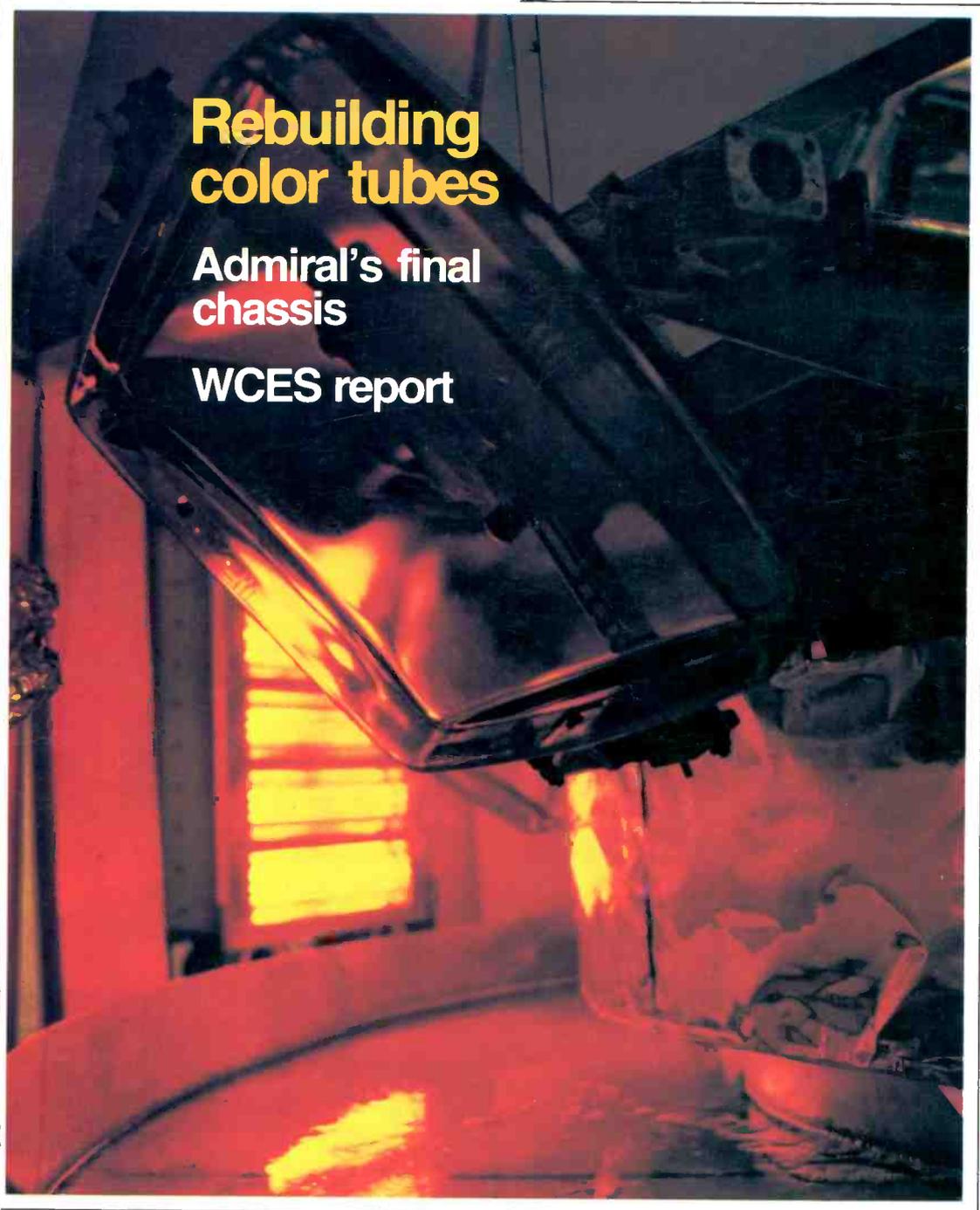


ET/D

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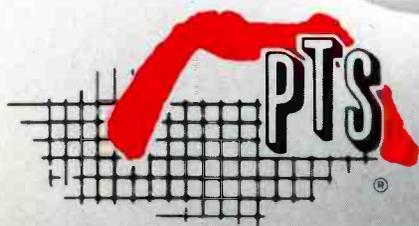
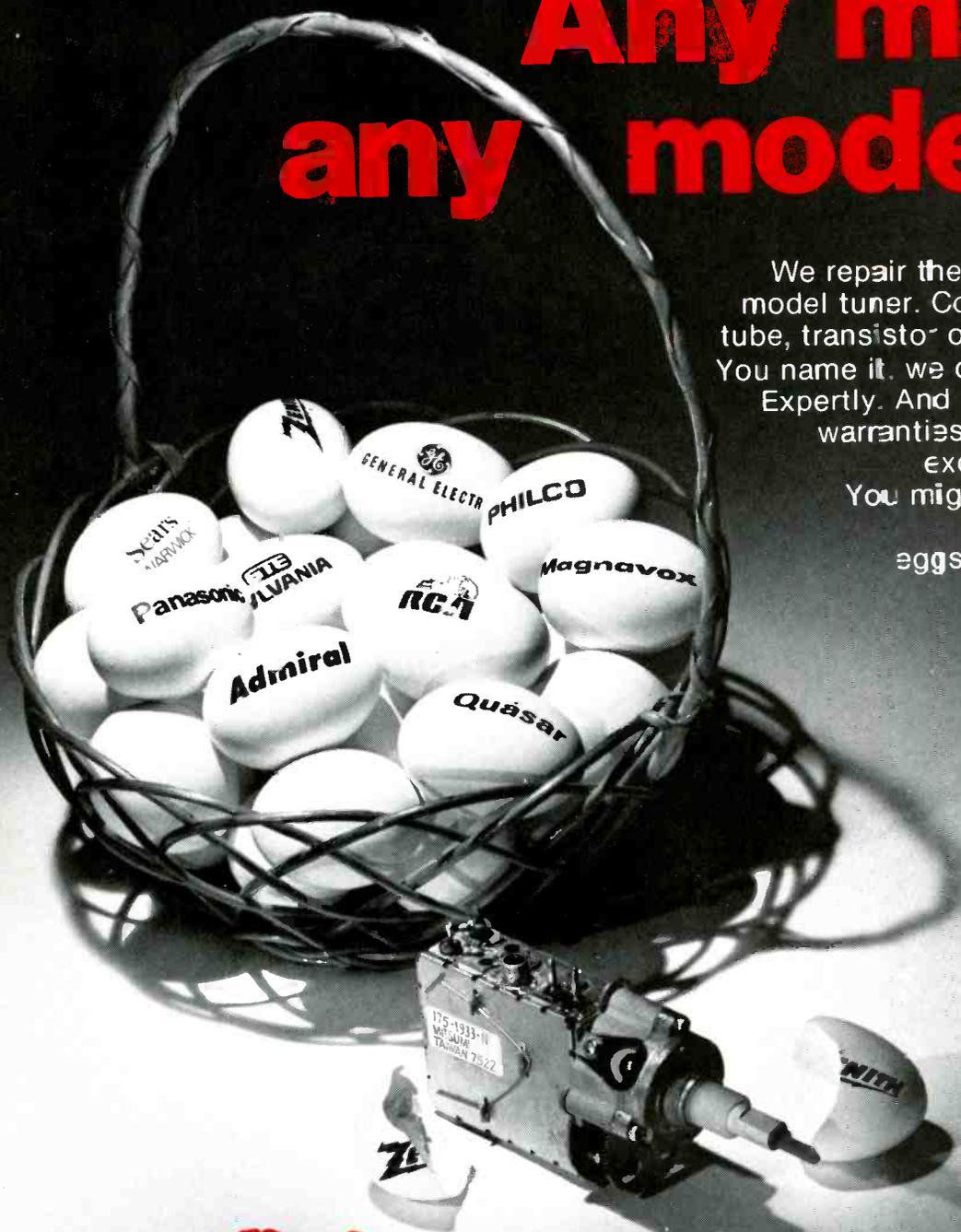
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INDUSTRY REPORT



Menegus Cited

ET/D's Senior Publisher Al Menegus is congratulated by HBJ Publication's President Richard Moeller (left) on being named a Fellow of the Radio Club of America. The inscription reads: "In recognition of your contribution to the Electronics and Communications Industry over the past 31 years as Editor and Publisher of major technical and trade publications."

Joint Microprocessor Course Held

The Maricopa Chapter of the Arizona State Electronics Association and Arizona Tech, a technical trade school in Phoenix, joined together to offer a special microprocessor course for professional electronics technicians.

According to ASEA's *Scanner*, the course was valued at \$450 per student, but through cooperative efforts was offered for only \$80. It was comprised of a special digital/microprocessor training program especially designed for shopowners, managers and electronic technicians. It consisted of 10, four-hour evening sessions at the school.

Final EIA Figures Released

The final sales figures on television's second biggest year ever have been released by the Electronic Industries Association. However, similar figures released in relation to the radio industry showed overall declines in sales.

In regard to television, the EIA statistics showed sales of both monochrome and color sets to dealers during 1978 totaled 16,300,723, a 10.4 per cent increase over the 14,771,017 units sold the previous year.

Color TV's greatest year to date sported an overall increase of 12.4 per cent in sales to dealers, from 9,106,826 in 1977 to 10,236,319 last year. Meanwhile, the sale of black and white sets

also showed a healthy increase of 7.1 per cent over 1977. Final figures there amounted to 6,064,404 in 1978 compared with 5,664,191 the previous year.

The EIA figures also indicated a less attractive picture for the radio industry in terms of the total number of units sold. According to EIA, every category of radio, i.e., AM, AM-FM, FM and auto sound, showed declines during 1978.

The total number of radio units sold last year was 45,146,245, down a hefty 17.5 per cent from the 54,694,701 units sold in 1977, EIA said.

Meanwhile, VTR sales finished the year at 401,930.

Electro Exhibition Expects 30,000

Electro '79, the annual high technology convention and show sponsored by the eastern chapters of the Institute of Electrical and Electronic Engineers and the Electronic Representatives Association, will be held April 24-26 in New York City.

Headquarters for the displays will be the Coliseum with the Americana Hotel serving as host to special seminars. According to sponsors of the show some 30,000 design engineers, managers, technicians and technical executives are expected to attend the three-day event.

The professional program will cover technical sessions on communications satellites, memory, fiber-optics, energy management, large scale integration, computer imagery and microprocessors.

"Magnavision" Introduced

Magnavox has finally introduced its long awaited video disc player and announced it plans a major marketing effort for the laser beam playback system during 1979.

Called "Magnavision," the first 25 units placed on sale in Atlanta late last year were snapped up immediately by the lucky among the thousands of potential buyers who attempted to purchase one of the initial players.

Magnavox reports the first units are selling for a suggested retail price of \$695 with MCA produced platters available at \$5.95 and \$15.95 for half hour and two hour programs respectively.

Magnavision is a compact video player unit about the same size as a phonograph turntable which is attached to any television receiver through its antenna input. Pictures appear on the screen with better quality than even a cable hook-up can provide, Magnavox tells us.

Additionally, according to Magnavox, audio fidelity can be improved over the TV's sound system by attaching the player to a stereo system. The player uses a tiny laser light beam to relay signals from the disc to the TV receiver or stereo system. In the extended play



PTS ELECTRONICS, INC.

Circle No. 102 on Reader Inquiry Card

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On the cover: Virtually unknown 25 years ago, the color picture tube industry has grown into a major manufacturing enterprise in this country. This month ET/D looks at one facet of that industry, the rebuilding of color CRTs. (Cover photo courtesy of GTE Sylvania's Electronic Components Group).

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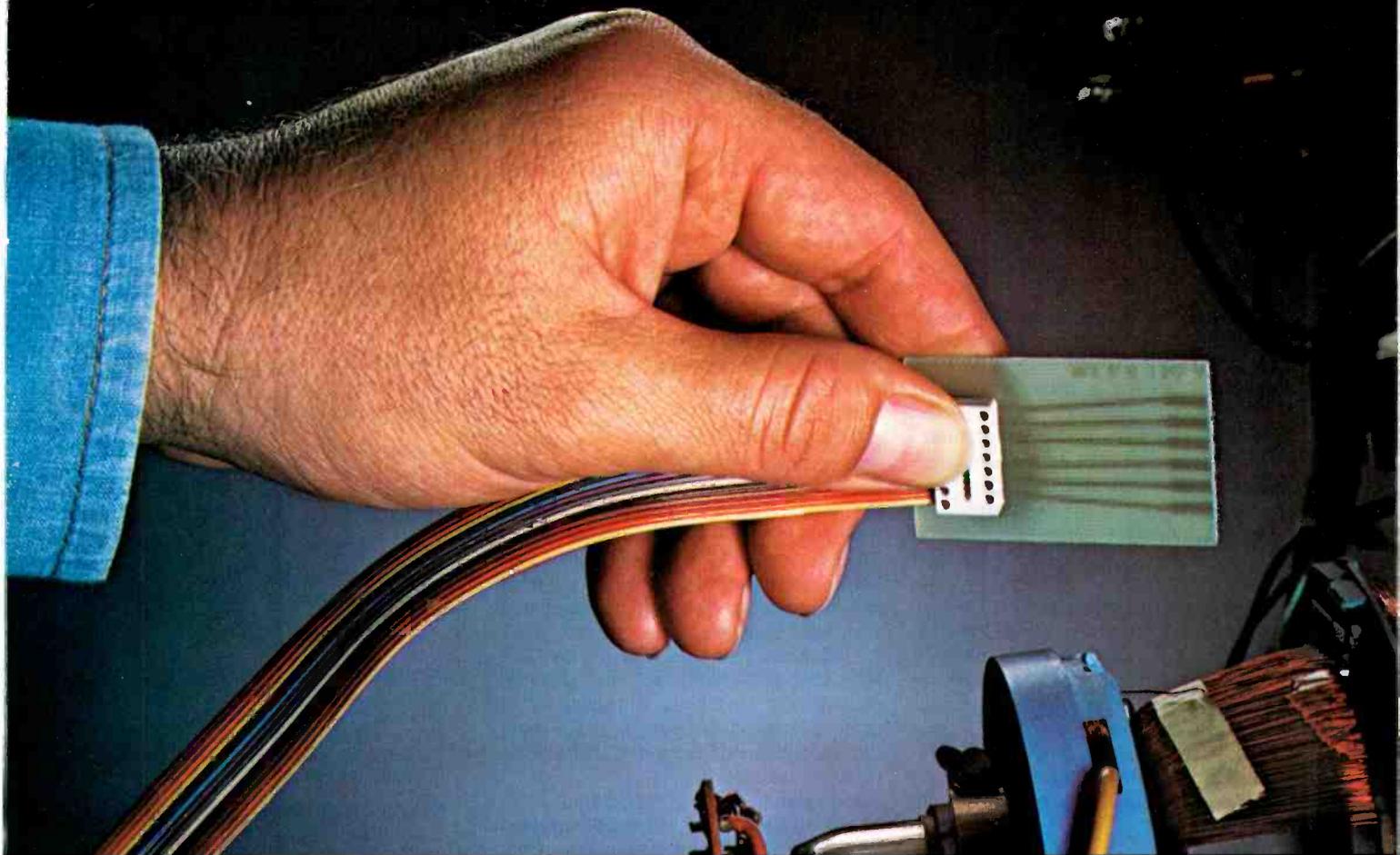


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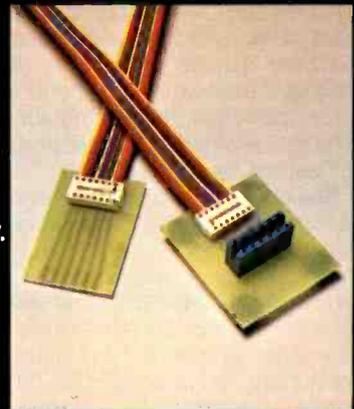


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mode, the videodisc will play up to 60 minutes per side for a total of two hours. In the standard play mode, the system will play up to 30 minutes per side for a total playing time of one hour.

Toshiba Opens Tennessee Color TV Plant

Toshiba has begun production of 13 and 19 inch color television receivers at its brand new production facility at Lebanon, Tenn.

The word is that Toshiba plans to become the first Japanese manufacturer to supply 100 per cent of its U.S. market requirements via U.S. produced receivers. While most components in the U.S. produced sets are Japanese manufactured, that too should change to a large degree, according to a company spokesman.

Picture tubes for the U.S. produced sets are now being supplied by RCA.

Statistic of the Month

The Federal Communications Commission imposes regulations on the nation's radio and television stations which require 30 million man-hours of paper work to fulfill.

That's according to a speech by National Association of Broadcasters' President Vincent Wasilewski made recently in California.

Sencore Appoints Brockway

Sencore has announced the appointment of Rich Brockway as head of its customer service division. In his new position Brockway will respond to individual customer and distributor questions concerning the application and use of Sencore test equipment.

Previously, Brockway served as Sencore's technical representative in Pennsylvania.

GI Buys Monsanto's LED Division

General Instrument Corporation and Monsanto Company have announced agreement "in principle" for GI's purchase of Monsanto's worldwide optoelectronics business.

Terms of the tentative agreement were not revealed.

According to a statement from General Instruments, Monsanto is a major manufacturer of LEDs, numeric and alpha-numeric displays, opto-isolator, opto-switches, gallium arsenide/gallium phosphide-based materials and dice.

General Instrument manufactures and supplies electronic systems and components, including on-line wagering and electronic point-of-sale systems, cable TV products, ICs and discrete semiconductors and digital electronic tuning systems for television sets.

RCA Enters Video Disc Race

RCA has announced plans to go ahead with its long delayed videodisc project and says it will be marketing a grooved disc, diamond stylus system that will sell for no more than \$400 by 1981.

In a move to become the second marketer of videodisc in the United States, the RCA announcement comes on the heels of the rapid success scored by Magnavox with the introduction late last year of its Magnavision system in Atlanta. Incidentally, Magnavox has now selected Seattle-Tacoma as the second test market for its newest video product.

In announcing RCA's entry into the potentially lucrative videodisc market, President Edgar Griffiths said market research indicates that the video disc will become a "multi-billion dollar business in the 1980s."

The decision to move into the videodisc picture rested on three objectives, Griffiths said. They were: development of a player that could be sold at retail for less than \$400; development of an uncoated disc that contained one-hour of programming per side, or a total of two hours per disc; and availability of adequate software.

"We have now met those goals; the videodisc provides us with the greatest opportunity since the introduction of color television to bring a major new consumer product to the American people," he said.

Underscoring the importance with which RCA views the videodisc's potential is the fact that a whole new unit, Selctavision Videodisc Operation, has been set up. It will be completely separate from RCA's Consumer Electronics Division.

There has been no decision yet on whether to make the units at the Indianapolis plant where discs are manufactured or at the television plant in Bloomington, Ind. **ET/D**

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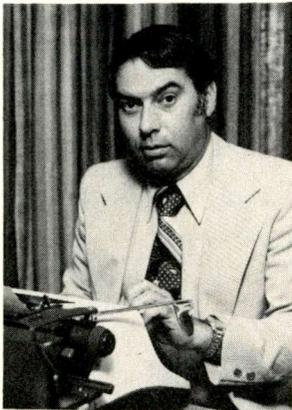
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ET/D - March 1979 / 5

FROM THE EDITOR'S DESK



Does your shop handle stereo servicing? For many reasons, some valid, some not so valid, we all know that many times the world of television service is virtually isolated from that of stereo service.

I realize the two are not entirely incompatible, but you and I both know that most shops which service primarily TV generally handle only smaller ticket stereo items and, on a limited basis only. Conversely, stereo sales and service shops usually shy away from TV service.

Is this a logical approach? Unfortunately at this point in time, perhaps. Yet, before you continue on with business as usual, you'd better take a look around to see what is going on out there in the consumer electronics marketplace.

For one thing, you might consider the possibility of being *forced* into stereo servicing, like it or not. Why? Well, we already know that "stereo TVs" are being made for test markets in Japan (Tokyo and Osaka) where stations are broadcasting stereo sound.

One industry publication, *Television Digest*, reports: "Stereo TVs include everything from large screen color consoles to mini-combo small screen black and white sets with stereo FM-AM, cassette and TV sound."

Additionally, we are told that most major television receiver manufacturers are enthusiastic about the prospects of stereo television sound in this country.

Of course, the drawback to the whole scheme, as you well know, is the broadcasters themselves. Until they broadcast it, we can all forget about it. Yet there seems to be little standing in the industry's way should it decide that stereo sound for TV is the coming thing.

The point of this whole discourse, if you haven't already guessed it, is: If you service business is not already into the stereo servicing market, you probably should be. Because as I just mentioned, at the whim of the broadcasters and with the blessing of the politically astute FCC, you could be—and virtually overnight.

Obviously, if you plan to stay in the television service business, you will have to service everything inside the TVs which are brought into your shop, whether it be a plain FM-only sound strip; a microprocessor controlled tuning system; a programmable set controller; or stereo sound.

Already the manufacturers of at least two television sets marketed in this country are emphasizing "TV sound" to a limited degree at least. There is Quasar, which introduced its "Audio Spectrum Sound" system in 1977 (see ET/D, Feb., 1978, p.20) and Tatung, which has done everything to ring the last drop of fidelity out of the sound that is broadcast over TV channels in the U.S.

So, without going any further, I think it would be wise to ask yourself the question: "If I'm not in the stereo service business, should I be?"

Sincerely,

Richard M. Lay

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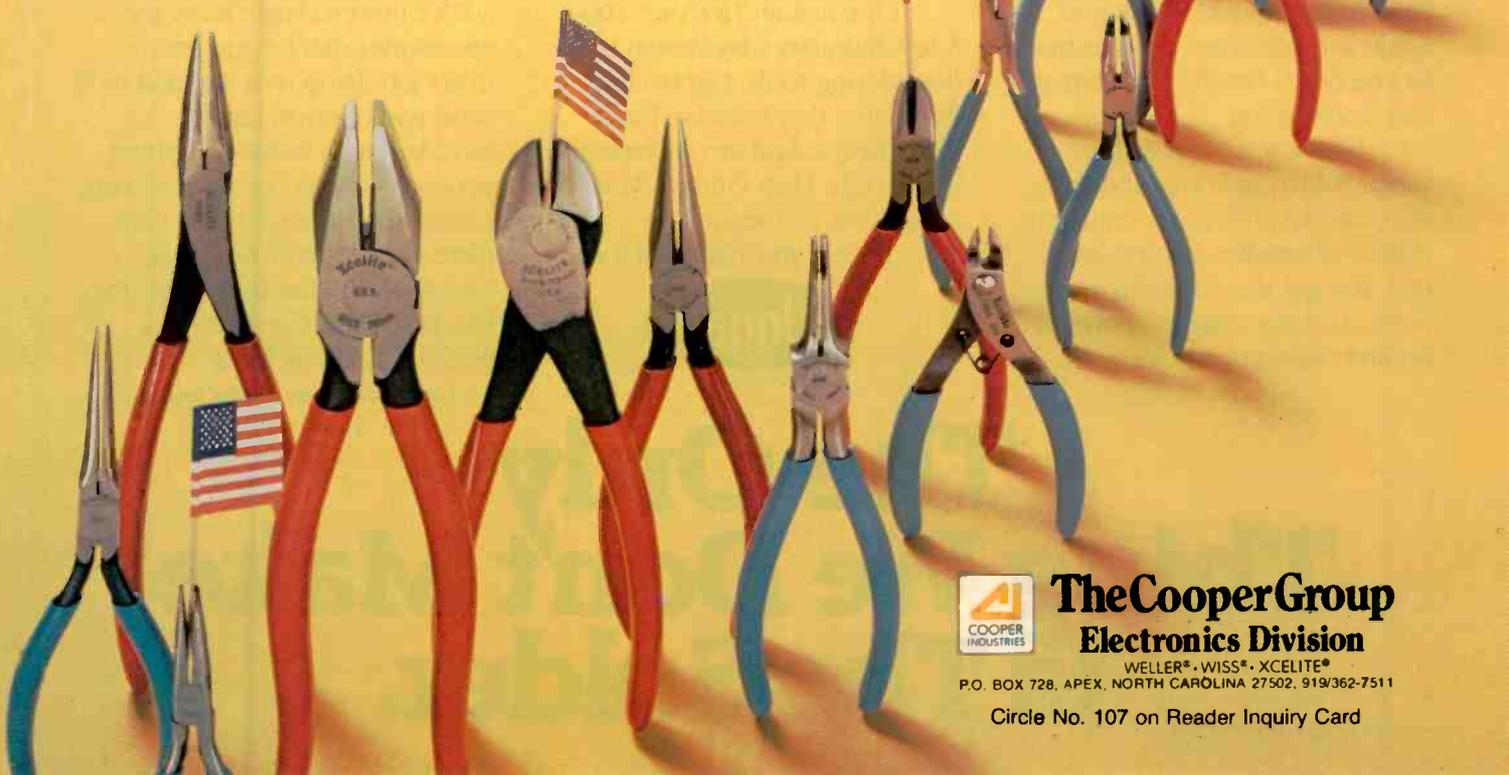
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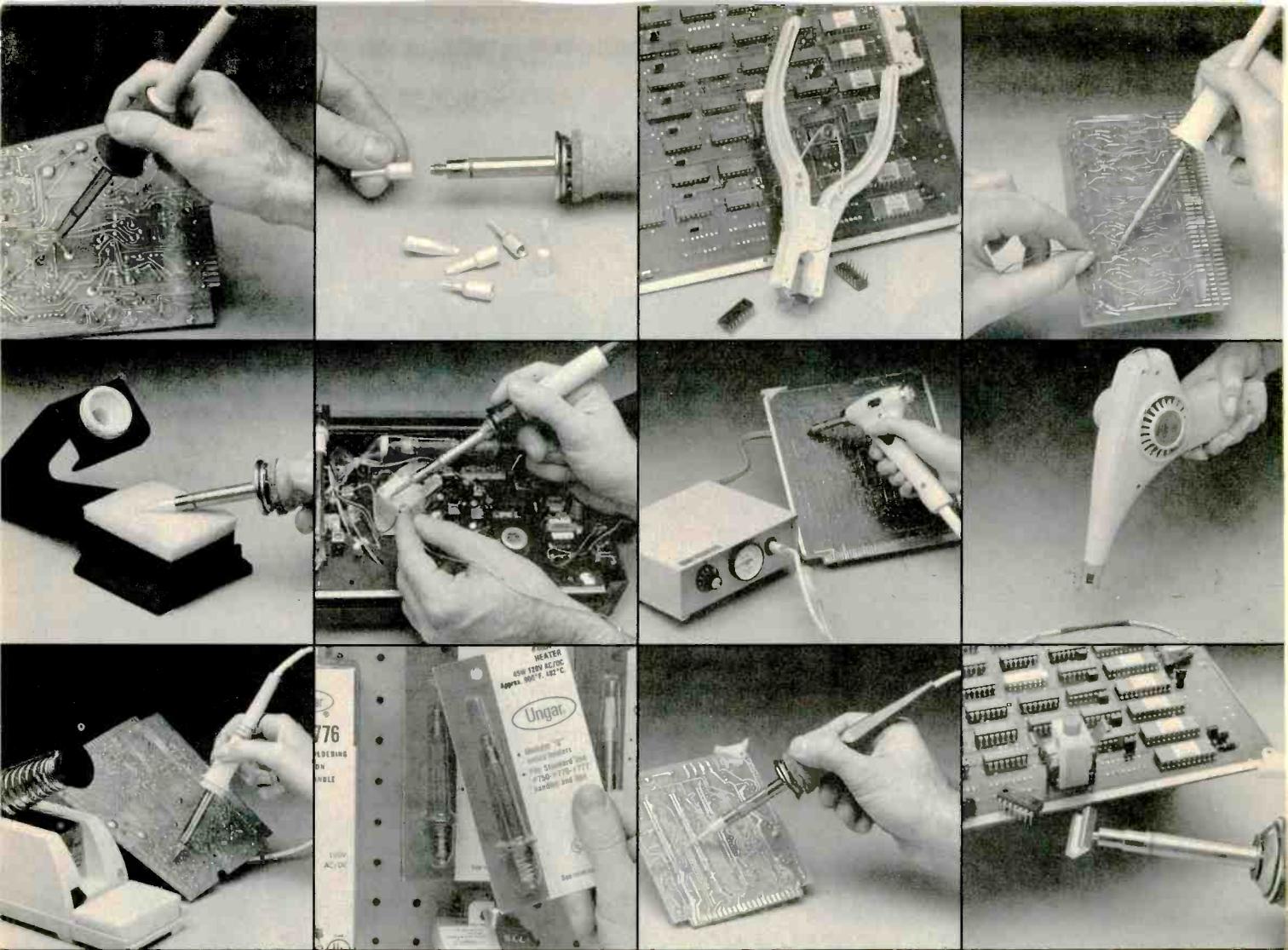
You don't know what you can do with pliers until you know what Xcelite pliers can do for you. See your distributor and let him update you.



