

FEBRUARY 1972  A HARCOURT BRACE JOVANOVIICH PJBICATION

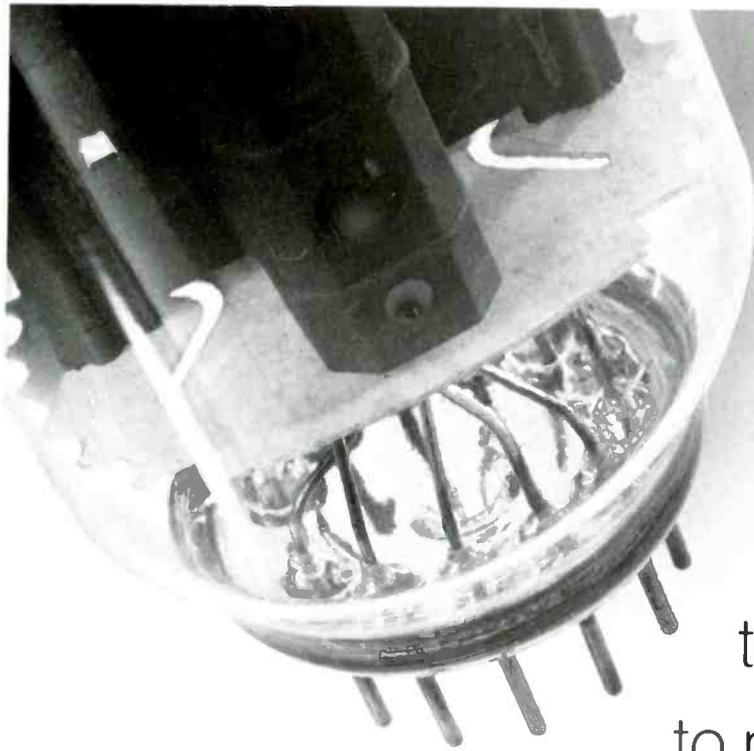
ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

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Motorola's IC Remote Receiver
Servicing CB Transceivers
Quadraline Four-Channel Sound



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



use GE receiving tubes
(made by professionals for professionals)

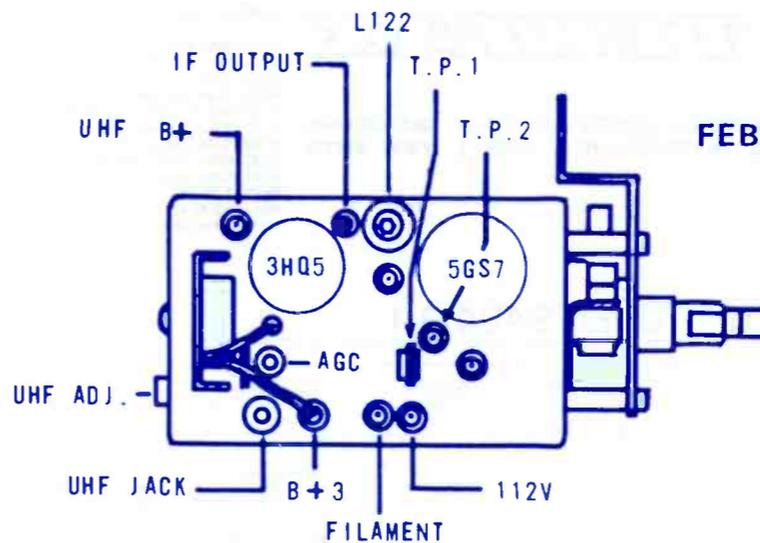
TUBE PRODUCTS DEPARTMENT • GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY 42301

GENERAL  ELECTRIC

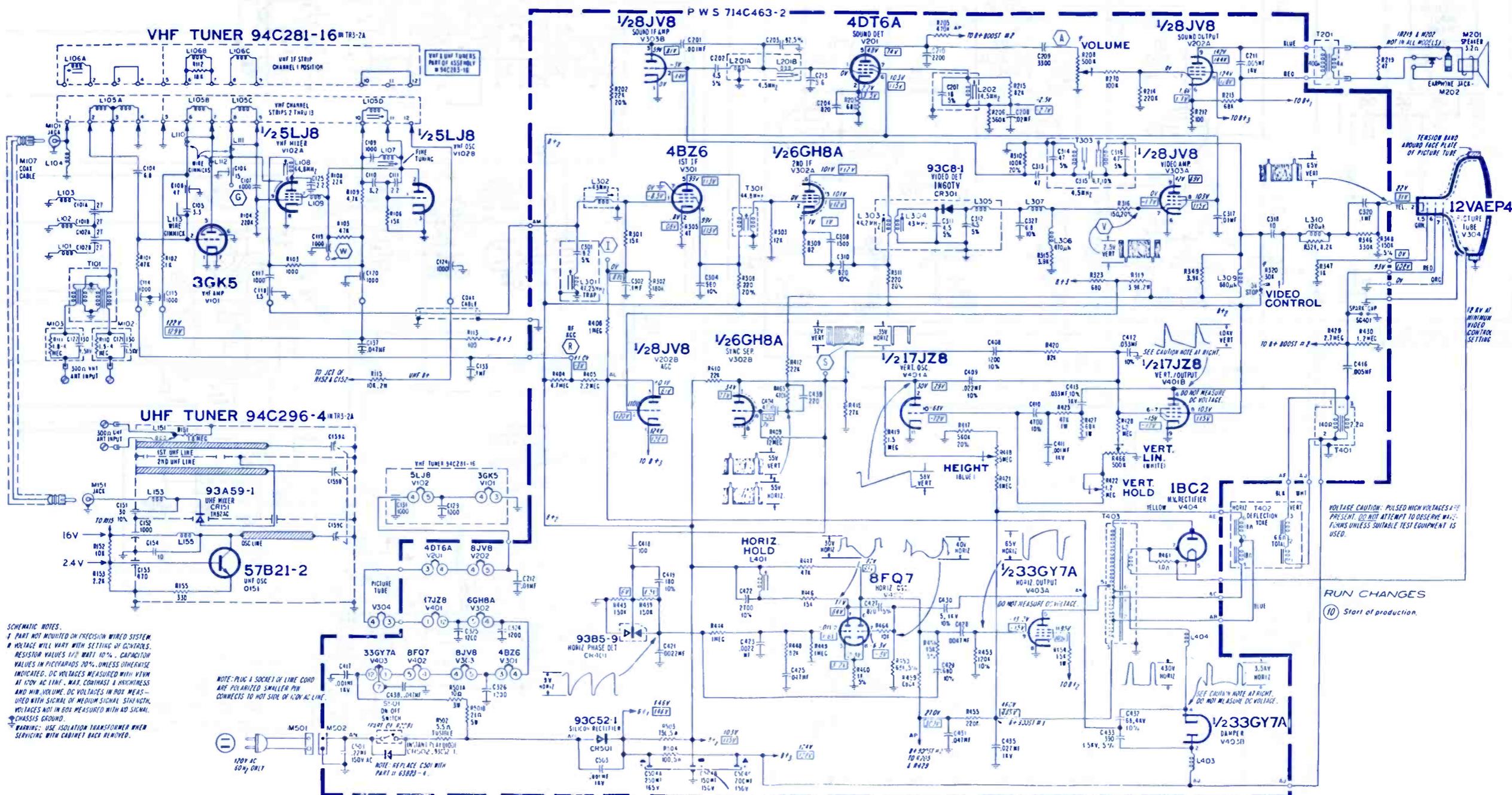
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 6 NEW SETS

GROUP
234

SCHEMATIC NO.	SCHEMATIC NO.
ADMIRAL TV Chassis TR3 1399	PANASONIC Color TV Model CT-771 1402
AIRLINE TV Models GCI-11102A, 102B, 132A, 132B 1403	PHILCO-FORD Color TV Chassis 22LT45/R 1401
EMERSON Color TV Chassis 30K17 1400	RCA SALES CORP. TV Chassis KCS 186 Series 1404



SYMBOL	DESCRIPTION	ADMIRAL PART NO.
R208	500K vol control w/switch	75A1185
R320	30K, video control	75A112-13
R418	height control	75A101-16
R422	1.2M vert hold control	75A100-8
R466	vert lin control	75A101-17
R502	5.5Ω fuse type	61A48-1
C432	68pF, 4kv, cer. disc N1500	65A10 275
C504A	150μF, 150v	
C504B	150μF, 150v elect	67A30-11
C504C	200μF, 150v	
L202	quad coil	72A132-77
L301	47.25MHz trap	72A296-4
L303,304	1F xformer	72A296-7
L401	horiz lock coil	94A17-19
T201	audio output xformer	79A124-5
T301	1st 1F xformer	72A132-76
T303	sound takeoff xformer	72A185-5
T401	vert output xformer	79A139-4
T402	deflection yoke assembly	94A372-2
T403	horiz output xformer	79A138-15
	tuner VHF	94A363-7
	tuner UHF	94A361-3



SCHEMATIC NOTES:
1. PART NOT MOUNTED ON PRECISION WIRED SYSTEM.
2. VOLTAGE WILL VARY WITH SETTING OF CONTROLS.
RESISTOR VALUES 1% UNLESS OTHERWISE INDICATED.
CAPACITOR VALUES IN PICTORIALS 20% UNLESS OTHERWISE INDICATED.
DC VOLTAGES MEASURED WITH VTVM AT 150V AC LINE. WAVE CONTRAST & BRIGHTNESS AND WAVE VOLUME DC VOLTAGES IN RED MEAS-URED WITH SIGNAL OF MEDIUM SIGNAL. SIGNAL VOLTAGES NOT IN RED MEASURED WITH NO SIGNAL.
CHASSIS GROUND.
WARNING: USE ISOLATION TRANSFORMER WHEN SERVICING WITH CABINET BACK REMOVED.

NOTE: PLUG A SOCKET OF LINE CORD ARE POLARIZED SMALLER PIN CONNECTS TO HOT SIDE OF 120V AC LINE.

VOLTAGE CAUTION: PULSED HIGH VOLTAGES ARE PRESENT. DO NOT ATTEMPT TO DISASSEMBLE TUBES UNLESS SUITABLE TEST EQUIPMENT IS USED.

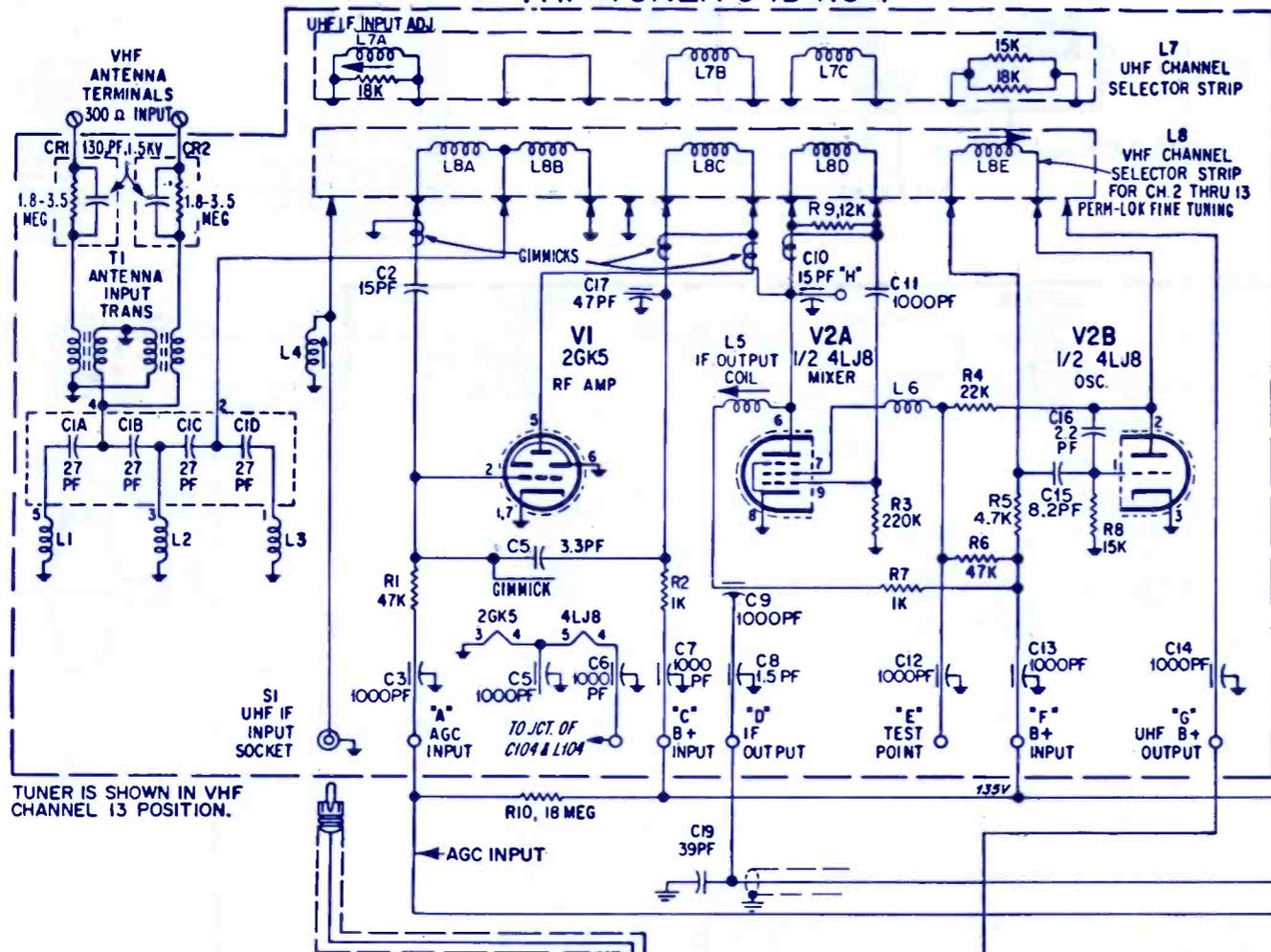
RUN CHANGES
⑩ Start of production.

SYMBOL	DESCRIPTION	EMERSON PART NO.
R119	66M, 6kv	60A30-5
R121	3M, focus adjust control (K17)	970807
R121	12M, focus adjust control	970806
R123	750K, vert hold control	971430
R127	1M, vol control on/off switch	75A179-6
R128	250Ω, contrast control	971432
R130	100K, bright control	971433
R131	500Ω, color control	75A149-7
R133	50K, tint control	971434
R509	3.4M, vert lin control	75A155-5
R517	100K, vert height control	part of R509
RT101	thermistor, degaussing	61A60-1

RV102	2ma@95v VDR	61A61-1
RV500	1ma@870v VDR	61A65-1
C109A	80μf 175v elect	
C109B	100μf 400v elect	
C109C	30μf 400v elect	67A76-1
C109D	10μf 150v	
C110A	120μf 400v	
C110B	20μf 400v	67A75-1
C110C	100μf 150v	
C110D	4μf 400v	
L105	filter choke	74A31-1
L201	quad coil	72A366-1
L501A	horiz osc coil	72A373-1

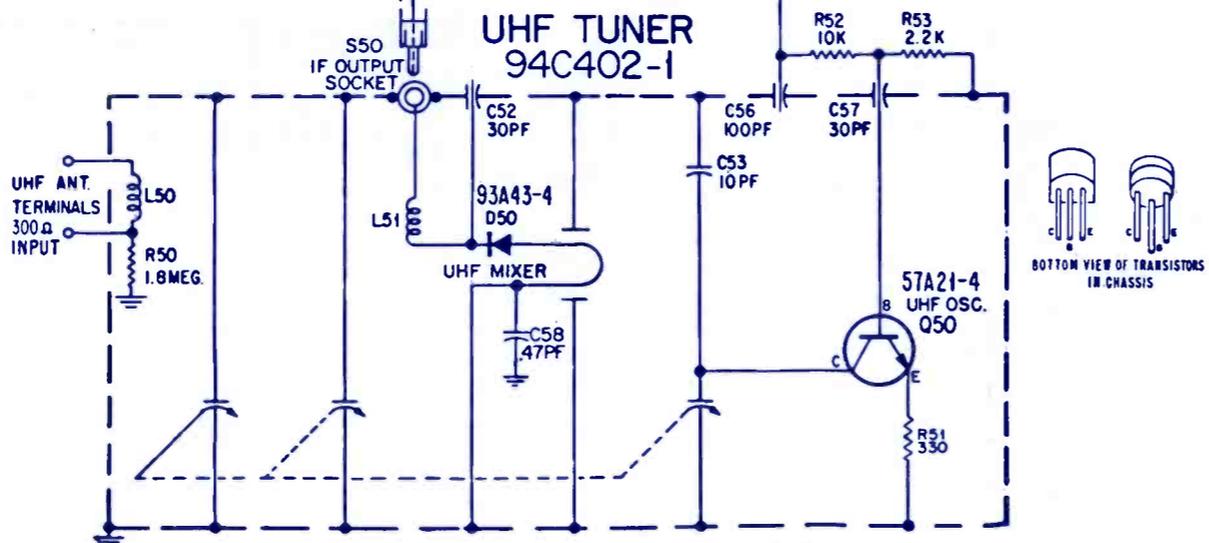
L501B	horiz osc coil	72A373-1
L700	5.6μh RF choke	73A125-3
DL300	delay line	72A372-1
T101	power xformer	80A116-1
T102	vert output xformer	79A153-2
T103	horiz output xformer	79A162-1
T200	sound take off & 4.5MHz trap	72A361-1
T201	audio output xformer	79A151-1
T700	chroma take off	72A368-1
T701	chroma bandpass	72A358-1
T802	Xtal filter xformer	72A362-1
CB101	circuit breaker	84A31-1
F101	fuse, 7a, 125v type	84A30-1

VHF TUNER 94D416-1

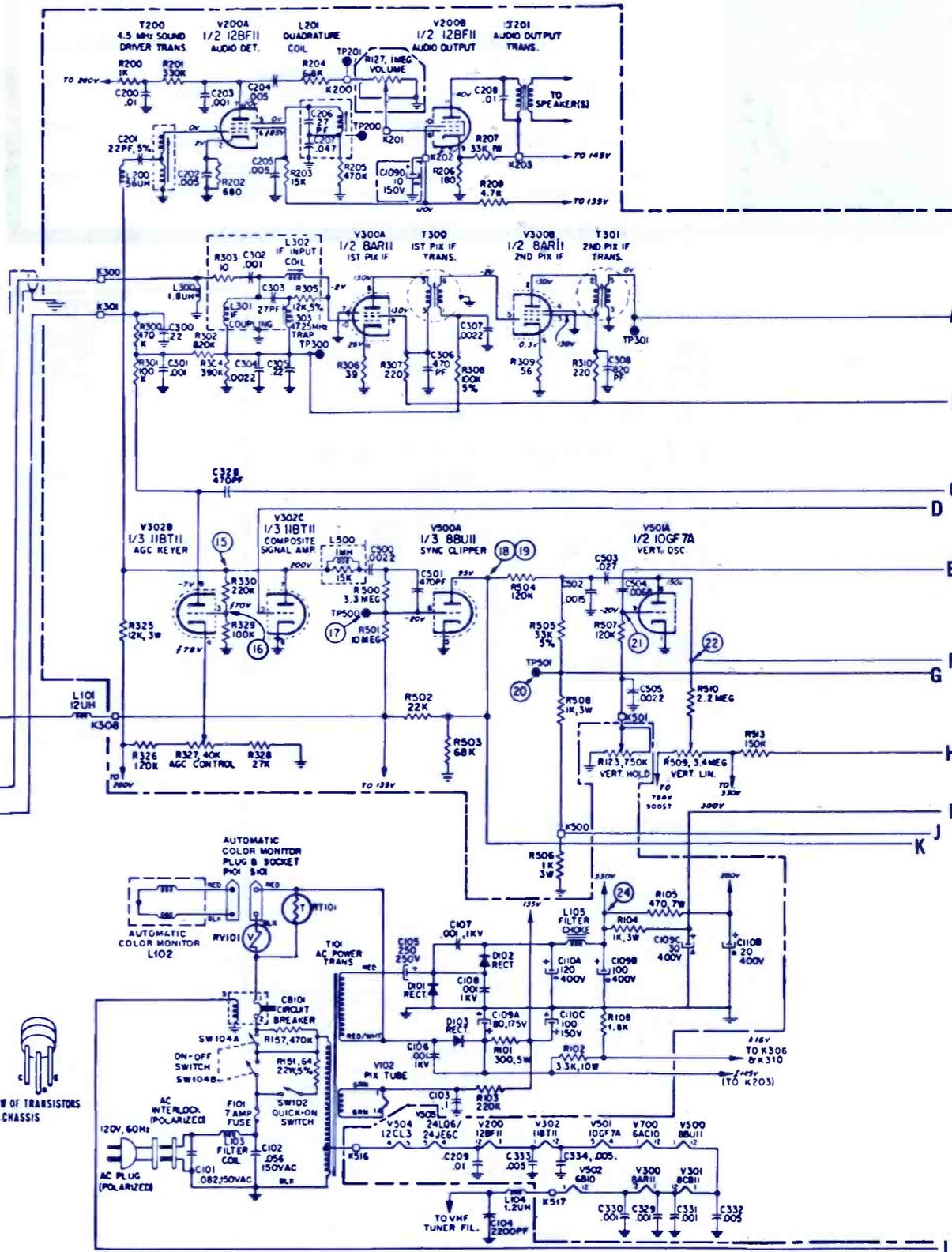


TUNER IS SHOWN IN VHF CHANNEL 13 POSITION.

UHF TUNER 94C402-1



BOTTOM VIEW OF TRANSISTORS IN CHASSIS

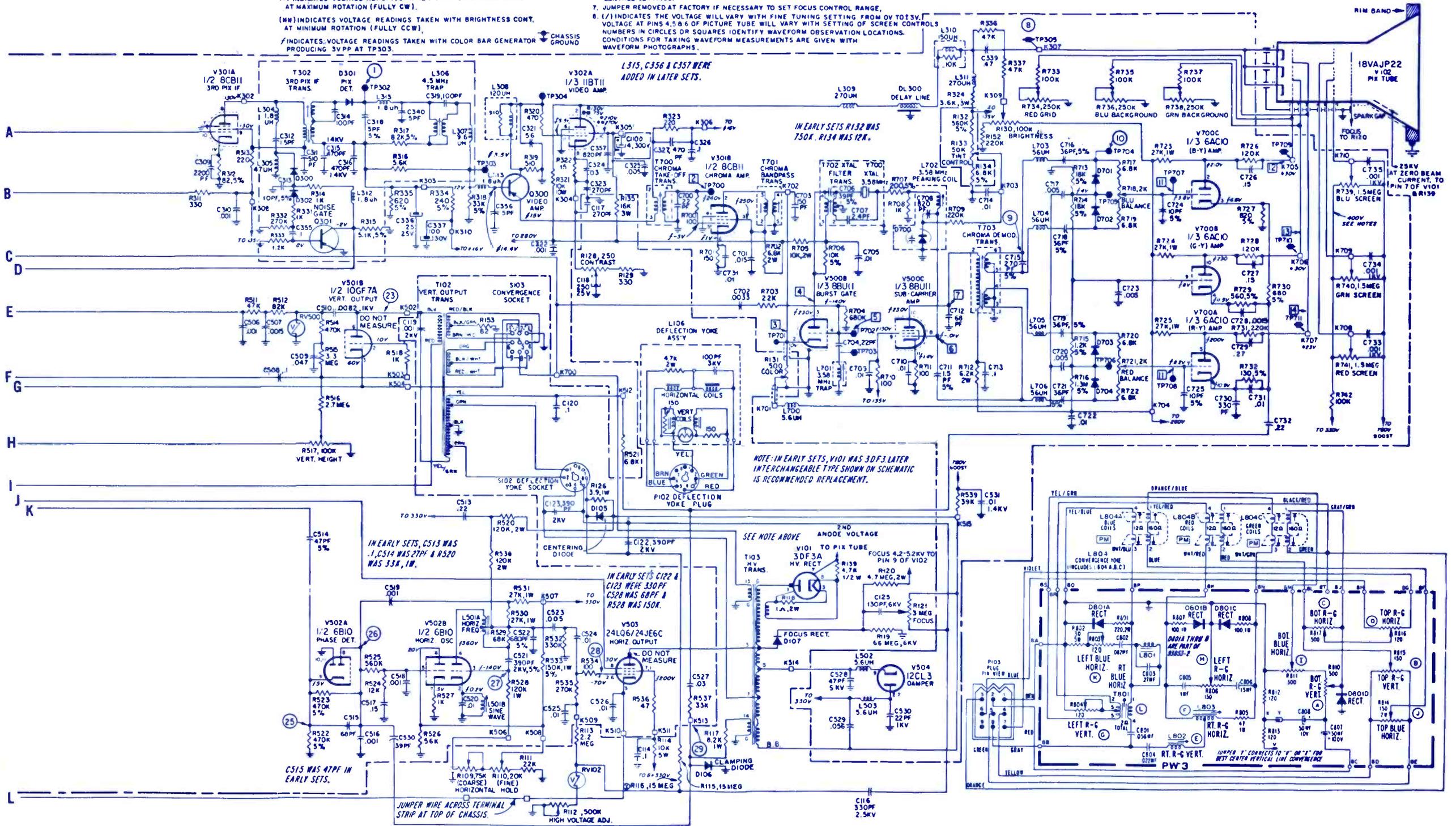


NOTES

1. ALL RESISTORS ARE 1/2 WATT, 10%, UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE IN MFD, UNLESS OTHERWISE NOTED.
3. CAUTION: USE ISOLATION TRANS WHEN WORKING ON CHASSIS.
4. DC VOLTAGES MEASURED WITH "VTVM" PLACED BETWEEN POINTS INDICATED & CHASSIS GND, WITH NORMAL SIGNAL INPUT.
- (#) INDICATES VOLTAGE READINGS TAKEN WITH BRIGHTNESS CONT. AT MAXIMUM ROTATION (FULLY CW).
- (#M) INDICATES VOLTAGE READINGS TAKEN WITH BRIGHTNESS CONT. AT MINIMUM ROTATION (FULLY CCW).
- (#V) INDICATES VOLTAGE READINGS TAKEN WITH COLOR BAR GENERATOR PRODUCING 3VPP AT TP303.

5. WAVEFORMS ARE TAKEN WITH NORMAL SIGNAL INPUT.
6. LINE VOLTAGE INPUT SET AT 120 VAC.
- # INDICATES THESE VOLTAGES WILL VARY WITH VIDEO CONTENT OF THE PICTURE BEING RECEIVED AND ARE AVERAGE READINGS.
- (@) INDICATES THESE VOLTAGES WILL VARY WITH BACKGROUND CONTROL SETTINGS.
7. JUMPER REMOVED AT FACTORY IF NECESSARY TO SET FOCUS CONTROL RANGE.
8. (1/1) INDICATES THE VOLTAGE WILL VARY WITH FINE TUNING SETTING FROM 0V TO 10.5V. VOLTAGE AT PINS 4, 5 & 6 OF PICTURE TUBE WILL VARY WITH SETTING OF SCREEN CONTROL.

NUMBERS IN CIRCLES OR SQUARES IDENTIFY WAVEFORM OBSERVATION LOCATIONS. CONDITIONS FOR TAKING WAVEFORM MEASUREMENTS ARE GIVEN WITH WAVEFORM PHOTOGRAPHS.



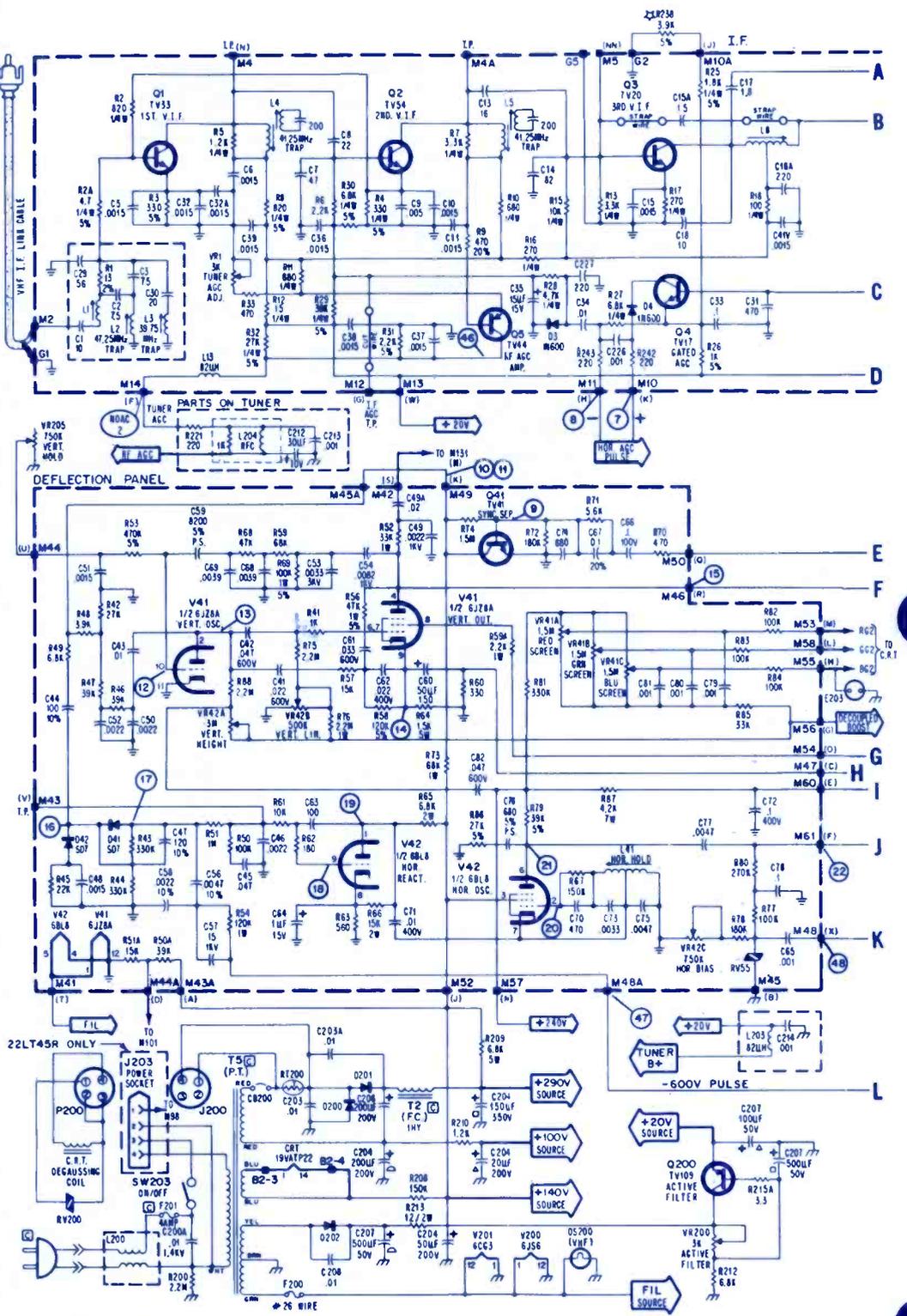
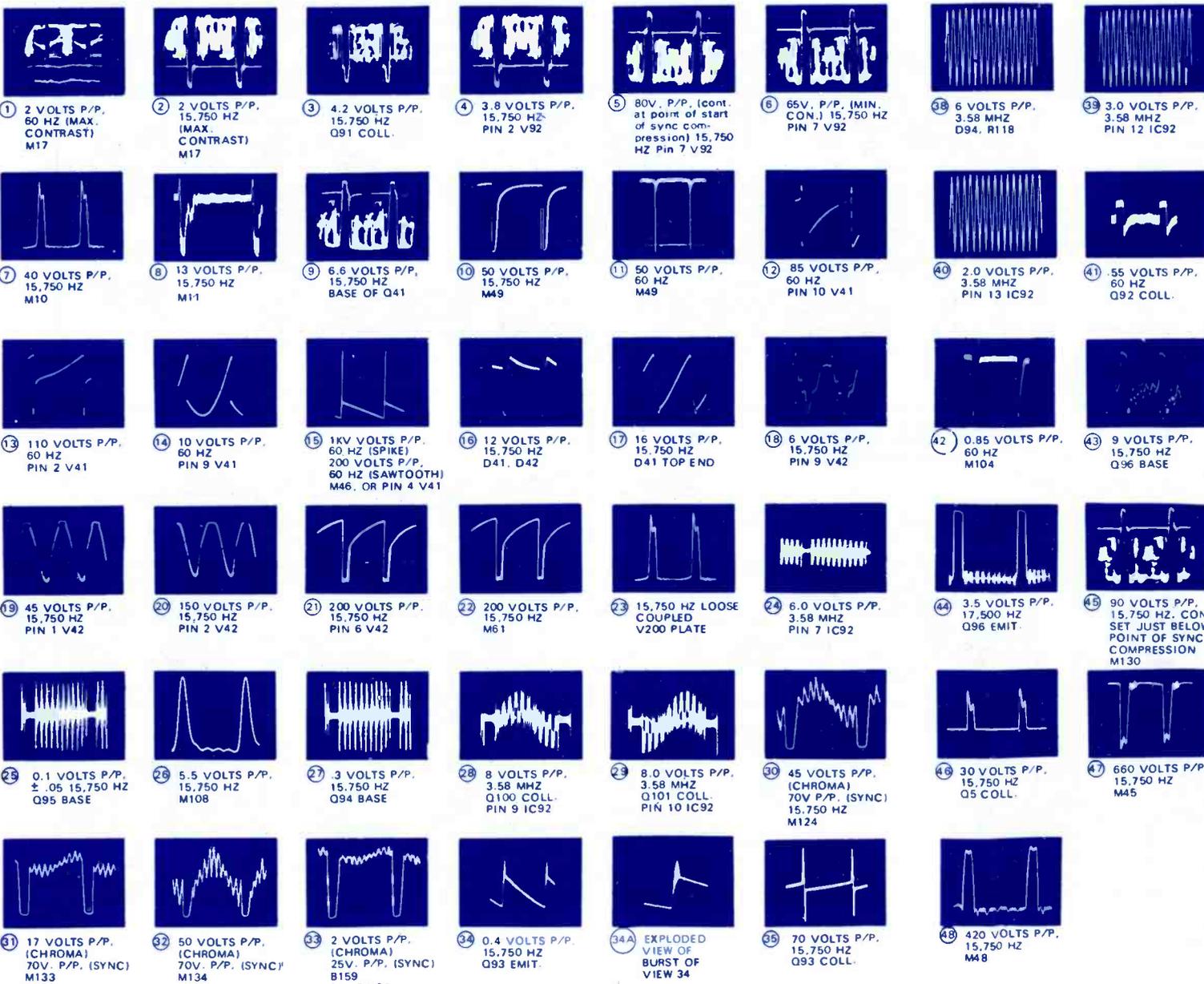
TRANSISTOR	FUNCTION	E	B	C
Q1	1ST VIF	330	1150	1.2K
Q2	2ND VID	330	2K	950
Q3	3RD VID	270	1750	750
Q4	AGC GATE	1150	1300	25K
Q5	RF AGC	700	1350	1400
Q6	1ST VID.	225	900	1100
Q41	SYNC SEP.	0	1300	25K
Q91	DELAY LINE DRIVER	300	1300	1300
Q92	COLOR KILLER	2.9K	4K	1.6K
Q93	BURST AMP	47K	4.7K	13K
Q94	2ND CHROMA	125	2.1K	1.5K
Q95	1ST CHROMA	69	1.7K	1.4K
Q96	BLANKER	68	5.6K	2.8K
Q97	DEMOD DRIVER	450	1650	425
Q200	ACTIVE FILTER	245	1350	3.4K
Q201	AUD. OUTPUT	18	1.3K	28K

SYMBOL DESCRIPTION PHILCO-FORD PART NO.

