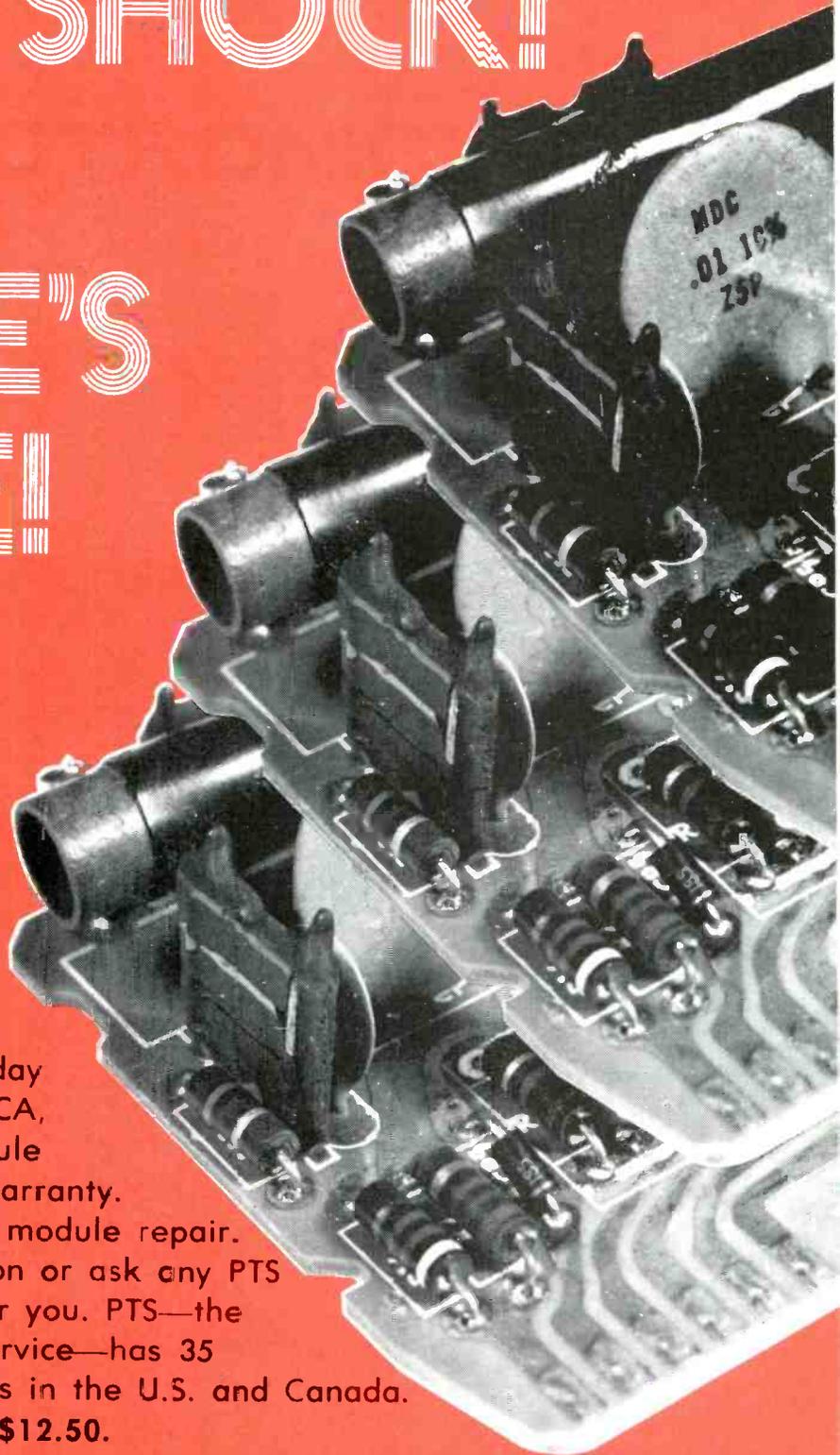


TUNER SHOCK! THE FUTURE'S HERE!

About the time you've picked up on all the latest in tuner design, some clever engineer sneaks in a new twist. That's where PTS comes in . . . a tuner repair service that's always a day ahead of design changes. And now PTS has entered the module field, providing same-day service for repair of Zenith, RCA, Quasar and GE modules. Module overhaul carries a one year warranty. Only PTS-Bloomington handles module repair. Mail units direct to Bloomington or ask any PTS service center to ship them for you. PTS—the world's largest tuner repair service—has 35 company-owned service centers in the U.S. and Canada. **Module Overhaul — \$5.95 to \$12.50.**



ELECTRONICS, INC.

PRECISION TUNER SERVICE

BLOOMINGTON MODULE CENTER / P.O. BOX 272 / BLOOMINGTON, IN 47401

Consult the white pages of your telephone directory for the address and number of your nearest PTS Service Center. General Headquarters: Bloomington (IN) - Birmingham - Phoenix - Los Angeles - San Diego - Sacramento - Arvada (CO) - Jacksonville - Tampa - Indianapolis - Kansas City (KS) - Metairie (LA) - Silver Spring (MD) - Boston - Springfield (MA) - Detroit - Minneapolis - St. Louis - E. Paterson (NJ) - Buffalo (NY) - Charlotte (NC) - Cincinnati - Columbus (OH) - Cleveland - Oklahoma City - Portland (OR) - Pittsburgh - Philadelphia - Montreal - Memphis - Houston - Langview (TX) - Norfolk - Seattle - Milwaukee.

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

"Breaker . . . Breaker . . ."

Break-through with **BREAKER!**

The New Freedom Line of CB Mobile and Base Antennas and Accessories made in the U.S.A. for communications between people.

A wide selection of "revolutionary" new CB High Efficiency communications antennas of superior strength, electronically and physically, for all the talk power your CB rig will deliver—coming and going in the 27 Megahertz frequency band.

Mobile Breaker antennas for cars, trucks, trailers, sports cars, station wagons, motorcycles, boats. Breaker base station antennas to communicate with mobiles and hand helds . . . all designed specifically for the outstanding transmission and reception of CB signals.

The high quality and materials of the Breaker CB antennas and accessories assure you the maximum in performance for many years and at reasonable cost. Performance-tested Breaker CB antennas offer you these advantages plus more:

- ★ Easily adjust for lowest VSWR
- ★ Long-life stainless steel and fiberglass whips
- ★ Highest quality coaxial cable with solderless connections
- ★ Innovative engineering designs
- ★ Packaged for quick, easy installation to get you on the air fast, complete with cables and hardware

All Breaker antennas are American made in Arlington, Texas. In keeping with the tradition of the Bi-Centennial they are proudly named after our revolutionary heroes and places. Red, white and blue are also the colors of Breaker. Chosen because we too are very proud of our heritage and contribution to making exciting products for use by people communicating with people. See and buy the Freedom line of Breaker antennas and accessories at your nearest electronic distributor. Look for the red, white and blue packaging.

WRITE FOR FREE CATALOG.

GEORGE WASHINGTON

**West Coast Mirror Mount
Dual Truck, RV Antennas
Model 10-200**

Weather resistant dual 57" stainless steel whip antennas with static arrestor tips. Secure horizontal or vertical mounting to West Coast side view truck type mirrors. Twin antennas co-phased for more directional power and easily adjustable for fine tuning. Hermetically sealed, white oversized ABS center load. Dual 18' low-loss coaxial phasing harnesses with solderless connectors and quick disconnect PL-259 plugs. Complete with corrosion resistant mounting hardware.

INDEPENDENCE

**Gutter Mount Antenna
Model 10-245**

Low-profile 21" stainless steel whip antenna with static arrestor and flex-matic shock spring. Fits practically any vehicle rain gutter. No interference with door opening or passenger exit. Heavy-duty molded clamp bracket insulates and supports antenna. Center loaded ABS load coil for excellent transmission and reception. 14' coaxial cable with solderless connector and quick-disconnect PL-259 plug. Complete with corrosion resistant mounting hardware

See them All At PC
'76 in the Las Vegas

Hilton Booths

528-529-530!

PAUL REVERE

**Roof Mount Antenna
Model 10-215**

Special "power-plus" 42" base-loaded roof mount with long-life stainless steel whip, rugged stainless steel shock spring and high-quality 16-ft. shielded coax cable and solderless connections for fast "on-the-air" installation. Named after the famed communicator and hero of revolutionary era.

THE PATRIOT

**Omni-directional
¼-Wave Base Antenna
Model 11-101**

High in quality, performance and efficiency, low in cost. Has three 108" quarter wave tubular aluminum radials plus a quarter-wave radiator (vertical element). Heavy-duty U-clamp fits mast up to 1½" diameter. Built-in lightning protector. SO-239 style connector mount. Mates with PL-259 plug. Shunt loaded coil. Heavy duty insulated molded clamp bracket. Easy to assemble and dis-assemble. Fixed construction.

THE MINUTEMAN

Trunk Mount Antenna Model 10-230

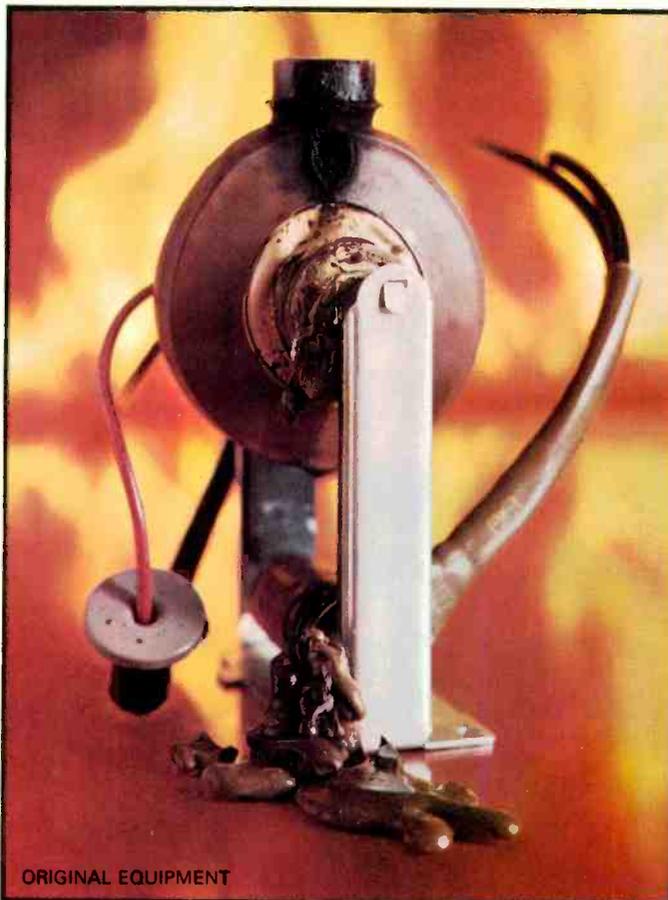
Sturdy, durable, no-hole required in trunk of vehicle. Super 44" stainless steel whip, base loaded low-profile antenna with stainless shock absorbing spring, chrome plated brass bell housing, 18-foot shielded coaxial cable and solderless connections.

... for more details circle 141 on Reader Service Card

"Just say it with Breaker!"

BREAKER
CORPORATION

1101 Great Southwest Parkway
Arlington, Texas 76011



ORIGINAL EQUIPMENT



THORDARSON

The difference in flybacks is a hot subject

After numerous lawsuits and liability claims against electronics service dealers, government regulations now require flame retardant flybacks in all new TVs. But most OEM replacement flybacks for pre-regulation sets do not meet those standards. Does it make sense to install a part that would be illegal in a new set today?

That's a risk THORDARSON believes you shouldn't have to take. So every color replacement flyback we make meets today's fire retardance standards.

99% of THORDARSON replacements sold are exact replacements, right down to the mounting holes and wiring color code.

And THORDARSON knows you can't afford long waits for replacements... so your TM distributor stocks in depth. And he can use our unique Rush Order system for factory shipment of hard-to-get parts directly to you!

It almost always costs less to specify THORDARSON quality... and it could keep you out of some very hot water.

Ask your independent distributor for your free THORDARSON Pocket Replacement Guide or write to...



Established 1895
THORDARSON MEISSNER INC.
 A subsidiary of Components Corp. of America
 Electronic Center Mount Carmel, IL 62863

Support your independent parts distributor... we do! NEDA Associate Member



...for more details circle 135 on Reader Service Card

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THE COVER: The increasing use of electronics in recreational and commercial boating—for communications, fish finding and navigation—has created a new growth market into which electronic sales and service dealers can profitably diversify, particularly those located on or near coastal waterways, lakes and large, navigable rivers. An article in this issue describes how one dealer on Florida's Northwest Coast is profiting from marine electronics sales and servicing.

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NEWS OF THE INDUSTRY

Motorola, RCA, GE, Panasonic, Hitachi And Superscope Announce Entry Into CB

As anticipated by most people already directly involved in the booming CB market, many of the "majors" in the consumer electronics industry, after biding their time and taking a short but hard look at which direction the CB market might go, have decided that it's solid enough to warrant a commitment and now, one by one, are throwing their hats into the ring.

Motorola, already a leader in most other two-way communications markets, has announced that it will have available "sometime in the second quarter" an initial CB product line comprised of under-dash transceivers, antennas and other mobile accessories as well as some base station units.

In-dash transceivers reportedly will be added to the Motorola CB line later in the year.

Motorola's CB products will be designed and built in the U.S. by its Communications Products Division, with distribution and marketing handled by its Automotive Products Division.

RCA, which also has a communications division that is experienced and successful in other two-way markets, in January introduced its first offerings to the CB market: two under-dash, solid-state, synthesized, 23-channel, mobile transceivers, one priced at \$124.95 and the other at \$159.95.

RCA citizen-band products are being marketed by the RCA Distributor and Special Products Division, Camden, New Jersey.

General Electric, another of the "major" consumer electronic manufacturers with a long, successful background in two-way communications, also has announced its upcoming entry into the CB market.

According to Paul Van Orden, general manager of the GE division which handles audio and housewares products, the initial GE citizens-band product line will be ready for marketing about mid-year and will include several mobile transceivers and at least one base-station unit, all with phase-locked-loop (PLL) 23-channel capability.

General Electric's CB units reportedly will be imported from Japan.

Panasonic's first entry into CB, announced in early January and displayed at the Winter Consumer Electronics Show in Chicago, is an in-dash, combination AM/FM stereo FM radio and 23-channel CB transceiver.

Clark Jones, national sales manager of Panasonic Auto Products, the division which is marketing Panasonic CB products, said that the in-dash approach "will enhance" Panasonic's position with both CB and new car dealers.

Featured in Panasonic's first CB entry is a "standby monitor" which permits CB reception while listening to standard AM or FM broadcasts.

Hitachi, already a manufacturer of private-label CB equipment, recently introduced a line of CB units under its own label. The initial Hitachi CB line consists of three mobile transceivers, with PLL 23-channel capability and 4 watts output; a 23-channel base station; and a 69-channel, single-sideband unit with 12 PEP watts output and a price of \$329.95.

Superscope, a familiar name in the audio entertainment electronics market, has established an "Automotive Products Division" which will carry out research, development and marketing of CB, and car stereo products and related accessories.

The new Superscope CB and automotive electronic products will be manufactured in Superscope's facilities on Taiwan and in Tokyo, Japan.

Safety & Special Radio Bureau To Recommend Class D Channel Expansion.

Charles A. Higginbotham, chief of the FCC's Safety & Special Radio Services Bureau, at press time reportedly was preparing to recommend to the FCC expansion of the number of Class D Citizen Radio Service channels.

A report in the February 22nd issue of *ELECTRONIC NEWS* stated that Higginbotham said he planned to make the expansion recommendation to the commission within 30 to 60 days of that date but that no decision had been reached on the extent of expansion his staff would recommend.

According to the *Electronic News* report, Higginbotham might recommend as many as 27 additional Class D channels, which would increase the present 23-channel allocation to 50.

Higginbotham reportedly believes that the FCC will approve some expansion of Class D, but the final decision on the extent of the expansion will be up to the full commission.

Higginbotham, according to the report, is pessimistic about the adoption of a Class E Citizens Radio Service, for two principal reasons: 1) Canada is concerned about protecting its radio amateurs from interference which might result if CB operations are permitted in the 220-MHz region proposed for Class E—a portion of the spectrum which in the Western Hemisphere now is reserved for radio amateur use. As a result, Canada probably would forbid use of 220-MHz CB within its borders. 2) Preliminary analyses by the

continued on page 6

In times like these, why are so many people paying a little more to get a Zenith?

The answer is value. Today it's more important than ever. And Zenith value is greater than ever, for a lot of good reasons.

1. Best Picture. The heart of every Zenith color TV is the patented *Chromacolor picture tube*, with a

QUESTION: In general, of the color TV brands you are familiar with, which would you say has the best overall picture?

ANSWERS:

ZENITH	36%
Brand A	20%
Brand B	10%
Brand C	7%
Brand D	6%
Brand E	3%
Brand F	2%
Brand G	2%
Brand H	2%
Brand I	1%
Other Brands	3%
About Equal	11%
Don't Know	4%

Note: Answers total over 100% due to multiple responses.

QUESTION: In general, of the Color TV brands you are familiar with, which one would you say requires the fewest repairs?

ANSWERS:

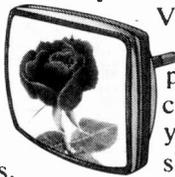
ZENITH	38%
Brand A	15%
Brand C	8%
Brand D	4%
Brand B	3%
Brand I	2%
Brand F	2%
Brand E	2%
Brand G	1%
Brand H	1%
Other Brands	4%
About Equal	14%
Don't Know	9%

level of brightness, contrast, and sharp detail that set a new standard for the TV industry.

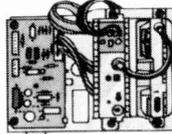
It's not surprising, then, that in the latest opinion survey of independent TV service technicians, *Zenith was selected again for best picture*, more than any other brand.

2. Fewest repairs. In the same nationwide survey, *Zenith was selected as needing fewest repairs*. By more than two-to-one over the next best brand (38% to 15%). Whether you buy a console or portable, today's Zenith is designed to bring you years of dependable viewing enjoyment.

3. Sharp picture performance year after year from Zenith's Electronic Video Guard Tuner.



With no moving parts to wear out or contacts to corrode, your picture stays sharp far longer than with conventional mechanical tuners.



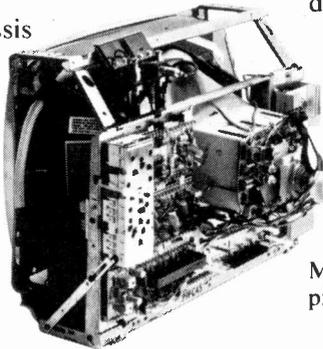
4. Zoom instant close-up. Another Zenith exclusive. Just press the Zoom button on a Zenith Space Command[®]1000—and the *Zoom picture is 50% larger*. While Zoom is available on 19" and 25"



diagonal sets, every Zenith Space Command lets you change channels and turn the set on or off from across the room.

5. 100% Solid-State reliability. Every Zenith Chromacolor II has

a rugged, 100% solid-state chassis for greater dependability, cooler running, and longer life. Modular chassis design means easier service if needed.



6. Uses less power. Some older sets actually use as much power as it takes to light five 75-watt lightbulbs. But *Zenith Chromacolor II uses less power* than it takes to light two. That's 64% less power.



7. Protection against power surges.

Even small changes in household voltage can hurt picture performance. Larger changes can even damage sets. *But every Zenith is protected by the patented Power Sentry system.* It guards against power surges you might not even notice.

8. We built it. We back it. The record speaks for itself. But if it should ever happen that a Zenith doesn't live up to your expectations—or if you'd like survey details—write to: Vice President, Consumer Affairs, Zenith Radio Corporation, 1900 N. Austin Ave., Chicago, Il. 60639.

Pictured below: The Malaga 25" diagonal Model G4768P and The Seabreeze 13" diagonal Model G3420W. Simulated TV pictures and wood finishes.



100% SOLID STATE
CHROMACOLOR II

The quality goes in before the name goes on.[®]

NEWS OF THE INDUSTRY

continued from page 4

Spectrum Allocations Staff of the FCC's chief engineer indicate that CB operation in the 220-MHz region would interfere with VHF TV Channels 11 (198-204 MHz) and 13 (210-216 MHz).

"Fair Trade" Dead Nationwide As Of March 11

On December 12, President Ford signed into law a bill which on March 11 revokes those portions of the federal antitrust exemptions under which states were permitted to adopt and enforce retail price maintenance agreements, or so-called "fair trade" laws.

At the time of the repeal bill's enactment, seven states still had fair trade statutes, while 15 others, in anticipation of federal repeal, had abolished fair trade during their 1975 legislative sessions.

Pearce-Simpson Establishes West And East Coast Distribution/Repair Centers

Miami-based CB manufacturer Pearce-Simpson has set up two new distribution/service facilities—one in Sun Valley, Calif., which will handle distribution and warranty and nonwarranty servicing of its products for the Western States, including Hawaii and Alaska, and another in Endicott, N.Y., which will handle distribution and repair for Pearce-Simpson outlets in East Coast states.

RCA Quits Test Instruments, Sells Business To VIZ

RCA, which announced in December that it was quitting the electronic test instrument business, has sold its test instrument inventory and related patents, designs and manufacturing rights to VIZ Manufacturing Company, a privately-held firm headquartered in Philadelphia.

VIZ, which has manufactured many test instruments for RCA since 1958, has taken over the distribution of the present inventory of RCA test instruments and will continue to manufacture and market under its own trade name these and other types of electronic test instruments.

At the time RCA announced its retirement from the test instrument business, it was manufacturing only about 5 to 10 percent of the test instruments marketed under its name by the RCA Distributor & Special Products Division, with the remainder produced under subcontract by VIZ and other private-label manufacturers.

First EIA-Sponsored Personal 2-Way Radio Show In Las Vegas, March 30-April 1

PC-76, the first annual tradeshow devoted exclusively to the personal two-way radio communications industry, will be held at the Las Vegas Hilton Hotel in Las Vegas, Nevada, March 30-April 1.

Sponsored by the Citizens Radio Section of the Electronic Industries Association's Communication's Division, PC-76 offers electronic distributors and dealers the unprecedented opportunity to analyze first hand the latest product lines of over 150 manufacturers and marketers of personal two-way communications equipment, including CB, marine and amateur transceivers, antennas, scanners, and every type of accessory available for use with personal two-way communications equipment. Equipment for testing, adjusting and maintaining two-way communications also will be exhibited.

Seminars covering merchandising and FCC regulation of personal two-way communications will be held in conjunction with the trade show.

FCC Commissioner Robert E. Lee will be the keynote speaker at the PC-76 kick-off banquet, scheduled for Monday evening, March 29.

Potpourri . . .

EIA reports that final TV sales-to-dealer figures for 1975 indicate that *total 1975 color TV sales* in 1975 were slightly less than 6.5 million, down 17.2 percent from 1974 sales, while *total 1975 monochrome TV sales* fell short of 5 million, down 16.4 percent from 1974 sales . . . Tokyo Shibaura Electric Co., the parent firm of *Toshiba*, recently became the sixth Japanese firm to acquire licensed rights to use *RCA's video disk player technology* . . . The *Missouri state highway patrol* says that during August, September and October 1975—the first three months after patrol cars were equipped with CB—there were *22,489 CB radio contacts between patrolmen and citizens*, with 17,277 of the contacts involving requests for assistance or reports of dangerous road conditions, while 5,212 of the contacts related to citizens reports of law violations, of which 1,307 led to arrests by law officers and 1,006 resulted in the issuance of warnings . . . *Home Box Office*, the pay TV network which last year began transmitting its daily 12-hour program schedule to CATV affiliates via *domestic satellite*, began 1975 with 60,000 subscribers but by the close of the year reportedly was serving *275,000 viewer homes* through more than 100 cable TV systems, with new CATV affiliates in ten additional states. ■

TECHNICAL LITERATURE

Speaker Application Chart lists domestic and foreign cars and trucks by make, model and year (1970-1976) and shows which Audiovox speakers are recommended for specific application in each. Data provided includes speaker diameter and speaker magnet weight. Available free from *Audiovox Corp.*, 150 Marcus Blvd., Hauppauge, N.Y. 11787.

Official 10-Code Signal List is a pocket-size pamphlet which lists the 34 numerical radio communications codes and their meanings adopted by the Associated Public Safety Communications Officers, Inc., plus the phonetic alphabet and other radio communications codes used by law enforcement agencies. Available free from *Siltronix*, 269 Airport Rd., Oceanside, Calif. 92054.

Video-Taped Training Courses Catalog lists video-taped courses on electronics theory, test instrument operation and maintenance and troubleshooting procedures for a broad range of electronic products. The courses are available on 1/2-inch open reel and 3/4-inch video cassettes from *Hewlett-Packard Video Products*. The catalog is available free from *Hewlett-Packard, Video Products*, 1819 Page Mill Rd., Palo Alto, Calif. 94304.

CB Products Catalog describes the line of UHF connectors, adapters, cable assemblies and other CB-related devices offered by *AVA Electronics Corp.* Called "The CB Showcase," the 4-page catalog is available free from *AVA Electronic Corp.*, 242 Pembroke Ave., Lansdowne, Penn. 19050.

Security Equipment Catalog explains specifications, principles of operation and applications of a variety of electronic and nonelectronic security, fire protection and signaling devices and systems and lists over 500 intrusion and fire alarm products. Available free from *Mountain West Alarm Supply*, 4215 N. 16th St., Phoenix, Ariz. 85016.

Standard Transformers and Inductors is an illustrated 48-page catalog which lists by type of application and Thordarson Meissner part number the mechanical and electrical specifications of standard audio, transistor, power, filament, rectifier and line adjusting transformers and inductors offered by Thordarson Meissner. Catalog No. 76 is available free from TM parts distributors or

from *Thordarson Meissner, Electronic Center*, Carmel, Ill. 62863.

Test Instruments is one of 55 categories of kit and assembled electronic products described in *Heathkit Catalog No. 807*. Available free from the *Heath Company*, Benton Harbor, Mich. 49022.

Semiconductor Replacement Guide cross-references universal replacement, registered, and domestic and foreign electronic equipment manufacturers' semiconductor part numbers to *Raytheon's RE* line of replacement semiconductors for home entertainment and commercial electronic products. Available free from *Raytheon Company, Distributor Products Operation*, 4th Ave., Burlington, Mass. 01803.

Tape Recorder Clinic Procedures Booklet outlines the tests and general servicing procedures which should be performed on reel-to-reel tape recorders during service clinics conducted by audio sales and service dealers. Available free from *Elpa Marketing Industries*, Thorens & Atlantic Avenues, New Hyde Park, N.Y. 11040.