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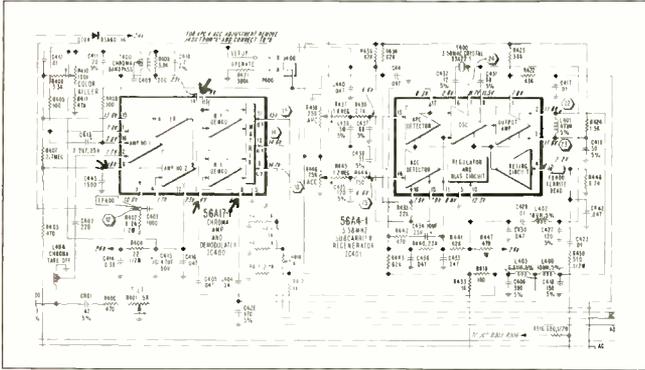
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SERVICE SEMINAR

ADMIRAL

Chassis 4/6/10M46; 10M55, 28M55—Colors arranged in vertical bands or missing in vertical strips. Look for open connections to color IC's. A horizontal flyback pulse is probably being fed into the chroma circuitry causing the same interference on successive scanning lines, resulting in a pattern from top to bottom of the CRT.



Chassis 4/6/10M46, 10M55, 28M55—Chroma Adjustments: 1. Center the APC control (R438) and the ACC control (R446). Set the tilt control (R401) fully clockwise. 2. Set the color killer control (R410) fully counterclockwise (color chan-

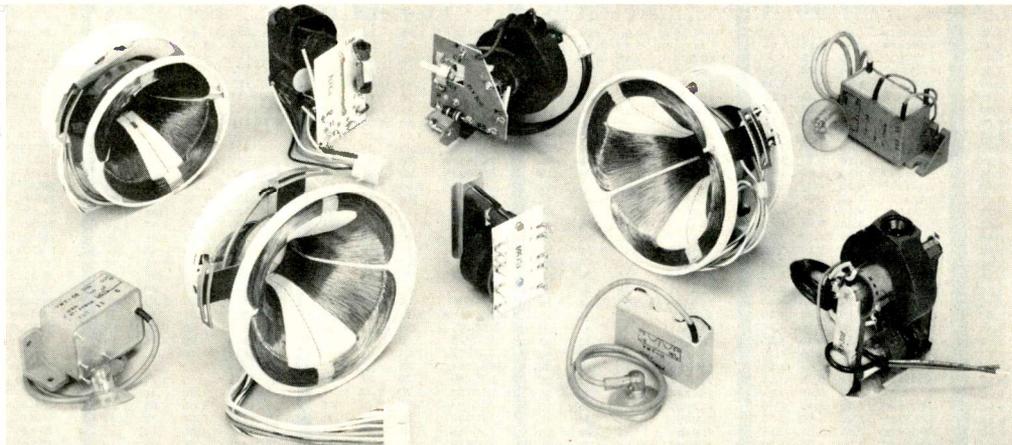
nel fully on). 3. Tune the receiver to the standard color bar pattern. 4. Set the color control fully clockwise, and fine tune to smear. 5. Adjust the APC control (R438) for color lock. 6. Remove jumper (J400) from "AA" and connect to "BB." 7. Measure the D.C. voltage between TP400 and ground (about 17-20 volts). 8. Remove jumper (J400) from "BB." Adjust ACC control (R446) for the D.C. voltage at TP400 to be the same as measured in Step 7. 9. Return the chroma set-up jumper to "AA" and turn color control to mid-position. 10. With the tuner "correctly" tune, set the tilt control for the "best transitions" between yellow and cyan and between green and magenta bars. 11. Tune to an unused UHF channel and turn color control fully clockwise. 12. Turn the color killer control clockwise until color noise is killed (be sure to "just" kill the color snow). 13. On a weak color bar signal, approximately 50 μ V, make sure oscillator locks and color bars are correct. Detune into smear and ascertain that the killer kills the color. Return the signal to normal. 14. Adjust the brightness and contrast controls for a "normal" picture. 15. Adjust color control for the color to "match" the contrast level. 16. Rotate the tint control throughout its range. The magenta bar should change from red (fully CW) to blue (fully CCW) as viewed on the CRT. 17. Set tint control for "correct" hue.

RCA

Chassis CTC85—Piecrusting, Christmas treeing, squealing then shut down. Check R437 (to pin 7 of regulator module), may be open.

Chassis CTC85—Blooming, excessive brightness. 210V

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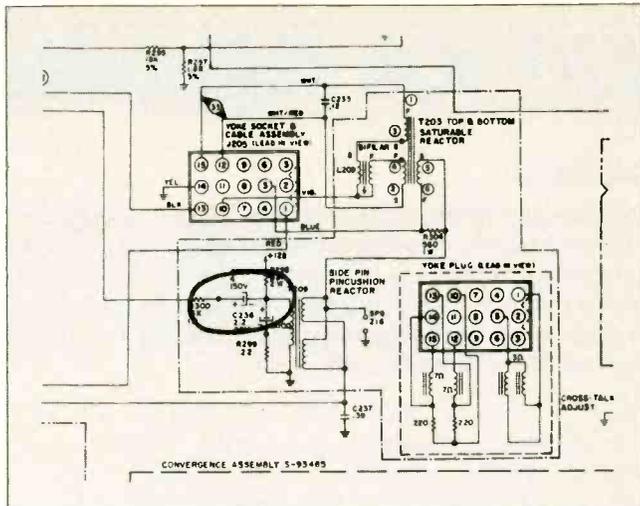
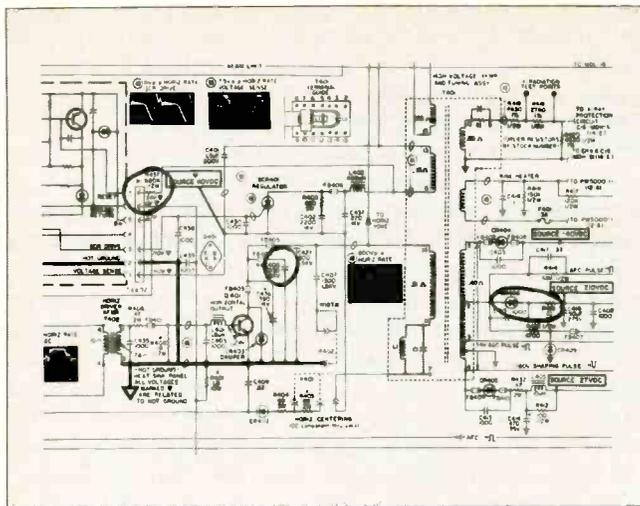
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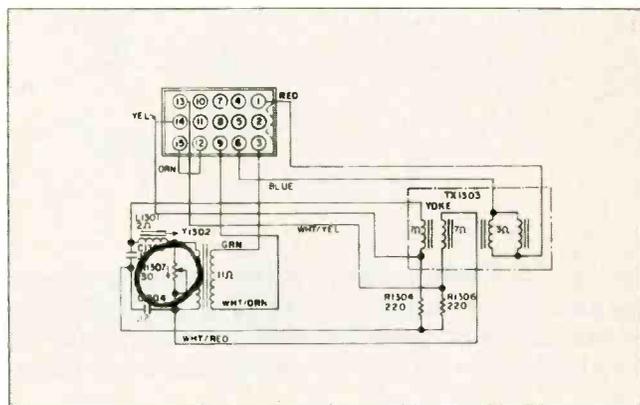
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source low, other sources near normal. Possible cause: C406 may be out of tolerance, check by substitution.
Chassis CTC85—Shut down after 15 to 20 seconds of operation. Check CR406 and R413. (210 volt source rectifier).

ZENITH

Chassis 25EC58—Picture unstable—Vertical sync pulse appears very unstable on scope. Check C238 (4mfd 150V) in pincushion reactor circuit.
Chassis 19EC45—Incorrect interlace top and bottom, center of picture o.k. Possible cause is open R1307 pincushion amp. control (30 ohms). ET/D



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Original Japanese Replacement Parts for TV, Stereo and CB

25-UP 10-24 1-9			25-UP 10-24 1-9			25-UP 10-24 1-9			25-UP 10-24 1-9			25-UP 10-24 1-9			25-UP 10-24 1-9								
AN115	2.00	2.15	2.25	TA7061P	.85	1.05	1.15	UPD857C	7.90	8.30	9.40	25C458	.18	.23	.27	25C1096	.40	.50	.55	25C2029	1.45	1.75	1.95
AN214Q	1.45	1.65	1.85	TA7062P	1.05	1.20	1.35	UPD858C	5.90	6.20	6.90	25C460	.30	.35	.40	25C1114	3.30	3.50	3.70	25C2072	3.50	3.70	3.90
AN234	5.04	5.51	6.00	TA7063P	.55	.65	.75	UPD861C	7.80	8.20	9.30	25C481	.90	1.10	1.25	25C1162	.75	.85	.95	25C2076	.40	.55	.60
AN239	4.10	4.30	4.80	TA7074P	2.40	2.60	2.80	25A102	.20	.25	.30	25C482	.80	.95	1.10	25C1172	.75	.85	.95	25C2091	.80	1.00	1.10
AN247P	2.40	2.60	2.90	TA7089P	1.80	2.10	2.30	25A473	.45	.55	.60	25C485	.95	1.15	1.30	25C1166	.20	.25	.30	25C2092	1.70	1.90	2.10
AN274	1.40	1.65	1.85	TA7092P	9.50	10.00	10.50	25A484	1.20	1.40	1.60	25C495	.30	.40	.50	25C1162	.60	.70	.80	25C2098	2.90	3.10	3.35
AN313	2.90	3.10	3.30	TA7120P	.85	.95	1.05	25A495	.25	.30	.35	25C509	.25	.30	.35	25C1166	.20	.25	.30	25D72	.45	.60	.65
AN315	1.75	1.95	2.20	TA7139P	1.55	1.75	1.95	25A509	.30	.35	.40	25C517	1.80	2.00	2.40	25C1172B	3.00	3.50	3.85	25D91	1.25	1.40	1.55
BA511A	1.60	1.80	2.05	TA7153P	5.70	5.90	6.10	25A562	.25	.30	.35	25C535	.25	.30	.35	25C1173	.45	.50	.55	25D92	1.25	1.35	1.45
BA521	1.80	2.00	2.30	TA7203P	2.40	2.60	2.80	25A564	.25	.30	.35	25C620	.25	.35	.40	25C1177	10.80	12.30	13.70	25C178	.85	.90	1.05
HA1151	1.45	1.70	1.85	TA7204P	1.90	2.10	2.40	25A634	.35	.40	.45	25C632A	.30	.35	.40	25C1209	.25	.30	.35	25D187	.30	.40	.45
HA1156W	1.55	1.75	1.95	TA7205P	1.50	1.70	1.90	25A636	.75	.95	1.15	25C634A	.30	.35	.40	25C1222	.20	.25	.30	25D218	2.40	2.60	2.90
HA1306W	1.90	2.10	2.40	TA7214P	4.10	4.30	4.50	25A643	.30	.35	.40	25C697A	2.65	2.95	3.20	25C1226A	.50	.55	.60	25D234	.55	.65	.75
HA1322	2.10	2.50	2.80	TA7310P	1.25	1.40	1.55	25A673	.30	.35	.40	25C710	.18	.25	.27	25C1237	1.60	1.80	2.05	25D235	.55	.65	.75
HA1339A	2.40	2.60	2.90	TA7607P	5.80	6.00	6.20	25A678	.30	.35	.40	25C711	.18	.25	.27	25C1239	2.00	2.55	2.75	25D261	.30	.35	.40
HA1342	2.50	2.70	3.00	TA7609P	4.00	4.32	4.80	25A683	.30	.35	.40	25C712	.18	.25	.27	25C1306	1.30	1.45	1.60	25D287	2.45	2.65	2.85
LA1222	1.50	1.55	1.60	TBA8105	2.75	2.97	3.30	25A684	.35	.40	.45	25C717	.30	.35	.40	25C1307	1.85	2.05	2.35	25D291	2.05	2.45	2.75
LA3101	3.45	3.60	3.75	TC5081P	2.90	3.10	3.30	25A695	.35	.40	.55	25C730	2.80	3.00	3.20	25C1318	.30	.35	.40	25D315	.55	.65	.70
LA4031P	1.75	1.95	2.20	TC5082P	3.30	3.45	3.80	25A699A	.40	.50	.60	25C732	.20	.25	.30	25C1364	.25	.35	.40	25D325	.55	.65	.70
LA4032P	1.75	1.95	2.20	TC9100P	7.54	8.02	8.50	25A706	.80	.95	1.05	25C733	.20	.25	.30	25C1383	.25	.30	.35	25D330	.55	.65	.70
LA4220	2.25	2.40	2.55	UHC1001	4.10	4.30	4.80	25A720	.25	.30	.35	25C734	.20	.25	.30	25C1384	.25	.30	.35	25D356	.65	.75	.85
LA4400	1.85	2.05	2.35	UHC1002	4.10	4.30	4.80	25A745R	3.60	3.80	4.20	25C735	.20	.25	.30	25C1424	2.60	2.70	2.80	25D358	.65	.75	.85
LD3141	1.70	1.80	1.90	UHC1003	4.10	4.30	4.80	25B22	.25	.30	.35	25C756A	1.30	1.60	1.80	25C1448A	.60	.70	.80	25D359	.75	.85	.95
MS1159	7.90	8.05	8.25	UHC1004	4.10	4.30	4.80	25B54	.20	.27	.30	25C761	.30	.32	.35	25C1475	.60	.70	.80	25D427	1.75	1.95	2.20
MS1513L	2.00	2.20	2.50	UHC005	4.10	4.30	4.80	25B77	.30	.40	.45	25C781	1.85	2.05	2.35	25C1509	.40	.45	.50	25D525	.70	1.00	1.10
MN3001	13.75	14.85	16.50	UHC006	4.10	4.30	4.80	25B175	.20	.27	.30	25C784	.25	.30	.35	25C1675	.20	.25	.30	25D526	.55	.65	.75
MN3002	9.62	10.40	11.55	UPC20C	2.00	2.40	2.50	25B186	.20	.27	.30	25C789	.75	.85	.95	25C1678	1.00	1.15	1.30	25K19	.45	.50	.55
MN3003	5.87	6.34	7.04	UPC141C	2.14	2.32	2.50	25B187	.20	.27	.30	25C793	1.90	2.10	2.40	25C1687	.35	.40	.45	25K23A	.65	.75	.85
PLL01A	3.00	4.20	4.60	UPC157A	3.25	3.45	3.65	25B324	.25	.30	.35	25C799	1.95	2.15	2.45	25C1727	1.55	1.65	1.75	25K30A	.40	.45	.50
PLL02A	5.00	5.20	5.90	UPC554C	1.25	1.40	1.55	25B367	.85	.95	1.10	25C828	.20	.25	.30	25C1728	.60	.70	.80	25K33	.55	.65	.75
PLL03A	7.60	8.00	8.80	UPC555H	1.25	1.40	1.55	25B405	.25	.30	.35	25C829	.20	.25	.30	25C1760	.65	.75	.85	25K34	.45	.55	.60
SG264A	6.24	7.02	7.80	UPC572C	3.45	3.55	3.65	25B420	.65	.80	.90	25C839	.25	.30	.35	25C1775	.30	.35	.40	25K41	.50	.55	.60
SG609	3.65	4.05	4.50	UPC574C	1.00	1.08	1.20	25B463	.80	1.00	1.10	25C867A	3.10	3.30	3.60	25C1816	1.35	1.60	1.80	35K22Y	1.35	1.55	1.75
SG613	5.20	5.40	5.95	UPC375C2	1.25	1.40	1.55	25B474	.60	.70	.80	25C900	.20	.25	.30	25C1908	.25	.35	.40	25K35	.60	.65	.70
SM5104	6.68	7.42	8.20	UPC1020H	1.85	2.05	2.35	25B507	.70	.80	.90	25C930	.20	.25	.30	25C1945	4.30	4.80	5.20	25K37	1.70	2.00	2.30
STK011	3.55	3.80	4.30	UPC592H2	.65	.75	.85	25B511	.60	.70	.85	25C940	.20	.25	.30	25C1945	4.30	4.80	5.20	25K40	.85	1.05	1.15
STK013	7.40	7.80	8.60	UPC1008H	4.10	4.30	4.80	25B557	1.60	1.85	2.30	25C950B	.20	.25	.30	25C1974	1.20	1.60	1.80	25K41	1.25	1.40	1.55
STK015	4.00	4.20	4.70	UPC1020H	1.85	2.05	2.35	25C183	.30	.40	.50	25C1000BL	.30	.40	.45	25C1975	1.20	1.60	1.80	25K48	3.30	3.40	3.70
STK050	23.10	25.98	28.86	UPC375C2	1.25	1.40	1.55	25C184	.30	.40	.50	25C1013	.50	.60	.65	25C1975	1.20	1.60	1.80	35K49	1.25	1.40	1.55
STK415	7.10	7.50	8.10	UPC157A	3.25	3.45	3.65	25C372	.18	.25	.28	25C1014	.45	.60	.65	25C2009	.70	.75	.80	35K48	3.30	3.40	3.70
STK435	4.40	4.90	5.50	UPC554C	1.25	1.40	1.55	25C373	.18	.25	.28	25C1018	.50	.60	.70	25C2021	.50	.55	.60	35K49	1.25	1.40	1.55
STK439	7.60	7.90	8.30	UPC555H	1.25	1.40	1.55	25C380	.18	.25	.28	25C1030	1.70	2.00	2.20	25C2028	.45	.50	.55				
TA7045M	1.90	2.10	2.40	UPC1031H	2.52	2.74	2.98	25C382	.30	.35	.40	25C1066	4.30	4.50	4.70								
TA7055P	1.90	2.10	2.40	UPC1152H	2.90	3.10	3.30	25C387A	.27	.35	.40	25C1061	.65	.75	.85								
TA7060P	.65	.75	.85	UPC1156H	1.85	2.05	2.35	25C394	.18	.23	.27												

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STRICTLY BUSINESS



When we play the money game, one of the tools we use is the Profit and Loss Statement (sometimes called the Operating Statement, or Income Statement). Really it's not hard. We want to know three things ... what did we sell? ... what did we pay for it? ... what were the expenses?

What did we sell? Too often our accountant doesn't give use enough information about that, largely because he doesn't know enough about the service business. He is apt to lump it all together in a figure he calls Sales. That's not good enough.

Off the top, we want to show Parts Sales as separate from Labor Sales. Depending on individual circumstances, we might want to show a separate figure for each brand.

There usually are several different activities that contribute to service income, such as:

Demand Labor. This is work we do for Mrs. Jones, and she pays cash or by check or puts it on her account. Regardless of how she pays, this is Demand Labor Income.

Warranty Billback. This is work done under warranty. We send a claim to the manufacturer, he sends a check, and we deposit the check in the account.

Contract Income. This comes up if we do work for another store. He doesn't have a service department so he hires us to do the work and he pays us. This is a particularly important account because we may have made a special deal at lower rates in order to get all of his business. We need to know if the deal is profitable. If these deals involve a large amount of business, a K-Mart, for instance, or a large department store, we would want to show each of these large accounts separately, while lumping the small ones together.

These accounts are very easy to track. Because there is a discernable income flow, your accountant can very easily assign an account, deposit the money into these accounts, and present a financial statement that reflects the activity. He can do it easily ... and should do it without any additional charges.

But there are some accounts that your accountant probably doesn't know anything about at all ... like cross billings to the sales department, and warranty shortfall, and service contract fulfillment. Let's take a look at those accounts next month.


Mgr., NARDA's Service Division

NEWSLINE

HITACHI MAXELL SEEKS U.S. SITE. Hitachi Maxell of Japan, manufacturers of audio and video tape products, reports it expects an announcement by the end of this month on a U.S. production facility site. A spokesman for the firm says the present area of interest is the southeastern U.S. from North Carolina to Alabama. Initially, plans call for the manufacture of cassette and digital products.

GTE SELECTS NEVADA BATTERY SITE. GTE has selected Henderson, Nev., as the site of its new lithium thionyl chloride battery production facility. GTE reports this new type of battery provides 20 times the power of conventional lead acid batteries of similar weight and 25 times the energy found in traditional zinc carbon flashlight batteries. GTE contends the "lithium" battery has important implications for applications demanding small power sources of light weight.

CB STILL POPULAR. The Electronics Industry Association reports that CB, far from being dead, is still growing. EIA reports there are an estimated 30-million CB radios in use in the United States at the present time. And, some 2.1 million new licenses--which are required to operate a CB legally -- were issued in 1978. That was a 16 per cent increase over the number issued in 1977.

GENERAL INSTRUMENT LICENSES JAPANESE FIRMS. General Instrument Corporation, the maker of electronics products including digital television tuners, has licensed three Japanese firms in the semiconductor business. According to the agreement, the three firms will be permitted to use GI's ion implant and silicon gate processes used in the manufacture of large scale integrated circuits. The three firms are Toshiba, Oki and Mitsubishi.

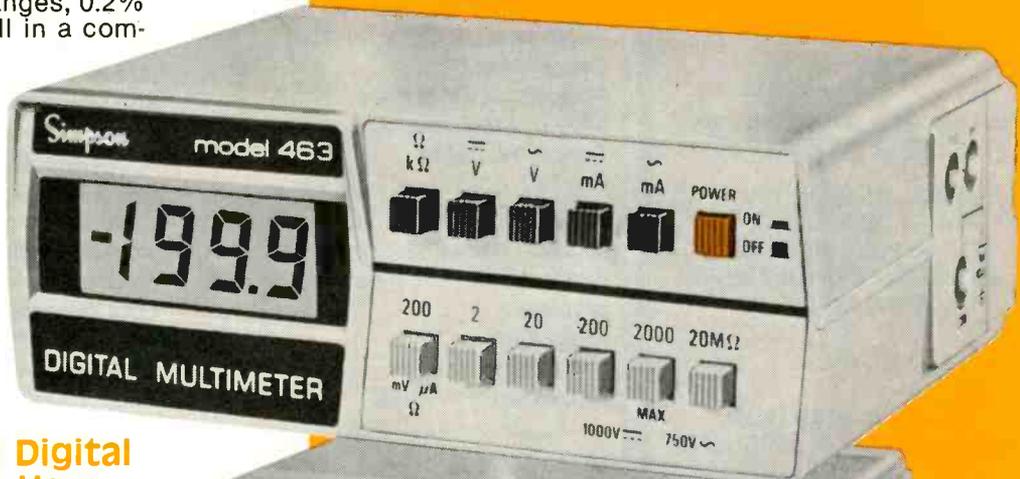
"PERSONAL COMPUTERS" GROWING. At least one market research firm -- Dataquest --foresees the market for personal computers reaching the \$1.2 billion level by the end of the year. Last year it was half a billion. The firm reports Radio Shack personal computer products dominated the market with \$105-million in sales. That was about 20 per cent of the total market. Other figures released by Dataquest showed Appel with dollar volume of \$30-million; PET with \$20-million; and, IMSAI with sales of \$8-million.

BETAMAX BACK IN COURT. Universal Studios and Walt Disney Productions are back at it again over alleged royalty and copyright infringements through the use of video tape recorders. Why Sony and its Betamax unit is the main defendant in the U.S. District Court Case in Los Angeles remains somewhat of a mystery considering that many companies market VTRs. However, it brings up once more the "nervous" attitude of some studios toward the potential loss of relicensing revenues for their artistic productions should taping off the public airwaves ever reduce the demand for them.

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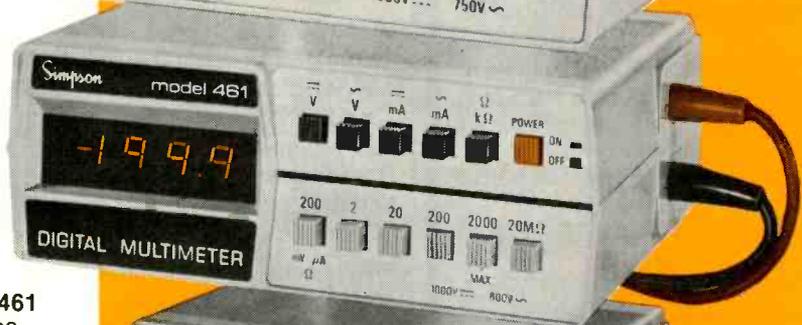


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reliable overload-protected LSI circuitry, easy-to-read 3-1/2-digit displays, automatic polarity. 200-hour burn-in backed by a 1-year guarantee. A full line of optional accessories.

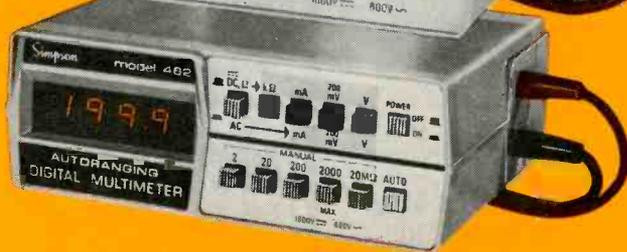
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Popular Compact Model 461 with 26 pushbutton ranges, 0.25% DC V accuracy.