C204A, B, C, D—200µf/200, 150µf/350, 50µf/200, 20µf/200, B+ filter	30-2616-11
C207—500µf/50, 500µf/50, 100µf/50, B+ filter	
CB200—power ac	42-2136-6
IC91—1CB 4.5MHz amp/demod	46-5002-8
IC92—1C5 color osc/react/demod	46-5002-5
L4—1st video IF	32-4957-2
L10—41.25MHz trap	32-4959-18
L17—4.5MHz trap	32-4869-3
L18—39.75MHz trap	32-4959-9
L41—horiz hold	32-4891-2
L92—quad	32-4876-1
L93—sound take off	32-4936-3
L94—burst trans	32-4931-1
L95—chroma take off	32-4878-3
L100—3.58MHz osc	32-4932-2
L101—chroma bandpass	32-4928-1
RT200—degaussing	33-1376-6

RT201—vert damping	33-0292
RV55—horiz bias	33-1379-21
RV200—degaussing	33-1379-8
T1—audio output xformer	32-10156-1
T2—filter choke xformer	32-10155-3
T3—vert output xformer	32-10167-1
T4—horiz output xformer	32-10111-6
T5—power xformer	32-10171-1
VR1—3K, tuner AGC adjust	33-5628-14
VR42—A height B-in C-horiz bias	33-5627-3
VR92—color killer	33-5628-8
VR93—CRT bias	33-5628-12
VR201—2.5K, tint	33-5648-18
VR202—500n color	33-5648-8
VR203—500n bright	33-5648-6
VR204—100n contrast	33-5648-5
VR205—750K, vert hold	33-5648-7
VR206—2.5K, vol	33-5648-10
VR207—12M focus	33-5631-24
tuner VHF (TT191 22LT45R)	76-14296-1
yoke	76-14303-3

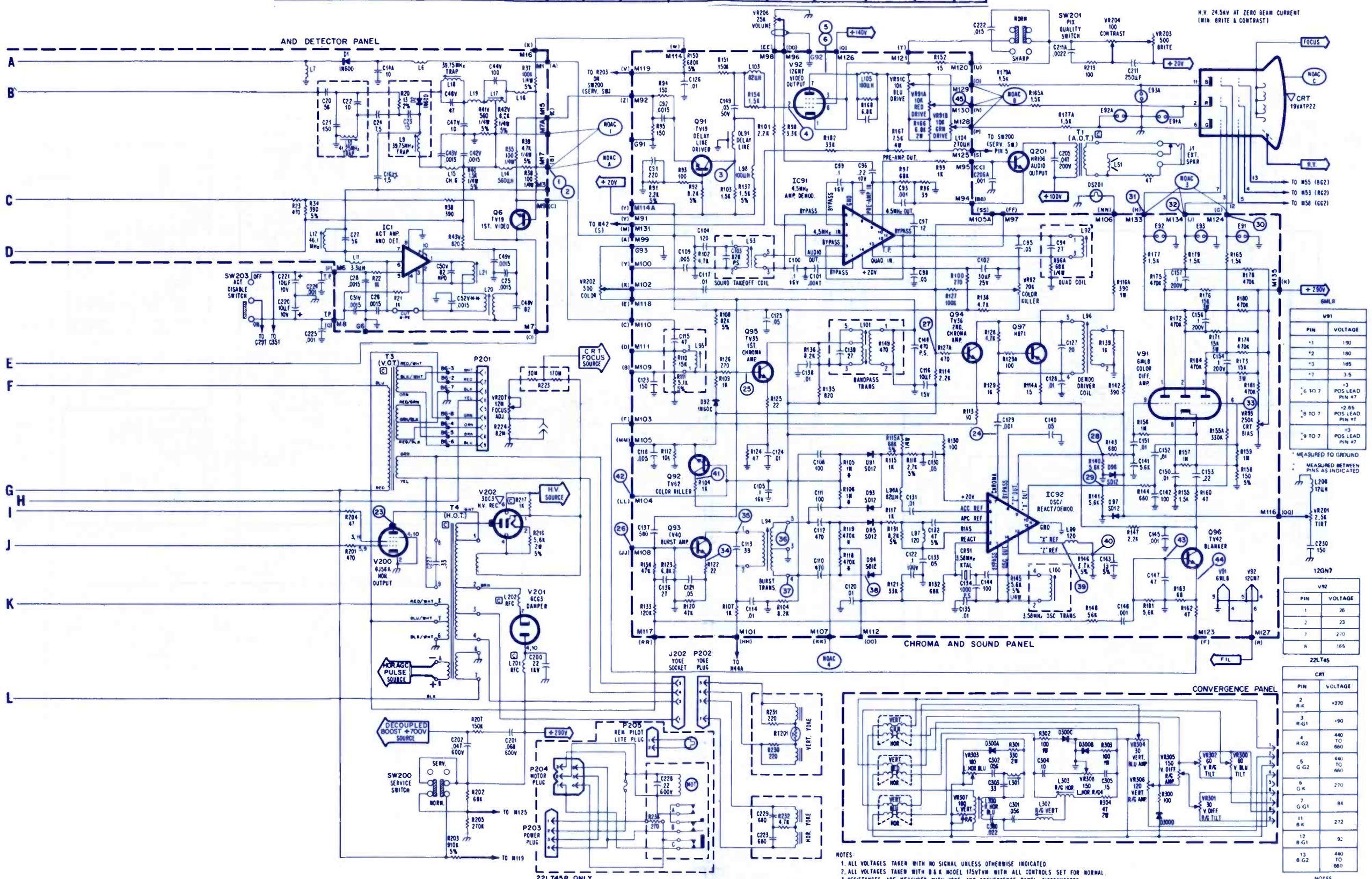
These waveforms were taken with the receiver AGC control adjusted for an approximate peak-to-peak output of two volts at the video detector, using an air signal. Do not reset AGC control when using color bar generator. All monochrome voltages taken with average air signal and all chroma voltages taken with a color bar generator connected to the antenna input terminals. The chroma peak-to-peak voltages were taken with the chroma control set for 0.3V peak-to-peak at center tap of chroma control or M102 and the tint control set for proper color bars (approximately mid-range), color bar generator output set for +1.5 VDC at M109, all other controls set for normal viewing. The frequencies shown are those of the waveforms. . . . not the sweep rate of the oscilloscope. All voltages taken with a wide band scope having a 5 MHz bandwidth similar to B&K Model 1450. Line voltage 120V.



TUBE	FUNCTION	1	2	3	4	5	6	7	8	9	10	11	12
V41	VERT. OUT/OSC.	F	*3.75M	--	17K	--	*2.5M	*2.5M	20K	1.6K	*800K	0	F
V42	HORZ. OSC/REACT.	10K	*1.65M	12K	F	F	50K	0	580	*1.4M			
V91	COLOR DIFF. AMP.	30K	30K	30K	F	F	1.1M	150	*1.1M	*950K			
V92	VIDEO OUTPUT	700	*28K	700	F	F	22K	12K	725				
V200	HORZ. OUTPUT	0	0	20K	0	*900K	--	--	--	*900K	0	20K	0
V201	DAMPER	0	--	--	16K	--	--	*800K	--	--	16K	--	0

TUBE RESISTANCES

PHILCO-FORD
Color TV Chassis
22LT45/R



PIN	VOLTAGE
*1	190
*2	180
*3	185
*7	3.5
*6 TO 7	+3 POS LEAD PIN #7
*8 TO 7	+2.85 POS LEAD PIN #7
*9 TO 7	+3 POS LEAD PIN #7

MEASURED TO GND/IND
MEASURED BETWEEN PINS AS INDICATED

PIN	VOLTAGE
1	26
2	23
7	210
8	165

PIN	VOLTAGE
1	26
2	23
7	210
8	165

PIN	VOLTAGE
2 R-K	+270
3 R-G1	+90
4 R-G2	440 TO 660
5 G-G2	440 TO 660
6 G-K	270
7 G-G1	84
11 B-K	272
12 B-G1	92
13 B-G2	440 TO 660

- NOTES
1. ALL VOLTAGES TAKEN WITH NO SIGNAL UNLESS OTHERWISE INDICATED.
 2. ALL VOLTAGES TAKEN WITH B & K MODEL 175V7M WITH ALL CONTROLS SET FOR NORMAL.
 3. RESISTANCES ARE MEASURED WITH YOKE AND CONVERGENCE PANEL DISCONNECTED.
 4. ASTERISK (*) INDICATES MATCHED PAIRS OF RESISTORS.
 5. STAR (*) INDICATES COMPONENTS ON COPPER SIDE OF PANEL.
 6. (C) CRITICAL SAFETY (REPLACE WITH EXACT SPECIFIED PART AS INDICATED IN PARTS LIST).
 7. DO NOT MEASURE VOLTAGES AT PINS OF IC91 & IC92. MEASURE VOLTAGES AT COMPONENT NEAREST PIN.
 8. (V) CRITICAL SAFETY (REPLACE WITH EXACT SPECIFIED PART INDICATED IN PARTS LIST) HIGH VOLTAGE COMPONENT.

1402

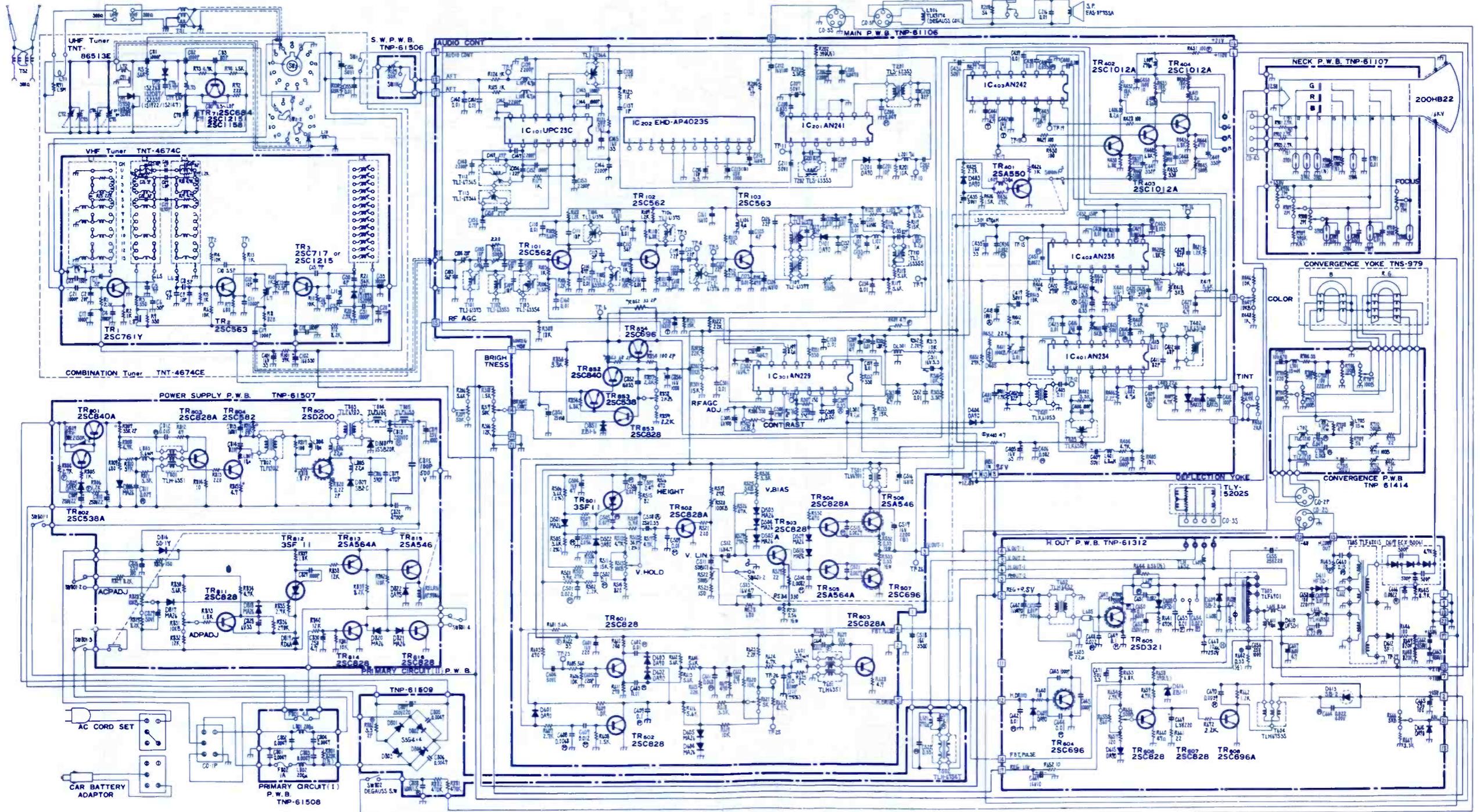
PANASONIC

Color TV Model
CT-771

ELECTRONIC TECHNICIAN/DEALER **TEKFA**X

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 6 NEW SETS

FEBRUARY • 1972



NOTE S

1. RESISTANCES ARE SHOWN IN OHMS, K=1,000 M=1,000,000
2. ALL RESISTORS ARE THE CARBON FILM RESISTOR UNLESS OTHERWISE NOTED.
 - 1/4 WATT'S SOLID RESISTOR
 - ⊞ WIRE WOUND RESISTOR
 - METAL OXIDE RESISTOR
 - Self-extinguish Carbon Film Resistor
3. ALL RESISTORS WITHOUT WATTAGE INDICATION ARE 1/4 WATT'S.

4. CAPACITANCES ARE SHOWN IN μ F=10⁻⁶ P=10⁻¹² F. UNLESS OTHERWISE NOTED; P=10⁻¹² F.
5. ALL CAPACITORS ARE CERAMIC CAPACITOR UNLESS OTHERWISE NOTED AS THE FOLLOWING MARKS.
 - POLYSTYRENE CAPACITOR
 - POLYESTER FILM CAPACITOR
 - POLYPROPYLENE FILM CAPACITOR
 - METALIZED POLYESTER FILM CAPACITOR

6. VOLTAGE MEASUREMENTS. TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM (±20%) WHEN RECEIVING COLOR BAR SIGNAL.

TRANSISTOR BASING DIAGRAMS (Bottom View)



COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 6 NEW SETS

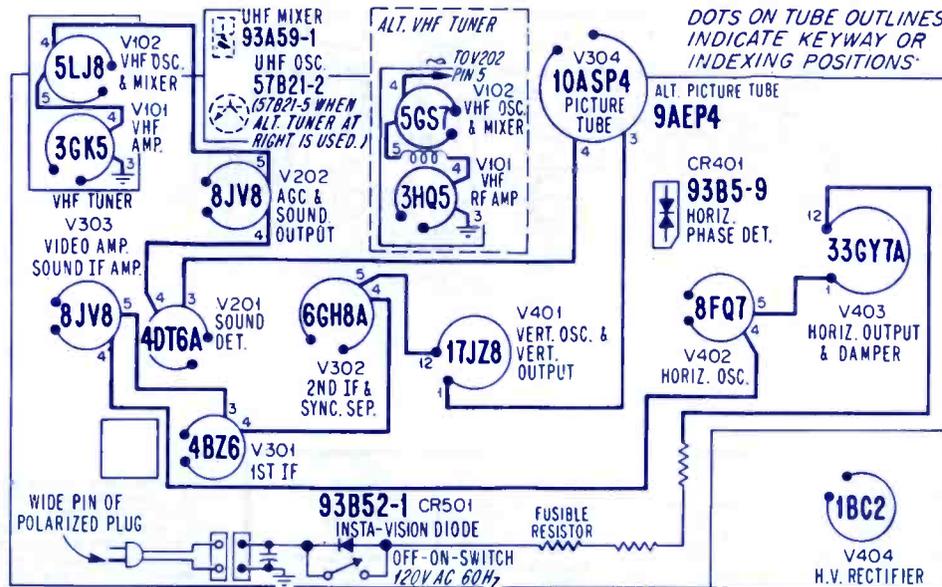
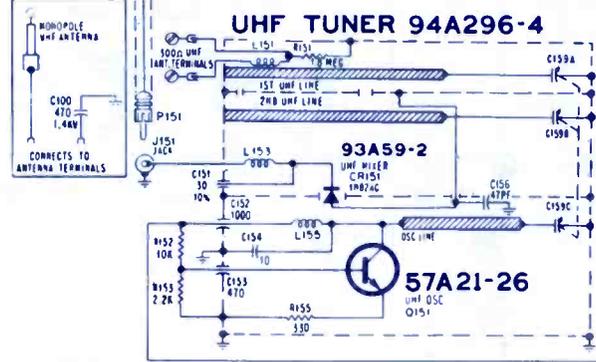
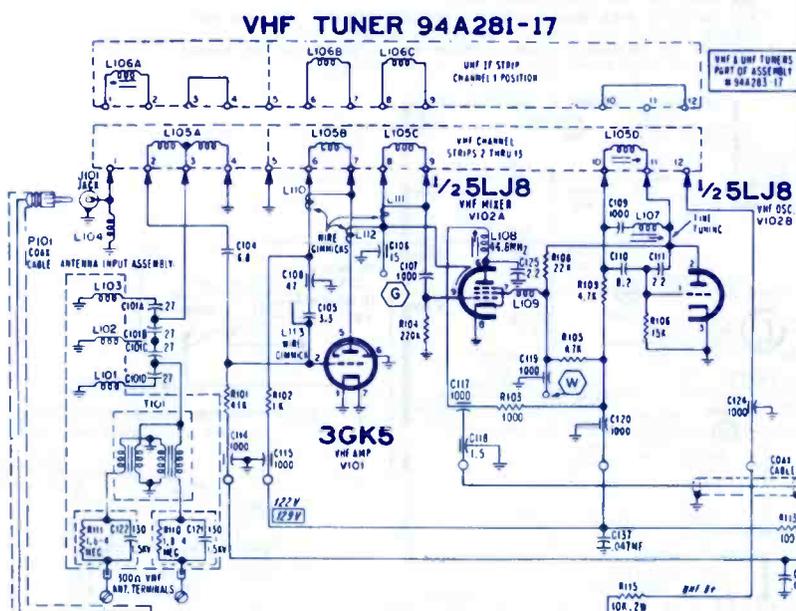
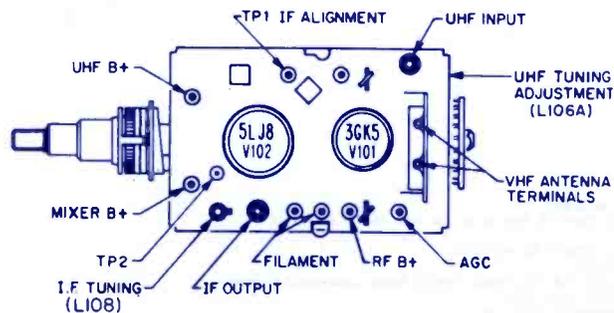
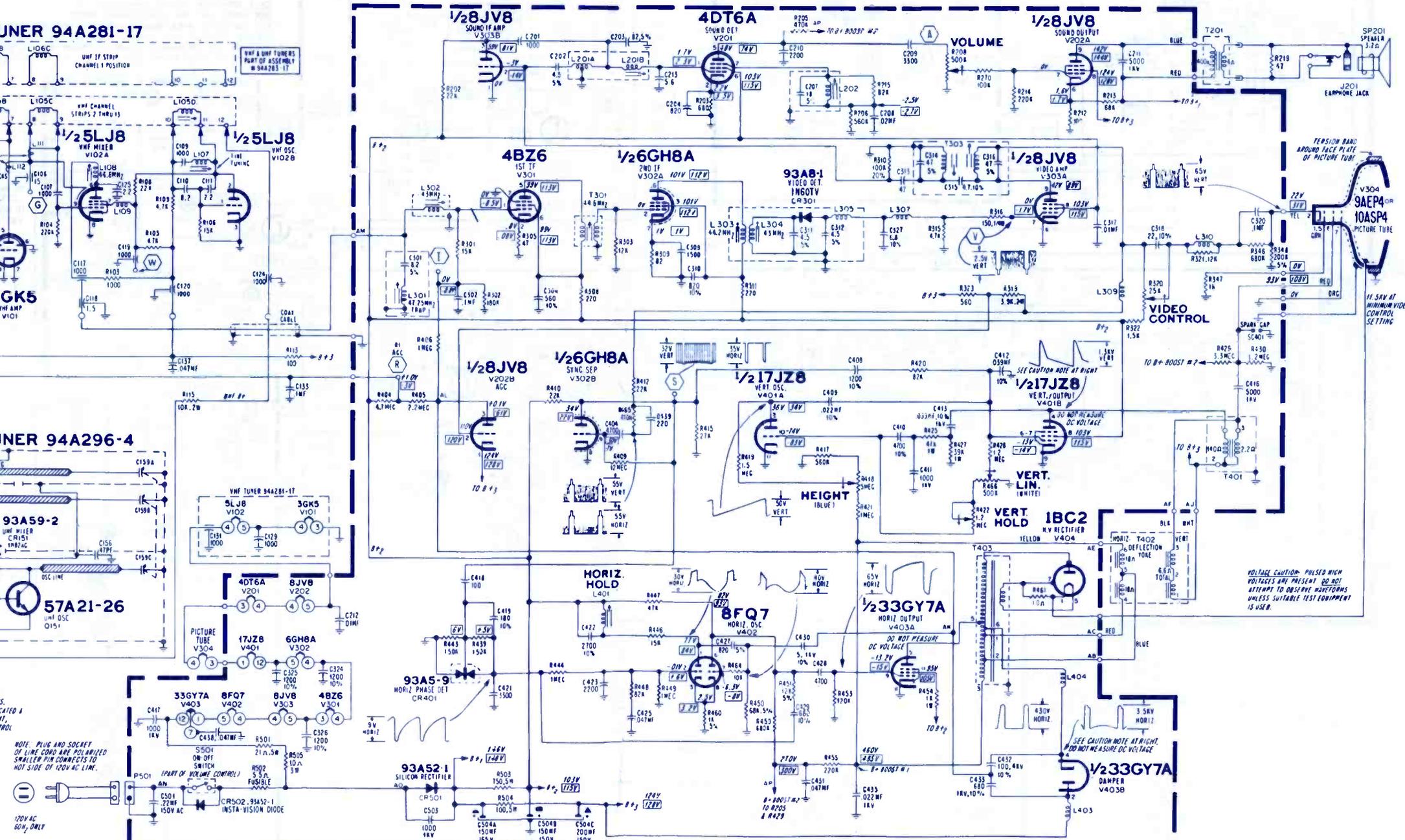


Table with 3 columns: SYMBOL, DESCRIPTION, AIRLINE PART NO. It lists various components like capacitors (C504, C505), resistors (R208, R501), and tubes (V304, V401).

Table with 3 columns: SYMBOL, DESCRIPTION, AIRLINE PART NO. It lists components like coils (L302, L304), transformers (T201, T301), and diodes (CR401, CR501).

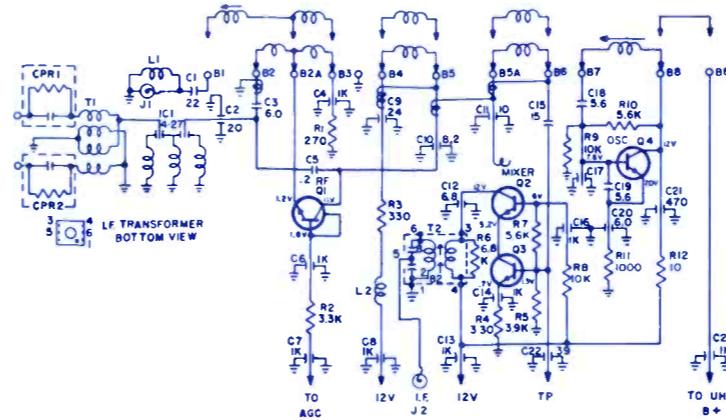


SCHEMATIC NOTES: 1. ALL RESISTORS ARE 1/2W, 10%, UNLESS OTHERWISE NOTED. 2. ALL CAPACITORS ARE PAPER, 50%, UNLESS OTHERWISE NOTED. 3. CAUTION: USE ISOLATION TRANSFORMER WHEN WORKING ON CHASSIS. 4. DC VOLTAGES MEASURED WITH 'VOM' PLACED BETWEEN POINTS INDICATED IN THE METAL SHIELD AT THE REAR OF THE HIGH VOLTAGE COMPARTMENT...

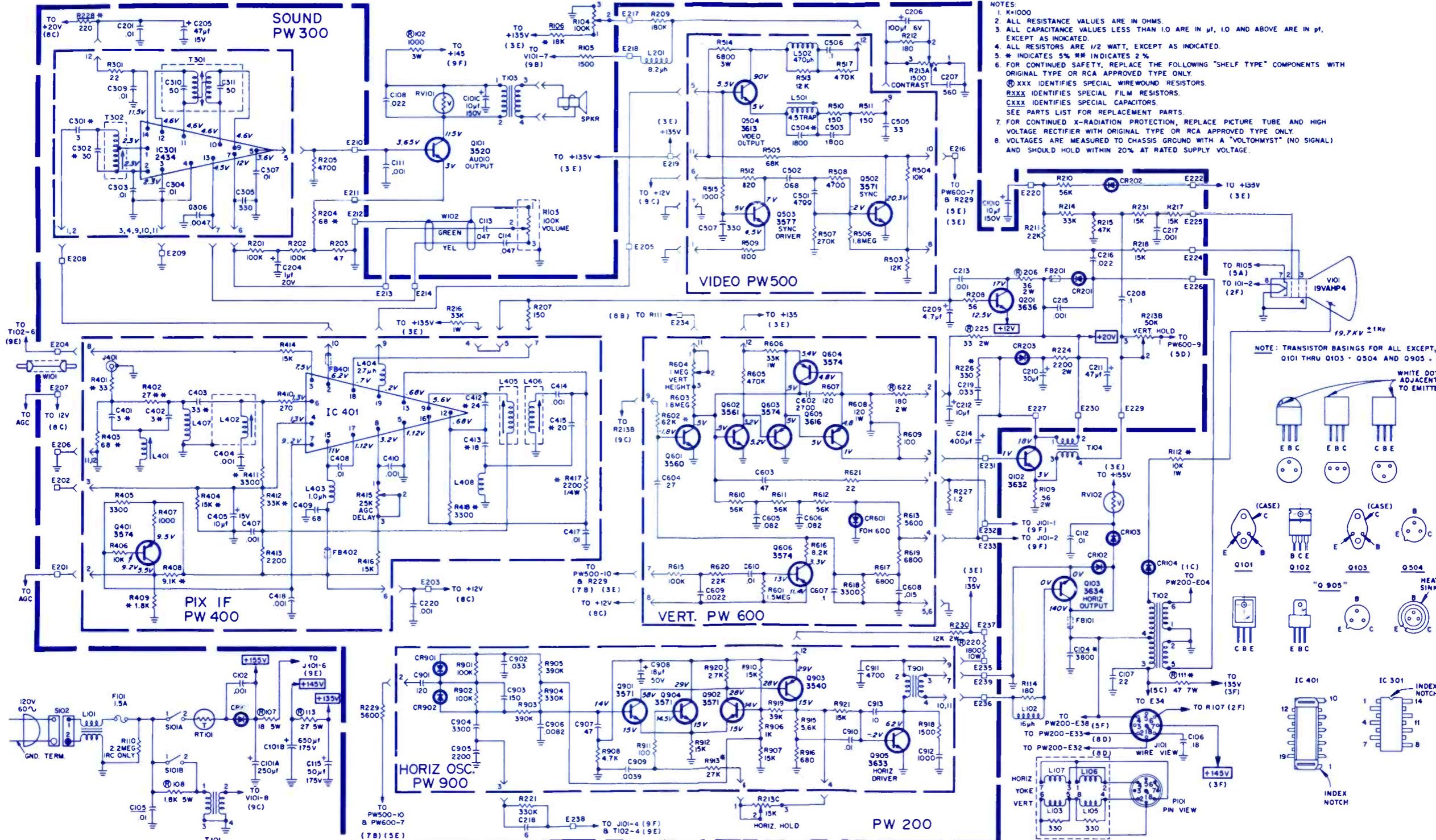


SYMBOL	DESCRIPTION	RCA PART NO.
KRK161A		130777
R103	—vol control	133514
R104	—bright control	133515
C101	—4 section elect	134822
C101A	—250 μ f, 200v	
C101B	—650 μ f, 175v	
C101C	—10 μ f, 150v	
C101D	—10 μ f, 150v	
F101	—fuse 1.5a, 125v	133466
L101	—coil line choke	117526

RT101	—thermistor 32 Ω cold	134012
RV101	—varistor 80v, 1ma	131652
RV102	—varistor 730v, 1.5ma	133754
T101	—x-former filament	134742
T102	—x-former horiz output	134758
T103	—x-former audio output	133046
T104	—x-former vert output	134826
R213	—control contrast vert hold horiz hold	133428
1C301	—circuit integ sound	126871
T301	—x-former discriminator	126738
T302	—x-former sound take off	129707
	tuner yoke deflection	134955

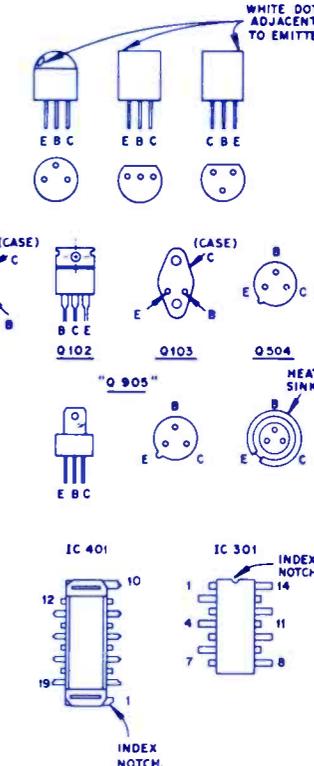


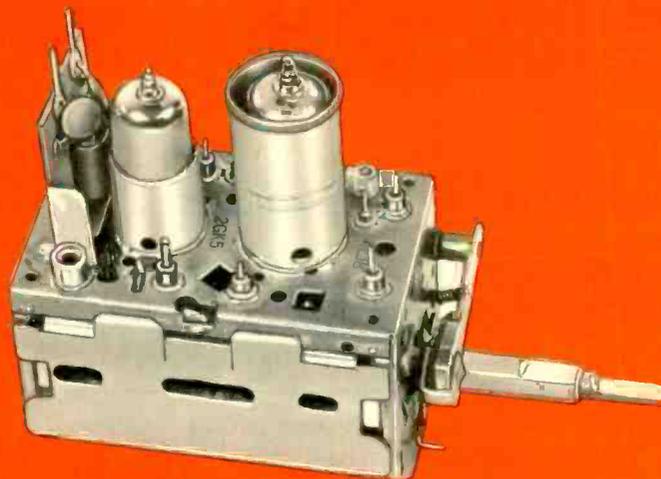
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- NOTES:
1. K=1000
 2. ALL RESISTANCE VALUES ARE IN OHMS.
 3. ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN μ f, 1.0 AND ABOVE ARE IN pF, EXCEPT AS INDICATED.
 4. ALL RESISTORS ARE 1/2 WATT, EXCEPT AS INDICATED.
 5. * INDICATES 5% ** INDICATES 2%
 6.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

NOTE: TRANSISTOR BASINGS FOR ALL EXCEPT, Q101 THRU Q103 - Q504 AND Q905.





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TUNER SERVICE CORPORATION

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SOUTH-EAST	1505 CYPRESS ST., Tampa, Florida	TEL: 813-253-0324
WEST	SARKES TARZIAN, Inc. TUNER SERVICE DIVISION 10654 MAGNOLIA BLVD., North Hollywood, California	TEL: 213-769-2720

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

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This month's cover photo, courtesy of Leader Instruments Corp., shows our managing editor observing circuit conditions in Panasonic's CT-771 portable color-TV set (to be described next month) with the aid of Leader's LBO-301 Scope and Leader's LCG-388 Color Bar Pattern Generator.

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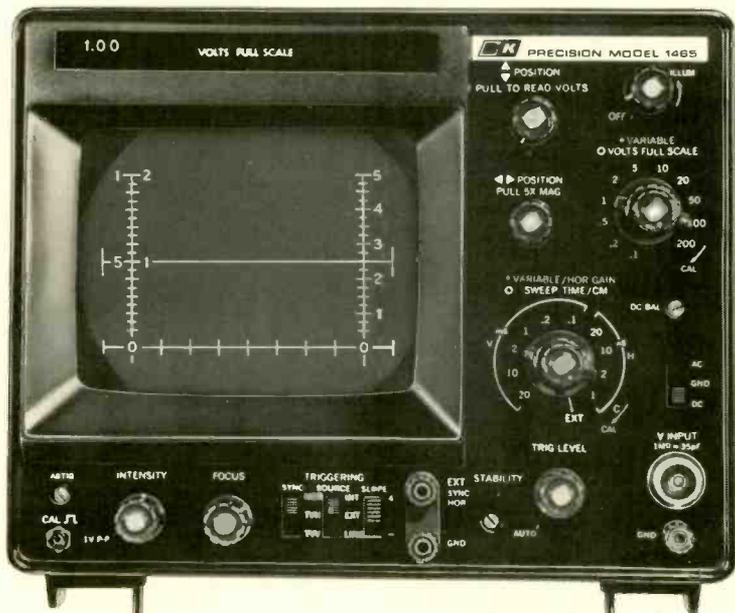
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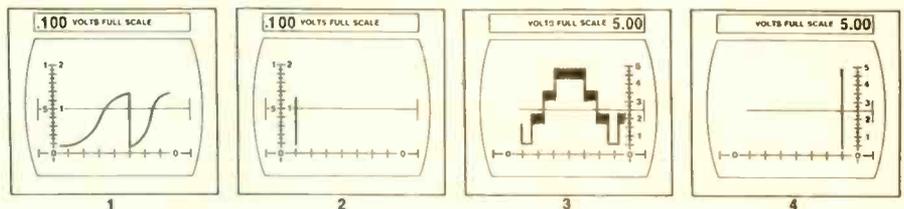
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Professional Associations

Few professional endeavors (such as ours) are so well suited for the individualist, the man who wants to be free to work for himself—free to set his own pace, as the



workload permits; free to determine his own fees, as the market permits; free to stop and investigate interesting innovations, as his own work schedule permits; free to support related community activities, as his own business permits. And then there is the personal challenge of matching one's wits against defective electronic circuitry, sometimes making the product function even better than when new; and the warm feeling of having a really satisfied customer, one who knows that **you** did a fair and honest job. All this plus the pleasure of personally selling a customer a high-quality product that will make life a little more pleasant for many years to come.