Tape Player Parts Catalog is an illustrated, make-and-model cross-referenced listing of replacement motors, belts, heads, transformers, solenoids, semiconductors and drive system parts available from *PTS Electronics, Inc.*, for over 100 brands of car and home eight-track and cassette tape players and player/recorders. Available for \$2.00 from *PTS Electronics, Inc.*, P.O. Box 272, 5233 Highway 37 South, Bloomington, Ind. 47401 or from *PTS Electronics* branches throughout the U.S.

Solid-State Replacement Guide cross references more than 112,000 domestic and foreign semiconductor devices to *RCA's SK-Series* semiconductor replacement line. Also included are an index of *SK-Series* semiconductors and accessories and related characteristic and application information, line drawings showing dimensional outlines and terminal arrangements, and a list of mounting hardware. *RCA Solid-State Replacement Guide No. SPG-2025* is available for \$1.00 from local *RCA* distributors or from *RCA Distributor and Special Products Div.*, P.O. Box 85, Runnemede, N.J. 08078.

Hand Tools, Tool Kits and Accessories for electronic servicers are listed in a catalog of products offered by *Techni-Tool*. Catalog No. 20 is available free from *Techni-Tool, Inc.*, 5 Apollo Rd., Plymouth Meeting, Penn. 19462. ■

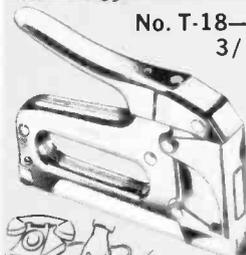
ARROW AUTOMATIC STAPLE GUNS

CUT WIRE & CABLE INSTALLATION COSTS

... without cutting into insulation!

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

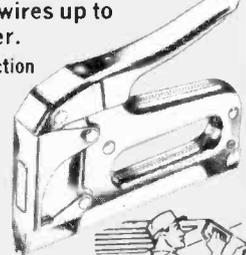
No. T-18—Fits wires up to 3/16" in diameter.



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

Uses T-18 staples with 3/16" round crown in 3/8" and 7/16" leg lengths.

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



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

Also used for **RADIANT HEAT WIRE**

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

NEW! Intermediate No. T-37—Fits wires and cables up to 5/16" in diameter.

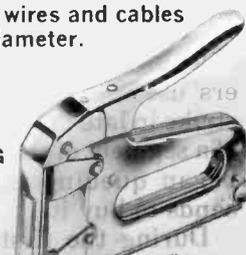


Same basic construction as Nos. T-18 & T-25.

Also used for **CATV and DRIVE RINGS** in stringing wires.

Uses T-37 staples with 5/16" round crown in 3/8", 1/2" and 9/16" leg lengths.

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



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

Also used as **DRIVE RINGS** in stringing wires.

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

ARROW FASTENER COMPANY, INC.
271 Mayhill Street, Saddle Brook, N. J. 07663

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

EDITOR'S MEMO



CB—Boom Or Bust? A Perspective

■ In the 16-year period between the FCC's establishment of Class-D CB in 1958 and the start of the present CB "boom" in late 1974, the FCC received less than 1 million applications for Class-D station licenses. As of June 30, 1974, there were only 928,642 licensed CB stations, plus an estimated equal number of stations operated illegally without a license. Based on a conservative estimate of two units per station, there probably were about 4 million Class-D CB units in use as of June 30, 1974.

Then, TV network and other news coverage of long-haul truckers' use of CB in their nation-wide strike in late 1974 struck the fancy of a segment of the public and they began queuing up by the thousands to buy it.

During the first 10 months of 1975, the FCC reportedly received over 1 million Class-D license applications, and since then applications have been pouring into the FCC at an average monthly rate of about 300,000—with expectations that by sometime this Spring the aggregate total of Class-D applica-

tions received by the FCC would approach 3 million.

Although there is no documentation of the present number of Class-D CB units in use, most reliable industry sources place the figure at about 8-10 million.

The sudden popularity of CB undoubtedly is attributable in part to the same "pop-cult" mechanism that has prompted an endless number of nationwide fads, or "crazes," most of which have fizzled out as suddenly as they emerged.

However, although psychological mechanisms such as "novelty" and "the desire to identify with the independent, rebellious, free-as-the-wind aura of long-haul truckers" probably have played a large roll in the meteoric popularity of CB, its inherent potential capability of fulfilling a *practical* as well as psychological need seemingly offers a reasonable probability that CB can survive the "fad" stage and become a well-entrenched, utilitarian product—if marketed properly.

There is inherent in a mobile society such as ours a *genuine need* for a reliable, easy-to-use, inexpensive, wireless system of mobile two-way communications, for both business and personal applications—and CB has achieved a state of the art which makes it ideally suited for such "general public" applications.

Whether or not the present popularity of CB spreads beyond the cult-motivated "fadist" market into the larger, broader spectrum of more practical-oriented consumers, who buy principally on the basis of *recognized need*, depends to a large degree on how quickly and how well manufacturers, marketers and merchandisers recognize the existence of practical-minded consumers and sell them on the *utilitarian* value of

citizens band equipment.

Meanwhile, an ever-increasing number of CB equipment manufacturers and importer/marketers continue to rush head-on into the present, but probably temporary, gap between supply and demand, with most seemingly concerned only with the short-range goal of pumping as much product into the market as possible. Many seem to have cast aside even the most fundamental marketing principals which, in a more normal market environment, are considered essential for long-term market development and growth.

Increasing numbers of dead-on-arrival and improperly adjusted units, which are indicative of short cuts in quality control and inspection at the factory, are neither conducive to good manufacturer-dealer and dealer-customer relations, nor do they bolster consumer confidence in the reliability and performance of CB in general.

Emphasis on "volume sales" through "volume" merchandisers—whose sales clerks typically do not have the product knowledge needed to educate purchasers about the proper installation, operation and use of CB, or help them select the right accessories—might maximize short-term volume and profit, but it certainly cannot be considered effective long-term market development, nor can failure to establish a nationwide system of proficient, convenient service centers, with ready access to replacement parts and service data.

Stop-gap measures like through-the-mail factory service with inherent one-and two-week turnaround might satisfy the warranty requirements of a fadist-oriented market, but, as soon as the production capacity of the CB industry equals or exceeds the

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volume demand of the "fadist" spectrum, CB producers and marketers who want to survive will find it necessary to begin seriously cultivating a broader market spectrum—a utilitarian-oriented spectrum which, by nature, is more sensitive about point-of-purchase assistance and after-the-sale installation and service support than the present CB market seems to be.

The successful establishment of CB as a long-lived, utilitarian product is also dependent on how soon the FCC takes positive action to relieve the congestion that exists on Class-D channels in many areas of the country.

Despite these and other self-inflicted growing pains, CB probably will mature beyond the present boom and become a well-entrenched, utilitarian product—one which is merchandised best by product-wise, electronics dealers who are able and willing to provide knowledgeable advice and assistance both before and after the sale.

Recent surveys indicate that a significant number of you are already into personal two-way communications sales and servicing, and large numbers of you who aren't into it yet are at least seriously considering it.

Because of your expressed interest in the personal two-way communications market, the entire staff of ET/D will be attending PC-76, the first national trade show devoted exclusively to personal two-way communications, in Las Vegas, March 29-April 1. Hopefully we will meet many of you there. For those unable to attend, we will publish in ET/D an overview report of the significant product and market developments which emerge at PC-76.

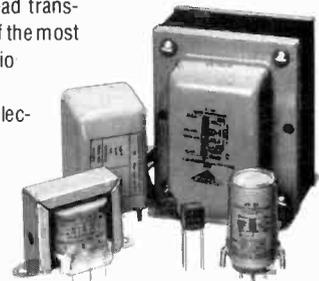
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NUMBER OF DIFFERENT BRANDS SOLD

Number of Brands	Per Cent of Dealers in Survey (19)
One	16%
Two	16%
Three	16%
Four	21%
Five	5%
Seven	5%
Nine	5%
Ten or More	11%
None (Service CB Only)	5%

dealers interviewed have worked with CB radio for more than five years, with 28% of the manager/owners in the sample stating that they had been in the business from 14 to 17 years.

HOW THEY FEEL ABOUT CB

The attitude towards "CB sales with service" was highlighted by comments made by a number of dealers during the interviews. A Courier dealer in Wichita, Kansas, Fred Howard, owner of Howard Electronics, said, "We know Courier is a good line, but we feel to a great extent we're the ones who make Courier look good in this part of the country. If you have good technicians and you constantly give good service you're just naturally going to make almost any good rig look better."

We don't worry about competition," he continued, "because we make sure everything about Courier is like it should be, and we guarantee satisfaction to the customer. There's just no way you can have problems when you operate this way."

Problems with CB radio do exist, however, for the two-way communications dealers. During the interviews we asked the dealers to tell us what the most difficult aspect was in selling and servicing CB. With 50% of the dealers it was the job of educating the customer on use of the equipment, FCC rules and regulations, antenna systems, and frequency or channel usage. A Kansas dealer said: "Too many people want us to

NUMBER OF BRANDS SERVICED

Number of Brands	Per Cent of Dealers in Survey (19)
All brands	53%
One	10%
Two	16%
Four	5%
None (Only sell CB)	16%

hide their antenna, mostly in the trunk." And a Pittsburgh dealer complained that "it's a job to explain to today's CB customer that their antenna has to be hooked up and matched before they use the transmitter." A communications dealer in Cleveland said, "Service is both essential and profitable, but it's also the largest source of hang-ups because of customer ignorance and the over-selling of the product by outlets that don't give a hoot what happens after the guy walks out of the store with the CB radio under his arm. When we sell a set, we encourage the customer to come back for a free antenna tuneup and for any other help and information he needs."

Another complaint heard from 23% of the respondent dealers was that the "product is being over-sold, with too many brands and models being put on the market and too many outlets selling price rather than quality." An Ohio dealer said, "Too many customers come into our shop expecting magic from CB. When we demonstrate a quality rig, the customer goes down the street and buys a cheapie from someone else. Sometime later, because we offer service, he comes to us with his grief. What it amounts to," he concluded, "is that you're asked to correct problems for people who you didn't make any money on in the first place."

Another dealer, one in Pennsylvania, put it another way: "People see a nice low price on a CB rig at a mass merchandiser or chain operation," he said, "but never stop to think 'where will I get it serviced after I buy it?' Sure, the radio has a warranty but it's with the factory and that takes time and is incon-

PER CENT OF ANNUAL INCOME FROM CB SALES & SERVICE

Per Cent of Annual Income	Per Cent of Dealers (17)
100%	34%
50%	12%
40%	6%
33%	6%
25%	12%
13%	6%
10%	12%
5%	12%

venient. We're the only CB outlet in Pittsburgh that services what we sell—and it pays off."

PARTS AVAILABILITY—A PROBLEM

Problems with 'replacement parts availability' also showed up in 12% of the interviews with the two-way specialists. A dealer in Cincinnati said, "Parts supply is the most insidious problem in the whole CB industry, mainly with imported items. Some of the firms that import CB equipment make no effort at all to stock renewal and repair parts in any depth at all, and", he continued, "they have not yet established any kind of component parts distribution system for CB, and that includes a number of American manufacturers." A dealer in New York complained that "unless you get into repair parts in a big way, you've got problems. It takes from 6 weeks to 3 months to get delivery on some items—and then unless you can provide 'loaner' equipment to your customer, you've got an exceedingly irate customer."

This problem of getting the product, its accessories and replacement parts to market—in other words, from the manufacturer to the consumer—occurs naturally when the desire for the product reaches boom proportions. Before the boom, CB products, accessories and parts reached the consumer usually through the two-way communications dealer or the open-door electronics distributor. In most cases, the supply line was from manufacturer to dealer to customer. In fact, with the two-way dealers we inter-

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viewed, that supply line is still in effect. The majority of dealers, 89%, said they buy *direct from the manufacturer*.

MORE TWO-STEP DISTRIBUTION ON THE WAY?

As the range of CB outlets has expanded to include the mass merchandisers and huge discount chains, however, a nationwide movement is underway to develop a stronger two-step distribution system for CB units, parts and accessories. The guiding force for this movement is the newly formed Communication Equipment Distributors Association (CEDA), with headquarters in Carbondale, Ill. A description of the new organization was provided in a recent report in *Radio & Television Weekly* by one of CEDA's founders, Harry Weiss. "We are joining together to combat the bastardizing of the marketplace by manufacturers who are selling to discount chains and mass merchandising operators direct instead of remaining loyal to their distributor system," Weiss explained. "With a multi-million dollar market forecast for 1976, we are going to make our buying power count," Weiss continued, explaining that "the organization (CEDA) controls roughly 65 per cent of the market distribution strength of CB and ham radio equipment in the U.S. right now, so we are going to have some say on how the industry grows in the future."

Incidentally, Mr. Weiss, who is president of Wren House Electronics, Inc., in Downers Grove, Ill., recently announced that his firm, "reaffirming its commitment to two-step distribution for CB and other personal communications products," has sold its retail outlet, and has adopted a 'wholesale only' sales policy. "We've prided

SOURCE OF SUPPLY FOR CB UNITS & ACCESSORIES

	Per Cent of Dealers (19)
From Manufacturer	89%
From Distributor	11%

ourselves on the service we provide to the Citizens' Band radio dealer," Mr. Weiss said, "and it became obvious that we couldn't give him the service he deserved if we were in competition with him."

SALES & SERVICE VOLUME CLIMBING

Problems with the availability of CB radios, accessories and parts were also mentioned when we asked the dealers in our survey "in

which direction have your CB sales gone during the past year?" While 76% said CB sales had increased, 12% said their sales had decreased, but only because "we couldn't get enough product." In fact, 55% of the dealers reported increases of 75% or more, with two reporting increases of 300% and 500%—and most of them said the increase in sales would have been greater if product had been available.

When asked about the increase or decrease in the volume of CB service during the past year, 63% of the dealers reported increases of over 100% and no one reported a decrease in service volume. However, 25% said their service volume hadn't changed much in the past year, mainly because so many new sets were still under warranty.

Where did their roughest competition for CB business come from? When we asked that question, most of the answers we got didn't surprise us. The discount chain store, a relative newcomer to CB sales, was the biggest competitor for 38% of the dealers, with other local electronic service shops in second place with 21%. One surprising answer, by 21% of the dealers, was: "I have no competition." One Los Angeles communications dealer put it this way, "Mass merchandisers are spewing out the CB equipment in large amounts, but that doesn't bother us much because our customers are interested in the better equipment—and in service to back it up."

MOST VOLUME FROM MOBILES

Although it's natural that mobile units produced by far the most CB sales volume—especially since the FCC changed the rules as to who a CB'er could talk to with his rig—we wanted to find out from the established two-way communications dealers if their experience was similar. When asked about the ratio between mobile and base unit sales, 11% of the dealers said the ratio is 70/30 in favor of mobile units, and 5% said they sell only mobile units, while the remaining 84% reported ratios of 99/1 to 75/25, all in favor

INSTALLATION OF MOBILE CB UNITS

What's the ratio of mobile units to base stations sold?

84% reported ratios of from 99/1 to 75/25, in favor of mobiles.

Of the mobiles you sell, what percentage do you install?

Percentage installed	Per Cent of Dealers Responding
99%	5%
90%	5%
75%	5%
60%	5%
50%	22%
25%	17%
20%	17%
10%	6%
9%	6%
5%	6%
1%	6%

Do you charge extra for mobile unit installation?

100% of comm dealers responding said YES

How much do you charge for mobile unit installation?

Charge	Per Cent of Comm dealers
\$40.00	11%
\$35.00	6%
\$30.00	22%
\$25.00	38%
\$23.00	6%
\$20.00	11%
\$ 8.00	6%

Of the mobile units you install, what percentage is purchased by the customer from some other retail outlet?

Per Cent from Other Outlet	Per Cent of Respondents
75 to 100%	16%
50 to 75%	17%
20 to 25%	15%
10 to 19%	21%
1 to 5%	10%
None	21%

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R0602 — Fast Recovery Rectifier	\$1.45	\$1.18	19%
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S9002 — Unijunction Transistor	\$1.64	\$1.38	16%

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of mobile units. A Seattle two-way dealer predicted, however, that "base station sales should increase as more mobile CB owners discover that it would be handy to have a base station in their homes for better utilization of their mobile unit."

Installation of the mobile CB units also adds to the income that a communications dealer can gain from CB sales, and it can help to prevent costly repairs resulting from improper antenna installation by the customer. When asked "of the mobile units you sell, what percent is installed by you?", 61% of the dealers said that they install 25% or more of the mobiles they sell. However, one Wisconsin dealer said that "lots of our customers install their own mobiles but come back to us to have the SWR checked."

All of the 18 dealers selling CB said they charge extra for installation of the units they sell. When asked what their installation charge was, 78% said between \$20 and \$30. Although the range of charges was from \$8 to \$40, the average charge was \$25.00.

COMMUNICATIONS DEALER IN UNIQUE POSITION

The ability to provide highly professional two-way communications service and the existence of at least one FCC-licensed technician on the staff would seem to put the average personal communications dealer/servicer in a unique position during the CB boom. As the whole industry wrestles to catch up with demand and to set up efficient methods of distribution, the communications dealer should be the one that manufacturers and even the mass merchandisers and discount chains look to for that necessary service back-up to the product. Most certainly, the end-user—the CB'er—is going to have to turn to the two-way communications dealer sooner or later if he wants to stay on the air with his new-found communications device.

We asked the dealers in our survey, first, what percentage, if any, of the mobile CB units they install are purchased by the consumer from some other retail outlet—and secondly—if other CB retail out-

lets in their area refer customers to them for installation and servicing. Although it might look like the same question asked two dif-

ferent ways, the first question refers to those customers who probably bought a mobile CB unit from a mass merchandiser or discount chain outlet and then, after the purchase, discovered they needed help with the installation, particularly with antenna selection, mounting and matching. The second question was asked to find out to what extent CB retail outlets without service were *prearranging* with communications dealers for installation and service for their customers.

In answer to the first question, 63% of the dealers said that 20% or less of the installations they perform were of units purchased at another retail outlet. Several dealers said that they discouraged this kind of business because "too often you end up trying to repair cheap equipment for which replacement parts and service information are just not available."

However, when asked if other CB outlets refer business to them by some *prearranged* agreement, 81% said "yes", and several dealers indicated that in their areas all the dealers "work together."

IS CB DIFFERENT?

The preceding statistics provide insight into how communications specialists are handling the current boom in CB sales. And when you add to those statistics the comments made by the specialists during the interviews, one fundamental fact emerges. *Selling CB equipment is something special.* It's not like selling TV sets or stereos. Anyone involved, or planning to get involved, should remember that it requires people with special expertise—people with more knowledge about CB than the customer—people who can educate the customer on the proper use of the equipment—and then it requires a solid backup by the selling organization of expert service and replacement parts.

If we become overawed by CB's current "boom" condition, if it's sold mainly to make a fast buck, or, if you will, as a "loss leader"—with no thought of what happens to the customer after he walks out of the store with a new CB rig under his arm—we're all in trouble! ■

CB EXPERIENCE

How long have you been selling and/or servicing CB?

Number of Years	Per Cent of Comm Dealers
1 to 5 years	28%
6 to 10 years	33%
11 to 15 years	28%
Over 15 years	11%

CB SALES IN 1975

	Per Cent of Comm Dealers
Sales Increased	76%
Sales Decreased	12%
No Change in Sales	12%

PER CENT OF INCREASE IN PAST YEAR

	Per Cent of Comm Dealers
500%	9%
300%	9%
100%	28%
75%	9%
65%	9%
50%	9%
35%	18%
30%	9%

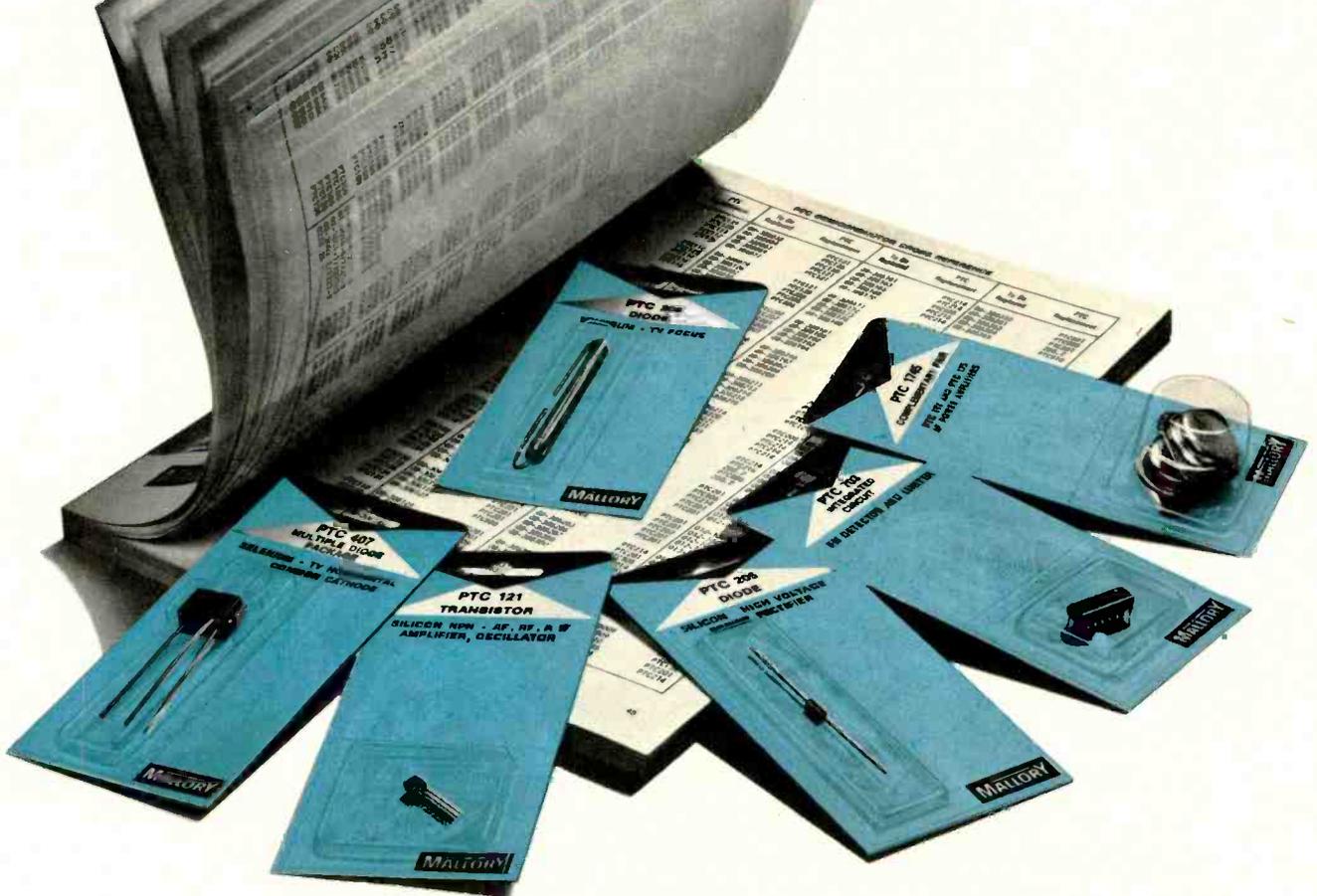
CB SERVICE IN 1975

	Per Cent of Comm Dealers
Service Volume Increased	75%
Service Volume Unchanged	25%

PER CENT OF SERVICE INCREASE IN PAST YEAR

	Per Cent of Comm Dealers
300%	25%
100%	38%
50%	12%
35%	25%

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ble-conversion is used, the circuit is a little more complex, but usually the only difference is another crystal and its oscillator.

TROUBLESHOOTING THE SYNTHESIZER

Now—with the synthesizer function outlined—let's talk about troubleshooting the synthesizer oscillator circuits themselves.

Table 1 is an example of the crystal chart which is usually included in the service data. This table shows which frequencies are controlled by which crystals. (This particular chart is one used for most E.F. Johnson transceivers, and although it wouldn't necessarily apply to other units, the principle is exactly the same.)

By referring to the crystal chart and carefully checking out the unit to determine which channels are receiving and transmitting properly, you can usually, quickly pin down the problem.

For example (referring to Fig. 2), assume that you find the transceiver operating normally on all channels (both receive and transmit) except channels 1 through 4. By looking to see which crystal is common to all four inoperative channels, you determine that the 32.700-MHz crystal is at fault.

At this point, do not jump to conclusions and decide that the crystal itself is defective. The problem could just as easily be an open connection, a broken wire, or a poor contact on the channel selector.

The crystal or tuning circuitry could also have aged and might merely need "re-tweaking". If this appears to be the case, be certain to check the frequency of the transmitter's output—and make sure that tweaking the oscillator doesn't cause some of the other channels to quit. The oscillator sections of some units are very critical and won't stand much tweaking.

Any time you deal with high-frequency RF, you should expect strange things to happen. Most oscillators, in CB units at least, have tuned output circuits. In conjunction with a crystal, you have a tuned-input/tuned-output oscillator. Additionally, the oscillators are usually biased so that they have a relatively high output of around 50 to several hundred mil-

TABLE
Typical Crystal Frequency Chart
For Synthesized CB Transceivers*
SYNTHESIZER SCHEME

CHANNEL	HF CRYSTAL	RECEIVE LF CRYSTAL	RECEIVE OUTPUT	TRANSMIT LF CRYSTAL	TRANSMIT OUTPUT
1	32.700	6.190	26.510	5.735	26.965
2	32.700	6.180	26.520	5.725	26.975
3	32.700	6.170	26.530	5.715	26.985
4	32.700	6.150	26.550	5.695	27.005
5	32.750	6.190	26.560	5.735	27.015
6	32.750	6.180	26.570	5.725	27.025
7	32.750	6.170	26.580	5.715	27.035
8	32.750	6.150	26.600	5.695	27.055
9	32.800	6.190	26.610	5.735	27.065
10	32.800	6.180	26.620	5.725	27.075
11	32.800	6.170	26.630	5.715	27.085
12	32.800	6.150	26.650	5.695	27.105
13	32.850	6.190	26.660	5.735	27.115
14	32.850	6.180	26.670	5.725	27.125
15	32.850	6.170	26.680	5.715	27.135
16	32.850	6.150	26.700	5.695	27.155
17	32.900	6.190	26.710	5.735	27.165
18	32.900	6.180	26.720	5.725	27.175
19	32.900	6.170	26.730	5.715	27.185
20	32.900	6.150	26.750	5.695	27.205
21	32.950	6.190	26.760	5.735	27.215
22	32.950	6.180	26.770	5.725	27.225
23	32.950	6.150	26.800	5.695	27.255

NOTE: All frequencies in MHz
*Chart Shown here is for E. F. Johnson
Model 123A CB Transceiver.

liwatts. Under these conditions, even if the crystal is dead or not properly connected, the oscillator "wants" to keep oscillating, and without the crystal to stabilize it, strange things might begin to happen. For example, you might have normal or near normal output on the transmitter and plenty of "squelch noise" on the receiver, yet the transmitter still doesn't "talk" on any channels although the receiver does function properly on all channels.