For \$199

Autorangeing Compact Model 462 with batteries, charger/adapter. 0.25% DC V accuracy.



For \$310

360-2 Digital VOM with 0.25% DC V accuracy, 28 ranges, low-power ohms, AC/battery operation.



For \$323*

Deluxe 460-3A with 0.1% DC V accuracy, 32 ranges, low-power ohms, analog trend display.



For \$345*

Autorangeing Model 465A with 0.1% DC V accuracy and low-power ohms ranges.



For \$245*

Popular Bench Model 464A with 0.1% DC V accuracy and 28 ranges.

*Price for AC line version. AC/battery charging version available for \$42 additional cost.

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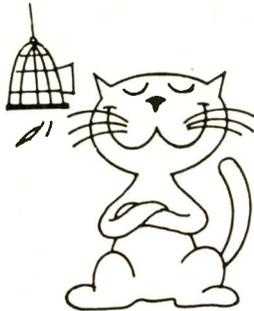
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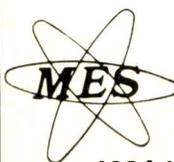
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LETTERS

HELP NEEDED

I'm an old subscriber to ET/D. I'm proud to keep the TEKFAK Manuals handy, but not too long ago TEKFAK No. 111 disappeared from my service van. Does any one have a TEKFAK 111 that I can buy?

Thanks for the help you bring every month with each publication.

*Gabriel Martinez
Magnificent TV Service
6809 N. Manhattan Ave.
Tampa, FL 33614*

I need operation, maintenance and calibration manuals for a Tektronix 545 oscilloscope. Any help would be appreciated.

*Philip King
313 Strauss Ave.
Johnstown, PA 15905*

I need schematics on: 1. Voxson Stereo 240 amplifier model H202B; 2. Monacor AM-FM Stereo Receiver model SMX-33.

*Paul Marquez
2608 Staples Ave.
Key West, FL 33040*

Please send me the complete address of McGraw-Hill Book Company, the company that published the book on oscilloscopes as listed on page 38 of the December ET/D. Thank you.

*Paul Capito
Capitol Radio Service
637 W. 21 St.
Erie, PA 16502*

EDITOR: McGraw-Hill's address is 1221 Avenue of the Americas, New York, NY 10020. Most of the books we review can

be obtained through any good trade book store, i.e., McGraw-Hill; Parker; Prentice Hall; Reston, etc. Sams and Tab Books often are available at your electronic parts distributors and Tab Books will send you a catalog to order direct.

TECHNICAL ARTICLES

I could not agree with you more on your Dec. 1978 editorial, any electronic magazine plus factory refresher courses are one way, one step better is a magazine which donates a thorough digestion of a particular model TV-or microwave or Hi-Fi where schematics-parts location is shown, troubleshooting steps and last, but not least, hints from manufacturer as to problems and how they were solved would be of more benefit than a load of general articles on theory of various circuits that soon are forgotten. In this way a file can be prepared for a particular chassis for reference. I have been in this field for 45 years, still going strong but I am finding that text books are too slow for when published the fix or test is 2-3 years old. Some articles are published which approach what we need, but these are few and far between. One receiver covered monthly in expanded steps, including Japanese TVs and factory hints. This will allow us to make a living without a lot of wasted time.

*Philip Adelman
Brentwood Village TV
125½ Barrington Pl.
Los Angeles, CA 90049*

EDITOR: Considering that some manufacturer's service manuals comprise anywhere from 30 to 60 to 70 pages of solid information on their various "new" chassis introductions each year, I'm sure you can appreciate what a voluminous undertaking it would be for any single publication to undertake a "detailed" review of all manufacturers'

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chassis. Considering ET/D's limited space and time considerations (we publish only 12 times a year) and considering the hundreds, perhaps thousands, of chassis on the market today when considering television, stereo, CB, communications, etc., I think you can begin to see the sheer impossibility of such an undertaking. ET/D still believes firmly that the proper place for any service organization to obtain such detailed service information is from the source of that information ... the manufacturer himself. Secondly, we believe the needs of the professional electronics service marketplace can best be served by ET/D through its role as a surveyor of what is new in electronic circuitry. Through this method, you are kept aware of changing technology, and by interacting properly with the manufacturer and obtaining his service data, you are then in a position to handle such changing technology when you see it on your bench. For ET/D to print detailed analysis of all television or stereo chassis would be a physical impossibility.

TEKFAX

Where is Sears in TEKFAX? Why don't you cover the foreign makes?

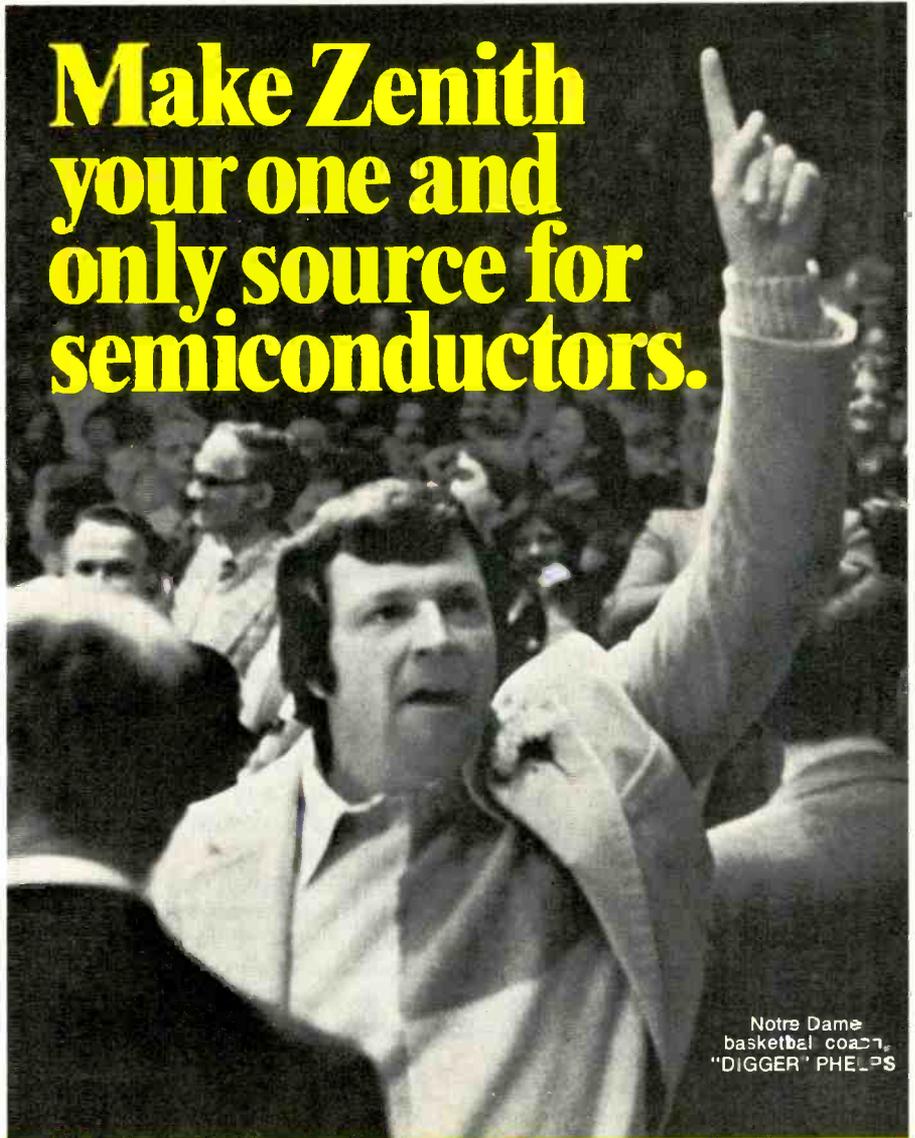
Wm Greer

*200 N. Beechwood St.
Brandon, CT*

EDITOR: For a long time Sears was not particularly cooperative. Now ET/D does receive microfiche service data on Sears TV and Audio but we have no way to process them for magazine reproduction at this time. ET/D has made contact with the service departments of the major Japanese brands and has been covering Panasonic, Sanyo, Sony, MGA, Toshiba, Hitachi, Midland and Sharp, as well as Coronado, beginning January, 1979, though it will take us a while to really catch up with everything available. If ET/D is missing something important, to you our readers, let us know, please. **ET/D**

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Rebuilding color picture tubes

And they're better than new, to boot

We take you on a personalized tour of one of the largest rebuilding facilities to show you how it's done and how your safety is of prime importance.

By Ervin Kuczogi*

Over 1,000,000 replacement tubes are installed each year. However, the quality of a large percentage of these tubes is highly questionable if they are not manufactured by one of the large national companies. In most cases it is impossible for the installer to know what to expect in the way of quality, performance, durability and safety, when he buys an off-brand tube.

Considering the high cost of tube replacement and the importance of assuring customer satisfaction along with dealer safety and profitability, it is important for every service man to know more about replacement CRT's

When a picture tube fails, the dealer has a choice of replacing it with an all new tube, a rescreened tube, or a remanufactured tube. We estimate that in approximately 90% of these cases dealers choose remanufactured tubes, which they consider to be the best replacement value. For this article we will describe the modern production and quality control methods used by the world's largest producer of replacement tubes. However, it should be noted the methods employed here are analogous to those used by other reputable national manufacturers of television picture tubes in the United States.

*Chief Engineer for Cathode Ray Tubes, Channel Master Division of Avnet, Inc.

Equipment used in and during processing is sophisticated and expensive. Channel Master's picture tube remanufacturing procedures and standards are as rigid as that of original equipment tube manufacturers. So called "rebuilders" do not have the resources to produce tubes at this quality level.

In many ways, it requires more care and effort to remanufacture a tube to high quality standards than it did to produce it in the first place. The reason is simple: in addition to all the usual manufacturing steps, there is the additional responsibility of properly "preparing" the dud. Old materials and impurities must be removed, and the introduction of new contamination prevented. Every remanufacturing technique, therefore, has been designed to achieve these goals. For one thing, it means mechanizing and automating as many operations as possible. For another, it means training people to respect and observe high quality standards.

Dirt is the enemy

It might first be helpful to remind the reader of the basics of color tube construction and operation. A tube consists of an electron gun, a phosphor screen, internal and external coatings, and various additional components. Tube functions are performed in a high vacuum, and the glass envelope must be free of contaminating particles. The majority of remanufacturing problems are due to unwanted foreign particles and contamination in the tube.

Duds entering the plant must first have their imposition-protection safety systems removed. The most difficult are those using protective panels which are laminated to the tube's face. These

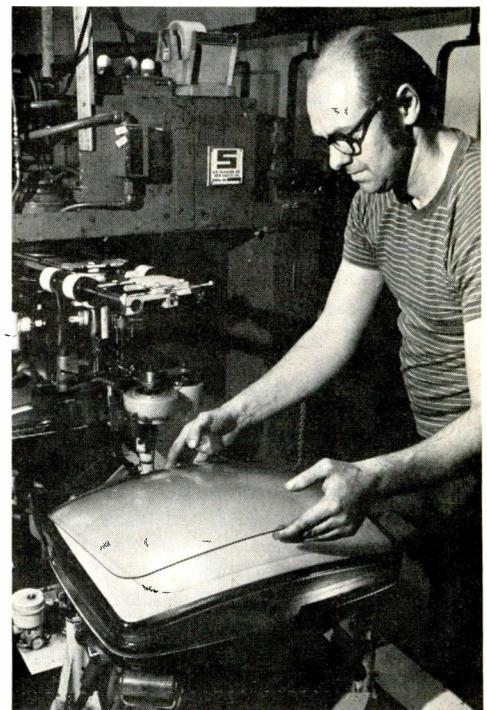


Fig. 1.—Workman removes glass safety panel from the CRT face as one of the first steps in the remanufacturing process.

tubes must be heated, and the protective face panels pried off and discarded. Without the removal of the safety devices the tube cannot be heated sufficiently during subsequent operations (Figure 1). New safety panels or rimbands will be applied later as part of the remanufacturing process. The tube face is then cleaned and polished, and the tube washed to remove dag (old graphite coating) and external dirt. The rinse water is neutralized for perfect pH balance. All the above steps are performed while the tube is still under vacuum. The stress applied during these procedures may cause some tubes to implode glass that might otherwise cause trouble in

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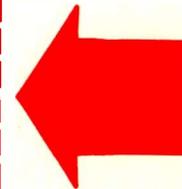
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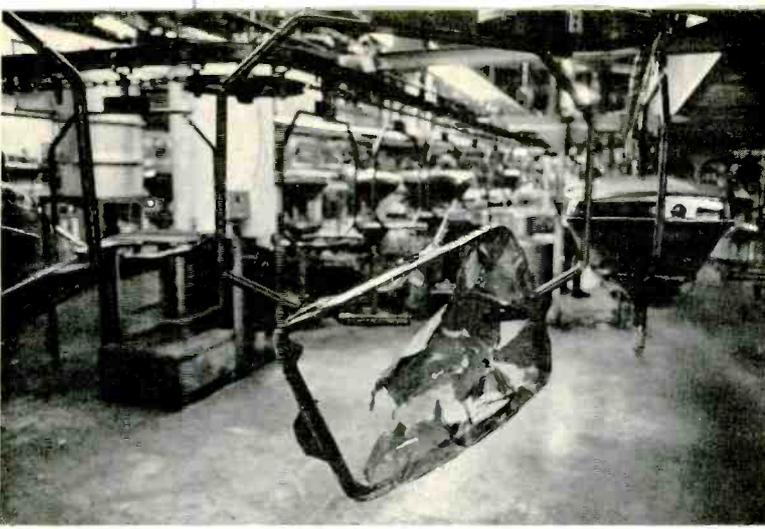


Fig. 2.—Implosion: The weeding out process begins.

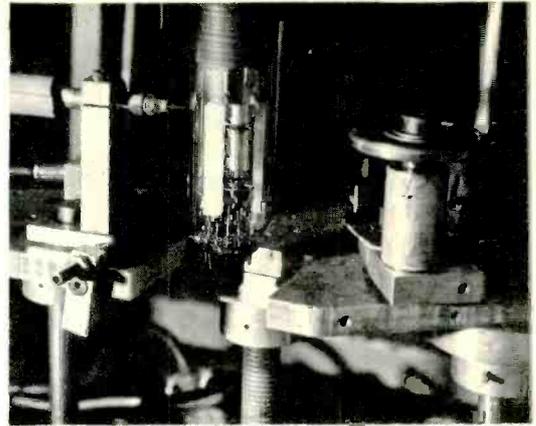


Fig. 3.—Temperature differentials are used to "crack off" the neck of the picture tube.

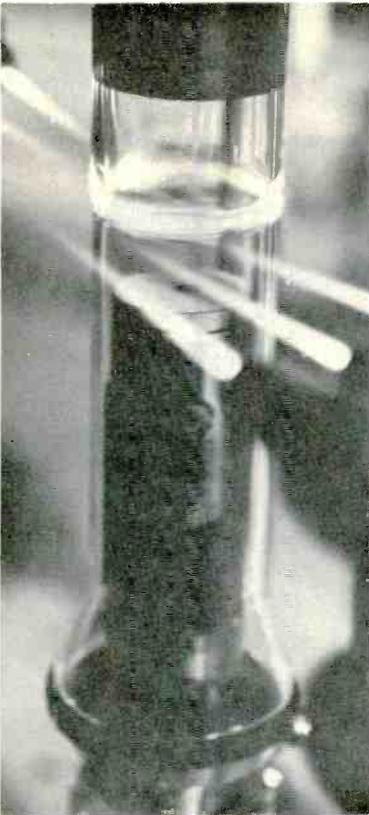


Fig. 4.—Hot jets of burning gas are used to splice on a new neck.

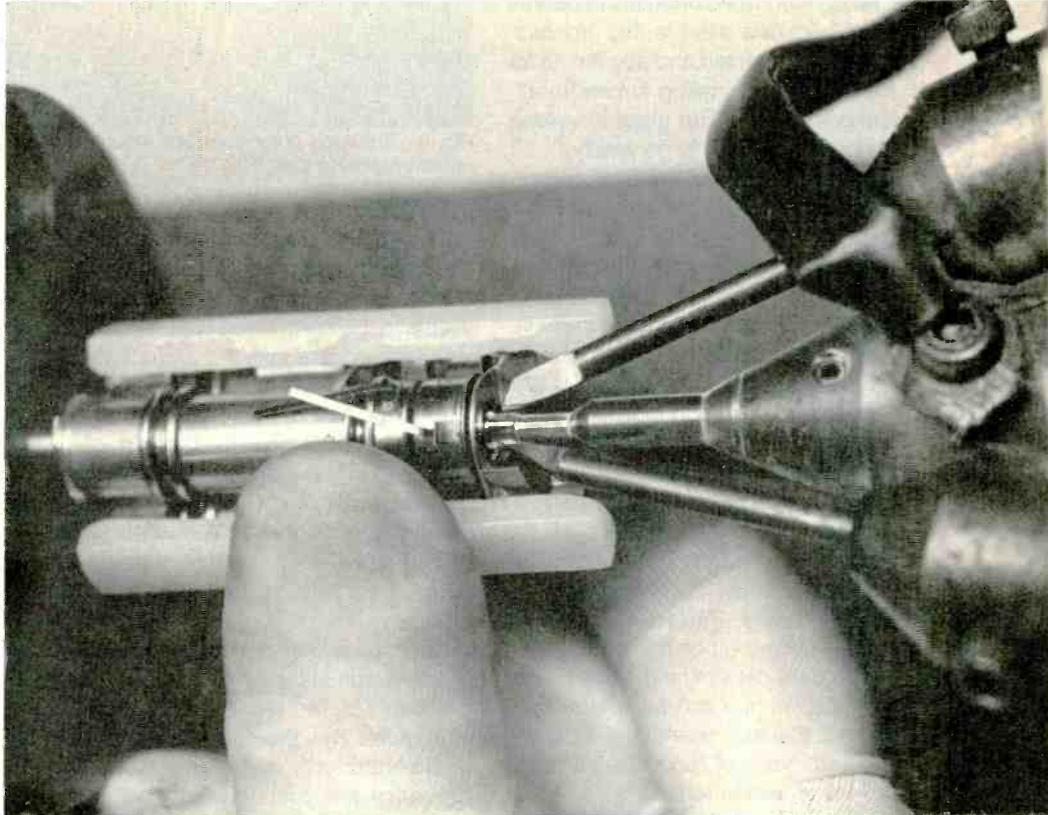


Fig. 5.—The spacing of all components on the electron gun are checked before installation in the neck of the tube.

someone's home. In fact, many of these remanufacturing procedures stress the tube far beyond anything it will experience in actual use.

It must constantly be remembered that air is the enemy of the tube. Contamination from humidity, oxygen, dirt and dust, and impurities in the atmosphere are destructive to a tube. One of the goals during manufacturing is to minimize exposure of the tube's inside to "dirty" air.

Opening the tube

The tube is now ready to be "let down to air." This is a critical operation since the risk of particle contamination, caused by air rushing in to fill a vacuum, is very

high, Channel Master has a special 2-stage technique and unique machinery for this operation. The tube is not let down to air under atmospheric pressure but in a controlled vacuum chamber. First, the tube is mounted on a machine of our design, the automatic "neck crack-off" machine, where a jet of flame concentrated at a certain point on the neck of the rotating tube, heats a narrow band of glass (Figure 3). A cold wheel, chilled by forced air, is brought into light contact with the rotating tube neck. The temperature difference of the cold metal wheel touching the hot glass causes a "thermal shock" which will crack the glass all around the neck. However, the tube remains under

vacuum because the neck is held tightly in position by the external air pressure. The tube is then placed on the automatic "let down" machine, a round machine with positions for twelve tubes, designed to bring each tube to atmospheric pressure at a controlled rate. The base of each tube is set in a chamber, and then the chamber is evacuated. When the inside and outside pressures of the neck area are equalized, the neck containing the old gun separates from the tube automatically. The chamber is then brought back up to atmospheric pressure by the injection of nitrogen at a controlled rate. This is the first taste of air the inside of the tube has had since being originally manufactured. We

selected nitrogen because it is a clean, dry, inert gas. Each of the twelve stations on the carousel has its own gage indicating the rate of nitrogen flow and each can be individually adjusted for differing tube sizes.

Here, as in virtually all operations, the tube is positioned "face up," to minimize the possibility of particles entering the tube.

Washing

The tube is again washed—the inside, this time. Washing the tube's interior is another carefully controlled operation requiring special equipment. Old dag (graphite coating) is washed away as are the concentrated deposits of barium oxide. Chemicals used in this process are carefully selected and applied so as to prevent contaminating fumes from entering the bulb. (The glass envelope not containing a gun is generally referred to as a "bulb"). As an added insurance the bulb is purged with warm filtered air.

A new neck must now be spliced on to the bulb, another critical procedure (Figure 4). This is done on the automatic "re-necking machine," another multi position carousel-like device. Bulbs are again placed face up in individual fixtures, and new necks positioned directly underneath. This machine guarantees positive neck alignment. Designed by our own engineers, it is the only machine of its kind in the world. The usual method is by "hand and eye," an imperfect system. Perfect alignment is essential since the position of the neck will eventually determine the positioning of the electron gun and will affect color purity and electron beam convergence.

Different types of replacement neck glass are available to tube manufacturers. Channel Master uses only X-ray attenuating (high lead content) glass which surpasses HEW's specifications. Unfortunately, existing laws requiring the use of leaded glass (which is costlier) are not being enforced. Some "price only" remanufacturers are still using non-leaded glass in their process.

Temperature control

The new neck is butted up against the base of the funnel and both sections are rotated at the same speed, while being heated by jets of flame. Temperature control is critical—the glass must be heated uniformly—and fusion of the two sections occurs when the glass reaches the exact temperature needed to make a solid weld. The splice is then annealed (cooled) under equally controlled

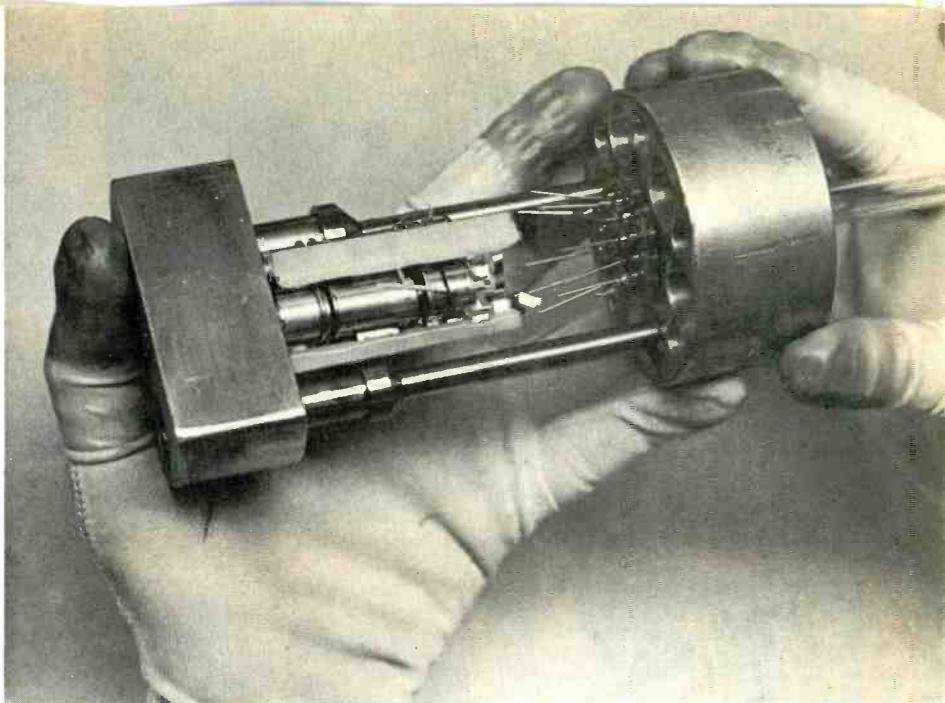


Fig. 6—The three color guns are mounted on the picture tube stem in this step of the remanufacturing process.

conditions.

The spliced neck is checked visually on a polaroscope which reveals any stresses and strains in the glass not visible to the normal eye. Such invisible weaknesses are culled out since they might be a cause of tube failure, later.

After the new neck is coated with fresh dag, the bulb is loaded—face up, of course—on the electrostatic discharge machine which removes loose particles that may be lodged in the internal parts of the bulb. The glass is then purged with another treatment of pure nitrogen.

The tube is finally ready to have a new electron gun inserted and sealed. At Channel Master, we manufacture our own guns. This provides the benefit of total control over quality, production efficiency and cost. In particular, it enables us to control cathode quality (each cathode element is individually inspected before insertion into the gun assembly) (Figure 5), and the critical spacing of all components to assure proper grey scale tracking.

A particularly crucial step in making the gun is the mounting of the beaded assembly, consisting of three color guns, to the stem. The rotation alignment must be precise and the gun center must be lined up with the proper stem pin (Figure 6). This is vital for achieving color purity and convergence. Twenty-five visual and mechanical inspections are conducted during assembly in the clean room including stress-pulls on welded connections.

The final element to be added is the "getter." Although the "getter" is not a



Fig. 7—In one of the final steps the neck glass is fused to the glass stem and then cooled.

functional part of the gun, it is attached to the gun assembly so that it can be properly positioned in the tube. In a later operation, the "getter" is "flashed," by the use of induction heating, thus realizing the barium from the getter ring, which will absorb unwanted gasses. Once activated, the getter continues its function, with diminishing effectiveness, throughout the life of the tube. Getters



Fig. 8—Finished picture tubes are “aged” at voltages many times higher than would be encountered in actual use.

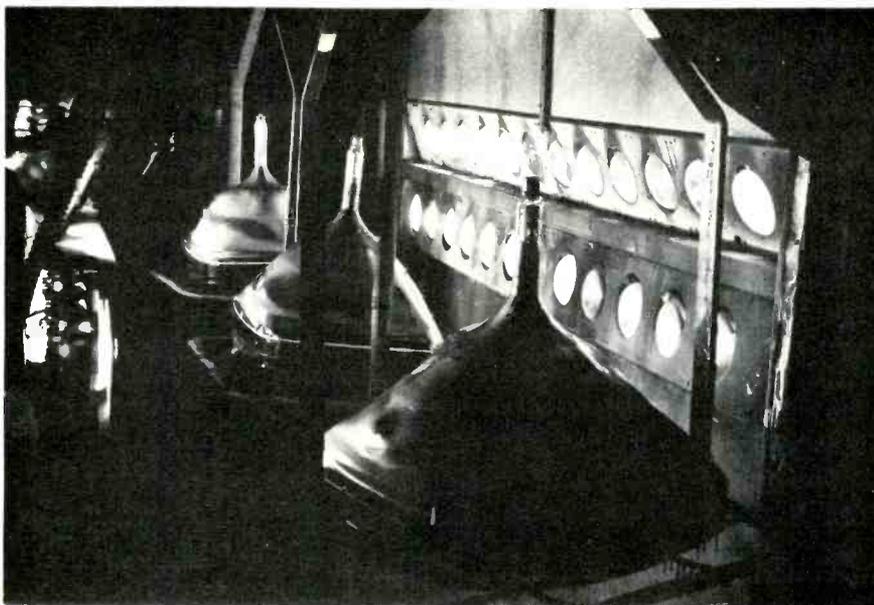


Fig. 9—Picture tubes on their three-hour trip through the 200 foot exhaust oven.

vary in quality. By building our own guns, we can specify the type of getter we want. We use only the costlier nitrogen-doped getters, since they are more effective in contributing to longer tube life.