But if we are able to enjoy such a degree of independence, why then be saddled with some trade association. Why throw away our cherished independence—particularly if there is nothing to be gained by such a great personal sacrifice.

But wait, what are these many freedoms that may be lost?

Will you be told what prices to charge your customers? No, but the associations might let you know what others are charging and how they determined their rates—maybe you will find that with your current charges you are cheating yourself.

Will they tell you what hours you must be open for business? No, but they might show you how a slight adjustment in business hours (if you care to make a

change) will increase your business.

Will they tell you how much insurance you must carry? No, but they can tell you how you might reduce your insurance premiums, and assure you of the coverage that you only think you now have.

Will they tell you who you must hire, and what you must pay in salaries? No, but they will help you get the best qualified service from those that you do hire, with minimum turnover. (Did you know that the federal government is willing to subsidize the salaries of veterans trained by qualified electronic technicians and service dealers?)

Will they tell you what brands you must sell or service, or that you must not sell or service? No, but they will tell you what manufacturers will help you make your job easier and what manufacturers produce products that have unreasonable maintenance problems.

By joining an association, you **do not** lose your independence, you are helped in maintaining your independent business. Far too many electronic technicians and service dealers are forced out of business each year because of the financial pressures that result from unsound business practices.

The associations, made up of independent businessmen, such as you, are formed for mutual support. These associations work to protect you from unreasonable government interference, unreasonable consumer demands, unreasonable manufacturer requirements, and unreasonable competition from dishonest businessmen.

These associations all function in a democratic manner. If you don't feel that they represent you, then join them and let your thoughts be heard! If you don't like their current direction, then get together with others that think as you and exert an influence to get things changed. Don't simply sit back in your shop and cry to us. Show up at these

meetings and make your thoughts known. Try to make it to the joint convention in New Orleans this coming August.

Despite a downturn in many segments of our economy, the consumer electronics industry had a very good year in 1971, and business will be even better in 1972. The American people have the money to be entertained—if for nothing else—and well-maintained consumer electronic products provide much of this entertainment.

All that one must do to maintain a financially healthy business is to run it in an effective, professional manner. And **ELECTRONIC TECHNICIAN/DEALER** is dedicated to the job of assisting you in that manner. We are a professional publication concerned about you and your professional associations. Although many letters have been received supporting our current editorial position, few have even approached the extreme position indicated by the following recent letter:

"From time to time you have published a letter from some irate reader who would want you to conform to the format of the various diddle and dab electronic publications. I read them also. I also read your editorials (as an example, the December one). I used to be a diddle this and dab that hobbyist. But that seems to be in the past, thanks to ET/D. If you change any part of your editorial policy, or format, to suit these piddlers, first I'll shoot you, then I'll draw and quarter you, and then to add insult to injury, I'll cancel my subscription. You keep aiming at the professional, and the rest of us will either catch up or fall by the way."

Phillip Waller

LETTERS

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

Proud to be a CET

I found Mr. Joseph Dianella's letter (November 1971 ET/D) interesting and deserving of a few comments. As a CET with the registration number "South Vietnam Number 1," I look upon my certificate as the ultimate conclusion to many years of independent and government study—a considerable amount of money spent and one of the most comprehensive tests I have ever taken. It was a dilly!!! That certificate is my most prized possession, and I think other CET's feel the same way.

I will go even further in stating that most CET's feel that electronics is an art and a labor of love. To be quite frank with you, I do not want a man to be associated with my art who does not understand its fundamentals, because I have learned that one cannot be truly competent as a "parts changer" or a "symptoms mechanic." I base this on many generations of repairmen that I have trained during my service in the Army. We have a high turnover rate you know!

During my off duty time I service TV sets and radios as well as other electronic devices, and I feel that I am letting my customers down if I cannot explain to them the whys and wherefores behind their problems. Public relations, as you know, are a large part of a business. Confidence in the technician brings its rewards, one of them being financial.

In the same issue the Editor brings up the difference between trade associations and unions. We need trade associations to represent those individuals who on their own recognized merit can be called technicians. Also, we need a uniform method of identifying individuals who can fit this description. We must initiate plans and procedures to eliminate those who are not competent to hold this title—through laws and licensing in the various states. No one person can do this. There is strength in numbers. I personally welcome constructive licensing as another step in the recognition of my craft and abilities.

I do not feel that the electronics industry is in need of new blood, rather it is in need of new *technicians*. If a man does not want to accept the challenge, to burn the midnight oil, to make the effort—let him go else-

where!! It would be as much folly to let a weakly motivated individual service your potentially dangerous TV set as it would be to send your children to a doctor with a second grade education.

How about unions? You say people are leaving the field. Who are they? The good or the bad? If they are bad—well, who cares? But, if they are good, why do they leave? Even a labor of love should get a return. I can say without any hesitation that men in my classification make twice as much as the average TV repairman. The government recognizes our abilities. Not so the private TV repairman. It would appear to me that the average shop owner makes a good buck. Why shouldn't the people he employs also benefit? A union could do this. The effective managers could give decent remuneration. The bad managers would either become competent or go out of business! Managers should welcome constructive unions too. Why? Unions are responsible to management for providing a properly trained technician at an identifiable skill level, i.e., apprentice, journeyman, etc. A proper union is an asset to all concerned.

I find it hard to believe that people like Mr. Crow, Mr. Glass or Mr. Moch need the "bundle of loot" from the dues. Rather, these are highly motivated, professional people who are upgrading a profession that has many critics and few stalwarts. I do not know any of these gentlemen personally, but I would wager that many of the expenses generated are covered out of their own pockets—to our collective shame.

I will close by quoting the wording used on the CET certificate. "Be it known by those present that _____ has successfully completed the technical tests and requirements entitling him to be universally recognized for his competence, ability and knowledge as a Certified Electronic Technician, a journeyman of the trade." These words are a statement of present fact, even more important a future challenge.

SFC RONALD BROMWICH, CET

Technician Continues Battle

Things have really been bubbling in this area due to my actions and letters.

With various newspaper clippings of the TV repair exposés and judgments handed down from licensed states on dealers and technicians across the nation, I arranged an interview with the local newspaper editor and tried to sell WSEC's certification program. I felt that both the shops and consumers

could benefit from this program in lieu of a legislative licensing bill. The editor was ultimately swayed and impressed.

I convinced the local working technicians to attend the local association meeting in order to express and utilize their right to vote on and improve the industry locally. We voted through a measure of public advertising to promote respect and support for the local association, along with a dues increase, which would double those of shop owner/dealers and triple technicians' dues. We technicians have also designed and ordered bumper stickers and truck decals.

Now I must say that these proposals were met with stern opposition from the older shop owners, who comprise what has been the industry in this area for the last 10 to 15 years.

This utilization of our democratic freedom of majority rule gave hint that the old apple cart was being modernized and updated. Also being proved was that through unity and reciprocal support the industry could improve itself.

Needless to say this campaign would also air a few wounds which the local industry suffers that some would rather ignore, or hope that NEA, NATESA, NARDA, the state association, low wages, softspoken underachieving technicians, manufacturers or distributors might supply a cure or remedy for.

In other words, "what the consumer doesn't know can't hurt us," while "what the consumer does know can hurt us!"

So if some shy, soft spoken underachieving technician tries to improve conditions against their wishes, just fire him in the hopes that he leaves the area and any supporters of his get the message at the same time. This happened to me!

I definitely feel that this is not a case of faltering due to fear of airing dirty linen in public, but rather that too many just don't want to remove the dirty linen for cleaning or possible replacement!

I lost my job due to hollering too loud to too many. What really spurred this is when outsiders began to listen and I began to act.

My employer states that it was due to the lack of work—yet three days earlier he stated to a newspaper editor that there were not enough shops in the area and that his shop had more than enough work—that they were even behind in their workload.

So you can draw your own conclusions as to this situation. Also conclude how often, in how many areas, this situation is repeated? Then try to

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Spots trouble fast-tells where it is



This Master Chro-Bar/Signalyst is the most advanced color-bar generator ever developed by RCA

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 - IC circuitry throughout... provides excellent pattern stability. No counter alignment controls to adjust.
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parts and labor... complete replacement parts availability. For immediate delivery and full information on the WR-515A Master Chro-Bar Generator, see your RCA Distributor or write RCA Test Equipment Headquarters, Harrison, N.J. 07029.

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RCA Electronic Components

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LETTERS...

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conclude why the national industry lacks young, bright, competent and interested technicians? Conclude why the average age of a technician is 50 plus. Conclude why unskilled ill-trained technicians continue to fill such vacancies. And most important, why the general public is disrespectful, confused, irate and suspicious.

I thank you for your past support, and now in search of that old job security, I will be forced to leave the local industry or perpetuate the acceptance of low wages, ill respect, lack of future advancements and security, etc., to continue in a trade in which 10 years of my life is sunk!

(another letter)

It was the desire of a few here that I would be forced to leave the area. But with the aid of my fellow-working technicians and a sympathetic and interested shop owner or two, I borrowed enough equipment to do two picture tube and chassis repair jobs at home and picked up \$100.00 clear profit.

And after an excellent interview of me and editorial by the local TV news broadcaster, I had a job the next Monday morning.

I do plan to continue to "moonlight" to supplement my income. This area is swamped with part timers, etc., due to the AEC nuclear plant here.

Yes, go ahead and print my previous letter with address. You might add that I am not looking for a change of scenery, but for a future for myself and family.

As for local support, I am and have received support and aid from: all working technicians (11); the president of our local association; two or three of the 10 shop owners in our area; John Kenney, president of the Washington State Electronics Council; *(plus too many other names for us to include with his letter.)*

ANTHONY CIZERLE, CES/CET
RICHLAND, WASH.

We were extremely pleased to see that Tony's complaints were also published in the November 1971 issue of TSA SERVICE NEWS, Seattle, Wash. There reference was also made to the fact that a more detailed version of Tony's first letter was being printed in the November issue of ELECTRONIC TECHNICIAN/DEALER. It was also good

to learn that despite some published bitter comments concerning service dealers in general, that there were still some service dealers in his own town that supported him—even with a new job.

It is our opinion that qualified electronic technicians most certainly do deserve a comfortable salary, and we have printed many letters supporting this position. However, we must also realize that in an area where there are a great many "moon lighters," the outside competition tends to drive the service charges down to a point where both the full-time electronic technician and the service dealer is hurting.

In the December 1971 issue of TSA SERVICE NEWS, Mrs. Mildred Huss wrote: "I watched and listened to the performance that you put on in Spokane for the entire group of WSEC members and after reading your article in TSA SERVICE NEWS, I have just the solution to your dilemma . . . why don't you open your own shop?"

... Wear the shoe so you will know what you are talking about. . . . Open up a shop. Show us shop owners a thing or two about running a business."

Supports Industry Licensing

In reply to your editorial in the November issue of ET/D, I would like to express my feelings toward licensing here in New York. I am an electronic TV technician, living in Huntington Township on Long Island. I feel that Suffolk County or New York State should pass a licensing law. The only thing that I don't think they should do is require shops to have all the latest test equipment and a complete file of schematics. This requirement will only hurt the guy starting out. I must explain why I am for licensing.

With a population of about 200,000 people, the Huntington Township phone book lists at least 80 shops. The only trouble is that only about 10 of these shops are what I would call honest and competent. What makes teachers, where I worked last year, call me to fix their TV sets, when they know that they will pay more?

Let me give you just one example why. A few weeks ago my neighbor bought an RCA color-TV set from her sister. Her sister told her that a local shop had installed a horizontal transformer late last August, and the set only lasted a few weeks before it broke down again. So, she bought a new Motorola. My neighbor asked me to give her an estimate, since the local shop had told her that it would cost about \$70 to fix again.

continued on page 28

SAVE TIME WITH OUR CHEMICAL SIGNAL TRACER

Time is money. And nothing eats up time like troublesome intermittents.

There is a way to fight back, though. With a faster kind of test equipment that comes in a can: SUPER FROST AID. After the set 'cooks' and the problem appears, hunt it down in minutes with SUPER FROST AID's unbeatable (-55°F) cooling power. Even on the most crowded printed circuit, SUPER FROST AID's lack of liquid residue lets you check component-by-component with pinpoint applications. And it's long-lasting—saves you more by using less!

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Universal tap simplifies MATV design

by Bert Wolf

Manager Jerrold DSD/ECSD Division

Until now, MATV system design has been somewhat complex. You had to calculate losses in decibels and specify a fixed tap-off isolation value at each receiver location.

The new Jerrold OMNI-TAPs have changed all this. OMNI-TAPs are universal. That is, *any* OMNI-TAP can be used *anywhere* in *any* MATV system. The secret is adjustable isolation, which you can vary simply by turning a screwdriver after the system has been installed.

Aside from simplifying system design, OMNI-TAPs also reduce your inventory problems. Since OMNI-TAPs can be varied continuously over a 12 to 25 dB range, one type of OMNI-TAP replaces three types of conventional tap-offs.

Figure 1, for example, shows a typical 8 story apartment house, older school or hotel, with eight TV outlets per floor. OMNI-TAPs are used for every TV outlet. Because tap insertion loss is very low (average about 0.6 dB per tap at VHF), isolation is adjustable, and Jerrold CAC-6 cable loss is minimal, (3.2 dB/100' at VHF), your system calculations are greatly simplified. Just use a Jerrold Gibraltar 3550 amplifier, fed by a Paralog Plus antenna. A new motel or school would be similar, except that trunklines would be run horizontally.

If your particular system is smaller, reduce the number of trunklines and tapoffs, but nothing else. The 3550 is economical enough even for small systems. If the system is bigger, add trunklines and tap-offs, but nothing else. The 3550 can easily handle up to 100 OMNI-TAPs. (For systems over 100 tap-offs, use the 3661 or 3880.)

Choose the antenna as you would an ordinary home TV antenna, except that it usually pays to choose the next larger model. If signals are weak, simply add a Powermate preamplifier.

Figure 1 is a VHF-only system. But adding UHF channels is no problem. Simply use a VU-FINDER PLUS antenna instead of the PARALOG PLUS, and a 4400 82 channel amplifier in place of the 3550. No other changes are required because the OMNI-TAPs, the splitters and the cable can handle UHF frequencies with no difficulty.

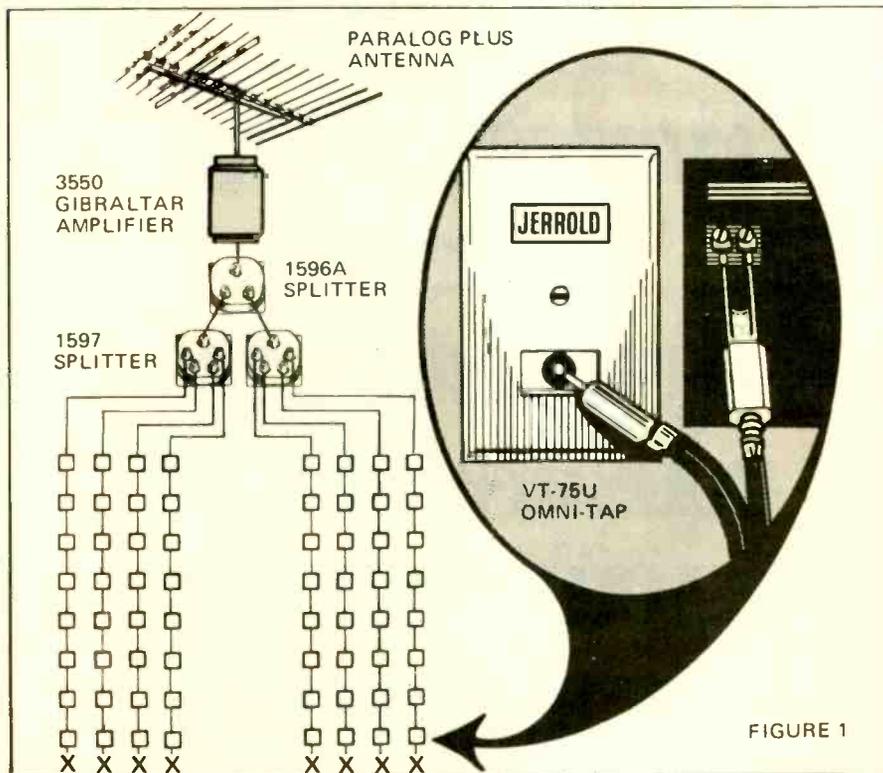


FIGURE 1

Adjusting Omni-Tap Isolation

Once the system is installed, you have to make sure it works properly. In many cases, no adjustments will be necessary. The OMNI-TAPs will work fine in the system just as you receive them.

In large systems, however, you will have to adjust the OMNI-TAPs so that they provide more isolation near the Head End amplifier than they do at the ends of the trunklines.

There are two ways to adjust OMNI-TAP isolation:

1. With a Field Strength Meter, such as the Jerrold 747. You should have a Field Strength Meter for MATV work anyhow, and this is the easiest way to adjust OMNI-TAP isolation.

Start by turning all of the OMNI-TAPs fully clockwise, for

maximum attenuation. Then, go to a tap in the middle of the trunkline and make sure you can read at least 1000 microvolts of picture carrier signal on the highest channel the system carries. If the reading is less than 1000 microvolts, turn the OMNI-TAP counterclockwise until you get 1000 microvolts. Repeat for each tap until you get to the end of the line.

2. With an Ohmmeter. Connect the Ohmmeter between the arm of the OMNI-TAP potentiometer and the center conductor of the tap output. Set the first four OMNI-TAPs in each trunkline (nearest the Head End) to 700 ohms. Set the next two OMNI-TAPs in each trunkline to 500 ohms. Then, reduce each tap-off in the line by 100 ohms until you get to the end of the line.

For help in laying out a system or solving specific system problems, contact Jerrold via your local Jerrold distributor.

Or, for more information on MATV systems, write Jerrold Electronics, P.O. Box A, Philadelphia, Pa.

If you're not using IR's "Functional Fifty" Universal Transistors, the odds are 800-to-1 you're wasting time and money!

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all IR transistors are conservatively rated to give reliable performance with extra margins of safety.

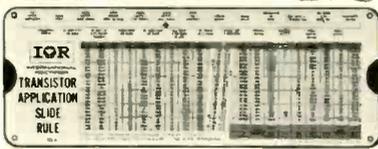
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LETTERS...

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When I looked at the set, I could not believe my eyes. It looked like the technician had soldered with a match and some pipe solder. I also noticed that none of the transformers in the TV set had been replaced. What he did do was replace a terminal strip and the focus rectifier tube socket.

The solder on the tube socket was such a glob that it was almost shorting the heater of the tube. As for the terminal strip, the solder had broken off and was shorting a high-voltage wire to the ground lug. He had used a low-voltage strip, and the high voltage was leaking to ground through the No-Arc that he had coated the strip with. The No-Arc was, more than likely, the only reason that it lasted to the end of the 30 day warranty that he gave her.

This is just one example of incompetence. When a technician can't even solder correctly, he should not be misleading the public by calling himself a technician. Even a screw left inside the TV set could cause the owner to throw out a \$600 investment.

I think technicians in New York who run an honest and competent shop won't mind taking a test or having controls. At least it will get rid of the bums who like collecting 1972 Lincolns by using methods that make the customer's set self-destruct after the shop's warranty runs out, and then does the same thing all over again when the customer brings it back. If I wanted to be such a serviceman, I would have. But I don't want to be one.

I would be much happier if I could trust *all* the other 70 shops in Huntington, even though I could use the extra money to pay off my Chevelle.

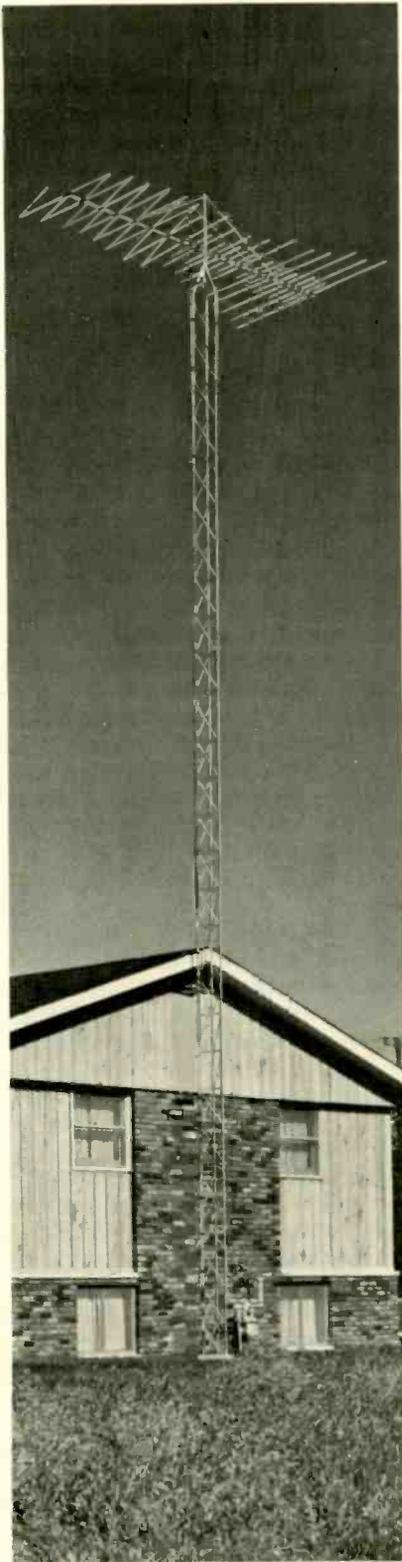
JAY GOLDEN

Disagrees with Earlier Letter

- When I have a medical problem
I look for an MD
- When I want life insurance information
I look for a CLU
- When I have an accounting problem
I look for a CPA
- When I have a TV problem
I look for a CET

A letter in the . . . issue by the one-man shop TV serviceman with . . . years experience, age about 38, probably tells much more than he wants credit for. He says that he never went to school to learn TV servicing. Nei-

continued on page 77



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Great Interest Develops Concerning the CET Exam

Ron Crow, executive director of the IS CET, recently wrote us concerning our coverage of the CET program. He said, "I can't tell you how pleased I am with the response your magazine has generated. I have been swamped with inquiries and so has Ed Schon, as I understand it."

And yet, we have received other correspondence indicating that some of our readers are still afraid to take this examination. They feel well qualified behind a soldering iron, but not behind a pen—afraid of having to put their knowledge on paper.

It is our contention that any good electronic technician can pass this examination. For some this may require a little extra reading during a few evenings, but the ability is there.

Since the fear of the unknown is always greater than the fear of the known, and since we know you wouldn't even be reading this publication unless you had an electronics background, this month we will begin publishing questions similar to CET test questions. Each monthly set of five questions represents one of the 12 sections that make up the CET exam—eight of these sections covering basic electronics common to many electronic fields, and four sections covering consumer electronics. These questions do not cover all areas of any subject. However, if you do well with each section, you should have little trouble with the CET exam.

If you have trouble with any one section, you will probably need to do some studying in that subject area. Many good text books are available for this purpose.

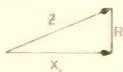
Section One

Basic Mathematics

1. A 0.01 μ f capacitor has what impedance at 5kHz?
2. What is the frequency of a sine wave that requires 2 μ s to complete a cycle?
3. If a circuit connected to a 1.5v battery conducts 3ma of current, what is the equivalent load?
4. What is the resulting impedance when an ac generator drives a 6 Ω resistor in series with an inductor having an 8 Ω impedance?
5. A red-red-red color coded resistor (lacking a tolerance color code) measures 2500 Ω . Is this resistance in tolerance?

Explanations

1. Since $X_c = \frac{1}{2\pi fc} = \frac{1}{6.28 (5 \times 10^3 \text{Hz}) (0.01 \times 10^{-6} \text{f})} = 3.18 \times 10^3 \Omega = 3180 \Omega$.
2. Since $T = \frac{1}{f}$, then $f = \frac{1}{T} = \frac{1}{2 \times 10^{-6} \text{ sec}} = 0.5 \text{MHz}$.
3. Since $R = \frac{E}{I} = \frac{1.5 \text{v}}{3 \times 10^{-3} \text{a}} = 500 \Omega$.
4. Since the voltage across an inductor is 90° out of phase with the voltage across a series resistor,



$$Z = \sqrt{X_L^2 + R^2} = \sqrt{(8\Omega)^2 + (6\Omega)^2} = \sqrt{64 + 36\Omega} = \sqrt{100\Omega} = 10\Omega$$

5. Since a red-red-red resistor is 2200 $\Omega \pm 20\%$, the resistance can be 2200 $\Omega \pm 440\Omega$ or from 1760 Ω to 2640 Ω . A 2500 Ω resistor would therefore be within tolerance.

Detailed Code of Ethics Proposed For Electronics Service Industry

W. S. (Bob) Harrison, director of Consumer Affairs for the Virginia Electronics Association, has proposed a universal code of ethics. In presenting his proposal, Bob said:

"Chairman Charles Couch has expended considerable exemplary effort in behalf of the promotion of voluntary self-regulation within the profession. If you have not received Mr. Couch's mailings, the September 1971 issue of ELECTRONIC TECHNICIAN/DEALER magazine partially outlines his goals, including his request for the formation and adoption of a universal code of ethics and/or other acceptable means of self-policing.

"Although NATESA's executive director, Frank Moch, has graciously offered the concise NATESA Code of Ethics, it is easily discernible that this—as well as the majority of "codes" from other trade associations around the country—is grossly inadequate for the present industry needs.

"Naturally, we do not wish to become so entangled in a proliferation of rules and regulations that we cannot profitably engage in our profession. Also, however, we most certainly do not wish—and, indeed, must scrupulously guard against—so-called 'equitable regulations' which may be designed by pseudo-protectors of 'consumers' welfare' and foisted upon us by status-seekers, headline-hunting politicians and/or the sensationalist-oriented portions of the news media. If we are to impress upon the public, consumer advocates, politicians and governmental agencies our truly intense desire to promote and provide competence, honesty and integrity—as well as a desire for effective self-policing—we must submit to a meaningful set of rules which are both definitive and enforceable and, consequently, capable of eliciting respect and trust from all segments.

"This proposal is a compilation of personal studies and opinions plus the results of research into various existing association codes (i.e., NATESA, VEA, FESA, CSEA, TESA-St. Louis, etc.). There is no intent, however, that this should be embraced immediately 'as is.' Some tenets are obviously too verbose while others should receive additional amplification. This is submitted with the hope that each of you will give this your serious study and consideration and, in the case of association leaders, will further distribute copies to your membership and will solicit and submit suggestions for specific additions, deletions and/or corrections. From the melting pot of many minds, we may hope to formulate a sane and tolerable, but truly effective, universal code of ethics for the electronics service industry.

"It is suggested that the comments and/or suggestions of yourself and/or the group you represent be forwarded so as to be received no later than April 1, 1972. At that time, all submitted suggestions and/or counter-proposals will be tabulated and resubmitted to this group and/or to all major electronic trade associations for possible acceptance at forthcoming annual or legal policy-making meetings.

"Please forward your comments to myself (W. S. Harrison, 5770 Chesapeake Blvd., Norfolk, Va. 23513) and/or to chairman Charles Couch, Jr., P.O. Box 536, Gainesville, Fla. 32601."

Television Service Industry Proposed Code of Ethics

1. **Maintain a Professional Business Status**
 - (A) Maintain all necessary business licenses and permits and promptly pay all legitimate and legal fees and debts.
 - (B) Maintain or show intent to maintain consistent business hours at an established business address in a bona-fide business location.
 - (C) Maintain all records required by law and any invoices, receipts or any other information necessary to insure proper and adequate fulfillment of all guarantees.
2. **Employ Qualified Technical Personnel**
 - (A) Send to the home, only competent persons of sober and honest character.
 - (B) Each shop or home service shall be performed only by persons qualified by study and/or training to competently render any feasible repair and perform technical procedures required on the unit, section or circuit being serviced.
 - (C) No novice or apprentice shall be passed off as a bona-fide technician. Any work performed by an apprentice shall be under the supervision and responsibility of a duly qualified technician.
 - (D) A technician must have at least three years of practical experience in

the servicing of electronic equipment or at least two years experience as an apprentice technician or at least one year of experience as an apprentice plus satisfactory completion of an approved technical study course or pass a test of qualification approved by the industry or law.

(E) Each service dealer that is not a qualified electronics technician must employ at least one qualified technician, who shall supervise all technical work performed.

3. Use Approved, Safe and Professional Procedures and Equipment

(A) Have available at all times, sufficient and accurate testing and servicing equipment and tools to assure a thorough and safe diagnosis or repair.

(B) Possess or maintain access to adequate service data, if available, for all units normally accepted for service.

(C) Participate frequently in available training and/or retraining seminars and/or other adequate means of service and repair training to keep all technicians apprised of new circuits and technology, modern servicing procedures and equipment and aware of any general potential hazards to the public and to gain knowledge of corrective and preventive safety procedures as the need arises.

(D) Use only methods and procedures which are or can be recognized and approved by the industry as being standard, adequate, safe and professional in workmanship. All repairs and/or installations shall conform at least to minimum safety and fire prevention codes. Inspect for and repair or advise the customer of the need to repair any abnormal and/or potentially hazardous condition detected during servicing, conducting all repairs and services to assure, as much as possible, the complete safety to the consumer in the continued use of the item.

4. Issue Specific and Valid Guarantees

(A) Guarantees and warranties should be in writing and shall be specific in clearly stating what and how much of parts and/or labor are covered for what period of time, and shall clearly designate if another company or agency is responsible for any written or implied warranty. If the warranty is in any way conditional, the terms and conditions and any additional costs which may be involved in the fulfillment of the warranty or any portion thereof shall be clearly itemized.

(B) Warranties on replacement parts installed shall be honored to the consumer at least to the extent of that issued by the manufacturer and/or supplier of the part. All labor, installations and other technical services performed shall be guaranteed to be of professional quality and any and all failures or defects caused by faulty workmanship shall be redone at no cost to the customer for the involved or affected parts or labor.

(C) All necessary or required provisions will be made by the service firm to insure that its warranty or contracted obligations will be fulfilled under any logically conceivable condition.

5. Assure Protection of Customer's Property

Carry adequate insurance coverage and/or prove moral and financial ability to assume full liability for the protection of customer's property while being serviced, stored or transported by the service company.

6. Render Prompt and Proficient Service

(A) Provide service as promptly during normal business hours as existing conditions permit. Schedule legitimate "re-calls," in-warranty and contract requests in the same prompt order and for the same efficient and courteous treatment as other service requests.

(B) Inform the customer promptly when any extensive or undue delay is encountered or anticipated in the completion of repairs for any reason. Promptly advise the customer when delaying obstacles have been overcome and when the repaired unit will be available for pick-up or delivery.

7. Render Conscientious Home Services as Promised

(A) Be prepared to complete in the home, all possible and practical repairs involving normally stocked tubes, fuses and other generally replaceable items on units normally serviced in the home if in-home servicing is advertised, offered or implied.

(B) If in-home repairs are not normally made on certain brands or types of units in the category requested, clearly inform the customer of such provisions prior to obligating the customer to a service fee or trip charge of any kind.

(C) Properly describe the services offered for any quoted fee. If the quoted or advertised fee for any type of home service is for services, less than those generally included and hereafter described as a "service call," clear and adequate explanation should be provided as to what services are included in the quoted price and what normally anticipated services are not.

(D) Obtain prior authorization from the customer for any charges to be made for any services which are not included in the quoted or advertised service fee.

(E) If repairs cannot be feasibly completed in the home, estimate charges and any additional repair costs should be fully explained upon request. In all cases where any service or other fees were advertised or quoted, the customer shall be clearly notified in advance if additional fees will be required for any services.

8. Perform Only Necessary Repairs and Provide Estimates When Requested

(A) Whenever possible and practical and when requested, provide estimates of repair costs for units to be repaired in the shop. Estimates should be as nearly correct as possible, and the customer should be promptly informed in all cases where the cost of an acceptable repair will exceed the estimated range.

(B) When additional costs in excess of the quoted estimates are deemed necessary for proper repairs, the customer may be allowed to refuse all repairs in lieu of the applicable charges for home services, technical analysis and/or estimate charges.

9. Install Best Quality Replacement Parts Available

(A) Install only such parts as are necessary to restore proper and safe operation.

(B) Use only parts of a quality and performance rating at least equal to the original components, when available and practical.

(C) Leave with or return to the customer, when requested, all parts replaced (except where impractical or dangerous).

10. Adequately Define All Quoted Home Services and Charges

(A) **Trip Charge:** This shall refer to the fee charged for travel to the customer's home by a qualified service person, including a vehicle and necessary equipment.

(B) **Inspection Fee:** This shall refer to the fee charged by a technician or other qualified servicing person to observe and analyze the performance of the unit to be serviced, and to provide a preliminary estimate of probable repair costs.

(C) **Basic Repair Fee:** This shall mean the fee charged to perform minor adjustments and repairs when repairs can be accomplished by the replacement of readily accessible, normally stocked tubes or other general replacement plug-in devices, providing repairs can be completed within 15 min. or other clearly specified period without having to dismantle or remove any panel, chassis or sub-chassis; and without the need to use a soldering iron, chemicals, special tools or intricate, bulky or costly testing equipment.