Under the same conditions (crystal dead or not properly connected), you might find duplication of channels on receive, transmit or both. These mysteries are easily solved.

In the first case, the affected oscillator probably is operating all by itself. To verify that this condition exists, perform a frequency check to determine if the frequency of the oscillator is wander-

ing all over the band.

Duplication of channels also can occur if an oscillator is dead and the tuned circuits between it and the mixer are tuned just right. In such an instance, the mixer has become a tune-input/tuned-output oscillator. As a rule, this would occur only if the unit has been severely mistuned (as can happen when the unit is tuned up on the basis of nothing more than a wattmeter). Another cause might be a leaky mixer transistor.

Duplication of channels, with the proper crystals installed and operating, can also be caused by one crystal "taking over" for another. A few picofarads of stray capacitance or a slightly conductive insulator on a switch, when combined with an itchy, over-eager oscillator, provides the perfect setup for a takeover. Restoring crystal operation usually cures the problem.

Crystals seldom operate in pairs; as a rule there is too much capacitance, and one or both are swamped out. This is usually the case if switching diodes are faulty. Front-to-back diode checks will pinpoint this problem.

If corrosion is suspected on a switch or crystal board, use a sensitive ohmmeter to check for it. This condition may be indicated by failure of an oscillator to function even when a crystal known to be good is installed.

You will notice that little has been said so far about troubleshooting the actual oscillator transistors and associated circuitry. There is little need to waste space discussing the obvious. One transistor amplifier is very much like another, and oscillators are no exception. Simple voltage checks will usually pinpoint a defective transistor.

Another problem rare enough to give you a fit when it does occur is a faulty coupling capacitor or transformer. Again, voltage and continuity checks usually isolate the problem.

If you encounter a problem that defies shortcut solutions, start at each oscillator and make stage-by-stage *RF* checks. Some technicians like to use a scope to make these checks because it can discriminate between various frequencies. A scope is useful in the low-impedance, high-output stages, but almost worthless elsewhere. Most scopes are insensitive at high frequencies and nearly all of them have too much probe capacitance and very low input impedance. They simply swamp the circuit and prevent oscillation.

Other technicians prefer to use a high-impedance *RF* probe on an electronic voltmeter. My preference is the Hewlett/Packard 410B; of course, there are other electronic voltmeters that will work as well. Remember, though, that the voltmeter probe has the disadvantage of being blind to frequency differences.

Another stage-by-stage method is that of loosely coupling a frequency meter to the circuit. Tune the meter to the specified frequency of the oscillator output and make sure that the output is present and on frequency. Then use the

RF probe to check the amplitude of the oscillator output. In my opinion, this is the best method, although, admittedly, it requires accurate and versatile test equipment.

The loose-coupling is accomplished by winding a few turns of wire into the form of a coil. Keep the turns parallel, because scrambled coils tend to be self-canceling at *RF* frequencies.

The pickup coil is then placed close to the oscillator in question, and the heterodyne beat in the speaker and the frequency meter readout tells you exactly what the output frequency of the oscillator is. Best of all, the oscillator circuit is not loaded by a directly connected probe.

If the problem is malfunction on only one channel on either receive, transmit, or both modes, or on more than one channel with no relationship between them, the problem is likely to be a dirty, broken or bent channel selector switch contact. Try cleaning the switch with tuner cleaner. If that doesn't help, make a close visual inspection. Sometimes a switch can be realigned to restore normal operation. Remember: The only thing unique to any one channel on a synthesized unit is that particular position on the channel selector.

Severe "downward modulation"—indicated when the wattmeter reading drops 25 per cent or more when modulation is applied—might indicate an oscillator problem. Some oscillators tend to "drop out" when they are peaked for maximum output. The solution is to back off to the gentle slope of the peak.

Downward modulation can also be caused by poor voltage regulation in the oscillator power supply. This would indicate a problem with a zener regulator, the B+ supply, or transmitter tuning.

If you find an open or leaky zener regulator, remember that it might have damaged the dropping resistor that supplies the B+. Monitoring of the regulated line while applying modulation will reveal this condition.

Downward modulation, however, is more likely caused by either an inadequate B+ supply (not enough current capability) or

a transmitter tuning problem (over-coupling). The B+ supply problem can be checked by placing a voltmeter across the supply line and noting the voltage drop under modulation. The second condition can be remedied by slightly retuning the final amplifier.

Some units are designed (by accident, I hope) so that they show downward modulation at any decent output level. In this case, forget it—you can't make a silk purse out of a sow's ear.

RESTORING XTAL ACTIVITY

If you have determined that your problem is a dead or inactive crystal, and you can see a long wait ahead for parts, don't despair. There is a fairly simple procedure that will give you about a 50/50 chance of restoring crystal activity.

Remove the crystal from the unit and hold it between your thumb and forefinger. Apply heat from a soldering iron directly to the pins or wire leads of the crystal. Hold the heat there until the crystal is too hot to hold comfortably and then remove the heat. Don't drop the crystal at this point, or all is lost. Allow it to cool for 15 to 20 seconds before you set it down. Then check for restored activity. What you have done, if it works, is resoldered the plates on either side of the tiny piece of quartz to their respective leads.

I have restored the activity of dozens of crystals in this manner. Some of the repairs outlasted the radio; some failed after a few hours of operation. You can't guarantee this repair, obviously. Often when you tell the customer that, he'll tell you to go ahead anyway and order a new crystal. In either case, you have little to lose.

When a crystal repair is made in the above manner, always check the frequency. I have never seen this procedure drastically change the operating frequency, but there is a first time for everything.

If you doubt this procedure—and most people do at first—experiment with some of the dead crystals in your "junk" parts inventory. It also works on crystals used in equipment other than CB. I learned it out of desperation. You have the advantage now of doing it at your leisure. ■



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Schedule of Events

PC-76

Personal Communications

2-way Radio Show

Las Vegas Hilton Hotel, Las Vegas, Nevada

March 29-April 1, 1976

Sponsored By: Citizens Radio Section,
Communications Division, Electronic Industries
Association (EIA)

MONDAY, MARCH 29

- 7:00 PM-8:00 PM—Cocktails/Reception
- 8:00 PM—PC-76 Kick-Off Banquet
- *Keynote Speaker*—Robert E. Lee, Commissioner, Federal Communications Commission (FCC)
- *Keynote Theme*—"Overview of Communications"

TUESDAY, MARCH 30

- 9:30 AM-11:30 AM—Seminar: * *Government Regulations and Attitudes—How They Affect Your Business*, Moderated by John Sodolski, vice president, Communications Division, EIA
- *Personal Communications—An Overview From the Executive Office*
Thomas Keller, General Counsel,
Office of Telecommunications Policy
Executive Office of the President
- *FCC Rules—The Current Structure, and A Look at the Future*
Charles Higginbotham, Chief,
Safety and Special Radio Service Bureau,
Federal Communications Commission
- *Technical Rules and Regulations—How Do You Comply?*
Raymond E. Spence, Jr.,
Chief Engineer,
Federal Communications Commission
- *The Free Market and Regulation—A Contradiction?*
Richard L. Brown,
Communications Attorney,
Washington, D.C.

11:00 AM-5:00 PM Trade Show Exhibits Open**

WEDNESDAY, MARCH 31

- 9:30 AM-11:30 AM—Seminar: * *Personal Communications—A Different Marketplace*, moderated by William Thomas, Pathcom, Inc., chairman, Citizens Radio Section; EIA
- *The Different Market—User Regulation*
Gus Wirth, Kris, Inc.
- *Product Regulations—Standards and Type Acceptance*
John Chase, Royce Inc.
- *Installation and Service in a Regulated Market*
Dave Bradley, E. F. Johnson Co.
- *Personal Communications Requires Different Display and Advertising*
Ed Walsh, Craig Corp.
- *The Different Distribution—Specialized VS. Mass Merchandising*
Joe Haskins, Pathcom, Inc.

● 11:00 AM-5:00 PM—Trade Show Exhibits Open**

THURSDAY, APRIL 1

● 11:00 AM-5:00 PM—Trade Show Exhibits Open**

* \$7.50 registration fee for two-day Seminar Series.

** No fee required for registering to attend Trade Show Exhibits. ■



Service Sells Comm and Marine Electronics

By David Norman and J.W. Phipps

How one sales & service dealer on Florida's Northwest coast has faced up to the decisions which today confront most electronic businesses that offer both product and service

■ Although still a relatively young marine and communications electronic sales and service firm, Destin Electronics, in Destin, Florida, is already popular with a surprisingly large percentage of the charter boat operators, commercial fishermen and pleasure boat owners along the 120 miles or so of Northwest Florida coastline between Pensacola, to the west of Destin, and Panama City, to the east.

There are a number of reasons for Destin Electronic's popularity and resultant prosperity, but, as is true of any successful, single-proprietor business, regardless of which reason you analyze, you always can trace its origin back to the fundamental business principles and philosophies of the

owner/operator—in this case, Kenny Mauldin, an electronics technician-turned-businessman.

Mauldin, who operated Destin Electronics on a part-time basis from his home before going full time in December 1973, has had to face up to the same dilemmas and decisions which today confront all owners of businesses which offer both product and service.

Determining Which Generic Types of Products You Should Sell And Service—*"You've got to be prepared to meet as many of the related product and service needs of your customer as is profitably possible."*

Mauldin has focused his business on the electronic-related needs of commercial fishermen and charter and pleasure boat

owners. A large part of Mauldin's annual gross revenue of \$225,000 is from sales, installation and servicing of the electronic equipment which commercial and sports fishermen use to pinpoint favorable fishing spots and locate fish around them. He also receives a substantial portion of his total revenue from sales, installation and servicing of two-way communications equipment such as CB, VHF marine and long-range, single-sideband transceivers. In addition, he also handles a few marine radar units each year and does a relatively small amount of electronic repair under contracts with the U.S. Air Force (Eglin Air Force Base is near Destin).

Mauldin admits that profit potential and compatibility to his operation are two prime factors in his selection of the generic types of electronic products he sells and services, but he also points out that an electronics sales and service business must be capable of meeting as many of the related product and service needs of its customers as is realistically possible, particularly if these needs are essential to a customer's business or principal form of recreation.

"Business owners in particular," says Mauldin, "don't have the time or inclination to shop around for either product or service, and they prefer to get service from the same source from which they buy the product. Before you decide to sell an electronic product which inherently requires installation and/or periodic servicing, you'd better be prepared to offer after-the-sale support of the product."

Adapting Your Business To The Changing Needs Of Your Customers—*"Recognizing new needs and responding to them are necessary for survival and sustained growth."*

Specialization in the marine and communications segments of the electronics market seemingly has worked for Mauldin. As he puts it: "I've recognized a void and I've focused my business on that void."

"But," as Mauldin points out, "once you commit yourself to a particular segment of the market, you'd better keep attuned to its changing needs or you might find yourself bypassed."

Citing one example of how the

need for a product and related service emerged in his own market, Mauldin explains:

"A few years ago, submerged reefs or wrecks within sight of shore made loran (Long Range Navigation) and fishfinding gear unnecessary. However, as fishing increased, the close-in holes were cleaned out. No longer could a charter boat captain rely on bearings from landmarks to find his spots. He simply was too far from shore to see them. When he found a new spot—or made one by dumping enough debris to start his own artificial reef—he had to be able to locate it again with precision.

"Following a compass course from the harbor, and watching his fathometer was not precise enough, and he might waste hours trying to find the right spot. However, now he can use two loran fixes to put him within a hundred feet or so of his spot, and use his high-resolution depth recorder to determine if the fish are home.

"As a result of this need for loran, we now do a significant volume of loran sales, installation and servicing, and it's profitable."

Adapting The Business To Meet The Volume Needs Of The Market—"If the business volume is there, you'd better expand to accommodate it or someone else will fill the gap—and that increases your competition now and in the future."

When Mauldin made the decision to go into business on a full-time basis, he weighed the potential of his market and optimistically decided to build a facility three times larger than he needed at the time. He then rented the excess space to other businesses. (Finding tenants was not difficult, because the cost of commercial real estate along the bustling Northwest coast of Florida was then, and still is, at a premium.)

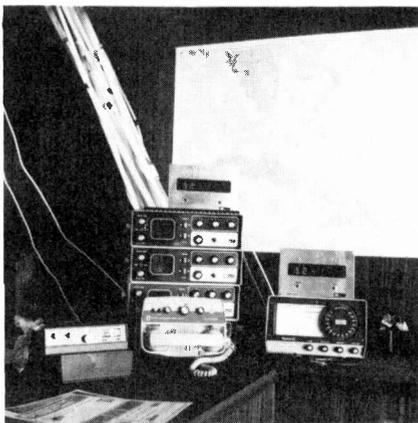
This assured him room for future expansion and the rent from tenants helped ease his overhead costs.

In recent months, Mauldin's foresight has begun paying off as an increasing backlog of repairs and installations have forced him to expand his shop facilities and hire additional help.

Mauldin's present payroll consists of himself, a full-time secretary/receptionist and two full-time and two part-time techni-



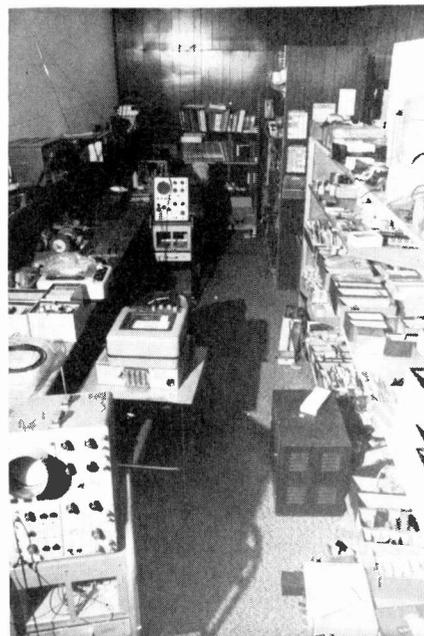
Kenny Mauldin, owner/operator of Destin Electronics, Destin, Florida—"Communications and marine electronics are definitely growth markets, but you'd better be prepared to back up sales with proficient installation and servicing if you expect to be in the business five years from now."



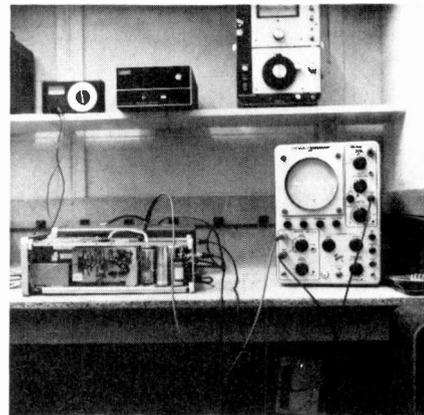
Counter display of three of the communications and marine electronics products sold, installed and serviced by Destin Electronics—CB transceivers, lorans and depth finders. In background are large marine communications antennas.

cians. The two part-time technicians work on what Mauldin calls "a loose contractual basis"—one handles most of the repair business the shop receives from Air Force contracts, and the other (myself, Dave Norman) handles most of the CB and marine VHF servicing.

Mauldin estimates that his newly expanded workforce and shop facilities will accommodate 30 to 40 percent more annual business, but, because of Destin Electronic's present high rate of growth, Mauldin is already planning the next step in what appears to be an inevitable need for further expansion. He is considering opening a branch operation in either Pensacola (about 50 miles west of Destin) or Panama City (about 50



A partial view of one of Destin Electronics' bench service areas. Unit on wheeled cart immediately above scope in foreground is a commercial fathometer.



Communications and marine electronics servicing requires accurate test instruments. Shown here is a frequency counter being calibrated in Destin Electronics "digital instrument lab."

miles east of Destin) but hasn't yet reached a decision about the feasibility of such "remotely-controlled" operations.

Meeting The Challenge of Seasonal Fluctuations In Workload—"Getting customers attuned to the idea of anticipating some of their needs has helped us smooth out some of our workload."

Because many of Mauldin's customers are charter boat operators who cater to the tourist trade, his business volume increases in the Spring as they start getting their boats and related electronic equipment ready for the approaching tourist season. Consequently, despite the recent expansion of his workforce and shop facilities and the built-in flexibility of his two "contract technicians," Mauldin



Destin Electronics employs four electronic technicians, three of whom are shown here. Two of the techs are employed on a full-time basis and two work part time on a contract labor basis, giving owner/operator Mauldin the work force flexibility he feels he needs to cope with the fluctuating nature of his market's servicing needs.

still is not certain that he will be able to easily handle what he calls "the perennial Spring rush."

However, he has been able to ease the problem somewhat by getting his customers into the habit of anticipating at least some of their product and service needs, thereby permitting him to spread a larger portion of the workload over several months instead of a few weeks.

"In a way," he says, "the seasonal jamup was partly my fault. When I started the business, I tried to do everything at once. When you only have a dozen customers, you can do it. Then, as business steadily increased, I found that I had to start looking ahead several months. I no longer could sell a new piece of gear and install it the same day; I had to fit the installation into the shop schedule where I could."

"As I learned what each of my customer's needs were, and what they needed to do to upgrade their equipment, I began to start working with them to plan ahead. For example, one of my customers owns several boats, some of them with equipment so old or obsolete that replacement is inevitable."

"When he came into the store on another matter, I merely asked him if it wasn't about time to start thinking about doing some upgrading. He agreed, but told me that the boat was too busy at present to shut down and that his money would be a little tight for the next few months."

"So we picked a time that would be after the peak season was over, and I made a note to order what he needed so that it would get in just when we were ready—both time-wise and moneywise."

"Actually, I usually try to order

equipment a little earlier than I need it. Old equipment has a way of going bad before the customer expects it to, and the customer may have to make an emergency shutdown, whether he wants to or not."

Deciding How Many Brands To Carry—"Carrying more brands than are required to meet your customer's needs not only increases your costs and reduces profits but it also dilutes your position with distributors and manufacturers."

While many electronic sales and service dealers seem to take on as many different lines as they can get their hands on, Mauldin's philosophy is to carry only as many different brands as he believes is necessary to cover his customer's needs.

He carries the complete line of one "major" brand of CB equipment, and when one of his customers needs or demands a unit or feature not available in that line—for example, a 32-volt unit—he orders it from another brand line.

Mauldin handles Konel/Furuno depth recorders and radars for more sophisticated boats, and Raytheon depth recorders and flashers for primary use on smaller vessels and as standby, or backup, units on more sophisticated boats.

He prefers SRD lorans because their modular construction makes possible quicker repair, thus minimizing downtime for the customer.

To cover the VHF FM marine radio needs of his customers, Mauldin stocks Motorola Triton units. (He believes that the new 55-channel units will become as popular among marine radio users as 23-channel units recently have become among CB'ers.)

Mauldin carries three "major" brands of communications antennas plus a few "special purpose" types not available from the particular major brand lines he stocks.

One of Mauldin's biggest inventory problems is keeping enough antennas on hand to cover his customer's needs. There is a heavy attrition of antennas on the boats that ply the waters along Florida's Northwest coast, principally because of the violent storms which occasionally strike that part of the Gulf. To meet his customer's needs

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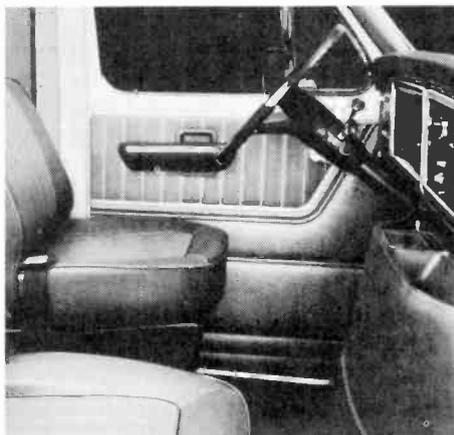
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Ford Parcel Delivery Vans not only take on big jobs, they make the driver's job easy.

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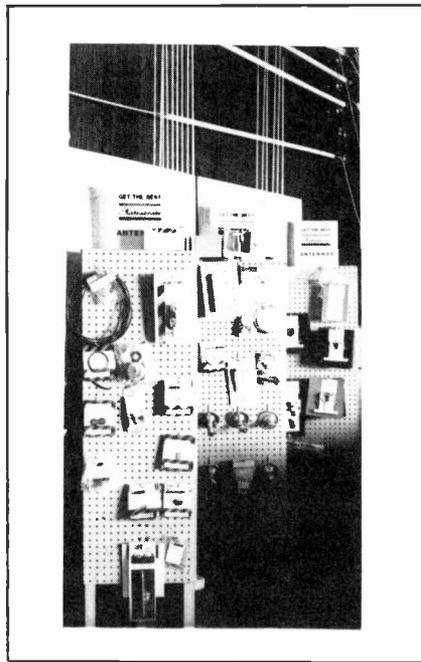
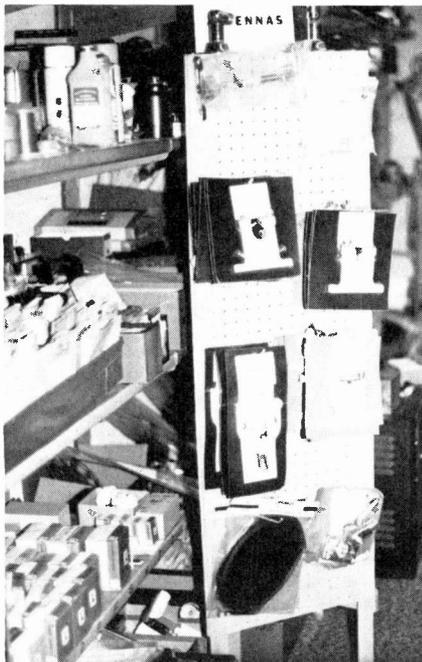
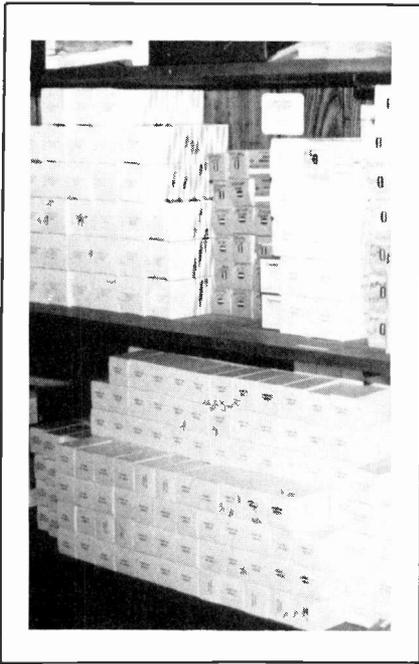


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A service delay because a part or accessory is not immediately available usually means only inconvenience to the customers of home entertainment electronic businesses. But because most of the communications and marine electronics equipment which Mauldin sells, installs and services is essential to his customers' businesses, delay to them means not only inconvenience but also loss of profit. For this reason, Mauldin carries a relatively broad range of parts and accessories, some of which are shown here.

in the aftermath of hurricane Eloise, Mauldin even removed and sold his own shop's antennas. If the peak tourist season hadn't been over, some of his customers who operate charter boats would have had to shut down anyway because Mauldin couldn't get the antennas they needed—everyone had them backordered.

Drawing the Line On The Amount Of Service Offered "Free," To Support Sales—
"Although service can be an effective

sive sales tool, you can afford to 'give it away' only to those customers from whom you have received, or realistically can expect to receive, sufficient sales profit to make your cost of the 'free' service relatively inconsequential."

Like most other successful electronic sales and service dealers, Mauldin recognizes that his most effective sales tool is the quality and quantity of after-the-sale support he offers on the products he sells.

Unlike some other sales and service dealers, however, Mauldin also recognizes that it is inherent in the nature of most humans to want "a little something extra," and that this human characteristic, when combined with other factors—such as warranty policies which fail to adequately compensate him for after-the-sale servicing required as a result of sloppy quality control and/or poor design—can quickly make after-the-sale product support more of a profit eater than a profit-producing sales tool.

"Nevertheless," says Mauldin, "I would have to be a fool to refuse to make an unprofitable service call on the equipment of a company which has purchased several marine radars from me for \$4000 each and is building another boat. Within the context of this type of equipment and customer, and the present and future profit involved, there realistically is no such thing as an 'unprofitable' service call."

"However," continues Mauldin, "not all of my customers and not all of the types of equipment I sell represent this level of actual or potential sales profit. It's realistic to 'give up' all or part of the profit in a \$50 service call for an established customer who contributed \$2000 to your sales profit in the past year, but it's anything but realistic to write off the same service profit or costs for a service call on a \$125 CB unit purchased by a customer you never saw before and probably will not see again—and you probably are better off not seeing him again if he demands \$50 worth of free service on a \$125 product. The only way you economically can do that kind of business is to force your profit-producing customers to subsidize the nonprofitable ones, and when you start doing that, you're going to end up with a guilty conscience, no profit-producing customers and an empty bank account."

The Need For Putting Most Servicing On A Profitable Basis—
"Because of the direct impact that service labor rates have on sales volume, I've been reluctant to increase labor rates, but increased costs and narrowing profit margins now demand it."

Until recently, Mauldin found it possible, and in some ways advantageous, to operate the service

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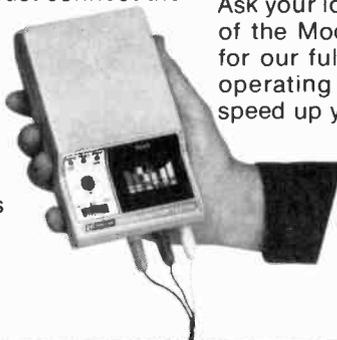
The new Model 510 combines the Dynapeak™ in-circuit semiconductor testing method with the new HI/LO power drive. In LO drive, a "good" power indication also automatically and positively identifies all three transistor leads—base, emitter, and collector. In HI, the Model 510 provides a positive GOOD/BAD indication in circuits with shunt resistance as low as 10 Ω and shunt capacitance up to 25 mfd.

The instrument requires a minimum of control manipulation, so a complete transistor test takes less than ten seconds. Just connect the test clips in any order to the device and turn the tester to LO. Move the six-position test switch until either the NPN-OK or PNP-OK indicator lamp lights. The test switch position identifies the device leads to which each test clip is

connected. Out-of-circuit tests are equally fast using the test clips or the convenient plug-in test socket.