Higher standards

The gun for the 70 degree tube is one we have designed ourselves. This is the gun used in the 21 inch round tube which currently accounts for 10% of all replacements. The design of this gun has been unchanged for twenty years. Our remanufactured tube using our more modern gun design is actually a better tube than the original—providing better picture resolution, longer life and

lower power consumption.

Prior to assembly, all gun components are “cleaned” in a hydrogen oven at 2000 degrees Fahrenheit, to degas them and release impurities. The new gun is carefully protected from the time it is made to the time it is sealed in the tube. Following assembly, it is kept in a closed, heated cabinet which is wheeled from the gun room to the automatic gun sealing machine. The gun is placed into a rotating fixture, the bulb is placed over it, face up. Here again, perfect rotational alignment is vital. The tube neck is pre-heated slowly, moving from one heating station to another. First the neck glass is fused to the glass stem of the gun, then the flared end of the neck or

the “cullet” is cut off by a sharp flame. Annealing (cooling) is also conducted at a controlled rate. Precise temperature measurements are made at each station, recorded on a continuous graph, and monitored by a technician. The new seals are checked for stress and strain in a “Polaroscope.”

The sealed bulb assembly is loaded on an exhaust cart which will evacuate it by conveying it through the exhaust oven for the next three hours. The 200 foot oven is actually divided into a number of chambers which raise the temperature of the glass at the rate of approximately 10 degrees Centigrade per minute until it reaches a maximum of 410 degrees Centigrade. The heating cycle drives the gasses inside the tube toward the center, from where they are pumped out. The goal, however, is not to create a perfect vacuum, since a specific amount of “desirable” gasses must be left inside to assure proper cathode conversion. The high heat assures us that this vacuum will be maintained throughout the life of the tube. After reaching maximum heat, the tube is cooled at the rate of 4 to 5 degrees Centigrade per minute.

Sealing the tube

On its trip through the oven the gun is bombarded with R.F. to heat the elements, surrounding the cathode to 825 degrees Centigrade. The bombardment causes the elements to eliminate gas, therefore, providing longer tube life. Again, during the exhaust process when the appropriate vacuum level is reached, the cathodes are automatically activated. At the proper temperature and vacuum, the glass tubulation is melted forming a vacuum seal. Typical tube rebuilders have little or no control over this important process which requires extremely expensive and sophisticated equipment.

Tubes exiting from the oven are immediately checked for cathode emission and gas ratio. A good tube at this point should have a gas ratio of less than 0.5. After getter flashing and aging, the gas ratio must not exceed .040. The finished tube can not exceed .030. Every tube undergoes several individual inspections for gas ratio, since it is the best indicator of the tube's long term reliability. Usually the installing technician does not conduct this quality check on the picture tube.

When the tube's center face temperature has cooled to 50 degrees Centigrade, the “getters” are flashed.

continued on page 43



Carl Meyer
President, A to Z TV Service
Clinton & Harlem Streets
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Coaxial cable:

Your best bet in the city

Learn why coaxial cable can go a long way toward eliminating much of the interference and noise common to most highly populated urban areas.

By James E. Kluge*

Over the past 20 years, TV ghosting has been a common problem around cities and large metropolitan areas but in the last decade or less the problem has been getting progressively worse. Even medium-sized cities are building up.

If you've taken a look around your city lately, you're probably amazed at how much the skyline has changed. The many high-rise structures are more than just buildings; they're very effective reflectors of the metro-area TV and FM broadcast signals.

Not always can one put up a simple television antenna, point it in the direction of the transmitter and expect clear, sharp pictures on the TV screen. Multipath reception, resulting from multiple signal paths over which a TV signal travels before arriving at the receiving antenna, causes trailing ghosts to appear in the picture to the right of the main image. Because the paths of these reflected signals are of different lengths, the various signal reflections arrive at the antenna at different times causing multiple ghosts. If there are many multiple paths, there will be many multiple ghosts to run together resulting in a smear at the right edge of the picture.

If the TV signal is picked up in the down-lead, that signal will arrive at the TV set *ahead* of the stronger signal received at the antenna. It will cause

*Technical Editor, Winegard Company



Fig. 1. Leading ghosts result from signals induced in the transmission line between the antenna and TV set. Short sections of open line (twinlead) act like an antenna inducing voltages that arrive at the set ahead of the main signal. Because the picture image "grows" from left to right on the screen, leading ghosts appear to the left of the main image.

what we call a "leading ghost" appearing to the left of the main image (because it arrived earlier).

Eliminating ghosts

It's one thing to understand how ghosts appear in a TV picture and another to be able to eliminate them.

Obviously, one can't relocate mountains, water towers or high-rise apartment buildings to eliminate these big reflectors that cause multiple paths. But we can design antennas that will better discriminate between the direct signal and reflected signals. Then, by using coaxial cable between the antenna and the TV set, the antenna signal can be preserved and protected.

It is commonly thought that small antennas are adequate in the metro

areas and large high-gain antennas belong in the outlying fringe areas. Until recent years, this could be considered a fairly accurate statement. But nowadays, with ghosting becoming more prevalent in metropolitan areas, it makes more sense to put up a large, highly directional array that is capable of rejecting the signals reflected off those large high-rise structures. If the high signal level off the antenna is troublesome, it can always be "padded down" to whatever level becomes workable.

In some cases, the high signal level might be advantageous, particularly in noisy environments commonly found in urban apartment buildings where elevators are running frequently, large neon signs are flashing across the

street, and automobile traffic on the streets below seldom ceases.

Antenna selection

In response to a need for a highly directional and discriminating antenna without the attendant high cost of a large array, some antenna makers have introduced to the marketplace effective units especially designed to handle ghosting problems.

Supersharp directivity and a high front-to-back ratio rejects signals reflected off large buildings and other urban structures.

Contrary to the common practice of designing antennas for 300-ohm balanced output, these antennas have a 75-ohm output impedance, and there's a good reason for this. The reason is to *discourage* installers and owners from using open wire, 300-ohm twinlead.

It makes very little sense to buy and install an antenna specially designed to eliminate ghosting and then use 300-ohm twinlead transmission line which is susceptible to direct pickup.

Why is it that some dealers avoid using coaxial cable for their antenna installations? Probably, one reason is its higher initial cost plus what they envision as extra time and expense to install connectors. Another might be their unfamiliarity with coax, its connectors and their applications.

Also, some installers, when reworking an older 300-ohm system, find it easier (and feel more comfortable) to simply replace the old 300-ohm twinlead with new when, in fact, it would most likely be easier, perhaps even cheaper, to run coax. Installed coax certainly would be more permanent and most likely would visibly upgrade the performance of the TV system. Also, there is wide-spread belief that coax attenuation is severe, thus requiring line amps, etc. Some of these are valid objections but, on the other hand, there are equally valid reasons in favor of using coax. Some of these are: 1) it is faster and easier to install, 2) freedom from problems of electrical-interference pickup and radiation in the downlead, 3) long life coupled with consistent performance, and 4) a professional looking installation.

Attenuation

With regard to attenuation, CL-2700 (RG-59/U) - Foam is only 2.6 dB/100' more than *tubular* twinlead at VHF and 4.6 dB/100' at UHF. When comparing CL-2800 (RG-6/U - Foam) with twinlead, it has only 1.5 dB/100' more attenuation than twinlead at VHF and

2.4 dB/100' more at UHF. When comparing coax with *flat* twinlead, the difference is even less. Since most home installations require less than 100 ft., attenuation is usually not a major consideration.

Additionally, when twinlead becomes wet it suffers more attenuation due to electrical conduction over its surface. Old twinlead deteriorates from sun, wind and weather. It becomes brittle and, with wind whipping, it develops minute cracks that absorb water and salt deposits which accelerate deteriorating performance. Twinlead should be replaced once every 3 years, whereas coax is permanent. Be sure the customer considers this recurring cost.

If you are in a strong signal area, such as you commonly find around large cities, then you are probably also in a high "noise" area. If leading ghosts and electrical noise interference are a problem, as they commonly are, then coaxial cable is a "must."

What is Coax?

Coaxial cable (or just coax as it is referred to) is a round, 2-conductor transmission line which instead of having the conductors parallel to each other, as in twinlead, has one inside the other. Coax is simply a 2-conductor cable of which one of the conductors is a flexible tubular shield and the other is a conventional wire centered inside the flexible tubular conductor (i.e. coaxial).

Because the outer shield is commonly tied to ground there is no voltage on it. The signal voltage is on the center conductor measured with respect to shield ground. Because the inner conductor is shielded, fields from such things as unwanted TV signals, noise, CB interference and other types of interference can't reach it. Thus, there will be no voltage induced in the center conductor due to these outside fields "cutting" it. The only signal voltages on the transmission line should be those induced in the antenna.

Twinlead

In contrast, twinlead has voltage on both conductors and they are both exposed to outside fields. The signal voltage on the line is the difference between the voltage on the two conductors since neither are tied to ground. Twinlead, being balanced, is somewhat able to reject voltages which are induced equally in its conductors as a result of its exposure to outside fields. If the voltages induced in each conductor are equal and in-phase, they will cancel when they meet at the balanced

termination of the line. However, if the line is not perfectly balanced, or the induced voltages are unequal or out of phase, (as may frequently be the case for fractional wavelengths approaching the conductor spacing) then signal voltages will be induced in the line and appear at the termination causing leading or lagging ghosts and other interference in the picture.

Coax has advantages that can offset or compensate for its higher cost. One of these advantages is ease of installation which can save a lot of time, and time is spelled *m-o-n-e-y!*

Briefly, coax can be routed many places that twinlead cannot. It can be taped to a metal mast, stapled in place, passed through metal window sash, metal conduit and cold air ducts. In contrast to twinlead, coaxial cable need cause no problem if it is relocated or subsequently moved about by other workmen. It can be buried underground, coiled in storage for later system expansion, and easily spliced using connectors. Coax is relatively unaffected by dirt, moisture or industrial deposits coating it. None of these advantages applies to twinlead.

Although coax cable usually requires connectors, there are many connections that do not. For example, when wiring an MATV system, line tapoffs (which usually constitute the majority of connections in a medium-to-large installation) have screw terminals and clamps for attaching coaxial cable.

Connectors for attaching the TV set to the output of the tapoff are commonly factory installed on the TV-signal cord set. Antenna, headend and line equipment generally do require cable connectors; however, they are usually supplied with the equipment and need not be purchased separately.

Tools are available at a nominal one-time cost that make connector installation fast and easy. In addition to a ferrule crimping tool, you should have a coax-cable stripper which effortlessly prepares coaxial cable for connectors. Available in two sizes, one for RG-59/U and RG-6/U coax, the stripper makes both cuts quickly and accurately. All that is left is to slip the connector onto the cable and crimp the ferrule.

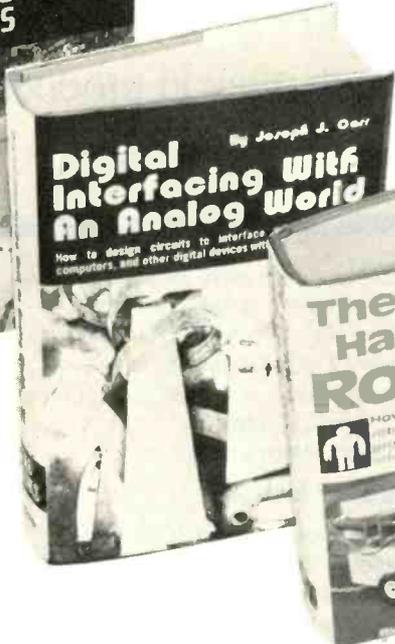
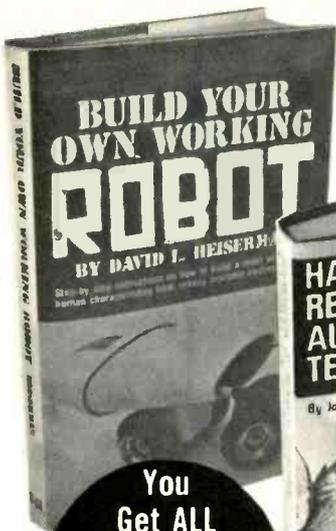
Professional MATV installers can install a connector in less time than it takes to prepare twinlead for conventional screw terminals. Coax can be spliced by using connectors. It is faster than twinlead which requires stripping, twisting and taping. Connectors provide a neat looking, *continued on page 45*

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The consumer electronics show

What's new in products for 1979

This year's review of the Las Vegas show revealed new products and new markets, plus a stern warning from the FTC to manufacturers to mind their warranty programs closer—or have someone do it for them.

By Richard W. Lay

Consumer Electronics Show Chief Jack Wayman called it a super event. And by virtually every standard it was: attendancewise, businesswise; and for the sheer weight of the number of consumer playthings and gadgets beginning to make their way a little closer toward the American home from both foreign and domestic factories.

The 1979 Winter Consumer Electronics Show in Las Vegas shielded by some 2,000 miles from the icy blasts of its previous home in Chicago, was by any standard indeed a success.

With over 50,000 visitors touring the exhibits during the four day show; with potentially new and lucrative consumer electronics markets beginning to appear over the horizon in several areas—including home (personal) computers; video tape recorder/players; improved television chassis design with greater horizontal resolution, more electronic tuning and brighter, more faithfully reproduced color, there was nothing afoot to dampen even the most pessimistic of those present. Right?

Wrong!

Because irony or ironies, who

should appear before this gathering of manufacturers, distributors, and buyers but a representative of the Federal Trade Commission whose message was, of all things, about that old manufacturers' bugaboo—Warranties.

Greater activity

And his message was clear and simple: In the future the Federal Trade Commission is going to be even more active in enforcing more equitable warranty contracts.

Speaking for the FTC was Lawrence Kanter. Many manufacturers in the home electronics industry still pay "far below" the going rate for warranty service, Kanter noted. "These manufacturers argue the servicer can afford to take a loss because he's building up future trade.

"I think this is bad business," Kanter noted, "and I also think two and three month's delays in reimbursement for warranty service are uncalled for and must be corrected.

"If the industry itself doesn't move to change these sore spots I think the states will and I believe you'll see more and more laws paralleling statutes now in force in Rhode Island."

Citing the auto industry as perhaps the most blatant offender of current warranty laws, Kanter nevertheless made it plain home entertainment electronics manufacturers in many cases still have a long way to go.

The Washington based attorney added that one primary reason states are developing their own warranty statutes is because many electronics manufacturers have failed to respond. Some states, Kanter said, are now getting active in the regulation of

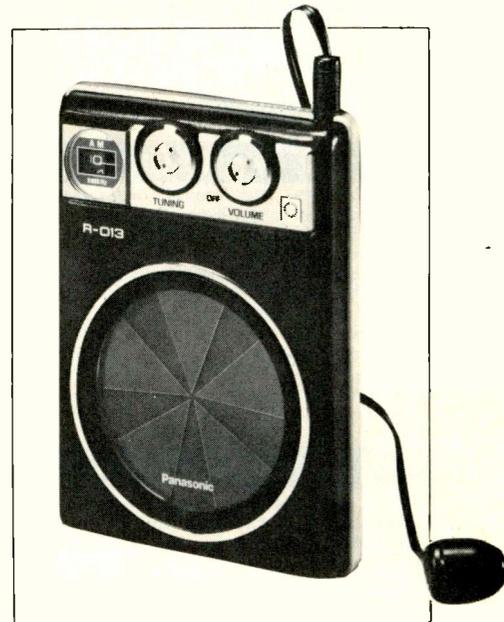


Fig. 1 Panasonic's solar powered AM radio was one of the many high technology products shown at this year's Winter CES held in January at Las Vegas. Exposing the front solar panel to the sun for four hours permits up to 35 hours of continuous operation, Panasonic reports.

so-called "extended service contracts," that is, contracts which continue warranty coverage for the consumer after expiration of the original contract.

A number of states, Kanter said, are currently considering placing such extended service contracts under the state insurance commissioner because of their close similarity to pure insurance. This impetus, he said, has apparently been generated from a number of manufacturers who have gone bankrupt while holding a large number of service contracts in force, thereby leaving the consumer holding an empty bag when it came to having warranty items repaired.



Fig. 2 Sharp showed the audio industry's first portable stereo radio/cassette deck with random access microprocessor control. The automatic program locate device allows the immediate selection of any program on the tape at the touch of a button. Suggested retail is \$320.



Fig. 3 Both Quasar and Pansonic showed a portable version of their VHS video tape cassette recorder/players at the winter show. Shown here is a model sporting Pansonic's new portable unit which, since it is not yet on the market, has not yet been priced.

Kanter stated that contrary to the dire predictions emanating from the audio industry, the impact of the enactment of the federal warranty statute some two years ago has led to the implementation of even more extended warranties—not fewer—as manufacturers use this gimmick as a very effective marketing tool in meeting their competition.

Record year

Last year, WCES attendees were told, was a record color television year with some 6.25 million units sold. Black and white came in with a solid 6.1 million (the best since '74), and there were over 400,000 VCRs sold in 1978 with some 600,000 expected to find their way into American homes this year.

All-in-all it was a great year for TV and 1979 will be close on its heels, according to the bullish statements made from the podium of the WCES business conferences.

According to the "experts" at the show, the best bets for expanding video related markets in consumer electronics seem to center on the VCR for the short term and the home (personal) computer in the longer run.

VCRs are projected for sales of up to 600,000 this year. And with industry giant RCA pouring some \$2-million into promotional campaigns during just



Fig. 4 Quasar's film-to-tape conversion system. It permits transfer of any film format—including 35 mm slides—to video tape. Thus users have the option of showing home movies or slides on their television screens, in color or black and white.

the first three months of this year, that seems to be a conservative estimate.

Incidentally, in case you've been wondering if there will be an American made consumer VCR on the market in the near future, apparently there will not. ET/D put that question to RCA's Jack Sauter recently and his response was that RCA prefers to concentrate on the more sophisticated "electronics" in the home entertainment area and to leave the quasi electronic/mechanical hardware to the Japanese.

There really wasn't that much new concerning VCR's at this show, the most significant being the miniaturization of circuitry by Matsushita to permit Panasonic and Quasar to come out with portable battery operated VCT/camera combos. Other than that the 7-day VCR programming machines we told you about at last year's WCES are now coming onto the market.

Perhaps the rosier—if not most ambitious—forecast to come out of the entire show—is that some day (no one said when) every American household is going to contain a small but powerful "personal" computer and that the personal computing industry is to be the next consumer electronics star.

Manufacturers of the personal computer systems who gathered in Las Vegas this past January for the

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meeting, have taken a giant step toward lifting the wrap of secrecy off of their products.

For the first time they have realized it is not the hardware itself, but rather the complementary software programs which allow the unsophisticated consumer to put their products to work. This is what is really going to permit the industry to grow.

More and more of the manufacturers are now out with program support for whatever hardware they offer. Almost all of them now offer such basic programming packages as banking and checking account handling; financial calculations, stock market analysis, and many other educational and game software applications.

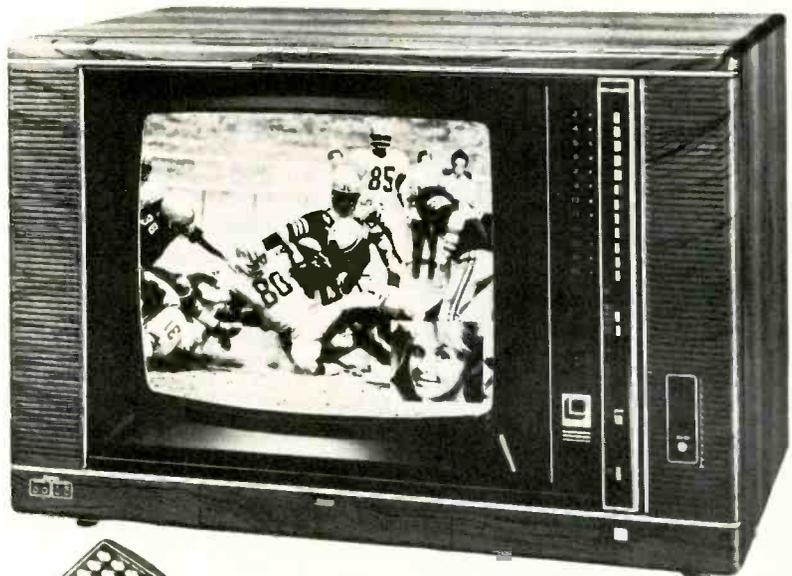
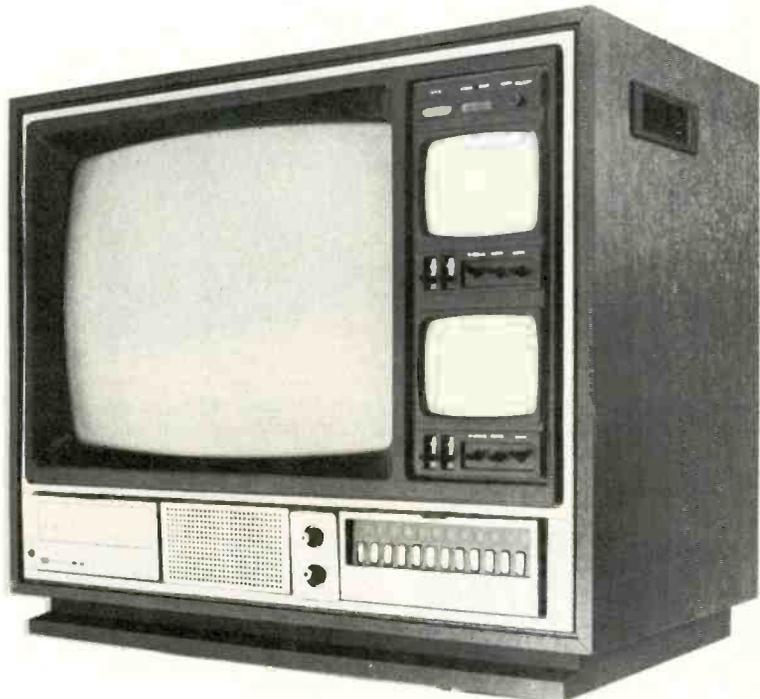


Fig. 5 Sharp Electronics again showed its "dual vision" television (above) which is just coming onto the market this month. A small black and white picture is superimposed over the larger color frame to permit ancillary viewing from closed circuit or other program material. However, Sampo Corp. of America went Sharp one better (at least) when it unveiled its "three screen" television set (top photo). In addition to the main 19-inch color CRT, Sampo provides the viewer with two 5-inch black and white screens. The unit is rated at 135 watts and is tuneable over the VHF range.

In effect, they've reached the point where the small computer, coupled with one of their own software programs, can now become a useful device for a consumer.

This is by far the most important contribution they've made to the industry in its four short years of life.

Large screen TV

While similar glowing predictions were heard for the large screen projection television industry, which, like home computers, is in its infancy, it seems to be stretching the point a bit to hope for 200,000 unit sales this year as one prognosticator indicated. This is especially true in view of the fact that 13 percent of the consumers who purchased large screens last year had to make structural changes in their homes just to fit it in.

At any rate, we at WCES were *continued on page 45*

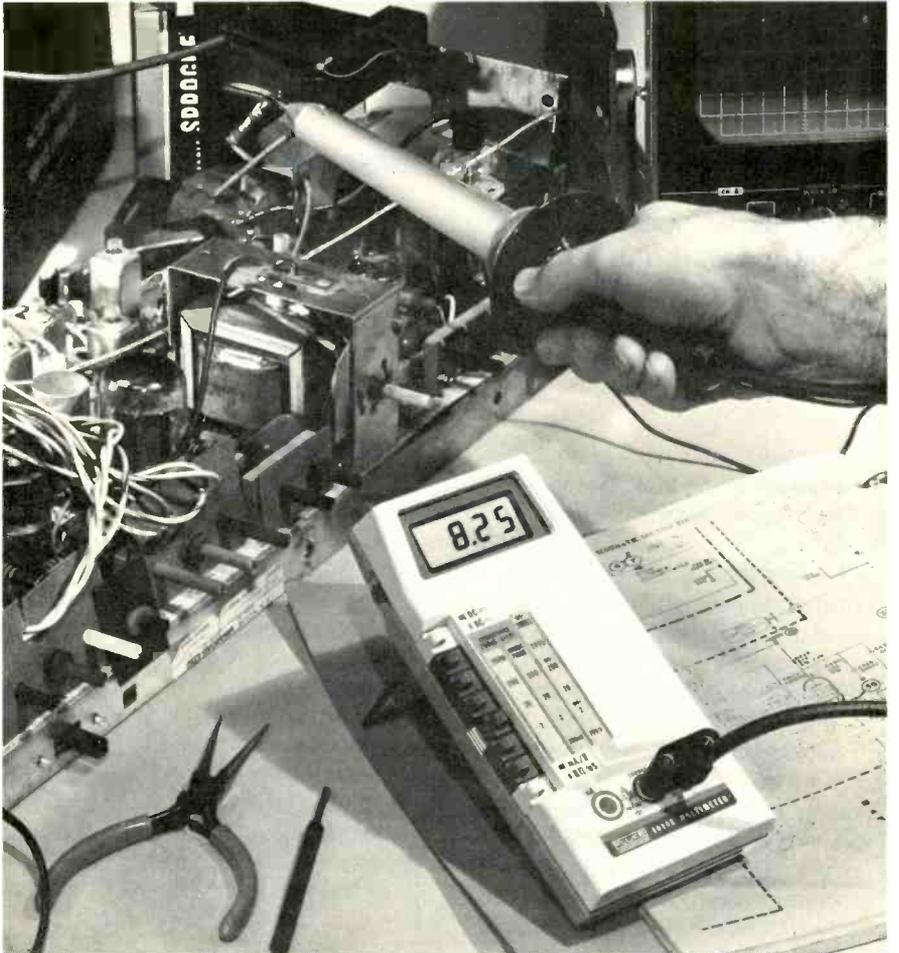


Fig. 6 Typical of the growing "home" and "personal" computer market is the influx of more and more competition. Here Atari (the TV game people) show their first entry into this still infant market.



