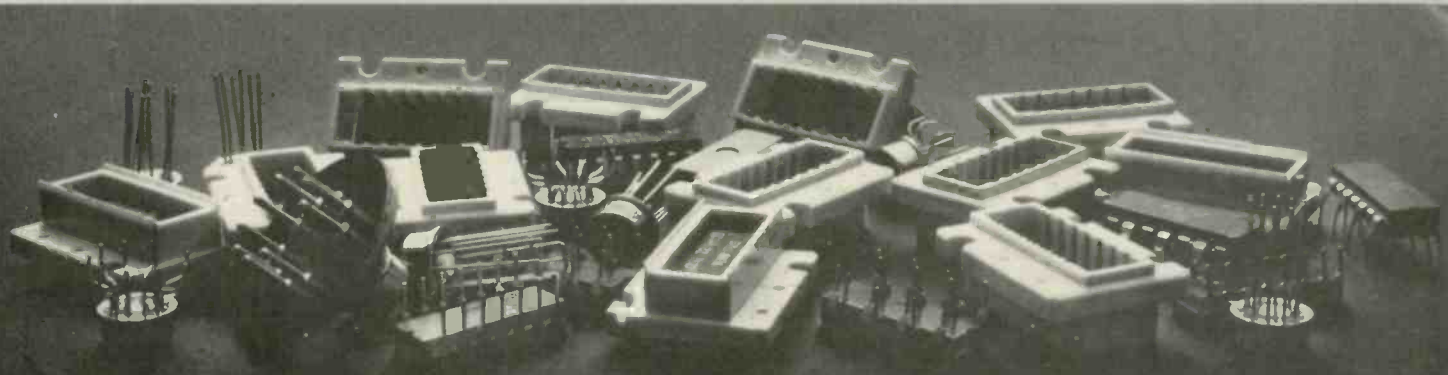
With Sylvania's 124 semiconductors you can handle almost all of your repair jobs right in your customer's home.

Stock up on Sylvania ECG semiconductors now.

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

Sylvania Electronic Components, Waltham, Mass. 02154

GTE SYLVANIA



Our 28 ICs replace...

To Be Replaced	ECG Replacement	To Be Replaced	ECG Replacement
CA3052	727	LM3028A	724
CA3053	724	LM3028B	724
CA3065	712	LM3053	724
CA3070	714	LM3065	712
CA3071	715	MC1303L	725
CA3072	713	MC1303P	725
CA3075	723	MC1304P	718
DM—11	709	MC1304PQ	720
DM—14	718	MC1305P	720
DM—24	719	MC1305PQ	720
DM—26	721	MC1307P	722
DM—30	721	MC1307PQ	722
EX4053	722	MC1314G	704
FF274	715	MC1328G	707
FL274	712	MC1328P	713
GE—IC2	712	MC1328PQ	713
GE—IC3	705A	MC1357P	708
GE—IC4	714	MC1358P	713
GE—IC5	713	MFC6010	703A
GE—IC6	715	N5111	708

and hundreds more.

Integrated circuits are still pretty new in TV and stereo equipment.

But Sylvania's ECG Semiconductor program really has those applications pinned down.

Today, just 28 of our ICs will replace over 300 type numbers.

We don't do it by magic, or by offering an "almost as good" replacement.

We do it by assigning our own part number to just one high quality IC that can be used to replace dozens of others.

And to make it easy for you, we've put together a replacement guide that tells you which of our ICs to use where.

Your customer won't know that you're not carrying 300 different ICs.

All he'll know is that you fixed his set fast, and fixed it right.

The fact that you only needed 28 IC replacements is your secret.

And ours.

In servicing, that can be the secret of success.

Sylvania Electronic Components, Waltham, Mass. 02154.

GTE SYLVANIA

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C.P.O., Box 1717

JUNE 1972 · VOLUME 94 NUMBER 6

Some tired electronic technician forgot to turn his instruments OFF before leaving for the night. More information concerning one instrument that didn't thus suffer from battery drain is included in the report on page 57. Photo courtesy of Triplett Corp.

FEATURES

A HARCOURT BRACE JOVANOVICH PUBLICATION

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Eastman Chemical Products, Inc. Industrial Chemicals Division

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

Introducing the expensive curve tracer that doesn't cost a lot.

The B&K Model 501A.

It's a lab-quality instrument that provides fast analysis of all semiconductors including J-FET's, MOS-FET's, signal and power bipolar transistors, SCR's, UJT's and diodes.

You can test transistors in circuit for GO/NO GO condition. Badly distorted curves will indicate the stage where a defective transistor or other faulty component exists.

The 501A is complete—with scope graticule and FP-3 probe for fast, one-handed in-circuit testing. It generates true current and voltage steps, with 3% accuracy, for measuring beta at all current levels. And it has a sweep up to 100 volts and 100 milliamperes.

$129.95

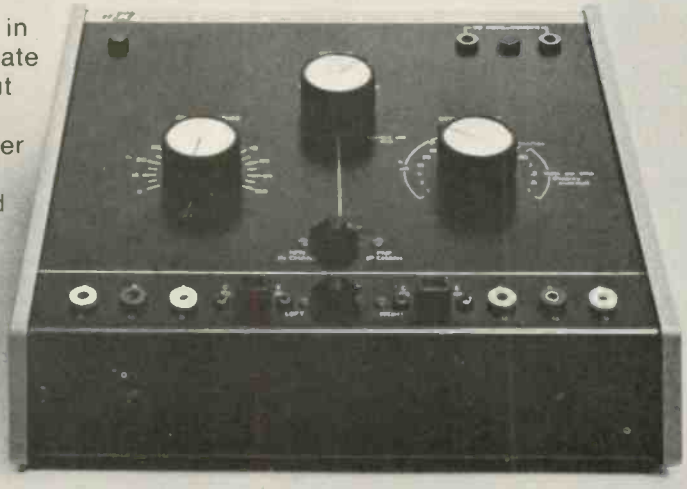
With the 501A, curves are displayed on an auxiliary scope screen. And you can hook it up to any scope—old or new.

All three controls can be set in quick-test positions to test and evaluate 90% of all solid-state devices without manufacturer's data sheets.

The 501A won't burn out either the semiconductors or itself.

With all these features, you'd think the 501A was an expensive curve tracer. But look at the price.

For complete technical data, call your B&K distributor. Or write Dynascan Corporation.



Very good equipment at a very good price. B&K

Product of Dynascan Corporation
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

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

A Bunch of Snobs

During my travels as editor of ELECTRONIC TECHNICIAN/DEALER, I have had an opportunity to make many new and lasting friendships. I have found that electronic technicians and service dealers are typically a friendly group, always ready to share their time and thoughts. Not once have I had the misfortune of personally encountering an electronic technician or service dealer that did not have at least a few likeable traits. Not one has acted like a snob in my presence.

However, during a recent trip to Indianapolis I had a lengthy visit with a service dealer from some other part of the country who complained to me about some snobs that are present in our industry. He spoke of the fact that some service dealers feel that they must act as though they are superior to the electronic technicians that they employ. They fear that given any sign of respect, "their men," will begin to attempt to run the store. They therefore severely limit any personal social contacts with their employees and refuse to join any associations that their employees might possibly join.

This service dealer complained that in one part of the country the situation became so bad that one evening when a group of service dealers felt compelled to attend a joint dinner with a group of electronic technicians, they arranged things so that the electronic technicians sat on one side of the room and they sat on the other side—at tables slightly raised above the floor level. If I had the misfortune of having to attend such a function, you can be certain that I would pull up my chair with the employees.

The service dealers that treat their employees with the least respect are generally the ones most fearful of unionization. Yet, it is their overreaction that may eventually force their employees to unionize.

Under some circumstances, I personally favor unions. I have been a union member and had hoped that the union would be more successful in its attempts to organize one company where I had been previously employed. Why? Because I felt that the job situation and employer attitudes warranted it. However, I also feel that the circumstances are different in the field of electronic servicing. There salary and promotions should be based entirely on one's servicing skills—not merely the length of time one has been able to stick out the job. Our profession requires too much use of the "independent spirit" for unionization to be desirable or practical—unless some snobs (due to their lack of personal security) make working conditions so bad that their employees have no choice but to unionize.

Our Duluth office has had a history of informality. Here everyone—the runners, clerks, computer programmers, editors, publishers and even the president—work together on a first-name basis. I have become so accustomed to such informality that I personally feel uncomfortable anytime someone calls me "Mr. Dahlen." It's "Phil" to everyone (no one can pronounce my last name—Dah-Lane—correctly anyway). But such informality has not resulted in a loss of personal respect.

A good example of a company that has not needed unions is Eastman Kodak Co., Rochester, N.Y. My grandmother and her sister retired from there. I have cousins working there now. Why no union? Because the company demonstrates an interest in its employees. It sponsors employee photography clubs, travel groups, has an employee auditorium and recreational facilities. Since no union could get them more, they haven't unionized.

Service dealers that demonstrate a personal interest in electronic technicians, encourage and support their membership in professional associations, and pay them a just wage (and I don't mean giving the shop away), have no need to worry that their employees will either form a union or turn a professional association into a union. Such enlightened service dealers will make certain that unionization isn't worth the effort—and all will benefit.

The service dealers that I know are not a bunch of snobs. They, and the professional electronic technicians that they employ, are concerned with upgrading our industry—not only becoming better professionals themselves, but helping the shop down the street do the same. There is enough business in electronic sales and servicing to keep everyone gainfully employed. With the use of proper professional skills, we should be so busy ringing the cash register that we haven't time to worry about personal egos.

Phillip Dahlen

NEWS OF THE INDUSTRY

Indianapolis Hosts Association Activities

On April 21, 1972 the Indiana Electronic Service Assn. was host to the NEA Quarterly Board of Directors Meeting, followed the next two days by the state association's annual convention.

Those arriving early on Thursday, April 20th, attended an afternoon tour of the RCA Color Picture Tube Plant in Marion, Indiana—bus transportation being provided by RCA. For everyone, including your editor, the tour was an extremely educational experience. Although we all had some understanding of the basic design and function of Color-TV picture tubes, we found that a great deal more could be learned by observing these efficient, well-lighted assembly lines.

Upon returning to the Ramada Inn where association meetings were held, everyone present was invited to a large RCA smorgasbord-style supper that could satisfy the hardiest appetite of any electronic technician or service dealer.

Later that night, while visiting in the hospitality center, your editor was publicly challenged by a disgruntled certified electronic technician. Did the editor actually know enough about electronics to be able to pass a CET examination? With the reputation of ELECTRONIC TECHNICIAN/DEALER at stake, the editor proceeded to take the examination—despite the late hour (nearly 11:00 p.m.), having been up much of the previous night with a crying baby, and not studying for the examination. With all of these handicaps, the score wasn't great, but he did pass the examination.

Although many topics were covered during the Friday board meeting, the greatest attention was given to the consideration of a new constitution, which will be presented to the members of NEA at the joint convention in New Orleans in August.

That afternoon there was a very interesting tour of the Howard W. Sams Co., where we were able to observe how they tear down consumer electronic products, photograph them, sketch the circuitry, draft schematics, and then finally print the SAMS PHOTOFACT. This was followed by a very enjoyable lunch in the company cafeteria.

At the evening banquet Morris L. Finneburgh, Sr., E.H.F., gave an impromptu speech. A surprisingly large portion of his talk concerned ELECTRONIC TECHNICIAN/DEALER's assistance in promoting Independent Service.

On Saturday there was an ISCET board meeting which your editor attended, plus a business school that Mr. Finneburgh covered. Mr. Finneburgh reported that the material —which was presented by Les Nesvik, and which will be presented again at the joint convention—was of *exceptional* quality! A *must* for any service dealer!

Phillip Dahlen, your editor, was the Saturday evening banquet speaker. Although much of his speech concerned the future of electronic sales and servicing—covering material similar to that in the May Editorial—an addendum to the speech stressed the importance of uniform servicing standards across the nation and the tremendous need for a *united* professional service association that could underwrite its own insurance needs, correct the parts problem and have considerable influence over the quality of electronic products placed on the market.

On Sunday the IESA had a breakfast, conducted its business meetings, and concluded with a luncheon.

Phillip Dahlen, editor of ELECTRONIC TECHNICIAN/DEALER, speaking at the Saturday evening banquet. *Photo courtesy of Dick Glass, CET.*

PTS Electronics Expands To Offer Tape Deck Service

PTS Electronics, Inc., has announced that in addition to servicing TV tuners, their services have been expanded to include the repair of all eight-track and cassette tape decks. These units can reportedly now be repaired at any of their branches within 24 hours for $9.95 plus parts and shipping —all work being guaranteed for 90 days.

Second T Day Scheduled for June 15th

With the first T day being such a great success, plans are now underway for a second T day on June 15, 1972. Those who have not yet taken the test should investigate now, before this second date also passes by.

This month we are printing Part IV in a series of questions and answers that are of the same type as those in the section of the CET Exam entitled, "Transistors and Semiconductors."

Section IV

Transistors and Semiconductors

1. What do the initials MOSFET and IGFET mean?
2. Why must the MOSFET have special care in handling?
3. Gate current can turn (ON/OFF) an SCR.
4. What phase relationship exists between an input signal and output signal of a common-base transistor amplifier?
5. A varactor diode is normally reverse biased. True or False

Explanation

1. MOSFET are the initials for metal-oxide-semiconductor field-effect transistor which is sometimes referred to as an IGFET, insulated-gate field-effect transistor.
2. Since the dielectric in a MOSFET is very thin, electrostatic voltages can easily puncture it. Some of the newer MOSFET's have built-in diode protection.
3. On. Once an SCR is turned ON or fired, the anode-cathode current must be reduced to near zero in order to switch the SCR OFF.
4. The common-base output voltage is in phase with the input voltage.
5. True. A varactor diode depends on the depletion region acting as a dielectric. Reverse bias is varied to vary the width of the depletion region to vary the dielectric—thus varying the effective capacitance.

LETTERS

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

CB Article Unethical

Referring to your editorial in the December 1971 issue, you state that you were shocked about a certain publication that told John Q. Consumer how to replace his own color picture tube. Well, I fully agree with you, it was a stupid thing to do.

The reason I am writing to you is to say that I feel you made a blunder that in comparison is just as big, if not bigger—publishing the article on how to service CB radios in the February 1972 issue.

I base my opinion on several factors, beginning with: Your article states, in one sentence only, that you must have a First or Second Class FCC Commercial License in order to adjust the transmitter—then tell, step by step, how to adjust the transmitter. No where in the instructions or article did I find the reason why a First or Second Class Commercial License is required.

The article doesn't mention the fact that the radio must comply with very rigid tolerances set forth in Volume VI, Part 95, Subpart C of the FCC Rules and Regulations (as an example, the frequency is only allowed to deviate approximately 1350Hz out of 27,000,000Hz, a tolerance of only 0.005 percent or 0.00005).

The article doesn't mention the fact that heavy fines can be incurred for violation of FCC rules, and it doesn't mention the fact that it takes fairly elaborate equipment to insure compliance with FCC rules.

Your publication is aimed primarily at the TV shops, you can plainly see that by the nature of the majority of articles you print. And may I say that it is a good publication for this purpose. However, if a person is properly qualified and licensed to service CB sets, he certainly doesn't need this article. He already has this information. If he didn't, he wouldn't have a license. If a person is not qualified and licensed, then he has no business with this information or working on CB sets.

Speaking professionally as a First Class FCC Commercially Licensed technician who has specialized in CB repair for approximately five years, I can assure you that one of the major problems that I meet in my work is unqualified people butchering, and I mean butchering, or badly misaligning CB radios due to a lack of knowledge or sophisticated test equipment or both.

I close by saying, you've made my job and that of other qualified, licensed CB technicians just so much harder, and I personally feel that you are assisting people in breaking FCC rules by intriguing unlicensed personnel with articles of this nature.

ROBERT D. PARSONS

No Business Printing CB Article

I feel that you really goofed in the February issue of ELECTRONIC TECHNICIAN/DEALER by printing the article on servicing CB radio.

In the past you have taken a stand against the newsstand electronic publications for furnishing the information for home TV service to the general public and encouraging such action in spite of the hazards to life, health and property involved. In your article on CB service, you have done a similar thing by showing thousands of technicians how to service CB radios in spite of the fact that they may not be legally qualified to perform these services unless they hold a current FCC Commercial First or Second Class Radio Telephone license and own FCC approved test equipment.

In the February article by C. A. Tuthill, you have a mild warning of the FCC requirements, then you proceed to furnish rather complete service information—including transmitter alignment. The article was quite well written and should provide all the information necessary for many TV service people to repair the HB 625 transceiver and other similar units—and then promptly end up in a federal penitentiary and/or pay a stiff fine if they do not hold a current FCC license of the proper class, and the FCC decides to make an example of their case.