The Model 510 measures 6-5/8" x 3-3/4" x 1-3/4" and weighs but a single pound, less batteries. The tester uses four "AA" cells for hundreds of hours of service. A flashing test light reminds you to turn the tester off when not in use. The instrument is supplied complete with three test clips and leather carrying case.

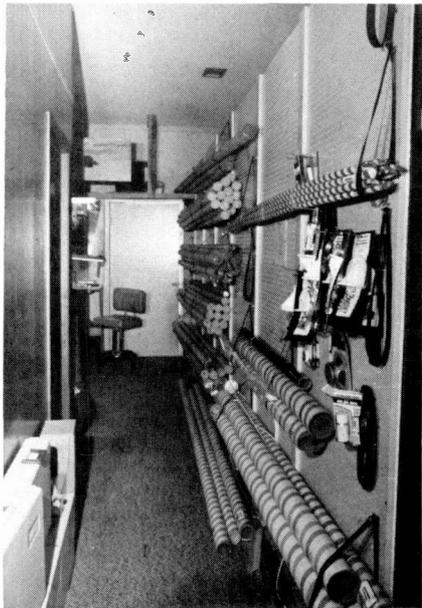
Ask your local distributor for a demonstration of the Model 510 Transistor Tester. Or write for our full color brochure that explains the operating ease and convenience that will speed up your solid state testing and service.



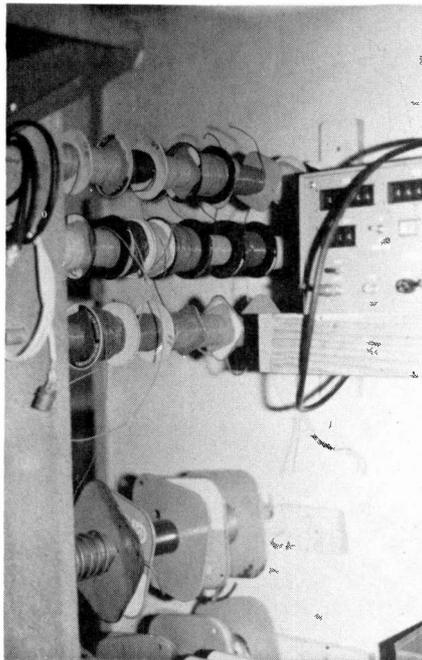
BK PRECISION

PRODUCTS OF DYNASCAN

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Efficient use of his shop facilities is one factor which has enabled Mauldin to cope with a steadily increasing volume of business. As shown here, Mauldin even uses hallways for storage. The striped poles are marine antennas, most of which will be sold during the rush which Destin Electronics experiences each Spring as charter boat operators gear up for the tourist season.



A large assortment of wire and cable is required in communications and marine electronics installation and servicing. Shown here is Destin Electronics' method of storing and dispensing some of the hundreds of feet of wire and cable used each year.

Typical Service Labor Charges & Rates Destin Electronics

Type Of Service	Charge/Rate
Accessory Repair (mike connectors, speakers, etc.)	\$ 5.00
CB Checkout (preliminary diagnosis & adj.)	5.00
CB Checkout (complete)	12.50
CB Installation (simple)	25.00
Hourly Service Labor Rate (bench & field)	16.00/Hr.
Complex Installations	Hrly Rate
Bench Service (diagnosis, repair & checkout)	35.00+ *

* Depends on type of equipment

part of his business at the break-even point or even at a slight loss.

"Now," says Mauldin, "the combined effects of inflation and recession have changed things. Before, I felt that the service labor rates of many electronic sales and service dealers were too high and that many customers were being ripped off by some dealers. Recently, however, I began to take a closer look at the total amount of revenue coming into my own business and weighed it against what I'm paying out. I realized that the profit margin was narrowing and that, as a result, I had no choice but to make some rate increases. It is not possible to pay good technicians what they are worth and need and still continue to bill out

labor at \$12.00 per hour."

"Being selective about what you accept for repair can help increase service profits and also head off many customer relations problems."

One other way by which Mauldin is attempting to put servicing on a more profitable basis is, as he puts it, "to be a bit more choosy about what we accept for repair."

Mauldin doesn't mean that he won't accept units that other dealers have sold. "After all," points out Mauldin, "if you adopt that kind of exclusionary policy, you'll be defeating the advantage that you have as a servicing dealer."

However, he has come to realize that he isn't doing either the customer or himself a favor when he

accepts for repair a piece of "fatigued" equipment which economically isn't worth repairing, particularly if there is a chance that he will have to take a loss on the repair just to keep the price at a level that is acceptable to the customer. And he also realizes that, even if he might profit from the initial repair of such equipment, there is still the higher-than-acceptable risk that the equipment will break down again sooner than the customer considers reasonable—and then, profit or no profit, he automatically will have a customer relations problem that will be both costly and difficult to resolve satisfactorily.

Coping With Need For Exchanging The Service Bench For A Desk—*"The role of a business manager isn't as appealing to me as that of a technician, but I know that it's essential that I devote more time to managing."*

As his business has grown, Mauldin, who holds an FCC First Class License and has spent more years than he "likes to admit" servicing a variety of electronic equipment, has had to gradually divorce himself from the service bench and now must spend much of his time behind a desk, performing such "managerial" duties as scheduling work and ordering equipment and parts.

His full-time secretary/receptionist assists him with scheduling, ordering, and billing. Once a month, either Mauldin, his secretary/receptionist or both meet with Mauldin's accountant-cum-tax expert. This is the part of the business that Mauldin likes least. Says Mauldin: "It was much simpler when all that I had to do was to work on something that was broken and collect for it on a COD basis when I repaired it. Now, however, I find myself being forced to spend more and more time on such matters as balancing the accounts receivable against the accounts payable and making sure we have enough operating cash left to make payrolls, buy new inventory and keep the business growing."

"But," Mauldin adds, philosophically, "so far it's all been worth it." ■

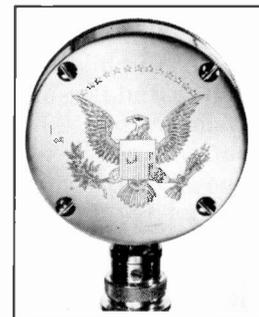


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Class-D CB Rules & Regs—A Guide

A subject reference guide to and relevant extracts from sections of Part 95 of the FCC Rules and Regulations which pertain specifically to Class-D of the Citizens Radio Service

■ The use, operation, installation, testing, adjustment, and specified operating characteristics of equipment authorized by the FCC for use in the Citizens Radio Service are stipulated in Volume VI, Part 95 of the Federal Communication Commission's (FCC) Rules and Regulations.

The following alphabetical listing of the various subject areas and related extracts of sections of Part 95 which pertain to Class D CB is intended only as a familiarization guide for electronic technicians and electronic dealers who service, install and/or sell Class D CB equipment. It is *not* intended to be used in lieu of the complete and current copy of Part 95 stipulated by the FCC in Section 95.105 of the Rules and Regulations.

ANTENNA RESTRICTIONS (Subpart B, 95.37)

(1) All antennas, both receiving and transmitting, and supporting structures associated or used in conjunction with a Class C or D citizens radio station operated from a fixed location must comply with at least one of the following:

(1) The antenna and its supporting structure does not exceed 20 feet in height above ground level; or

(2) The antenna and its supporting structure does not exceed by more than 20 feet the height of any natural formation, tree or man-made structure on which it is mounted; or

(3) The antenna is mounted on the transmitting antenna structure of another authorized radio station and exceeds neither 60 feet above ground level nor the height of the antenna supporting structure of the other station; or

(4) The antenna is mounted on and does not exceed the height of the antenna structure otherwise used solely for receiving purposes, which structure itself complies with subparagraph (1) or (2) of this paragraph.

(5) The antenna is omnidirectional and the highest point of the antenna and its supporting structure does not exceed 60 feet above ground level and the highest

point also does not exceed one foot in height above the established airport elevation for each 100 feet of horizontal distance from the nearest point of the nearest airport runway.

COMPLIANCE WITH TECHNICAL REQUIREMENTS

(Subpart C, 95.53)

(a) Upon receipt of notification from the Commission of a deviation from the technical requirements of the rules in this part, the radiations of the transmitter involved shall be suspended immediately, except for necessary tests and adjustments, and shall not be resumed until such deviation has been corrected.

(b) When any citizens radio station licensee receives a notice of violation indicating that the station has been operated contrary to any of the provisions contained in Subpart C of this part, or where it otherwise appears that operation of a station in this service may not be in accordance with applicable technical standards, the Commission may require the licensee to conduct such tests as may be necessary to determine whether the equipment is capable of meeting these standards and to make such adjustments as may be necessary to assure compliance therewith. A licensee who is notified that he is required to conduct such tests and/or make adjustments must, within the time limit specified in the notice, report to the Commission the results thereof.

(c) All tests and adjustments which may be required in accordance with paragraph (b) of this section shall be made by, or under the immediate supervision of, a person holding a first- or second-class commercial operator license, either radiotelephone or radio telegraph as may be appropriate for the type of emission employed. In each case, the report which is submitted to the Commission shall be signed by the licensed commercial operator. Such report shall describe the results of the tests and adjustments, the test equipment and procedures used, and shall state the type, class, and serial number of the operator's license. A copy of this report shall also be kept with the station records.

EMISSION REQUIREMENTS

Types Permitted (Subpart C, 95.47)

(d) Transmitters used at Class D stations in this service are authorized to use amplitude voice modulation, either single or double sideband. Tone signals or signalling devices may be used only to actuate receiver circuits, such as tone operated squelch or selective calling circuits, the primary function of which is to establish or maintain voice communications. The use of any signals solely to attract attention or for the control of remote objects or devices is prohibited.

Limitations (Subpart C, 95.49)

(c) The authorized bandwidth of the emission of any transmitter employing amplitude modulation shall be 8 kHz for double sideband, 4 kHz for single sideband and the authorized bandwidth of the emission of transmitters employing frequency or phase modulation (Class F2 or F3) shall be 20 kHz. The use of Class F2 and F3 emissions in the frequency band

26.96-27.28 MHz is not authorized.

EXTERNAL RF POWER AMPS PROHIBITION (Subpart C, 95.44)

No external radio frequency power amplifier shall be used or attached, by connection, coupling attachment or in any other way at any Class D station.

NOTE: An external radio frequency power amplifier at a Class D station will be presumed to have been used where it is in the operator's possession or on his premises and there is extrinsic evidence of any operation of such Class D station in excess of power limitations provided under this rule part unless the operator of such equipment holds a station license in another radio service under which license the use of the said amplifier at its maximum rate output power is permitted.

FREQUENCIES AND THEIR USAGE (Subpart C, 95.41)

General—

(d) The frequencies listed in the following tables are available for use by Class D mobile stations employing radiotelephony only, on a shared basis with other stations in the Citizens Radio Service, and subject to no protection from interference due to the operation of industrial, scientific, or medical devices within the 26.96—27.28 MHz band.

Normal Communications Channels—

(1) The following frequencies, commonly known as channels, may be used for communication between units of the same station (intrastation) or different stations (interstation):

MHz	Channel	MHz	Channel
26.965	1	27.125	14
26.975	2	27.135	15
26.985	3	27.155	16
27.005	4	27.165	17
27.015	5	27.175	18
27.025	6	27.185	19
27.035	7	27.205	20
27.055	8	27.215	21
27.075	10	27.225	22
27.105	12	27.255	23
27.115	13		

Emergency Communications (Channel 9)—

The frequency 27.065 MHz (Channel 9) shall be used solely for:

(i) Emergency communications involving the immediate safety of life of individuals or the immediate protection of property or

(ii) Communications necessary to render assistance to a motorist.

Calling (Channel 11)—

(3) The frequency 27.085 MHz (Channel 11) shall be used only as a calling frequency for the sole purpose of establishing communications and moving to another frequency (channel) to conduct communications.

FREQUENCY TOLERANCE (Accuracy) (Subpart C, 95.45)

(a) Except as provided in paragraphs (b)* and (c)* of this section, the carrier frequency of a transmitter in this service shall be maintained within the following percentage of the authorized frequency:

Class of station	Frequency tolerance	
	Fixed and base	Mobile
D005

*Paragraphs (b) and (c) pertain solely to Class C and A, respectively, and therefore have no relevancy to Class D operations.

GEOGRAPHICAL OPERATING LOCATIONS PERMITTED (Subpart C, 95.117)

(c) A Class C or Class D mobile station may be used or operated anywhere in the United States Subject to the provisions of paragraph (d) of this section.

(d) A mobile station authorized in this service may be used or operated on any vessel, aircraft, or vehicle of the United States: *Provided*, That when such vessel, aircraft, or vehicle is outside the territorial limits of the United States, the station, its operation, and its operator shall be subject to the governing provisions of any treaty concerning telecommunications to which the United States is a party, and when within the territorial limits of any foreign country, the station shall be subject also to such laws and regulations of that country as may be applicable.

MODIFICATION PROHIBITIONS (Subpart B, 95.35)

(d) Transmitting equipment type accepted for use in Class D stations shall not be modified by the user. Changes which are specifically prohibited include:

(1) Internal or external connection or addition of any part, device or accessory not included by the manufacturer with the transmitter for its type acceptance. This shall not prohibit the external connection of antennas or antenna transmission lines, antenna switches, passive networks for coupling transmission lines or antennas to transmitters, or replacement of microphones.

(2) Modification in any way not specified by the transmitter manufacturer and not approved by the Commission.

(3) Replacement of any transmitter part by a part having different electrical characteristics and ratings from that replaced unless such part is specified as a replacement by the transmitter manufacturer.

(4) Substitution or addition of any transmitter oscillator crystal unless the crystal manufacturer or transmitter manufacturer has made an express determination that the crystal type, as installed in the specific transmitter type, will provide that transmitter type with the capability of operating within the frequency tolerance specified in Section 95.45:(a).

(5) Addition or substitution of any component, crystal or combination of crystals, or any other alteration to enable transmission on any frequency not authorized for use by the licensee.

(e) Only the manufacturer of the particular unit of equipment type accepted for use in Class D stations may make the permissive changes allowed under the

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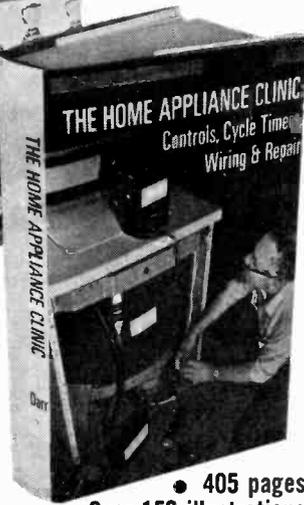
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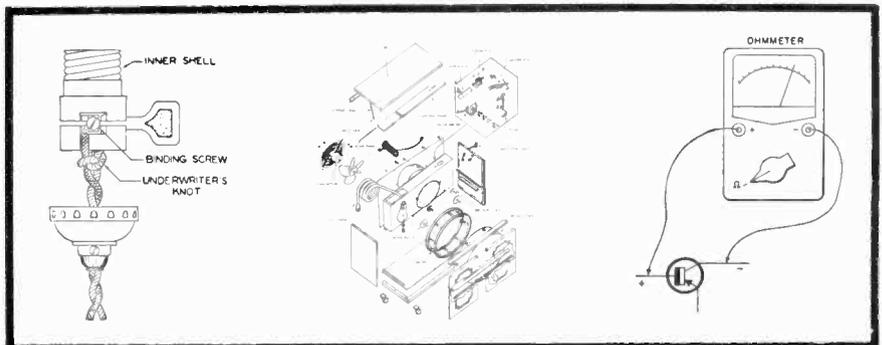
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Part 2 of this chapter for type acceptance.

MODULATION REQUIREMENTS (Subpart C, 95.51)

(a) When double sideband, amplitude modulation is used for telephony, the modulation percentage shall be sufficient to provide efficient communication and shall not exceed 100 percent.

(b) Each transmitter for use in Class D stations, other than single sideband, suppressed carrier, or controlled carrier, for which type acceptance is requested after May 24, 1974, having more than 2.5 watts maximum output power shall be equipped with a device which automatically prevents modulation in excess of 100 percent on positive and negative peaks.

(c) The maximum audio frequency required for satisfactory radiotelephone intelligibility for use in this service is considered to be 3000 Hz.

OPERATOR LICENSE NOT REQUIRED (Subpart C, 95.97)

(a) No operator license is required for the *operation* of a citizens radio station except that stations manually transmitting Morse Code* shall be operated by the holders of a third or higher class radiotelegraph operator license.

*Class D CB may be operated radiotelephony only.

OPERATING PRACTICES

Permitted Communications (Subpart C, 95.81)–

Stations licensed in the citizens radio service are authorized to transmit the following types of communications:

(a) Communications to facilitate the personal or business activity of the licensee.

(b) Communications relating to:

(1) The immediate safety of life or the immediate protection of property in accordance with 95.85.

(2) The lending of assistance to a motorist, mariner, or other traveler.

(3) Civil defense activities in accordance with 95.12.

(4) Other activities only as specifically authorized pursuant to 95.87.

(c) Communications with other stations authorized in other radio services except as prohibited by 95.83

(a) (3).

Prohibited Communications (Subpart C, 95.83)–

(a) A citizens radio station shall not be used:

(1) For any purpose or in connection with any activity which is contrary to federal, state, or local law.

(2) For the transmission of communications containing obscene, indecent, or profane words, language, or meaning.

(3) To communicate with an amateur station, an unlicensed station, or foreign stations (other than provided in Subpart E) except for communications pursuant to 95.85 (b) and 95.121.

(4) To convey program material for retransmission live or delayed on a broadcast facility.

(5) To intentionally interfere with the communications of another station.

(6) For the direct transmission of any material to the public through a public address system or similar means.

(7) For the transmission of music, whistling, sound effects, or any material for amusement or entertainment purposes or solely to attract attention.

(8) To transmit the word "MAYDAY" or other international distress signals, except when the station is located in a ship, aircraft, or other vehicle which is threatened by grave and imminent danger and requests immediate assistance.

(9) For advertising or soliciting the sale of any goods or services.

(10) For transmitting messages in other than plain language. Abbreviations, including nationally or internationally recognized operating signals, may be used only if a list of all such abbreviations and their meaning is kept in the station records and made available to any commission representative on demand.

(11) To carry on communications for hire whether the remuneration or benefit received is direct or indirect.

(b) A Class D station may not be used to communicate with, or attempt to communicate with, any unit of the same or another station over a distance of more than 150 miles.

(c) A licensee of a Citizens radio station who is engaged in the business of selling Citizens radio transmitting equipment shall not allow a customer to operate under his station license. In addition, all communications by the licensee for the purpose of demonstrating such equipment shall consist only of brief messages addressed to other units of the same station.

Station Identification (Subpart C, 95.95)–

(a) The call sign of a citizens radio station shall consist of three letters followed by four digits.

(b) Each transmission of the station call sign shall be made in the English language by each unit, shall be complete, and each letter and digit shall be separately and distinctly transmitted. Only standard phonetic alphabets, nationally or internationally recognized, may be used in lieu of pronunciation of letters for voice transmission of call signs. A unit designator or special identification may be used in addition to the station call sign but not as a substitute therefor.

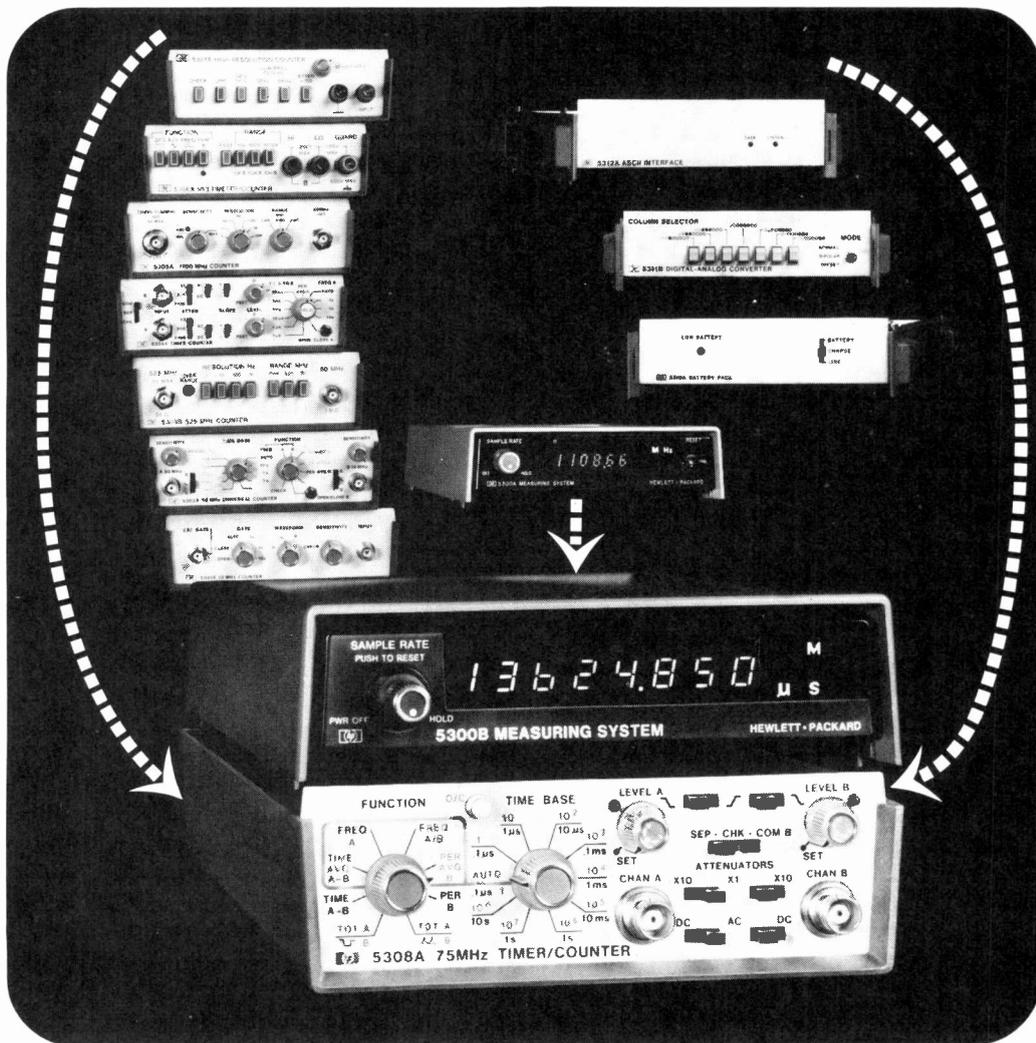
(c) Except as provided in paragraph (d) of this section, all transmissions from each unit of a citizens radio station shall be identified by the transmission of its assigned call at the beginning and end of each transmission or series of transmissions, but at least at intervals not to exceed 10 minutes.

(d) Unless specifically required by the station authorization, the transmissions of a citizens radio station need not be identified when the station (1) is a Class A station which automatically retransmits the information received by radio from another station which is properly identified or (2) is not being used for telephony emission.

Duration Of Transmissions (Subpart C, 95.91)–

(a) All communications or signals, regardless of their nature, shall be restricted to the minimum practicable transmission time. The radiation of energy shall be limited to transmissions modulated or keyed for actual permissible communications,

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- time interval averaging to 1nsec.
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tests, or control signals. Continuous or uninterrupted transmissions from a single station or between a number of communicating stations is prohibited, except for communications involving the immediate safety of life or property.

(b) All communications between Class D stations (interstation) shall be restricted to not longer than 5 continuous minutes. At the conclusion of this 5-minute period, or the exchange of less than 5 minutes, the participating station shall remain silent for at least 1 minute.

(c) All communication between units of the same Class D station (intra-station) shall be restricted to the minimum practicable transmission.

Operation By Other Than Licensee (Subpart C, 95.87)—

(a) Transmitters authorized in this service must be under the control of the licensee at all times. A licensee shall not transfer, assign, or dispose of, in any manner, directly or indirectly, the operating authority under his station license, and shall be responsible for the proper operation of all units of the station.

(b) Citizens radio stations may be operated only by the following persons, except as provided in paragraph (c) of this section:

(1) The licensee;

(2) Members of the licensee's immediate family living in the same household;

(3) The partners, if the licensee is a partnership, provided the communications relate to the business of the partnership;

(4) The members, if the licensee is an unincorporated association, provided the communications relate to the business of the association;

(5) Employees of the licensee only while acting within the scope of their employment;

(6) Any person under the control or supervision of the licensee when the station is used solely for the control of remote objects or devices, other than devices used only as a means of attracting attention; and

(7) Other persons, upon specific prior approval of the Commission shown on or attached to the station license, under the following circumstances:

(i) Licensee is a corporation and proposes to provide private radiocommunication facilities for the transmission of messages or signals by or on behalf of its parent corporation, another subsidiary of the parent corporation, or its own subsidiary. Any remuneration or compensation received by the licensee for the use of the radiocommunication facilities shall be governed by a contract entered into by the parties concerned and the total of the compensation shall not exceed the cost of providing the facilities. Records which show the cost of service and its nonprofit or cost-sharing basis shall be maintained by the licensee.

(iii) Other cases where there is a need for other persons to operate a unit of licensee's radio station. Requests for authority may be made either at the time of the filing of the application for station license or thereafter by letter. In either case, the licensee must show the nature of the proposed use and that it relates to an activity of the licensee, how he proposes

to maintain control over the transmitters at all times, and why it is not appropriate for such other person to obtain a station license in his own name. The authority, if granted, may be specific with respect to the names of the persons who are permitted to operate, or may authorize operation by unnamed persons for specific purposes. This authority may be revoked by the Commission in its discretion, at any time.

(c) An individual who was formerly a citizens radio station licensee shall not be permitted to operate any citizens radio station of the same class licensed to another person until such time as he again has been issued a valid radio station license of that class, when his license has been:

(1) Revoked by the Commission.

(2) Surrendered for cancellation after the institution of revocation proceedings by the Commission.

(3) Surrendered for cancellation after a notice of apparent liability for forfeiture has been served by the Commission.

Priority Must Be Given To Emergency Communications (Subpart C, 95.85)—

(a) All Citizens radio stations shall give priority to the emergency communications of other stations which involve the immediate safety of life of individuals or the immediate protection of property.

POSTING OF STATION LICENSE & TRANSMITTER ID (Subpart C, 95.101)

(a) The current authorization, or a clearly legible photocopy thereof, for each station (including units of a Class C or Class D station) operated at a fixed location shall be posted at a conspicuous place at the principal fixed location from which such station is controlled, and a photocopy of such authorization shall also be posted at all other fixed locations from which the station is controlled. If a photocopy of the authorization is posted at the principal control point, the location of the original shall be stated on that photocopy. In addition, an executed Transmitter Identification Card (FCC Form 452-C) or a plate of metal or other durable substance, legibly indicating the call sign and the licensee's name and address, shall be affixed, readily visible for inspection, to each transmitter operated at a fixed location when such transmitter is not in view of, or is not readily accessible to, the operator of at least one of the locations at which the station authorization or a photocopy thereof is required to be posted.