Fig. 7 Matshusta Electric Company's newly developed one-gun color picture tube was displayed at WCES. Multiplexing of the Red, Blue, and Green signals, plus the absence of a shadow mask, permit operation at power levels 30 per cent below conventional CRTs.

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Circularly polarized T.V. signals

What they mean to the viewer

The most noticeable effect is at the viewing end where picture quality has been substantially improved, even with "rabbit ears."

U.S. broadcasters have been authorized by the FCC for more than a year now to transmit circularly polarized (CP) television signals. The principal benefit of CP over the usual horizontally polarized (HP) signal is a significant reduction in ghosting and in some areas increased market coverage—plus improved overall picture quality.

For those broadcasters choosing to convert to CP, it means doubling their present transmitter power and investing in a new transmitting antenna. But that's the broadcasters problem, what about the viewer? Does he need a new antenna and what are the benefits at the receiving end?

No!

Viewers do not need a new antenna. In fact, CP makes the existing antenna seem to perform better—especially those indoor set-top antennas.

What is CP?

Before we get into details, let's first understand what circular-polarization is and how it works. First, radio and TV signals are electromagnetic (EM) waves comprised of a magnetic and an electric field. The electric field is the one we're concerned with here. It has either a vertical or horizontal orientation (think polarization). AM broadcast, CB, fire-and-police 2-way radio all use vertical polarization (VP) of the electric wave. This we know from viewing the transmitting/receiving antennas which are mounted vertically; usually a vehicle

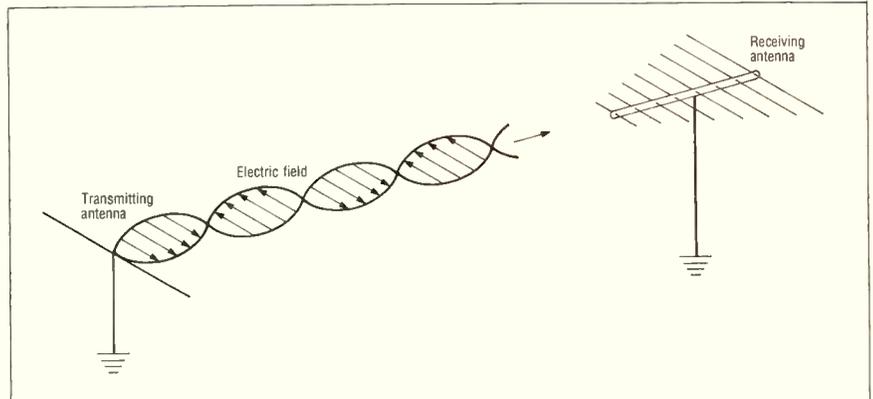


Fig. 1 Horizontally polarized field patterns.

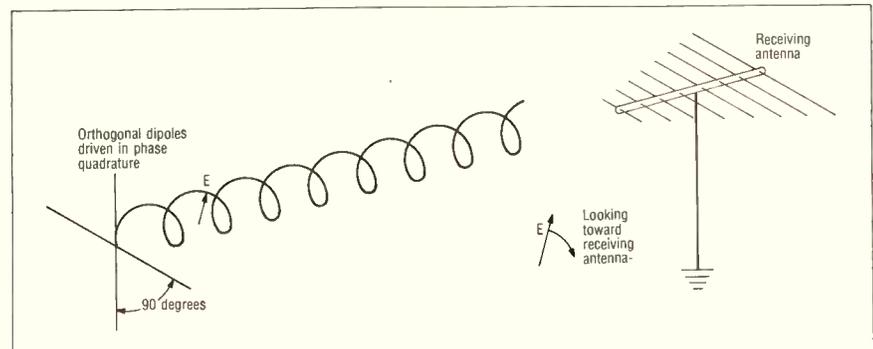


Fig. 2 Circularly polarized field pattern (right-hand rotation).

roof-mounted whip antenna. Television and FM broadcast, on the other hand, generally employ horizontally polarized antennas and, as you know from viewing residential rooftops, they are horizontally oriented; i.e. they are positioned in a horizontal plane.

Horizontally polarized electric-field signals also lie in a horizontal plane and the amplitude of the electric field varies sinusoidally as it propagates away from the transmitter (Fig. 1). Rotating a receiving antenna 90 degrees on its longitudinal axis (boom) will virtually null a received HP signal. A CP signal on the other hand rotates with a constant amplitude as its is propagated. The electric-field vector creates a pattern which, if it could be

seen, would resemble an auger-type wood bit (Fig. 2).

Circular polarization causes the electric field vector to rotate either with a right-hand or left-hand rotation as it propagates away from the transmitting antenna.

Looking at a circularly polarized wave, then at any particular instant the field vector may be anywhere in between a horizontal and vertical orientation as it rotates. And, therefore during one cycle of rotation it excites both the vertically and horizontally polarized antennas as well as those oriented between such as "rabbit ears" antennas adjusted at some angle as well as leaning or tipped rooftop antennas.

Circular polarization is not new. As the number of FM receivers in automobiles and portable radios have increased (both of which sport vertical whip antennas), FM broadcasters have switched to circular polarization to accommodate these new markets.

Benefits of CP

Benefits from circular polarization of FM broadcasts are essentially the same as those of TV except that in the case of the former the improvement is aural and the latter is visual.

The principal benefit to TV viewers, is reduced ghosting of the picture and, to FM listeners it is reduced multipath reception resulting in less distortion of the FM audio.

Those who stand to benefit the most from CP are those who have indoor antennas. These are the apartment dwellers, and residents who, by restrictive covenants, etc., are prohibited from using outdoor TV antennas.

Indoor antennas

For best reception of horizontally polarized TV broadcasts, "rabbit ear"

antennas should ideally be horizontal, but in a living room or apartment this would be impractical because the arms would extend 9 ft. overall if tuned to channel 2. Instead the user not only shortens the dipoles but raises them to about a 60-deg. angle from the horizontal so they take up less space.

Shortening not only reduces the capture area but detunes the antenna; raising the dipoles shortens their effective horizontal length even more.

If CP signals are broadcast, then that same antenna can be properly oriented at any angle because at some instant of the field-vector rotation cycle it will correspond to the angle of the antenna. However, instead of spreading the "rabbit ears," it would be better to stand them straight up and extend the telescoping arms to the proper 1/4 wave-length. A single vertical dipole would be best. It would generate just one signal voltage. There would be no phase difference to contend with as there would be if the "rabbit ears" were spread as they typically are.

In all, CP would substantially

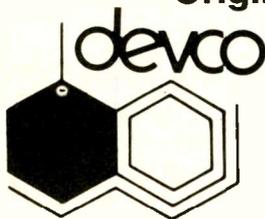
simplify any adjustment of indoor set-top antennas to produce a sharp, clear picture and conventional outdoor antennas would be fully compatible with circular-polarized signals. Signal voltages induced in conventional antennas, when properly pointed toward the transmitter, would be unaffected by antenna orientation even if they were rotated around an axis common with the boom.

Outdoor antennas

Finally, if you have a quality, properly installed outdoor TV antenna in good working condition, the pictures you receive should be every bit as good on CP broadcasts as they are on HP broadcasts. There is *no* need to buy a specially designed antenna to receive CP signals except in cases where you experience difficult reception problems involving such things as severe ghosting, co-channel and adjacent channel interference. However, in most cases ghosting problems can be solved with a special purpose anti-ghost antenna or a large highly directional one. In any event leave that determination to a qualified antenna installer/technician. **ET/D**

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A last look at Admiral

Circuit description and troubleshooting hints

Five chassis, used in 13, 17, 19, and 25 in color sets, all of basically similar, straightforward, design, comprise the '79 Admiral line.*

By Walter H. Schwartz

Since Admiral recently announced the phasing out of production and sales of television receivers in the U.S. (reported in November '78 ET/D), this will probably be the last examination of Admiral television to appear in ET/D.

The chassis all bear great similarity, differences generally being those to accommodate various size picture tubes and the different gun configurations. They also all resemble closely the 1978 26M55 and 27M55, in that they have abandoned the integrated circuit IF amplifiers and synchronous detector in favor of a discrete transistor IF and a diode video detector.

The 4M46 and 6M46 are essentially identical except for the CRT size which is 13 in. and 17 in. respectively. The 10M46 and 10M55 are also quite similar and use a 19 in. CRT. Also 10M46 145V B+ supply is regulated. These chassis all use in-line gun picture tubes. The 28M55 also is quite similar, the differences here being those necessary for a 90° negative matrix delta 25 in. CRT, i.e., pincushion and convergence circuitry. Other small differences exist in the 10M55 and 28M55 to accommodate the various turning systems available.

Tuning systems

The tuners used in the '79 Admiral are either varactor or strip or wafer units
*All illustrations courtesy Admiral Group.

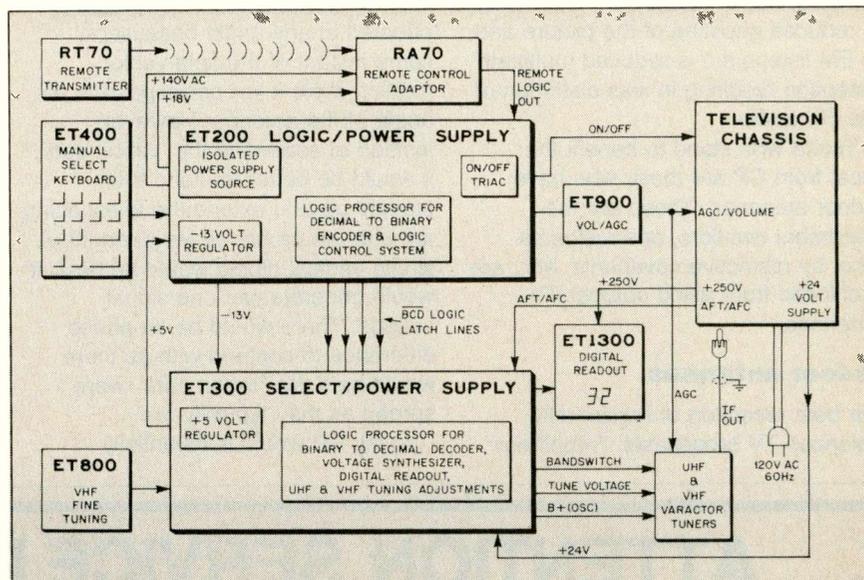


Fig. 1. The ET5 Tuning System.

for channels 2 to 13, and either varactor or 70 position detent tuners for UHF with several methods of overall control.

The standard detent tuners use separate tuners with separate knobs for each. The Uni-tuner uses one knob which alternately selects VHF and UHF channels with a VHF channel appearing between UHF channels. Since there are about six times as many UHF as VHF channels, each VHF channel repeats about six times. The twenty position control uses separate UHF and VHF varactor tuners. The single control selects any of the twelve VHF channels and any eight UHF channels.

The PV12 electronic tuning system uses twelve pushbutton switches, any of which can be set to any VHF or UHF channel by means of appropriate switching and channel tuning potentiometer adjustment. Four digital IC's respond to the closure of a momentary pushbutton switch to do the selection and give indication of the

channel selected.

Admiral's ET5 electronic tuning system is a direct address system which is operated by keyboard selection of the channel desired and then activating the selection process by pressing the SELECT button. At turn on it will return to the last channel and last volume level previously selected if power to the set has not been interrupted. The system assembly is modular; most service, at least in home, would most advantageously be performed by module replacement (see Fig. 1). The ET200 and ET300 modules may be replaced as may the M1300 digital readout, the ET400 manual select keyboard, the M900 volume/AGC assembly, the ET800 VHF fine tuning assembly, the RT70 remote transmitter and the RA80 remote adaptor.

The most common problem encountered would be improper tuning of one or more of the channels desired. The channel selection must be made following the proper

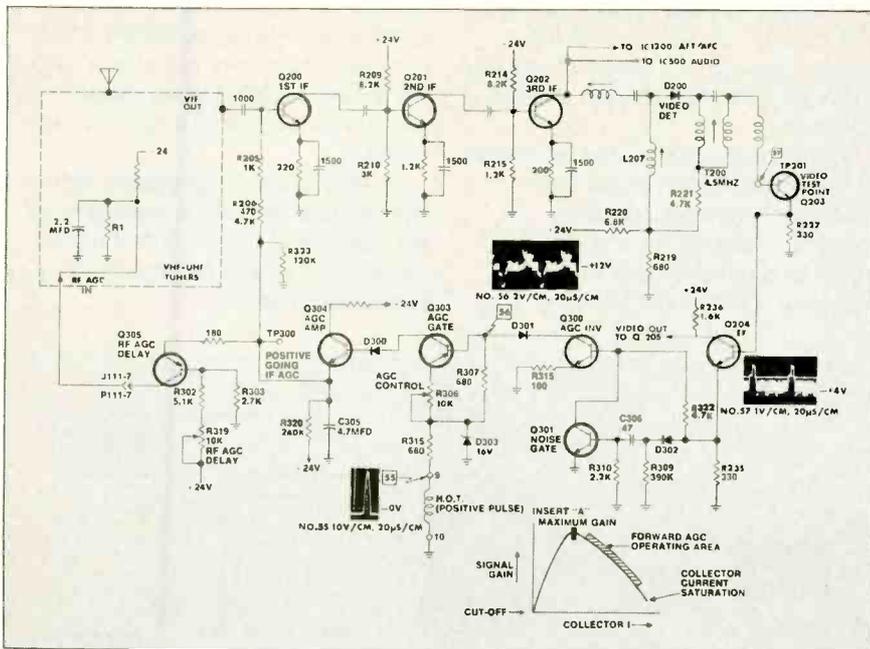


Fig. 2. The AGC/Signal Loop, Simplified Schematic.

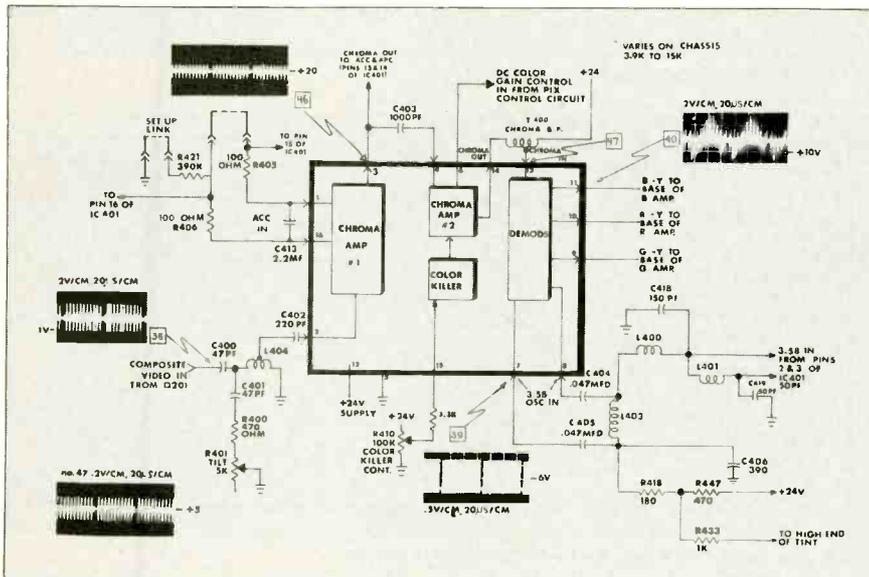


Fig. 3. Chroma Amplifier and Demodulator IC.

procedure. The VHF field adjustment follows; the UHF procedure is much more involved.

- 1) Push the UHF five tune/AFC control in (off) and rotate it to mechanical center.
- 2) Set all VHF preset controls to mechanical center.
- 3) Select the highest active VHF channel and adjust the VHF coarse tune for best reception.
- 4) Select the next highest channel and adjust the proper VHF preset. Continue for each channel in use.
- 5) Recheck—touch up coarse tune if necessary.

AGC/Signal loop

The AGC/Signal circuitry is intended to maintain a composite video of

about 2V p-p at TP201 (Fig. 2) under conditions from deep fringe to strong local signal without distortion of video or sync. This loop uses discrete transistors for all functions. The video used for AGC is taken from the emitter of Q203, to emitter follower Q204, from where it goes to the AGC inverter, Q300 and noise gate Q301. The positive pulses developed at the collector of Q303, the AGC gate, are applied to the base of Q304 to develop a filtered positive AGC voltage in the emitter circuit of Q304.

The overall performance can be checked reasonably well by disconnecting the antenna to observe weak signal conditions, the picture should be very snowy, and upon reconnecting the antenna, no overload

should occur. Switch on and off channel to observe horizontal and vertical as well as color, sync performance.

If the set overloads and the AGC control (R306) cannot remedy it, first check for proper flyback pulse at the center arm of the AGC control (10V p-p). Between channels the IF AGC should be about +3V and the RF AGC at the collector of Q305 should be about +1.5V. A snow-free picture should produce about +5.5V IF AGC and +3V tuner AGC. Overload and no such increase indicates AGC trouble.

If the problem is insufficient gain, again check the no signal tuner and ID AGC voltages. If they are incorrect check the voltage dividers which determine them. If they are correct the problem is in the IF, emitter follower, or tuner. Signal substitution will determine whether it is the tuner or IF. If the AGC voltages are ok without signal but high with signal the trouble is again in the AGC circuits.

AFT

All chassis use AFT. IC 200 accepts signal from the collector of Q202 and produces a differential control voltage between pins 5 and 8 for control of the tuner oscillator varactor.

Video

The video channel uses discrete transistors. From the video detector the composite video passes through an emitter follower which is followed by a second stage which acts as an emitter follower for the AGC and has a collector load for video take-off to another emitter follower, then to a video preamp which produces most of the gain of the Y channel, through the delay line and to the video driver which drives the emitters of the video outputs.

Troubleshooting is most easily done with a scope and a signal from a pattern generator, particularly in the case of smear or ringing. Improper voltages anywhere in the video channel will affect brightness.

Color circuits

IC400 is the chroma amplifier and demodulators (Fig. 4) IC401 is the subcarrier regenerator (Fig. 5). The output of the demodulator IC400 is fed to the bases of the R, G and B amplifier transistors.

The oscilloscope is the primary troubleshooting instrument for color trouble. To eliminate front end problems as a cause, burst should be

examined at the video detector, if IC substitution has not remedied the problem. Average color program material will probably average about .2V p-p at pin 2 of IC400 while color difference outputs at pins 8-9-10 should be about 3V p-p. 3.58 MHz input to pins 7 and 8 should be about 1.2V p-p to ground. Color gain is controlled by a DC voltage from the color controls on pin 6. The lower the voltage the greater the gain. (Also see Service Seminar this issue for color adjustments.)

Sync

Sync separation as well as the horizontal oscillator, horizontal APC and vertical countdown circuitry are contained in IC600 (Fig. 5). Troubleshooting sync problems if proper signals are present (a minimum of 2.8V p-p composite video at pin 5, and a 5V pulse somewhat integrated, on pin 2), consists primarily of replacing IC600.

Vertical sweep

The vertical sweep begins with a countdown from twice the horizontal frequency (31.5KHz) in IC600. The output pulse of IC600 discharges a Miller Sawtooth integration circuit (refer to Fig. 5). Q601 and Q602 then drive output transistors Q101 and Q102 which supply a sawtooth current to the yoke. Except for convergence and pincushion circuitry used in the 28M55 the vertical sections are identical from chassis to chassis. For troubleshooting sync, again *use your scope!* Look for output from IC600; if none substitute or look for about 2.8V p-p video in on pin 5 and horizontal sawtooth at pin 2. For no sweep, observe waveforms and make a quick voltage check at the emitter of Q101 or Q102 where about 50V indicates dc conduction.

Horizontal sweep

A properly synchronized horizontal square wave is produced at a frequency of 31.5 KHz and divided by 2 within IC600. The 15.75 KHz square wave output is fed to the horizontal driver transistor which in turn drives the horizontal output transistor. The circuitry is all fairly conventional including the horizontal output transformer, yoke and H.V. tripler (Fig. 6).

Horizontal sweep faults can produce a variety of symptoms. If either the ac line or B+ line fuses blow, first remove the horizontal output transistor

Q100 to be sure the horizontal output is at fault. If it is the cause of the trouble it usually is a shorted transistor Q100, an open damper or a shorted H.V. tripler.

Brightness problems may be caused by loading of the HV by the CRT because of improper operating voltages. Checking the HV with the anode lead removed is a valuable test. Note: CRT heater power is

derived from the horizontal output transformer. Always substitute a 56 ohm 10w resistor for the heater, on the socket mounted video output board when removing it from the tube for tests.

To quickly check for causes of low high voltage look at the waveform at the collector of the horizontal output transistor. If should be about 850V p-p *continued on page 45*

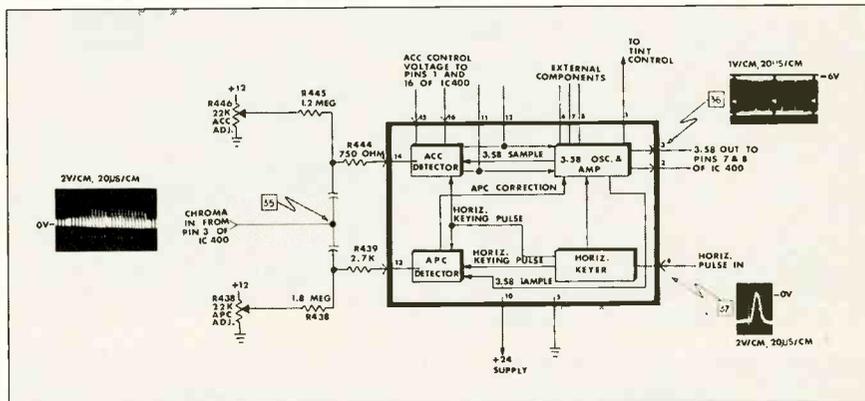


Fig. 4. 3.58 MHz Subcarrier Regenerator IC.

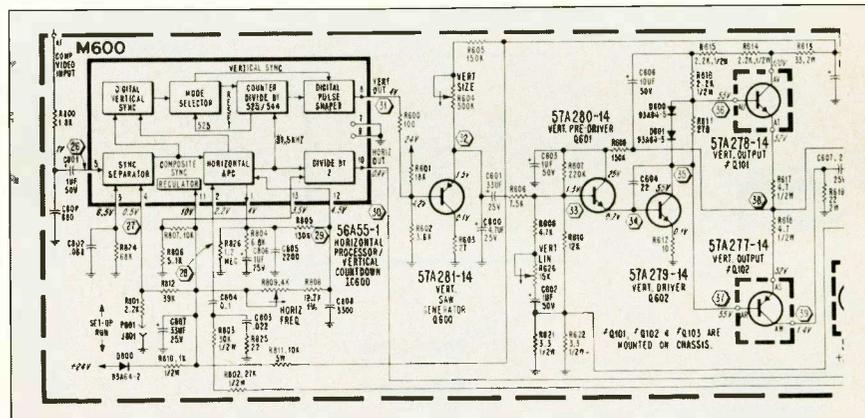


Fig. 5. The Sync Processor and Vertical Sweep System.

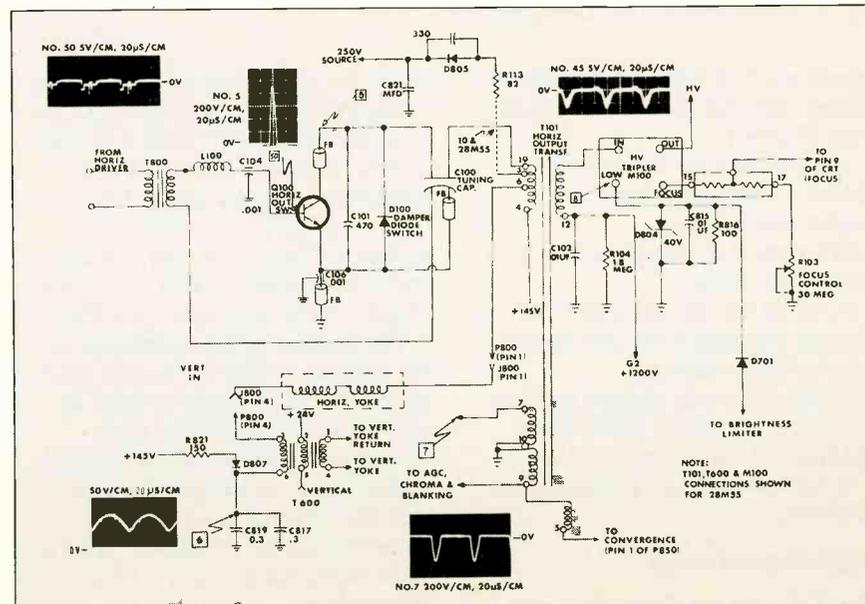


Fig. 6. The Horizontal Output Stage.

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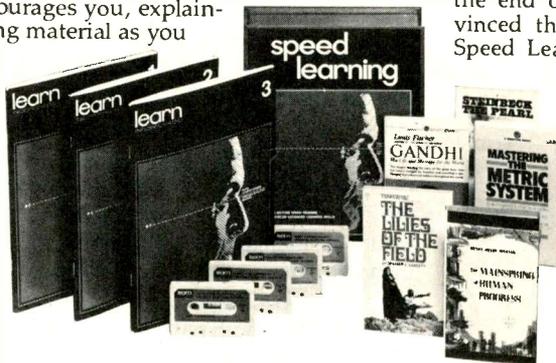
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TEST INSTRUMENT REPORT

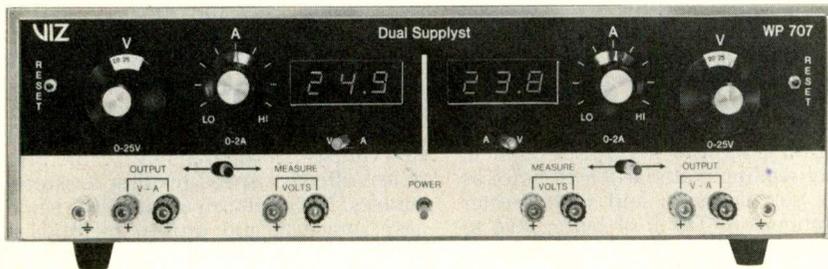
The VIZ WP-707 "Dual Supplyst" is a versatile version of a bench-top power supply ... and more. The unit, one version of four "Supplyst" models currently on the market, is actually two separate 0-25VDC supplies, plus two DC digital voltmeters. When connected in series (externally) they are capable of up to 50 volts of regulated DC at two amps.

dial we were able to swing the actual output on the various coarse ranges (under no load conditions) from .2 to 5.9; 4.5 to 10.6; 9.8 to 15.9; from 15 to 21.1; and from 20.6 to 26.7.

There are two front panel toggle switches. One, located directly below the digital display, permits the operator to monitor either the power supply voltage output or the current output by switching between the "V" or "A" positions. A lower toggle switch is for determining the mode of operation of the unit and cuts in one of two separate pairs of output/input jacks. When the switch is thrown in one direction the unit permits display of either the output voltage or current supply (depending on the setting of the upper toggle switch) and when in the other direction it cuts into the circuit the voltmeter input jacks. When used as a voltmeter, the unit is capable of reading and displaying DC voltages up to 99.9.