As a holder of a current FCC First Class Radio Telephone License and formerly working in the two-way radio field, I am quite aware of what someone must do to service any two-way radio. First, he must have a proper license, which requires considerable study and knowledge. Then he must obtain the proper FCC approved frequency and modulation meters, besides the normal electronic repair instruments. The specialized test equipment alone can cost several thousands of dollars.

Presently, I am actively engaged in CATV, MATV and TV-set sales and service, but do not service CB radio because I do not feel that I can handle the volume of CB work necessary to pay for the specialized equipment needed for CB—on top of my other work. If I cannot service equipment properly and legally, I would rather not risk the penalties that might be involved.

I would strongly suggest that other electronic technicians keep "hands off" CB radio unless or until they are properly licensed and equipped to do this work legally. The FCC penalties are too strict to ignore.

I would also feel a lot better about ELECTRONIC TECHNICIAN/DEALER if you did not furnish the information to electronic technicians to service equipment that has special license requirements for service. In spite of the fact that most technicians are honest, the sad fact is that some are not, and there is a strong possibility that your article may encourage more abuses in an already very badly abused area. Most reputable manufacturers will furnish service information to qualified service facilities. Perhaps in this area it would be better not to publish information that could be used illegally.

There are many other areas of interest and profit making potential that could be covered in future articles in detail, without encouraging illegal action. These include: CATV service, MATV service, commercial sound, background music, home and business security systems, home and business intercom systems, depthfinders, electronic music instruments, etc.

C. ROBERT PARSONS

Bob phoned us at his own expense right after the February issue came out; and although we did not completely agree with his position, we requested that he send us this letter so that other readers would become better aware of the dangers of servicing CB transceivers when not qualified.

We are in complete agreement with Bob when he says that you must keep a hands-off policy unless you are licensed and your shop is adequately equipped. We were probably in error in not stressing this point more in the CB servicing article.

We still hold to our previously stated position that no publication (newsstand or otherwise) is responsible if it encourages people off the street, or even unqualified electronic technicians, to attempt jobs that they are not technically or legally qualified to handle.

We have provided CB servicing articles for two purposes. First to show the unqualified electronic technicians how easy CB servicing is—thus encouraging them to enter the field once they have become licensed and obtained the proper instrumentation. Sec-

continued on page 66

READERS' AID

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

For Sale

I have back issues of ELECTRONIC TECHNICIAN/DEALER that I would like to sell.

MRS. R. FLEISCHER
68-30 Fleet St.
Forest Hills, N.Y. 11375

I have the following available for sale: a marker adder, a crystal calibrated marker generator, a sweep generator and a capacitor analyst. All articles are in excellent condition. Probes and manuals are included.

JEROME MEYER
221 N. First St.
Harbor Beach, Mich. 48441

I have 70 plug-in Crystals—mixed lot, plus an assortment of tubes for sale.

THOMAS E. DIXON
Box 454
Harvard, Nebr. 68944

I have 962 Sams Photofact sets that I would like to sell (as a group only). They date back to set No. 1. The last 400 sets have never been used. All sets are in excellent condition. If anyone is interested I would be glad to state price, etc.

GEORGE F. POMIAN
1723 Catalpa Ln.
Mt. Prospect, Ill. 60056

I am closing shop due to illness, and am selling my Sams folders for $1.00 each. Send the list numbers needed.

DUTCHESS RADIO SERVICE
Box 105
Flushing, N.Y. 11355

Wanted

I would like an RCA WR 99A crystal calibrated TV marker generator.

MICHAEL BRADY
R. A. V. Service
461 North Harper
Los Angeles, Calif. 90048

I would like used Sams A. R. manuals to complete my set.

PAULMER WILLIAMS
106 South Jefferson St.
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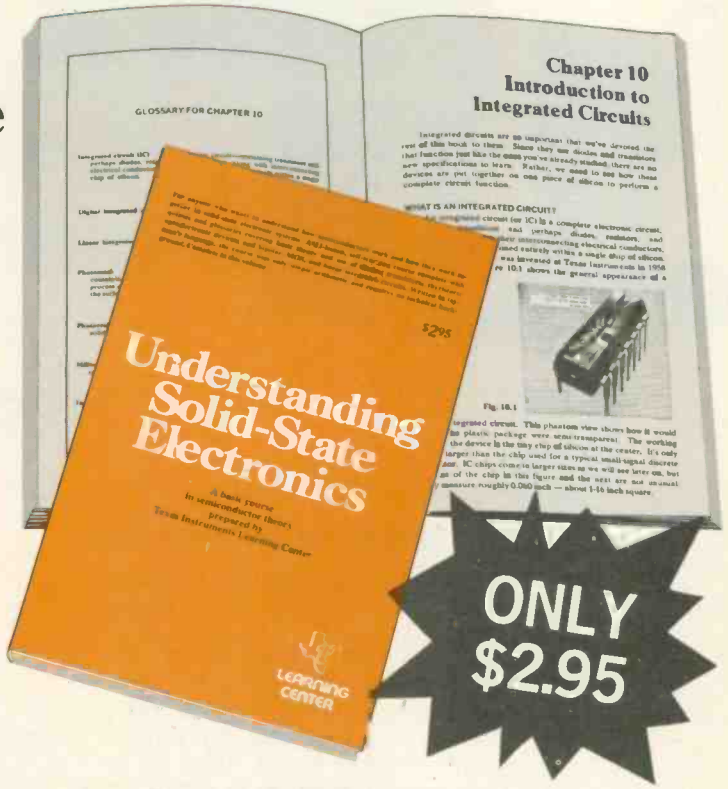

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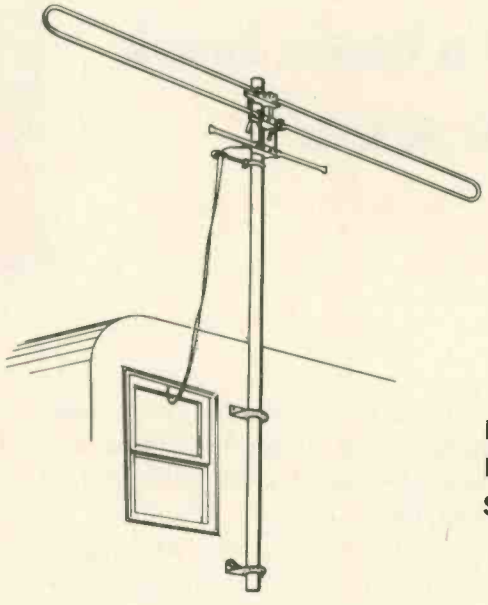

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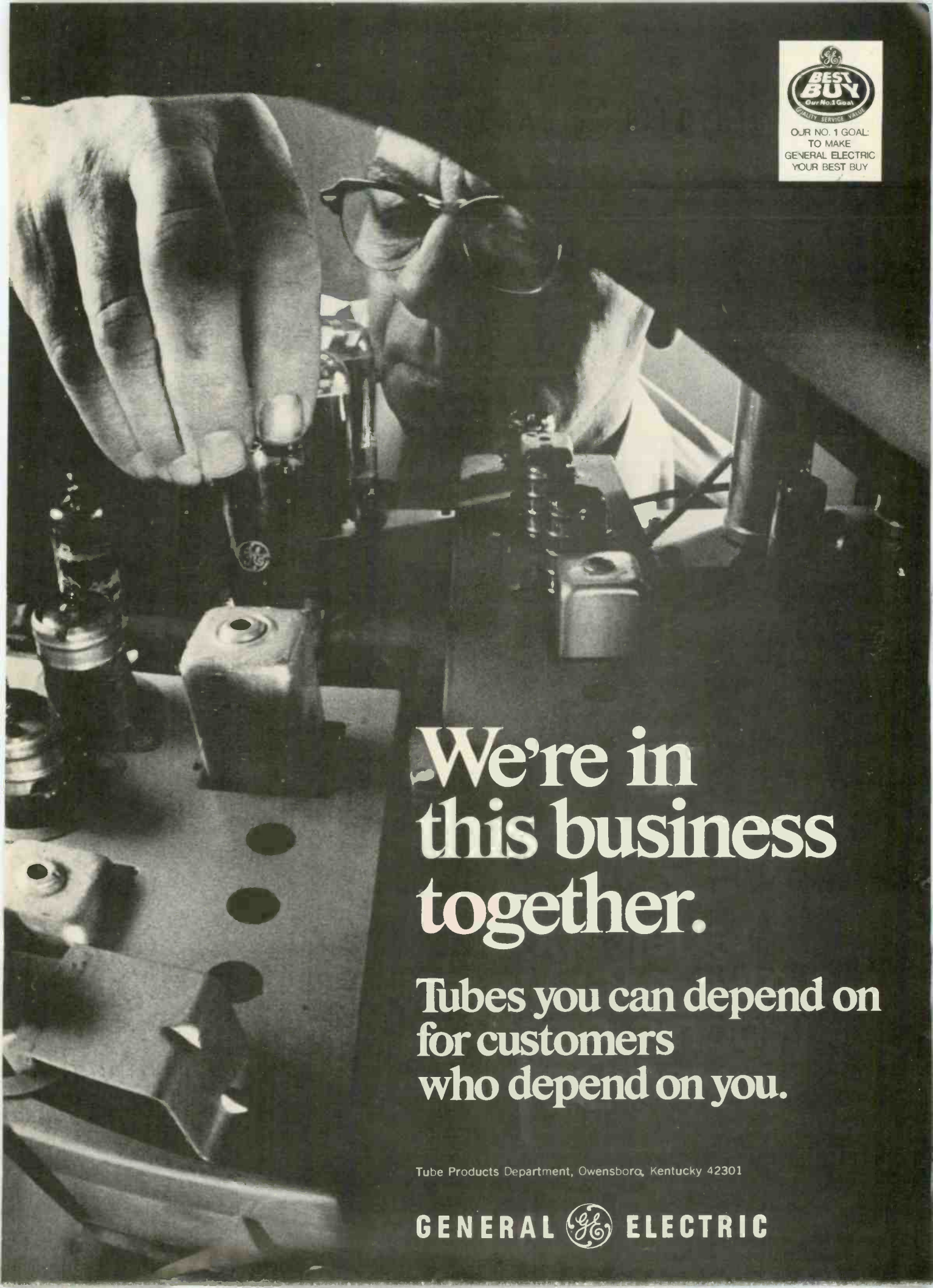
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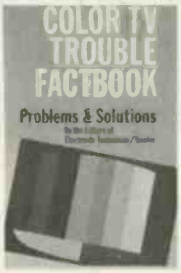
Color TV Trouble Factbook



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

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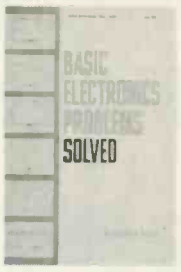

Here are easy step-by-step solutions to basic electronics problems in a convenient one-stop source dealing with both solid-state and tube-type circuits. The content not only presents a detailed explanation of each point, but also provides many actual examples on how to work out problems. Then, to firmly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

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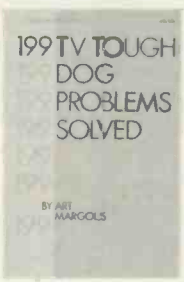
199 TV Tough-Dog Problems Solved



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

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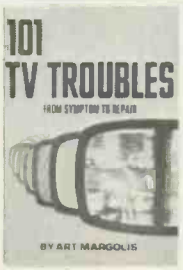
101 TV Troubles: From Symptom to Repair



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

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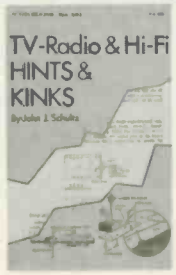

If you want to get the best performance out of consumer electronics equipment, you'll find this to be the most informative and useful handbook ever published. Over 150 ideas suggest ways to customize and add accessories to any equipment setup—how to connect single and multiple accessory speakers, how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

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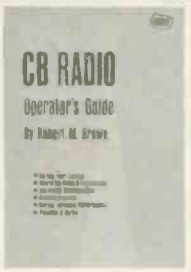

An all-in-one handbook on Citizens Band radio, and how to make the best use of available equipment. Tells you everything you must know to get on the air, with complete details on what you can and can't do right down to the "nitty gritty" rules and regulations! What's more, you receive expert advice on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

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TEKLAB REPORT

Philco-Ford's Model C4870AWA Color-TV Set

Now two tiny integrated circuits mounted in their own individual plug-in sockets make up most of the chroma and sound circuits

by Joseph Zauhar

■ Many television dealers are reporting that portable color-TV sets are becoming a major part of their sales volume. And Philco-Ford has strengthened its selection of portable screen sizes by adding a 19-in. (measured diagonally) color-TV set. Each year we find more and more automatic electronic circuits added for a more precisely tuned picture, and which help do away with tuning confusion. "Philcomatic" is Philco-Ford's trade name for the new simplified color tuning in the Model C4870AWA portable color-TV set described this month. It employs the 22LT45 chassis, which in many respects is similar to the 20QT76 chassis with a number of new circuits—21 circuits providing automatic functions.

As we unpacked the TV set, which included a deluxe rollabout stand, we noted that the cabinet did not have a single exposed control on the front panel. The UHF, VHF channel selectors, VOLUME, TINT and COLOR controls, plus the push-button ACT and ON/OFF switch, are hidden behind a panel door which blends in with the cabinet. The VERTICAL, CONTRAST and BRIGHTNESS controls are located on the top rear edge of the cabinet within easy reach. An external speaker jack is mounted on the front of the cabinet next to the front-mounted 5-in. oval speaker.

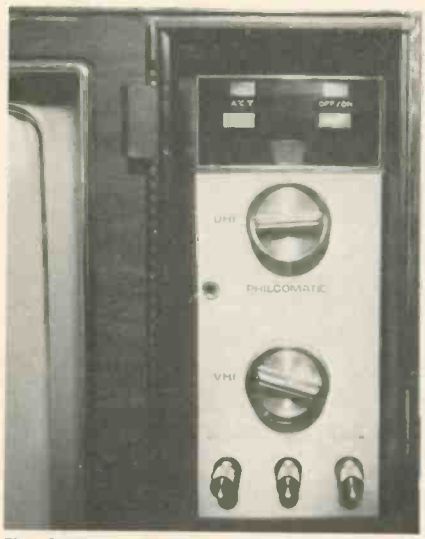
If servicing is required, just remove five screws and slide the cabinet cover off. The chassis is then exposed, including the underside of the circuit boards for easy component removal. We also noted that the convergence board is placed around the neck of the picture tube. This feature conserves cabinet space and requires only a short wire harness which is connected to the convergence board with an edge connector socket. The convergence assembly also includes the lateral magnet and purity assembly.

The 22LT45 is a transformer powered, hybrid color-TV chassis employing 15 transistors, 3 integrated circuits and 7 tubes, excluding the 19VATP22 picture tube. The deflection panel employs a 6JZ8 vertical oscillator/output tube and a type 6BL8 horizontal reactance/

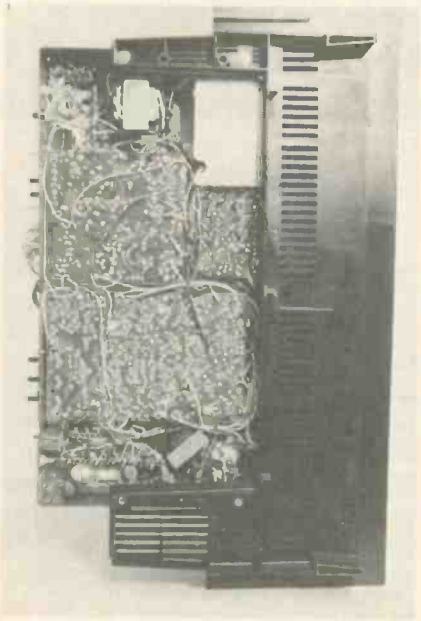
Philco-Ford's Model C4870AWA 19-in. (diagonally measured) portable color-TV set includes a deluxe rollabout stand.

oscillator tube. The horizontal circuit employs a 6JS6A horizontal output tube, 6CG3 damper tube, and a 3DC3 high-voltage rectifier tube. A 12GN7 video output tube and a 6ML8 color difference amplifier tube are employed on the chroma and sound panel.