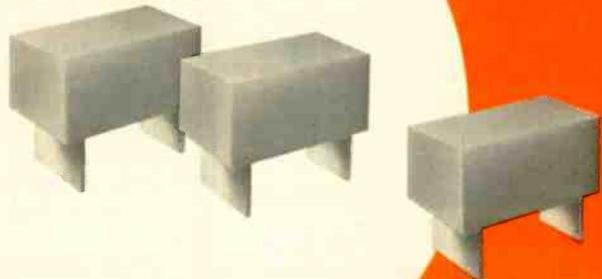
(D) **Home Service Charge:** Any reference to "service charge," "service call," "home service," "home service charge" or similar connotation shall be understood to include the total fee charged for all of the services listed as "Trip," "Inspection" and "Basic Repair" in the preceding paragraphs. A home service call shall include travel to the home (within normal defined service boundaries) by a qualified technician and/or other competent and adequately equipped servicing person; observation, inspection and analysis of component and circuit performance and/or unit operation; minor repair of unit when accomplished within 30 min. or other specified period in the home by the replacement of a readily accessible tube, fuse or other easily insertable plug-in device, when such device is a part of normal vehicle inventory.

(E) **Additional Charges:** Charges in excess of the basic repair fee or home service charge may be made for additional time required on the job in excess of the allotted or prescribed period; difficult or unusual access to parts; necessity to remove chassis or to remove or dismantle sub-chassis or assemblies; circuit tracing required to locate a defective component; replacement of any part or repair of any items which requires soldering or special fastening; the need for chemicals, special tools, or specialized testing or servicing equipment; additionally required trips for special parts not normally stocked, special servicing equipment or material; the return of a unit taken to the shop for repairs, or any additional trip required for reasons not the fault of the servicing company or person or for abnormal servicing problems such as intermittent defects or thermal breakdowns. Additional charges shall also be applicable for services performed on additional sets, components or circuits while on the same call. Charges may be made for the replacement of defective in-warranty new or replacement parts if the failure of the part or parts was due to the manufacturer or other defects not the fault of the servicer, and if payment to the servicer for the full costs of handling, procuring and replacing the guaranteed part is not included in the manufacturer's or supplier's warranty.

continued on page 66

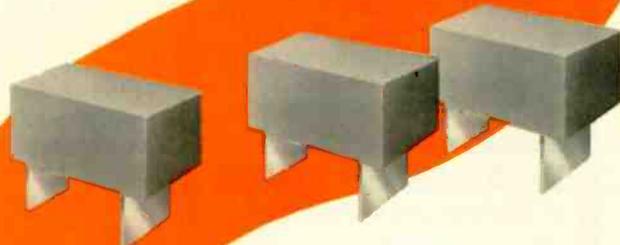
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\$19⁹⁵

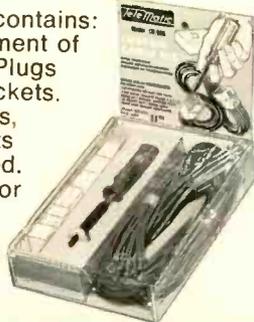
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READERS' AID

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

For Sale

53 years—believe it or not. An amateur in 1918, and engaged in service work since about 1927. Now at 72 I think I should hang up my test leads and call it quits. I have a fully equipped shop and will dispose of all of the test equipment. Equipment runs from old-timers to the most modern color and solid-state test equipment, as well as a filing cabinet full of Photo-facts and a complete set of ET/D service diagrams from No. 59, July 1957, right through to the latest. It's all for sale. In case anyone is interested, I will be pleased to send complete listing. I'm kind of sorry to hang up on it—but it is just about time.

CARL G. SCHAUM

47-24 Robinson Street
Flushing, N.Y. 11355

Tekfax Needed

I need the following Tekfax—July and November, 1961; April, May, August and October, 1962; February, 1963; February, March, August, November and December, 1964; January, April, May and September, 1965; February, March, April, June, July, August, September, October and November, 1966; January through August 1967; and July, 1969. Please write fee desired.

S. R. STANTON

4624 N. Marving St.
Philadelphia, Pa. 19140

Information Needed

I am trying to locate a company known as the Superior Instrument Co., whose former address was—2435 White Plains Road, New York, N.Y. Recent mail addressed to the New York address was returned to me as unknown. Can anyone help me?

WILMER SMITH

615 Perkiomen Avenue
Lansdale, Pa. 19446

I repair, if and when possible, old radios from the early 1930's and earlier. It is not always easy to obtain schematics or information necessary to repair them. Right now I have a Lyric Radio No. 20194, at least that's the only number I could find anywhere on it. The manufacturer was The All

American Mohawk Corp. and the radio came out around 1930 or thereabouts. It is in fine shape except for the power transformer, and I would appreciate and pay for any information regarding this radio.

RAYMOND ISADORE

6100 W. Burnham Street, Apt. 23
West Allis, Wis. 53219.

Schematic Needed

I'm in dire need of a schematic for a Simpson Model 479 TV-FM signal generator or a Simpson Model 480 genescope. Simpson indicates that the prints are no longer available. I will gladly pay the cost of having a copy sent to me.

DICK BERGERON

Box 311
10 Maplelawn Dr.
Essex, Vt. 05451

Tubes Needed

I'm in need of the following tubes—1H5GT, 1A7, 1N5, 3Q5. Also, I would like a Ballast tube for a GE J62 radio, BL42D. Thank you.

HENRY HOLGERSON

5 Green Street
New Berlin, N.Y. 13411

I'm trying to repair several old radios and I am in need of the following tubes—WD-11, DL-7, 01A and C299. Also, I could use a horn-type speaker and any other items for pre-1930 radios.

WILFORD WILKES

Box 43
Brisbin, Pa. 16620

Wanted

I am trying to locate an ARC Model 601 battery operated radio receiver made by the ARC Radio Corp. of Brooklyn in 1947. It must be complete and in good restorable condition.

DAVID MURPHY

Box 105
Prattsville, N.Y. 12468

Information Requested

Does anyone have information on a possible solid-state circuit to eliminate the A, B (and C?) battery pack powering a Jefferson Travis Marine receiver using a 1A7GT, 2-1N5GT, 1H5GT and 3Q5GT?

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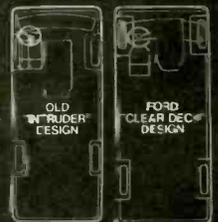
Strong, Twin-I-Beam Independent Front Suspension—Ford's exclusive design smooths the going for both load and driver. Two forged steel I-beam axles provide strength and durability; wide wheel stance means stability in cross winds.



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FORD ECONOLINE VANS



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NEW AND NOTEWORTHY

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



DIGITAL MULTIMETER 701

Has 3½ digit capacity with up to 0.1% accuracy

The new IM-102 digital multimeter, with 3½ digits and rated lab-calibrated accuracy to 0.1% v dc is said to measure 5 ac voltage ranges from 100 μ v to 500v, 5 dc voltage ranges from 100 μ v to 500v, 10 ac or dc current ranges from 100na to 2a and 6 resistance ranges from 0.1 Ω to 20M. Resolution is 100 μ v on the 200mv range, 1v on 1000v. There reportedly is no need to change probes or switch the meter for changes in dc polarity. The IM-102 switches automatically with an illuminated display indicating plus or minus. Input impedance is approximately 1000M on the 2v range (10 Ω on higher ranges). Overload protection is built-in on all ranges and an overrange condition is shown by a panel light. The decimal point is automatically placed with range selection. A unique feature of the instrument is that it can be calibrated by the kit builder at home, using the preassembled dc calibrator furnished. This method is designed to permit 0.2% dc voltage accuracy. If the buyer requires tighter tolerances, the unit can be calibrated 0.1% with lab equipment. The circuitry is enclosed in a rugged aluminum cabinet with die-cast front panel and detachable three wire line cord (no batteries needed). Price per kit \$299.95. Heath Co.

FOR MORE NEW PRODUCTS SEE PAGE 71



OSCILLOSCOPE 700

Has front panel vectorscope capability

The Model 1440, a 5-in. dc-to-10MHz recurrent-sweep scope, features sync-separator circuits in the TV-H and TV-V positions and a dc amplifier for measurement of ac and dc components. It has front-panel vectorscope capability, is all solid-state (except for the CRT), comes complete with a combination 10-to-1 and direct probe, has the low-profile case design, an outside dimension of 9 in. by 10 in. by 17 in., and is portable with a shipping weight of only 27 lb. The unit operates on 117v ac, 50 or 60Hz. Net price \$299.95. Dynascan Corp.

FUNCTION GENERATOR 702

Covers frequency range from 0.002Hz to 3MHz

The Model 5100A function generator incorporates a new symmetry control to allow the pulse repetition rate to be set independently of the pulse width. It also provides an independently adjustable triangle slope. The unit reportedly covers a frequency range from 0.002Hz to 3MHz and produces sine, square, triangle, ramp, pulse and sawtooth waveforms as well as an auxiliary 5v p-p square wave. In addition a unique wave shaping network minimizes sine-wave impurities normally found in conventional function generators. Maximum output of the Model 5100A is 20v p-p, amplitude is controlled by a three-position attenuator and vernier to permit operation down to 0.5mv p-p. All waveforms may be positioned around 0v, \pm 5v, with the dc OFFSET control. An external control voltage of -15mv to -15v can be used to provide a 1:1000 frequency range sweep. Krohn-Hite Corp.



PRODUCT SELECTION GUIDE

TYPE	STOCK NO.	NAME	LOW-NOISE AMPLIFIER DESCRIPTION (Power Supply Included with All Models.)	LIST PRICE	AMPLIFIER CIRCUITS	ACTIVE AMPLIFYING TRANSISTORS	TYPICAL NOISE FIGURE (dB)	GAIN (dB)	AMP. INPUT (OHMS)	AMP. OUTPUTS (OHMS)	P.S. OUTPUT (OHMS)	CONNECTION SCHEMATIC
VHF/FM CH. 2-13 AND FM	4551	AB-30	Broadband amplification system includes pre-amplifier and separate indoor amplifier. For very weak to weak signal areas. 75-ohm downlead. Single output can supply more than 8 TV sets.	\$76.60	1-H.B. VHF 1-L.B. VHF in mast unit. 1-ICEF circuit in indoor unit.	3	4.6	30	300	75	75	
	4640	HORIZON	Our best selling high performance mast-mounted amplifier. For very weak to medium signal areas. 300-ohm downlead, two 300-ohm outputs for two TV sets.	\$46.10	1-L.B. VHF 1-H.B. VHF	2	4.6	16	300	300	(2) 300	
	4641	SKYLINER	Your best buy for lightning prone areas. 75-ohm downlead, single 75-ohm output.	\$49.30	1-L.B. VHF 1-H.B. VHF	2	4.6	16	300	75	75	
	4806	VAMP T-1c	Unsurpassed Blonder-Tongue quality and economy too! Tunable FM trap makes it a favorite for eliminating interfering FM signals. 300 ohm downlead, two 300-ohm outputs for two TV sets.	\$28.30	1-ICEF circuit	1	6.5	16	300	300	(2) 300	
UHF ALL UHF TV CHANNELS	1233	ABLE-U2	Popular high performance home amplifier. Full UHF range for very weak to medium signal areas. 300-ohm downlead. Single 300-ohm output.	\$52.40	1	2	8.8	12	300	300	300	
	4702	AMERICAN 75	Amplify UHF and pass VHF. For very weak to medium signal areas. 75-ohm downlead. Band separator included. Provides individual 300-ohm UHF and VHF outputs.	\$54.95	1	2	6.5	14	300	75	75	
	4703	AMERICAN 300	Amplify UHF and pass VHF. For very weak to medium signal areas. 300-ohm downlead. Single 300-ohm UHF/VHF output.	\$52.50	1	2	6.5	14	300	300	300	
U/V CH. 2-13, FM ALL UHF CHANNELS	4552	CROSS COUNTRY	High performance all-channel amplifier. Accepts single combined 300-ohm UHF/VHF input. 300-ohm downlead. Single 300-ohm UHF/VHF output.	\$56.60	1-L.B. VHF 1-H.B. VHF 1-UHF	4	4.6V 7.0U	15	300	300	300	
	4542	SUBURBAN	Ultra high performance all-channel amplifier for lightning prone areas. Accepts single combined 300-ohm UHF/VHF input. 75-ohm downlead. Band separator supplied. Provides individual 300-ohm UHF and VHF outputs.	\$62.90	1-L.B. VHF 1-H.B. VHF 1-UHF	4	4.6V 7.0U	16	300	75	75	
	4545	VAULTER	Ultra high performance all-channel amplifier for lightning prone areas. Separate UHF and VHF inputs. 75-ohm downlead. Band separator supplied. Provides individual 300-ohm UHF and VHF outputs.	\$62.90	1-L.B. VHF 1-H.B. VHF 1-UHF	4	4.6V 7.0U	15	1-VHF 300 1-UHF 300	75	75	
	4553	VOYAGER	High performance all-channel amplifier. Separate UHF and VHF inputs. 300-ohm downlead. Band separator supplied. Provides individual 300-ohm UHF and VHF outputs.	\$61.70	1-L.B. VHF 1-H.B. VHF 1-UHF	4	4.6V 7.0U	15	1-VHF 300 1-UHF 300	300	300	
	4611	SPANNER	Economy and quality in an all-channel amplifier! Single input, 300-ohm downlead. Single 300-ohm output.	\$34.95	1-U/V	1	4.6V 7.5U	10	300	300	300	

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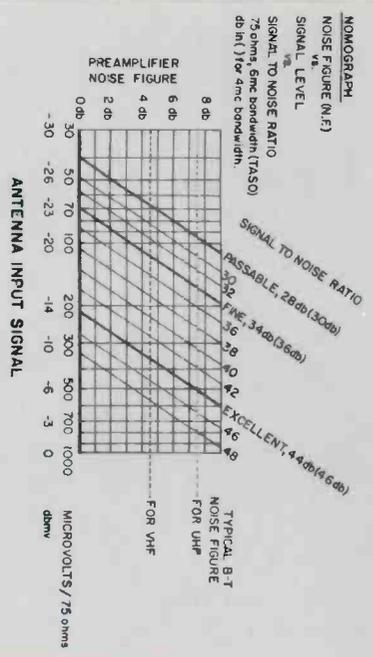
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PRODUCT SELECTION GUIDE

THE IMPORTANCE OF THE NOISE FIGURE SPECIFICATION

by I. S. Blonder



THE CASE FOR SPLIT BAND AMPLIFIERS

by B. H. Tongue

Ideally, an individual preamplifier should be used for each weak channel in a particular area. However, in areas where there are several weak channels, it is often impractical (expensive) to use separate preamplifiers. One solution to this problem is the broadband pre-amplifier. Broadband preamplifiers are tuned for a wide band of frequencies and can thus amplify all TV channels (often both UHF and VHF). However, there are problems with broadband amplifier design. First, the amplifier must be able to tolerate strong local channels and be sensitive enough for weak distant channels. Second, and perhaps more important, the amplifier must be able to keep the different channels from interfering with one another. A common type of interference between channels is harmonic distortion caused by the second and third order harmonics of low band TV and FM channels interfering with high band channels. The result is a variety of patterns on a TV screen, all of which degrade the picture quality.

The split-band preamplifier is a compromise between expensive individual preamplifiers and the more interference-prone broadband amplifiers. Split-band preamplifiers are divided into separate amplifier sections, providing separate amplifiers for each band of TV channels: low band VHF, high band VHF, and UHF. This design provides the economy of a single preamplifier for all channels and solves some problems of broadband amplifier design. Because the channel bands are split between different amplifier sections, the amplifier as a whole can tolerate higher input signal levels than a broadband amplifier and still maintain its sensitivity to weak channels. Split-band design minimizes the possibility of harmonic distortion interference. High, low, and UHF band channels are amplified in separate sections, each passing less than one octave of frequency bandwidths. Separate amplifiers for each band also allow each amplifier to be optimized for the highest dynamic range (the best tradeoff between signal-to-noise ratio, gain, and signal input capability).

What's the most important "spec" for a preamplifier? Many people would say gain! While gain is an important consideration in any amplifier, it is not of prime importance for a mast-mounted TV amplifier (preamplifier). Preamplifiers are used in areas where some or all of the TV channels are weak and need to be strengthened before being applied to the TV set. However, since the signals are weak, they are susceptible to deterioration due to "noise" generated in equipment between the TV antenna and the set. The ratio between the actual signal level and the noise level (signal-to-noise ratio) affects the quality of the TV picture; the greater the ratio, the better the picture. That's why the "noise figure" of a preamplifier is its most important specification. A unit's noise figure is the amount of noise it generates above the minimum theoretical noise in a 75-ohm system (-59 dBmV).

Blonder-Tongue engineers design all preamplifiers for the absolute minimum noise figure possible, consistent with the number of channels the unit is designed to amplify. All transistors are selected to provide the optimum noise figure without sacrificing gain or input capability. If you're mathematically inclined, the formula below will show you how the noise figure of a two stage amplifier is arrived at:

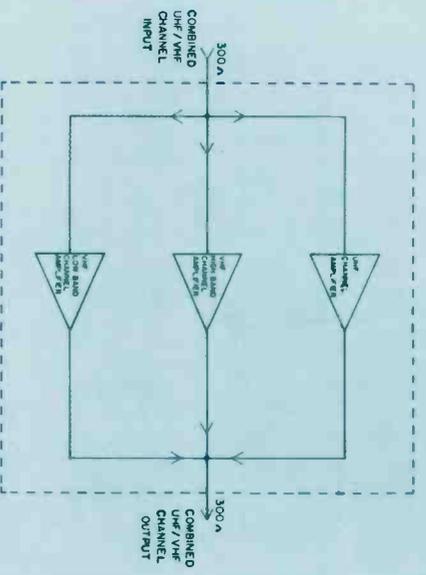
$$F_{Total} = F_1 + \frac{F_2 - 1}{G_1}$$

F_{Total} = Noise figure
 F_1 = Noise figure of 1st stage
 F_2 = Noise figure of 2nd stage
 G_1 = Gain of 1st stage

F_1 can be considered as the noise figure of the first of two transistors or two amplifiers, or a preamp in front of a TV set. Your preamp has more effect upon minimum snow (noise) in a TV picture than any other component in a TV system.

BAND AMPLIFIERS

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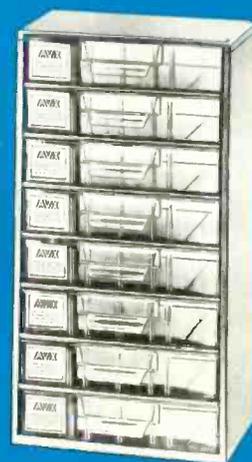
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Zenith Instant Parts Program

TEKLAB REPORT**Motorola's Model TU945HS
Color-TV Set**

Part II

by Joseph Zauhar

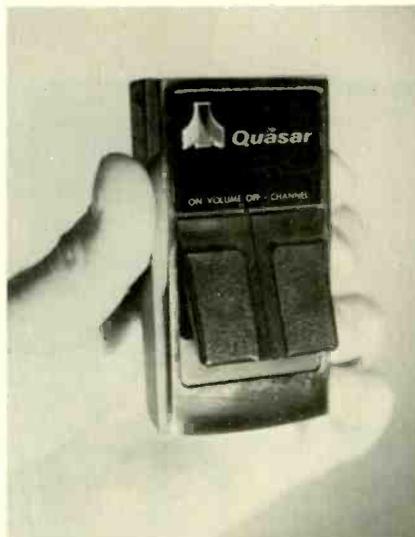
Insta-Matic Color-TV tuning has simplified the remote control system. The transmitter has only two push buttons—one turns the TV set ON or OFF and changes the volume level, the other changes channels

■ In an earlier Teklab report (July 1971, page 39), we reviewed the design of a simplified color-TV tuning system employing preset controls—eliminating many of the most often used customer controls—INTENSITY, HUE, BRIGHTNESS, CONTRAST and FINE TUNING. These preset controls were adjusted at the factory and were combined with automatic color circuits. That preset system has now been incorporated in a remote control unit; and the resulting circuit simplifications make remote control available to people who could not previously afford this luxury.

Remote Control Transmitter

With preset controls employed in the color-TV set, only two push buttons are needed on the sonic, hand-operated, remote-control transmitter. By depressing a button, the spring loaded hammer strikes the end of a mechanically resonant rod. The rod acts as a transducer, converting mechanical energy vibrations within the rod to acoustical energy.

One transducer emits a 41.5kHz sound, which activates the remote receiver channel change circuits. The other, larger transducer emits 38.5kHz sound, which activates the remote receiver ON/OFF and VOLUME step circuits.



The remote control transmitter is a compact unit, with two push buttons—one turns the TV set ON or OFF and changes the volume level, while the other changes channels.

After being struck, each transducer is dampened by the hammer as the push button is released, and only a short burst of acoustical energy is generally emitted for each hammer blow.

Power Supply and YA Remote-Control Panel

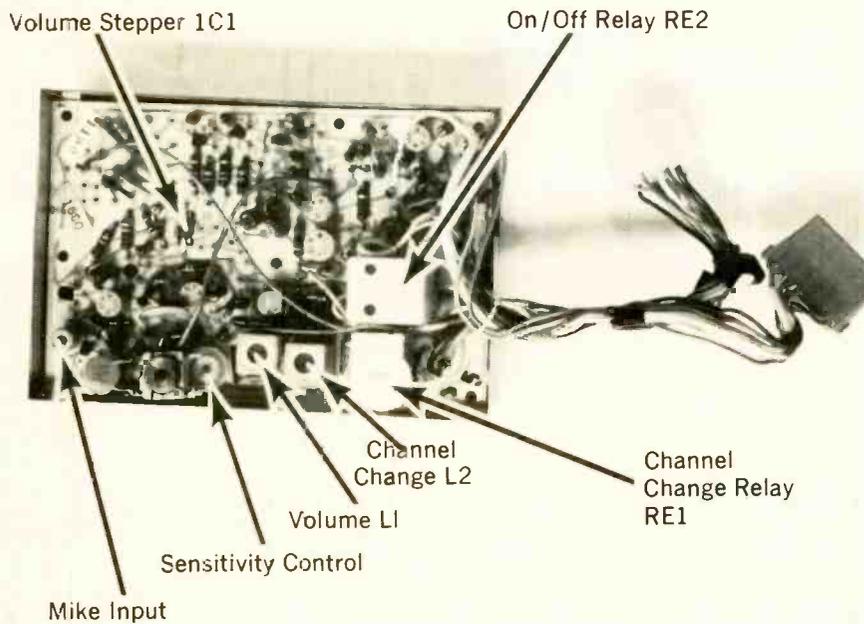
A separate transformer supplies power to the YA remote-control panel as shown in the schematic—

plus filament voltage to the picture tube at a reduced level when the TV receiver is OFF. The transformer is physically located in the rear of the chassis, next to the VA Vertical Deflection Panel. Most of the remote-control receiver circuitry is located on a separate plug-in panel (YA).

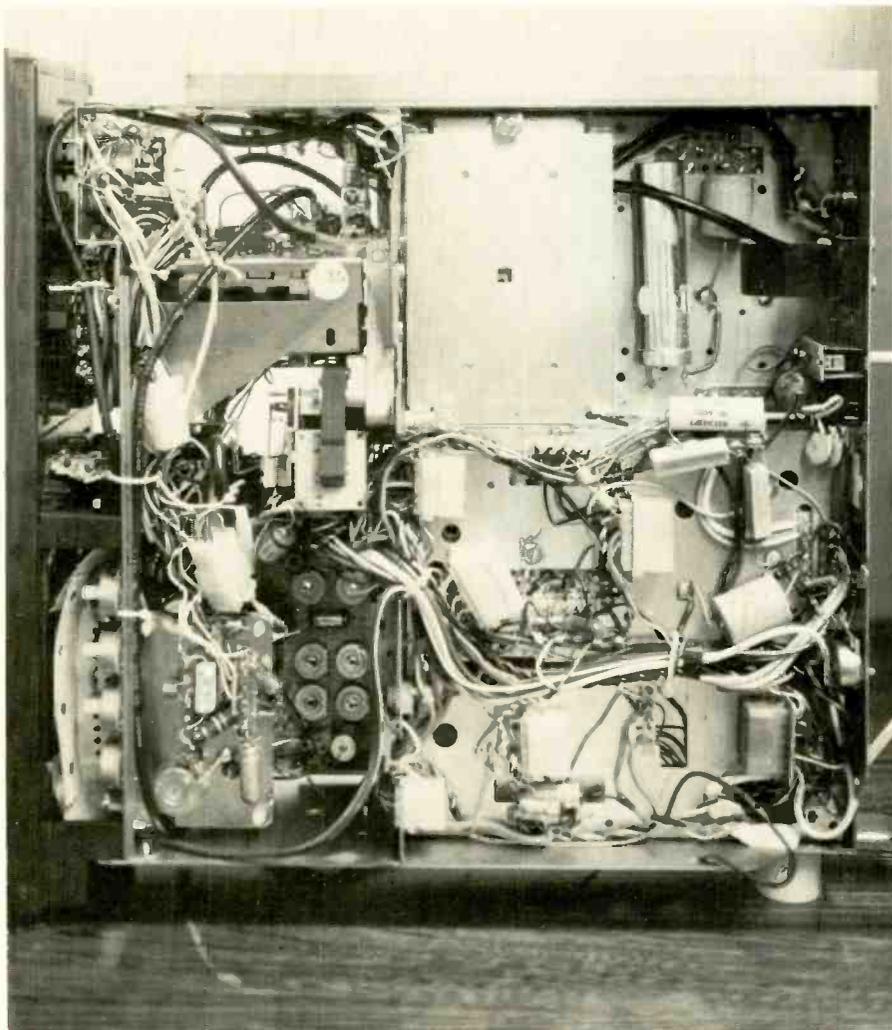
CHANNEL-CHANGE Function

When the remote-control-transmitter, CHANNEL-CHANGE button is pressed, a 41.5kHz acoustical signal is transmitted. The remote receiver microphone then receives this signal and couples it to the three-transistor preamplifier (Q1, Q2 and Q3). Direct-coupled common emitter circuits are used and the sensitivity of the preamplifier is determined by a 10K variable control (R10) between the collector of transistor Q3 and ground. The preamplifier output is capacitance coupled to the CHANNEL-CHANGE, ON/OFF, VOLUME, and lamp-level circuits.

The 41.5kHz signal from the preamplifier circuit is capacitance coupled by capacitor C12 (56pf) to the CHANNEL-CHANGE tuned circuit (coil T2, capacitor C13). This high Q frequency selective circuit is tuned to select only the 41.5kHz signal. Relay winding (RE1) is the collector load for the channel-



Most of the remote control receiver circuitry is located on a separate YA plug-in panel.



Side view of Motorola's color-TV chassis TS938 with the remote receiver removed.

change pulse-detector transistor Q4. With the proper signal applied, conduction of this transistor is through the relay winding, closing its contacts and applying ac line voltage to the channel-change motor.

When the motor armature rotates, it is drawn into the motor housing, activating the MUTE switch. The mute circuit blanks the picture tube and mutes the audio during channel-change operation.

Current from transistor Q4—the channel-change pulse detector—flows through emitter resistor R41, which is common to both the CHANNEL-CHANGE and ON/OFF detectors, developing a less positive voltage. This voltage is applied to the emitter of transistor Q5, biasing it OFF to ensure the operation of only one function at a time.

The MUTE switch applies a positive voltage through divider resistors R44 and R46 to terminal 17TA of the integrated circuit color demodulator, and the picture tube is blanked during channel change.

Diode D3 is also forward biased, muting the sound. It is connected to the high side of the VOLUME control and in series with a 100Ω resistor (R48) to ground. The VOLUME control is shunted to ground, muting the audio by the low forward resistance of D3 and R48.

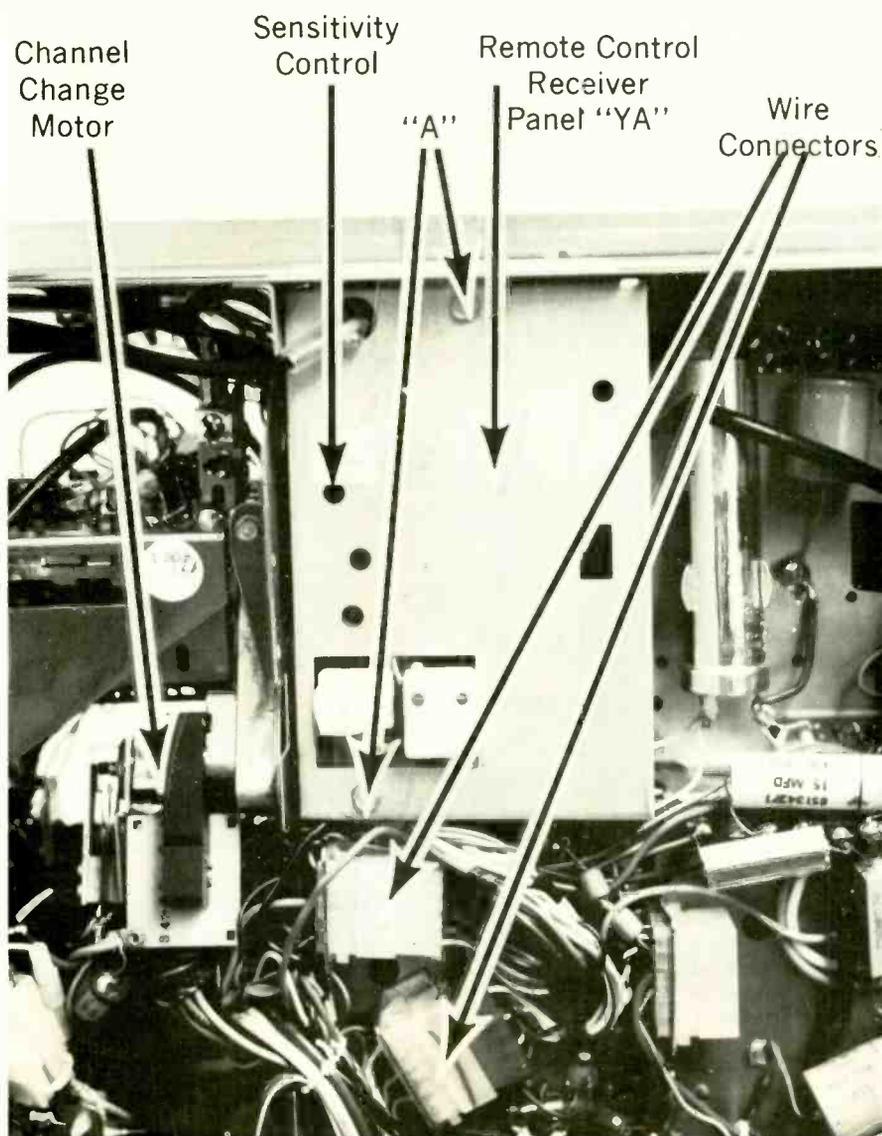
Channel change can also be accomplished manually by depressing the POWER TUNE push-button switch located on the front panel of the TV set.

To skip undesired channels, the FINE TUNING control is turned counterclockwise, to the left, about 10 turns.

VOLUME and Indicator Lamp Function

When the ON/OFF volume button on the remote transmitter is depressed, a 38.5kHz signal is received by the microphone, amplified, and then applied to the base of the ON/OFF volume pulse detector transistor Q5 through a tuned circuit (coil T1, capacitor C5) that resonates at that frequency.

From this transistor, the current flows through the common-emitter resistor biasing OFF the channel-



To replace the YA panel, remove two 1/4-in. hex head screws (A) and disconnect the microphone cable. Disconnect two plug-in cables, a 10-prong and 12-prong connector, and then slip the panel out of the retainer.

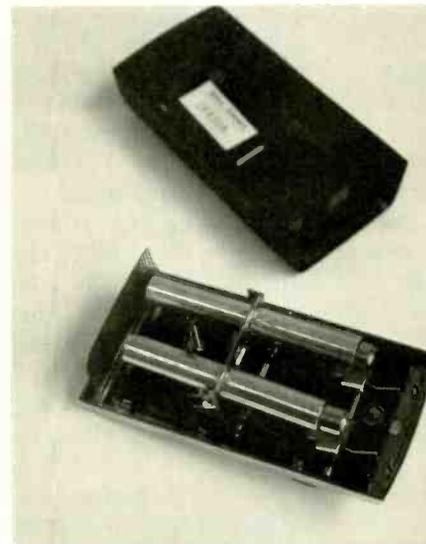
change detector to ensure operation of the selected function.

The positive pulse of voltage developed at the collector of transistor Q5 is applied to a flip-flop pulse shaper circuit consisting of transistors Q6 and Q7. The output of this circuit is a negative going square wave with very short fall time—the only type of signal that will activate the IC counting circuit.

The output from the pulse shaper is applied to a volume stepper circuit (IC1) consisting of two bistable multivibrators and control circuits connected in cascade. Control voltages generated by the volume stepper are applied to the lamp control and volume switch circuits.

If we take the output of one bistable multivibrator, which we will call MV1, and apply it to the input of another multivibrator, called MV2, we will have the following outputs in comparison to the trigger pulse: With no trigger pulse neither multivibrator will have an output. Applying a negative trigger pulse to MV1, its output goes positive. A negative trigger pulse is required to obtain an output so MV2 has no output.

When a second trigger pulse is applied to MV1, its positive output decreases to 0v and remains in this condition. A negative trigger (positive voltage decreasing to 0v) causes MV2 to have a positive output.



Inside view of the transmitter showing the mechanically resonant rods, which act as a transducer to convert mechanical energy to acoustical energy.

This condition of positive output remains until it is again triggered by a negative pulse.

With a third trigger pulse, the output of MV1 goes positive and the MV2 output stays positive.

With the fourth trigger pulse applied to MV1, the output drops from positive to 0v. This negative going voltage results in 0v output from both MV1 and MV2. The outputs from the volume stepper are applied to the lamp and VOLUME control transistors.

VOLUME and Lamp Level Control

When the TV receiver is OFF, and no transmitted signals are applied from the remote transmitter, transistors Q9 and Q10 are nonconducting. Two situations then exist: The collector voltage of transistors Q9 and Q10 is high, diodes D5 and D6 are reversed biased and the indicator lamp is not illuminated. The positive collector voltage is applied to the gates of the N-channel FET's (Q11 and Q12) resulting in heavy conduction through two resistors (R35 and R36), which shunt the VOLUME control.