A separate and fifth output jack connects the unit to external ground. A current overload "reset" button comprises the final front panel control.

As we mentioned before the Dual Supplysts contain identical regulated units. Thus with this particular model one is capable of monitoring the unit's output current and voltage while at the same time working in the circuit under test with the second unit being used in the digital voltmeter mode. Also, to confirm proper operation of either of the units, or to monitor the voltage and current supply simultaneously, one unit may be connected as a voltmeter to the



For more information about this instrument, circle 150 on The Reader Service Card in this issue.

VIZ's Dual Supplyst

Two power supplies in one

By Richard W. Lay

Incidentally, the other members of the "Supplyst" family are: The WP 705, 50-volt Supplyst, the WP 706 25-volt unit, and the WP 708 "Triple Supplyst," which contains two 0-20VDC supplies plus a fixed 5-volt, four amp section.

However, the versatility of this particular VIZ unit is that each of the separate supplies has its own three digit, seven segment LED readout which is capable of monitoring output volts in tenths of a volt and amps in milliamps (i.e., there is a floating decimal point).

Thus one of the attractive features of the 707 is that it permits the operator the luxury (at the flip of a front panel switch) to monitor the loading effects on both the voltage supplied and on the output current. Because both of the units comprising the Dual Supplysts are identical, we will proceed with a description of only one unit with the understanding that it is exactly the same in operation and use as its companion unit.

In addition to the three digit LED display, the front panel contains all of the necessary controls for operation of the unit, except in the case of possible rewiring for use with 230VAC house current.

There are three front panel dials. One controls the current limiting function while the second and third control coarse and fine voltage adjustments. The coarse voltage is adjustable in five increments: 0-5, 5-10, 10-15, 15-20, and 20-25. Using the fine voltage adjust

Specifications

Output Voltage: 0-25V in five switched ranges, continuously variable between ranges; 0-2A

Output Current: 0-2A over entire voltage range; full load.

Load Regulation: 0.075% max. (0.1%, wp-706) over full operating range.

Line Regulation: 0.05% max. at full output voltage and current from 108 VAC to 130 VAC

Ripple: 10mv peak to peak, maximum
Overshoot: No overshoot at turn-on, turn-off or reset

Output Impedance: 1 ohm DC to 10KHz

Output vs. Temp: 0.01% per degree C

Load Protection: Current foldback & automatic shut down

DC Voltmeter Input: 99.9V DC full scale, 0.1V resolution

Input Impedance: 5 Megohms

Panel Meters: 3 digit .43" LED, resolution 0.1V and 0.02A, accuracy 1% ± 1 digit

Size (HWD): 4" × 15" × 9½" 10cm × 38cm × 24cm

Weight: WP-707 15 lbs.

Power Requirement: 110/120 50/60Hz
220/240 50/60Hz

output of the other while the first unit is used to monitor the current output to the load under test.

Another feature of the whole Supplysts family is current limiting ability of the units. By shorting the output leads together and rotating the current adjust dial (described previously), the operator is able to adjust a desired maximum output current on the digital display. Then, if the circuit under test requires more current than set for, the unit will automatically shut itself off and a LED indicator lamp in the digital display will light. Then if desired, the current limiter may be readjusted as desired, the "reset" button pressed, and the unit again becomes operable.

Each of the supplies in the dual unit is completely separate and fully isolated from the other and each contains four integrated circuits (not counting the readout displays) plus six transistors. Two sets of test leads with dual banana jack plugs are included in the Dual Supplysts \$299 suggested price. **ETD**

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1474-P
Dual-Trace 5" -30MHz Triggered Scope
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BULLETIN BOARD

The real world is analog; microprocessors respond only to properly prepared digital data. Methods must be found to convert the analog output of a transducer, a device that converts pressure, temperature, position, etc., to a proportional electrical signal, to something the microcomputer can process. "Digital Interfacing with an Analog World" by Joseph J. Carr explains the whole process, from selecting the transducer, through analog signal processing, to methods of converting the data to

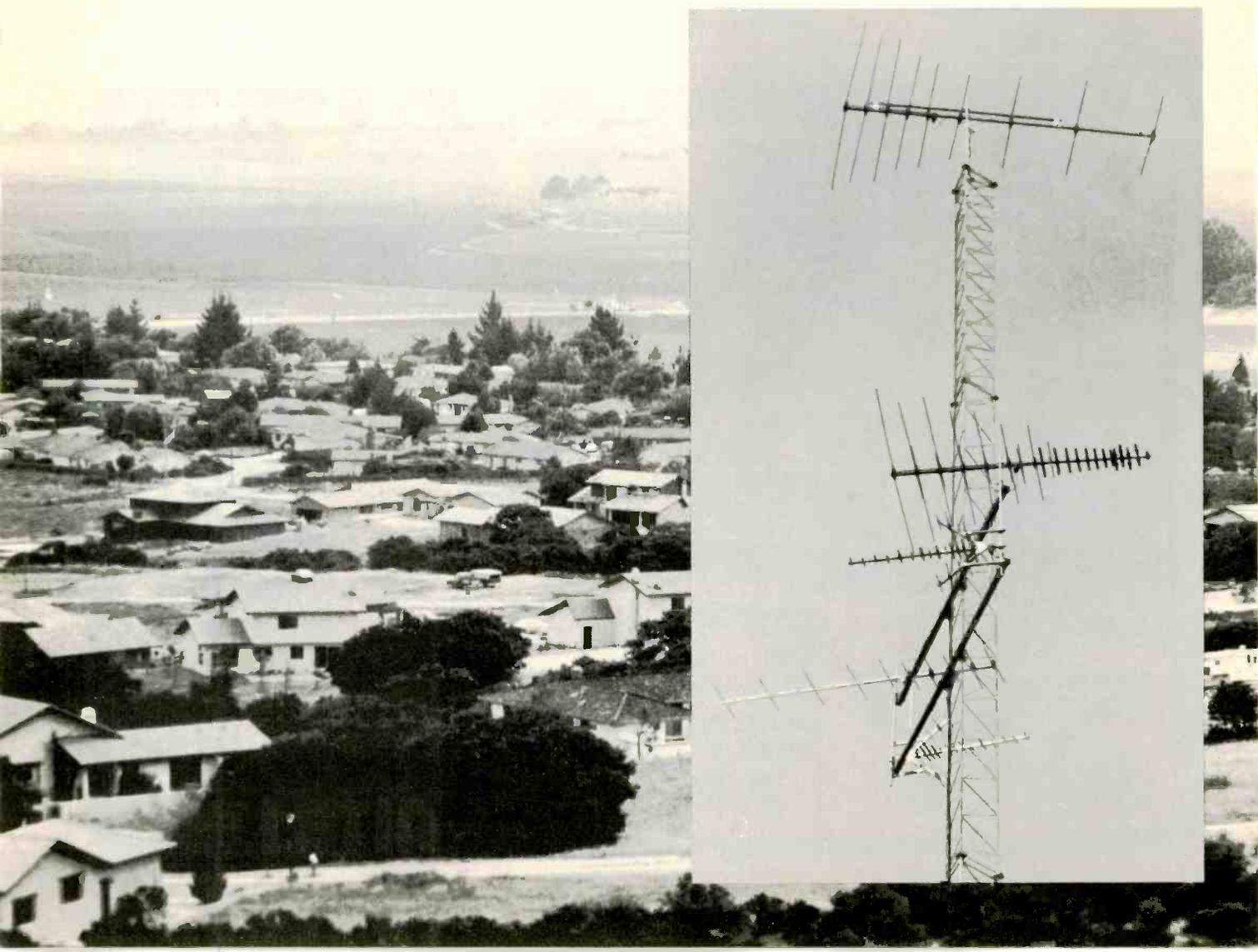
digital form and then when necessary into a form for real world control. Here is over four hundred pages of information on transducers, operational amplifiers, analog to digital converters, digital to analog converters, digital codes, multiplexing, data transmission and even automatic telephone dialing systems. It is available (paper), for \$8.95 from *TAB Books*, Blue Ridge Summit, PA 17214.

A new 100 page coil, filter and communications essentials catalog is now available from *J.W. Miller Division of Bell Industries*. Covered are RF coils, chokes, filters and related communications components, a broad line of high-pass, low-pass, audio and power line filters and new additions including SWR/power meters, an RF speech pro-

cessor and coaxial switches. Detailed specifications and schematic diagrams for all coils are given. Catalog 79 is free from all *J.W. Miller* distributors or from: *Bell Industries, J.W. Miller Division*, 19070 Reyes Ave., P.O. Box 5825, Compton, CA 90224.

A new 16-page short form catalog from *Vector Electronic Company* describes a broad range of bread board, prototype and production hardware. Emphasis is given to microprocessor boards, Plugboards[™] and prepunched boards, of which 120 are listed. The catalog also covers terminals, cases, kits and tools. It is available from *Vector* distributors, or write *Vector Electronic Company*, 12460 Gladstone Ave., Sylmar, CA 91342.

WINEGARD WORKS...



"Technician's Guide to Servicing Two-Way Radio" by Daniel K. Neely. This is a basic, fairly complete guide to the two-way radio field. It covers the setup of a service bench, necessary specialized test equipment, in vehicle checkout, repair of the various sections of the two-way unit, accessories, remote control systems and system installation. The author stresses the importance of the manufacturers' service manuals and the value of service bay, in-vehicle repair. The price is \$14.95 and the book is available from *Parker Publishing Co. Inc.*, Dept GC-501, Mail Order Sales, West Nyack, NY 10994.

A completely new catalog of tools for the electronic, electrical, maintenance, construction and communication fields

has recently been issued by Klein Tools. The 84-page catalog covers pliers, screwdrivers, knives, levels, wrenches, saws, cable cutters and other tools and a line of occupational safety equipment. Catalog #122 is available free from *Klein Tools, Inc.*, 7200 McCormick Blvd., Chicago, IL 60645.

A new catalog of test equipment has recently been issued by *Triplet*. It covers their line of V-O-Ms and accessories. Included are descriptions of eight versions of the popular 630 series, several versions of the hand-size 310 including an FET model, several examples of the extra rugged Model 60 series and new digital V-O-M's, the Models 3300 and 3400 as well as clamp on ammeter accessories, test leads, and carrying

cases. It concludes with a comparison chart of the complete line of Triplet V-O-M's. Catalog 1978-A is available free from Triplet distributors, or Triplet Corporation, Bluffton, OH 45817.

Transistor-Transistor logic is the most popular type of logic device today. The 5400/7400 family of TTL devices has been around for about fifteen years now so if you are not aware of it you should be, so buy a book. **"Transistor-Transistor Logic"** (2nd Edition) by George Glynn will not only familiarize you with TTL but will increase your general digital knowledge as well. It covers TTL as used for gates, inverters, flip-flops, decoders, shift registers—all the logic applications. Appendices list devices available, numbering systems,

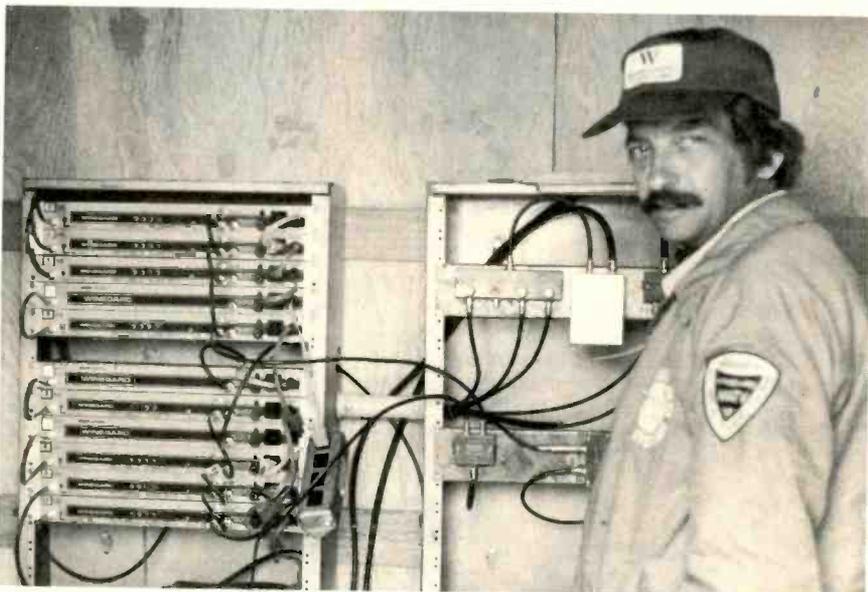
for an entire community.

Indian Springs, California, 85 miles from San Francisco, is a great place to live, but not for getting much television.

To help sell their 155-home development, the Jules Duc Construction Company planned a community MATV system. Dave Marsh, who had left a good telephone company job to go on his own as a TV antenna installer, got the chance to bid on the job. He got a set of blueprints of the site and designed a Winegard CLA system. "Then," Marsh recalls, "I sent the plan to Winegard where some improvements were made. I priced it out, submitted the bid, and got the job"

To get TV signals from San Francisco, a 70-foot self-supporting tower was put on the side of the highest hill in Indian Springs. Because of the inaccessibility of the location and the time requirement, Marsh hired a helicopter. The job that would've taken six men three days to complete was done by four men in two hours. Marsh installed five Winegard antennas on the tower: CH-2026 for channels 2, 4, and 5, CH-9055 for channel 81, CH-2008 for 8, CH-7082 for 11-36, and a CH-9055 for channel 46. Other equipment used included: AC-0926 preamp; ME-26 tuned for channels 2, 4, and 5; DX-0302, DX-0303, DX-0304, DX-0305, DX-0306, DX-0308, DX-0309, and DX-0311 strip amplifiers; Three VC-4213's; CL-22 and CLA-121 line amplifiers; CT-1001, CT-1002, CT-1004 drop-taps; AF-0500, IP-6, IP-12. IVB voltage block and CL-2800 cable.

"As the homes would go up I'd pre-wire them," Marsh said. "I'd go in right after the electrician and just before the drywaller. Each house received three outlets." With-



Dave Marsh, owner of AA Antenna Systems in San Jose, California, shows off the Winegard MATV headend he installed to service 155 homes in the Indian Springs housing development. Reception is reported to be excellent although this is a very difficult signal area.

out the Winegard system only two stations, channels 8 and 46, would've been available to the homeowners. As a result of the system each homeowner now receives channels 2, 4, 5, 8, 9, 11, 36, 46 and 81. Marsh credits the assistance he received from his Winegard distributor, and the Winegard District Manager, in helping him establish

his business. "Everytime I had a problem I'd call on Winegard and they spent the time to get things straightened out," Marsh stated.

Winegard has products that work, and the experienced personnel who work to help dealers solve the toughest TV reception problems.

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system design guidelines and a glossary of logic terms. Published by *Howard W. Sams and Co. Inc.*, the cost is \$6.95 (paper) available from your Sams' distributor.

An Audio-visual cassette line catalog has recently been published by The *Professional Products Department of Sharp Electronics* covering the firm's line of cassette products designed for educational and industrial use and featuring the seven Sharp models currently in the line. A comparison chart lists all of the specifications of each unit. Copies of the catalog may be obtained free from: Robert Garbutt, Sharp Electronics Corporation, 10 Keystone Place, Paramus, N.J. 07652.

Heathkit catalog 843, Winter/1979 has just been released. It covers the complete line of Heathkit products including a new 35 MHz oscilloscope, a new Weather Computer, a microprocessor-based weather station, and the Heathkit continuing education series including new programs on test equipment use. For your free copy write the *Heath Company*, Benton Harbor, MI 49022.

A 16-page catalog of Oscilloscopes and accessories has recently been published by Gould. Five oscilloscopes from a 50 MHz dual trace model at \$1795, to a 10 MHz dual trace unit at \$595, are featured in detail. All are portable models, compact and light in weight. A storage oscilloscope and accessories such as carts, carrying cases, front panel covers, viewing hoods and rack mounting kits for the entire line are also listed. Copies are available free from *Gould Inc., Instruments Division*, 3631 Perkins Ave., Cleveland, OH 44114.

Literature and samples of a new design of nylon cable ties from Andfel Corp. are now available. Meeting UL and MIL specs they are said to reduce cost by 20% or more over conventional cable ties. *Andfel Corp.*, 2350 Fulton St., Chicago, IL 60612.

A continuing series of "Supper Seminars" is being conducted by The Antenna Specialists Company. These seminars presented to groups of from 25 to 100 include a one hour presentation of state-of-the art antenna information and an informal supper, permitting discussion and exchange of ideas. These meetings are conducted throughout the country on a prescheduled basis. For information on scheduling contact *The Antenna Specialists Co.*, Professional Products Division, 12435 Euclid Ave., Cleveland, OH 44106. **ETD**

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Automatic Telephone Dialer
Circle No. 151 on Reader Inquiry Card

An automatic dialer which can, reportedly, call up to 32 numbers at the touch of a button, has been introduced by *Webcor*, a division of Leisurecraft Products, Ltd. The Dial-A-Tron can be acoustically coupled to the telephone eliminating the need for electrical connections, and a built-in speaker allows anyone in the room to hear incoming conversations. The unit can store up to a ten digit number and so also can be used to store social security numbers, birth dates and similar data. The suggested retail price is \$150.

Ultra-Compact Scanner Receiver

Circle No. 152 on Reader Inquiry Card

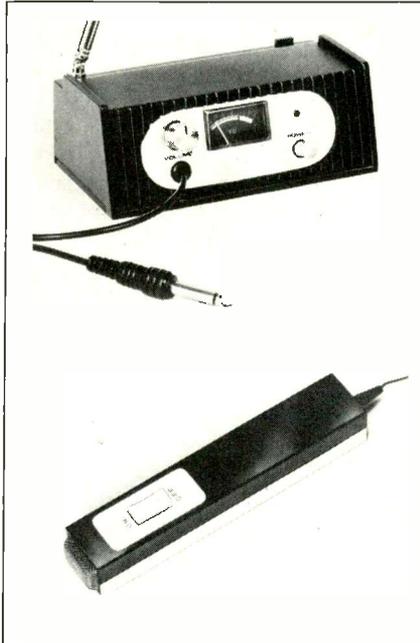


The "world's smallest scanner radio" according to *Electra* is their "Bearcat Thin Scan." Featuring an all metal case

and weighing 10 ounces, the manufacturer feels it will be particularly popular with professionals and others using scanners under demanding conditions. The Thin Scan covers four channels and receives both low band and high band with a flexible "rubber ducky" antenna supplied. Wire antennas can be used.

Wireless Microphone

Circle No. 153 on Reader Inquiry Card



Mura Corporation now offers a wireless microphone system consisting of a 100 milliwatt transmitter and a matched receiver operating in the new 49MHz walkie-talkie band. Both units are crystal controlled and are powered by 9V transistor batteries. The receiver output has a quarter inch phone plug for connection to a PA mike input and a VU meter to monitor the transmitter.

PA Amplifiers

Circle No. 154 on Reader Inquiry Card

Three solid state public address amplifiers are now being manufactured by *Perma Power Electronics, Inc.* Model S-302 is a mobile and marine amplifier which plugs into the lighter socket of most cars or can be wired into the vehicle's electrical system. Reportedly it can deliver 32 watts output at 5% thd into 8



ohms. The Model S-402 is an ac powered unit with background music capability and paging override. The manufacturer states it can power up to eight speakers and operates from 12V dc for emergency use. The S-702 is a portable amplifier designed to operate, according to *Perma Power*, for 200 hours on one set of alkaline "D" cells. It delivers 35 watts nominal battery powered output.

Marine CB Antenna

Circle No. 155 on Reader Inquiry Card

Antenna Specialists now has available a new marine CB antenna specifically designed for small boats. It features a two hole swivel ball mounting for sloping deck or side mount and is of half-wavelength design to eliminate the need for a ground plane. The fiberglass whip



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Circle No. 125 on Reader Inquiry Card

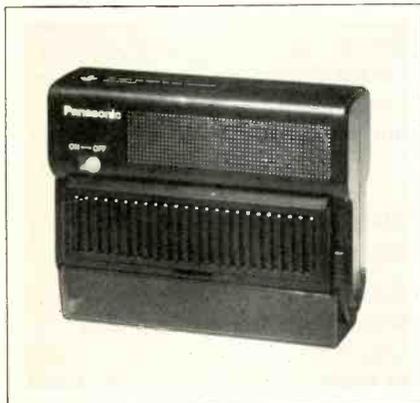
Circle No. 108 on Reader Inquiry Card

is four feet in length, white in color and comes complete with mounting hardware and six feet of coaxial cable with a PL-259 installed. The suggested user price of the Model ASM-251 is \$29.95.

Record Cleaner

Circle No. 156 on Reader Inquiry Card

A battery operated record cleaner, employing the "double clean" method, has been introduced by *Panasonic*. Designated the BH-651E, it uses the "double clean" method which uses a



rotary brush to collect dust from the record surface and deposit the particles in a built-in dust box. According to *Panasonic*, the rotary brush's thin bristles (0.05mm) collect dust without bruising the record surface or causing static electricity—like the record, the brush is made of PVC. The brush turns at 3000 RPM and is battery operated.

Cordless Telephone System

Circle No. 157 on Reader Inquiry Card

An average effective operating range of 1/3 mile is reported for *Fracom/Rovafone's* Model 2500/B cordless telephone system. The hand held remote



weighs 28 ounces and features touch pad pulse dialer, 16 digit memory of last number dialed, automatic redialing, and up to 40 hours of stand by time between battery charges. The system includes the base, remote, carrying case, 2 antennas, Ni-Cad batteries, remote charger, base power module and a modular line cord, and is approved for direct connection to a single phone line. The suggested price is \$649.95.

Ultrasonic Alarm

Circle No. 158 on Reader Inquiry Card

Master Lock now offers an ultrasonic burglar alarm called Ultrason-II which reportedly automatically adjusts to distinguish between random room disturbances and actual intrusion. It can signal via existing house wiring by means of a special FM-coded signal to optional satellite repeaters located remotely. The Ultrason-II has a 15 second delay to allow the owner to enter and disarm it without actuating the alarm, and outlets for controlling auxiliary lights, sirens, flashers or other devices.



Digi-Scale

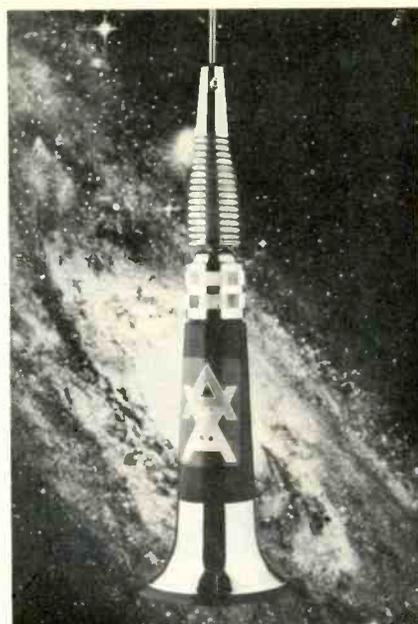
Circle No. 159 on Reader Inquiry Card

Webcor Division of Leisurecraft Products has introduced a LED, Electronic Digital Scale which can register weight to one-tenth of a pound on a lightweight digital readout unit which can be hand-held or wall mounted. The *Webcor* Digi-Scale, Model #100, has a retail price of \$49.95.

Swivel Base CB Antennas

Circle No. 160 on Reader Inquiry Card

A new line of CB antennas including "Quick Swivel" models for mounting on inclined surfaces is available from *AVA*. The 700 Series antennas include roof mount models, the 710 trunk mount, the

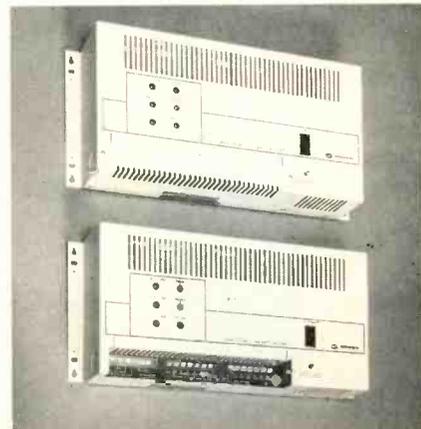


730 magnet mount, the 740 mirror mount, the 750 hatchback and the 760 hood mount models, all available with the "Quick-Swivel" feature, 17 feet of cable and a quick-disconnect PL-259 connector. Specifications include stainless steel whip and hardware, triple chrome plated bases, factory installed in-line connectors and SWR of 1.7/1 or better over 40 channels.

Wall or Rack PA Amps

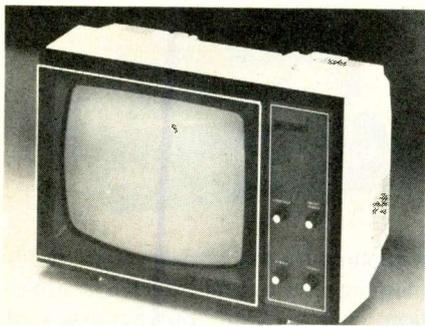
Circle No. 162 on Reader Inquiry Card

Bogen Division of Lear Siegler, Inc., has recently announced the TU Series of public address amplifiers designed to interface with telephone lines and for wall or 19" rack mounting. The three fully solid state models, with power ratings of 35, 60, and 100 watts, have 600 ohm line input transformers, three input channels, 25V, 70V, and 16 ohm outputs, individual input and master volume controls, separate bass and treble controls, front panel circuit breaker, output



stage thermal circuit breaker and can be powered from 120V 60Hz line or 48V dc.

Low-Cost Video Terminal
Circle No. 163 on Reader Inquiry Card



A black and white 12-inch video monitor is offered by *Micro Products Unlimited*. Specifications include: 12Mhz \pm 3dB video bandwidth, 75 ohm input impedance, minimum 650 line resolution in central 80% of CRT, 550 lines beyond. The list price is \$139.00. Dealer inquiries invited.

Record Care Products

Circle No. 164 on Reader Inquiry Card

The *Cecil Watts* line of record care products has been repackaged in a new uniform gold and ebony design giving all the



Watts products a family identity for the first time. Among the products in the Cecil Watts line are the Dust Bugs; the Preener, a self humidifying velvet pad for manual groove cleaning and the Manual Parastat a broom of nylon bristles between two velvet pads. Cecil Watts products are marketed in the US exclusively by Empire Scientific.