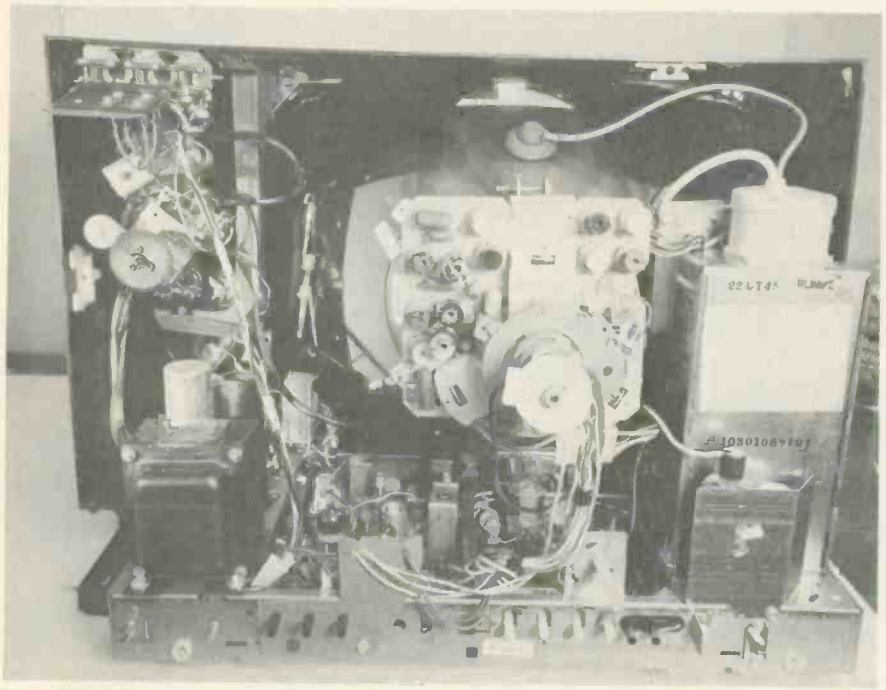
After we turned the TV set ON, a red indicator light on the control panel caught our eye. According to the manufacturer, this indicator, part of the "Philcomatic" system, glows when a color program is being received. This color indicator can also be used as a tuning aid for the customers. As we misadjusted the FINE TUNING control, the indicator light went out. This light is used in conjunction with the Auto-Lock Channel Tuning (ACT), which fine tunes the picture. When the light is ON, we are receiving color and the picture is properly tuned. This feature can also be used as a service aid in isolating chroma troubles ahead or behind the color IC.



The front panel customer controls include a "Color Lite" indicator. When the control panel door is closed, all controls are hidden.



The rear cover has been removed and the TV set tipped on its side for the easy removal of components.



Rear view of the compact 22LT45 color-TV chassis showing the service adjustment controls.

As we review some of the new circuits, they can be followed in the February Tekfax schematic, No. 1401. To make servicing of this chassis even easier, not only the waveforms and voltages are shown on the schematic and service information, but the resistance measurements for the pins of the transistors and tubes are also given with signal applied and without signal.

Color Light Indicator Circuit

The color light circuit (Fig. 1) is quite simple and consists of a transistor (Q97) and a few resistors. This circuit operates in the following manner: When chroma sideband information is present, the second chroma stage, transistor Q94, draws enough current to drop the voltage at the junction of resistors R128 and R129. This negative-going voltage is applied to the base of a PNP transistor, Q97, forward biasing it into heavy conduction. As a result, heavy current flows from ground through the Philcomatic Lite, resistor R116A, transistor Q97 and resistor R114A to the 20v supply. This current causes the light to glow, and it will continue to glow as long as color information is present.

Video IF and Detector Circuits

This chassis employs a transistorized three-stage video IF amplifier with maximum trapping used in these circuits. The trapping includes a 47.25MHz trap at the first IF input. There are three stages using the 41.25 trap, two stages as part of the first and second video IF coils, plus the third video IF stage which provides improvement in 4.5MHz and 920kHz rejection. A 39.75MHz trap is also employed in series with the output of the second detector diode. The SOUND REJECT control is no longer used, but the 4.5MHz trap remains unchanged.

This chassis contains a completely new chroma and sound circuit panel. Two new 14-lead IC "H" chips mounted in individual plug-in sockets are used to simplify servicing of this chassis. One IC is used as a 4.5MHz amplifier/sound demodulator and the other is used as the 3.58MHz oscillator/reactance/and demodulator. Another feature,

which makes this board different from previous ones, is the quad coil sound system used—instead of ratio-detector-type circuit.

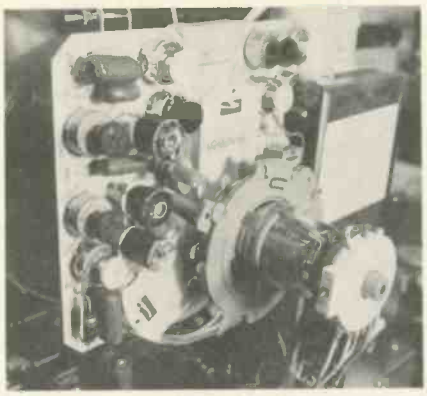
The color IC has condensed the color circuits by eliminating three of the eight transistors previously employed, plus the individual 3.58MHz color oscillator IC. The three transistors that have been eliminated are normally for the X demodulator, Z demodulator and buffer.

3.58MHz Oscillator, Reactance and Demodulator Circuits

The basic circuit layout used in the color APC loop (Fig. 2) is the same as that used in the 22QT79/80 chassis. The new color IC (IC92) is shown divided into three distinct sections, the 3.58MHz chroma reference oscillator with buffering, a reactance element for reference oscillator control, and X and Z chroma demodulators.

The chroma signals are applied to the burst amplifier transistor, Q93, where burst separation is accomplished. This burst signal is then coupled to the color-killer and color-phase detectors. Two buffered outputs from the 3.58MHz reference oscillator, which is part of the IC, constitute the second signals applied to the detectors. These 3.58MHz reference signals are applied through Pins 4 and 5 of the IC. There is 0° and 180° phasing between the burst and reference oscillator to the color killer detector, and 90° and 270° phasing to the color phase detector. Correction voltage from the balanced color phase detector is applied to the varactor in the IC through Pin 2.

This correction voltage controls the frequency and phase of the reference oscillator in step with the burst signal. The killer phase detector output is a positive going dc voltage, which is proportional to the burst amplitude and is applied to the base of the color killer transistor, Q92, for ACC and color-killer functions. Chroma side band information is applied through Pin 7 to the chroma demodulators in IC92. The tint control circuit—consisting of a potentiometer, VR201, in series with a 150pf capacitor and a 12μh coil—is placed between Pin 7 and ground. Moving the potentiometer arm changes the phase of the chroma sidebands, altering the phase angle of demodulation or correcting color-hue errors. Diodes D96 and D97 are limiting diodes. One conducts on the positive half cycle of the chroma sidebands as soon as the junction barrier potential of about .65v is overcome, while the other conducts on the negative half cycle after the signal overcomes the diode junction barrier.



The convergence board includes the lateral magnet and purity assembly placed around the neck of the picture tube to conserve cabinet space.

The B-Y and R-Y color difference signals, removed from the IC at Pins 9 and 10 respectively, are then applied to the color-difference amplifiers, just as in other chassis such as the 22QT79/80.

IC Color Circuits

When troubleshooting the color circuits, it may prove helpful to know how these circuits function within and around the IC. Then direct substitution is simplified by employing a plug-in socket on the

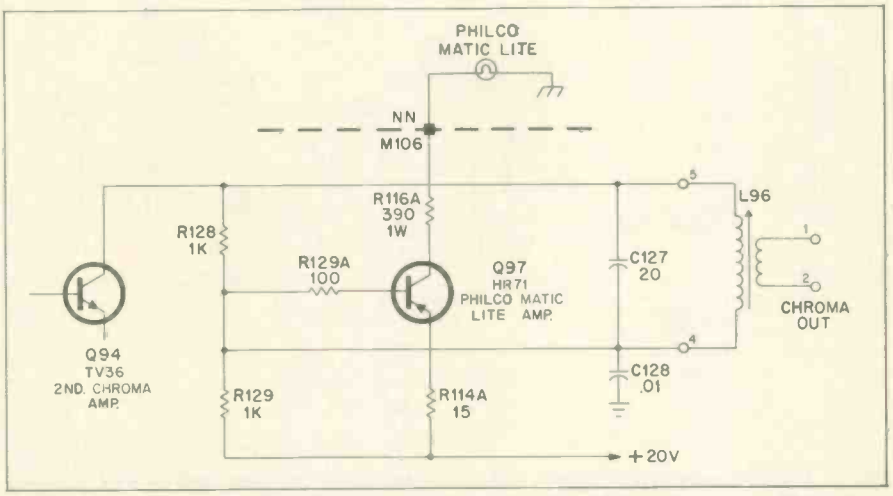


Fig. 1—The Color Lite circuit consists of a transistor and a few resistors. *Courtesy of Philco-Ford.*

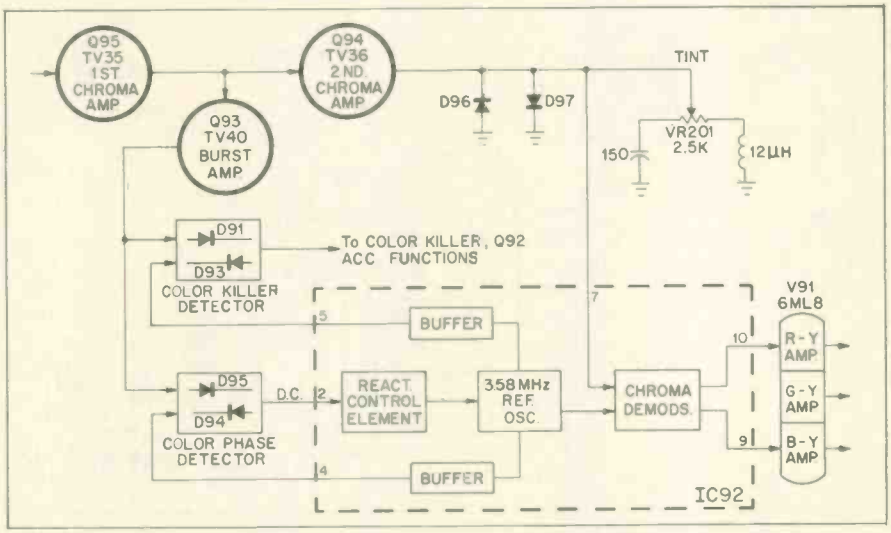


Fig. 2—Block diagram of the basic circuit layout used in the color APC loop. *Courtesy of Philco-Ford.*

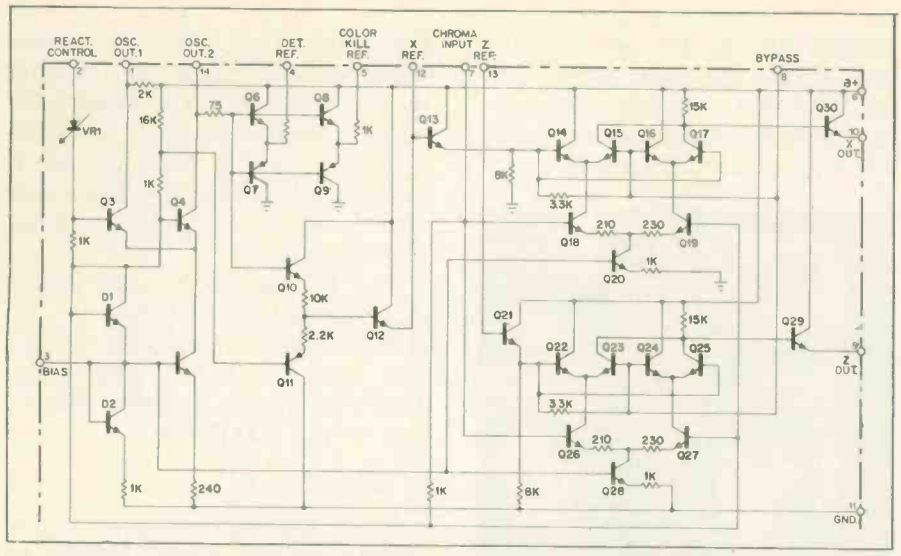


Fig. 3—Schematic of the oscillator/reactance/demodulator, chroma integrated circuit (IC92). *Courtesy of Philco-Ford.*

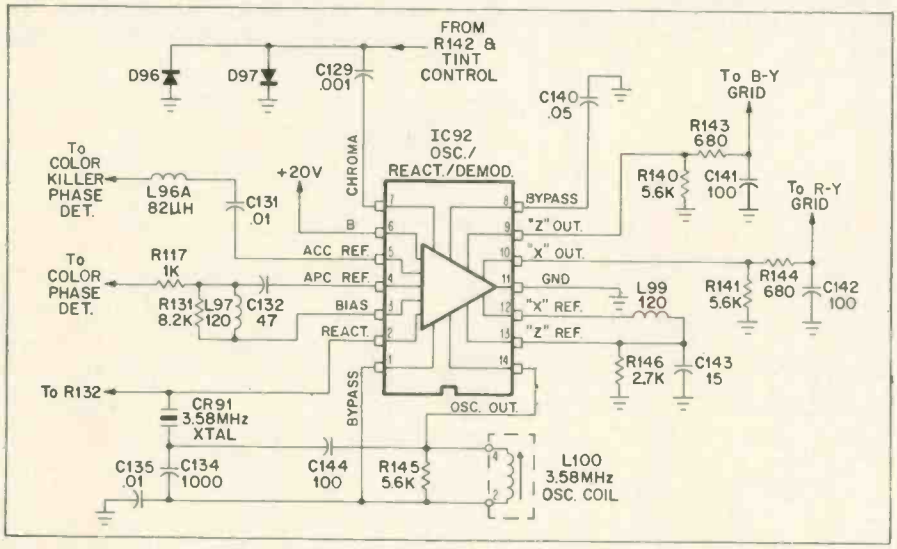


Fig. 4—Simplified schematic of chroma integrated circuit IC92 and associated circuits. *Courtesy of Philco-Ford.*

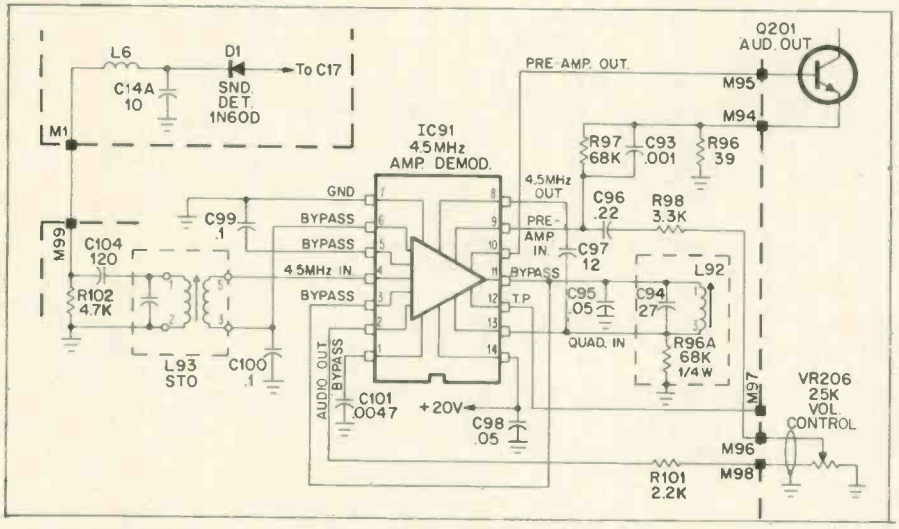


Fig. 5—The 4.5MHz sound amplifier and demodulator integrated circuit, IC91, and associated circuits. *Courtesy of Philco-Ford.*

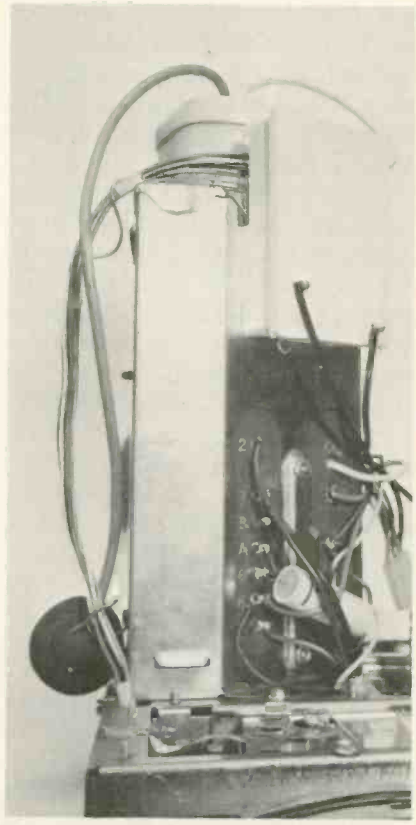
chassis for the color IC.