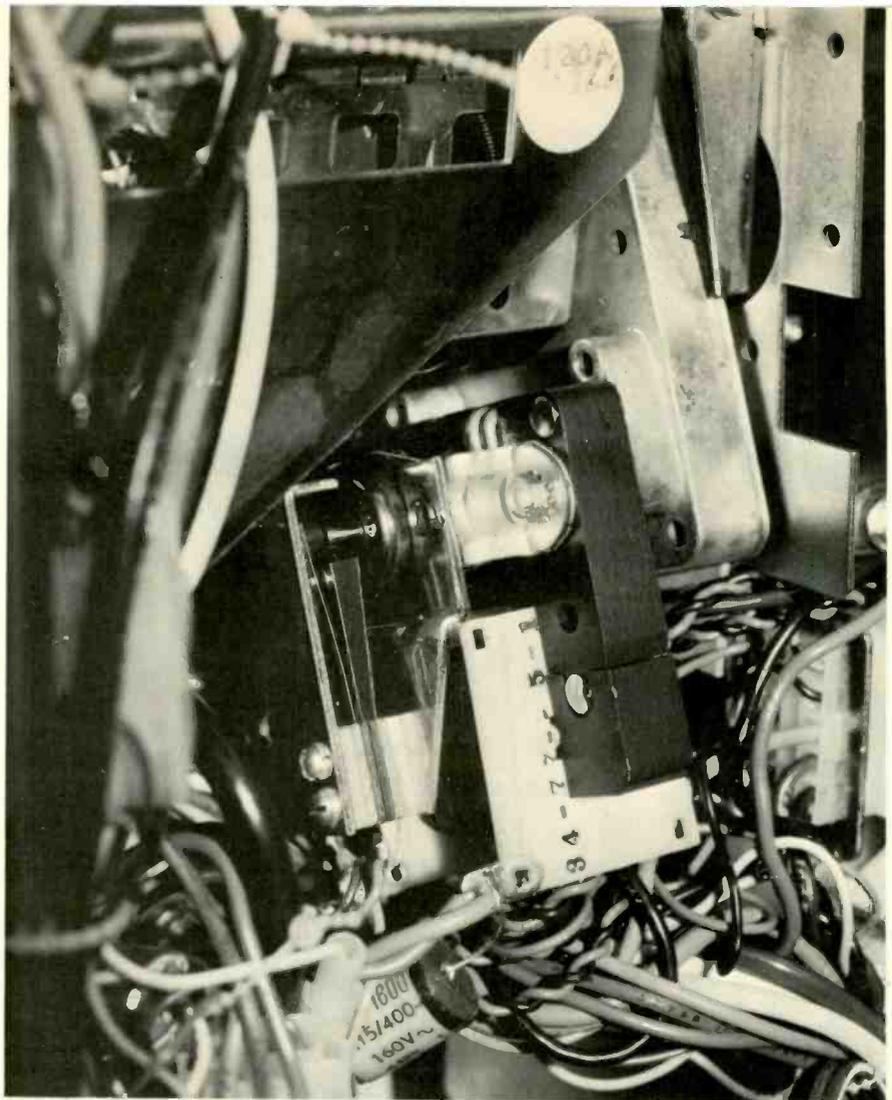
When the transmitter VOLUME function is activated once, the base of transistor Q9 is driven with a positive voltage (from Pin 4 of IC1), resulting in a decrease in collector voltage, Diode D5 is forward biased and the indicator lamp lights

dimly through the 300Ω resistor, diode D5 and transistor Q9. The reduced collector voltage is applied to the gate of FET Q11, biasing it OFF and in effect removing the 1.8K resistor (R36) from the VOLUME control circuit. However, transistor Q10 is not conducting (no driving signal applied from Pin 3 of IC1), the collector voltage is high and FET Q12 continues to conduct. The 220Ω resistor (R35) thus remains effectively in parallel with the VOLUME control through the low impedance of FET Q12—resulting in a low volume level.

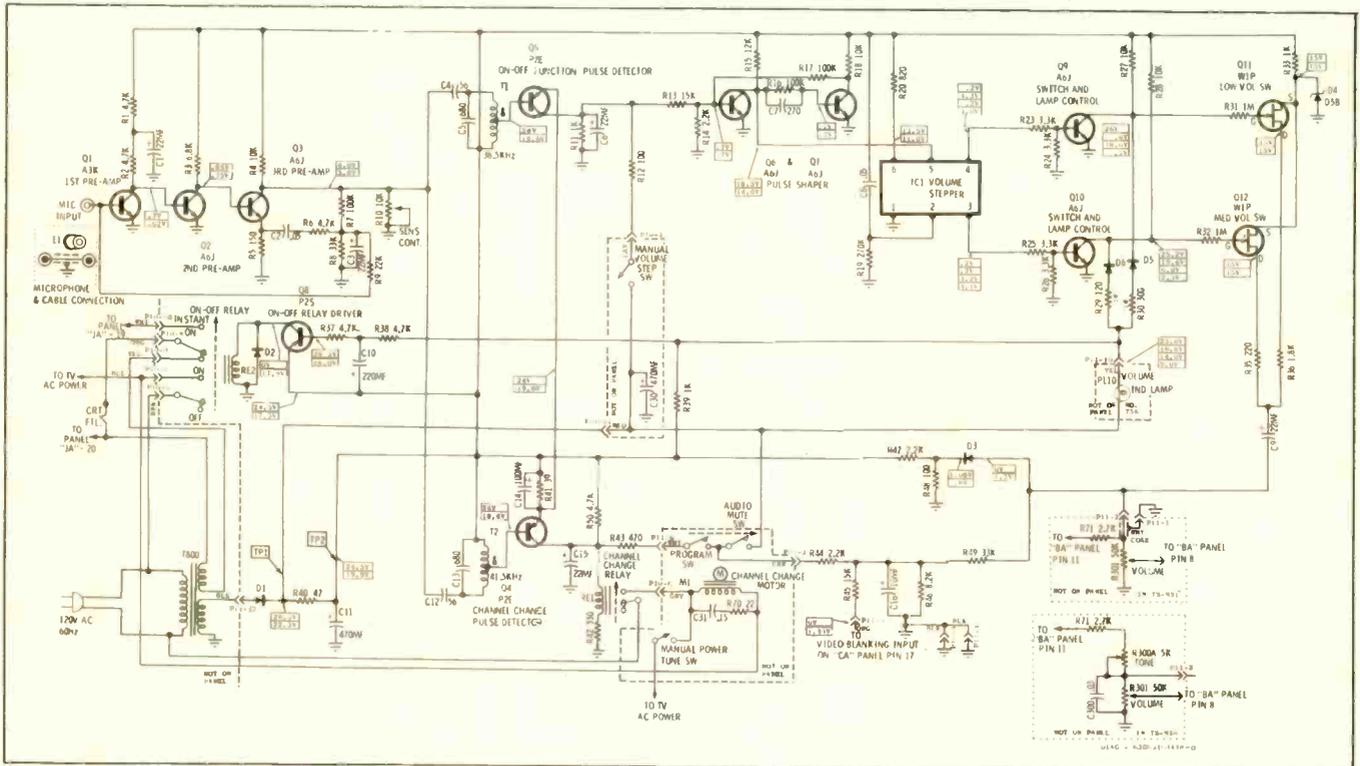
If the transmitter volume function is activated a second time, transistor Q9 is turned OFF by the control voltage from the volume stepper (Pin 4, IC1) and transistor Q10 is turned ON. With transistor Q10 conducting, indicator lamp PL10 lights brighter through the lower resistance path of Q10, forward biased diode D6 and the 120Ω resistor.

The collector voltage of transistor Q9 rises and is applied to the gate of FET Q11, resulting in conduction through the 1.8K resistor across the VOLUME control. However, FET Q12 is now nonconducting and so the 220Ω resistor (R35) is in effect

continued on page 78



The mute switch is located at the rear of the channel-change motor armature. This switch blanks the picture and mutes the audio signal during tuner rotation.



Complete schematic of the Motorola Model TRR-11 Remote Control System.

Servicing CB Transceivers

by C. A. Tuthill

Tips concerning the maintenance and operation of these popular two-way radios.

■ To properly service a modern Citizens Band (CB) two-way radio, it is important to understand the function of various portions of its circuitry. This must include some background in the operation of channel synthesizers, RF noise silencers and antennas, plus RF and IF alignment of both the transmitter and receiver sections.

CHANNEL SYNTHESIZER

Even in solid-state two-way radios, there is enough difference between the channel synthesizers encountered to require study before any attempt is made at servicing. Circuitry differs from one synthesizer to another—some requiring 10 crystals and others using 14 to operate on the 23 assigned channels.

For example: The blank channel between Channels 22 and 23 must not be used. Interference with government services would result and might cause license revocation. This is so important that the FCC dictates that, "transmitter adjustments must be made only by one in possession of a Commercial First or Second Class Radio Telephone License." It is important that any operator of a CB transceiver read and understand the dictates of Part 95 of the applicable FCC regulations.

Basic servicing instructions for a typical solid-state unit, the Lafayette HB-625 transceiver (Fig. 1), are presented here. Other models will be covered later in this series. In this case the frequencies derived from the synthesizer are common to both the transmit and receive modes. Table I speaks for itself. Note that in each case the derived frequency is exactly 11.275MHz higher than the operative channel.

During transmission, the derived frequency (Table I) is converted to the desired channel frequency by the 11.275MHz oscillator TR-4 (Fig. 2). In the receive mode, the derived frequency is heterodyned with the incoming channel frequency at the first mixer (TR-10 in the overall block diagram, Fig. 2). This produces a first IF at 11.275MHz.

Table II shows the frequency of each crystal. This is an aid to the technician when replacement is required. The part number is given in the manufacturer's catalog, free for the asking. Table II also points out that failure of any one of the 10 crystals used will cause a malfunction on several channels. Study the right-hand column of Table II. From it you will note that failure of Crystal One will inhibit operation on channels one through four.



Fig. 1—Lafayette HB-625 Transceiver. Courtesy of Lafayette Radio Electronics Corp.

TABLE I

U.S. CHANNEL	CHANNEL FREQUENCY	CRYSTALS USED	DERIVED FREQ.
1	26.965MHz	1 and 7	38.240MHz
2	26.975MHz	1 and 8	38.250MHz
3	26.985MHz	1 and 9	38.260MHz
4	27.005MHz	1 and 10	38.280MHz
5	27.015MHz	2 and 7	38.290MHz
6	27.025MHz	2 and 8	38.300MHz
7	27.035MHz	2 and 9	38.310MHz
8	27.055MHz	2 and 10	38.330MHz
9	27.065MHz	3 and 7	38.340MHz
10	27.075MHz	3 and 8	38.350MHz
11	27.085MHz	3 and 9	38.360MHz
12	27.105MHz	3 and 10	38.380MHz
13	27.115MHz	4 and 7	38.390MHz
14	27.125MHz	4 and 8	38.400MHz
15	27.135MHz	4 and 9	38.410MHz
16	27.155MHz	4 and 10	38.430MHz
17	27.165MHz	5 and 7	38.440MHz
18	27.175MHz	5 and 8	38.450MHz
19	27.185MHz	5 and 9	38.460MHz
20	27.205MHz	5 and 10	38.480MHz
21	27.215MHz	6 and 7	38.490MHz
22	27.225MHz	6 and 8	38.500MHz
23	27.255MHz	6 and 10	38.530MHz

Fortunately this is not a chronic failure, crystals are quite reliable. From Table II we also see that failure on Crystal Seven will disable the transceiver on channels 1, 5, 9, 13, 17 and 21. But, the redeeming feature for technicians is that reference to Table II will steer them directly to a limited area of trouble. Troubleshooting will therefore take less time.

A description of the synthesization of Channel One (with the partial block diagram in Fig. 3) will help clarify the explanation of this circuit's function, since this analysis applies to all 23 channels. Note that in a

transmit or receive mode of Channel One (26.965MHz), Crystals One and Seven are used—Oscillator TR-1 takes its input from Crystal One, and Oscillator TR-2 takes its input from Crystal Seven. Outputs from these oscillators are mixed in Circuit TR-3. The output from Mixer TR-3 is applied to tuned circuits that only pass frequencies in the 38MHz range. Thus, only the sum frequency ($23.290\text{MHz} + 14.950\text{MHz} = 38.240\text{MHz}$) is applied to Mixer TR-5 (Fig. 3). This system of beating two crystal frequencies is used for every one of the 23 CB channels.

Although this description is only of Channel One, the

TABLE II

CRYSTAL	FREQUENCY	USED IN CHANNELS (TRANSMIT AND RECEIVER)
1	23.290kHz	1, 2, 3, 4
2	23.340kHz	5, 6, 7, 8
3	23.390kHz	9, 10, 11, 12
4	23.440kHz	13, 14, 15, 16
5	23.490kHz	17, 18, 19, 20
6	23.540kHz	21, 22, 23
7	14.950kHz	1, 5, 9, 13, 17, 21
8	14.960kHz	2, 6, 10, 14, 18, 22
9	14.970kHz	3, 7, 11, 15, 19
10	14.990kHz	4, 8, 12, 16, 20, 23

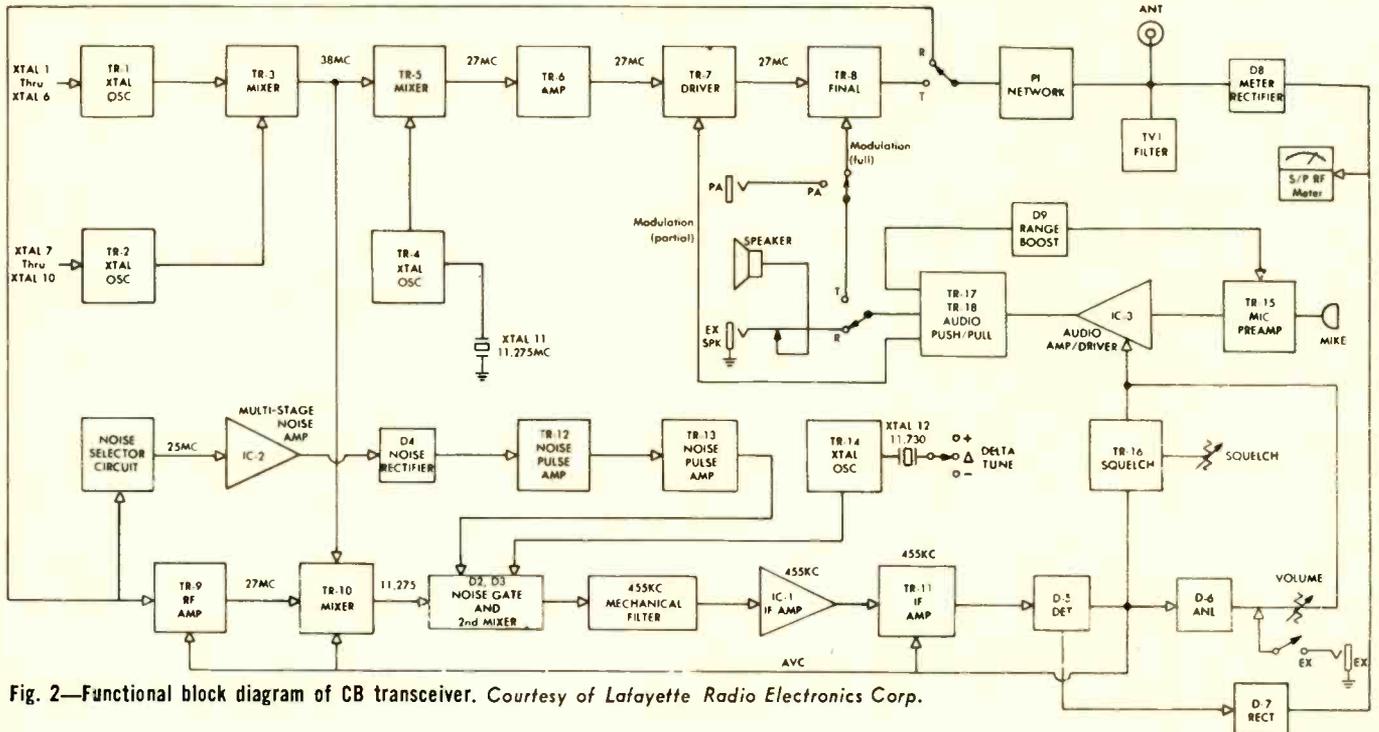


Fig. 2—Functional block diagram of CB transceiver. Courtesy of Lafayette Radio Electronics Corp.

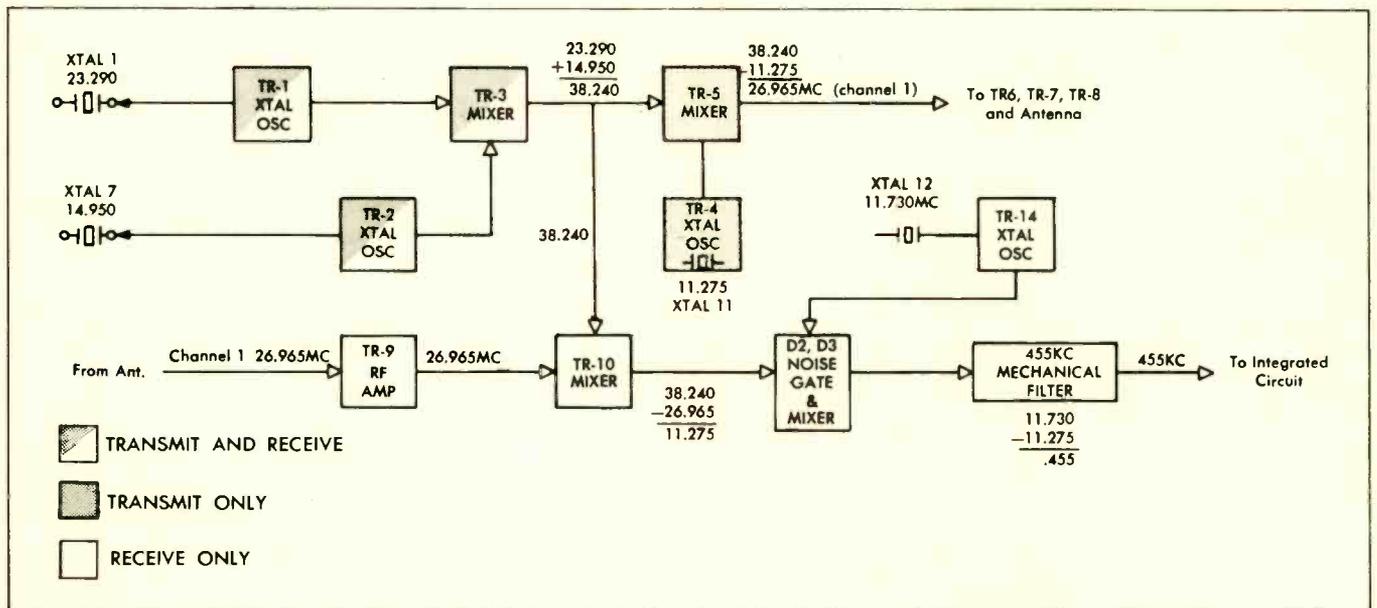


Fig. 3—Frequency conversion for Channel One. Courtesy of Lafayette Radio Electronics Corp.

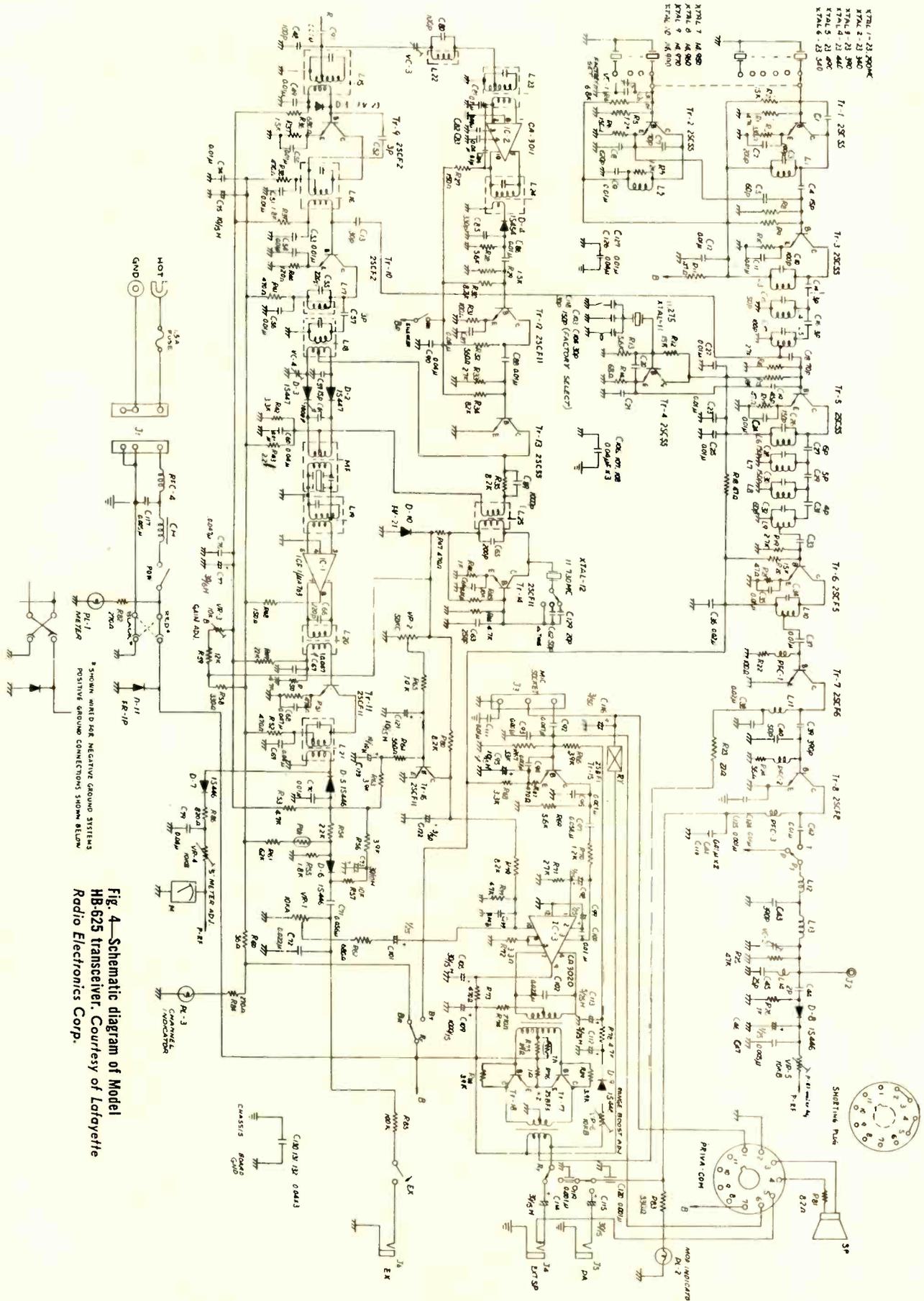


Fig. 4—Schematic diagram of Model HB-625 transceiver. Courtesy of Lafayette Radio Electronics Corp.

tables in this article explain the other combinations for obtaining operative frequencies.

From Fig. 3 we also see that the noise gate output from Circuit D2, D3 drives a sharply tuned mechanical filter that will only pass 455MHz signals. This represents the difference between the two inputs applied to the circuit (D2, D3)—the 11.730MHz output from Crystal 12 minus the 11.275MHz output from Mixer TR-10 equals 455MHz. For every channel this double conversion is used to produce the 455KHz second IF signal. An overall detailed schematic is shown in Fig. 4.

RF NOISE SILENCER

The RF noise silencer circuit (Fig. 5) is designed to eliminate impulse noise, such as that generated by ignition systems. Other systems, that operate in the audio range, merely limit the amplitude of noise pulses. This RF silencer quiets the receiver for the duration of each noise pulse, thus eliminating the noise from the signal. To make an overall check of this silencer, apply a scope to the major test points indicated by the black arrows in Fig. 5. Components can be checked with the aid of the waveforms shown in this same illustration.

When no noise pulses are picked up by the antenna, there is no output from Amplifier TR-13. In this case the Balanced Noise Gate and Second Mixer D2, D3 operate normally—driven by the first mixer TR-10.

ANTENNA

Transceiver efficiency is heavily dependent upon the use of a proper antenna, input cabling and proper impedance matching between the antenna and the transceiver. The normal antenna input for this unit is 50Ω, but it may be used with 30Ω to 100Ω antennas. At the rear of the chassis there is an Antenna Loading adjustment for maximum radiated output.

Mobile

An antenna cable for a mobile rig should consist of a 50Ω, RG-58/U cable cut to a length of 11 ft 9 in., or multiples thereof—such as 23 ft 6 in. If either length is too long, coil the excess cable in loops not less than 8 in. in diameter. The mobile antenna can serve double duty, and replace the regular auto radio antenna if a commercially marketed two-way coupler is installed. In this case, a short loaded whip-type antenna will serve with little loss of radiation.

Base Station

The familiar ground plane, vertical coaxial or directional beam antenna may be used for base stations. For short distances, between buildings, a base loaded whip will work. This can be mounted directly on the rear of the transceiver. When lead-in lengths from larger external antennas exceed 50 ft, using RG-8/U cable instead of RG-58/U cable will result in less signal loss. A short run to a cold-water pipe is acceptable for a ground.

ALIGNMENTS AND ADJUSTMENTS*

For access to components and adjustments, position

* The data presented here has been authenticated by Lafayette Radio Electronics.

the transceiver upside down on the test bench, with the speaker grill upwards and the front panel facing the front of the bench. Then remove the four Phillips head screws securing the uppermost chassis cover. Caution should be taken when removing the cover since the speaker is connected to the chassis by two leads terminated with push-type plugs. They should be pulled out gently.

Caution: Certain coil cores are sealed with wax. This wax must be carefully melted before attempting adjustments.

TR-1 Oscillator Alignment

- Connect a dc VTVM between the emitter of transistor TR-1 and ground. Then apply 12.6vdc power to the transceiver.
- Turn the selector to Channel 13.
- Adjust the core of coil L1 for a maximum reading on the VTVM. It should read between 3v and 4v.

TR-2 Oscillator Alignment

- Connect the dc VTVM between the emitter of transistor TR-2 and ground.
- Adjust the core of coil L2 for a maximum reading of between 3v and 4v.

RF and IF Alignment

- Connect an RF signal generator to the antenna connector.
- Connect an ac VTVM across the speaker terminals. Set the Volume control to mid-position. Squelch and RF Noise Silencer to OFF and Delta Tune to mid-position.
- Tune the signal generator to 27.115MHz (Channel 13) and modulate the RF signal 30 percent with a 1kHz tone. Adjust the signal generator's output to 10v.
- Turn the selector to Channel 13 and vary the signal generator frequency around 27.115MHz to obtain a maximum reading on the VTVM.
- Adjust IF transformers L15 and L16 for maximum output on the VTVM.
- Reduce the signal generator's RF output to approximately 1μv. Then sequentially adjust coils L3, L4 and L5, and IF transformers L15, L16, L17 and L18, plus the MF (mechanical filter) and IF transformers L19, L20 and L21 for a maximum reading on the VTVM. Repeat this procedure until no further improvement can be obtained.
- Increase the signal generator's RF output to 100μv and then adjust potentiometer VR-4 until the S-meter reads S-9.

TR-14 Oscillator Alignment

The second conversion oscillator has its frequency controlled by the position of the Delta Tune switch. In the normal (center) position of this switch, this oscillator operates at 11.730MHz. With this switch in that position, adjust IF transformer L25 for a maximum reading of the ac VTVM while the meter is connected across the speaker terminals. Finally, rotate the slug of

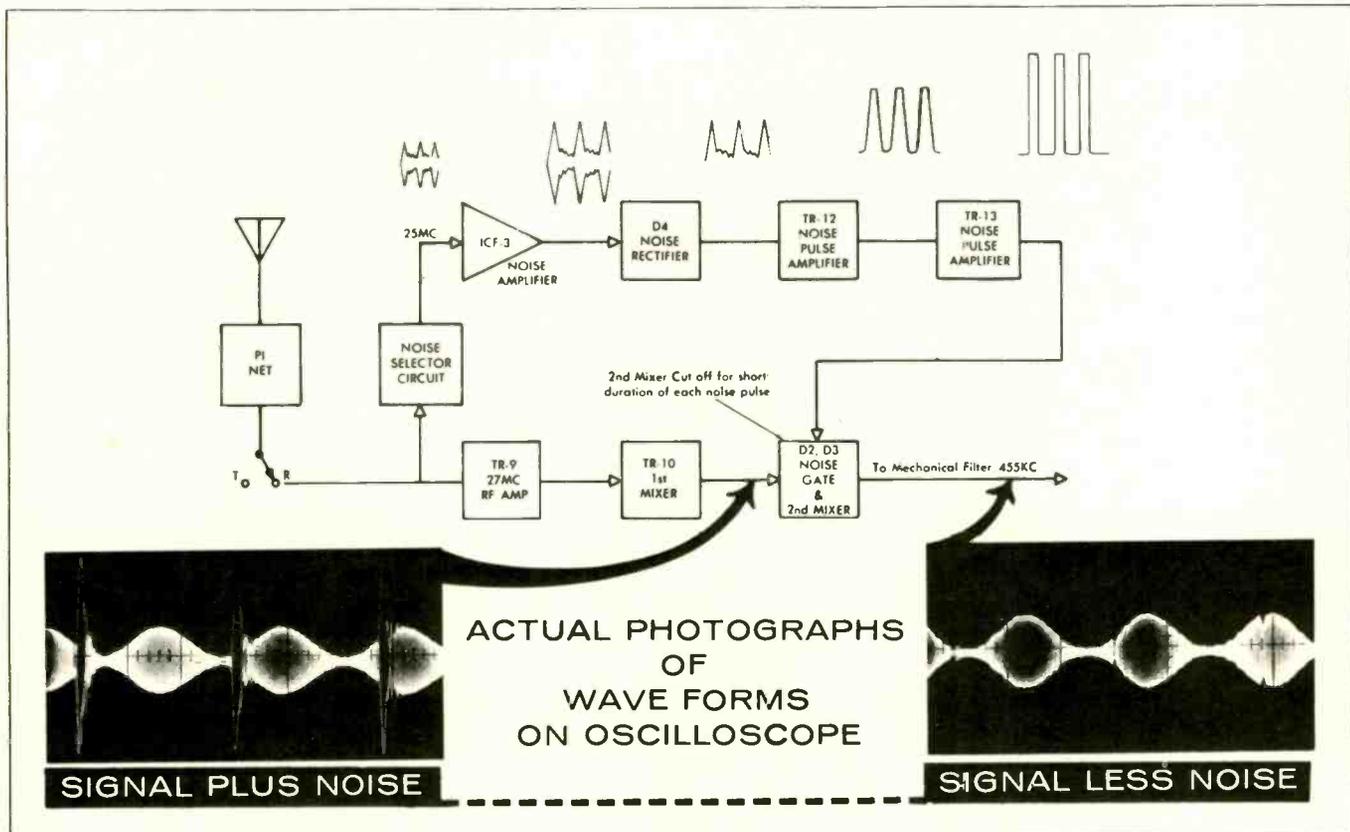


Fig. 5—RF Noise silencer circuit and waveforms. Courtesy of Lafayette Radio Electronics Corp.

this transformer (L25) 1/8th turn clockwise from the peak reading. This offers a cushion.

Gain Adjustments

- Connect a dc VTVM between ground and the junction of resistors R58 and R59.
- With no signal applied to the antenna, adjust potentiometer VR3 for a reading of 7.0vdc on the VTVM.

RF Noise Silencer

- Set the Noise Silencer to ON and the Channel Selector to One.
- Connect a dc VTVM (for a negative dc reading) to the output side of diode D4. With the VTVM ground lead connected to the negative side (American cars) of the EX jack (board ground), use the signal generator to supply an unmodulated Channel One signal (26.965MHz) into the antenna input jack. Increase the signal level until a negative dc reading is obtained on the VTVM. Adjust coil L22 and variable capacitor VC3 for a minimum reading.
- Set the signal generator to 25.0MHz and adjust IF transformers L23 and L24 for a maximum negative dc reading.

Transmitter

Warning: You must obtain a Class D Citizen's Band License before operating your transceiver. You should be thoroughly familiar with applicable FCC regulations. Part 95 of the FCC rules may be obtained for \$1.25 from the Superintendent of Documents, Government

Printing Office, Washington, D.C. 20525.

Note: Alignment of oscillators TR1 and TR2 is described with the receiver alignment portion of this article. Since these two synthesizer components are used for both the transmit and receive functions, no additional data is required in this article.

- Connect a 50Ω RF wattmeter to the antenna terminal of the transceiver.
- Turn the selector to Channel 13.
- Apply 12.6vdc power to the transceiver. Depress the microphone button and adjust sequentially the cores of coils L6 through L11 for maximum indication on the RF wattmeter.
- *Note: The adjustment of coil L10 is critical. Careless adjustment here can reduce the transmitter's output to zero.*
- If power output is low on certain channels, check Channels 1 and 23 as in the previous step. This should result in equal output on all 23 channels.
- Adjust coils L12 and L13, plus variable capacitor VC-2, for maximum output on the RF wattmeter.
- *Note: Coil L12 is adjusted by compression or expansion of the coil turns. Use a non-metallic tuning tool for this adjustment.*
- Depress the mike button and adjust potentiometer VR-5 until the transceiver's S/P-RF meter reads the same power as the wattmeter.
- If an RF field strength meter is applied, the transceiver may be peaked at the installation with the antenna connected. Through a hole in the rear of the

continued on page 69

Quadraline Four-Channel Sound

by Phillip Dahlen

Examining a New Breed of Audio Equipment

■ It was back in college that I heard my first stereo. The professor had been doing some experimental work with dual-track magnetic tape, and it was interesting to hear the jet planes zooming in through the classroom window and out through the corridor door, followed by a string of locomotives. More accurately, it was thrilling!

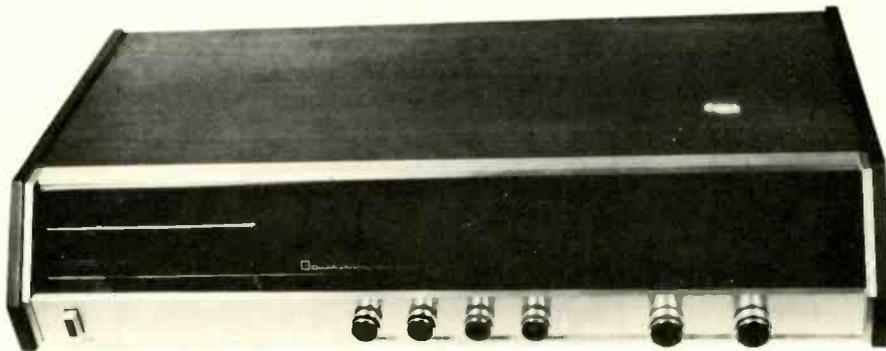
Then about two years ago we heard our first four-channel sound demonstration—oh how terrible! Percussion instruments were *pounding* at us from all four corners of the room. It was therefore with some hesitation that I brought home Motorola's 275 Quadraline four-channel cartridge tape player and sample cartridge to become better

acquainted with their system. One speaker was placed in each corner of the living room, the connecting wires being neatly draped around one side of the room.