(b) The current authorization for each station operated as a mobile station shall be retained as a permanent part of the station records, but need not be posted. In addition, an executed Transmitter Identification Card (FCC Form 452-C) or a plate of metal or other durable substance, legibly indicating the call sign and the licensee's name and address, shall be affixed, readily visible for inspection, to each of such transmitters: *Provided*, That, if the transmitter is not in view of the location from which it is controlled, or is not readily accessible for inspection, then such card or plate shall be affixed to the control equipment at the transmitter operating position or posted adjacent thereto.

POWER LEVELS (Transmitter Output) PERMITTED (Subpart C, 95.43)

(a) Transmitter power is the power at the transmitter output terminals and delivered to the antenna, antenna transmission line or any other impedance-matched, radio frequency load.

(1) For single sideband transmitters and other transmitters employing a reduced carrier, a suppressed carrier or a controlled carrier, used at Class D stations, transmitter power is the peak envelope power.

(2) For all transmitters other than those covered by paragraph (a) (1) of this section, the transmitter power is the carrier power.

(b) The transmitter power of a station shall not exceed the following values under any condition of modulation or other circumstances.

Class of station:	Transmitter power in watts
D—Carrier (where applicable)4
D—Peak envelope power (where applicable)	12

REMOTE CONTROL PROHIBITIONS (Subpart C, 95.119)—

(c) Remote control of a citizens radio station means the control of the transmitting equipment of that station from any place other than the location of the transmitting equipment, except that direct mechani-

cal control or direct electrical control by wired connections of transmitting equipment from some other point on the same premises, craft, or vehicle shall not be considered remote control.

(d) Operation of any Class C or Class D station by remote control is prohibited except remote control by wire upon specific authorization by the Commission when satisfactory need is shown.

STATION LICENSING REQUIREMENTS & PROCEDURES

All CB Stations Must Be Licensed (Subpart B, 95.11)—

No radio station shall be operated in the Citizens Radio Service except under and in accordance with an authorization granted by the Federal Communications Commission.

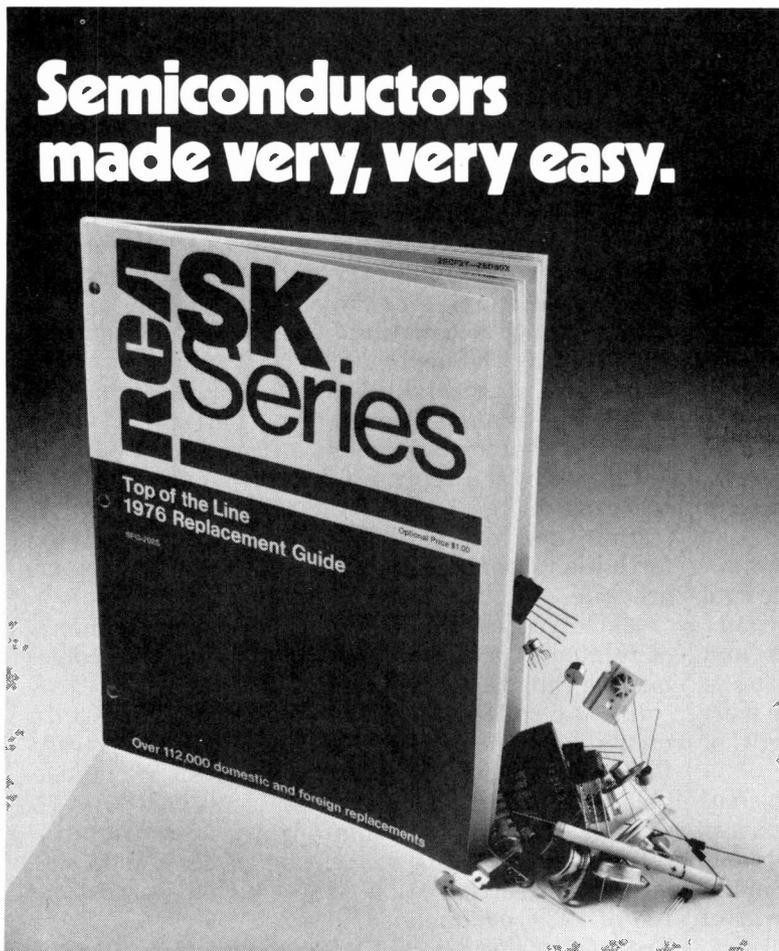
Term of License (Subpart B, 95.33)—

Licenses for stations in the Citizens Radio Service will normally be issued for a term of 5 years from the date of original issuance, major modification, or renewal.

Citizenship Restrictions (Subpart A, 95.7)—

A station license may not be granted to or held by:

- (a) Any alien or the representative of any alien;
- (b) Any foreign government or the representative thereof;
- (c) Any corporation organized under the laws of any foreign government;
- (d) Any corporation of which any officer or director is an alien;



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(e) Any corporation of which more than one-fifth of the capital stock is owned of record or voted by: Aliens or their representatives; a foreign government or representative thereof; or any corporation organized under the laws of a foreign country;

(f) Any corporation directly or indirectly controlled by any other corporation of which any officer or more than one-fourth of the directors are aliens, if the Commission finds that the public interest will be served by the refusal or revocation of such license; or

(g) Any corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by: Aliens or their representatives; a foreign government or representatives thereof; or any corporation organized under the laws of a foreign government, if the Commission finds that the public interest will be served by the refusal or revocation of such license.

Eligibility Criteria (Subpart B, 95.13)–

(a) Subject to the general restrictions of §95.7, any person is eligible to hold an authorization to operate a station in the Citizens Radio Service: *Provided*, That if an applicant for a Class A or Class D station authorization is an individual or partnership, such individual or each partner is eighteen or more years of age; or if an applicant for a Class C station authorization is an individual or partnership, such individual or each partner is twelve or more years of age. An unincorporated association, when licensed under the provisions of this paragraph, may upon specific prior approval of the Commission provide radiocommunications for its members.

(c) No person shall hold more than one Class C and one Class D station license.

Filing Procedures (Subpart B, 95.15)–

(b) All formal applications for Class C or Class D new, modified, or renewal station authorizations shall be submitted to the Commission's office at 334 York Street, Gettysburg, Pa 17325. Applications for Class A station authorizations, applications for consent to transfer of control of a corporation holding any citizens radio station authorization, requests for special temporary authority or other special requests, and correspondence relating to an application for any class citizens radio station authorization shall be submitted to the Commission's Office at Washington, D.C. 20554, and should be directed to the attention of the Secretary . . . Applications involving Class A or Class D station equipment which is neither type approved nor crystal controlled, whether of commercial or home construction, shall be accompanied by supplemental data describing in detail the design and construction of the transmitter and methods employed in testing it to determine compliance with the technical requirements set forth in Subpart C of this part.

(c) Unless otherwise specified, an application shall be filed at least 60 days prior to the date on which it is desired that Commission action thereon be completed. In any case where the applicant has made timely and sufficient application for renewal of license, in accordance with the Commission's rules,

no license with reference to any activity of a continuing nature shall expire until such application shall have been finally determined.

Forms To Be Used (Subpart B, 95.19)–

(a) *FCC Form 505, Application for Class C or D Station License in the Citizens Radio Service.* This form shall be used when:

(1) Application is made for a new Class C or Class D authorization. A separate application shall be submitted for each proposed class of station.

(2) Application is made for modification of any existing Class C or Class D station authorization in those cases where prior Commission approval of certain changes is required (see §95.35).

(3) Application is made for renewal of an existing Class C or Class D station authorization, or for reinstatement of such an expired authorization.

(c) *FCC Form 703, Application for Consent to Transfer of Control of Corporation Holding Construction Permit or Station License.* This form shall be used when application is made for consent to transfer control of a corporation holding any citizens radio station authorization.

Who May Sign Application (Subpart B, 95.17)–

(a) Except as provided in paragraph (b) of this section, applications, amendments thereto, and related statements of fact required by the Commission shall be personally signed by the applicant, if the applicant is an individual; by one of the partners, if the applicant is a partnership; by an officer, if the applicant is a corporation; or by a member who is an officer, if the applicant is an unincorporated association. Applications, amendments, and related statements of fact filed on behalf of eligible government entities, such as states and territories of the United States and political subdivisions thereof, the District of Columbia, and units of local government, including incorporated municipalities, shall be signed by such duly elected or appointed officials as may be competent to do so under the laws of the applicable jurisdiction.

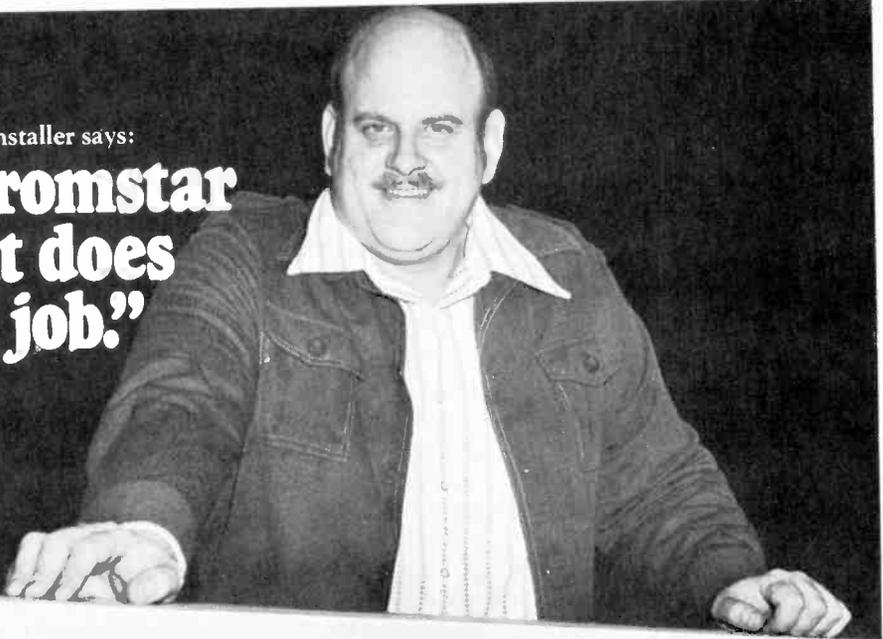
(b) Applications, amendments thereto, and related statements of fact required by the Commission may be signed by the applicant's attorney in case of the applicant's physical disability or of his absence from the United States. The attorney shall in that event separately set forth the reason why the application is not signed by the applicant. In addition, if any matter is stated on the basis of the attorney's belief only (rather than his knowledge), he shall separately set forth his reasons for believing that such statements are true.

(c) Only the original of applications, amendments, or related statements of fact need be signed; copies may be conformed.

(d) Applications, amendments, and related statements of fact need not be signed under oath. Willful false statements made therein, however, are punishable by fine and imprisonment. U.S. Code, Title 18, section 1001, and by appropriate administrative sanctions, including revocation of station license pursuant to section 312 (a) (1) of the Communications Act of 1934, as amended.

Transfer of License Prohibited (Subpart B, 95.27)–

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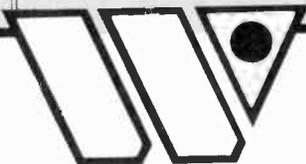
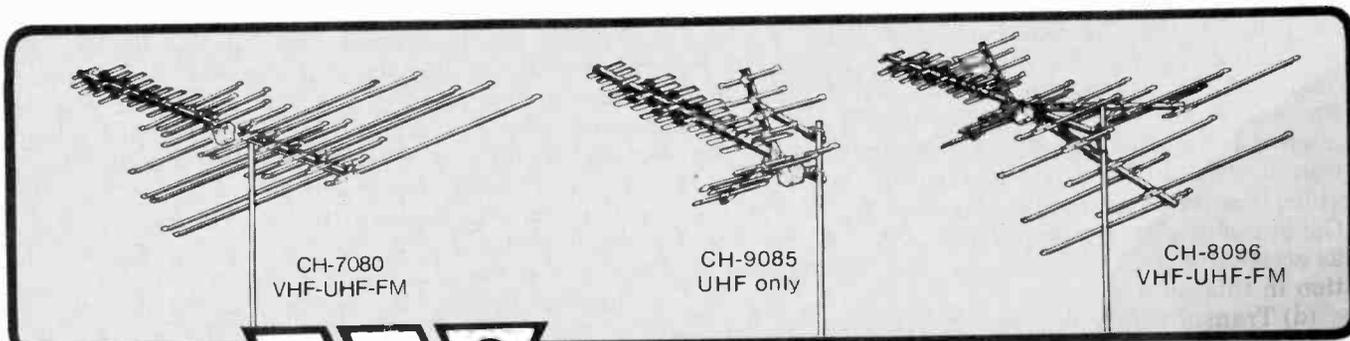
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A station authorization in the Citizens Radio Service may not be transferred or assigned. In lieu of such transfer or assignment, an application for new station authorization shall be filed in each case, and the previous authorization shall be forwarded to the Commission for cancellation.

Changes in Transmitters & Stations (Subpart B, 95.35)-

Authority for certain changes in transmitters and authorized stations must be obtained from the Commission before the changes are made, while other changes do not require prior Commission approval. The following paragraphs of this section describe the conditions under which prior Commission approval is or is not necessary.

(a) Proposed changes which will result in operation inconsistent with any of the terms of the current authorization require that an application for modification of license be submitted to the Commission. Application for modification shall be submitted in the same manner as an application for a new station license, and the licensee shall forward his existing authorization to the Commission for cancellation immediately upon receipt of the superseding authorization. Any of the following changes to authorized stations may be made only upon approval by the Commission:

(1) Increase the overall number of transmitters authorized.

(b) When the name of a licensee is changed (without changes in the ownership, control, or corporate structure), or when the mailing address of the licensee is changed (without changing the authorized location of the base or fixed Class A station) a formal application for modification of the license is not required. However, the licensee shall notify the Commission promptly of these changes. The notice, which may be in letter form, shall contain the name and address of the licensee as they appear in the Commission's records, the new name and/or address, as the case may be, and the call signs and classes of all radio stations authorized to the licensee under this part. The notice concerning Class C or D radio stations shall be sent to Federal Communications Commission, Gettysburg, Pa. 17325, and a copy shall be maintained with the records of the station.

(c) Proposed changes which will not depart from any of the terms of the outstanding authorization for the station may be made without prior Commission approval. Included in such changes is the substitution of transmitting equipment at any station, provided that the equipment employed is included in the Commission's "Radio Equipment List," and is listed as acceptable for use in the appropriate class of station in this service.

(d) Transmitting equipment type accepted for use in Class D stations shall not be modified by the user.

STATION RECORDS

General Requirements (Subpart C, 95.103)-

All stations and records of stations in the Citizens Radio Service shall be made available for inspection

upon the request of an authorized representative of the Commission made to the licensee or to his representative (see §1.6 of this chapter). Unless otherwise stated in this part, all required station records shall be maintained for a period of at least 1 year.

Current Copy Of Rules Required (Subpart C, 95.105)-

Each licensee in this service shall maintain as a part of his station records a current copy of Part 95, Citizens Radio Service, of this chapter.

TEST PROCEDURES & RELATED LICENSE REQUIREMENTS

Specified Procedures (Subpart C, 95.93)-

All tests or adjustments of citizens radio transmitting equipment involving an external connection to the radio frequency output circuit shall be made using a nonradiating dummy antenna. However, a brief test signal, either with or without modulation, as appropriate, may be transmitted when it is necessary to adjust a transmitter to an antenna for a new station installation or for an existing installation involving a change of antenna or change of transmitters, or when necessary for the detection, measurement, and suppression of harmonic or other spurious radiation. Test transmissions using a radiating antenna shall not exceed a total of 1 minute during any 5-minute period, shall not interfere with communications already in progress on the operating frequency, and shall be properly identified as required by 95.95, but may otherwise be unmodulated as appropriate.

License Requirements For Testing & Adjusting (Subpart C, 95.97)-

(b) Except as provided in paragraph (c) of this section, all transmitter adjustments or tests while radiating energy during or coincident with the construction, installation, servicing, or maintenance of a radio station in this service, which may affect the proper operation of such stations, shall be made by or under the immediate supervision and responsibility of a person holding a first- or second-class commercial radio operator license, either radiotelephone or radio telegraph, as may be appropriate for the type of emission employed, and such person shall be responsible for the proper functioning of the station equipment at the conclusion of such adjustments or tests. Further, in any case where a transmitter adjustment which may affect the proper operation of the transmitter has been made while not radiating energy by a person not the holder of the required commercial radio operator license or not under the supervision of such licensed operator, other than the factory assembling or repair of equipment, the transmitter shall be checked for compliance with the technical requirements of the rules by a commercial radio operator of the proper grade before it is placed on the air.

(c) Except as provided in §95.53 and in paragraph (d) of this section, no commercial radio operator license is required to be held by the person performing transmitter adjustments or tests during or coincident with the construction, installation, servicing, or maintenance of Class C transmitters, or Class D transmitters used at stations authorized prior to May 24, 1974: *Provided*, That there is compliance with all

of the following conditions:

(1) The transmitting equipment shall be crystal-controlled with a crystal capable of maintaining the station frequency within the prescribed tolerance;

(2) The transmitting equipment either shall have been factory assembled or shall have been provided in kit form by a manufacturer who provided all components together with full and detailed instructions for their assembly by nonfactory personnel;

(3) The frequency determining elements of the transmitter, including the crystal(s) and all other components of the crystal oscillator circuit, shall have been preassembled by the manufacturer, pre-tuned to a specific available frequency, and sealed by the manufacturer so that replacement of any component or any adjustment which might cause off-frequency operation cannot be made without breaking such seal and thereby voiding the certification of the manufacturer required by this paragraph;

(4) The transmitting equipment shall have been so designed that none of the transmitter adjustments or tests normally performed during or coincident with the installation, servicing, or maintenance of the station, or during the normal rendition of the service of the station, or during the final assembly of kits or partially preassembled units, may reasonably be expected to result in off-frequency operation, excessive input power, overmodulation, or excessive harmonics or other spurious emissions; and

(5) The manufacturer of the transmitting equipment or of the kit from which the transmitting equipment is assembled shall have certified in writing to the purchaser of the equipment (and to the Commission upon request) that the equipment has been designed, manufactured, and furnished in accordance with the specifications contained in the foregoing subparagraphs of this paragraph. The manufacturer's certification concerning design and construction features of Class C or Class D station transmitting equipment, as required if the provisions of this paragraph are invoked, may be specific as to a particular unit of transmitting equipment or general as to a group or model of such equipment, and may be in any form adequate to assure the purchaser of the equipment or the Commission that the conditions described in this paragraph have been fulfilled.

(d) Any tests and adjustments necessary to correct any deviation of a transmitter of any Class of station in this service from the technical requirements of the rules in this part shall be made by, or under the immediate supervision of, a person holding a first- or second-class commercial operator license, either radiotelephone or radiotelegraph, as may be appropriate for the type of emission employed.

TYPE ACCEPTANCE REQUIREMENTS

General Requirements (Subpart C, 95.55 & 95.58)—

Transmitters type approved or type accepted for use under this part are included in the Commission's Radio Equipment List. Copies of this list are available for public reference at the Commission's Washington, D.C., offices and field offices. The re-

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quirements for transmitters which may be operated under a license in this service are set forth in the following paragraphs.

(c) Class D Stations:

(1) All transmitters first licensed, or marketed as specified in § 2.805 of this chapter, prior to November 22, 1974, shall be type accepted or crystal controlled.

(2) All transmitters first licensed, or marketed as specified in § 2.803 of this chapter, on or after November 22, 1974, shall be type accepted.

(3) Effective November 23, 1978, all transmitters shall be type accepted.

(4) Transmitters which are equipped to operate on any frequency not included in § 95.41 (d) (1) may not be installed at, or used by, any Class D station unless there is a station license posted at the transmitter location, or a transmitter identification card (FCC Form 452-C) attached to the transmitter, which indicates that operation of the transmitter on such frequency has been authorized by the Commission.

(d) With the exception of equipment type approved for use at a Class C station, all transmitting equipment authorized in this service shall be crystal controlled.

(e) No controls, switches or other functions which can cause operation in violation of the technical regulations of this part shall be accessible from the operating panel or exterior to the cabinet enclosing a transmitter authorized in this service.

Specific Design Requirements (Subpart C, 95.55)—

(a) All transmitters shall be crystal controlled.

(b) Except for transmitters type accepted for use at Class A stations, transmitters shall not include any provisions for increasing power to levels in excess of the pertinent limits specified in Section 95.43.

(c) In addition to all other applicable technical requirements set forth in this part, transmitters for which type acceptance is requested after May 24, 1974, for use at Class D stations shall comply with the following:

(1) Single sideband transmitters and other transmitters employing reduced, suppressed or controlled carrier shall include a means for automatically preventing the transmitter power from exceeding either the maximum permissible peak envelope power or the rated peak envelope power of the transmitter, whichever is lower.

(2) Multi-frequency transmitters shall not provide more than 23 transmitting frequencies, and the frequency selector shall be limited to a single control.

(3) Other than the channel selector switch, all transmitting frequency determining circuitry, including crystals, employed in Class D station equipment shall be internal to the equipment and shall not be accessible from the exterior of the equipment cabinet or operating panel.

(4) Single sideband transmitters shall be capable of transmitting on the upper sideband. Capability for transmission also on the lower sideband is permissible.

(5) The total dissipation ratings, established by the manufacturer of the electron tubes or semiconductors which supply radio frequency power to the antenna

terminals of the transmitter, shall not exceed 10 watts. For electron tubes, the rating shall be the Intermittent Commercial and Amateur Service (ICAS) plate dissipation value if established. For semiconductors, the rating shall be the collector or device dissipation value, whichever is greater, which may be temperature de-rated to not more than 50°C.

(d) Only the following external transmitter controls, connections or devices will normally be permitted in transmitters for which type acceptance is requested after May 24, 1974 for use at Class D stations. Approval of additional controls, connections or devices may be given after consideration of the function to be performed by such additions.

(1) Primary power connection. (Circuitry or devices such as rectifiers, transformers, or inverters which provide the nominal rated transmitter primary supply voltage may be used without voiding the transmitter type acceptance.)

(2) Microphone connection.

(3) Radio frequency output power connection.

(4) Audio frequency power amplifier output connector and selector switch.

(5) On-off switch for primary power to transmitter. May be combined with receiver controls such as the receiver on-off switch and volume control.

(6) Upper-lower sideband selector; for single sideband transmitters only.

(7) Selector for choice of carrier level; for single sideband transmitters only. May be combined with sideband selector.

(8) Transmitting frequency selector switch.

(9) Transmit-receive switch.

(10) Meter(s) and selector switch for monitoring transmitter performance.

(11) Pilot lamp or meter to indicate the presence of radio frequency output power or that transmitter control circuits are activated to transmit.

(e) An instruction book for the user shall be furnished with each transmitter sold and one copy (a draft or preliminary copy is acceptable providing a final copy is furnished when completed) shall be forwarded to the Commission with each request for type acceptance or type approval. The book shall contain all information necessary for the proper installation and operation of the transmitter including:

(1) Instructions concerning all controls, adjustments and switches which may be operated or adjusted without causing violation of technical regulations of this part;

(2) Warnings concerning any adjustment which, according to the rules of this part, may be made only by, or under the immediate supervision of, a person holding a commercial first or second class radio operator license;

(3) Warnings concerning the replacement or substitution of crystals, tubes or other components which could cause violation of the technical regulations of this part and of the type acceptance or type approval requirements of Part 2 of this chapter.

(4) Warnings concerning licensing requirements and details concerning the application procedures for licensing. ■

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TEST INSTRUMENT REPORT



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CB SERVICING SYSTEM

B&K-Precision's Model 1040 CB Servicemaster, shown next to the technician's left hand in the accompanying illustration, is the heart of a new CB servicing system introduced recently by B&K-Precision.

The Model 1040 incorporates in one instrument the functions of an AM modulation meter, an RF wattmeter/dummy load, an audio wattmeter, an audio generator and a distortion meter.

When interconnected with an oscilloscope (2MHz or greater bandwidth), a stable RF signal generator and a frequency counter, the CB Servicemaster sequentially measures transmitter RF power output, AM and SSB modulation, antenna SWR, receiver sensitivity (signal-to-noise ratio), receiver audio output and distortion, and checks receiver frequency response, AGC, squelch action and adjacent channel rejection—all without changing the initial test setup and interconnections.

The CB Servicemaster also can be operated from a 12 VDC power source, for mobile antenna system measurements.

In addition to programmed testing of CB transmitter and receiver performance characteristics, the Model 1040 also can be used as an analyst to pinpoint the specific transceiver circuit(s) responsible for subnormal operation. Price is \$250.

RF POWER METER

Leader's Model LPM-880 RF Power Meter is a direct-reading type capable of measuring RF

power levels up to and including 120W over a frequency range of 1.8 MHz to 500 MHz.

The Model LPM-880 has a built-in load impedance of 50 ohms and a measuring accuracy of ± 10 percent of the full-scale reading.

For more precise readout, the 120-watt measuring range of the LPM-880 is divided into three pushbutton-selected ranges—5W, 20W and 120W—with corresponding scales on the meter.

Transmitter output connection to the LPM-880 is via a type M (UHF) connector.

The unit is 5 inches high, 4-3/4 inches wide, 9 inches deep and weighs approximately 4 pounds. Price is \$149.95.



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ATC COLOR BAR PATTERN GENERATOR MODEL ATC-10

American Technology Corporation's Color Bar Pattern Generator Model ATC-10, not only performs all of the functions of a deluxe instrument, but has additional functions which can be employed as an analyst and a tuner subber.

The instrument now produces a RED RASTER pattern to simplify purity adjustments and a 3.58 MONITOR pattern for the checking and adjusting of the free-running frequency of the 3.58 MHz oscillator without time wasting requirement for grounding the input to the 3.58 MHz oscillator.

The primary function of the generator is for troubleshooting color TV sets, but is very useful in the servicing of B-W TV receivers,



For more details circle 107 on Reader Service Card.

closed circuit TV monitors, video tape apparatus and cable TV/community antenna systems.

The compact, lightweight portable instrument is built for bench or in-home service applications. Its flex handle allows the unit to be carried together with a tube caddy or other instruments. The test leads and accessories can be stored quickly and neatly in their special compartment and are held in place by the inherent spring tension in the cords.