The small color IC chip (IC92—Fig. 3) contains 26 transistors, 4 diodes, 1 varactor and their associated circuitry. A temperature compensated differential amplifier containing three transistors and two diodes make up the color oscillator circuit included in the chip.

Within this oscillator circuit there are four oscillator buffering transistors. One pair of buffer transistors, Q6 and Q7, are used to drive the phase detector circuitry. In Fig. 4 we see that the phase angle of this signal is controlled by a 47pf capacitor (C132), a 120μh coil (L97) and a 8.2K resistor (R131) connected to Pin 4 of the IC. The adjustable 3.58MHz tank coil and associated capacitors are connected between Pins 1 and 14 of the IC.

A second pair of buffer transistors (Fig. 3—Q8 and Q9) buffer the oscillator to drive the color-killer reference detector. The signal phase is controlled by coil (L96A) associated with the color-killer output/ACC—Pin 5 of the IC.

Transistors Q10, Q11 and Q12 provide additional reference signal



Focus voltage for the picture tube is obtained from the focus bleeder resistor network mounted on the side of the high-voltage cage.

buffering. Their output is applied directly to the X demodulator through transistor Q13, and shifted in phase by an RLC network consisting of R146, L99 and C143 connected between Pins 12 and 13 of the IC. This network sets the demodulator angle between the X and Z demodulator and is applied to the Z demodulator through transistor Q21.

Reactance control is maintained by varactor VR1. This reactance control is similar to the varactor control operation used in the 20KT40 chassis.

The X and Z demodulator portion of the IC is composed of 18 transistors. The color reference oscillator signal is injected into the bases of the X and Z input transistors, and the chroma information into the bases of another two pairs of transistors (the current sources) Q18 and Q19, plus Q26 and Q27. The X and Z demodulated signals are fed to emitter-follower transistors Q30 and Q29 respectively. The X and Z demodulator outputs (Pins 9 and 10 of the IC) produce color drive signals which are matrixed in the 6ML8 external color difference amplifier tube, V91.

4.5MHz Amplifier and Sound Demodulator Circuits

A new sound IC (IC91) is used in this chassis. It functions as the limiting IF amplifier, the quadrature detector and the audio preamplifier and driver sections. This IC contains 22 transistors, 7 diodes, a zener diode and 21 diffused resistors. This 14 lead dual-in-line plastic package is plug-in mounted on the chroma panel.

Conventional type circuits are employed for sound take-off from the IF and detector panel, Fig. 5. The sound take-off diode detector (D1) develops the 4.5MHz sound IF signal by mixing the video and sound carrier signals, and then applying them to the sound take-off transformer (L93). This transformer couples the sound IF to IC Pin 4, which is the limiting IF amplifier section of the IC. Other circuits external to the sound IC—but associated with the 4.5MHz amplifier, demodulator and audio output amplifier—include the following: A quadrature coil and tuned circuit connected between Pins 11 and 13, the volume control circuitry connected to Pins 2 and 9; and the audio output connected to Pin 10 of the IC. Bypass capacitors, used for decoupling, are connected to Pins 1, 5, 6 and 11. The 20v power source is applied to Pin 14, and the ground is connected to Pin 7.

The limiting IF amplifier, which is contained in the IC, consists of three differential pairs of transistors and

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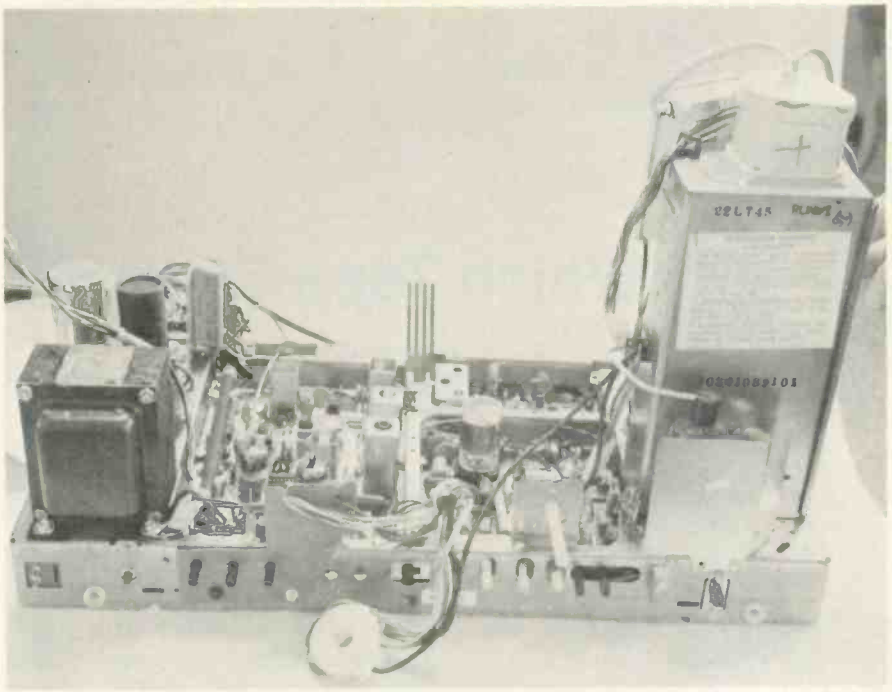
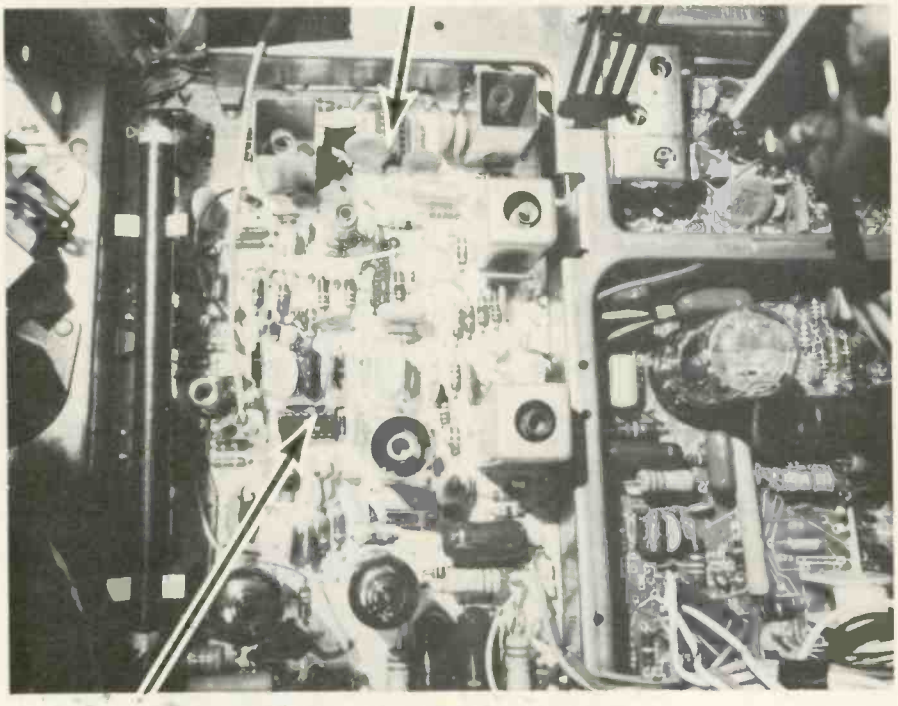


A top view of the transformer-powered hybrid 22LT45 color-TV chassis, which employs 15 transistors, 3 integrated circuits and 7 tubes—excluding the picture tube.



The chassis employs a completely new chroma and sound panel with two IC's mounted in plug-in sockets. One is used as a 4.5MHz amplifier/sound demodulator and the other is used as a chroma 3.58MHz oscillator/reactance/demodulator.

Which Tape System?

When your customers are thinking of buying a tape music system, they may choose among three incompatible tape formats—open reel, cartridge and cassette

■ Five years ago, less than four percent of all recorded music sold in the United States was on tape; the balance, of course, was on records. In 1971, tape's share was a hefty 33 percent and further gains are expected this year, according to Ampex Corp., a leading producer of tape and recording equipment.

The principal reason for this boom is the emergence of convenient and compact cartridge and cassette tape recorders, although in some circles the popularity of the open reel tape format is still increasing. The following comments are designed to help you more intelligently assist your customers as they decide to select one of these three systems to fit their particular needs.

Open Reel

The oldest form of tape music is open reel, or reel-to-reel, which was the only available format until the mid-1960's when cartridge systems began to appear. It appealed to critical listeners because of its high quality sound reproduction. However, because of the relative complexity of threading tape on reels and the smaller supply of recorded music available on tape reels, the open reel recorder has not achieved mass acceptance for music playback. It remains a favorite tool of the serious music lover, high-fidelity enthusiast or recording hobbyist.

Most of the open reel recorders sold today are called "decks," i.e., recording and playing mechanisms without amplifiers and speakers. Decks may be joined with high-fidelity systems or components. Good to excellent quality decks range in price from $200 to $700. Complete systems, including a tape deck, receiver (amplifier/tuner combination) and speakers may range from $600 to several thousand dollars, depending on how demanding your customer is.

An open reel deck combined with the other system elements is in many respects the finest home music source there is. For long selections like operas, the long playing time of open reel tapes is a distinct advantage. The sound quality of a recorded tape is generally the equal of the finest discs when played on equipment of comparable quality; while after a number of playings, tape may be noticeably better, because of record wear.

If used solely for playing back professional recordings, the open reel deck has some disadvantages compared with the record player. A good quality recorder deck costs more than a good quality record changer. Tape threading still seems difficult to many people compared with starting a record. With tape, it is less convenient to play a specific part of an album since the tape must be advanced or rewound to a desired selection with the aid of a tape footage counter. With a phonograph, of course, the stylus is simply picked up and placed on the desired spot.

Open reel recordings are much less readily available than records. In fact, as retailers stock increasing numbers of cartridge and cassette recordings, inventories of open reel selections have actually declined.

Eight-Track Cartridge

More recorded tape music is sold in the eight-track cartridge format than any other. The eight-track cartridge—a plastic box about the size of a paperback book containing an endless loop of tape—should not be confused with the four-track cartridge, an earlier format which has largely disappeared from the market.

Since introduced by Lear Jet in the mid-1960's, eight-track cartridge sales have grown phenomenally. Primarily for use in auto stereo systems, the cartridge has recently made headway in the home market. In 1971, more than half the eight-track units sold were auto systems.

A major advantage of the eight-track cartridge format is operating convenience. The cartridge is merely inserted in the player and begins to play. It plays a complete album over and over again with only brief interruptions while it switches automatically from one pair of tracks to the next. Three such interruptions occur on each album-length tape. Another advantage is cost. Eight-track auto systems range from $50 to $100. Home decks start at $100. Quality systems range from $150 to $300.

There are disadvantages to the cartridge format. Sound reproduction cannot approach that of open reel or good quality phonographs, although the highest sound quality

is not to be expected in moderately priced units and automobile players. Because the endless loop design involves constant tape-against-tape movement, eight-track tapes are lubricated to assure continued smooth operation. After many playings, however, the lubrication may begin to wear, and occasionally the tape will jam within the cartridge.

Another disadvantage is the lack of a rapid rewind capability common with open reel and cassette decks. Rewinding permits you to repeat a specific selection or return to a certain position on the tape for recording. Most eight-track units offer a push-button advance which permits movement from one pair of tracks to the next and fast forward capability. But the absence of rewind capability makes it more awkward to produce recordings or locate individual selections with cartridge equipment than with the other formats.

As you know, recorded music is available in three major tape formats: open reel, eight-track cartridge and cassette. Open reel (left) is the familiar reel of tape and is the choice for high-fidelity and classical music because of its high quality and long playing time. Eight-track cartridge (center) contains a single endless loop of tape in a plastic case and is most commonly used in automobile players. The cassette (right) holds two tiny reels of tape in a plastic case and is one-fourth the size of the cartridge. According to Ampex, it is the most convenient format because of its size, ease of operation and portability.

Cassette

Cassette tape recorders, developed by Philips of Holland, were first available in monaural battery-operated portable models for voice recording. Stereo units for home recording and music playback were introduced in 1966. Ampex was the first U.S. company to offer stereo cassette systems in 1967. Cassette auto stereo systems have been available for several years as add-on accessories. Manual cassette recorders have all but replaced open-reel recorders in the under $100 range, and stereo cassette systems are achieving widespread acceptance in the home. Cassette auto systems have made only modest inroads in the auto stereo market, where the eight-track cartridge remains dominant.

Cassettes, like cartridges, are no match for open reel tape or phonographs in terms of sound reproduction quality. There is little measureable difference in sound quality between the cassette and cartridge, but new developments in tape and equipment can significantly enhance the quality of cassette sound for an additional cost.

One new development is the Dolby noise suppression system, which modifies the record and playback signal electronically to significantly reduce the amount of hiss or noise heard when playing the tape. The Dolby technique is one of three or four noise suppression systems, but by far the most widely accepted. Dolby systems are incorporated in some higher priced recorder/players and may be purchased as accessories for existing units.

Other improvements, involving the tape itself, have been developed for those who enjoy recording on their cassette systems—extended frequency tapes and chromium dioxide tapes, available at extra cost, are specially formulated to permit faithful reproduction of the full range of sound.

Compactness, versatility and economy are important virtues of the stereo cassette system. The cassette itself is about one-fourth the size of a cartridge, and the recorder or player also can be more compact. A cassette consists of two tiny reels of tape encased in a plastic box instead of the endless loop of tape in a cartridge. Cassette tape does not have to be lubricated. Like open reel, but unlike cartridges, cassette tapes can be reversed at high speed to locate individual selections.

Automobile cassette stereo systems are making some headway in competition with the eight-track cartridge because of smaller size. A glove compartment will hold three to four times as many cassettes as cartridges. Newer cassette auto stereo systems have an automatic reverse system so that both sides of an album may be played without handling, and the cassette can be cued to repeat itself.

Stereo cassette equipment ranges in price from $100 for a simple "deck" to $500 for a top of the line system. Auto players sell from $60 to $130.

Four-Channel Sound

An exciting new development in recorded music is four-channel or quadraphonic sound, which broadens the musical experience by breaking the performance into four parts rather than the two used in stereo. In the best of cases, listening to quadraphonic recordings is like being surrounded by an orchestra. So

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Temporary Fixes for Etched Circuit Modules

Many of the newer solid-state circuit modules use very critical values to achieve correct operation. The trend is toward using a complete replacement unit or subassembly whenever a value becomes so far off as to prevent the correct operation of the whole module. But sometimes such a module may not be readily enough available to get the consumer electronic product back into service when wanted.

by Norman Crowhurst

■ When replacement modules are not readily available, it may be desirable to use some sort of "makeshift" technique to repair the original defective module. Although in most instances these modules become defective because of a faulty semiconductor, or maybe even a faulty capacitor, there are cases when the trouble results from a slight change in resistor values as a result of heat. This article is primarily concerned with this latter component.

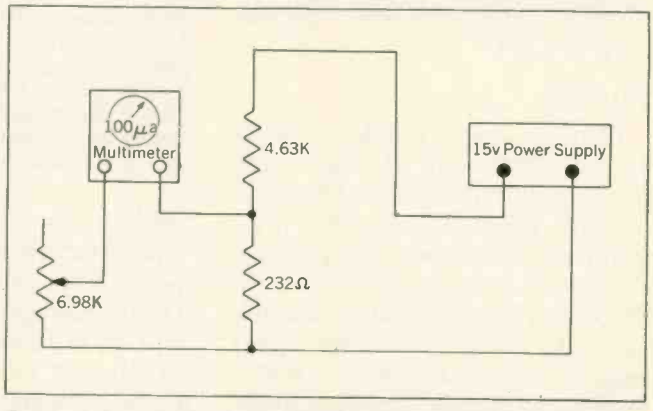
Voltage-divider circuits are probably the most critical when it comes to resistance changes, since they can yield a voltage sufficiently different from the design value, thus preventing proper circuit operation. Suppose, for example, that two resistors across a 15v supply (Fig. 1) have nominal values of 240Ω and 4650Ω (each with a 1 percent tolerance). This means that in the absence of any current drawn from the voltage-divider junction, the voltage at this junction should be: 15v × 240Ω/ (240Ω + 4650Ω) = 15v × 240Ω/4890Ω ≈ 0.7362v or 0.74v.

By substituting resistance values, we can see that the greatest junction voltage will occur when the value of the 240Ω resistor is up 1 percent while the value of the 4650Ω resistor is down 1 percent—the resulting junction voltage being ≈ 0.7503v or 0.75v. Similar calculations indicate that the smallest junction voltage will occur when the value of the 240Ω resistor is down 1 percent while the value of the 4650Ω resistor is up 1 percent—the resulting junction voltage being ≈ 0.7223v or 0.72v. This means that under the first condition we would have a voltage error that is ≈ +1.92 percent or +2.0 percent; and under the second condition we would have a voltage error that is ≈ —1.89 percent or —2.0 percent. Thus, in this example, the percentage of voltage error is double the percentage of component value error.