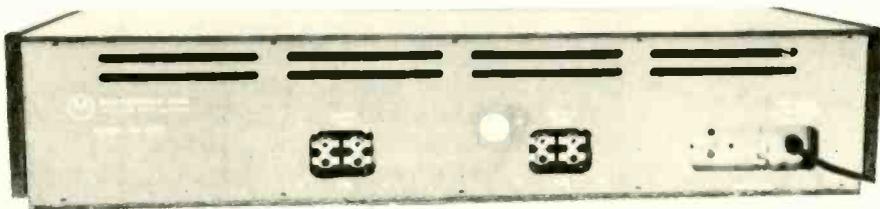
It was a very pleasant surprise to hear the resulting music. For now I heard demonstration music at a much lower decibel level, and it sounded very natural. You were no longer sitting way in the back of the auditorium, hearing the music coming from but one direction; you no longer had a front-row seat, hearing the sound from appropriate positions across the stage; you were now on the stage among the musicians, hearing each instrument sound from its relative position in front, behind, to the left or right of you. It was a very relaxing experience.



Motorola's 275 Quadraline four-channel cartridge tape player with the power ON to illuminate the channel number, MODE, LEVEL and TONE control settings and balancing grid.



With the power OFF, tape-player settings are concealed behind the tinted panel.



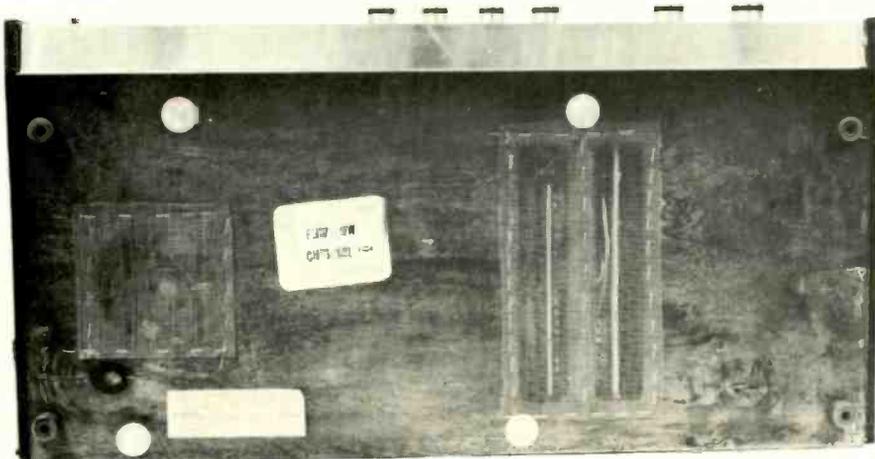
Two sets of phono-type jacks are provided on the back of the tape player for auxiliary inputs and speaker outputs.

Tape-Player Controls

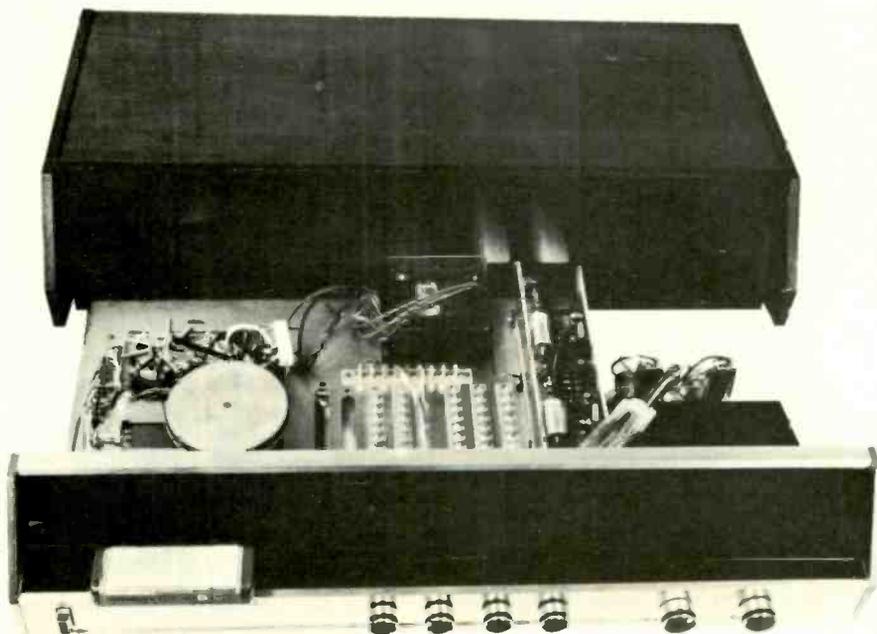
On the left portion of the control panel there is a PROGRAM SELECTOR push-button switch for selecting tape channels one or two on eight-track, four-channel tapes, or channels one through four on eight-track, stereo tapes. If not manually switched, the tape player will alternately switch between channels one and two upon the completion of each four-channel track, or from channel one through channel four and back to channel one upon the completion of each stereo track. The corresponding channel number is illuminated on the panel above the selector switch.

The next control to the right (MODE switch) offers a choice of tape, four-channel auxiliary or two-channel auxiliary (the two channel sound coming from all four speakers). Lights behind the tinted panel illuminate words stating the current mode of operation.

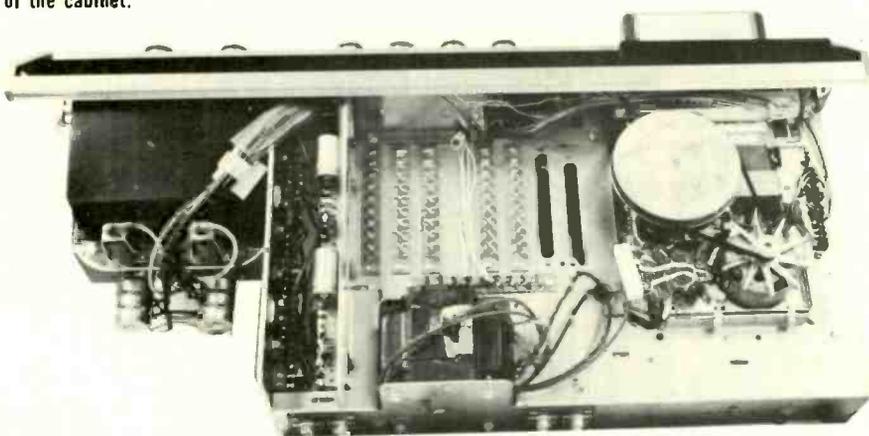
The BASE control has an illuminated numerical scale and is said to provide 13dB cut at 60Hz on all



The bottom of the tape player is well vented.



After removing six bolts from the underside of the cabinet, the chassis can be slid out the front of the cabinet.



Top view of tape-player chassis with tape cartridge in place.

four channels, while the TREBLE control has an illuminated numerical scale and is said to provide 17dB cut at 10kHz on all four channels. The illuminated MASTER LEVEL control regulates the level of all four channels before the first amplifier stage and is center tapped to provide bass boost at lower level settings.

The grid balance system is probably the most impressive appearing system in the tape player. When the player is ON, a horizontal grid is illuminated and can be seen through the tinted front panel. The corners of this green grid represent the four speakers. The red dot shining through the grid represents the relative position between speakers where you intend to listen. The four-pot FRONT-TO-REAR BALANCE control moves this dot towards the front or back of the grid, while the four-pot LEFT-TO-RIGHT BALANCE control moves it left or right across the grid.

Tape Deck

The presence of a groove on the four-channel tape cartridge is used to distinguish it from a stereo tape cartridge. Without this groove, the MODE switch is moved to its two-channel position upon inserting a standard stereo eight-track cartridge.

Inserting either type cartridge also presses the POWER switch, turning the tape player ON. The cartridge is also pressed against the cartridge eject arm, which in this unit is used to merely press another arm against the side of the cartridge, holding it in place—in other units the eject arm is also used to remove the cartridge from the tape player.

Like all other standard cartridges, the four-channel eight-track cartridge contains a long continuous loop of magnetic tape. An electrically conductive strip is secured across one segment of this loop, completing

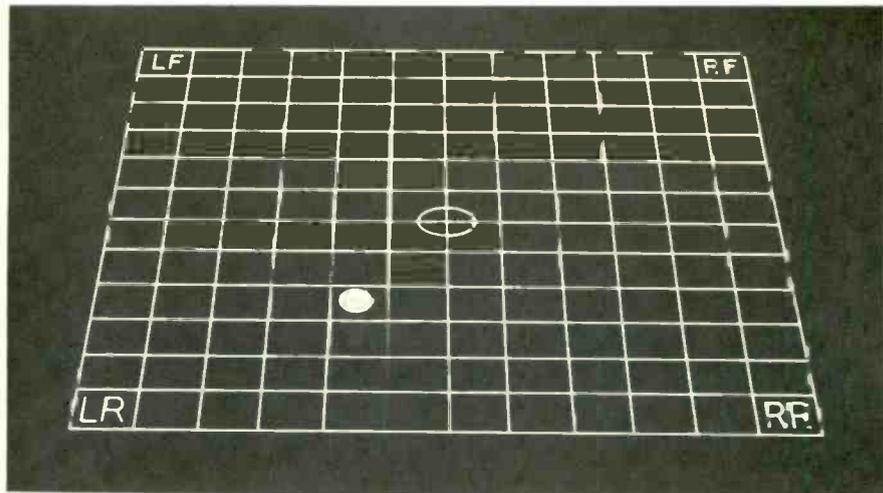
an electrical circuit across the TRACK switch with the completion of each loop, so that the tape deck can be automatically switched to another track. This is done by activating an electrical solenoid, which pulls a plunger to rotate a cam. The cam, in turn, raises or lowers the tape-head assembly and rotates the PROGRAM INDICATOR switch.

The tape-head assembly actually contains four tape heads, one for each of the four audio channels. When the assembly is in its upper position, the tape heads are sensitive to the recorded signals on tape tracks 1, 3, 5 and 7; while when in the lower position, they play tracks 2, 4, 6 and 8. To play four-channel sound, the tape-head assembly moves to alternately play the two sets of tracks just noted (the tape guide preventing the tape from vertically shifting along with the head assembly). However, when playing two-channel stereo programs, the top pair of tape heads play tracks 1 and 3, then the head assembly drops and the same pair of tape heads play tracks 2 and 4, then the head assembly rises to its original position and the second pair of tape heads play tracks 5 and 7, then the head assembly drops again and the second pair of tape heads play tracks 6 and 8. After completing this cycle, the head assembly again rises and the first pair of tape heads again plays tracks 1 and 3—repeating the initial music unless another cartridge is placed in the tape deck.

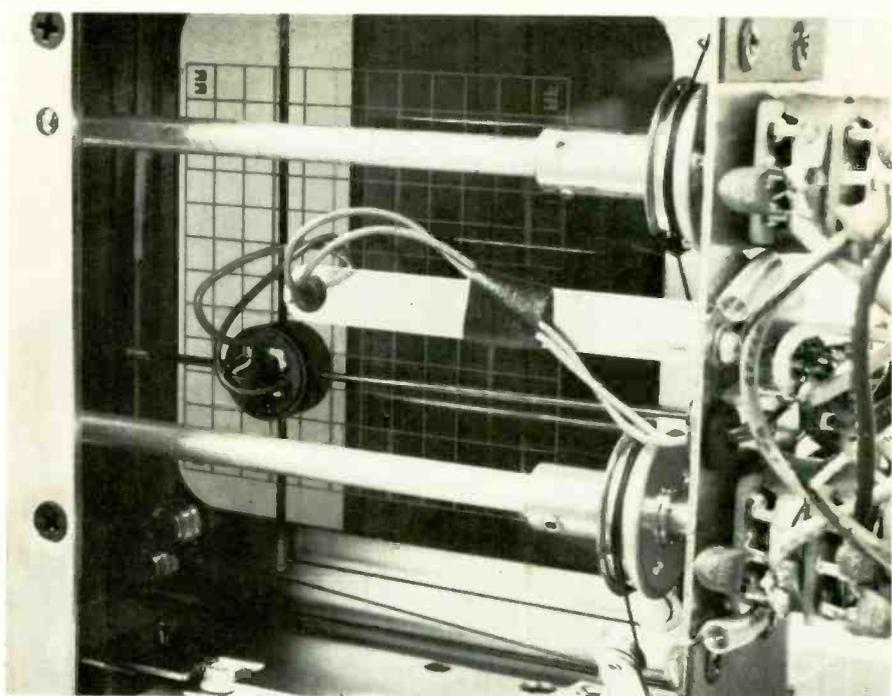
Amplifier Design

Each of the four channels has its own two-transistor preamplifier, the four circuits being constructed on a single printed-circuit board, which is mounted on the tape deck. During two-channel operation, the MODE switch ties the two left channel and right channel outputs together. This would result in distortion in the first stage of the next amplifier if it were not for a diode, which effectively removes the load of the nonconducting preamplifier from the load of the conducting preamplifier, maintaining an 8.2K load at the input of the first audio amplifier.

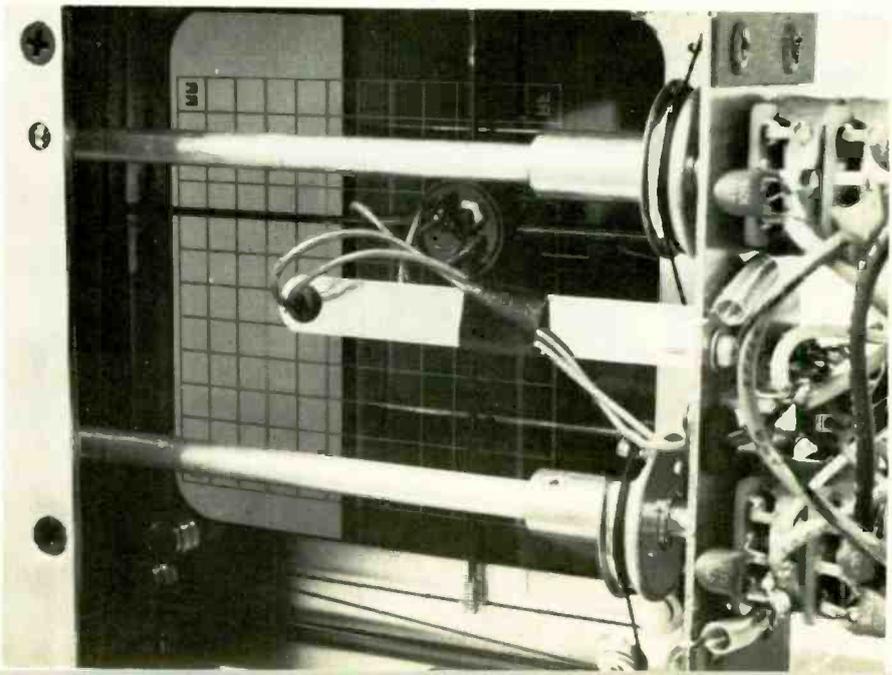
The four-channel audio amplifiers are also identical, each consisting of



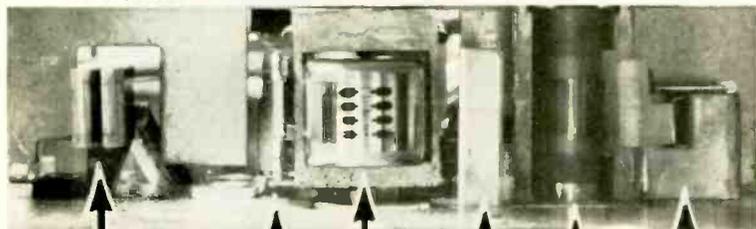
Four-channel BALANCE control grid system as seen through the front panel. The grid pattern (illuminated in green) represents the room in which the tape player is used, the corners of the grid representing speaker locations. The position of the dot (illuminated in red) can be moved across the grid to a location corresponding to your position within the room—the location for which you want the speakers balanced.



Dial cords attached to the FRONT-TO-REAR BALANCE control and LEFT-TO-RIGHT BALANCE control are used to vary the position of a lamp housed beneath the transparent grid pattern. A red filter on the underside of the grid pattern causes the lamp to appear as a red dot.

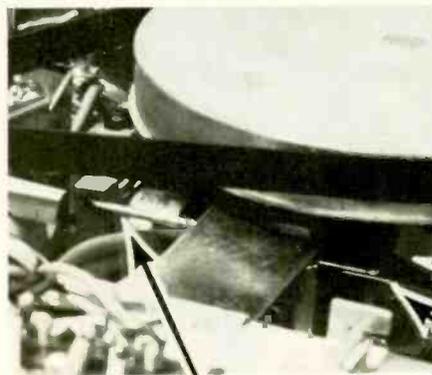


Upon peering through the panel opening through which the tape cartridge is inserted, we can see the TRACK switch, tape guide, tape head, cartridge eject arm, tape drive capstan and POWER switch.

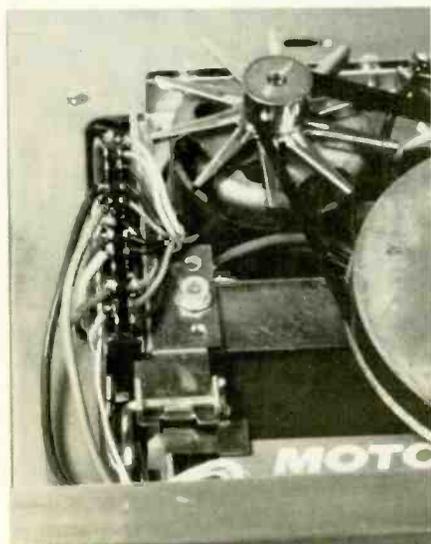


TRACK SWITCH
 TAPE GUIDE
 FOUR-TRACK TAPE-HEAD ASSEMBLY
 CARTRIDGE EJECT ARM
 TAPE-DRIVE CAPSTAN
 ON/OFF SWITCH ACTIVATOR

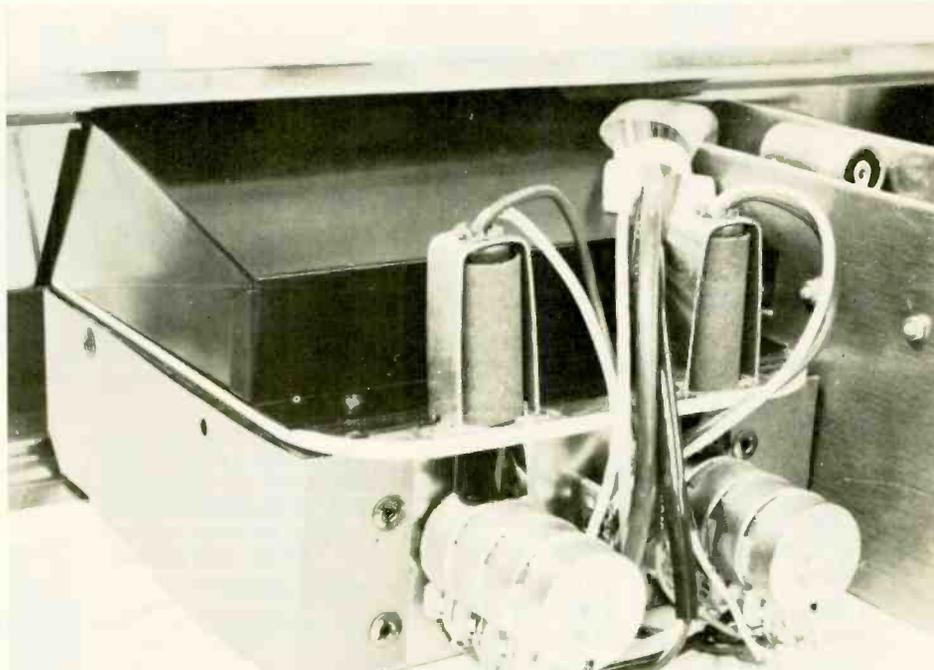
The tape-head assembly is supported by a pivoted lever.



TAPE-HEAD ASSEMBLY
 TAPE GUIDE
 ARM FOR SUPPORTING TAPE-HEAD ASSEMBLY AS IT MOVES UP AND DOWN



The many wires shown at the left are connected to the cartridge MODE switch. Because of the slot in the four-channel cartridge, inserting the cartridge does not cause the lever to press against the switch—leaving it in the four-channel mode.



Two lamps mounted at the back of the frame housing the grid pattern are used to illuminate it. A filter around each bulb causes the pattern to appear green.

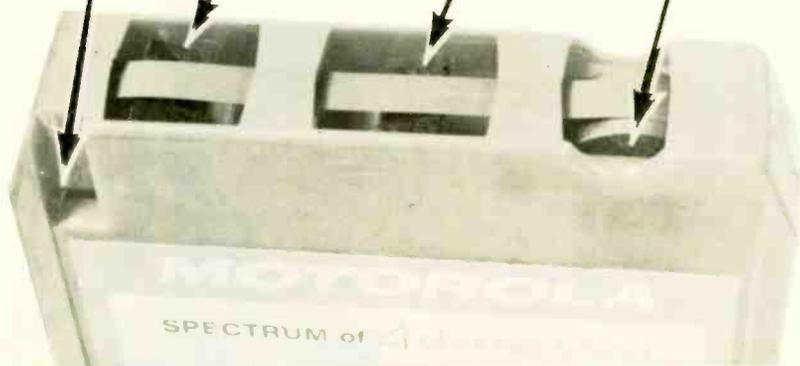
WITH THIS NOTCH PRESENT, MODE ACTIVATOR SWITCH REMAINS IN FOUR-CHANNEL POSITION

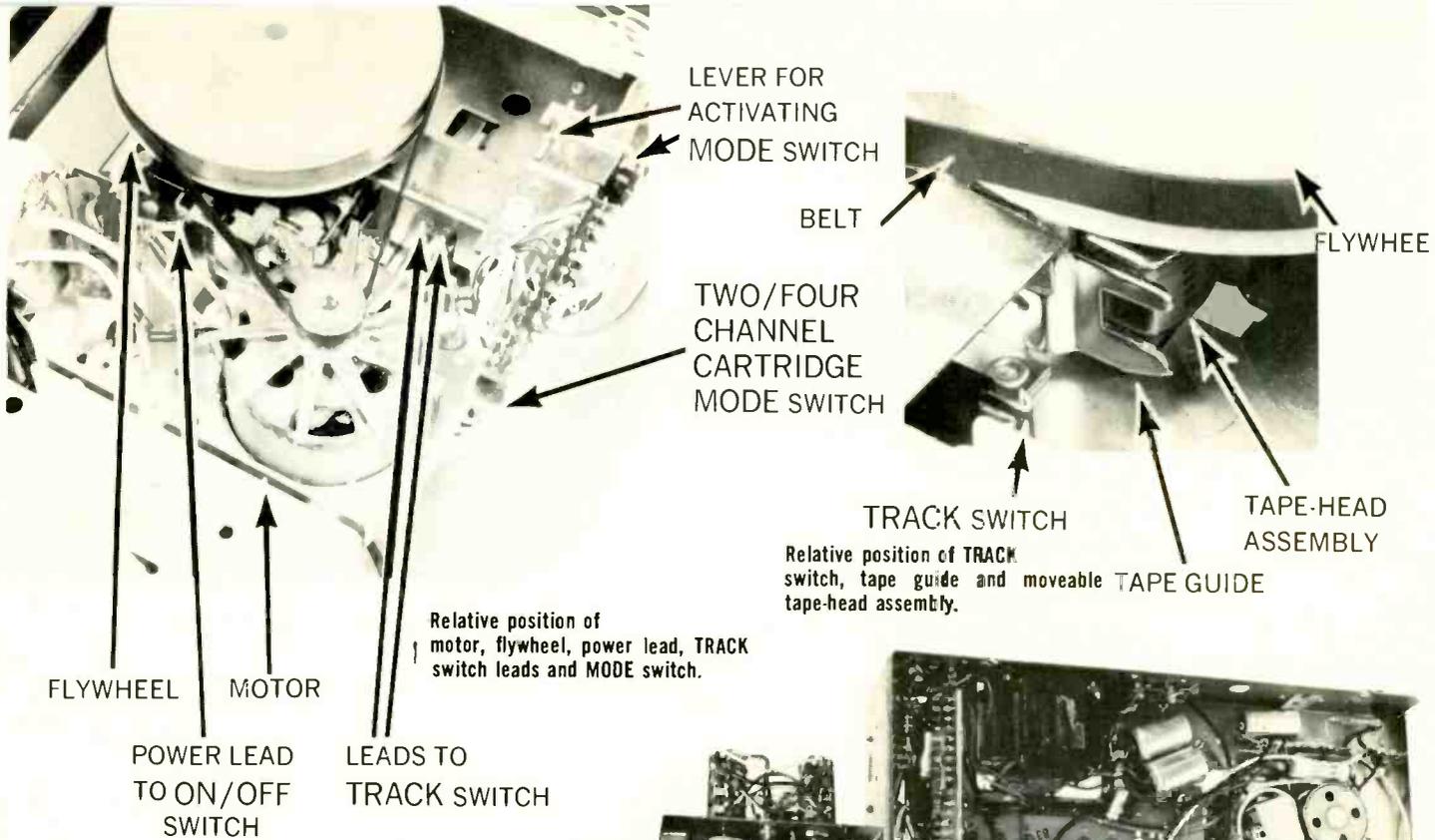
PRESSURE FOOT FOR TRACK SWITCH

RUBBER PRESSURE ROLLER

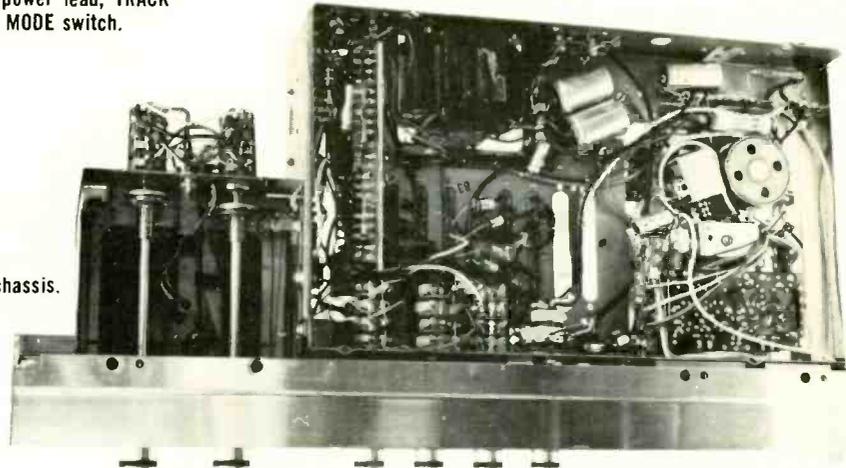
PRESSURE FOOT FOR TAPE-HEAD ASSEMBLY

An end view of the four-channel eight-track cartridge used to demonstrate the tape system.





Bottom view of tape-player chassis.



Quadriline ...

two stages of amplification—one drive stage and a complementary symmetry output.

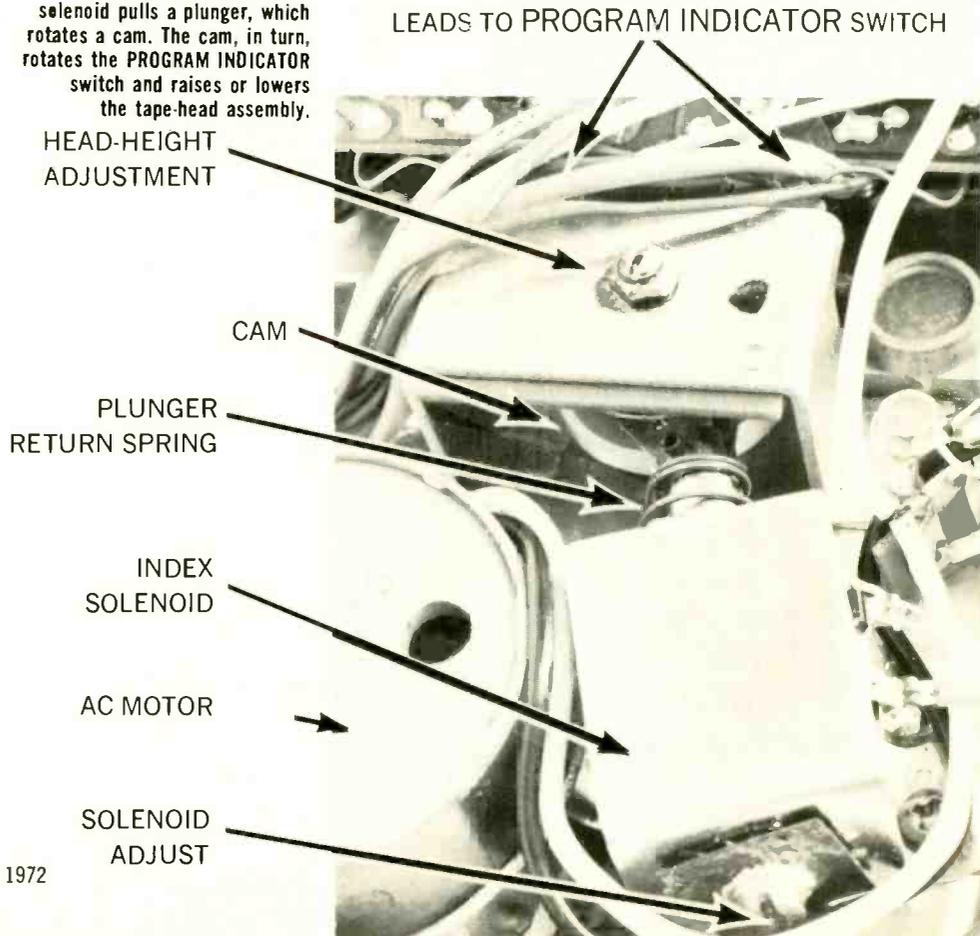
Manufacturer Specifications

The tape player is said to run on 122v ac at 60Hz, consuming approximately 105w of power. It has a rated peak power output of approximately 30w per channel, each channel having a 16Ω speaker load. The capacity-start tape-drive motor is self-regulated for 122v dc.

Conclusion

Unlike some systems now on the market, this system offers true four-channel sound rather than merely synthesizing four-channel sound from stereo by reproducing stereo treble notes from the front speakers and stereo base notes from the rear speakers. Such synthesizing systems were also prevalent with the initial development of stereo—monaural base notes then being reproduced from the left speaker and monaural treble notes being reproduced from the right speaker. ■

To change tape tracks, the solenoid pulls a plunger, which rotates a cam. The cam, in turn, rotates the PROGRAM INDICATOR switch and raises or lowers the tape-head assembly.



How to tell which is the largest compact van built in America.

(No matter how you look at it.)



**If you can't close the rear doors,
you haven't loaded a Dodge Maxivan Strong Box.**
And you'd better get one.

Dodge Strong Boxes give you a lot more than just more room: Independent front suspension and longer 127-inch wheelbase mean better handling and ride. Shorter turning circle. Even with a 127-inch wheelbase, you have greater maneuverability. Wind-tunnel body and curved windows reduce wind-sway effect. Front wheels can be inexpensively aligned on passenger-car equipment. Biggest V8 engine offered. 360 cubic inches.* Three-speed TorqueFlite automatic transmission* with a choice of three engines available on all models. Integral power steering.* Power brakes. Fresh Air air conditioning* and exclusive Fresh Air heater provide even flow of clean air. Air is not recirculated. High-level air intake helps keep incoming air cleaner. Front passenger's seat does not block side cargo door entrance. Both front seats are easily adjustable. Concealed side safety-step offers firm footing since it doesn't collect ice or snow. Wider front doors and door steps and less wheelhouse intrusion make for easier ins and outs. Full-foam padded bucket seats up front give softer ride and more comfort.



Two-stage door checks conveniently hold doors in two positions. Biggest  CHRYSLER MOTORS CORPORATION gas tank. 26 gallons. Smaller engine cover is easy to remove for servicing. Also, easier for driver to reach back seats. Extra rust protection on undersides, doors, and panels. Large hood opening. Battery, dipstick, and radiator are easy to reach. Engine can be removed quickly and easily through the front. And the list continues at your Dodge Dealer's.

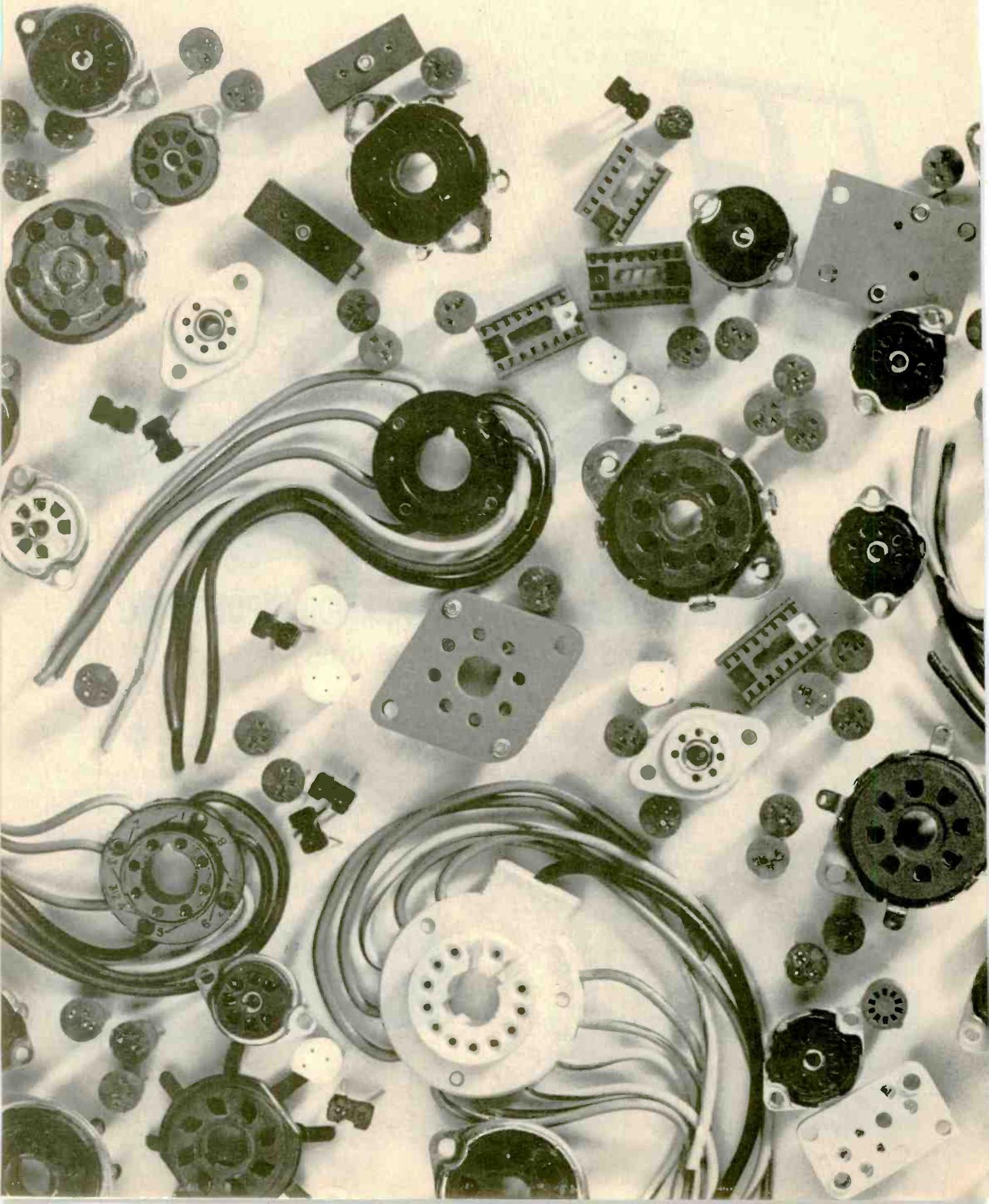
Dodge Maxivan takes the "packed" out of compact vans!