Cassette Deck Head Cleaner

Circle No. 165 on Reader Inquiry Card

The *Allsop 3* cassette deck cleaner simultaneously cleans the head, capstan and pinch roller of a cassette deck. A special solution is applied to the pads of the *Allsop 3* before it is inserted into the player. Once inserted, the deck play

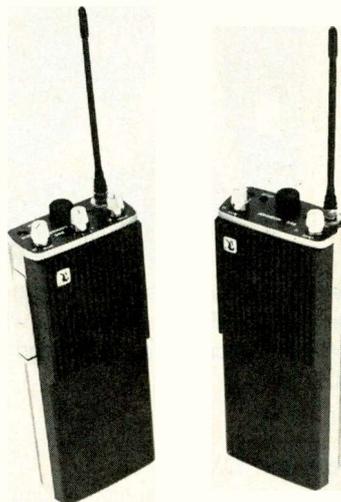
function is operated for 20 to 40 seconds to clean. Suggested list price is \$5.95.



Handheld UHF FM Transceiver

Circle No. 166 on Reader Inquiry Card

The Radio Products Division of the *E.F. Johnson Company* has announced the addition of the FM548 to its economy portable product line. The FM548 with 1, 2 or 4 channels in the 450-512MHz range is reportedly available with two power levels, 1.25 or 4.0 watts. It can be used as a handheld, as a portable with a separate push to talk microphone, or as a compact base unit. Optional accessories include: callguard tone squelch, external speaker/microphone, earphone, six unit battery charger, base station consol/charger, leather carrying case, mobile charger and stub antenna. Made in the USA, it carries Johnson's one year warranty on both parts and labor. **ET/D**



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offers more
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Model
DP-50

- Reveals pulse presence to 50MHz
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- Multi-family, compatible with TTL, DTL, RTL, CMOS, MOS, and HiNIL
- Clearly displays in-circuit logic activity
- Memory mode to "freeze" pulse display
- Pulse mode to "stretch" short pulses
- 2 megohm input impedance
- Typically detects pulses to 10 nanoseconds
- Overload and reverse polarity protected

The new B&K-PRECISION DP-50 50MHz digital probe simplifies the troubleshooting and analysis of all digital circuits by clearly displaying in-circuit logic activity and pulse presence.

This compact instrument includes every important logic probe feature and more. Three bright LED indicators display pulse presence and high- and low-logic states. Unlike ordinary logic probes, the DP-50 digital probe will continue to indicate pulse presence to 50MHz.

Available for immediate delivery at your local distributor.



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Circle No. 106 on Reader Inquiry Card

ET/D - March 1979 / 41

NEW PRODUCTS



Portable Isolation Transformer

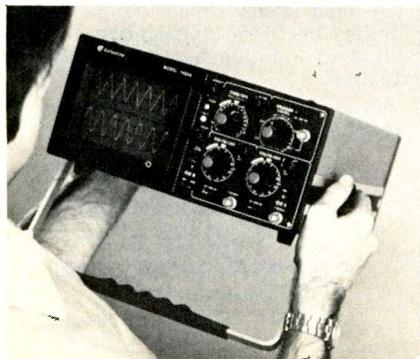
Circle No. 133 on Reader Inquiry Card

VIZ Mfg. Co. has just introduced a compact, low weight isolation transformer portable enough to be carried on service calls. Called the Porta-Isotap it is rated at 150VA continuous and weighs eight pounds. It offers a non-isolated output rated at 500VA for a light, soldering iron, or test instruments, and comes with accessory cords that allow it to be plugged into the interlock connection on the back of the TV set.

Dual Triggering Oscilloscope

Circle No. 133 on Reader Inquiry Card

A 20MHz dual trace instrument with a unique, reportedly exclusive, independent dual triggering capability is the latest addition to *Ballantine Laboratories* line of general purpose oscilloscopes. The model 1032A has ten trigger modes including independent dual triggering which permits simultaneously viewing two asynchronous waveforms.



Intended for portable operation the 1032A has die-cast front and rear frames for strength and rigidity and a tight all aluminum case for RFI shielding. The construction is modular for easy maintenance; the circuit boards are removable or replaceable in less than five minutes and replacements are available as pre-tested assemblies. Front switches plug in without cables and all replacement parts are off-the-shelf, none are proprietary. Specifications include a 20MHz (3dB) passband, sensitivity from 5mV/div to 20V/div and sweep speeds from .5 sec/div to 1 μ sec/div. A 2.5 to 1 sweep vernier is provided and a X10 magnifier function is included. Display models include, channel 1 or 2 only, chopped or alternate dual trace, channel 1 plus or minus channel 2 and X-Y. The price is \$895.

Miniature Electric Drill

Circle No. 134 on Reader Inquiry Card

The Iso-Tip Electronic Technician is a small lightweight electric drill of $\frac{1}{8}$ in. capacity from *Wahl Clipper Corporation*. It is intended for circuit board revision, solder removal, lead hole cleaning and

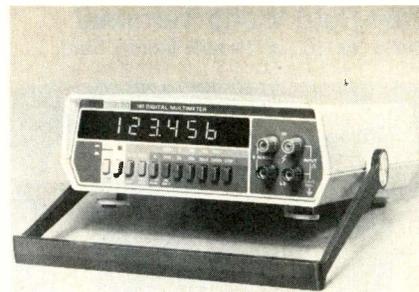


other such jobs. Its speed is approximately 9,000 RPM and it comes with a collet chuck, 4 collets and #56 and #71 drills.

Precision DVM

Circle No. 135 on Reader Inquiry Card

A microprocessor based 5½ digit multimeter has recently been announced by *Keithley Instruments*. The 191 is a manual ranging bench instrument with dc volts and ohms standard; an ac volts plug in is optional. The measuring ranges are from 200mV to 1000V full scale ac and dc volts and to 20

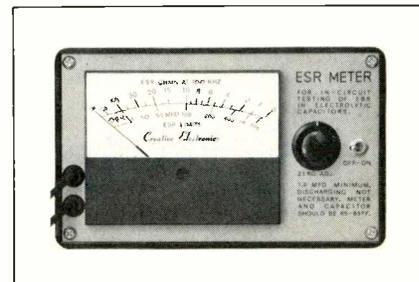


megohms resistance with 1 μ V and 1 milliohm sensitivity and 0.0005% resolution. Twenty-four hour accuracy at 22-24°C is reportedly as good as .004% + 1.5 digits on dc volts. Other features are push button null which stores the displayed reading in memory and displays subsequent readings as deviations from it, and 2/4 terminal ohms. Accessories available are ac volts option, RF probe, 50-ampere shunt, 200 ampere clamp-on current probe, 40 KV HV probe, mounting kits, carrying cases and test leads. The price of the 191 is \$499, the ac option is \$175.

In-Circuit Capacitance Tester

Circle No. 136 on Reader Inquiry Card

An in-circuit electrolytic capacitor tester has recently been announced by *Creative Electronics*. Called an ESR meter because it measures the equivalent series resistance of electrolytic capacitors, it reportedly will locate dried out electrolytics and intermittent opens in-

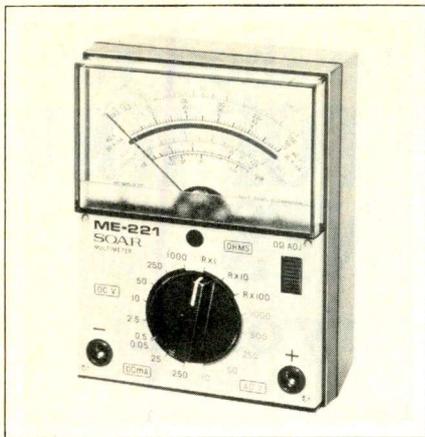


stantly and in circuit. The manufacturer states that its field failure research discovered these two problems account for 99% of today's field failures. The specially scaled meter also indicates potential failures by indicating relative electrolyte dryness. It is stated that the ESR meter can increase productivity and profits for the typical service shop by 5%. It is priced at \$79.50.

Low-Cost Multimeter

Circle No. 137 on Reader Inquiry Card

Soar has recently introduced a new low cost analog multimeter which is stated to be drop-proof, utilizing a U.S. made taut-band meter movement which repor-



tedly can absorb shocks to 50 G's. Small and light (11.6 oz.), the meter features a 95° mirrored scale and ranges from .5 to 1000V dc, 10 to 1000V ac, dc current to 250mA and ohms scale X1, X10, and X 100. The stated accuracy is $\pm 3\%$ dc and $\pm 4\%$ ac. The price is \$30.00.

Digital Capacitance Box

Circle No. 139 on Reader Inquiry Card

A digitally switched capacitance substitution box with a range of 100pf to 99.9999 μ F in 100pf steps has been in-

ADMIRAL

continued from page 32

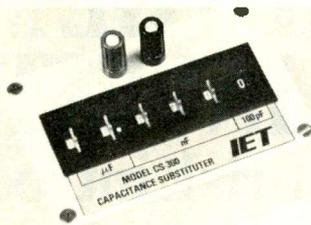
in M47 series and 950V p-p in 10 and 28M55 chassis and have a base width of about 12 microseconds. If it is too wide the HV will be low but the picture will be wide. If it is narrow the picture will be narrow but the HV will be high. If the pulse amplitude is low the HV will be low and the picture will be narrow. Abnormal pulse width is caused by a problem in the components that make up the output resonant circuit; insufficient amplitude is usually caused by low 145v B+ or resistive loading of the output circuit which may also cause the horizontal output transformer to overheat.

Intermittent breakdown of the HV tripler can cause overheating of the horizontal output transformer. Improper mounting of the horizontal output transistor, failure to use proper heat transfer compound, can cause premature failure.

Power supplies

All chassis use a half wave +145v supply for a basic B+ source. The 10M46 chassis uses a series regulator in this supply. All chassis also use a scan derived +24v supply and a 6.3v RMS scan derived voltage for the CRT heaters. This is a complex waveform with about a 120v peak

roduced by IET Labs, Inc. The Model CS-300 C-box uses six thumb wheel switches and 4% 100 volt capacitors in a high impact plastic case. The price is \$99.95.



Portable Microfiche Reader

Circle No. 140 on Reader Inquiry Card

More and more service data is becoming available on microfiche; *Information Technology, Inc.*, has just introduced a new portable microfiche reader, The Fichette which can deliver a crisp bright image under normal office lights, according to the manufacturer. It is suitable for field use weighing 3 pounds and is 8 x 10 x 2 1/2 inches in size in its case, including storage for 12 microfiche. The price is \$149.00. **ET/D**

value limited by zener diodes. The 10M55 also uses a scan derived +65v supply for the vertical output transistors and the 10/28M55 use a scan derived +250v source for the RGB output transistors. Loss of either the +145v supply or the +24v supply will result in a dead set. A sixty Hz hum bar or raster distortion can occur because of poor +145v filtering. **ET/D**

REBUILDING TUBES

continued from page 19

Each tube is now "spot-knocked" with voltages ranging from 45-to-70-KV and "aged" for fifty minutes at voltages many times higher than will be experienced in actual use in a TV chassis (Figure 8).

The aging process

Aging equalizes the emission levels of all three guns, and activates the total surface of a cathode to peak emission level. If a tube is not aged in the plant, it will age in the set, requiring constant adjustment of tracking. Cathode currents are automatically measured and recorded during the aging process.

Each tube is then checked again for gas ratio and loaded in a test set where it is subjected to a battery of tests and measurements for high voltage stability; G-2 cutoff; red, green, and blue purity; convergence; screen blemishes, white

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Model FS-73
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PL-259 for RG8U Cable

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4 Pin Mic Connector

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10-99 Qty. .80

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Adapta PL-259 to Motorola plug
or RCA type phone jack.

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phone jack

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UHF/VHF Splitter with
Matching Transformer

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10-99 Qty. 1.40

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UHF/VHF

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10-99 Qty. 1.50

Model SP 803
UHF/VHF/FM

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Model FS-72
Heavy Duty Clip Leads
Two each of 5 different colors
22" long lip to lip

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Matching Transformer
75-300 ohm

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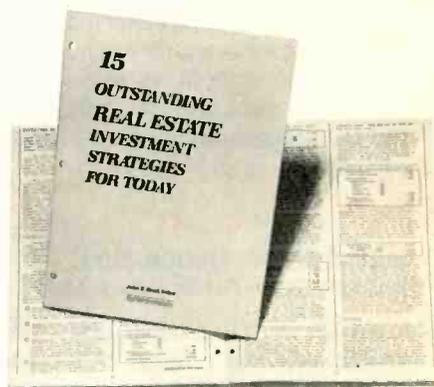
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H91604

field uniformity; anode leakage; G-3 leakage; G-2 RGB leakage; G-1, RGB leakage; heater-cathode leakage; zero bias emission and focus resolution.

It takes two pounds of resin to properly bond a 25 inch tube. The tube then "cures" for 80 minutes, during which the resin hardens. However, we find that some tube rebuilders economize on this operation. They either just tape the faceplate into position with no resin at all or inject resin only into the corners. Such shortcuts make the faceplate merely cosmetic, and provide no implosion protection at all.

Implosion protection

The rimband system, which is becoming more prevalent, employs a two piece metal frame that encloses the perimeter of the tube face. The frame is cemented to the tube with a continuous coating of epoxy, and then banded by a high strength metal strap, tightened to 2,000 pounds pressure per square inch. A combination of the compression and the bonded frame provide the implosion protection. Examination of duds entering our plant reveals that many rimband types have been rebuilt without epoxy, and without steel bands of sufficient tension. Again, implosion protection is sacrificed in the interests of economy . . . at the expense of the dealer's and consumer's safety.

It is also important to note that some rebuilders may not remove their rimbands or bonded faceplates and therefore, can not heat the tube sufficiently during later stages of manufacture, particularly when the tubes are again put under vacuum. This process not only makes the tube dangerous to handle but also makes for a very short life reliability.

After the tubes have received the proper implosion protection system it is then sprayed with an external coating of dag, and dried in an infrared oven. (The internal coating, covering the tube from gun anode to screen, maintains equal voltage so that there is no electrostatic field to deflect beams from desired paths. The external coating, when grounded, provides a built in capacitor, with internal coating, for the anode circuit). An anti-corona spray is applied around the anode button. This is a high resistance, high moisture absorbing paint, that helps prevent anode leakage to the external coating.

Lot samples of each day's production are selected for various quality checks, including physical appearance, low voltage performance on commercial tube checkers, high voltage

characteristics, and X-ray emission.

After still another round of 100% electrical and visual inspection (including rise time emission, gas ratio, gun inspection, tube face and resin quality) all tubes are bulk packaged and taken on a 70 mile road test at highway speeds over roads of varying quality. Each individual tube is *again* checked and tested for gas ratio, leakage (all grids), screen appearance, G-2 cut off and peak cathode emission RGD. These final tests take place after the completed tube has been held in inventory for at least three days, enough time to detect any slow gas leaks that can affect tube emission and life.

It has taken a total of 17½ hours to make the tube!

Major brand tube remanufacturers require their tubes to exceed new tube quality standards. For example, the "Opti-Vue" tube allows only .020 inch (twenty-thousandths of an inch) blemish on the screen where the prevailing new tube allowance is as large as .050 inch. Many rebuilders can not afford the equipment required to make measurements of this kind. But, the tubes of major brands follow UL's safety test requirements. **ET/D**

COAXIAL

continued from 22

mechanically and electrically reliable joint that can be separated and reconnected hundreds of times if necessary. Separation may be necessary when troubleshooting the system or adding equipment such as splitters, pads or line amplifiers.

Next time you make a trip to your distributor, ask him to show you the advantages of coaxial cable over twinlead; and have him explain how it can actually *increase* your profits. **ET/D**

CONSUMER SHOW

continued from 27

given this brief profile of the "typical" large screen projection television purchaser:

—Current owners are in the upper 2 percent income bracket;

—They average 26 hours of TV watching per week, which approaches almost twice the national average;

—Most are males who like watching sports first and movies second;

—And, as noted, 13 percent of them made structural design changes in their homes just to fit these units in.

How much of a market there really is for this type of plaything is certainly a question for debate. As for ET/D, we'll just wait and see. **ET/D**

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		15 1588 .25
		15 1885 .20
		15 2078 .25
		15 2093 .45
		15 2473 .20
		1N 34 .15
		1N 60 .15
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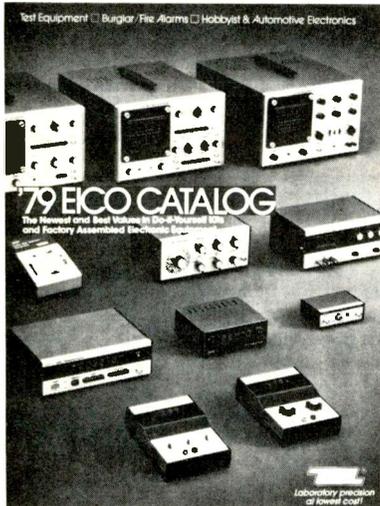
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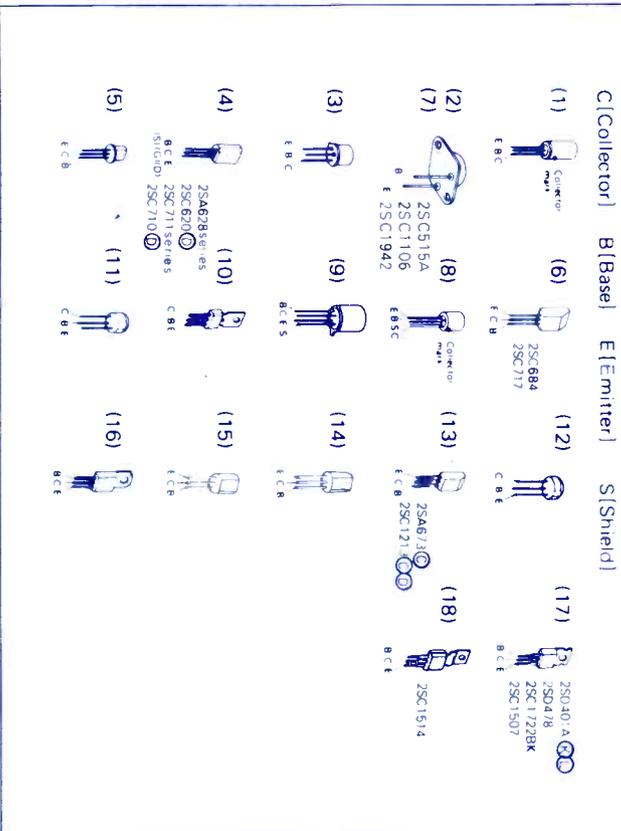


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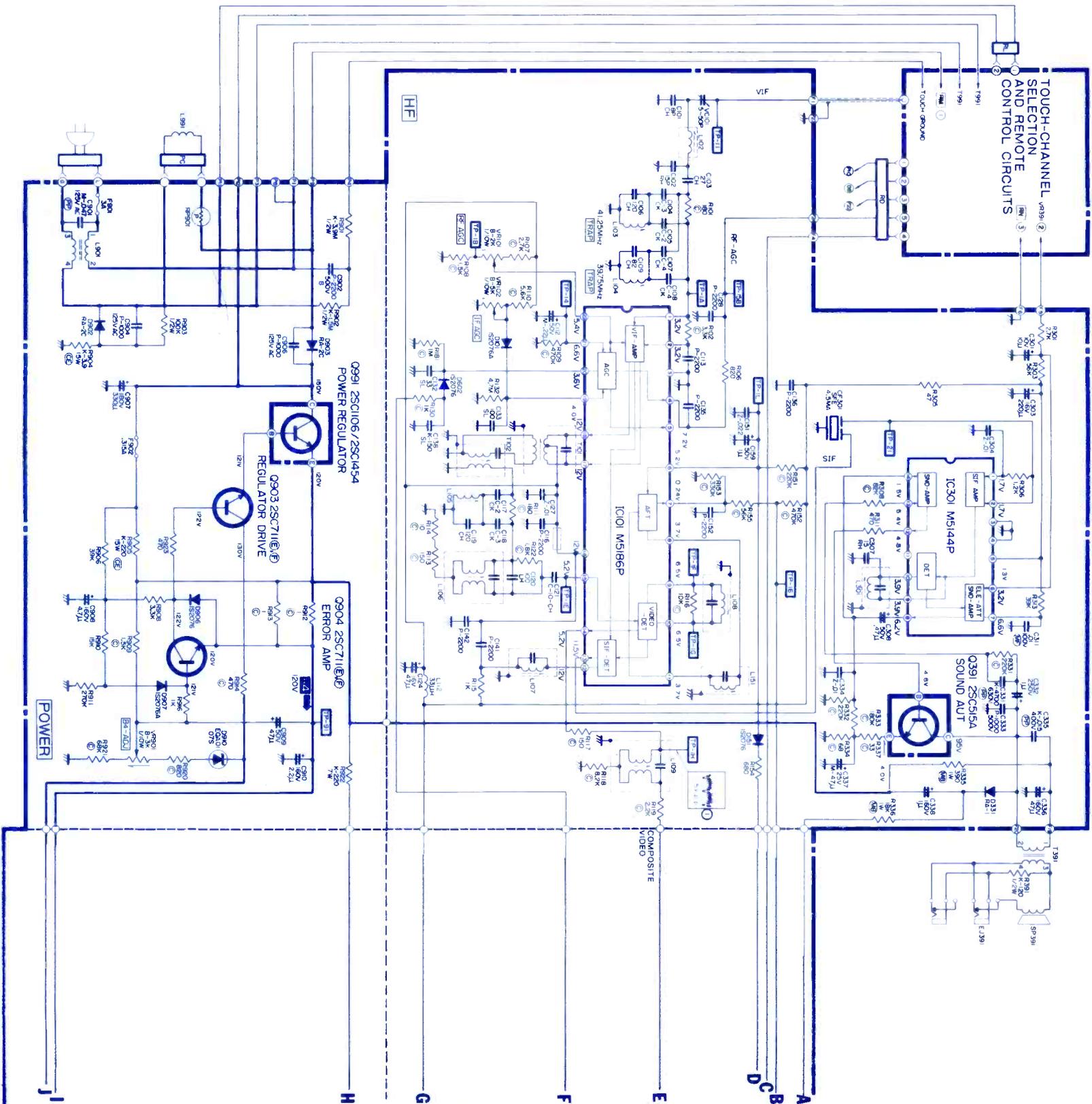
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2SA628(E)(F)	//	2SA628(C)(D)	4
2SA628(F)	//	2SD401A(K)(L)	17
2SA673(C)	13	2SD478	//
2SC620(D)	4	2SC711A(F)(G)	4
2SC711A(E)	//	2SA628A(D)(E)(F)	//
2SC711(E)(F)	//	2SC1722BK	17
2SC710(D)	//	2SC1507	//
2SC1514	18	2SC711A(G)	4
2SC1213(C)(D)	13	2SC1942	2
2SA673(D)	13	2SC515A	7
2SA628A(E)(F)	4		
2SC1106	2		

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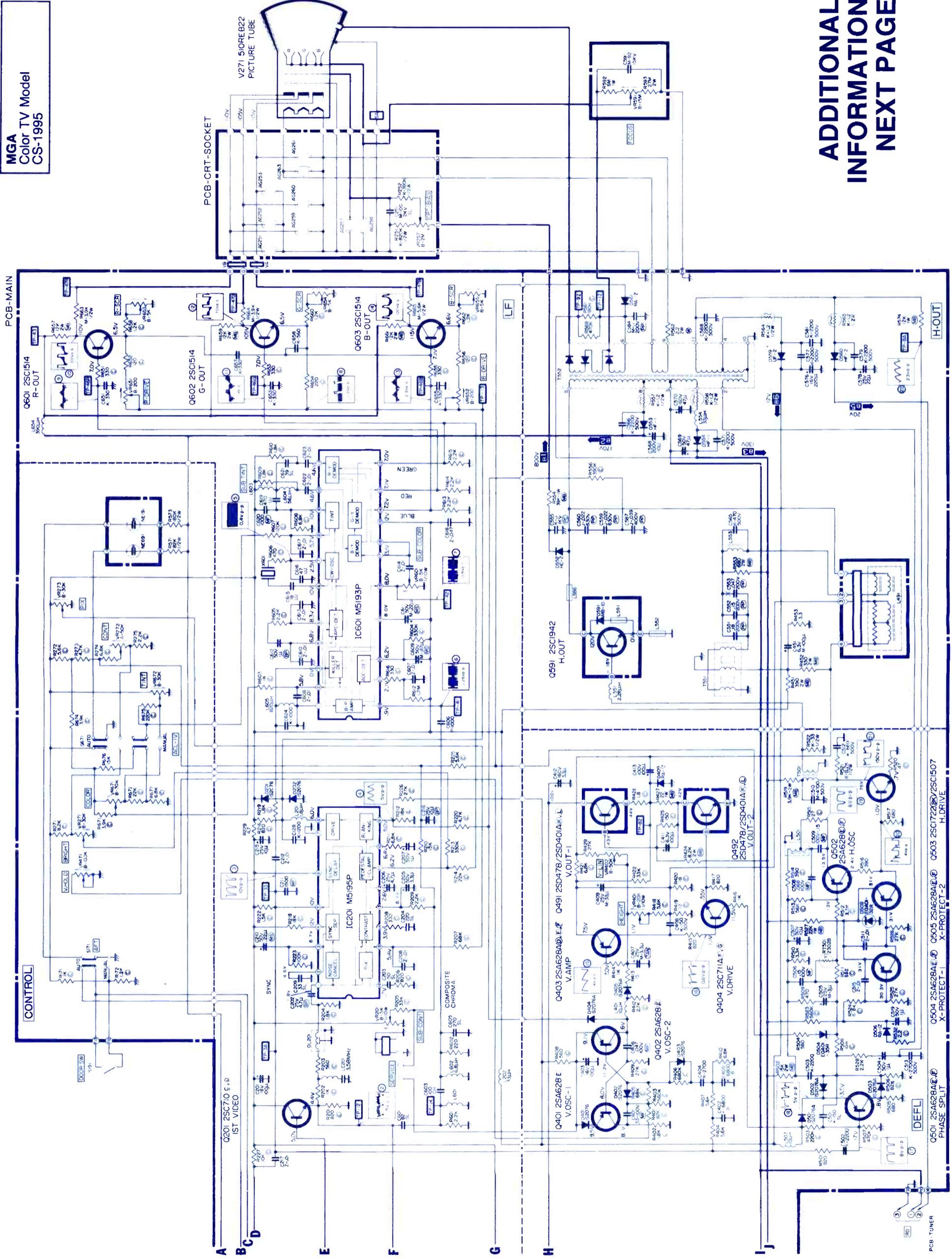


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MGA
Color TV Model
CS-1995



**ADDITIONAL
INFORMATION
NEXT PAGE**

TOUCH CHANNEL SELECTION AND REMOTE CONTROL CIRCUITS

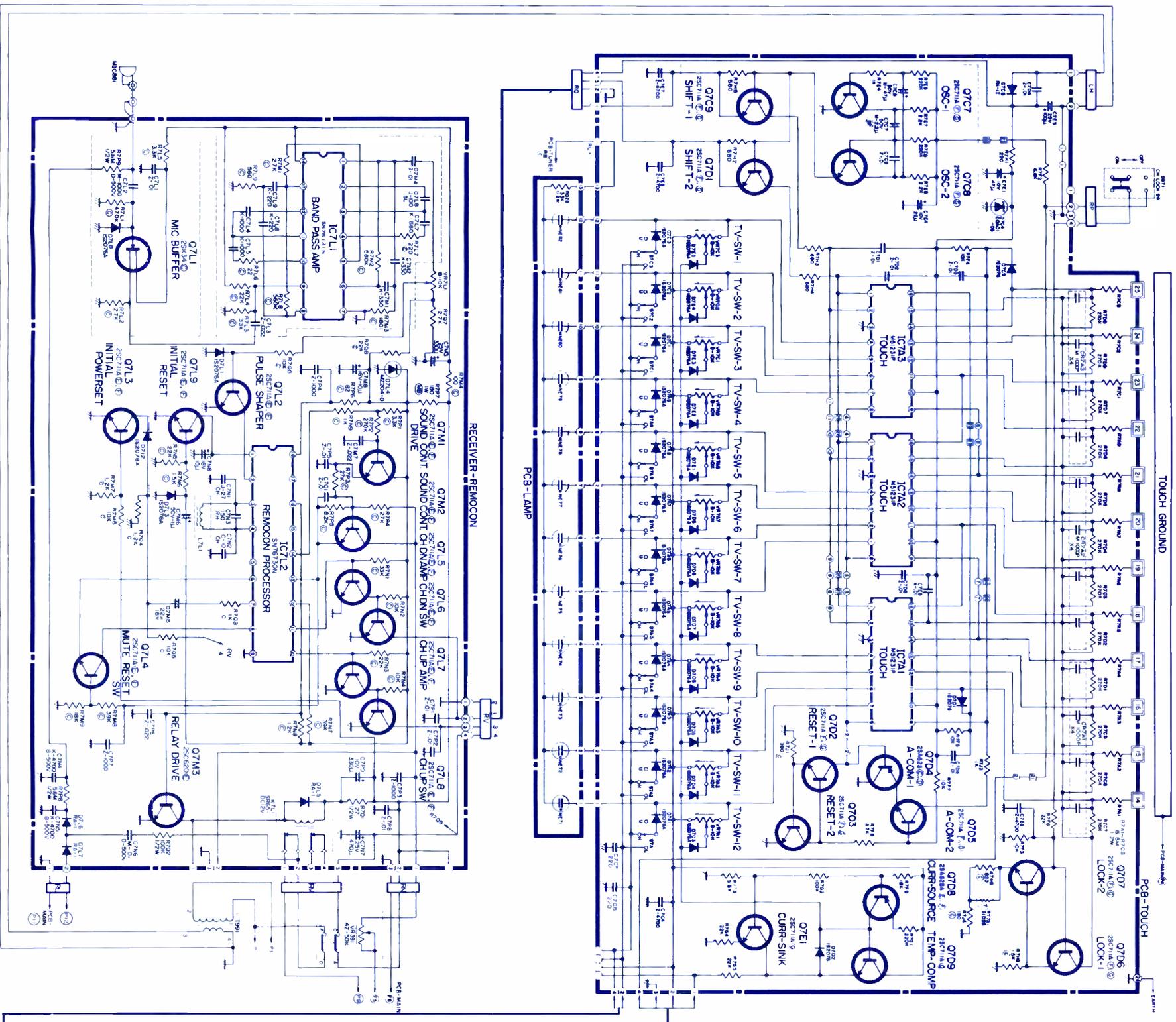
VOLTAGE TABLE FOR PCB-TOUCH, PCB-TUNER, AND RECEIVER-REMOCON.