Now suppose that during normal operation a current of up to 100μa is drawn from this voltage-divider junction. This current source resistance is the combined parallel resistance of 240Ω and 4650Ω, which is about 230Ω (±1 percent). So with this load current the voltage at the voltage-divider junction will drop 23mv or 0.023v. And thus the voltage with this load current will drop from 0.736v to 0.714v—and may vary from 0.698v to 0.728v within tolerance variation.

[*I must admit that I was personally disturbed by the information in this preceding paragraph and wrote Norman the following concerning the matter: Assuming that the B+ and B— supplies are both ac coupled to ground, then your statement concerning the parallel effect of the 240Ω and 4650Ω resistors would be correct—but only for ac signals. Unfortunately, this portion of the article refers to dc biasing, and the entire base current of a transistor must flow through the 4650Ω resistor. On that basis, the resulting voltage is 0.3v, rather than the 0.714v stated in your article.*

Norman responded immediately and advised me that I was actually the one in error. Still puzzled, I went into our lab to see who was actually correct, connecting two resistors and a potentiometer as shown in the diagram



Component arrangement for demonstrating the parallel load theory presented by the author. The same effect would have been observed if a larger maximum-value potentiometer was instead placed in parallel with the larger value resistor.

above. Without the potentiometer a voltage drop of 0.721v was measured across the smaller resistor. With the potentiometer adjusted so that the multimeter measured a 100μa current, this voltage was reduced to 0.698v—the 0.023v change noted by the author. It is amazing how easily one can forget some of the basic dc theory concerning merely a voltage source and some resistors! Ed.]

So much for calculating what voltages should be under normal operation. Most schematics will give at least some indication of what the voltage ought to be. In some circuit you may note that the voltage, which its schematic indicates should change between 0.71v and 0.74v, shows an actual change between 0.60v and 0.63v —way too low.

You may then suspect that one of the resistors has changed value, and upon checking find that the one rated as 4650Ω is in fact 4700Ω, while the one rated as 240Ω is in fact 204Ω.

The larger one is just at its 1 percent tolerance limit,

but the one with the 240Ω value has gone low by 36Ω, a 15 percent change. This error is great enough to easily designate the 1 percent resistor faulty. The best thing would be to replace the whole unit containing this part. But if it is not immediately available, you may want to effect a temporary remedy.

Arithmetically, the obvious solution would be to insert a 36Ω resistor in series with the 204Ω resistor, so that the total value in this portion of the circuit is what it is supposed to be. But this may not be practical. Inserting a resistor in series means that one end of the original resistor must be removed from the circuit board and another inserted in series with it (Fig. 2). The assembly layout may not physically provide room to get these components into the space available.

A change probably involving less space would be to parallel the 4650Ω resistor with a value that will bring the voltage back to what it should be (Fig. 3). However, calculating the value required to do this is not quite so simple. But there are several ways to go.

Possibly the most foolproof technique involves the use of voltage and current calculations. Assume you decide to make the open-circuit voltage correct at 0.74v. With the 204Ω actual resistance, the current passed will be: $\frac{0.74v}{0.204K} = 3.63ma$. The pair of resistors in parallel—across 15v − 0.74v = 14.26v—must pass the same 3.63ma, requiring that the parallel combination have a value of $\frac{14.26v}{3.63ma} = 3.930K$.

Applying the parallel resistance formula to obtain the desired total value, when one resistor is measured at 4700Ω, requires a value of $3930\Omega \times \frac{4700\Omega}{(4700\Omega - 3930\Omega)}$ $= 3930\Omega \times \frac{4700\Omega}{770\Omega} = 28{,}000\Omega$. If you select a 27K resistor that is a little high in its tolerance, it should do the trick.

That is one possibility. On occasions a resistor will go high in value, but more often, with composition or film-type resistors, they will go low—due to absorption of humidity while their temperature is elevated, which may be caused by either internal or external heat generation.

Suppose now that the 4650Ω resistor is the one that has gone low in value, to about 4200Ω—resulting in a voltage drop of 0.81v without the 100μa load and 0.79v with the 100μa load.

Again the proper correction would be to raise the 4200Ω value to its 4650Ω normal value by inserting about 450Ω in series with it (Fig. 4). But this may be difficult due to a problem of obtaining adequate space, and parallel connections may be simpler to install.

Figuring that 15v − 0.74v = 14.26v should be dropped across the 4200Ω actual resistance, this means that it must pass $\frac{14.26v}{4.2K} = 3.4ma$. A resistor that must produce the nominal 0.74v when 3.4ma flows through it will need a value of $\frac{0.74v}{0.0034a} = 218\Omega$. The actual

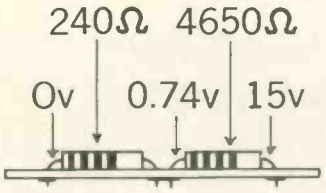


Fig. 1—Suppose that two resistors across a 15v supply have nominal values of 240Ω and 4650Ω.

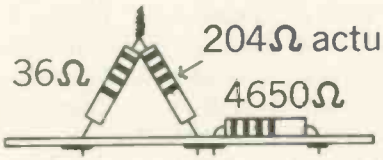


Fig. 2—Inserting a resistor in series means that one end of the original resistor must be removed from the circuit board and another inserted in series with it.

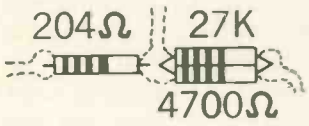


Fig. 3—A change probably involving less space would be to parallel the 4650Ω resistor with a value that will bring the voltage back to what it should be.

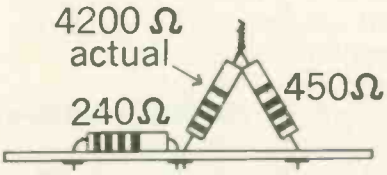


Fig. 4—One proper method of correction would be to raise the 4200Ω value to its 4650Ω normal value by inserting about 450Ω in series with it.

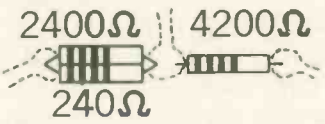


Fig. 5—The actual value of the resistor in this circuit is 240Ω, so a parallel value of 240Ω is required.

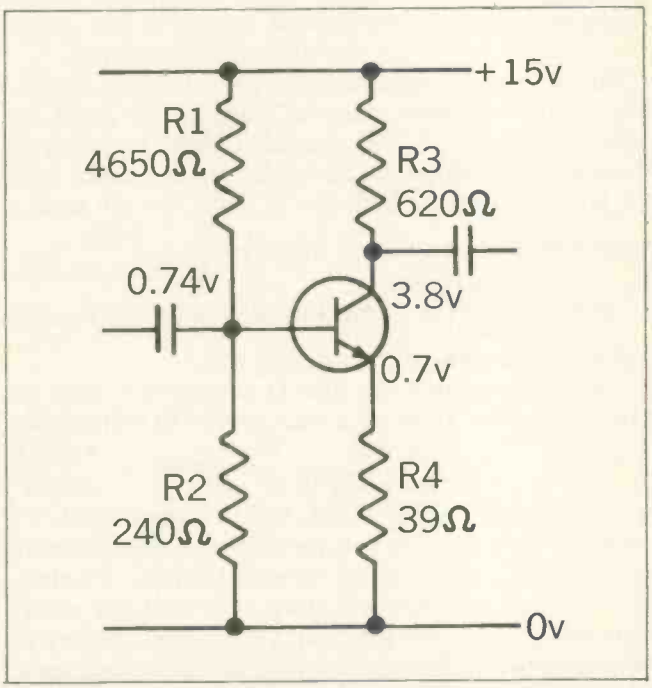
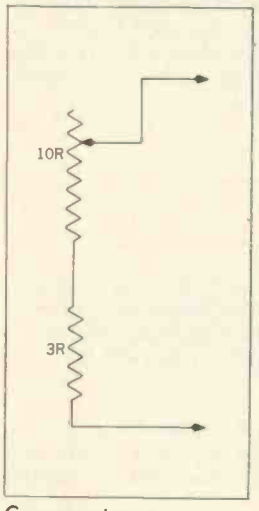


Fig. 6—A critical balance of resistance values can sometimes be found around a transistor stage biased for the semiconductor's linear mode of operation.

value of the resistor in the circuit is 240Ω, so the parallel value required is $240\Omega \times \frac{218\Omega}{(240\Omega - 218\Omega)} = 240\Omega \times \frac{218\Omega}{22\Omega} = 2{,}400\Omega$, almost exactly (Fig. 5).

[*Although we feel that it is very important to have an understanding of the calculations described thus far in the article so that selecting shunt resistors is not a matter of guesswork, a less mathematical technique may prove faster. Instead, take a potentiometer having a maximum value approximately 10 times that of the resistor that has* not *changed and, as a safety feature, connect it in series with a resistor having a value approximately three times that of the resistor that has* not *changed—as in the diagram shown at the right. Connect the resulting circuit in a parallel with the unchanged, good resistor and adjust the potentiometer to compensate for the excess current flowing through the resistor that has decreased in value. When properly adjusted, the voltage-divider junction voltage will be back to normal. Then measure the resistance of the shunting circuit and substitute a resistor of near equal value. Ed.*]



Component arrangement for experimentally determining the required parallel resistance.

There are also other possibilities in this circuit that should be considered: what if one or the other resistor has gone high in value, rather than low. Usually the value will go very high, due to a physical fracture in the material. Under these conditions a replacement resistor, having as near the original value as possible, should be shunted across the bad one if it can't be readily removed.

But suppose the value has gone just a little too high—just too far to remain operative. Suppose the 240Ω resistor has risen to 340Ω—indicated either by a rise in the voltage measured, by measuring the resistance with the power OFF, or by both checks. Now, we will need a resistor that has a value of $340\Omega \times \frac{240\Omega}{(340\Omega - 240\Omega)} = 340\Omega \times \frac{240\Omega}{100\Omega} = 816\Omega$, for which an 820Ω resistor will probably serve as a temporary fix.

Now suppose that the 4650Ω resistor has risen in value to 5600Ω. To bring it back to 4650Ω will require a $5600\Omega \times \frac{4650\Omega}{(5600\Omega - 4650\Omega)} = 5600\Omega \times \frac{4650\Omega}{950\Omega} = 27{,}400\Omega$, for which a 27K resistor comes close.

Far less likely than one resistor having changed value is the possibility that both of them might have. Furthermore, if both of these resistors have changed value, then there is a greater probability that other resistors in the circuit—as well as these voltage dividers—may have also changed value, with the result that correcting the voltage would still not make the circuit function correctly, even temporarily.

So if both resistors have changed value beyond their tolerances, the best decision is to wait for a replacement and not try to fix the unit as it is.

A similarly critical balance of resistance values can sometimes be found around a transistor stage biased for the semiconductor's linear mode of operation (Fig. 6). Here the resistors across the supply (R1 and R2) provide a base bias voltage of the order just described. And the collector and emitter resistors (R3 and R4), combined with this voltage, determine the operating condition for the transistor.

The emitter voltage "follows" the base voltage, while the emitter resistor determines the collector current. Suppose the emitter voltage is 0.7v and the resistor has a value of 39Ω—this fixes the emitter current at $\frac{0.7v}{0.039K}$ = 18ma. The collector current will be almost identical, and the collector voltage will then be determined by the collector resistor.

If the collector resistor has a value of 620Ω, a current of 18ma will result in a voltage drop of 11.2v, leaving 3.8v between the collector and ground, or 3.1v between the collector and the emitter—adequate for correct transistor operation. But if the 39Ω resistor goes low in value, the collector current will rise, reducing the voltage available across the transistor—maybe saturating it for that particular collector resistor value.

Or if the collector resistor rises in value, the voltage across the transistor will again fall as that across the collector resistor rises, causing possible saturation. Either way, the error in resistor value will show up during measurement—the collector voltage measuring the same as the emitter voltage (0v across the transistor). The point to realize is that this does not necessarily indicate that the transistor has short circuited—although this is another possible cause for this incorrect voltage indication.

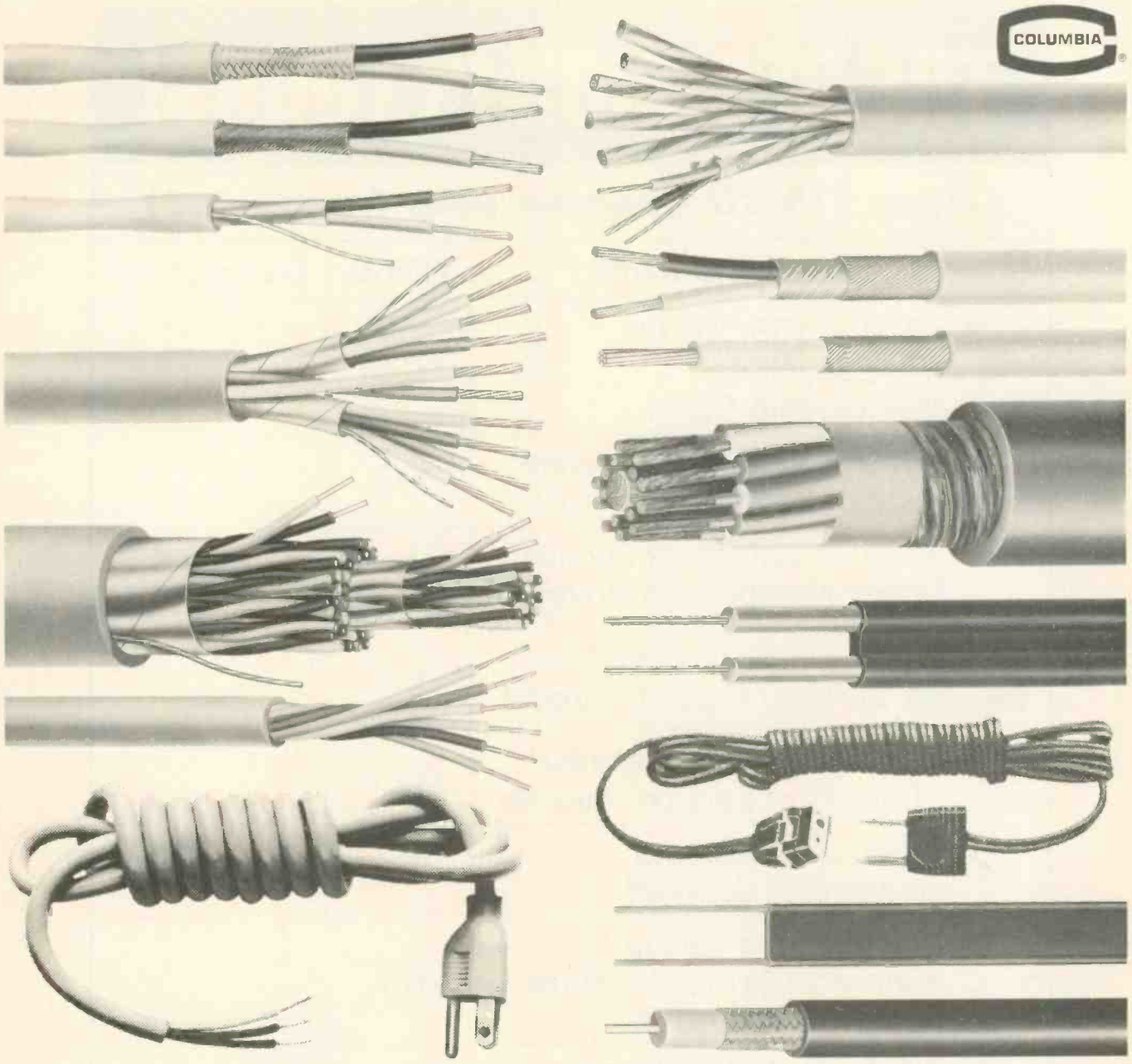
When encountering this kind of wrong indication, the first thing to do is to check the transistor with an in-circuit tester (and the power OFF, since its own circuit saturates it with the power ON). Then, if the transistor is okay, check circuit values and carefully calculate what voltage these values should produce at the collector—as has been done in the article.

If the values combine to produce an unworkable value, either replace the defective module, or modify one of the values (probably the collector resistor in this case) to make the voltage workable.

Note that it is generally normal for there to be a low transistor collector-to-emitter voltage, provided it is not low enough to cause saturation. Making the working collector voltage low keeps transistor power dissipation down, and allows a bigger current swing than would be available from the same transistor working with a higher collector voltage.