*Optional at extra cost.

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

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We have a tremendous line of receiving tubes—over 1000 at last count.

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grams (like our ECG semiconductor program), so that you can keep the least amount of stock on hand to replace the most number of parts.

We publish the Sylvania Technical Manual, which is practically a replacement encyclopedia (32,000 components!).

We have loads of specialized replacement literature. And we help you with any replacement problem.

See your Sylvania distributor and get to know the family.

GTE SYLVANIA

Electronic Components Group, 100 First Ave., Waltham, Mass. 02154.

GUEST AUTHOR

Cashing in at the MATV Super Market

by Richard Deutsch

MATV is receiving lots of attention these days. The convenience and superior quality of TV reception provided, and the profit potential all make it a highly attractive investment for the electronics service dealer, the building contractor and the end user alike. It is indeed a super market whose potential hasn't even begun to be realized.

■ Getting into the MATV field is easier than you'd think—even if you've never handled a piece of MATV equipment in your career! Most MATV equipment manufacturers have systems planning and education programs to assist you with the technical data and information you'll need for laying out and installing systems for every need. For the purposes of this discussion, let's assume that you have got the know-how to handle any system for any commercial and residential need. Now, where do you get your leads?

Let's start with the foundations. There's a potential MATV customer any place where you see excavations being dug. Whether it's a real estate development, high-rise apartment, hotel, motel, office building, department store, hospital or school, you've got a vital lead that should be followed up.

Contact real estate firms, contractors, engineers and architects with a brief resumé of MATV and its overall profitability. Your most powerful sales points are: MATV's increasing the value of the building under construction; its profitability through leasing or contracting to the tenant, or owner; its ease of installation maintenance, and its overall economy. All this pointing up to the fact that TV is one of the most powerful forces in our daily lives. Al-

though we may not admit it, sooner or later all of us become addicted.

You don't need to present final quotes or a definite proposal, but you should be able to offer suggested uses for MATV and CCTV.

You've got several angles of approach in installing the system, since it can easily be worked into the electrical system during the initial planning stages, or can be added to a building under construction or nearing completion with very little deviation from the initial plans.

Naturally, the most efficient and economical installation is performed during the building's construction, however the costs can be cut down, when the building has been completed, by using a little imagination in planning. Running cable and conduit down through attics, or up through crawl spaces and basements cuts the costs and keeps the amount of exposed line to a minimum.

In many cases, interior line can be hidden behind base boards and decorative trim. In planning, make sure that the only visible part of the system to the occupant is the wall outlet—and the superior TV reception he tunes in.

MATV not only adds to the building's overall value, but provides additional revenue as well. When charged for on a monthly basis, or included in the basic rental fee, it most often pays for itself



Richard Deutsch is vice president of Sales and Marketing, Channel Master, Division of Avnet, Inc. He joined the firm's engineering department in 1954 and quickly moved into sales, where he moved up the ranks from sales manager to national sales manager, and recently to his present position. He is currently involved with the development of diverse marketing programs for all Channel Master product lines including antennas, consumer entertainers and MATV electronic products.

within the first year, and in many cases can be expected to show a profit. In high-rise apartment houses, MATV can be offered as a rental option. As an installer you have the option of leasing the system or selling it outright. When selling, be sure to obtain the periodic service contract.

Don't be afraid to take a risk. Many dealers have developed profitable business by installing systems in buildings at their own expense, and then offering them to the buyer as an option, such as central vacuum systems and air conditioning.

Model homes are ideal for developing MATV sales. Couples looking into new homes are investing in their future comfort, and the relatively modest cost of MATV, combined with its convenience and practicality, make it its own best salesman. People may opt against the fireplace or the flagstone terrace, but they'll seldom cut corners when it comes to TV.

Contact the developer and arrange to set up a working system in the home. You can display TV sets

with your own advertising, and offer them as part of the house package. This is also a fine opportunity for introducing CCTV as a monitor for the nursery, front entry or play-room.

In many cases, displaying in model homes also leads to related sales of TV sets, Hi-Fi equipment, home intercoms and other applications that you as a dealer may handle. Another fringe benefit to showing in model homes is that you'll most often be the one the buyer contacts when his TV sets need attention—especially if he's just moved into the area.

You might also check the social pages of your paper for entries such as: "Mr. and Mrs. Joe Blat have moved to their new home on Wentworth Drive"—*and are customers for MATV!*

Other areas to look into:

Watch for bid submissions . . . they're required by law to be announced publically, and will be published in your local papers. If you have the means, and the growth rate of your area justifies it, you may want to subscribe to the **DODGE CONSTRUCTION REPORT**. This is a compendium of construction activity published monthly by area, and is a quick and easy reference to contracts being let out for bid.

You'll also want to check the papers and your town clerk for any building permits that have been issued. Visit the local lumber yard and find out who's buying materials to add a new wing or dormer. These are your potential customers.

And, it's always wise to make yourself known around town. Talk to PTA's, school principals and teachers' associations about the benefits of MATV and CCTV for educational purposes. Have a brief talk prepared that you can give in front of civic groups. The local Rotary or Lions are generally the people who are involved in what's happening, and can be invaluable contacts . . . the man in the fifth row who's all ears may just have been awarded the contract for the new community hospital!

Incidentally, hospitals are an exceptionally healthy MATV marketing opportunity. They offer a self-

Suggested MATV and CCTV Marketing Outlets

Schools

MATV is used for distributing televised special and newsworthy events as well as ETV. As an augmentation of the educational function, outlets are recommended as follows: ● 1 per classroom ● 1 per laboratory (language and science) ● 1 per teachers lounge ● 2 to 6 in auditoriums, reading and study halls ● 1 to 6 in cafeterias.

CCTV can be used as an educational aid in telecasting: ● special school events ● lectures ● guest speakers ● experiments from remote laboratories.

Hospitals

MATV is used for providing entertainment and recreation for patients as well as staff during breaks. Outlets are recommended as follows: ● 1 per room ● 1 per doctors' and nurses' lounge ● 2 to 6 per ward ● 2 to 4 per cafeteria.

CCTV is used for the assistance of staff in its duties of surveying: ● private rooms ● recovery wards ● intensive care units ● operating theaters.

Nursing Homes

TV is a prime source of entertainment and pastime for the aged.

MATV outlets are recommended as follows: ● 1 per room ● 2 to 6 in recreation and entertainment facilities.

CCTV is used for the survey of the following areas (depending on the degree of nursing care provided): ● room ● entertainment and geriatric treatment devices.

Hotels and Motels

MATV is an indispensable part of the furnishing of guest rooms. Outlets are recommended as follows: ● 1 per guest unit ● 1 per room within suite ● 4 per meeting or conference room ● 2 per lounge or bar ● 1 per lobby.

CCTV is used for: ● distributing advertising and entertainment that originate within the hotel ● piping background music through TV sets ● surveillance of lobbies, hallways and elevators.

Apartments

MATV outlets are recommended as follows: ● 1 per unit (at least) ● 1 per bedroom ● 1 per kitchen ● 1 to 2 per communal recreation area or lounge.

CCTV is used for security surveillance of: ● lobbies ● playground areas ● laundry rooms ● elevators ● entries. It can also be used to provide door answering service and be distributed to a central security officer's monitoring station and/or individual TV sets.

Business and Industry

MATV is used to distribute programming to offices with vested interests in TV (such as advertising agencies and studios) as well as to provide breacktime entertainment for workers. Outlets are recommended as follows: ● 1 per office ● 1 per executive suite ● 1 per employee lounge ● 1 per cafeteria ● 2 per suite of offices ● 4 per conference room.

CCTV is used for general surveillance and transmission of information in the following instances: ● stock quotation monitoring ● observing personnel and production lines ● traffic control ● monitoring specialized manufacturing equipment (e.g., the insides of blast furnaces) ● broadcasting to remote conference rooms ● transferring shipping and dispatch information.

General Security and Surveillance

CCTV is recommended for monitoring: ● inventory depots ● entries and exits ● shipping points ● traffic control ● inside storage and bank vaults ● general security in banks, supermarkets and department stores.

Private Residences

MATV outlets are recommended as follows: ● 1 per living room ● 1 per family room ● 1 per bedroom.

CCTV is used for surveying: ● entries ● play areas ● nurseries.

liquidating means of providing TV entertainment for patients, through the expedience of pay TV. A simple coin device hooked up to the TV set will cut off the audio portion of the broadcast, and release it when money is inserted. You'll also find applications for CCTV through the monitoring of hospital sick bays, intensive-care units and operating theaters.

What you're basically selling is an RF video distribution system with

provisions for distributing outside TV broadcasts and inside TV programming. The system is inherently versatile, since it's compatible to any future innovations in the field, and is therefore an immense asset in convenience and profitability to the owner of any building. The horizons are virtually unlimited. Use the opportunities at hand, and your own imagination, and you've got the key to a highly lucrative supermarket with a wide open profit potential. ■

TEST INSTRUMENT REPORT

Leader's LS-5 Electronic Switch

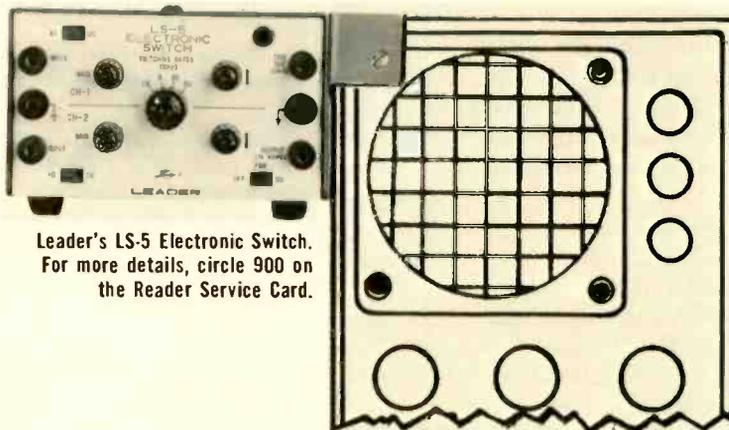
by Phillip Dahlen

Designed to upgrade your present scope

■ We have frequently stressed the importance of having a good, professional scope for greater servicing efficiency. Such a scope can eliminate many wasted hours, thus quickly paying for itself with the resulting increase in revenue.

Although we hold strongly to this position, we must also recognize the fact that not everyone entering our profession has the necessary capital to immediately purchase all of the professional-quality instruments required. Suppose that before entering trade school you purchased a single-trace, ac-only scope. Now that you have attained greater technical competency, you find that for effective servicing you really need a more expensive ac/dc-coupled scope—there also being occasions when it is desirable to compare waveforms (or signal conditions) with a dual trace. But your present scope, though inadequate, is in good operating condition, and you cannot afford to replace it.

There is an answer to your problem. One that should be well within your budget. That is the purchase of an electronic switch. By attaching such an accessory to the input terminals of your scope (no circuits within your scope need be modified), suddenly your ac-only scope is capable of measuring dc voltages. You are also able to observe dual traces on your scope. The additional trace may be used merely as a 0v dc reference when noting both the ac and dc components of the signal observed with the first trace. Or the second trace may be used to observe a different signal present in the defective circuit under test.



Leader's LS-5 Electronic Switch.
For more details, circle 900 on
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One electronic switch now on the market is made by Leader Instruments Corp. Their Model LS-5 solid-state switch is said to have switching frequencies of 1.5, 5, 30 and 50kHz. Specifications indicate that in addition to having "instant-on" capability, it offers a triggered output to facilitate very fast and highly stable synchronization of the observed signal.

Additional specifications indicate that the dc frequency response is dc to 300kHz, while the ac frequency response is 2Hz to 300kHz—each of the two channel inputs being ac or dc switchable. Vertical sensitivity is rated at 0.05v/cm with an input impedance of 1M at 40pf.

Individual GAIN and POSITION controls are provided for each channel.

The instrument measures 3¼ in. H by 5¼ in. W by 4 in. D and comes with a specially integrated mounting bracket to facilitate the direct attachment of this instrument to any scope used. The instrument weighs approximately 3 lb. ■



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3. Each approved NEW NEA or NATESA Member will receive from The Finney Company a GIFT CERTIFICATE good for \$35 worth of FINCO PRODUCTS at SERVICE DEALER WHOLESALE PRICE! When sold to your prospective customer at regular price (approx: \$59.50) you will have received back your original \$35 dues — PLUS — a \$24.50 NET PROFIT! — THAT'S RIGHT! — FINCO is actually making it possible for each new affiliate to make a \$24.50 profit by joining either NEA or NATESA!
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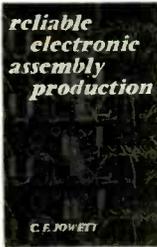
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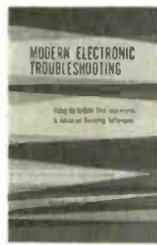
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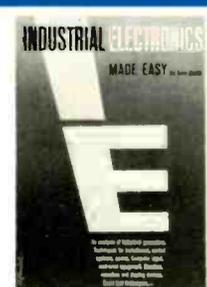
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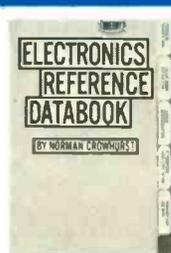


Here is a practical guide to electronic processing and control circuits and systems, written especially for service technicians. It provides technical knowledge on the operation and application of industrial process, control, recording, and measuring circuits and devices. The author compares industrial circuits with those used

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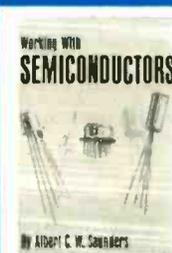


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NEWS...

continued from page 31

11. **Prominently Display Shop Labor Rates and Technical Fees**
 - (A) Prominently display a plainly legible listing of minimum service rates, estimate charges and/or hourly labor fees for all units normally accepted for service.
 - (B) Maintain and display, upon request, a complete listing of service charges, diagnostic fees, flat-labor rates and/or maximum hourly fees upon which all service rates are billed.
12. **Issue Itemized Bills**
 - (A) Provide with each repair for which charges are made, an accurately itemized statement for material used, procurement or handling charges, taxes, basic service fees, technical time and/or labor charges and any other items included in the total price of the bill.
 - (B) Charge no more than a reasonable installed price, including procurement and handling charges for any part installed or provided.
13. **Maintain Truth In Advertising**
 - (A) Employ no tactics nor use any advertising which tends to deceive or mislead any portion of the public either in actual wording, suggestive phrasing or by the omission or obscure placement of pertinent facts.
 - (B) Pertinent conditions and descriptive facts concerning an advertised item or service must be included in the same message or ad and, if printed, must appear in type no smaller than one-fourth (¼) the size of the type used for other direct or indirect references to the product. No merchandise or service shall be offered which is not readily available at the quoted or advertised price or which is not wholly useful without the necessity of "optional extra" items or services unless such conditions are clearly stated.
 - (C) Charge only for parts actually installed and for services actually performed. Charge no more than a reasonable installed price, including procurement and handling charges for any part installed or provided.
 - (D) The services of a trip charge shall not be advertised as a service charge, etc. Properly and truthfully define the products and services for which prices have been advertised or quoted. List the brand name and full model or part number of any product or part for which a picture and/or price is displayed or quoted.
 - (E) Plainly list the principal business and/or office address and telephone number of the service company in all advertisements and upon all receipts, invoices, billings, etc. No implication shall be made that a branch or office exists in an area where no such establishment exists.
 - (F) The words "banded," "authorized," "certified," "approved," etc., or words of similar connotation shall not be used in any advertising unless it is also clearly stated to what extent and by whom such bonding, authorizing, licensing, certifying, approving, etc., is granted.
 - (G) No reference or implication shall be made to indicate that a service or sales establishment is a factory branch or possesses any factory authorization without the ability to clearly and unquestionably prove such claims upon demand, or that the firm is in any way or manner connected when another firm or line of business when no such connection exists.
 - (H) No claims shall be made as to the amount of percentage of repairs which may be or are completed in the home within a given period of time, or any other changeable or unforeseeable variable. Superlatives which are merely opinions and subject to change shall not be used unless specifically related, provable facts are also itemized. No claims of any kind may be made in any manner which cannot be promptly and clearly substantiated.
 - (I) The word "free" shall not be used in the advertising of any product or service when such product or service may be obtained only by purchasing or making a commitment for another product or service for which a fee or other obligation or service must be provided in any manner.
 - (J) All advertisements shall conform to standards as recommended by laws, the Advertising Code of American Business, local Better Business Bureaus and/or other responsible agencies representing and/or endorsed by the electronics servicing industry.
14. **Cooperate with Authorized Industry-Policing Agencies**
 - (A) Cooperate with and assist in any reasonable investigation by legal or authorized agencies or personnel concerning any question of violation of any of these prescribed codes.
 - (B) Each service invoice shall contain the customer's name and full address; the make, model and serial number (when available) of the unit or units being serviced; the dates upon which service was requested and completed on each individual unit; and shall be signed or distinctively initialed by the technician or other qualified person performing or assuming liability for each or all services performed.
 - (C) Testify truthfully and/or offer provable evidence against known violators of these codes or other ethical business practices to proper investigating committees or agencies, and make immediately available any required copies of records pertinent to any validly questioned transaction when requested.
 - (D) Do not engage in malicious or insinuated, unprovable attacks upon the integrity of individual or collective competitors or upon the quality of parts or services allegedly provided by them when in the presence of a customer or the general public.
15. **Observe the "Golden Rule"**
 - (A) Be professional and fair to the consumer, to your employees and to yourself.
 - (B) Expect just respect and compensation, as a skilled professional, for valuable services provided and be proud at all times to be part of an honorable and worthwhile profession.
 - (C) Be neat and courteous and respectful to all customers and acquaintances and treat each client as you would expect to be treated if you were the client receiving the services and the bill.

RCA Announces Recall of AM Clock Radios

RCA has initiated a recall and product modification program for its RZD-422 AM clock radio model.

W. Thomas Collins, manager of Consumer Affairs, RCA Consumer Electronics, said the action resulted from incidents involving three of the 27,000 units of the model produced. The incidents involved only damage to the radio itself with no other reported damage or personal injury.

Mr. Collins urged that owners of these clock radios promptly unplug them and return them for modification to any RCA Consumer Electronics dealer or distributor. The RZD-422 is the only model involved in the program.

"An extraordinary combination of circumstances—a capacitor changing value as a result of the radio being turned on a large number of times, followed by the unrelated failure of a diode—could cause this model to overheat to such an extent that a small hole may be burned in the plastic cabinet," Mr. Collins noted.

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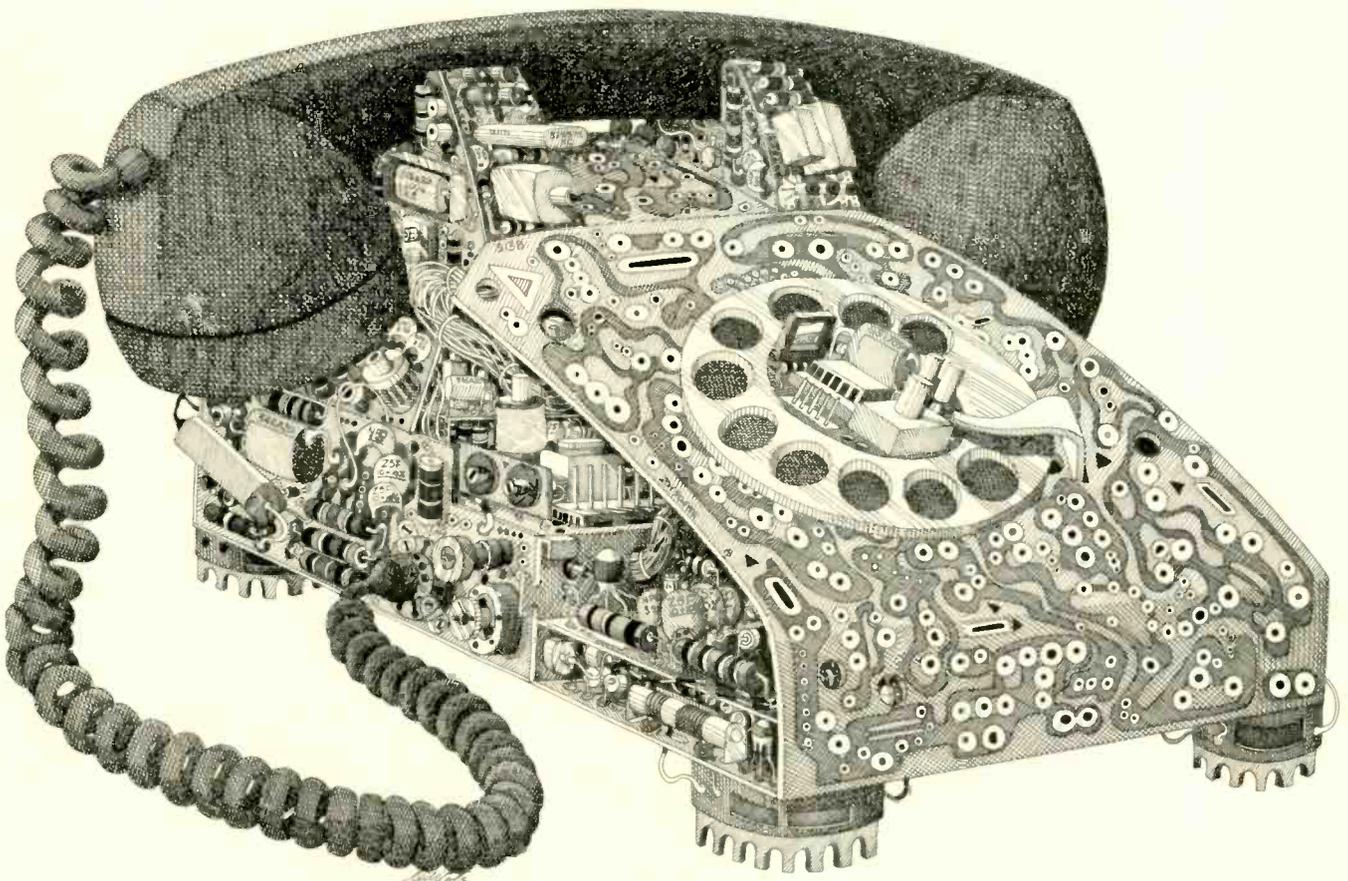
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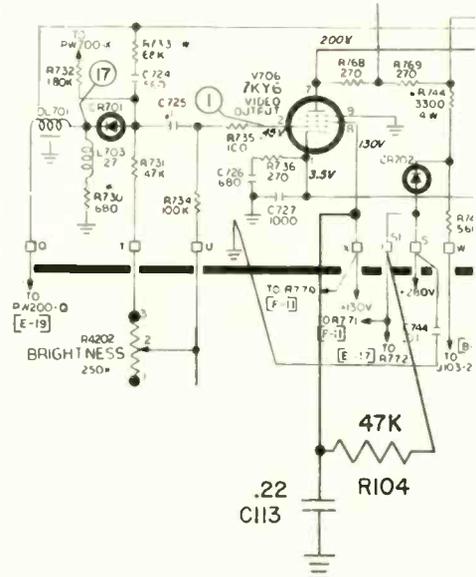
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The following adjustment and check procedures (in brief form) may be helpful in resolving "insufficient brightness," "poor picture," or similar problems in early-production instruments.

Brightness Limiter Adjustment

The line voltage should be 120vac and the chassis ON for at least 10 min. Then turn the tuner to an unused channel and obtain a blank raster by inserting a screwdriver blade between tie point TP203 and the adjacent IF can (see Tek-fax schematic No. 1378 and illustration). Then set the SCREEN controls correctly (just cut off). Turn the BRIGHTNESS control to maximum, CONTRAST control to mid-range and adjust the BRIGHTNESS LIMITER control (R406) to obtain a horizontal output tube cathode current of 260ma. If



the 260ma current cannot be obtained, either change resistor R731 to 27K or bridge it with a 68K resistor.

The 260ma setting is correct for the early-production chassis. The current should be set to 240ma in the later-production chassis (chassis with a video output screen resistor 47K, R104).

High-Voltage Check

Perform this check on normal station signal. The high voltage should measure 21.5kv with an open jumper across resistor R413. Then turn the BRIGHTNESS control to maximum—the allowable drop from the previous reading is 3kv.

MOVING?

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

CB Servicing...

continued from page 49

transceiver chassis, the Antenna Loading control may be adjusted with a non-magnetic screwdriver for maximum output, as indicated on the field-strength meter. For accurate results, place the meter at least 30 ft from the antenna.

Modulation Adjustment

- Connect a modulation monitor to the transceiver.
- Connect an audio generator between ground and the center pin of the microphone connector. Tune the signal generator frequency to 1kHz and adjust its output level to 10mv.
- Apply power to the transceiver and depress the mike button. Adjust potentiometer VR-6 to produce 80 percent modulation as indicated by the modulation monitor. Voice modulation should *never* exceed 100 percent.

TVI Adjustment

- Tune a TV set to Channel 2.
- Depress the mike button and adjust coil L14 at the rear of the transceiver for minimum interference on the TV set. (The interference being eliminated may appear as a cross-hatch or wavy line pattern on the TV screen during CB transmission.)

SERVICE NOTES

Remember that it is the transmitter that is licensed and *not* the operator. Anyone may operate a properly licensed transceiver, but the licensee is responsible for any violations. Therefore, power to the auto transceiver should be available only when the ignition switch is ON. This will prevent unauthorized operation by other persons and prevent battery drain when the unit is not in use.

Most American cars use negative ground system while most foreign cars use positive ground. Care must therefore be taken to determine the polarity of ground before any repair or modification is begun. ■



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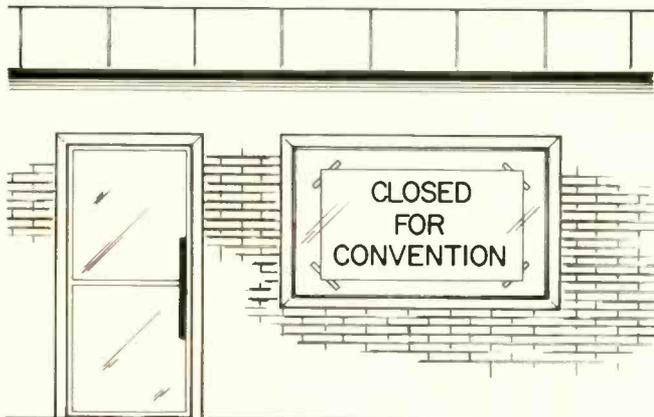
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Maybe some Canadian service dealer stayed home and will service my TV set.

Don't be a stray, join the crowd and benefit by the educational experience offered at the first joint service conference—National Electronic Associations, National Alliance of Television Service Associations, International Society of Certified Electronic Technicians, and Electronic Technicians Association of Louisiana. Jung Hotel, New Orleans, La., August 9-13, 1972.

TECHNICAL DIGEST

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

MAGNAVOX

Record Changers—Slow Turntable Speed

Slow turntable speed can be caused by the incorrect location sequence of the turntable bearing and washers on the turntable spigot housing assembly. It is not uncommon for the bearing and washers to adhere to the turntable hub during turntable removal, and fall off as the turntable clears the record spindle. Therefore, for all complaints of "slow turntable speed," consider the possibility that the turntable may have previously been removed and then re-installed with the bearing/washer group in an incorrect sequence. It is imperative that the bearing/washer group be installed in the sequence shown in the service manual for the changer involved. If the bearing/washer group is assembled in an incorrect sequence, the speed of turntable rotation can be reduced by as much as 10 percent.

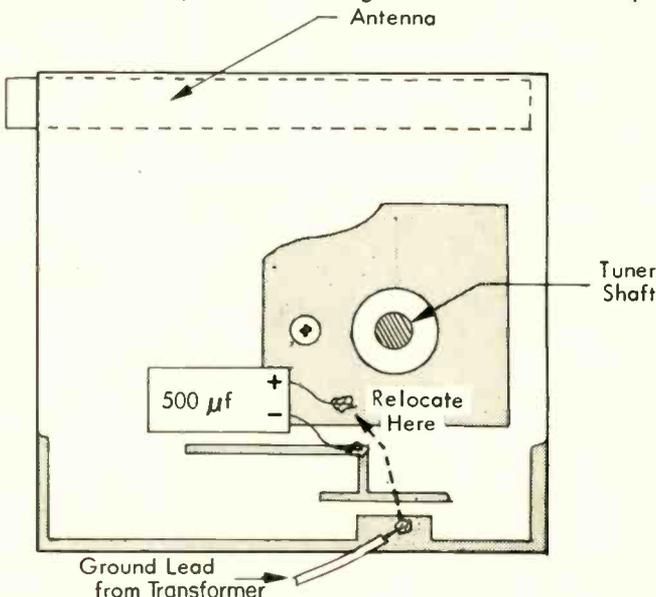
Tape Recorder Model 1K8879—Replacing 60Hz Capstan Sleeves

The dual capstan drive of this tape recorder requires that both 60Hz capstan sleeves have precisely identical outside diameters. A small difference in outside diameters of the two sleeves, which could result when replacing only one sleeve, can cause the tape to bunch in one direction. Because of this requirement, replacement sleeves are supplied in matched pairs under Part No. 11C028-5. It is imperative that the sleeves be replaced in pairs, using only matched pair replacements.

EMERSON

Radio Model 31T73W—Excessive Hum At Low Volume Level

In case of excessive hum at the minimum setting of the VOLUME control, disconnect the ground lead from the step-



down transformer and reconnect it to the same solder connection used for the grounded-positive lead from the 500 μ f filter capacitor, as shown in the illustration.

DEALER SHOWCASE

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

POCKET RADIO PAGER 703

Receives messages in both voice and alert tone

A miniaturized personal radio weighing less than 9 oz reportedly receives messages in both voice and alert tone. It measures 2½ in. by 5 in., is less than 1 in. thick and can be slipped into a pocket or clipped to a belt. The pager normally operates with a built-in antenna but the user can wear a small wire antenna for improved sensitivity and range. The unit is available with a simple tone alert or with tone-plus-voice. It is operated by encoding signals transmitted by pushbutton or a dial-access system, and uses either throwaway mercury or rechargeable nickel cadmium batteries. RCA Government and Commercial Systems.

CB RADIO 704

Transceiver rated at 0.5µv sensitivity

Features of the Puma 23 CB include an S/RF meter that glows amber when receiving, red when transmitting and flashes bright red indicating modulation. The noise cancelling mike plugs



in, power leads are quick disconnect and jacks are conveniently placed for PA and remote speaker. The Puma 23 receiver is reportedly rated at 0.5µv sensitivity and has a crystal filter and high performance automatic noise limiter. Price: \$114.95. Pearce-Simpson Div., Gladding Corp.

DUAL RECEIVE MOBILE UNIT 705

Any of 23 channels can be used while monitoring another channel

The Messenger 323-M, a dual-receive capability mobile unit reportedly allows the operator to use any of the 23 channels normally while simultaneously monitoring any other channel.

Separate SQUELCH controls are provided for the primary receiver and the monitoring function. This permits the operator to squelch down the monitored channel so that only local callers



will activate the DRC circuitry. A feature of this unit is its two-mode operation selectable by a switch. In the AUTOMATIC mode, when a signal is received on the monitored channel, a signal light illuminates and the call is interjected through the speaker. If, however, the operator doesn't want his normal operation interrupted he can use the ALERT mode. In this mode the signal light illuminates to indicate a call on the monitored channel, but the receiver continues to operate normally on the channel in use. Either of two channels can be monitored by the unit, selectable by a front-panel switch. A crystal for Emergency Channel 9 is supplied, while the other monitor position is left open for the installation of a local club or calling channel crystal. The main channel selector covers 23 channels, with all crystals supplied. Suggested price is \$289.95. E. F. Johnson Co.

MOBILE CB TWO-WAY RADIO 706

The unit has emergency Channel 9 scan-alert

The Cobra 28 is reportedly a 23-channel two-way radio with an exclusive Emergency Channel 9 scan-alert



that enables the user to monitor the emergency channel and any other selected channel simultaneously. The unit continuously scans both channels but locks in on the first signal. It is all solid-state and features a noise blanker

and automatic noise limiter, delta tune, PWR/S meter, plug-in dynamic microphone, PA switch and external speaker jack. It operates on 12v dc but may be used with the PAC 24, a 117v ac power supply, in base applications. Price: \$169.95. Dynascan Corp.

FM TWO-WAY PORTABLE RADIO 707

Provides intermodulation protection of 70dB

The Model HANDIE-COM MH-70 radio is available in either a standard or universal configuration with 2.0w RF power output and up to 4 frequency operation. The universal configuration provides a removable coil-cord remote speaker-microphone with which one can transmit and receive without removing the unit from its belt-carrying case. By disconnecting



the remote unit, the radio operates on the internal speaker and microphone without further adjustment. Through the use of field effect transistors and IF crystal filter techniques, the MH-70 reportedly provides intermodulation protection of 70dB. Rated at 90dB selectivity and 0.50µv sensitivity, the MH-70 receiver provides maximum protection against adjacent channel interference and is able to pick up signals. The radio can be powered with either a rechargeable nickel-cadmium battery or a long-lasting mercury battery. Also available is a battery cartridge clip which can be loaded with AA size mercury or alkaline cells. Motorola Communications Div.