DC voltages were measured from each semiconductor lead to the circuit ground with a bulb voltmeter.
Line voltage at 120V AC on signal applied.

PCB-TOUCH				
SYMBOL NO.	DESCRIPTION	C	B	E
Q7C7	OSC 1	0.1	0.64	0
Q7C8	OSC 2	4.9	4.6	7.0
Q7C9	SHIFT 1	6.5	7.0	7.0
Q7D1	SHIFT 2	6.5	7.0	7.0
Q7D2	RESET 1	3.1	1.2	0.8
Q7D3	RESET 2	1.2	0.6	0
Q7D4	A COM 1	0	3.1	2.3
Q7D5	A COM 2	6.0	2.8	2.3
Q7D6	LOCK 1	4.8	0	0
Q7D7	LOCK 2	3.8	1.88	0.95
Q7D8	C-SOURCE	0.6-28.5	0.96	0.38
Q7D9	T-COMP	33	0.6-28.5	0.6-28.5
Q7E1	C-SINK	0.5-28	1.21	0.65

PCB-TUNER				
SYMBOL NO.	DESCRIPTION	C	B	E
Q7W0	AFT-1	20	6.5	5.8
Q7W2	VBH-SW	15	14.3	15
Q7W3	UR-SW	15	0.7	0
Q7S0	VBL-SW	15	14.3	15
Q7S1	AGC-SW-V	7	7.3	7
Q7S2	AGC-SW-U	7	7.3	7

RECEIVER-REMOCON				
SYMBOL NO.	DESCRIPTION	C	B	E
Q7M1	TOUCH	1	2	6.5
Q7M2	TOUCH	3	4	0
Q7M3	TOUCH	5	6	0.03
Q7M4	TOUCH	7	8	3.1
Q7M5	TOUCH	9	10	6.0
Q7M6	TOUCH	11	12	6.0
Q7M7	TOUCH	13	14	4.7
Q7M8	TOUCH	15	16	3.7
Q7M9	TOUCH	17	18	4.8
Q7M10	TOUCH	19	20	3.8

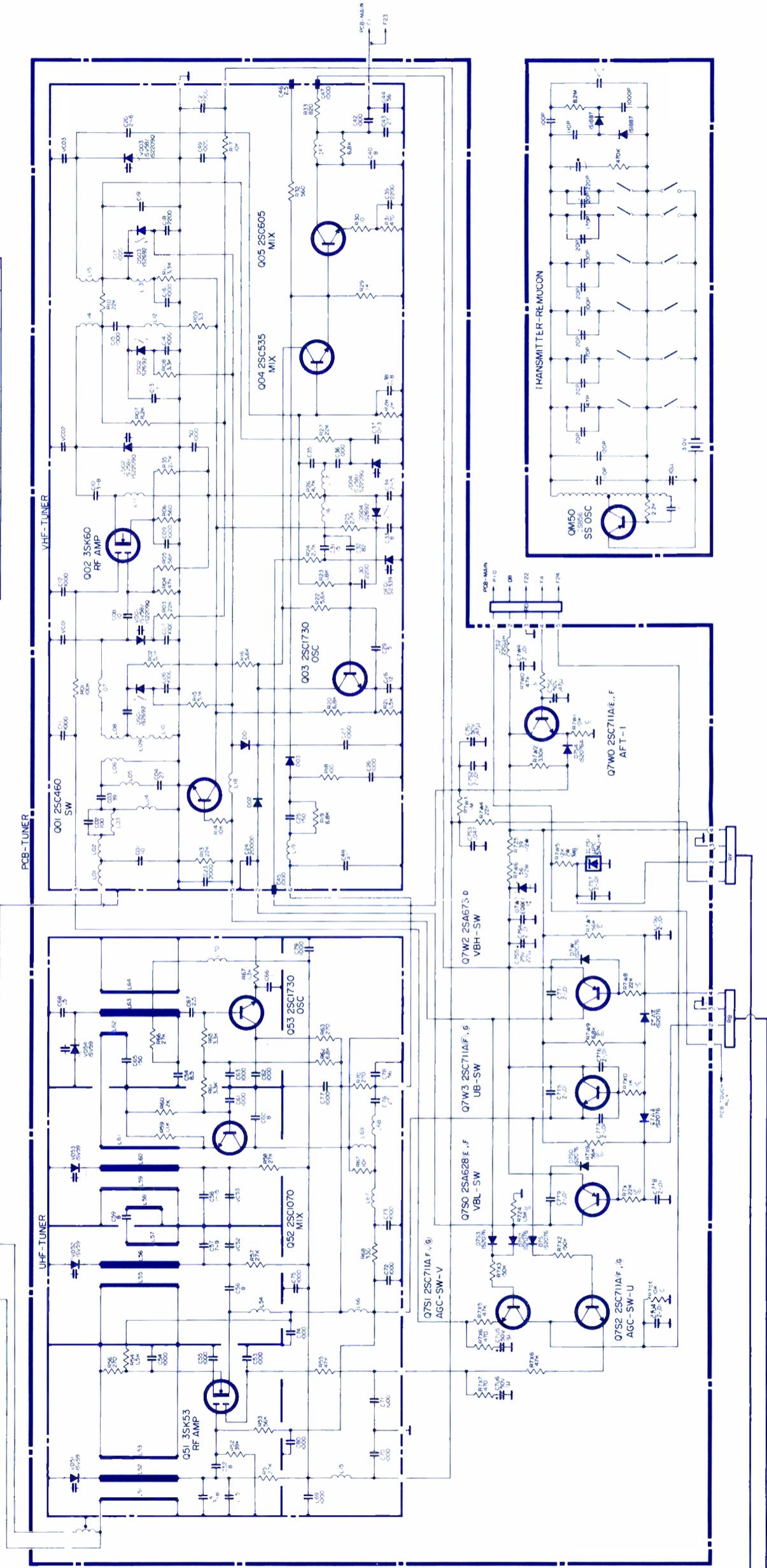
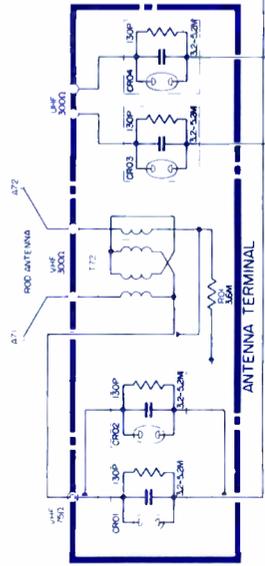


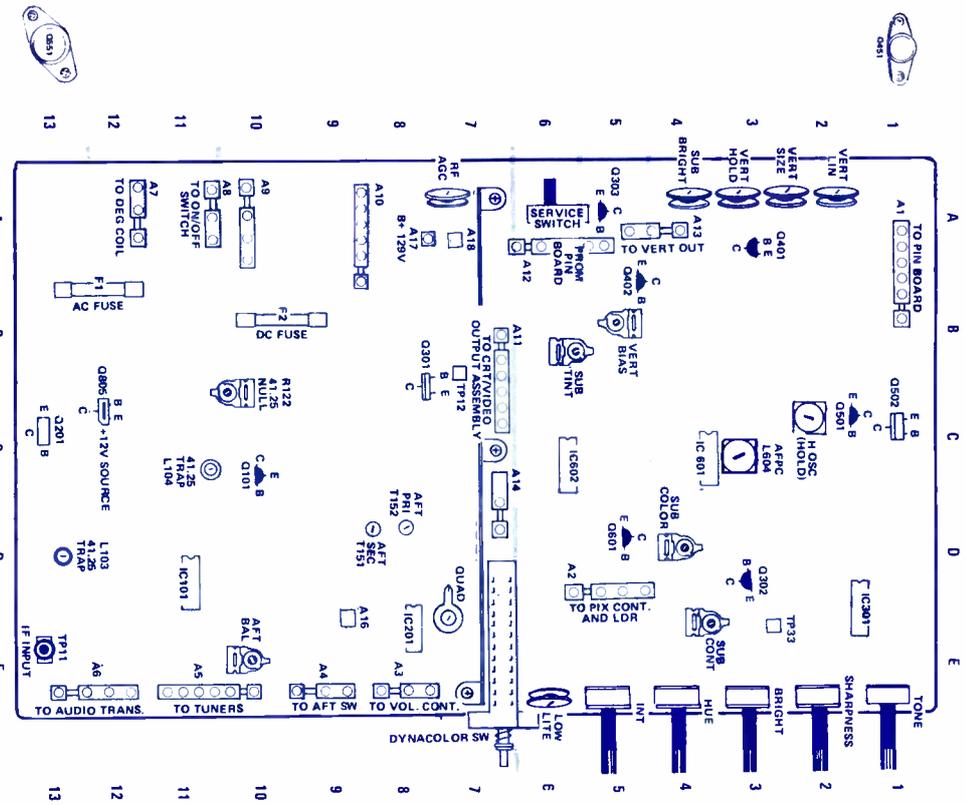
MGA
Color TV Model
CS-1995

RECEIVER-REMOCON

SYMBOL NO.	DESCRIPTION	PIN NO.	V
07L1	MIC BUFFER	25K34 (C)	7.0
07L2	PULSE SHAPER	25C711A (E) (F)	12.0
07L3	INITIAL POWER SET	..	9.5
07L4	MUTE RESET SW	..	9.5
07L5	CH, DN AMP	..	6.6
07L6	CH, DN SW	..	6.6
07L7	CH UP AMP	..	0
07L8	CH UP SW	..	6.5
07L9	INITIAL RESET	..	6.5
07M1	SOUND CONT DRIVE	..	9.5
07M2	SOUND CONT	..	12.0
07M3	RELAY DRIVE	25C620 (D) (E)	6.6
			13
			6.6
			12.9

SYMBOL NO.	DESCRIPTION	PIN NO.	TRANSMITTER REMOCON OPERATION	V
IC7L1	BAND PASS AMP	1		0.7
		2		0.45
		3		0.2
		4		0.2
		5	VOL. LO - SW KEPT ON	0.7
		6	VOL. HI - SW KEPT ON	0.7
		7	POWER ON/OFF - SW KEPT ON	0.7
		8	MUTE - SW KEPT ON	0
		9		0.6
		10	CH. UP - SW KEPT ON	0
		11	CH. DOWN - SW KEPT ON	0.6
		12		0.8
		13	MUTE	0
		14	VOLUME MIN.	2.5
		15	VOLUME MAX.	3.1
		16		0
		17		4.0
		18		0.8
				0.9

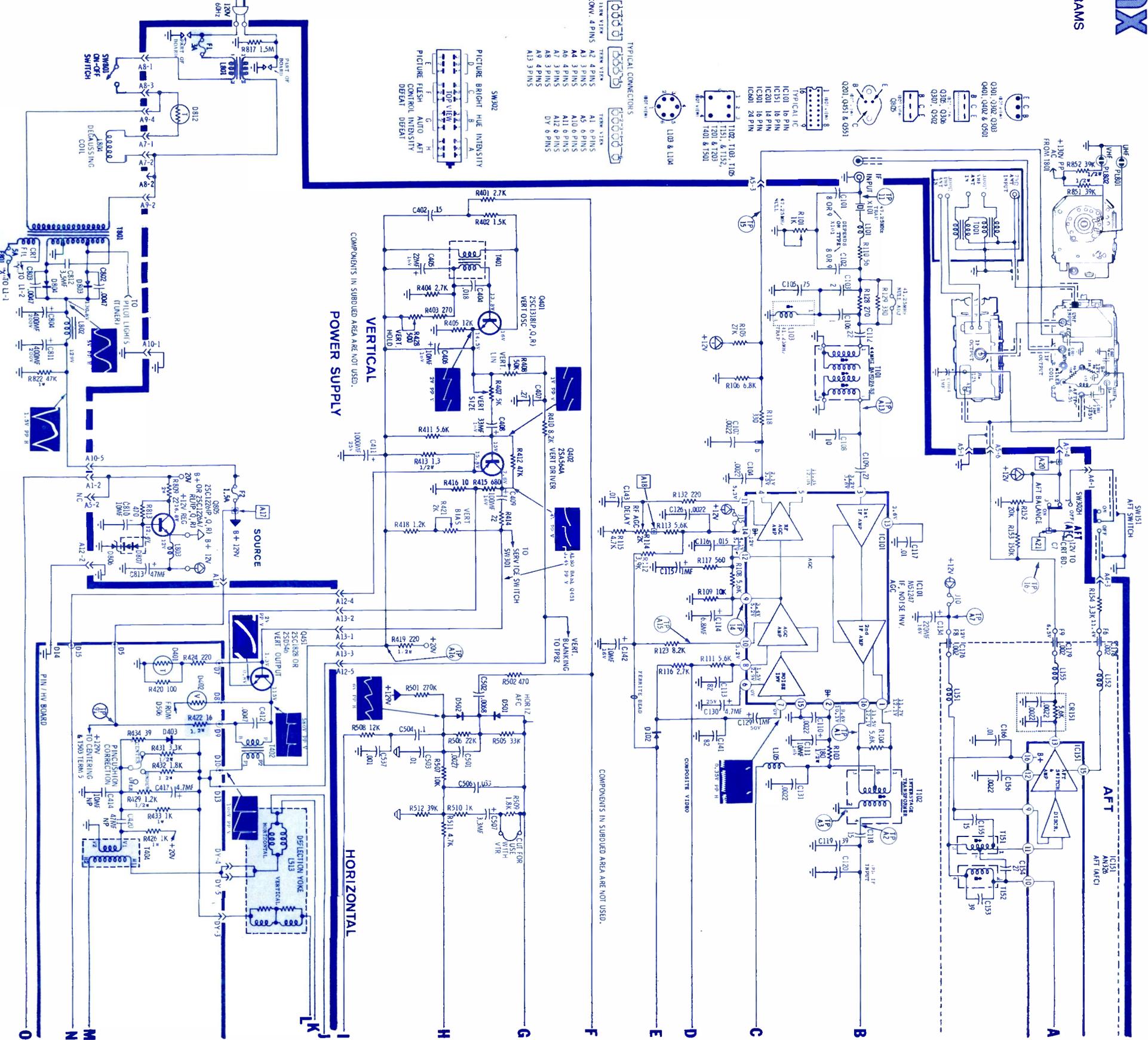




Test points are not shown, but can be found in the coordinates as listed in this chart.

TEST POINTS	LOCATION	TP46B	C-7
TP46G	C-4	TP46R	B-6
TP46S	C-5	TP46T	B-6
TP46U	C-5	TP46V	D-11
TP46W	C-5	TP46X	D-10
TP46Y	C-5	TP46Z	D-10
TP47	B-5	TP48	C-10
TP48	B-5	TP49	D-9
TP49	A-7	TP50	D-10
TP50	E-7	TP51	D-3
TP51	E-10	TP52	E-8
TP52	E-6	TP53	D-12
TP53	A-8	TP54	A/5
TP54	E-8	TP55	D-5
TP55	E-7	TP56	B-12/13
TP56	B-7	TP57	B-9/10
TP57	A-6/7	TP58	C/D-7/8/9
TP58	E-11	TP59	A12/13
TP59	E-10	TP60	A/6
TP60	A/8	TP61	D/4
TP61	E-10	TP62	D/E-6/7
TP62	E-3		
TP63	D-4		
TP64	C-6		
TP65			
TP66			
TP67			
TP68			
TP69			
TP70			
TP71			
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TP98			
TP99			
TP100			

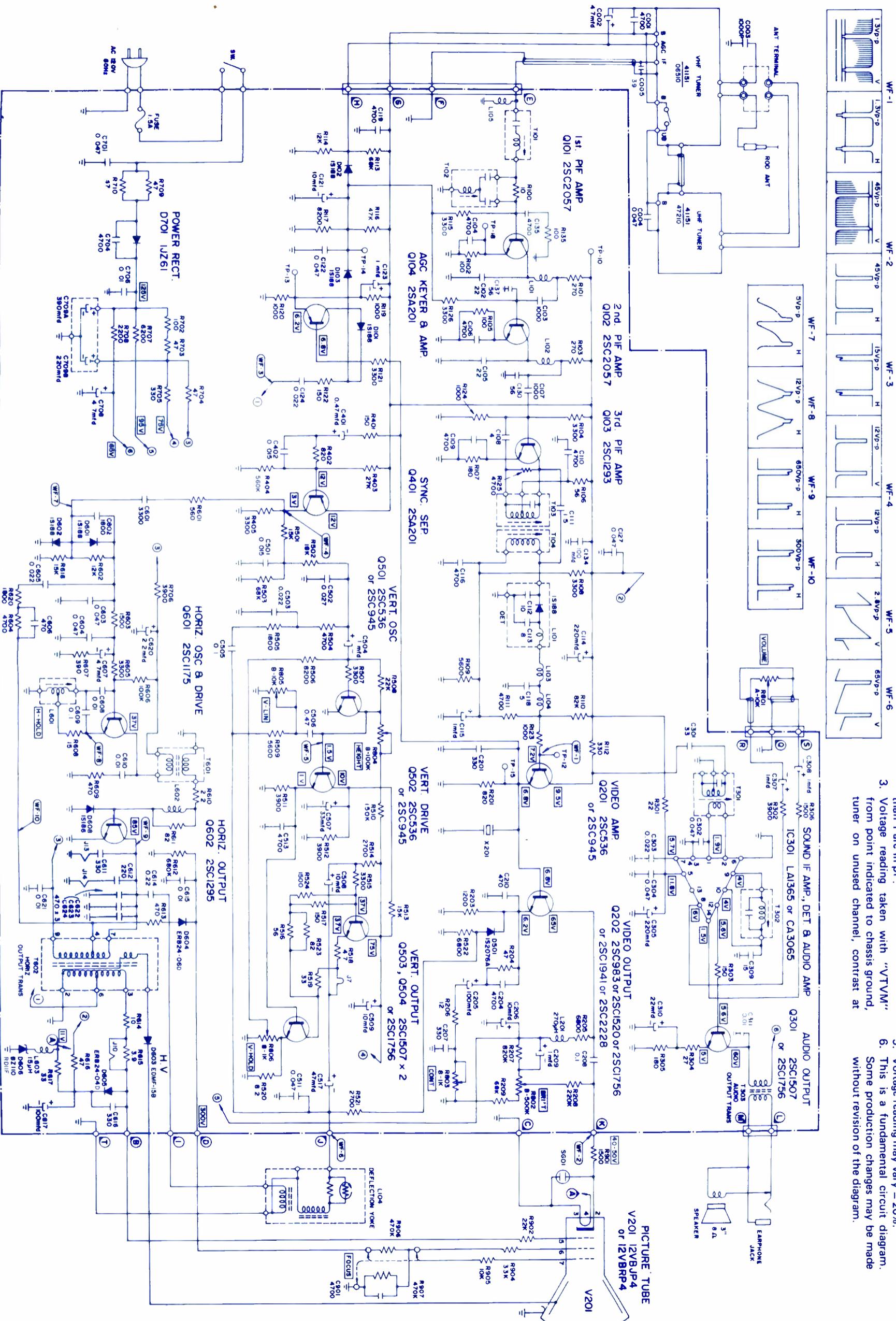
Super Module Transistor, Test Point, and Control Locations



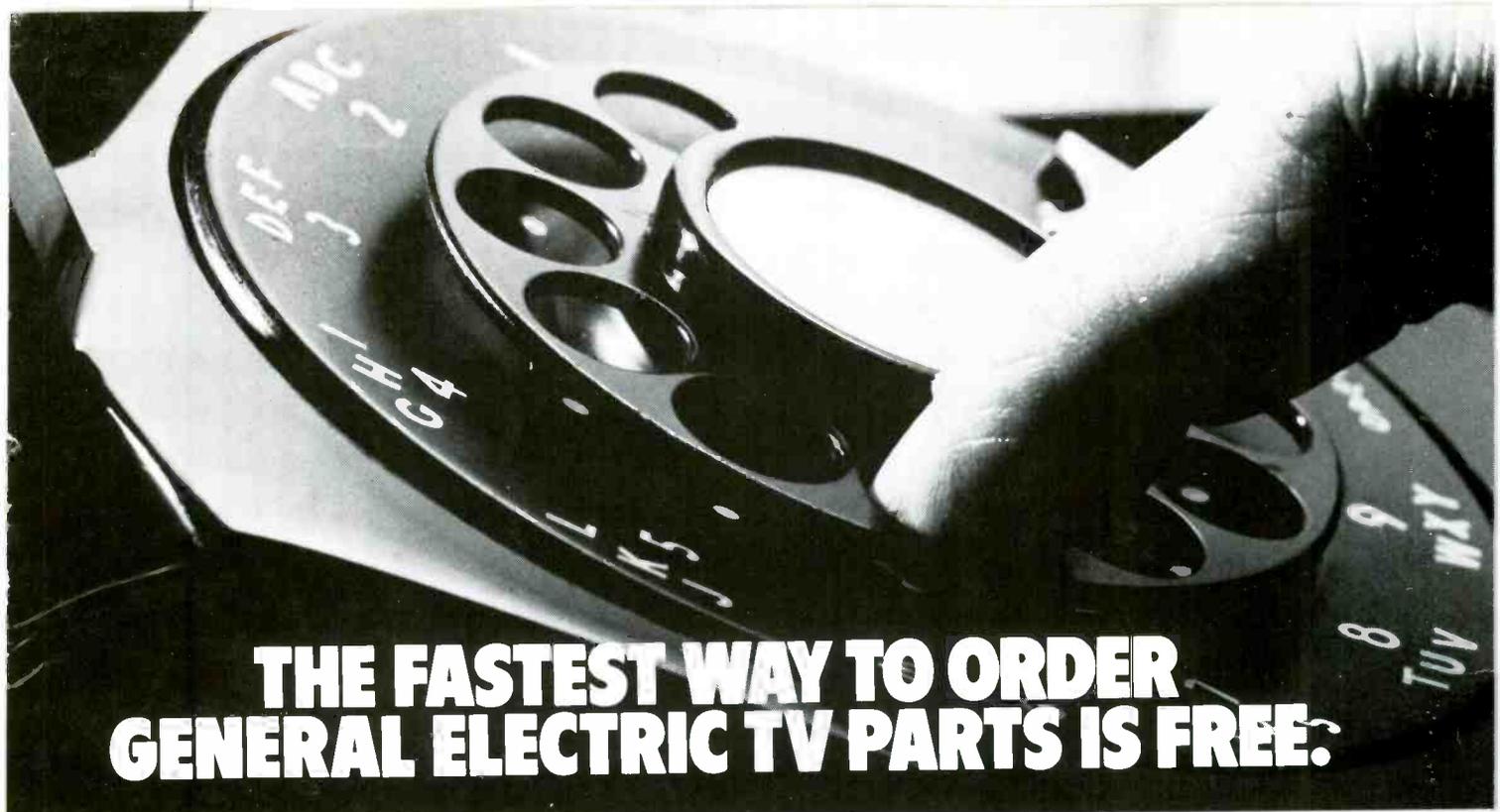


COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS

MARCH • 1979



- NOTES:
1. All resistance values in ohm.
K = 1,000 M = 1,000,000
 2. Unless otherwise noted in schematic diagram, all capacitors less than 1 are expressed in mfd, and the values larger than 1 are in pF.
 3. Voltage reading taken with "VTVM" from point indicated to chassis ground, tuner on unused channel, contrast at max., other controls at normal, local line voltage.
 4. All waveforms measured with strong signal input, contrast set to give normal picture.
 5. Voltage reading may vary ± 20%.
 6. This is a fundamental circuit diagram. Some production changes may be made without revision of the diagram.



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