If the values are not far enough "off" to saturate as a steady condition, they may still cause the transistor to saturate during part of the signal waveform, causing clipping. Again, the voltages measured will indicate this. Note whether or not the collector voltage swings up a little in the presence of a signal, as it will if this stage is

continued on page 58



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Service Contracts are Big Business

by William Joseph

Did you know that TV service contracts have been around for almost 25 years? That's pretty good longevity for an invention that some service dealers have scorned as a temporary gimmick.

■ There are still, of course, some widely differing opinions among dealers when it comes to the question of whether or not to start selling service contracts. However, regardless of what position you take on the matter, there are some facts with which you should be familiar.

Service contracts apparently are here to stay, and they are definitely big business. Just how big, nobody knows for sure. One thing that is certain, though, is that this form of service sales promotion continues to capture a steadily increasing share of the paid service market each year. While there are no total industry figures available, it is estimated that the combined service contract sales of the three industry leaders (Montgomery Ward, Sears and RCA Service Co.) are well in excess of $200 million, annually. Obviously, the American public believes in service contracts. One thing to remember is that each increase in service contract sales produces a corresponding decrease in the paid service market available to the dealer who does not sell them.

The advantages of a successful contract sales program for the individual dealer have been well demonstrated. To begin with, selling service contracts means that the dealer has opened the door to a huge and growing market which otherwise would not be available to him. This, in turn, creates potential increases in income and profits. Further, the sale of renewal contracts to regular customers provides an increasing base for future income.

In addition, contract sales in volume tend to minimize the age-old problem of severely fluctuating work loads. Customers who are on a pay-as-you-go basis often tend to postpone repairs during the vacation months or when the household budget is stretched. On the other hand, TV viewers who buy service contracts will usually call for service whenever the need arises. As a result, the dealer with a number of service contract customers finds it easier to predict service volume and to budget manpower requirements.

Of course, there are disadvantages to be recognized and dealt with; some of which are of considerable significance. Probably the most important of these is the strict accounting discipline required as part of any contract sales program. When you sell a service contract today—and accept the money today—you have created a deferred obligation that must be fulfilled as much as a year or two later. The financial risks of such a situation are evident. If your handling of finances is sloppy, you will be courting disaster. In recognition of this, Uncle Sam has imposed certain accounting regulations for deferred obligation situations, and they apply directly to service contract sales. In the final analysis, though, no one but you and your accountant can protect you from poor financial management.

Of no less importance is the problem of pricing. The service contract that you sell today, at today's prices, will be fulfilled at a future time for which your costs are presently unknown. Obviously, then, the pricing that you apply to the contracts you offer must be arrived at with great care.

It is quite possible to overcome these problems, as demonstrated by the many small dealers who have been in the service contract business for 10 years and more. The risks cannot be taken lightly, however. Careless handling of contract income and unrealistic pricing of contracts have led some firms into bankruptcy.

Despite the risks involved, the potential rewards of a successful service contract program are luring more and more independent service dealers into experimental efforts. There are also those who feel that getting started now in the sale of contracts will be an advantage if and when the manufacturers start extending their warranties for a year or longer.

Speaking before the National Electronic Associations' business management school last summer, Jerry Canter discussed this problem. Mr. Canter, who is president of Universal Television in Los Angeles, feels that original warranties of at least one full year, and possibly two years, are inevitable. Smaller service companies that get started with service contract programs now, he says, will be prepared to do business with customers who want complete coverage for the second, third, or fourth years and beyond.

For those who want to get started, the biggest problem is just that—getting started. Obviously, the first

contract cannot be sold until a schedule of pricing is determined. Ideally, pricing of service contracts is done on the basis of careful studies of the costs involved in fulfilling the contracts. In fact, after sufficient records and experience are available, this is the only acceptable method for determining how much to charge. There is no reason, however, that the dealer just getting started with contracts cannot capitalize on the experience of the bigger companies to establish his basic prices.

The large companies have had years to study their fulfillment costs, and they have hundreds of thousands of records to analyze. Presumably, the independent TV service dealer will not have costs higher than the big companies—more likely, his costs will be lower. Thus, the prices charged by the big companies in a given area should provide a safe starting point for the independent dealer. Fig. 1 shows the contract selling prices of several firms in one large metropolitan area. You should have no trouble obtaining the prices being used in your area.

Once you begin to sell contracts, a precise analysis of your fulfillments costs is an absolute necessity. Only by determining your exact costs can you expect to arrive at selling prices that are optimum for your organization. Fig. 2 is a suggested form that can easily be kept for each contract customer to determine fulfillment costs.

Selling prices for both parts and labor can be entered on the form each time a service call is made under the contract. Thus, at the expiration of the contract, you can compare how much you would have received on a pay-as-you-go basis, with what you charged for the contract.

As your contract sales increase, you will be able to average out your figures over a number of contracts; thus, your prices will begin to reflect your own experience. As an example, let us assume that your study of 50 expired contracts covering 3-year-old B/W-TV sets shows that pay-as-you-go income would have been $2,050. Dividing that figure by 50 gives us $41 per contract.

Before you can price your contract, though, you still need one more figure. There are direct expenses that will be involved in your contract sales program. Such things as printing costs for the certificates and form letters, postage and sales commissions all must be taken into consideration. To complete our example, we will assume that the total of these direct expenses divided by the number of contracts sold during the period in question comes to

SERVICE CONTRACT PRICES IN EFFECT IN ONE MAJOR CITY

B/W-TV SET HOME SERVICE	RCA	G.E.	SEARS
1st year of ownership	$ 36.95	$ 30.95	$29.95
2nd year of ownership	$ 69.95	$ 56.95	$49.95
3rd year of ownership	$ 69.95	$ 62.95	$54.95
COLOR-TV SET HOME SERVICE			
1st year of ownership	$ 46.95	$ 45.95	$49.95
2nd year of ownership	$103.50	$100.95	$84.95
3rd year of ownership	$103.50	$127.95	$94.95
COLOR-TV SET SHOP SERVICE			
1st year of ownership	$ 30.95	$ 29.95*	$29.95
2nd year of ownership	$ 51.95	$ 55.95*	$59.95
3rd year of ownership	$ 51.95	$ 71.95*	$69.95

*18-in. screen

Fig. 1

SERVICE CONTRACT EXPENSE RECORD

NAME _____ BRAND _____

ADDRESS _____ AGE _____

TECHNICIAN	DATE	COMPLAINT	SERVICE TIME	PARTS USED	LABOR CHARGE	REMARKS

Fig. 2

$8.60. Adding that to the fulfillment cost described previously brings the total to $49.60. This would suggest $49.95 as a logical selling price for your third year TV-set contract.

There are, of course, a number of other ways to approach the job of pricing contracts. The bigger companies, with the aid of thousands of records and computer analysis often use exact cost figures in their parts and labor statistics. This provides them with a cost figure to which they can add their desired markup. Also, because they deal with great quantities of the same make and model, they are able to gather precise history-of-failure records. Realistically, however, the small dealer must stick to a simple system such as the one just described.

Before entering into a contract sales program, it would be well for you to understand the necessity of volume sales. Since the pricing of contracts is based on the premise of average costs, a reasonable number of sales are required to make the averages valid. A half-hearted sales program exposes you to the risk that your only contract customers will be those who are easy to sell. Inevitably, the customers who are the most anxious to buy contracts will be those who have a history of excessive service requirements. An aggressive and professional sales program will minimize this risk by providing you with a broad base of customers.

Basically, there are three sources of service contract sales for the independent service dealer: sales by technicians, direct mail, and telephone solicitation. A truly successful effort will require attention to all three.

The easiest method for entering the contract sales business is by selling through the electronic technicians themselves. Most customers view the electronic technician as an expert, and his recommendations will usually carry considerable weight. Since these technicians will eventually come into contact with all of your current customers, they will be a valuable source of sales.

Usually, all that is needed to get started is a reasonable amount of training for your men so that they will understand the advantages to both the customers and the company, plus an incentive to keep them interested. Most dealers prefer to pay technicians on a commission basis for contract sales, with the rate varying between 5 percent and 20 percent.

For most dealers, sales by electronic technicians soon prove to be inadequate to provide the volume required to make the program workable. For this reason, it is suggested that direct mail and telephone solicitation be incorporated in any service contract program right from the beginning.

While both direct mail and telephone selling are complex subjects beyond the scope of this article, there are a few important principles that can be outlined.

There is general agreement that direct mail and telephone selling should be tied together in a program that will permit them to complement each other. One popular system calls for a direct mail piece followed in a specific number of days by a telephone solicitation to customers who do not respond to the mail ad. Theoretically, at least, the mail piece "softens up" the customer and paves the way for the telephone solicitor.

This system is particularly valuable for the sale of renewal contracts. Once a program for selling contracts has been running successfully for a year, renewals become a factor. One point on which all dealers selling contracts seem to agree is the importance of taking advantage of the great income potential and profitability of renewal sales to regular customers. As a result, a program like the one-two punch just described can be found in most service shops selling contracts.

Direct mail is an exacting field, and the dealer expecting to make use of it should attempt to learn as much as he can about it. Professional help, wherever it is practical, will usually be a good investment. Probably the most important single point to be remembered when preparing direct mail is the effect that physical appearance will have on results. The professionals have long since learned that compromises in the quality of reproduction and the materials used in direct mail will nearly always have serious negative effects. It does not take much imagination to figure out why—especially in the case of a service contract promotion. If your mailing is amateurish, cheap-looking or careless, you cannot expect your customer to have confidence in your ability and willingness to provide professional service.

Most experienced dealers would agree with Jack Badaracco of the RCA Service Co. who said, "You can sell three times as many contracts with a direct mail and telephone program as you can with a direct mail program alone." There is no doubt about it: telephone selling is an essential part of a contract sales program.

Telephone selling, too, is a highly specialized field. Not everyone is suited to this type of work, so you must make an effort to find the right man or woman for the job. Sometimes it is necessary to try several before the right person is found.

Once you are set up, you will have to experiment with the all-important matter of timing. Generally speaking, the calls should be made about a week or 10 days after the mailing of your printed materials. The experience of several dealers interviewed would seem to indicate that the evening hours (before 9:00 p.m.) are better than daytime hours for selling TV contracts. Perhaps this is because both husband and wife are home at that time. Also, there would appear to be a slight edge in favor of the male telephone salesman, although there are many dealers who use only females in this work.

Do not forget that the telephone company in most areas will gladly provide free training for telephone sales personnel. If you decide to enter a contract sales program, you should not overlook this important source of expert help.

Selling service contracts is not a decision to be taken lightly. A successful program demands careful preparation and aggressive attention. However, the service dealer who chooses to bypass the service-contract business is excluding himself from an increasingly important segment of the television service market. ■

Protecting Business Records

by Ernest Fair

The protection of an electronic technician's or dealer's business records is of greater importance than one usually realizes—unless you have already been caught without them.

■ Certain records are vital for the collection of insurance claims when disaster hits, and others are a must for tax purposes. Some of the basic types of records that must be protected include the following:

Records covering every single item protected by insurance of any kind

The establishment of a claim after a fire or other disaster may well depend upon these records. A good rule is that if insurance coverage is involved, the records to substantiate claims must be present after the loss.

These include a record of purchases, date and source, for all equipment in order to collect the true salvage value of each unit. All supplies and other inventory should be kept up to date to show what was on hand at the time the disaster took place. No insurance claim of any kind will be settled for any more than the owner can prove was present at the time of the disaster.

Basic records showing the performance of the business

Business performance records may be necessary for a number of reasons, but primarily for securing financial assistance in the future. Few such assistance programs can proceed without extensive background records covering the business. These records may even be necessary to secure a loan needed to get started again after a disaster.

Where business interruption insurance is carried, such records are a must if the full claim is to be obtained for the total period of time required for the business to get back to its earning capability.

Depreciation records of all kinds

It is necessary to substantiate data on capital assets for many uses. Records showing date of purchase, cost, estimated useful life, estimated salvage value and depreciation taken are important.

They are of course very necessary should an income tax return be challenged for any period covered in the past. They also have value in settling insurance claims and will be needed should the business ever be sold or merged.

Salary and wage records covering every individual on the staff from the shop owner down to the smallest-salaried individual

Complete payroll records are necessary for many elements of continued business operation after a disaster. They may be needed in settling disputes over wages and terms, for use in negotiating new wage arrangements and for settling any possible future disagreement with government agencies concerned about such records in tax and regulatory matters.

Tax withholding statements

The law states that tax withholding statements must be kept by every business, and even a small shop hiring but one man is no exception. This includes all records covering income taxes withheld from wages, special government levies, pension fund payments through a private business arrangement and unemployment data.

All such records should be kept safe after the legal reasons for their retention have expired, since they have additional value in a number of other areas concerned with future business operations—such as loan solicitation forms to prove business operation costs.

Unusual business expense records

Too frequently records of unusual business expenses are handled carelessly after the current year's bookkeeping has been tabulated. This can create a costly situation if the deductions involved in such expense records are challenged in the future and no details are available to substantiate them.

Every business expense record should be retained for a reasonable period of time, if for nothing more than to prove that the account concerned has been paid. Claims of this nature can come back as much as a year after actual payment.

Records of business losses

Any records concerning business losses are, of course, necessary with respect to tax matters. But they can also have value concerning future insurance claim matters. Too frequently only summary records of this nature are kept and all supplemental items pertaining to the basic total information are discarded or not given adequate protection against loss. Even the most supplemental data can have great value at a time when such basic total records must be proven.

Reports and drawings

It would be a mistake to downgrade reports and drawings with respect to security and protection. There are many ways in which any or all of them can have serious impact on the business in the future.

They are most frequently required to provide evidence in a future lawsuit, and no owner of a business can ever be assured that he will not have one of these. They may also be needed to substantiate the position of the business during a merger, sale of the business, settlement of an estate, etc.

Historical data

A great deal of historical data has value in determining the course of future business. If such information is not present when needed, its loss

continued on page 65

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23VARP22	25ANP22	25BRP22	25VP22
23VASP22	25AP22	25BVP22	25WP22
23VATP22	25AP22A	25BXP22	25XP22
23VAUP22	25AP22A/25XP22	25BZP22	25XP22/25AP22A
23VAXP22	25AQP22	25CBP22	25ZP22
23VBEP22	25BAP22	25CP22	

23VAZP22 replaces 10 types

23VAZP22	25RP22
25AEP22	25YP22
25BP22	25YP22/25BP22A
25BP22A	
25BP22A/25YP22	
25FP22	
25FP22A	

C-25BKP22, 23VBAP22 replace 23 types

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23VADP22	23VBJP22	25AZP22
23VAMP22	23VBRP22	25BDP22
23VAQP22	25ADP22	25BFP22
23VAWP22	25AGP22	25BHP22
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23VBCP22	25AWP22	

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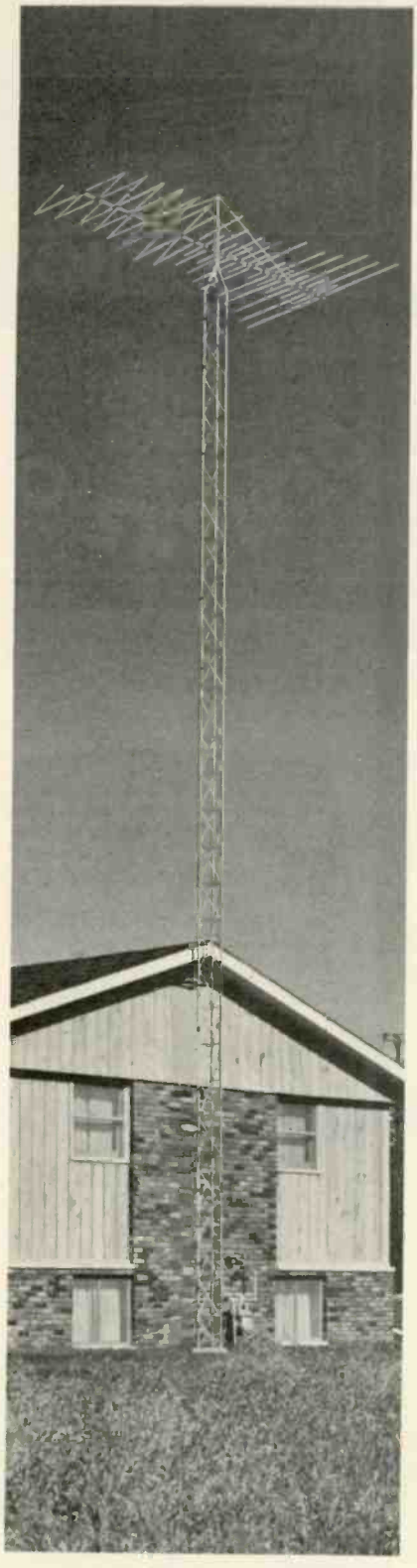

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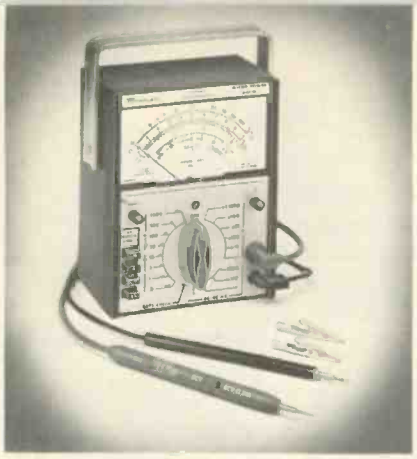


Triplett's Model 603 FET VOM. For more details, circle 900 on the Reader Service Card.