VHF-FM RADIOTELEPHONE 708

The unit has provision for full remote control

The Model MK25 uses a new series of integrated circuits, including a unique quadrature detector containing almost 50 solid-state components. State-of-the-art monolithic crystal filters are employed to provide more

continued on next page

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INFORMATION

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CHECKS: sync, sweep, video, audio circuits, high voltage supplies (DC, RF or Pulse), low voltage supplies, coils, capacitors, resistors, tubes, transistors, diodes, transformers, speakers, etc. Will locate trouble to a particular stage, determine defective component and can actually be clamped in circuit to restore circuit operation temporarily in 80% of component or tube defects. Ideal for locating and confirming intermittents.

SPECIFICATIONS:

RF & AF Signal Tracer, RF & AF Signal Injector, AC & DC Voltage Indicator 0/60/550/20,000 DC Polarity Indicator 60/550/20,000 volts, Lo ohms 0-5, Hi ohms 0-500k-20 meg-ohms, Tests Condensers, .00025-12 mfd., Tests Resistors 2 ohms-20 megohms, 2 Capacitance Sub ranges .01-1 & 4-40 mfd., 3 Resistance Sub ranges 50-500 ohms, 5k-25k, 100k-1 meg.

NEW CT-1

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Will allow you
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The Model CT-1 features a built-in electronic power supply providing BOTH AC and DC Test Voltages in a special circuit with highly sensitive NEON type leakage indicator. The CT-1 permits quick, accurate testing of condensers for leakage or shorts with actual DC voltage applied and readily indicates intermittent OPEN condensers with AC applied. Self-regulating power supply circuit provides tapered forming current to suit particular requirements of capacitor under test. Special circuit re-forms and polarizes electrolytic and tantalum capacitors under test. High sensitivity permits determination of condenser dielectric breakdown before leakage causes major shut-down.

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Sensitivity: Over 200 MEG OHMS

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DEALER SHOWCASE

continued from page 71

than 80dB of adjacent channel rejection. The unit features 12 channel operation, plus ESSA weather reception. Marine channels 6, 16, and 26 are installed by the factory. The 25w radio-telephone has provision for full remote control, including channel



changing. It employs a broadband FET front-end design which provides an average sensitivity of $0.35\mu\text{v}$ over the entire marine band. Airmarc Corp.

MOBILE TRANSCEIVER 709

Features five-stage
noise blanker

Designated as the SST, this 23 channel transceiver is said to feature a five-stage noise blanker, a PA function



having an audio output in excess of 7w, and ceramic filtering to provide selectivity of over 55dB. Utilizing a cascode front end, sensitivity is rated at $0.3\mu\text{v}$ for 10dB S+N/N. Price: \$169.95. Browning Laboratories, Inc.

CASSETTE RECORDER 710

Frequency response is rated
at 35Hz to 15kHz $\pm 2\text{dB}$

The Model 2516AV stereo cassette unit is an amplified deck with a headphone input on the top panel. It incorporates a heavy-duty biperipheral drive system which reportedly is noted for its low wow and flutter characteristic. Frequency response is rated at 35Hz to 15kHz $\pm 2\text{dB}$, wow and flutter less than 0.15% and signal-to-noise ratio greater than 46dB. It is equipped

with an end-of-tape shutoff mechanism which is designed to disengage the



pinch roller and heads from the cassette and revert automatically to the stop mode. The mechanism also senses a defective or stalled cassette. Suggested list price is \$239.95. 3M Co.

FM TRANSCEIVER 711

Features a built-in
tone burst encoder

The built-in tone burst encoder featured in the 2 meter FM transceiver Model RW-Bnd reportedly provides quick and easy access into tone activated repeaters. All tones are factory



preset to the more commonly used frequencies, but can be reset in the field following the instructions provided with the transceiver. A front panel power selector switch allows a choice of power output of 0.1w, 1.0w or 10w. The power requirement is 13.5v dc $\pm 10\%$ at 2.42a. The unit has 12 channel capability with a selector switch control. Ross and White Co.

STEREO CENTER 712

Combines a sensitive tuner
with a powerful amplifier

In a new compact stereo system the receiver combines a sensitive and selective FM and AM tuner with a powerful amplifier rated at 120w IHF (45w per channel, rms). The receiver's ceramic IF filters provide 60dB alternate channel selectivity on FM

and over 40dB adjacent channel selectivity on AM. The Model BC360 includes integrated circuits, field-effect transistors, and all-silicon solid-state design. In place of conventional knobs, it features push buttons for instant selection of inputs and outputs, tape monitor, loudness compensation, high and low filters, and FM muting. The speaker selector buttons give the owner a choice of four positions—local, remote, local and remote, and all speakers OFF for private listening with headphones. Linear slide levers provide control of volume, stereo balance, bass and treble. The slide controls adjust smoothly and afford the



additional advantage of easily visible settings. The compact's 4-speed BSR turntable has controls for anti-skate, cueing and pause, stylus pressure and a counter-balance adjustment. The turntable may also be set to automatically shut OFF the entire unit upon completion of the last record. Suggested list price is \$379.95. Bogen Communications Div./Lear Siegler, Inc.

AM/FM STEREO RECEIVER 713

Rated at 140 continuous RMS watts

Priced at \$499.00, the Model 2270 receiver is rated at 140w rms continuous (70w per channel) with both



channels driven into 8Ω and with less than 0.3% 1M or TH distortion for any combination of frequencies between 20Hz and 20kHz at full rated power. Superscope, Inc.

FOUR-CHANNEL PRE/POWER AMP 714

Achieves four-channel sound from two-channel sound sources

The QA-800 consists of four amplifiers plus quadralizer circuitry for the

creation of four-channel sound. It is capable of providing each of the different four-channel modes prevalent today, or can be used for conventional



two-channel stereo. The advantage of this unit reportedly is that it is able to achieve four-channel sound from two-channel sound sources through its quadralizer, supplying either matrix or phase-shift sound selected from a front panel switch. No additional amplifiers or synthesizers are needed. With click stop type TONE controls, it is possible to have precision settings. There are separate controls for both front and rear speakers when the unit is used in the quadraphonic stereo mode. The QA-800 has a master VOLUME control for adjusting the sound level of all four channels at the same time, but there are also four separate LEVEL controls, one for each channel. U.S. Pioneer Electronics Corp.

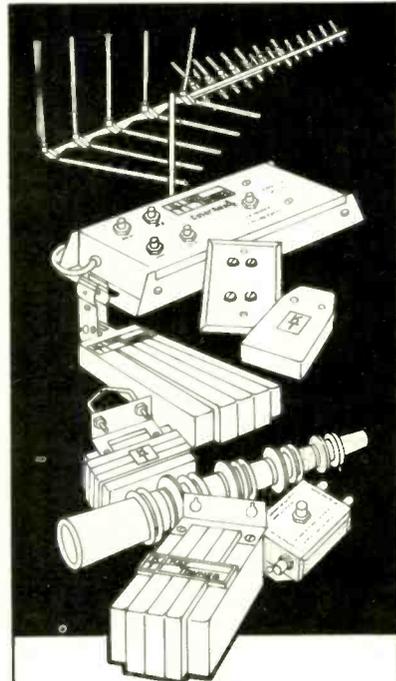
DICTATING UNIT 715

Operates on miniaturized cassettes

The Norelco 88 portable dictating unit operates on miniaturized cassettes slightly larger than a book of matches, providing up to 30 min dictation time.



Powered by a standard 9v battery, the unit weighs less than 20 oz. Its features include visual indexing, automatic sound LEVEL control and separate built-in microphone and speaker elements. Philips Business Systems Inc.



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



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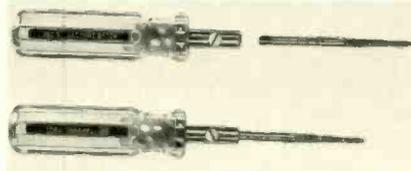
NEW PRODUCTS

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

TAPPING TOOL 716

Can be used to form new threads

A 3-in-1 Tapping Tool has two interchangeable bits. Each blade has three tap sizes—one has 10-24, 8-32 and 6-32 taps, the other has 10-32, 8-32, and 6-32. Sizes are stamped on the blade. It is claimed that this tool can be used to form new threads or



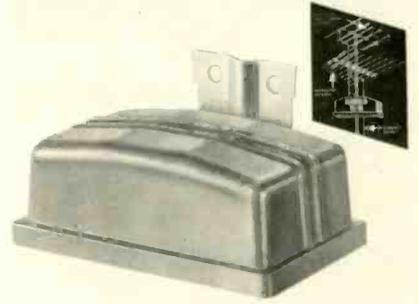
reform burred threads in metal up to 3/16 in. thick. The blade is reportedly made of special high carbon steel to prevent snap-off. Also, for faster, accurate threading, each tap has a specially designed lead thread. Overall length of the tool is 7 in., weight 3 oz. Holub Industries, Inc.

weathering and corrosive atmospheres. It also resists rot and is repellent to rodents. It is highly flexible and can be bent and wrapped around corners. The 25-year warranty protects the user from deterioration and decay caused by weathering and industrial atmospheres, and against defects in materials and workmanship. Channel Master.

COUPLER 718

Effective in eliminating reflective or ghost signals

The Yagi model coupler is useful in areas where channels are broadcast from different directions. Used with directional antennas, it is effective in eliminating reflected or ghost TV signals. In many cases, the coupler is said to eliminate the need for an antenna rotator. Multiple single-channel an-



tennas can be combined into a single downlead to the TV set with the Yagi coupler. It can also be used to combine a single channel antenna with a broadband antenna. This coupler provides two paths for TV signals. One path passes a specific TV channel with a minimum of loss (typically 2.0dB), but attenuates all other channels severely (about 20dB). The other path attenuates the channel to which it is tuned by about 10dB, passing all other channels with only about 1dB attenuation. The coupler is encased in a weatherproof housing and is complete with straps and thumbscrews for easy mast mounting. Jerrold Electronics Corp.

GOLD VINYL ROTOR WIRE 717

Designed to conduct current for even heavy rotors

The gold vinyl rotor wire reportedly provides installation durability to the extent that the firm is guaranteeing it for a full 25 years. The wire, protected from deterioration by a tough, gold vinyl jacket, is designed to



drive the heaviest rotors with ease, even when the rotor must be located some distance from the TV receiver. The wire uses pure copper, 20 gauge conductors and has an extra wide reference conductor, imprinted for rapid identification. The vinyl jacket reportedly provides a tough, long-lasting shield from ultra-violet rays, wind,

CONNECTOR KIT 719

Designed to help simplify modular-circuit maintenance

Many of today's modularly designed TV sets and audio systems contain po-

Now in a mobile unit... DRC*

*DUAL RECEIVE CAPABILITY



New Messenger 323-M

Hottest CB idea since 23-channel operation! DRC lets operator work one channel while automatically monitoring another. 2 monitor channels are switch selectable. Indicator light flashes when call is received on monitored channel. Mode switch selects indicator light only or automatic switching to monitor channel audio. Separate squelch circuits, too.

You're going to hear more from...



JOHNSON
Waseca, Minnesota 56093

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

larized nylon connectors. In the event that any of these connectors become defective and require replacement, a kit has been developed to simplify the repair of this modern circuitry. Available from electronic distributors across the country, it has been designed to eliminate searching for proper nylon connectors or tools, reportedly containing everything needed to

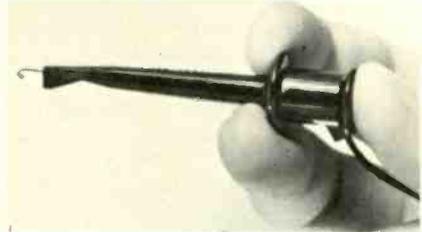


make male and female nylon connector housings, from single- to multi-circuit types. The kit is also said to include a prototype hand crimping tool and a special terminal ejector tool. Waldom/Molex products, Molex Products Co.

MINI-TEST CLIP 720

Spring loaded contact hook

The test clip features a spring loaded contact hook which can be quickly and positively connected to component leads or terminals. The plunger type action led to its nickname "The



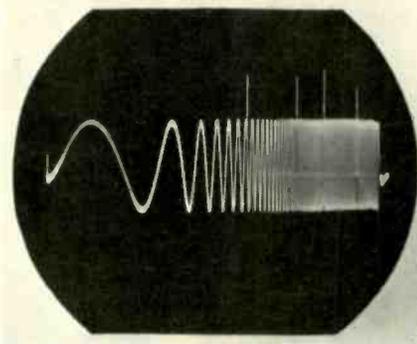
Grabber." The design specifications indicate the probe tip slips down over any 0.025-sq.-in. wire-wrap pin, making positive contact. The molded nylon probe is completely insulated to the point of connection. Pomona Electronics Co., Inc.

TEST TAPE 721

Offers instantaneous method of checking frequency response

The No. 113T eight-track cartridge test tape offers an instantaneous method of checking frequency response on all types of stereophonic equipment.

This tape is designed with all necessary correction factors included in it, therefore, no charts or graphs are needed for instant response measurement. Reportedly all that is needed is a scope and a sweep-frequency tape for instantaneous response measurements. Only a few quick adjustments

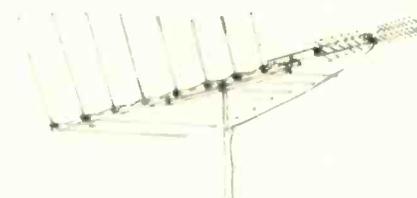


on the equalizer circuits, and the job is done. The audio range of the unit is from 60Hz to 15KHz with marker pulses at 1, 3, 5, 10 and 15KHz. Pacific Transducer Corp.

OUTDOOR TV ANTENNA 722

Designed for stronger signal pick-up and transfer

The Colorfinder model VHF-UHF-FM outdoor color-TV antenna reportedly features a space-age, super-swept V elements system for stronger



signal pick-up and superior transfer; heavy-duty square double booms for increased strength and rigidity; a bonded gold acrylic finish that resists weather, rust and corrosion; multi-driven elements; low silhouette cradle mount for superior wind resistance; and UHF drive for stronger UHF channel performance. Gavin Electronics, Div. of Antennacraft.

TRANSISTOR CURVE TRACER 723

Checks transistors in and out-of-circuit

The Model 101 transistor curve tracer is an instrument reportedly functionally designed for rapid troubleshooting of transistors both in and out-of-circuit. This unit is expressly intended for use in radio/TV repair, transistor theory instruction, labora-

continued on next page

ARROW AUTOMATIC STAPLE GUNS

CUT WIRE & CABLE INSTALLATION COSTS

... without cutting into insulation!

SAFE! Grooved Guide positions wire for proper staple envelopment! Grooved Driving Blade stops staple at right depth of penetration to prevent cutting into wire or cable insulation!

No. T-18—Fits wires up to 3/16" in diameter.

BELL, TELEPHONE, THERMOSTAT, INTERCOM, BURGLAR ALARM and other low voltage wiring.

Uses T-18 staples with 3/16" round crown in 3/8" leg length only.

No. T-25—Fits wires up to 1/4" in diameter.

Same basic construction and fastens same wires as No. T-18.

Also used for RADIANT HEAT WIRE

Uses T-25 staples with 1/4" round crown in 9/32", 3/8", 7/16" and 9/16" leg lengths.

T-18 and T-25 staples also available in Monel and with beige, brown and ivory finish at extra cost.

No. T-75—Fits wires and cables up to 1/2" in diameter.

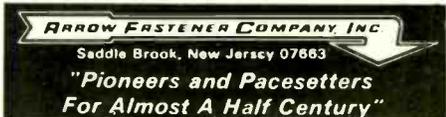
RADIANT HEAT CABLE, UF CABLE, WIRE CONDUIT COPPER TUBING or any non-metallic sheathed cable.

Also used as DRIVE RINGS in stringing wires.

Uses T-75 staples with 1/2" flat crown in 9/16", 5/8" and 7/8" leg lengths.

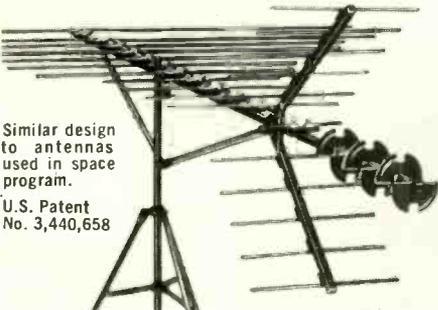
Arrow Automatic Staple Guns save 70% in time and effort on every type of wire or cable fastening job. Arrow staples are specially designed with divergent-pointed legs for easier driving and rosin-coated for greater holding power! All-steel construction and high-carbon hardened steel working parts are your assurance of maximum long-life service and trouble-free performance.

Ask your Electrical Supply Dealer or write for further details.



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"STAR-TRACK"™ the most Advanced Space-Age VHF/UHF/FM Color Antennas ever introduced!



Similar design to antennas used in space program.
U.S. Patent No. 3,440,658

- Corner Reflector Driven Disc Director Array for total UHF coverage!
- Multiple Tuned, Cut-to-Channel VHF Elements for total VHF and FM coverage!
- Maximum construction for long installation life!
- Exclusive Reynolds Aluminum COLORWELD durable baked enamel Gold finish!
- Includes RMS SP-332 VHF/UHF Splitter for economical single down-lead installation!

Model	RANGE OF RECEPTION	
	VHF	UHF
SK-716	Up to 50 miles	Up to 50 miles
SK-1117	Up to 125 miles	Up to 75 miles
SK-1519	Up to 150 miles	Up to 100 miles
SK-13	—	Up to 25 miles
SK-15	—	Up to 50 miles
SK-19	—	Up to 100 miles

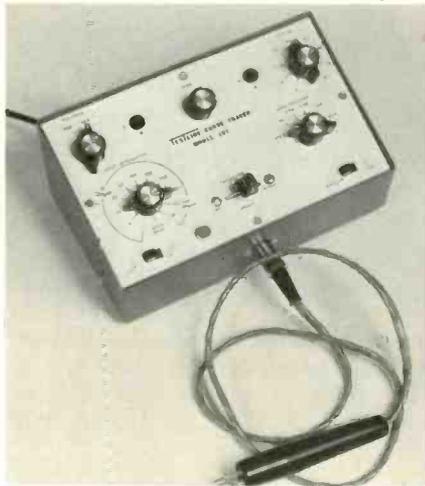
Write for Catalog Profit Details!—
RMS ELECTRONICS, INC.
50 Antin Place, Bronx, N.Y. 10462
Tel. (212) 892-6700

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

NEW PRODUCTS...

continued from page 75

tory, quality control and circuit design. The Model 101 has a 1% current sampling resistor and a 5% input attenuator network. It has a 1/16-in. welded steel chassis and a fiberglass



circuit board. This instrument checks both bi-polar and field effect transistors and is designed to operate in conjunction with any general purpose scope to display a six-line family of curves. It has two sockets for testing and matching transistors out-of-circuit and two types of probes for in-circuit testing. Price is \$150.00 including both probes. Testline Instruments.

bubble pack card and designated as Stock No. 70135. List price is \$2.95. Vaco Products Co.

725

TUNER CLEANER/LUBRICANT

Compound blended of methyl alkyl silicones and transport fluids

A blended compound of methyl alkyl silicones and transport fluids are formulated for polishing and lubricating tuner contacts. It reportedly provides continuous cleaning for both color- and B/W-TV tuners. The TV tuner cleaner/lubricant is said to be safe for all plastics, driftless, non-flammable, will not evaporate or run, and resists temperature extremes. The contacts are both paintable and solderable after normal cleanup. Available in an 8 oz aerosol can, it has an extension spray nozzle that is flexible and can be easily directed to contacts. General Electric Co.



TOOL BAG CABINET COMBINATION

726

Padding provides all-weather protection for cabinet

The bag is made of black vinyl, reinforced with padding on all sides to provide all-weather protection for the metal cabinet and its contents. The front cover has a layer of foam rubber to cushion the drawers, and when open serves as a placemat for delicate



instruments and tools. In the upper part of the bag, above the cabinet, is a storage section to hold larger tools, instruments, etc. Brass hardware, for a tight enclosure, completes the kit. RAACO Corp.

HEX DRIVE SOCKET TOOL 724

One tool performs the jobs of five regular style nut drivers

A nut setting tool with interchangeable socket heads has sockets that snap on, snap off from the hex shaped driving shaft, and extra sockets that are stored in handle when not in use. This permits one tool to perform the



jobs of 5 regular style nut drivers. Included with the hex drive socket tool are 1/4-in., 5/16-in., 3/8-in., 7/16-in. and 1/2-in. hex sockets, plus a 1/4-in. hex offset wrench for turning sockets in cramped or confined quarters. Tool and components are mounted on a

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LETTERS...

continued from page 28

ther did I, but I have attended many service meetings and some factory training sessions.

I do not imply that I am the best. I do my best and I expect my customers to receive a fair return for money paid me. I do, however, want my customers to know that I have reasonable knowledge and experience.

Some of my customers were glad to know that at age 61 I was able to pass the CET examination, and have been able to keep abreast of advancements in my field. Good books and trade magazines have been of considerable assistance.

That man's letter tells me that some of his customers are asking questions and that he is beginning to doubt his ability. In plain language, he has been too busy trying to fix sets to continue proper study and now he has fears that he may need to apply for a license of some kind.

He is a young man and should take a different attitude—his customers deserve it.

I suggest that any service man with three or more years of experience get off . . . and qualify instead of making excuses. The CET examination and certification can be a good step, it is not that difficult.

SAM DAVIES, CET
MEMBER OF ISCET

Doesn't Pay Taxes

I've got a gripe that needs correcting.

Admiral Corp. TV will not give TV technicians a serviceman's price unless they have a tax number.

Many TV men don't have tax numbers as they mean a lot of extra bookkeeping and red tape. Also you must post a bond to get one (in . . . anyway). I prefer paying the tax on the part or unit at the time of purchase, thus saving bookkeeping, filing reports, etc.

I now must order through a sub-dealer at a probable increase in price.

Please do something about this before all TV outfits start the same practice.

We decided that we had better withhold the writer's name.

The state law requires that a sales tax be paid on all retail sales. I can't say for your state, but in Minnesota they are beginning to track down electronic technicians not abiding by that law. To pay the tax on wholesale prices denies the state a tax on the markup in price—therefore your activity is illegal.

We suggest that you begin filing sales tax reports. We know the extra bookkeeping required—our managing editor does TV repair work at night and he must file reports with both the state and city.

Admiral is merely protecting you by preventing retail customers from getting the lower prices that you can get as a law-abiding businessman. Ed.

Faces Same Problem

I have just finished reading Tony Cizerle's letter, "Technicians Must Eat Too." He has described exactly the conditions that I am working under at the present time, four men having quit within the past six months because of the pay situation.

The owners in this area have everything under their thumbs. They have gotten to the point where service is based strictly on quantity and not quality. The pressure on the technicians is tremendous.

Our shop is a member of the IESA, and I have heard the owners comment that the only reason that they joined was to keep the association off their backs, and to be able to use the association as a reference when people question our honesty and quality.

I could go on and on, but I thought

you might be happy to know that other technicians feel the same way you do, Tony. If only there were some way to organize the technicians so that they could stand up and demand their equal share.

I have talked to several technicians and most of them are afraid that they will lose what they have. I am 40 and have responsibilities, and it is these responsibilities which keep us where we are.

Name withheld upon request

Enjoys Old Radios

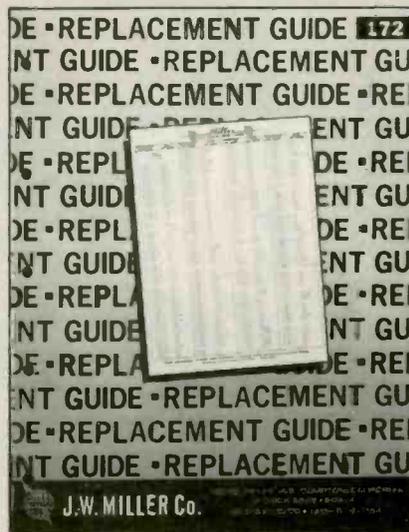
In the October 1971 Readers' Aid Column, Mr. Tucker requested information concerning his Model 32 Atwater Kent Radio.

I hope he gets it, and if he does, maybe you'll publish his letter and tell me where he got it.

I have two years' worth of addresses of people who are said to be able to answer problems of this type. So far most letters are neither answered nor returned.

I am trying to rebuild a model 447, and it's hard to do after the water, bugs and mold have all had their go at it.

PETER MANN



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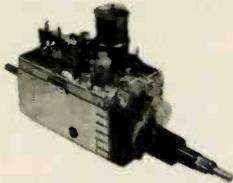
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TECHNICAL LITERATURE

Test Instrument Catalog

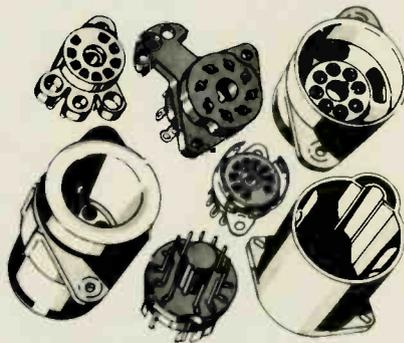
A 1972 catalog, "Precision Test Instruments for the Professional Technician," contains specifications and prices for sweep-marker generators, scopes, color-bar generators and other test instruments. Lectrotech, Inc., 4529 N. Kedzie Ave., Chicago, Ill. 60625.

Nutdriver Bulletin

Bulletin/price list 671L describes a series of magnetic nutdrivers which are said to eliminate lost motion and fumbling when driving hex screws and bolts or starting nuts in close quarters and hard-to-reach places. Specifications show that the magnetic drivers are available with 1/4 and 5/16-in. hex socket openings and in midjet pocket clip, regular, extra long and super long fixed handle styles, as well as interchangeable shanks. Xcelite Inc., Orchard Park, N.Y. 14127.

Components Catalog

Catalog No. 100 is a new 1972 catalog of replacement components for radio and TV. It contains 68 pages of resistors, fusing devices, circuit break-



ers, sockets, convergence controls, service accessories, electronic chemicals, audio cables, adapters for hi-fi and cassette type recorders, battery holders and proto-type kit components. The catalog also includes 4 pages in full color to illustrate Amp fuses, Sans-a-fuse and special promotional packages. Workman Electronic Products, Inc., Box 3828, Sarasota, Fla. 33578.

Test Instrument Brochure

A full-color, 4-page brochure, 1971A, describes the product line of

Digilin, Inc., as well as a list of its sales representatives throughout the country. New additions to the product line include the Type 2330 series digital panel meters and the Type 2370 limit set comparator. Digilin, Inc., 1007 Air Way, Glendale, Calif. 91201.

Instrument Folder

The presentation folder, PF-45, describes a line of snap-around volt-ohmmeters, master electrical kits, multi-testers and accessories for the electrical and climate fields. A. W. Sperry Instruments Inc., 245 Marcus Blvd., Hauppauge, N.Y. 11787.

Stylus Maintenance

On a single page the importance of proper cleaning of a stylus is explained. The product featured is Micro stylus cleaner, Duotone Company, 6875 Southwest 81st St., South Miami, Fla. 33143.

Brochure

A 4-page brochure illustrating new transformers, plugs, antennas and fuses is now available from Workman Electronic Products, Inc., Box 3828, Sarasota, Fla. 33578.

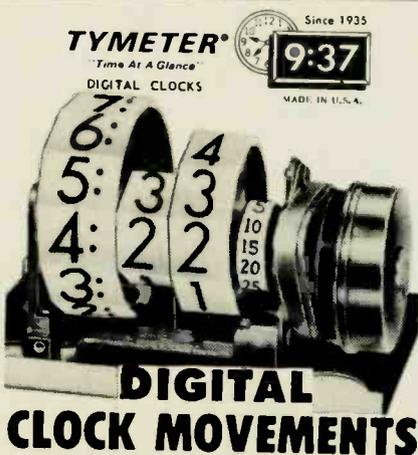
TEKLAB ...

continued from page 44
removed from the volume circuit. The VOLUME control is now shunted by a larger resistor and the volume is increased.

The third time the volume function of the transmitter is activated, both transistors Q9 and Q10 are conducting and the indicator lamp (PL1) lights the brightest through parallel electrical circuits consisting of transistors Q9 and Q10, forward biased diodes D5 and D6, and the 120Ω and 300Ω resistors.

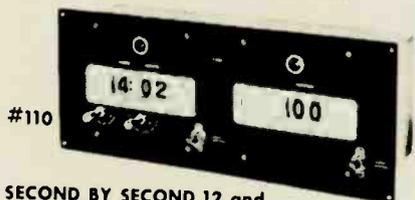
Under these conditions, FETs Q11 and Q12 are not conducting, in effect removing both resistors (R35 and R36) from the VOLUME control circuit, and resulting in high volume level.

When the VOLUME function button is pressed again (a fourth time), the lamp control transistors (Q9 and Q10) are turned OFF and the indicator lamp is not lit. Both FET's Q11 and Q12 then conduct, setting the volume at minimum for the next sequence.



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ON/OFF Function

PNP transistor Q8 is a relay driver for the ON/OFF function and relay winding RE2 is its collector load, the emitter being connected directly to B+. The base is coupled through an RC time constant (resistors R37 and R38, and capacitor C10) to the indicator lamp and its 1K shunt resistor (R39). When transistor Q9, Q10 or both conduct and reduce the positive voltage at the base of transistor Q8 (ON/OFF relay driver), this transistor (Q8) becomes forward biased. Current then flows through relay winding RE2, closing its contacts. By closing the relay contacts, the circuit is completed between the 120v ac power source and the color-TV receiver voltage doubler input, and the TV set is turned ON.

The RC time constant in the base circuit of transistor Q8 allows a time lapse of 6 sec before the TV receiver is turned OFF by the absence of a voltage drop through either transistor Q8 or Q10. This allows passing from a high volume level through the OFF position and back to ON with a low VOLUME level without interruption.

Conclusion

This simplified remote control system accomplishes the following functions: It turns the TV receiver ON or OFF, varies the VOLUME level in three steps, with a corresponding visual indication, and changes channels. From a servicing standpoint, we felt that the remote system has been simplified by having most of the circuits on a single plug-in panel, which can be changed in the home. ■



"SHE FOLLOWED MY CAR HOME, DEAR—CAN I KEEP HER?"

BOOK REVIEWS

REPAIRING TRANSISTOR RADIOS by Sol Libes, published by Hayden Book Co., 192 pages, paperback \$4.65.

The first portion of this book is devoted to electron theory as related to semiconductor design. Such theory then progresses to basic transistor circuits and related transistor characteristic curves.

These fundamentals are applied to basic transformer-coupled circuits, RC coupled circuits, direct coupled circuits, gain controls, and tone controls. This is followed by a servicing chart for audio driver and preamplifier stages.

The next major segment of the book deals with power amplifiers—their basic design and servicing techniques. The same procedure is used in covering IF and RF amplifiers; oscillators, converters and mixers; and AM and FM detector and AGC circuits.

The remaining chapters in this book include typical portable radio receiver circuits and automobile transistor radios, plus additional servicing tips.

This book should be of value to any electronic technician who has not yet developed much experience in servicing basic transceiver radios.

UNDERSTANDING IC OPERATIONAL AMPLIFIERS by Roger Melen and Harry Garland, published by Howard W. Sams, 128 pages, paperback \$3.95.

Beginning with a description of the ideal operational amplifier, the book then goes into basic semiconductor theory and the resulting fabrication of integrated circuits. The authors then deal with such fundamentals as constant-voltage reference sources; differential amplifiers with grounded inputs, common-mode input, differential-mode input; constant-current sources; and a typical level-shifter circuit. These basic circuits are then shown incorporated in a complementary output stage and simple operational-amplifier circuits. And from there the book goes on to describe the external circuitry used with IC OP amplifiers, and the resulting signal conditions. The book also includes typical OP-amplifier specification sheets in its appendix, and a glossary of many of the more common terms.

We feel that this book is of value to electronic technicians who wish to prepare themselves for new IC applications that they are encountering.

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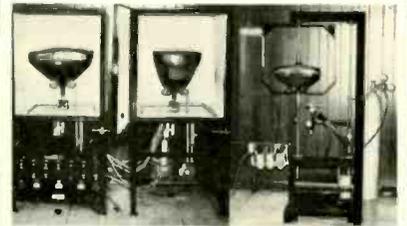
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The Tuner People



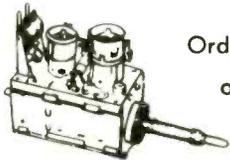
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19GLP22	490ADB22	490JB22A
19GSP22	490AEB22	490KB22
19GVP22	490AFB22	490KB22A
19GVP22/	490AGB22	490LB22
19EXP22	490AHB22	490MB22
19GWP22	490AHB22A	490NB22
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21AXP22	21FKP22
21AXP22A	21GUP22
21AXP22A/	21GUP22/
21AXP22	21FBP22A
21CYP22	21GVP22
21CYP22A	21GVP22/
21FBP22	21FJP22A
21FBP22A	21GXP22
21FBP22A/	21GYP22
21GUP22	21GZP22
21FJP22	21HAP22
21FJP22A	

Replaces 75 25" types

23EGP22	25ABP22	25BP22A/
23EGP22A	25ADP22	25YP22
23VABP22	25AEP22	25BRP22
23VACP22	25AFP22	25BSP22
23VADP22	25AGP22	25BVP22
23VAHP22	25AJP22	25BWP22
23VALP22	25ANP22	25BXP22
23VAMP22	25AP22	25BZP22
23VANP22	25AP22A	25CBP22
23VAQP22	25AP22A/	25CP22
23VARP22	25XP22	25CP22A
23VASP22	25AQP22	25FP22
23VATP22	25ASP22	25FP22A
23VAUP22	25AWP22	25GP22
23VAWP22	25AXP22	25GP22A
23VAXP22	25AZP22	25RP22
23VAYP22	25BAP22	25SP22
23VAZP22	25BCP22	25VP22
23VBAP22	25BDP22	25WP22
23VBGP22	25BFP22	25XP22
23VBDP22	25BGP22	25XP22/
23VBEP22	25BHP22	25AP22A
23VBGP22	25BJP22	25YP22
23VBHP22	25BMP22	25YP22/
23VBJP22	25BP22	25BP22A
23VBRP22	25BP22A	25ZP22
23VBTP22		

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