Controls

There are only four versatile controls used to place the instrument into operation: 1) *Pattern Selector*—All eleven test patterns and *power off* are selected by the use of a single rotary selector switch. 2) *RF/IF Control*—To select RF operation, push-in, to select IF operation, pull-out on this knob. The power level of the RF or IF output is adjusted by rotating this same knob. 3) *Chroma/Interlace Control*—A single push-pull rotating knob controls the chroma level and selects INTERLACE on non-interlace. The chroma level can be adjusted over the range of 0 to approximately 200 percent. Pull out on the knob to select INTERLACE or push in for non-interlace. 4) *Video Amplitude/Polarity Control*—A push-pull rotating knob controls the video output polarity and amplitude. Push the control in for video with negative sync polarity or pull it out for video with positive sync polarity. Rotate the control clockwise to increase the amplitude of the video output.

Outputs

Video Output—The video output is obtained through a front panel mounted BNC jack. The high amplitude and low imped-

ance of the signal makes it suitable for injecting video between stages without disconnecting the previous stage and for driving the inputs of video tape recorders, TV monitors, etc. A unique "fuseless" protective circuit is employed to protect the output from damage if connected to any DC voltage between minus 50 and plus 250 volts. Either negative or positive polarity is available. The video amplitude is adjustable from 0 to 1.6 volts p-p into a 75-ohm coaxial load or 3.0 volts p-p open circuit.

RF Output—The crystal-controlled RF output signal can be employed on either Channel 2 or Channel 3 (no extra cost option). The 75-ohm type F connector can be fed directly into TV sets with 75-ohm coaxial inputs or with matching transformer for TV sets with 300-ohm inputs.

IF Output—A 45.75 MHz output signal is provided. This signal substitutes for the tuner output as an aid in determining whether a receiver's problem is in the tuner or the IF amplifier. It can also be used for signal injection in isolating a defective IF stage.

Horizontal/Vertical Trigger Output—Horizontal and vertical trigger outputs are available for externally synchronizing an oscilloscope to the color pattern generator. Select (-) sync polarity on the oscilloscope to view the events which occur during the respective horizontal or vertical blanking interval. Select (+) sync polarity to display events which occur during the scanning interval.

Test Patterns

Red Raster—Check and adjust purity at the flip of a switch without disabling the blue and green electron gun or resetting the screen controls. **3.5MHz Monitor**—A gated rainbow with color burst or luminance pedestal. **Color Bars**—A gated rainbow pattern for checking hue centering and range, demodulation angle, etc. **Vector**—A gated rainbow with a unique chroma-to-sweep frequency/phase relationship. **Gray Quad**—Provides a panoramic view of high, medium, and low lights for checking and adjusting

gray scale tracking. The pattern can be used in conjunction with calibrated RF output signal for checking receivers sensitivity and 60 Hz video response. **Hatchdot**—Composite (single dot plus crosshatch) pattern. **Hatchdots**—A composite convergence pattern with the panoramic advantages of a single dot, a crosshatch and a 10 x 10 dots pattern. **Dots**—A center-marked convergence pattern which serves as both a single dot and a 10 x 10 dots pattern.

The instrument measures 8.25 inches wide by 2.60 inches high by 8.25 inches deep and weighs 4 lbs 5 oz. Price is \$299.95



For more details circle 108 on Reader Service Card.

THREE-DIGIT PORTABLE DVM

Scencore's Model DVM 35 digital multimeter provides three-digit readout of DC voltages from 1mv to 999 volts with an accuracy of 1 percent and an input impedance of 15 megohms. In addition, pressing a "TIMES TWO" button on the probe expands the maximum DC voltage measuring capability to 1998 volts and increases the input impedance to 30 megohms. (Optional High-Voltage Probe HP200 extends the maximum DC measurement capability to 50Kv.)

The resistance measuring capability of the DVM35 covers the range from .1 ohm to 9.99 K ohms in the "Lo-Power" mode and from 99.9 K ohms to 9.99 megohms in the "Hi-Power" mode.

The range of currents measurable with the DVM35 extends from .1 μ A to .999 mA.

The Model DVM35 is powered by AA batteries. A "TOUCH ON" button on the probe eliminates battery current drain between measurements, thereby significantly increasing the life of the batteries. (Optional Power Adaptor/Recharger PA202 permits AC line operation of the DVM35.)

A replaceable fuse in the probe of the DVM35 provides "burn-out" protection up to 2KvDC.

The price of Model DVM35 is \$124.

OSCILLOSCOPE COURSE

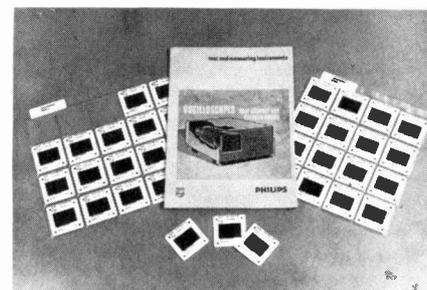
A new slide-illustrated educational course called *Oscilloscopes—Dual-Channel and Delayed Sweep* is announced by Philips Test & Measuring Instruments, Inc.

The course is a sequel to *Oscilloscopes-Series 1—Basic Principles*, announced earlier this year.

The aim of this more advanced 37-slide course is to explain to the student how oscilloscopes display more than one vertical input signal, the advantages and disadvantages of dual-beam and dual-trace oscilloscopes, the principles of chopped and alternate time-base modes, and how a delayed time-base is derived and the advantages to be gained from it.

Supplied with *Oscilloscopes—Dual Channel and Delayed Sweep* is a comprehensive 18-page booklet which explains dual-channel and delayed-sweep oscilloscopes step by step in conjunction with the slide course.

Both oscilloscope courses—Part 1, consisting of 34 slides and a 14-page booklet, and Part 11, *Oscilloscopes-Dual Channel and Delayed Sweep*—are each available for \$25.00 ■



For more details circle 109 on Reader Service Card.

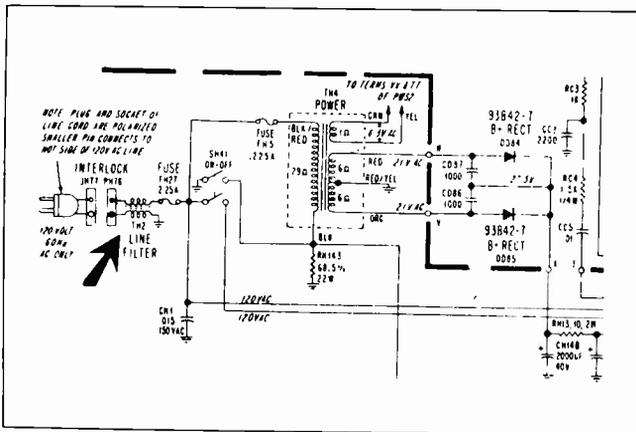
TECHNICAL DIGEST

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

ADMIRAL

Color TV Chassis K10—Hum In The Sound

A symptom of hum in the sound which is objectionable at low volume or with volume off, can be possibly caused by the TH2 line filter being placed too close to the audio transformer. Redress TH2 away from the audio transformer. Listen while carefully moving the filter choke to the position which gives the least hum. Keep in mind that TH2 is at line potential.



Color TV Chassis M10, M20, M24, M25, M30 1M30—Service Hint

When servicing any of the above chassis for a 'No sound' condition, keep in mind that the Volume control does not have an AC audio signal applied to it. The control varies a DC voltage within IC500 which, in turn, controls the AC signal level.

Color TV Chassis K20, M20, M25—84A28-10 Fuse Replacement

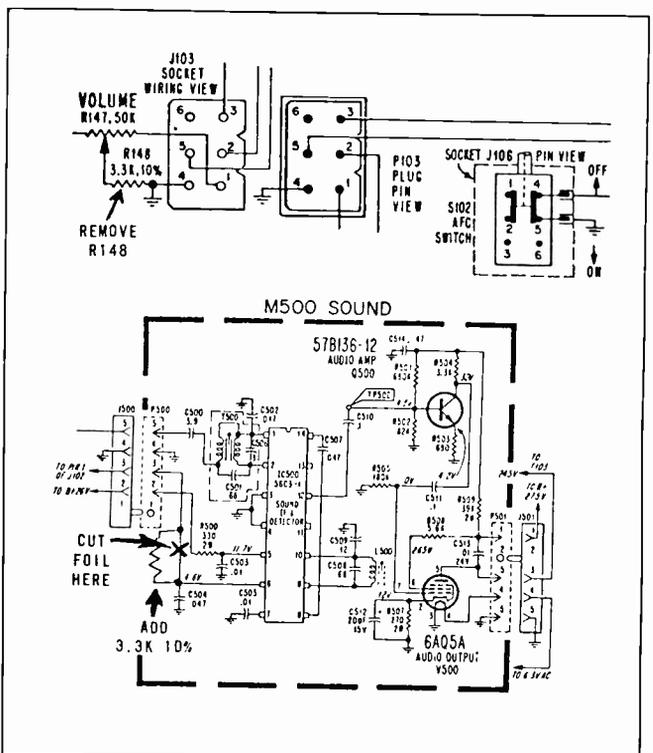
The 84A28-10 (3.0 Ampere) fuse used in the K20, M20 and M25 chassis is no longer available. However, Admiral has obtained engineering approval to substitute the 84A28-11 (3.1 Ampere) fuse for this application. The -11 is mechanically identical to the -10 except for the case color (tan) and will plug directly into the (red) socket on the chassis.

Admiral will automatically substitute the -11 on all orders for the 84A28-10 fuse.

Color TV Chassis 3M20—Failure Of Sound IC

Failure of the Sound IC (56A3-1) during an electrical storm can be prevented from occurring again by making the following corrections.

Remove resistor R148 from the tuner cluster and ground the wiper of the volume control R147. Cut the foil between



Pin 3 of P500 and terminal 6 of the IC on the A8911-1 sound board (M500). Add a 3.3K resistor across the gap you have created. Capacitor C504 is to be placed on the terminal 6 side of the added resistor. Keep the resistor leads short. Make good mechanical and electrical solder connections.

GENERAL ELECTRIC

Color TV Chassis MC—Repeated Failure Of Y1141 On Buffer Module

Check pins 7 and 8 of the high voltage transformer. If a .005 µf capacitor is found there, remove it and install a .01 µf, 1 kv capacitor in its place. If there is no capacitor on the pins, install a .01 µf, 1 kv capacitor. The catalog number is EU22X89. Be sure the solder connections are smooth with no sharp points.

To improve reliability and help prevent callbacks, check for this capacitor whenever you replace a buffer module in an MC chassis. ■

The Money Generator



GENERATES MONEY FOR YOU!

It's a DOG FIGHTER, TOO!

The Model ATC-10 is much more than a color bar pattern generator. It should be called a portable multi-purpose TV diagnostic and servicing aid, but that's too much of a mouthful. We would have nicknamed it the Dog Fighter (instead of the Money Generator), but that might be misinterpreted to mean that it's only useful in the shop. The versatile ATC-10, a portable, moderately-priced instrument, combines the most essential features of a color bar pattern generator, a TV "analyzer," and a substitute tuner plus several brand new "dog fighting" and timesaving innovations. With all this extra versatility, however, the ATC-10 is human engineered with only four simple-to-master controls.

Two illustrated brochures describe the ATC-10. The first brochure describes the many unique and unusual features which make the ATC-10 a "dog fighter" and a time-saver. The second brochure compares the money-making potential of the ATC-10 with 18 competitive models. It includes a comprehensive chart which compares the features of 19 makes and models, lists the estimated timesaving potential of these 33 respective performance features, and then calculates the money making potential of the various models. We think you are in for some surprises, such as the potential of the ATC-10 for returning its \$299.95 purchase price in as little as three or four months.

These brochures are yours for the asking — write direct for immediate reply.

American Technology Corporation

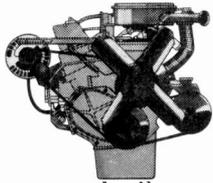
225 Main, Dept. 3B, Canon City, CO 81212

...for more details circle 110 on Reader Service Card

"I wouldn't trade my Tradesman for all the wood in Woodstock." And here are 5 good reasons why:



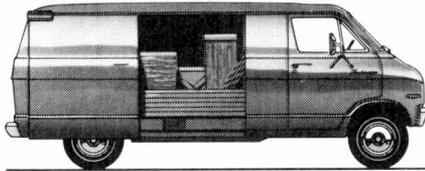
1. Dodge Tradesman: Best gas mileage.



Trade my Tradesman? No way. Not when it got the best gas mileage of any van on the road. In the latest EPA tests, Tradesman—powered by a 225/6 with a manual transmission—turned in an estimated mileage of 26 miles per gallon on the highway. And 18 in the city. Of course, the mileage you get will depend on your own driving habits, road conditions and your van's equipment. See your Dodge Dealer for California estimates.

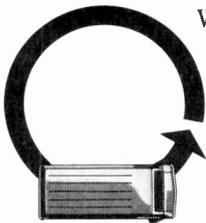
2. Dodge Tradesman: Carries more.

Dodge Tradesman weighs less and can carry more than any other van. On comparable models, it weighs 524 pounds less than Ford. And



140 pounds less than Chevy. A lot less weight that can add up to a lot more cargo. And the more cargo you carry in one trip, the less trips you have to make.

3. Dodge Tradesman: Better maneuverability.



When you've got a narrow loading dock staring you in the face, you'll be darn glad you've got a Dodge. Curb to curb, Tradesman's turning circle is shorter than either Ford's or Chevy's. So even in the tightest spots, it's a cinch to do your business a good turn.

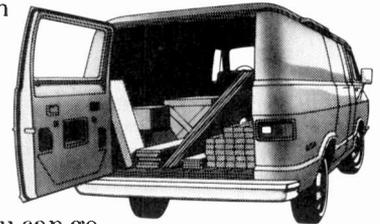
4. Dodge Maxivan: Biggest van there is.

For extra-big jobs, Dodge Maxivan gives you 18 extra inches of load length to work with. And that makes it the biggest van in the business. Got a big bundle of 12-foot two-by-fours? Maxivan can swallow 'em whole.

5. Dodge Tradesman: Single rear door.

Looking for a van with a view? Tradesman's new optional single rear door has a single rear window that's wide enough

to take in the world. Plus a door opening that's wide enough to take on a load of cargo. And only Dodge has it. As for getting in and out on the side, you can go



with our swing-out doors. Or opt for one that slides.

Dodge Tradesman: A whole lot more.

Dodge has made Tradesman even more untradable with other great features like: Small 6 and V8 engines (225/6 and 318 V8). A standard gas tank that's 22 gallons big. Large side-door opening for easier side loading. Short 109-inch wheelbase on B 300 model. In-cab hood release. Automatic speed control. Proven electronic ignition. Glove box. Auxiliary rear heater. Lower overall vehicle height and shorter length for garageability. And a standard two-stage front door check.

Fleet Purchase Allowance.

If you own as few as ten vehicles (cars or trucks), you can qualify for an allowance direct from Chrysler Corporation. It'll be well worth your time to find out about this program. For complete information on how you can qualify for our Fleet Purchase Program, see your Dodge Dealer.



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

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Dodge Trucks **VAN**

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who want to expand
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50 / ELECTRONIC TECHNICIAN/DEALER, MARCH 1976

NEW PRODUCTS

Descriptions and specifications of the products included in this department are provided by the manufacturers. For additional information, circle the corresponding numbers on the Reader Service Card in this issue.

SWR POWER METER

143

Measuring the transmitter power output in the 1.8 to 54 MHz frequency band and the SWR of transmission lines in one principle feature of the Model LPM-885, inline type power meter now offered by *Leader Instruments Corp., Communications Div.* It facilitates adjustment of transmitter and antenna systems in communication rigs so that the highest efficiency may be obtained. The unit may be left

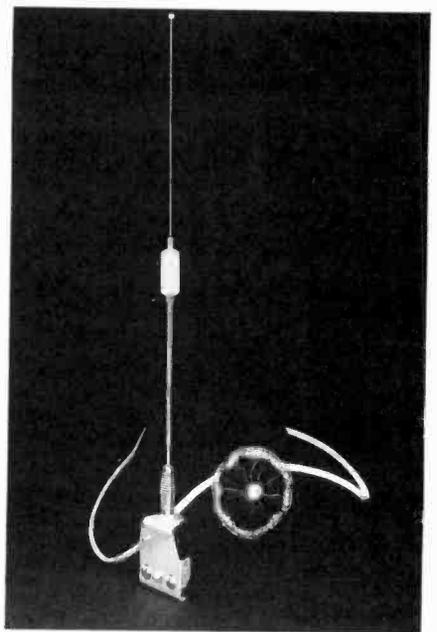


in circuit for continuous power output monitoring from 1 to 1000 w. Another useful feature is the separation capability of the detecting circuit assembly for remote measurements. The wide scale meter assures easy reading of all power and SWR indications. A forward-to-reverse power ratio is utilized to assure accurate SWR measurements. The instrument also features feed through power metering to eliminate any power loss. Compact, lightweight, the meter is part of the company's new "Performance Test Center" product grouping which is being made available to Ham and CB enthusiasts as well as other communicators. Price is \$99.95.

CB ANTENNA

144

The "INDEPENDENCE" Model 10-245 low profile, 27 MHz antenna introduced by *Breaker Corp.*, is simple to install on any vehicle rain gutter. Only 28 inches long, the top whip is a soft luster stainless steel and the base is chrome-plated brass. The antenna may be mounted quickly with the chrome-plated steel bracket designed



for long wear and ample door clearance. The whip includes a static arrester for ultra-quiet reception and has a pre-tuned heavy-duty ABS encapsulated center load coil for optimum efficiency over the entire Class "D" band. An auto-flex stainless steel spring relieves whip shock. An Allen wrench for fine tuning the antenna, plus a 10 foot coax cable with a PL-259 plug that mates with any standard SO-239 transceiver antenna receptacle is included with the antenna. The price is \$22.95.

CB RADIO CONNECTORS

145

A new simple-to-install device to help prevent theft of citizen band radios, stereos, tape decks, speakers, and other accessories from vehicles, is being marketed by *Har-Cor International*. When installed, the accessory can be removed in seconds. The Quick Disconnect Connector not only disconnects easily for fast removal but connects equally fast. It provides the user with the flexibility of quick installation and fast removal of expen-



sive electronic accessories from the vehicle. Installation to the power source leads is simple. The molded connector is completely insulated and polarized, which prevents misconnections. Positive locking is provided and accidental disengagement with the "open and close" clasp feature of the connector. To splice the power supply leads to the male portion of the connector and the female end of the connector to the accessory, four small molded quick splice connectors are used. Metal contacts molded in the small splicers shear into the connecting wires making positive, electrical contact under pressure applied by ordinary pliers. The two-section, quick disconnect connector with connecting leads, four quick splice connectors is bubble packed on an attractive display card. Price is \$2.45.

SWR BRIDGE/RF OUTPUT METER

146

An output meter that measures up to 100 watts output power and VSWR from 1:1 to infinity is now available from *Siltronix*, a division of Cubic Corp. Designated Model SWR-2, the unit incorporates two meters—one indicating RF output and the other standing wave ration (SWR). With this arrangement, no switching is needed to obtain RF output and SWR measurements. The compactness of the unit and the availability of con-



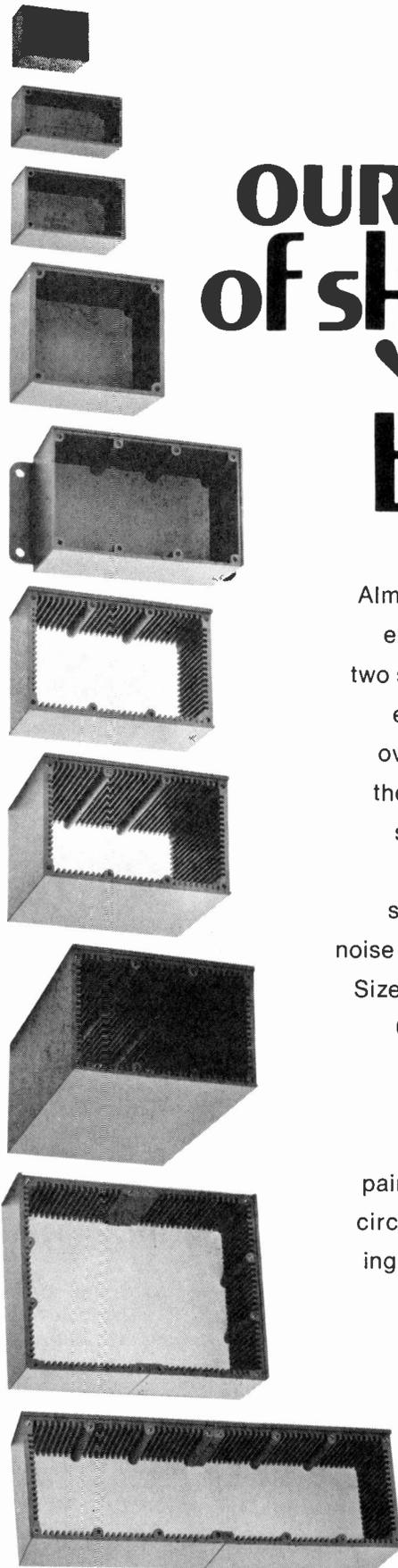
tinuous readout of both power and SWR, without affecting normal operation, make it feasible to leave the meter in the transmission line at all times to monitor transmitter power and antenna operation. Frequency coverage of the new unit is 3.5 to 150 MHz. Good sensitivity is achieved by using two of the 100 microampmeter movements. The Model SWR-2 is the first in a line of equipment to be introduced by *Siltronix* that will provide a complete meter accessory series for the Citizen Band radio operator. Price is \$21.95.

BASE STATION FILTER

147

Cornell-Dubilier Electric, has added a Model CBBS-1 base station filter to their line of noise filter products. The unit is designed to remove interfering power line signals entering base station receptacles. These interfering signals originate from many sources such as home appliances, office

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MARCH 1976, ELECTRONIC TECHNICIAN/DEALER / 51

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<input type="checkbox"/> 2AV2	5 for \$4.20	<input type="checkbox"/> 6HV5	5 for \$11.80
<input type="checkbox"/> 3A3	5 for \$5.35	<input type="checkbox"/> 6JC8	5 for \$5.95
<input type="checkbox"/> 3AT2	5 for \$5.20	<input type="checkbox"/> 6JE8	5 for \$11.15
<input type="checkbox"/> 3G15	5 for \$5.15	<input type="checkbox"/> 6J8	5 for \$9.90
<input type="checkbox"/> 3HA5	5 for \$5.10	<input type="checkbox"/> 6JU8	5 for \$5.90
<input type="checkbox"/> 3HM5	5 for \$5.10	<input type="checkbox"/> 6KA8	5 for \$6.50
<input type="checkbox"/> 5GH8	5 for \$6.25	<input type="checkbox"/> 6KE8	5 for \$8.15
<input type="checkbox"/> 6BK4	5 for \$9.95	<input type="checkbox"/> 6KT8	5 for \$7.25
<input type="checkbox"/> 6CG3	5 for \$5.25	<input type="checkbox"/> 6KZ8	5 for \$5.25
<input type="checkbox"/> 6CJ3	5 for \$5.00	<input type="checkbox"/> 6LB8	5 for \$10.75
<input type="checkbox"/> 6DW4	5 for \$5.00	<input type="checkbox"/> 6LQ8	5 for \$11.15
<input type="checkbox"/> 6EA8	5 for \$5.25	<input type="checkbox"/> 8FQ7	5 for \$4.05
<input type="checkbox"/> 6EH7	5 for \$5.10	<input type="checkbox"/> 12BY7	5 for \$7.00
<input type="checkbox"/> 6EJ7	5 for \$4.75	<input type="checkbox"/> 12GN7	5 for \$7.40
<input type="checkbox"/> 6FQ7	5 for \$4.05	<input type="checkbox"/> 17JZ8	5 for \$4.75
<input type="checkbox"/> 6G7	5 for \$7.05	<input type="checkbox"/> 23Z9	5 for \$6.35
<input type="checkbox"/> 6GH8	5 for \$4.20	<input type="checkbox"/> 33GY7	5 for \$8.05
<input type="checkbox"/> 6GJ7	5 for \$3.70	<input type="checkbox"/> 38MC8	5 for \$11.40
<input type="checkbox"/> 6GU7	5 for \$5.55	<input type="checkbox"/> 38HE7	5 for \$9.75
<input type="checkbox"/> 6HA5	5 for \$5.10	<input type="checkbox"/> 38HK7	5 for \$5.55

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SPECIAL—100 6GH8 \$69.00

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<input type="checkbox"/> 93K4	5 for \$13.45	<input type="checkbox"/> 8LR8	5 for \$13.84
<input type="checkbox"/> 6CJ3	5 for \$8.75	<input type="checkbox"/> 17JZ8	5 for \$6.44
<input type="checkbox"/> 8FQ7	5 for \$5.47	<input type="checkbox"/> 21L8	5 for \$8.37
<input type="checkbox"/> 6GH8	5 for \$5.87	<input type="checkbox"/> 23Z9	5 for \$8.57
<input type="checkbox"/> 6HA5	5 for \$6.89	<input type="checkbox"/> 35LR6	5 for \$13.84
<input type="checkbox"/> 6LB8	5 for \$14.51	<input type="checkbox"/> 42KN6	5 for \$12.36

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<input type="checkbox"/> 3009	121	10 for \$5.85	
<input type="checkbox"/> 3018	108	10 for \$3.38	
<input type="checkbox"/> 3021	124	10 for \$4.73	
<input type="checkbox"/> 3041	152	10 for \$8.30	
<input type="checkbox"/> 3052	155	10 for \$5.85	
<input type="checkbox"/> 3054	196	10 for \$6.75	
<input type="checkbox"/> 3065	222	5 for \$6.90	
<input type="checkbox"/> 3083	185	10 for \$6.30	
<input type="checkbox"/> 3084	193	10 for \$4.50	
<input type="checkbox"/> 3103	157	10 for \$4.50	
<input type="checkbox"/> 3114	159	10 for \$3.80	
<input type="checkbox"/> 3115	165	10 for \$5.00	
<input type="checkbox"/> 3124	123A	10 for \$3.15	
<input type="checkbox"/> 3132		10 for \$3.90	
<input type="checkbox"/> Hep 707	Hep 740	10 for \$5.00	
<input type="checkbox"/> 221-42; 221-45; 221-48; 221-48; 221-48; 221-82;		10 for \$5.00	
<input type="checkbox"/> ECG182; 708; 709; 712; 713; 714; 718;			
<input type="checkbox"/> 722; 723; 725; 731; 740; 790 ANY (5)			
<input type="checkbox"/> for \$5.00			

YOKES

<input type="checkbox"/> Y130	<input type="checkbox"/> Y94	<input type="checkbox"/> Y105
<input type="checkbox"/> 95-2779	ea. \$5.95	5 for \$25.00
<input type="checkbox"/> Y110	<input type="checkbox"/> Y162/Y132	<input type="checkbox"/> Y137
<input type="checkbox"/> Y147	<input type="checkbox"/> DY92C ea. \$9.95	5 for \$40.00

DIODES, RECTIFIERS EQUIV.