TEST INSTRUMENT REPORT

Triplett's Model 603 FET VOM

by Phillip Dahlen

May be left ON indefinitely, drawing only 10μa from batteries

■ If you share any of my bad habits, then you have also occasionally discovered the next morning that you had forgotten to turn all your instruments OFF the night before. Our front cover shows such a situation—a meter (the one described in this report) in operation during the middle of the night—long after everyone had gone home.

Although such forgetfulness may be hard on the batteries of some multimeters, this is not the case with Triplett's Model 603 FET VOM, since it requires only 10μa of battery current when in use. In fact, it may be left ON indefinitely without impairing its performance—the battery life for the carbon batteries approaching that of shelf life.

Additional features include automatic polarity (when desired) where you are interested in taking voltage and current measurements but are not concerned with the polarity. (The instrument can also be operated in the conventional positive or negative polarity mode.) And the low-power ohms scales permit in-circuit resistance and continuity measurements without biasing or destroying sensitive diodes, IC's and transistors.

Other manufacturer specifications include those given at the right:

DC Volts

Ranges: 0-0.3-1-3-10-30-100-300-1000v.
Accuracy: ±3% of full scale, all ranges.
Input resistance, all ranges: 11.12M (1.12M resistor in probe tip).
Auto Polarity: Pointer indicates up scale for either polarity.
Polarity Determination: Push button + or −.

AC Volts

Ranges: 0-0.3-1-3-10-30-100-300-1000v ac.
Accuracy: ±3% of full scale, all ranges.
Input impedance, all ranges: 10M.
Frequency range: 20Hz to 10kHz—all ranges except 300v and 1000v.
Detection: Average calibrated in rms.

Ohms—Low Power

Ranges: 0-1K-10K-100K-1M-10M-1000M.
Accuracy: ±3% of dc v arc on all ranges.
Open circuit voltage: 70mv.
Maximum power applied to device under test: Low range, 123μw. All other ranges, power is correspondingly less. (10Ω center scale on low range.)

Ohms—Conventional

Ranges: 0-1K-10K-100K-1M-10M-1000M.
Accuracy: ±3% of dc v arc on all ranges.
Open circuit voltage: 1.5v.
Maximum power applied to device under test: low range, 57mw. All other ranges, power is correspondingly less. (10Ω center scale on low range.)

AC and DC Milliamperes

Ranges: 0-1-10-100-1000ma with 316mv voltage drop.
Accuracy: ±4% of full scale, all ranges.
Auto Polarity: Pointer indicates up scale for either polarity.
Polarity Determination: Push button + or −.

Decibels

Ranges: −30dB to +62dB.
Accuracy: ±3% of full scale, all ranges.
Scale: lower arc, lettered −20 to +2, 0dB = .776v.

Instrument Construction

Dimensions: 5⅛ in. wide by 6½ in. high by 3 3/16 in. deep.
Weight: Approximately 2½ lb with batteries.

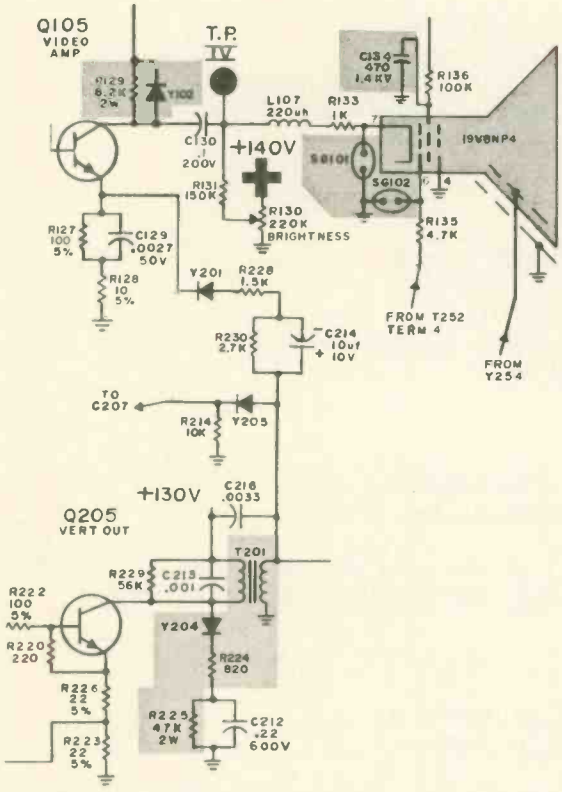
COLORFAX

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

GENERAL ELECTRIC

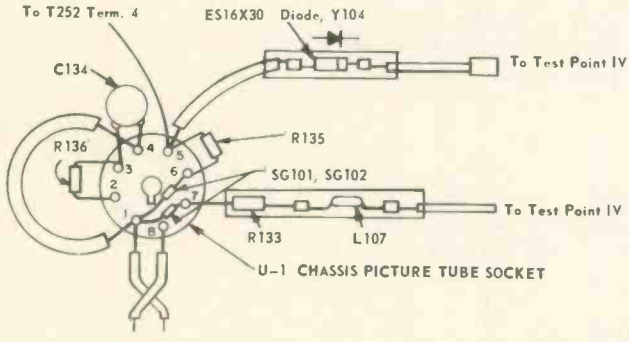
TV Chassis U-1—Dark Vertical Wedge on Left Side of Picture

A dark vertical wedge-shaped area may appear on the upper left side of the picture approximately 2-in. from the top and 3-in. from the left side of the picture. To correct this problem, replace resistor R230 with a 4.7K, ½w resistor. This resistor was changed during production in October (Code 5T4N) from 2.7K, ½w to 4.7K, ½w.



TV Chassis U-1—Picture Tube Circuit Changes

Circuit changes were made early in production to improve voltage regulation on the picture tube grid. Resistor



R135 was changed from 4.7K to 10K and a diode Y104 was added from the junction of Test Point IV, capacitor C130 and coil L107 to the junction of R135 and the jumper to Terminal 4 of the high-voltage transformer.

MOVING?

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

TEMPORARY FIXES...

continued from page 48

causing that kind of clipping.

Also, when you check the transistor be certain to check its cut-off current. The same symptoms can appear when the transistor becomes "leaky"—conducting more current at cut-off than it should. Check the measured cut-off current against the rated maximum value for the type of transistor used. If it is higher than it should be, saturation will not be controlled entirely by circuit values, and the transistor should be replaced with one for which the leakage current has been found to be within the proper rating.

[*Although the replacement of resistors that have changed in value as a result of heat may be considered a complete repair job—provided the source of heat has been satisfactorily investigated—as the author has indicated in the title of this article, shunting resistors that have changed value can be considered only a "temporary fix." Only by replacing such resistors, with the use of new resistors or new complete modules, will the repair job be final. This is due to the fact that there is no assurance that the defective resistors might not continue to slowly change in value. Ed.*] ■

A better idea
for safety: Buckle up.

Better ideas, van after van.

That's why Ford has led in sales for 11 straight years.

Over the years, only Ford vans have had so many better ideas that make vans easier to drive, to service, to use:

Choice of swinging doors or new gliding side door for cargo handling in cramped alleys and beside loading docks. Three separate tracks, at top, bottom and center, give bridge-like support for solid, smooth, one-handed operation, tight seal.

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

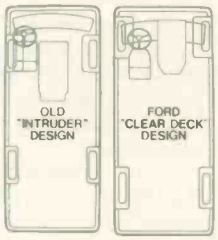
Wider at top for built-ins. Body sides are more vertical, wider apart at top than other vans. Built-in units fit better and leave more aisle. Many modular units offered allowing you to customize almost any interior you need.

Easy, out-front servicing. Routine service points are right at hand under the convenient outside hood: radiator, oil level, battery, windshield washer reservoir, voltage regulator, wiper motor, brake master cylinder and optional power-steering reservoir.

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

Biggest payload. Husky construction, high capacity axles allow you to haul a heavier load than any other van. Three series (two lengths). One takes payloads up to 4,285 lbs.—largest in the industry.

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



FORD ECONOLINE VANS

Ford

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

TECHNICAL DIGEST

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

MAGNAVOX

Tuner/Amplifier Chassis R243/244/245—Distorted or No Audio on One Channel Only (Early Version)

There have been reported cases of "distorted audio" or "no audio" (usually affecting only one channel) in the early version of the R243, R244 and R245 chassis. For no apparent reason the fuses open in the output section of the affected channel. For such symptoms, check fuses F401 and F403, or F402 and F404 before making any further troubleshooting checks. If a fuse is open, replace it with one of the exact value and type called for in the service manual for that particular chassis. Then, with the speakers disconnected, check the dc voltage between the two speaker terminals of the affected channel mentioned in the following steps under servicing precautions. If the dc voltage at the speaker terminals is within the indicated limits, there is probably no circuit malfunction and the chassis can be returned to service.

Servicing Precautions

In some cases, damage to the amplifier section circuit components and speakers has resulted from improper service procedures. Because of the relatively heavy currents in the amplifier sections of these units, the following service procedures must be strictly observed.

Never replace an amplifier section fuse with a slow blow type or one of a higher ampere rating than called for in the service manual. The correct replacement fuses are as follows:

Chassis Model	Ampere Rating	Magnavox Part No.
R243	2.5a	181021-1250
R244	3a	181021-1300
R245	4a	181021-1400

Never, substitute a higher ampere rated fuse or bridging device, such as a clip lead, for a fuse in the amplifier section. Such procedures can result in almost instantaneous damage to speakers and/or components of the amplifier section.

Always, before connecting speakers to the amplifier, measure the dc voltage at the output of each channel. This measurement can be made at the speaker terminals, between the ground terminal and the hot terminal, but the front panel mounted speaker switches must first be closed to connect the speaker terminals to the amplifier section. The voltage between the terminals for each channel should be 0v ±0.2v. If the voltage is not within these limits, there is a malfunction in the amplifier section and this malfunction must be corrected before the speakers are connected.

Always, immediately upon connecting speakers to the amplifier and before power is applied, check the connections at the speaker terminals to insure that the speaker leads are not shorted together or shorted to the amplifier case.

Later Version Production Change

Beginning with the "C" version, i.e., R243-01-CA, of these chassis, fuses F401, F402, F403 and F404 will not be used in the output circuits of the amplifier section. The function of the fuses will be performed by special type 0.47Ω resistors (similar to fusible resistors) used for the R437, R438, R439 and R440 chassis. In the R243 and R244 chassis these special resistors are 0.47Ω, 2w components, Part No. 240104-1. In the R245 chassis these special resistors are 0.47Ω, 3w components, Part No. 240104-2. Because of the protective characteristics of these special resistors and their importance in these applications, only the specified Magnavox replacement part should be used if replacement is required.

Power Amplifier Bias Adjustment

To provide a more accurate adjustment of the idling current through the audio output stages and prevent the possibility of cross-over distortion, instructions under the heading "Power-Amplifier Bias Adjust" should be changed to the following:

(1) Place the speaker switches to the OFF position and the VOLUME control fully CCW. (2) Connect a milliammeter in series with transistor Q415 and Q417 (if the instrument has fuses in the output circuit, remove a fuse from the appropriate channel and connect the milliammeter across the fuse holder) and set the BIAS ADJUST pot, R419, for a reading of between 20ma and 40ma. Or this adjustment can be made with the following step: Connect a VTVM or other high-impedance voltmeter between the emitter of Q415 and the collector of Q417 and set the BIAS ADJUST pot (R419) for a reading of between 20mv and 40mv. (3) Repeat steps for Q416 and Q418 and adjust R420 for the same readings. Add these notations to service manuals 1478, page 8; 1479, page 18 and 1480, page 18.

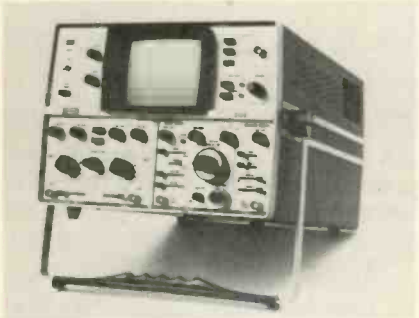
NEW PRODUCTS

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

SCOPE 703

Has 35MHz bandwidth with 5 mv/division sensitivity

A bright 8 by 10 cm display and a rugged portable package are features of the Model 3100 scope. This instrument has a 35MHz bandwidth with 5 mv/division sensitivity at full bandwidth. Rise time is 10ns. Sweep speeds are up to 20ns per division.



Plug-in semiconductors and modular printed circuit cards contribute to ease of service and calibration. A variable hold-off delay increases the capability of the scope for either digital or analog applications. Price: $1,675.00. Raytheon Co.

SURGE ELIMINATOR 704

No installation required

The Tube Guard color-TV surge eliminator reportedly increases the life of color-TV picture tubes and components. No installation is required. It simply plugs into the wall socket. Workman Electronics.

ADHESIVE 705

Joins any combination of materials

Eastman 910 adhesive makes a firm bond in seconds. It joins virtually any combination of materials at up to 5,000 psi, depending on the materials bonded. It is ready for use right out of the tube. Contact pressure initiates the bond and heat is not required to accelerate setting time. Since heat or solvents are not required, the adhesive will not shrink. Recommended application is one drop per sq in. Cost, at user level, is roughly 1½¢ per drop. The possible uses of Eastman 910 adhesive by TV technicians include the repair of wafer switches, O rings, belts

and plastic trim. The adhesive is packaged in a metal tube and is, therefore, less susceptible to damage, before use, by heat and humidity. Tech Spray.

HIGH-VOLTAGE SOCKET 706

Designed to reduce any danger of fire

A number of new fire-retarding, high-voltage tube sockets, such as the S-105-C shown, have been added to

the line, making the company a single source for 74 different types of sockets. Oneida Electric Mfg. Inc.

POTELCO POWER PACK 707

For maintaining voltage during power failure

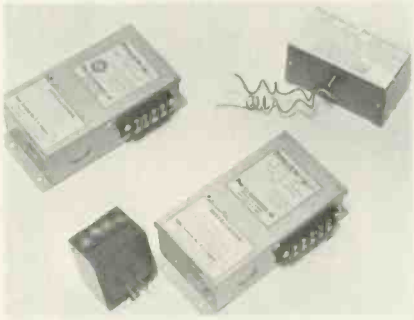
Potelco power-supplies use nickel cadmium batteries as a dc power source. The battery is protected against possible deep discharge by a built-in protective device, thus guaranteeing a maximum life of the battery. If ac power-outage should last up to 36 hours, the stand-by is reportedly still ready to initiate the alarm and op-

continued on next page

NEW PRODUCTS . . .

continued from page 61

erate a transmitter or dialer and in addition ring a local bell for 10 to 15 minutes. To insure full voltage in a protective circuit loop requiring up to 30 mills of current, a limiting resistor is employed. The unit is also protected

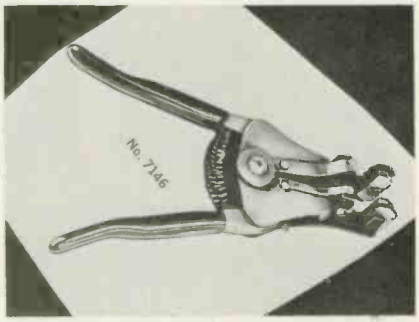


against possible overload and short circuit conditions by a built-in fusing system. Pow-Tec Electronics, Inc.

WIRE STRIPPER-CUTTER 708

Has gauge for uniform length stripping

With this wire stripper-cutter, insulation is removed by putting very light pressure on the handles with the end of the wire placed in the handle-jaws. The tool is equipped with a strip gauge for uniform length stripping. Stripping AWG standard wire No. 24, 16, 14 and 12, the tool can also be

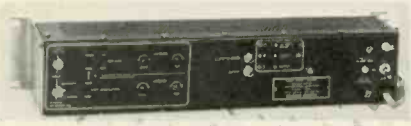


used as a wire cutter. This wire stripper reportedly enables cleaner and more frequent cuts per unit time than previous methods. Price $13.75. Starnetics Co.