RCA Damper Diode Equiv. to:
RCA 120818 \$1.00 RCA 135932 \$2.00
6500 PIV Color Focus Rect. 10 for \$5.00
2.5 Amp 1000 PIV IR-170 10 for \$3.95
Syl. Volt. Tripler Repl. 32-29778-3 ea. \$9.95

AUDIO-CARTRIDGES-NEEDLES-SPEAKERS REPL.

<input type="checkbox"/> N44	<input type="checkbox"/> N75	<input type="checkbox"/> N77	
<input type="checkbox"/> N81	<input type="checkbox"/> V15	ea. \$2.95	10 for \$29.00
<input type="checkbox"/> N3-7D Needle			10 for \$10.00
<input type="checkbox"/> Astatic Cart. 142			8 for \$10.00
<input type="checkbox"/> Tetrad SN-4	<input type="checkbox"/> SN-1 Asst.		5 for \$10.00
<input type="checkbox"/> GE 850 Cart.			3 for \$10.00
<input type="checkbox"/> EV5015			5 for \$10.00

ANTENNAS

<input type="checkbox"/> 72 ohm to 300 ohm Matching Transformer	10 for \$7.50
<input type="checkbox"/> 50U "F" Connectors	100 for \$10.00
<input type="checkbox"/> 300 ohm 2 set Coupler G012	5 for \$7.50
<input type="checkbox"/> 72 ohm to 300 ohm Signal Splitters	5 for \$8.50
<input type="checkbox"/> 72 ohm 2 set Coupler	10 for \$10.00
<input type="checkbox"/> 72 ohm 3 set Coupler	10 for \$20.00

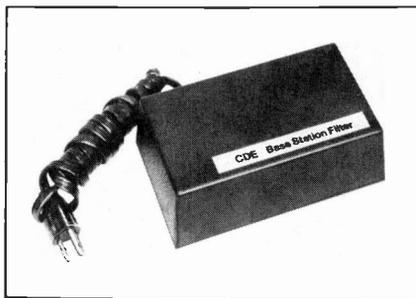
GENERAL

<input type="checkbox"/> 19" & 25" Color Boosters	<input type="checkbox"/> 21"	3 for \$11.95
<input type="checkbox"/> 4 Asst. Tuners New Incl. Tubes		\$15.00
<input type="checkbox"/> 4 Asst. New Color Tuners Incl. Tubes		\$25.00
<input type="checkbox"/> 20 Asst. Belts (Dealer Price Net \$70.00) Your Cost		\$7.00
<input type="checkbox"/> 25 ft. Stereo Extension Cord		10 for \$14.95
<input type="checkbox"/> 80 minute Irish cassette tapes		12 for \$4.00
<input type="checkbox"/> 80 minute Norelco boxed type 12		for \$10.00
<input type="checkbox"/> 84 minute Irish 8-track tape		7 for \$6.00
<input type="checkbox"/> 84 minute Shamrock 8-track tape		6 for \$6.00
<input type="checkbox"/> 40 minute Shamrock 8-track tape		6 for \$4.00
<input type="checkbox"/> 5 x 7 Speaker Kit		\$2.95
<input type="checkbox"/> 6 x 9 Grills		10 for \$8.00
<input type="checkbox"/> 21" Speaker Enclosures		\$29.95 pair

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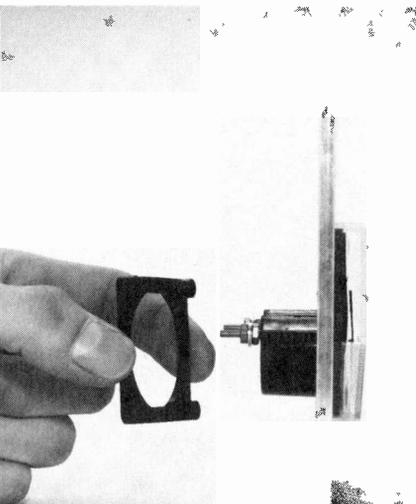
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machines, industrial equipment, etc., which find their way into the power lines and conduct along the lines to the receptacle when the base station line cord is connected. This filter is applied at the base station.

PANEL METER SERIES 148

A new series of slim-profile, taut-band panel meters equipped with a Ring-Lock mounting system which eliminates the need for mounting bolts and associated holes has been introduced by *Weston Instruments, Inc.* Called the Mustang series, the new panel meters are available in 1½-inch through 6-inch sizes, with clear or painted fronts and a choice of front or rear panel mounting. In addition to the new bolt-less mounting system and the slim profile—which reduces

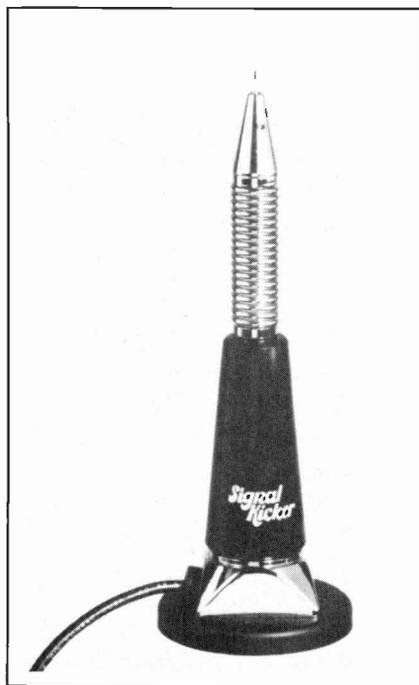


meter bulge, saves space and makes possible a smaller insert hole—the new panel meter series also features a translucent scale back, which simplifies backlighting, and a choice of easily inserted, snap-lock, light-diffusing scales. Models available in the series include DC microammeters, DC milliammeters, DC ammeters, DC voltmeters and rectifier type AC voltmeters.

CB ANTENNA 149

The *Turner Division of Conrac Corp.*, is adding two magnetic mount antennas to its *Signal Kicker* citizens' band antenna line. The antennas use a magnet with a specification strength

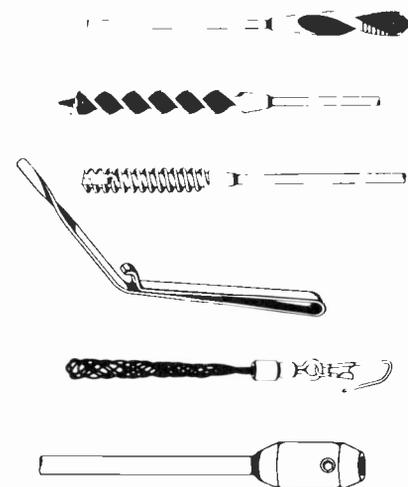
of 90 pounds of direct pull. The SK900 Series antennas are provided with 18 feet of coaxial cable. They are factory pretuned for a low VSWR and will take up to 500 watts of power, radiat-



ing from a 46-inch stainless steel whip. The SK900, supplied without shock spring, will list for \$25; while the SK910 will include a stainless steel shock spring and list for \$28.

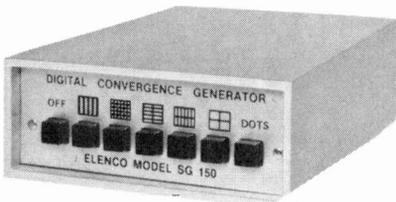
CABLE INSTALLATION TOOL SYSTEM 150

By combining a long flexible spring-steel shaft with high-quality drill bits, *Blonder-Tongue* is marketing the *D'versiBit* tool system that reduces the time required for frustrating and time-consuming in-wall cable installations. The tools can be used for rapid installation of coaxial and electrical cable within all types of building walls. A standard quarter-inch drill is



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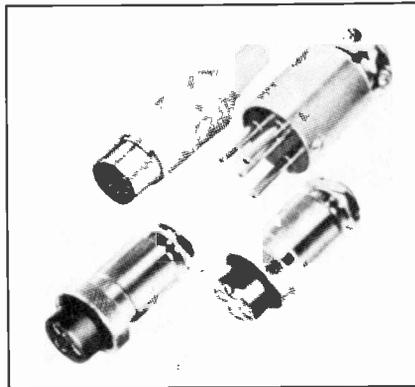
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used to drive the tools. The various items making up the system include: a half-inch auger bit with a 54-in. flexible shaft for easy starting and a clean entrance hold; a half-inch carbide-tipped masonry bit with a 54-inch flexible shaft for general-purpose use. Also available is a special alignment tool to guide and hold steady the D'versaBit flexible shafts; a line-recovery pulling-grip attachment for drawing RG-59 and RG-6 coax cable through the drilled holes; and a 54-inch extension attachment.

CB MICROPHONE CONNECTORS 151

A line of CB microphone connectors are being packaged individually in blister-cards with a cross-reference chart that shows which connectors to use on various transceivers is announced by *Mura Corp.* The chart



makes it easy to select the proper connector to adapt a microphone to any of the most popular rigs in use today. The connectors in 3, 4 and 5-pin configurations are designated PD-3, PD-4, PD-5 and PY-4 and range in price from .88¢ to \$1.85 each.

HIDE-AWAY MOBILE CB ANTENNA 152

Two new 39-inch mobile CB antennas offered by *Breaker Corp.* have a magnetic base which permits quick attachment and removal and eliminates the need for mounting holes and brackets.

Because the presence of an antenna alerts a thief that the vehicle is equipped with a CB transceiver, the probability of theft is reduced by the quick-removal-and-hide-away feature of the Liberty antenna series.

Both models in the Liberty series are equipped with a 40-pound-holding-power base magnet which prevents crawling or accidental dislodgment of the antenna. To prevent scratching of the surface of the vehicle, the base magnet is encapsulated in ABS plastic. (The Liberty series is not recommended for vehicles with soft vinyl tops.)

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The Liberty I (Model IO-275) has a fiberglass whip and the Liberty II (Model IO-285) has a stainless steel whip.

Both models are equipped with a base-load coil and stainless steel whip spring and include 16 feet of coaxial cable with a PL-259 plug and a capacitive impedance match which eliminates the need for matching transformers. Price of either model is \$27.95.

SOLDERING GUN 153

The Weller Model GT 150-watt soldering gun accepts both the 6 B powerhead with 1/8-inch cone point tip and the 7A 3/16-inch chisel point, with controlled outputs of 600 and 700 de-



grees F., respectively. Designed for solid state electronic work without damage to sensitive components, the 7 oz. gun features a slim, long reach barrel in both two and three-wire cord models. The double-coated tips are operation-tested for 30,000 connections.

REPLACEMENT COLOR TV MODULES 154

Same-day service is now offered by PTS Electronics, Inc., on replacement/repair of Zenith, RCA, Quasar and GE color TV modules.

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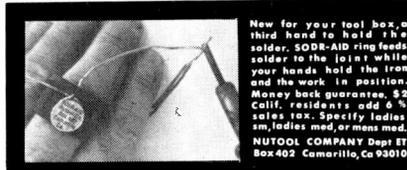
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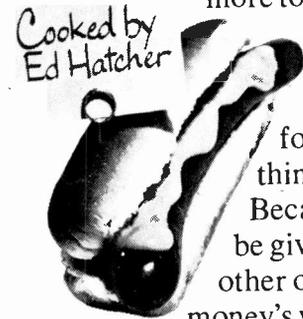
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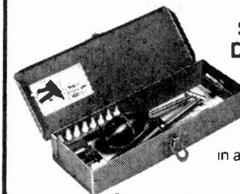


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Spartanburg, South Carolina

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GROUP
283

SCHEMATIC NO.		SCHEMATIC NO.	
ADMIRAL Color TV Chassis 1M30B	1632	SYLVANIA TV Chassis A19-3	1635
ADMIRAL TV Chassis T21K8	1631	SYLVANIA Color TV Chassis E20-2	1634
MAGNAVOX Color TV Chassis T985/T986	1633		

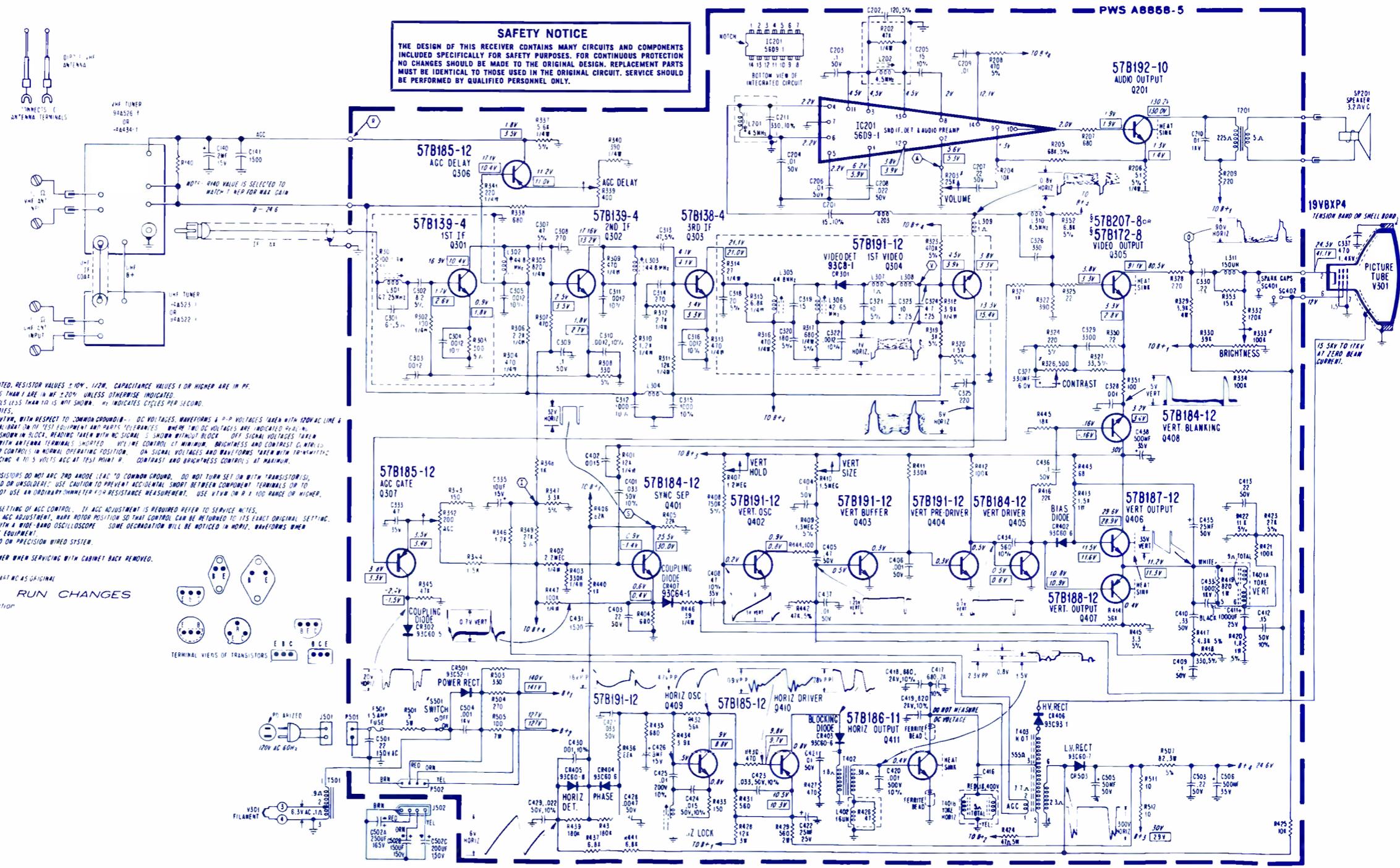
MODEL CHART						
MODEL	FINISH	CRT	VHF	UHF	CHASSIS	CURRENT
SK19B667	White	19VBXP4	94A526-1	94A523-1	T21K8-1B	.70 Amps
SK19B667M	White	19VBXP4	94A434-1	94A522-1	T21K8-2B	@ 120VAC

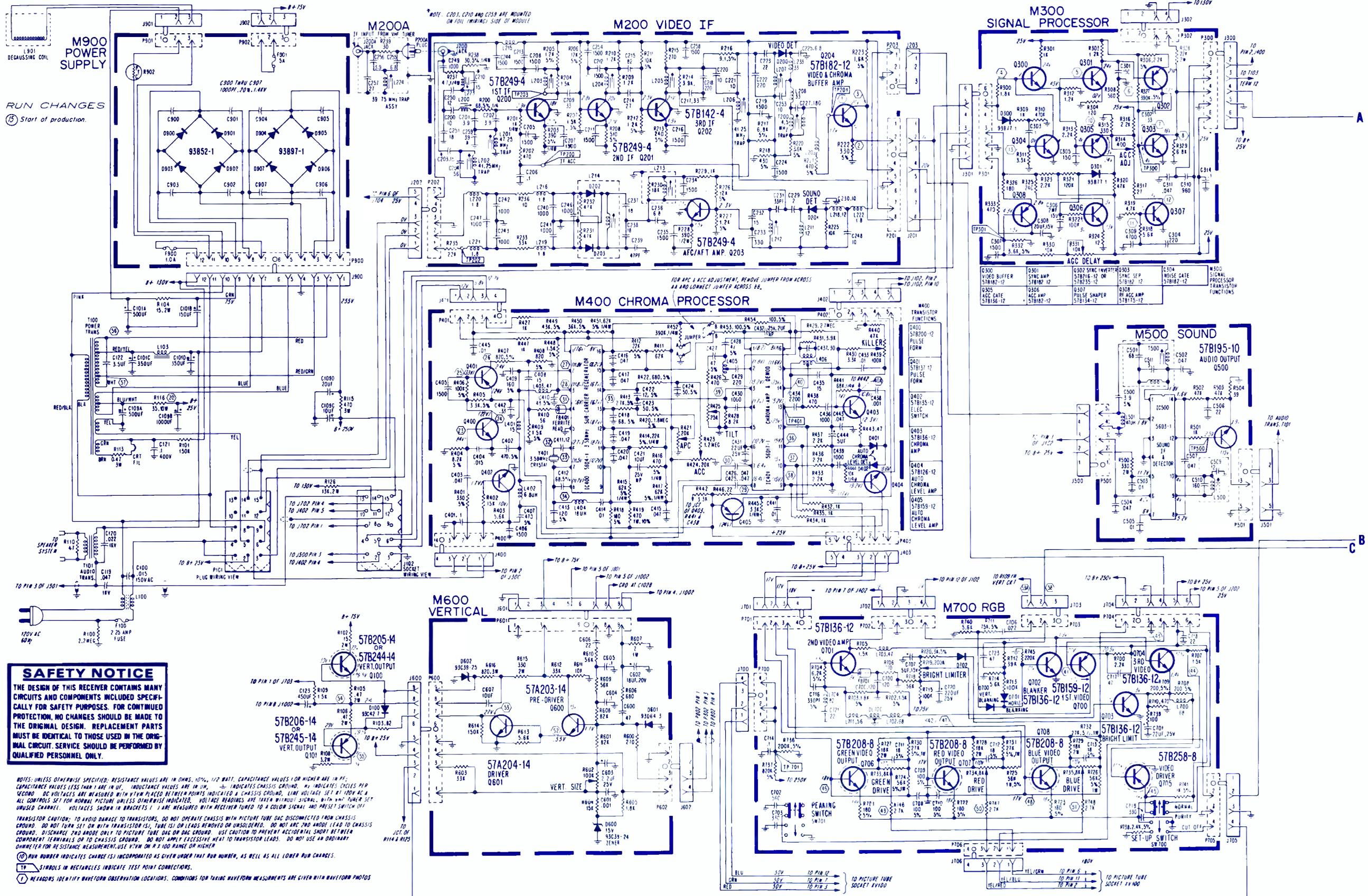
SCHEMATIC NOTES:
UNLESS OTHERWISE INDICATED, RESISTOR VALUES $\pm 10\%$, $\pm 2\%$. CAPACITANCE VALUES 1 OR HIGHER ARE IN PF. CAPACITANCE VALUES LESS THAN 1 ARE IN NF. $\pm 20\%$, UNLESS OTHERWISE INDICATED.
RESISTANCE VALUE OF COILS LESS THAN 10 IS NOT SHOWN. Hz INDICATES CYCLES PER SECOND.
VOLTAGE AND WAVEFORM NOTES:
DC VOLTAGES TAKEN WITH W/VM, WITH RESPECT TO COMMON GROUND. AC VOLTAGES, WAVEFORMS & P-P VOLTAGES TAKEN WITH 120V AC LINE & MAY VARY DEPENDING ON SKU/DIAT OR TEST EQUIPMENT AND PARTS TOLERANCES. WHEN TWO DC VOLTAGES ARE INDICATED (A-B), A-B IS TAKEN WITH TV SIGNAL IS SHOWN IN BLOCK, READINGS TAKEN WITH NO SIGNAL. B SHOWN WITHOUT BLOCK. OFF SIGNAL VOLTAGES TAKEN ON UNUSED VHF CHANNEL WITH ANTENNA TERMINALS SHORTED. VOLUME CONTROL AT MINIMUM. BRIGHTNESS AND CONTRAST CONTROLS AT MAXIMUM. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION. ON SIGNAL VOLTAGES AND WAVEFORMS TAKEN WITH TRANSMITTING NOISE FREE SIGNAL PRODUCING A 10 V VOLTS ACC AT TEST POINT W. CONTRAST AND BRIGHTNESS CONTROLS AT MAXIMUM.
TRANSISTOR CAUTION:
TO AVOID DAMAGE TO TRANSISTORS DO NOT ARC AND/OR LEAD TO COMMON GROUND. DO NOT TURN SET ON WITH TRANSISTORS/TUBES OR LEADS REMOVED OR UNSOLDERED. USE CAUTION TO PREVENT ACCIDENTAL SHORT BETWEEN COMPONENT TERMINALS OR TO COMMON GROUND. DO NOT USE AN ORDINARY OHMMETER FOR RESISTANCE MEASUREMENT. USE W/VM OR A 100 OHM OR HIGHER, ACC CAUTION.
DO NOT DISTURB FACTORY SETTING OF AGC CONTROL. IF AGC ADJUSTMENT IS REQUIRED REFER TO SERVICE NOTES.
IF NECESSARY TO DISTURB AGC ADJUSTMENT, MARK ROTOR POSITION SO THAT CONTROL CAN BE RETURNED TO ITS EXACT ORIGINAL SETTING.
ALL WAVEFORMS TAKEN WITH A WIDE-BAND OSCILLOSCOPE. SOME DEGRADATION WILL BE NOTICED IN HORIZ. WAVEFORMS WHEN USING NARROW BANDPASS EQUIPMENT.
* COMPONENT NOT MOUNTED ON PRECISION WIRED SYSTEM.
WARNING:
USE ISOLATION TRANSFORMER WHEN SERVICING WITH CABINET BACK REMOVED.
* COMMON GROUND (G)
* REPLACE WITH SAME PART NO AS ORIGINAL