UHF/VHF AMPLIFIER 709

Delivers gain from 50 to 52dB

The MATV amplifier features complete front panel signal control over the entire frequency range and delivers gain from 50 to 52 dB with output levels of up to 1v. It is said to provide maximum performance through the use of separate amplifying circuits that maintain stable and efficient operation through all line voltage fluctuations and temperature and seasonal changes that normally af-

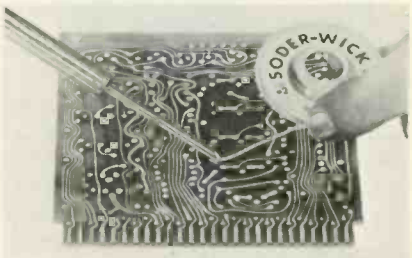


fect signal levels. Switchable and tunable FM traps permit tuning out or attenuating the entire FM band or a portion of it. Separate high and low band gain and tilt controls permit adjusting signal levels to precise levels as on-site conditions dictate. Individually switch controlled preamplifier and line extending power is also included. In addition, it has backmatched input and output monitors that permit checking the system without disrupting service. Channel Master.

DRY DE-SOLDERING TOOL 710

Removes solder from joints and connectors

Solder removal is reportedly fast, economical and convenient when a Soder-Wick dry desoldering tool is



used. When used in conjunction with an ordinary soldering iron, it removes solder from all sizes of electronic joints and connectors. No special equipment is needed to remove solder from integrated circuits or printed circuits. The technician simply touches Soder-Wick to the heated joint and solder is drawn up. Flux contamination is eliminated, and residue, if any, is non-corrosive and non-conductive. Each roll contains 5 ft of wick and sells for $1.49 per roll. Jensen Tools and Alloys.

HOOK-UP WIRE 711

Is insulated with irradiated polyvinylchloride

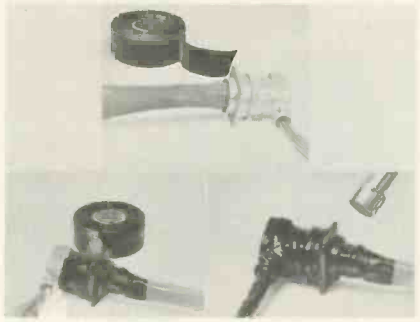
RX-7000 hook-up wire is insulated with irradiated polyvinylchloride (PVC). The radiation process rearranges the molecular structure of PVC, reportedly improving the basic properties of the material. This is said to result in high-performance electrical, mechanical and thermal characteristics for this insulation. Specifications indicate that RX-7000 resists high tem-

peratures, including contact with a hot soldering iron, without melting, flowing, shrinking back or deforming. Alpha Wire.

HEAT SHRINKABLE TAPE 712

Clings tightly to the object it surrounds

An irradiated heat shrinkable electrical tape is said to shrink, mold, encapsulate, waterproof and be flexible. The T-Y-T 100 series has an operating temperature of -55°C to +125°C. When heated in excess of 121°C, the tape will start to shrink longitudinally to a maximum of 30%. The inner polyolefin liner will then melt and flow into the tape wrappings as well as the interstices of the object it surrounds. As it shrinks it clings tightly to the object it surrounds and the shrinking action eliminates wrinkles and bubbles in the tape wrap. When cooled, the resulting fusion forms a tight mechanical fit, bonding and molding to itself, forming a complete encapsulating barrier. The cooled wrap reportedly cannot be peeled off. Cole-Flex Corp.



ERRATUM

An error appeared in the EICO ad on page 66 of the April 1972 issue. The correct price for the Model FC-100 with 'Fail Safe'-System by EICO is $69.95 rather than the price given in that ad.

ERRATA

The wrong price was given for the EKU Color Tube Tester described on page 69 of our April 1972 issue. The correct price is $49.95.

DEALER SHOWCASE

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

STEREOPHONES 713

Features high-performance driver elements

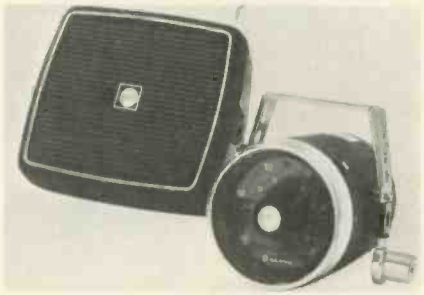
The Model K-711 is said to feature high-performance driver elements, as well as a distinctive one-piece headband of flexible, high-strength polypropylene to conform to any head size

for comfortable wearing. It is reportedly available in either red or black. Price: $29.95. Koss Corp.

AUTOMOBILE RADIO 714

New concept "tach" radio

This new concept in automobile radios has speed equipment styling. It is



priced at $59.95 and can be installed by the do-it-yourselfer. Sanyo Electric, Inc.

ANTENNA MULTICOUPLER 715

Provides uniform gain, high isolation

The Model 909084 solid-state antenna multicoupler is said to provide uniform gain, high isolation and separate HF and VHF outputs. Designed to cover the 1.5MHz to 100MHz frequency range, this multicoupler reportedly exhibits a 10dB gain from input to any of 8 outputs, 50dB minimum isolation between outputs, typically 100dB dynamic range, and a 7dB

maximum noise figure. Merrimac Research and Development, Inc.

TWO-WAY RADIOS 716

Feature mobile-to-base interchangeability

Operating in the 450 to 470MHz band, the solid-state MOCOM series FM two-way radios are available with 1 or 4w in the MOCOM 10 version and 10w in the MOCOM 35 version. Featuring mobile-to-base interchangeability, a mobile unit can be substituted for the base unit, assuring continuous system operation even if the

base should require servicing. Motorola Communications and Electronics, Inc.

MINI TV CAMERA 717

Functions with all makes of 1-in. vidicon tubes

The Minicon Model 201 is a new self-contained miniature TV camera offering a wide choice of line rates. Combining high sensitivity and resolution in a small package, the unit reportedly provides sharp TV images

with scene illumination as low as 1 ft candle. In addition, the camera reportedly functions with all makes of 1-in. vidicon tubes—including the new

silicon diode types. Other features include automatic compensation for vidicon dark current shift, 18MHz bandwidth with 12MHz internal filter, simple maintenance and AGC/ATC. Remote controls are an available option. Sierra Scientific Corp.

CASSETTE HEAD CLEANER 718

Removes dirt and oxide from the magnetic heads

The QM-140 cassette head cleaner is designed to remove accumulated dirt and oxide from the magnetic heads in cassette machines — thus preventing spacing losses and protecting expensive pre-recorded tapes. The product features a special non-abrasive 9-ft belt that is said to remove built-up contaminants completely without damaging the head surface. Nortronics Co., Inc.

HOME ADAPTER 719

Delivers 12v dc at 3a, 5a of switchable current

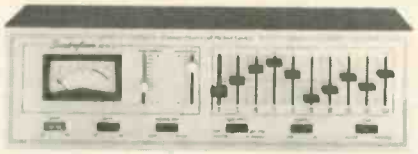
When plugged into the power line, the Model 3AS12 home adapter reportedly will deliver 12v dc at 3a and

provide 5a of switching current. The unit has an ON/OFF switch, pilot light, and an automatic circuit breaker; and is housed in a gold finished cabinet. Alpha Components Corp.

RECORDING-PLAYBACK EQUALIZER 720

Allows control of ±12dB on each octave

Frequency-balanced tape and disc recordings reportedly can be made with the model RP10-12 equalizer. Frequency control flexibility is offered in both recording and playback modes, with instant monitoring of the altered and unaltered signals. Connected into the tape monitor circuit of Hi-Fi systems or between the preamplifier and



basic amplifier in commercial sound applications, this product allows control ±12dB of each octave. Soundcraftsmen.

CB TWO-WAY SYSTEM 721

Provides 5w of transmit power

A new 5w Citizen-Band two-way radio system, designated PACE 100-Sa, is complete with clip-on antenna plus crystals installed for Channels 9, 11, 12, 13 and 14. The unit provides for full 5w of transmit power with provision to operate on Channel 9 CB for emergency use, plus Channels 11, 12, 13 or 14 CB for general convenience calling. An additional channel may be

selected from the 23 channels assigned to the Citizens Radio Service to provide a total of 6 channels of operation when desired. It has visual indicator lights to indicate the transmitting or receive mode. A meter is included so that an incoming signal may be seen if the volume is turned low. Pathcom, Inc.

BUSINESS RECORDS...

continued from page 54

can have a major effect on a new business program being developed.

Contracts, copyrights, patents, franchise agreements, etc., all are of major importance to the continued operation of the business. They need as much, if not more, protection than the tax records.

It is important to remember that any record or document that has value today will be equally important in the future as well. If it has disappeared in a fire, been stolen or lost, replacement may be next to impossible.

All of the records that have been mentioned are essential for the future operation of the business, large or small, and should receive full security. To these may well be added basic customer records—particularly when credit is offered. ■

TEKLAB . . .

continued from page 43

an emitter follower for each pair of differential transistors. It is said to provide excellent characteristics and good AM rejection with an overall gain of 60dB.

The quad detector portion of the IC operates as a full-wave detector. This type of a detector has some desirable properties that make it particularly suitable for FM detection. No fundamental carrier frequency is present at the detector output, decreasing the susceptibility of parasitic noise. The detector does not provide gain at the carrier frequency, decreasing the risk of oscillations. The output voltage swing of the detector is determined only by the deviation of the input signal, not by the amplitude variations of the input signal. Detected audio signals are received from Pin 2 (audio output) of the IC, through a capacitor to Pin 9 of the IC, which is the preamplifier input terminal.

The audio preamplifier within the IC is basically a single common-emitter stage with emitter-follower circuits used before and after the stage. The preamplifier and driver stage function basically the same as in previous transistorized chassis where separate preamplifier and driver transistors were employed. This stage provides the necessary current gain to drive the audio output stage.

A conventional audio output stage employs a common-emitter, class-A amplifier, which develops approximately 1w to drive a 3.2Ω speaker. This circuit is basically the same system employed in the 20KT41 series chassis.

Conclusion

We feel that the TV set produces an excellent picture and is very stable. The many automatic circuits made the TV set easy to adjust and will help to eliminate tuning confusion for some customers.

From the servicing viewpoint we feel that the manufacturer did an excellent job on the most important part of servicing—the servicing data. In addition to the regular data, they have added voltage and resistance charts for the transistors and tubes. Also, pictorial views of the chassis wiring are given along with the wire color code for various chassis circuits. ■

LETTERS . . .

continued from page 29

ondly, although most of our readers are TV-set service electronic technicians who specialize in TV-set servicing, we do have a significant number of readers who are qualified (with the proper license and instrumentation) to do CB servicing. We know of no other publication that serves these technicians and do not feel that they should be ignored.

We originally planned on printing the second in Mr. C. A. Tuthill's series of articles in this month's issue, but would first like to hear how our other readers feel concerning this subject. Ed.

Comments on Earlier Letters

In the November issue of ELECTRONIC TECHNICIAN/DEALER, the letter from Joseph Dianella and the letter from Tony Cizerle were complementary to each other.

I have been in the electronics servicing industry for the last 25 years at

the manufacturing, distributing and retailing levels, and have progressed from factory and bench technician through management positions. I felt 20 years ago that compulsory licensing for technicians could do nothing but enhance the status and income of technicians and shop owners alike. Licensing will most probably lead to unionization of the licensed technicians and this is not necessarily bad for shop owners. This is the history of the craft unions that were licensed in the 1930's. The increased income and wages for the craft technicians allowed the shop owners to charge the necessary rates to insure a good income, both for themselves as well as for the people who work for them.

I spent 18 years working for one man who today is a millionaire. What started as a one-man shop became a large servicing organization, which branched into other parts of the electronic industry. Most of the people who helped this man grow and become rich were given the usual pat on the back and promises of things to come.

After 18 years, I finally became "too soon old and too late smart" and left with a good case of nerves and absolutely nothing in the way of retirement, profit sharing, etc.

The shop owners will never upgrade their image in the eyes of the consumer until such time that they upgrade the people who are working for them. The glamour of working on TV sets back in the mid-40's and early 50's is no longer there. Many of us were willing to work to learn, but when a man reaches his 40's, if he hasn't learned his trade by then and become a first-class craftsman, then he has been in the wrong business and it is the shop owner's and manager's duty not to carry any dead wood.

There have been many articles and letters in the industry press about the background and education needed for technicians in the consumer electronic field, and many comparisons as to the qualifications for this field as compared to an electrician. The fact that construction and repair electricians make over $8.00 an hour in almost all areas of the country with less necessary training and education than electronic technicians, speaks well for the electricians and their unions. It is past time for us to follow their example.

Legislation forcing all technicians to be licensed will force the owners of the servicing firms to change the rates to cover the salaries that the organized technicians would then demand. I have not been a working technician for many years, but have been on the

continued on page 68

READERS SERVICE INDEX

ADVERTISER'S INDEX

NEW PRODUCTS

TEST INSTRUMENT

TAPE SYSTEM . . .

continued from page 45

far, few four-channel players or recordings are available, but the concept is catching on rapidly and will undoubtedly assume a major role in the market.

Among tape formats, the principal four-channel activity today is in eight-track cartridges. The eight-track tape is wide enough to accommodate four separate or discrete channels of music. Four-channel sound can be achieved in cassette systems by electronically combining the four channels into two on the tape by a technique known as the matrix system. Open reel would also lend itself to discrete four-channel, but there has been relatively little progress in this part of the market to date. ■

LETTERS . . .

continued from page 67

management side of the desk. However, manager's salaries are usually tied to technician's salaries, and except for the owner operators of medium and large organizations, the technical managers also suffer because of the low rates that are charged to customers and directly related to that, the low wages paid to the technicians.

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

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

ADVERTISED PRODUCTS

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

TEST INSTRUMENTS

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

NEW PRODUCTS

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

This card is usable until September 5, 1972. 6/72

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PLEASE CHECK BELOW:

1. In the TV, Radio and other consumer products fields, is your firm PRIMARILY a: (please check most descriptive item)
   - ☐ Retailer with service department
   - ☐ Service/repair firm with some retail
   - ☐ Service/repair firm with no retail
   - ☐ Industrial electronics service firm
   - ☐ Manufacturer
   - ☐ Other (please describe)

2. Title: (please check one)
   - ☐ Owner, manager, buyer, other executive
   - ☐ Service manager
   - ☐ Service repairman or other employee

NAME _____ STREET _____

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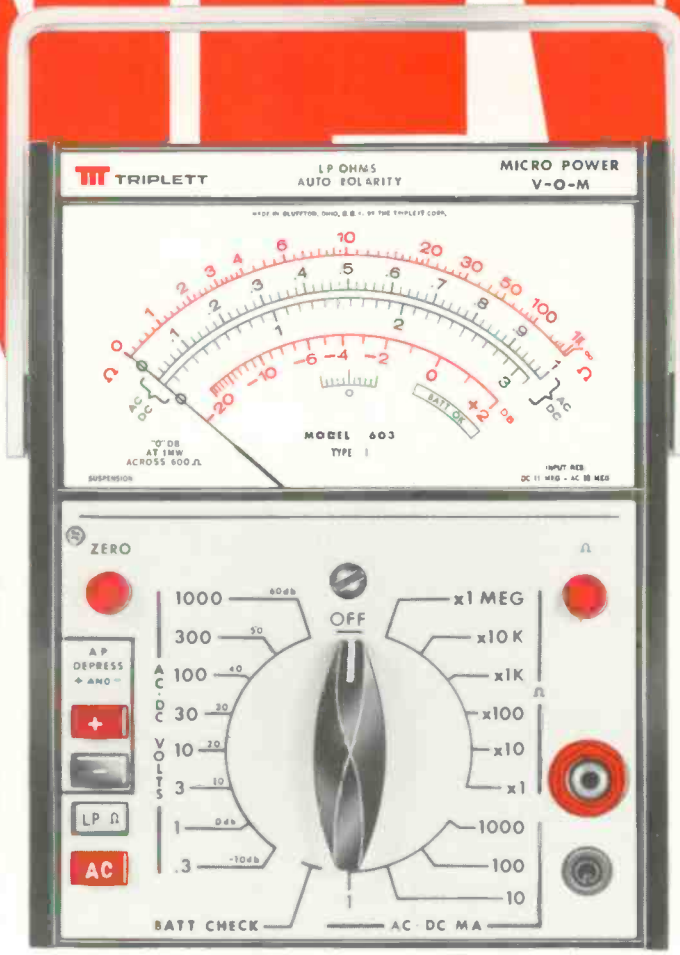

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