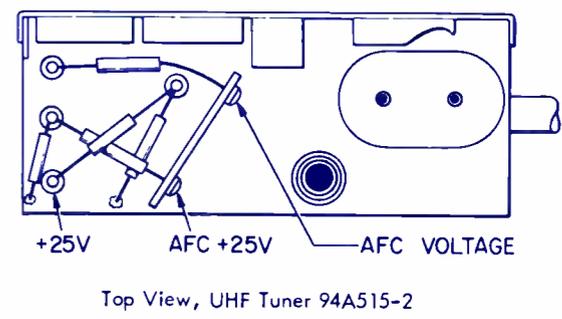
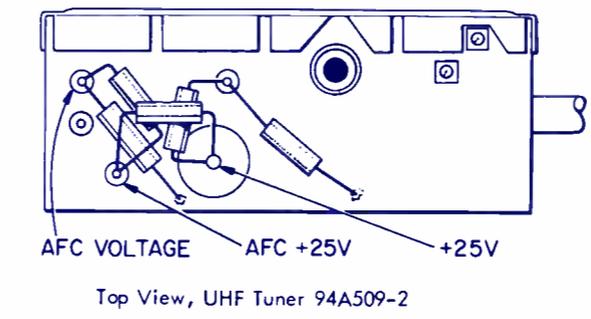
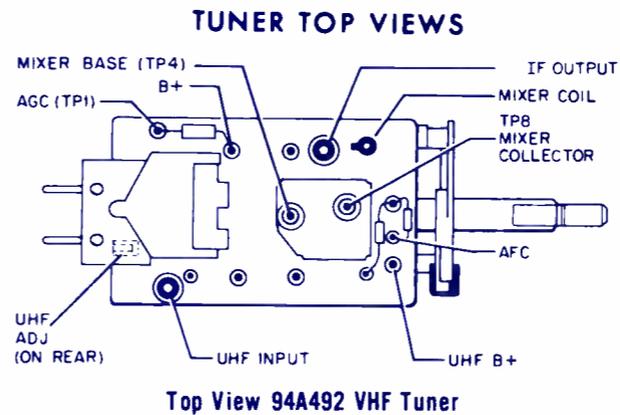
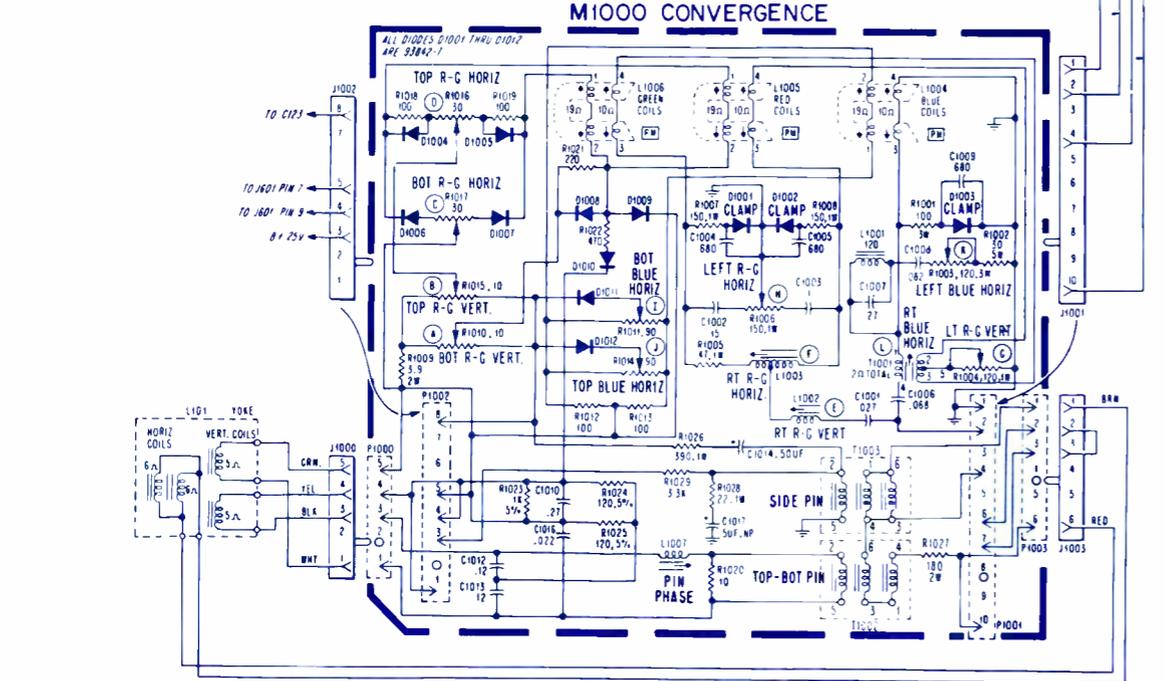
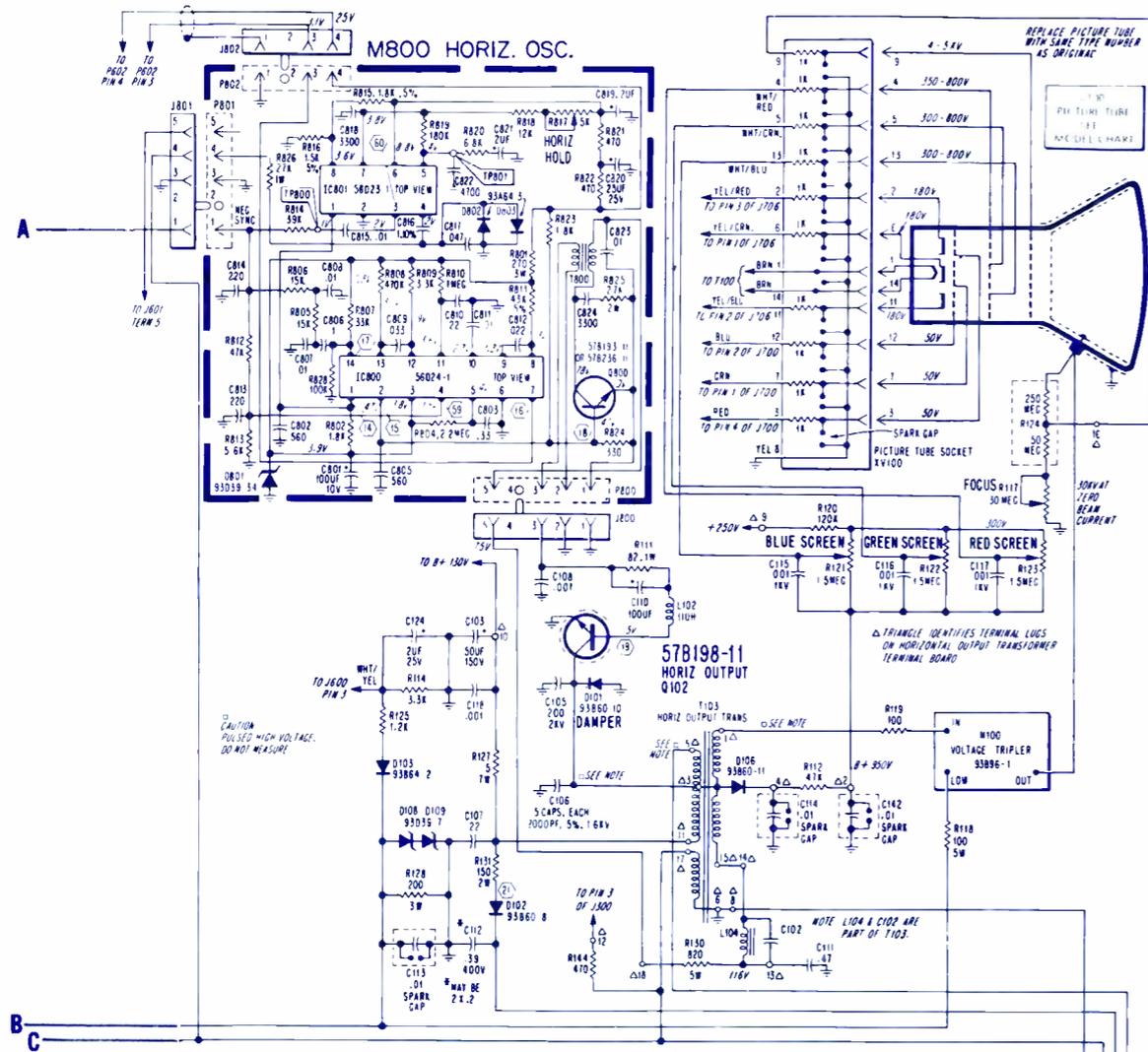
RUN CHANGES
① Start of production

TERMINAL VIEWS OF TRANSISTORS

SAFETY NOTICE
THE DESIGN OF THIS RECEIVER CONTAINS MANY CIRCUITS AND COMPONENTS INCLUDED SPECIFICALLY FOR SAFETY PURPOSES. FOR CONTINUOUS PROTECTION NO CHANGES SHOULD BE MADE TO THE ORIGINAL DESIGN. REPLACEMENT PARTS MUST BE IDENTICAL TO THOSE USED IN THE ORIGINAL CIRCUIT. SERVICE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.





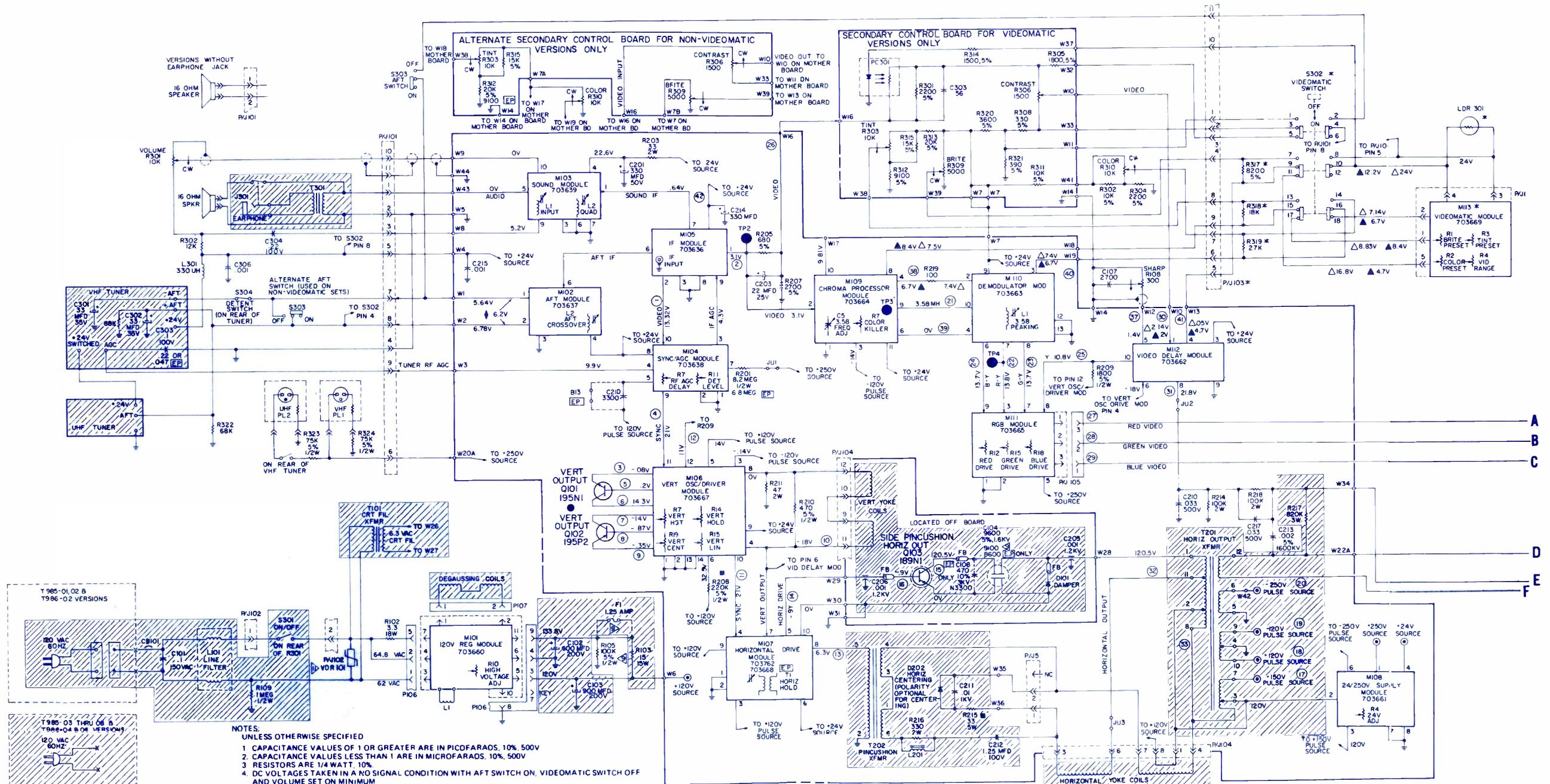


SYMBOL DESCRIPTION ADMIRAL PART NO.

T500 — xformer, 4.5MHz72A318-6
 1C500 — integ circuit, sound IF and detect56A3-1
 R314 — 400 ohm, AGC adj75A101-53
 R331 — 10K, AGC delay75A101-25
 R719 — 200K, brite limiter75A101-28
 R733, 734
 735 — 3 section, 8K, red, blue & green drive75A95-14
 R817 — 5K, horiz hold75A101-64
 1C800 — integ circuit, countdown56A24-1
 1C801 — integ circuit, horiz osc & APC56A23-1

MODEL CHART

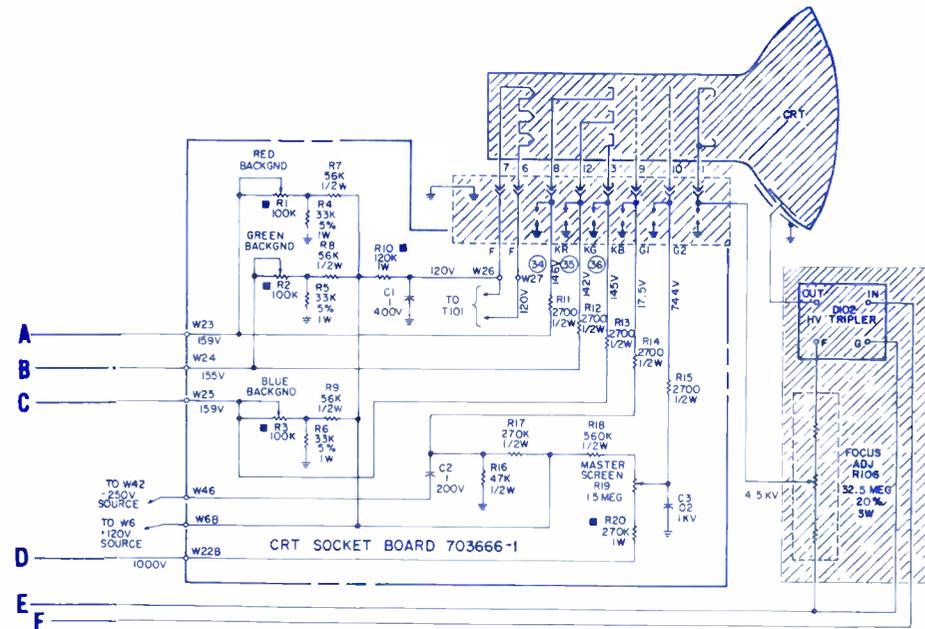
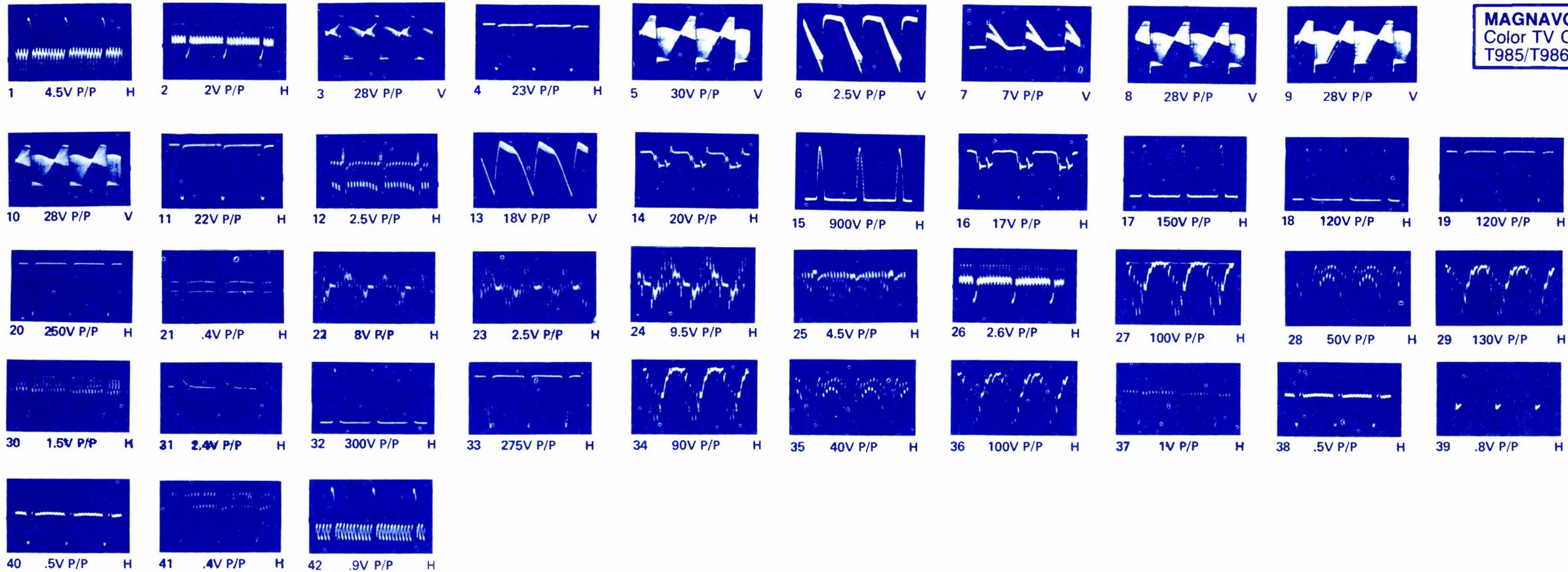
MODEL	FINISH	CRT	TUNER CLUSTER	VHF	UHF	CHASSIS	CURRENT
SK25C671	Walnut	25VCZP22 or 25VCNP22	NC2810-5	94A492-4	94A509-2 or 94A515-2	1M30B	1.8 Amp @ 120V
SK25C673	Oak	25VCZP22 or 25VCNP22	NC2810-5	94A492-4	94A509-2 or 94A515-2	1M30B	1.8 Amp @ 120V
SK25C676	Pine	25VCZP22 or 25VCNP22	NC2810-5	94A492-4	94A509-2 or 94A515-2	1M30B	1.8 Amp @ 120V
23C668	Pecan	23VCEP22	NC2824-1	94A492-4	94A509-2 or 94A515-2	1M30B	1.8 Amp @ 120V



- NOTES:
UNLESS OTHERWISE SPECIFIED
- 1 CAPACITANCE VALUES OF 1 OR GREATER ARE IN PICOFARADS, 10%, 500V
 - 2 CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS, 10%, 500V
 - 3 RESISTORS ARE 1/4 WATT, 10%
 - 4 DC VOLTAGES TAKEN IN A NO SIGNAL CONDITION WITH AFT SWITCH ON, VIDEOOMATIC SWITCH OFF AND VOLUME SET ON MINIMUM
 - 5 DC VOLTAGES MEASURED WITH A VTVM. LINE VOLTAGE MAINTAINED AT 120 VAC
 - 6 Q101 & Q102 ARE MOUNTED ON A HEAT SINK ON THE BASIC CHASSIS. THEY ARE NOT INCLUDED WITH A REPLACEMENT VERTICAL OSCILLATOR DRIVER MODULE
 - 7 ▲ VOLTAGES TAKEN WITH VIDEOOMATIC SWITCH ON. THESE VOLTAGES WILL VARY WITH THE SETTINGS OF THE SECONDARY CONTROLS & THE VIDEOOMATIC PRE SETS
▲ THESE VOLTAGES WILL VARY WITH THE SETTINGS OF THE SECONDARY CONTROLS AND THE VIDEOOMATIC PRE SETS
 - 8 ◆ VOLTAGES TAKEN WITH AFT SWITCH OFF

- ◆ USED ON T985 CHASSIS ONLY
- 10 * USED ON VIDEOOMATIC SETS ONLY
- ▲ VDR101, used on Early Production T985-07-BB Chassis Only, P.N. 230225.1.
- PART SHOULD BE ELEVATED 1/4 INCH ABOVE BOARD.

MAGNAVOX
Color TV Chassis
T985/T986



WARNING

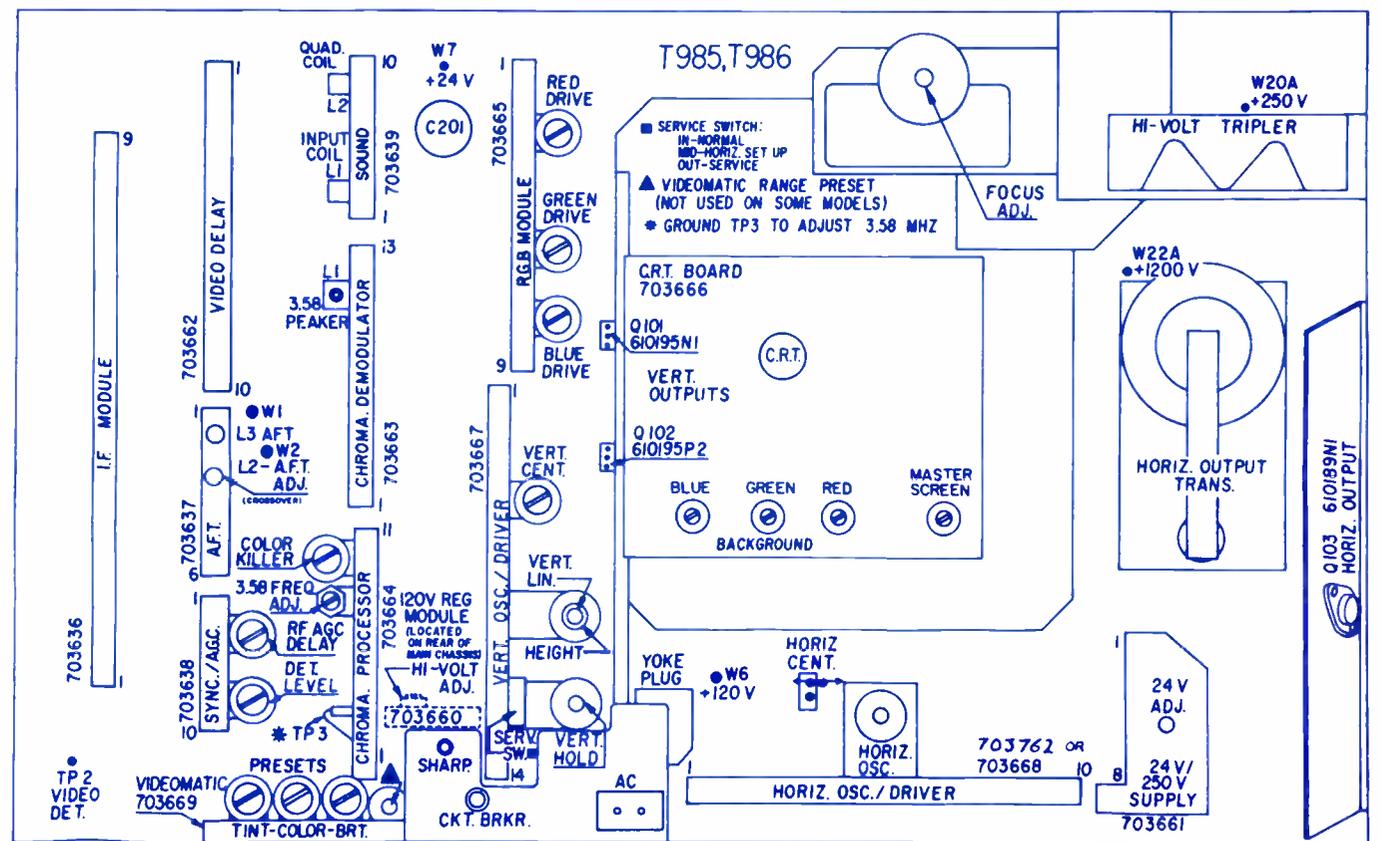
Magnavox Consumer Electronics Company is committed to marketing safe products which meet or exceed applicable safety standards of industry, government agencies and independent laboratories. It therefore uses parts in its products designed for maximum safety, reliability and performance.

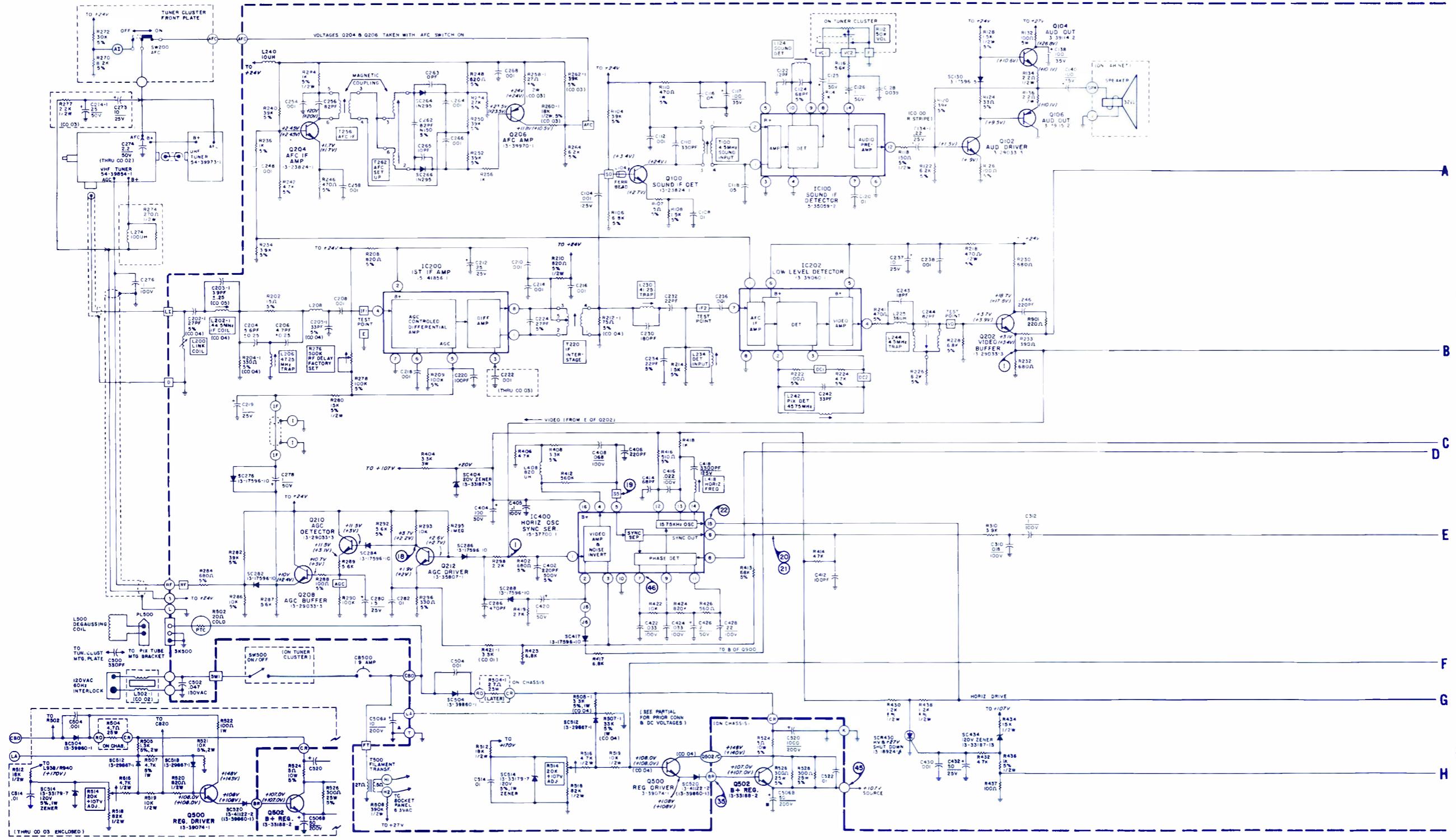
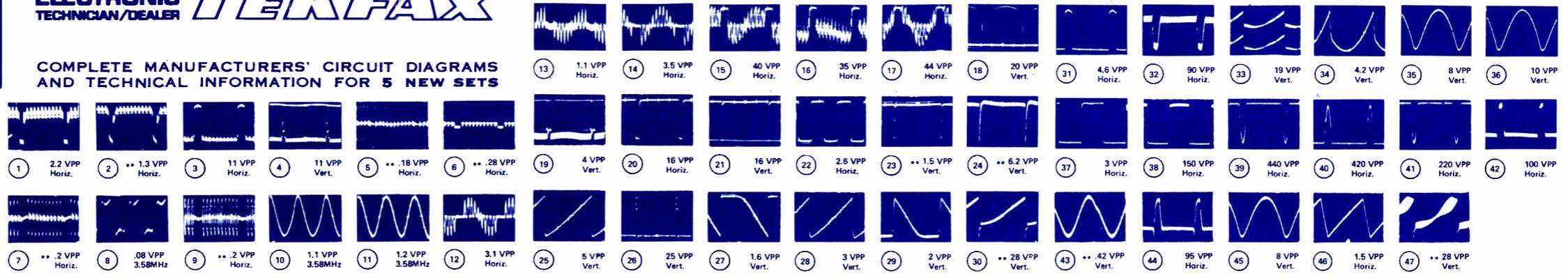
For continued safety of this product, parts shown in the shaded areas of this schematic must be replaced with only those identified in the Parts List of this manual. Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards.

For maximum reliability and performance, all other parts must be replaced by those having identical specifications.

Under no circumstances may the original design be modified or altered without permission from The Magnavox Company, otherwise the consumer may be exposed to fire and/or shock hazards.

**T985/T986 CHASSIS LAYOUT
(FROM REAR OF SET)**





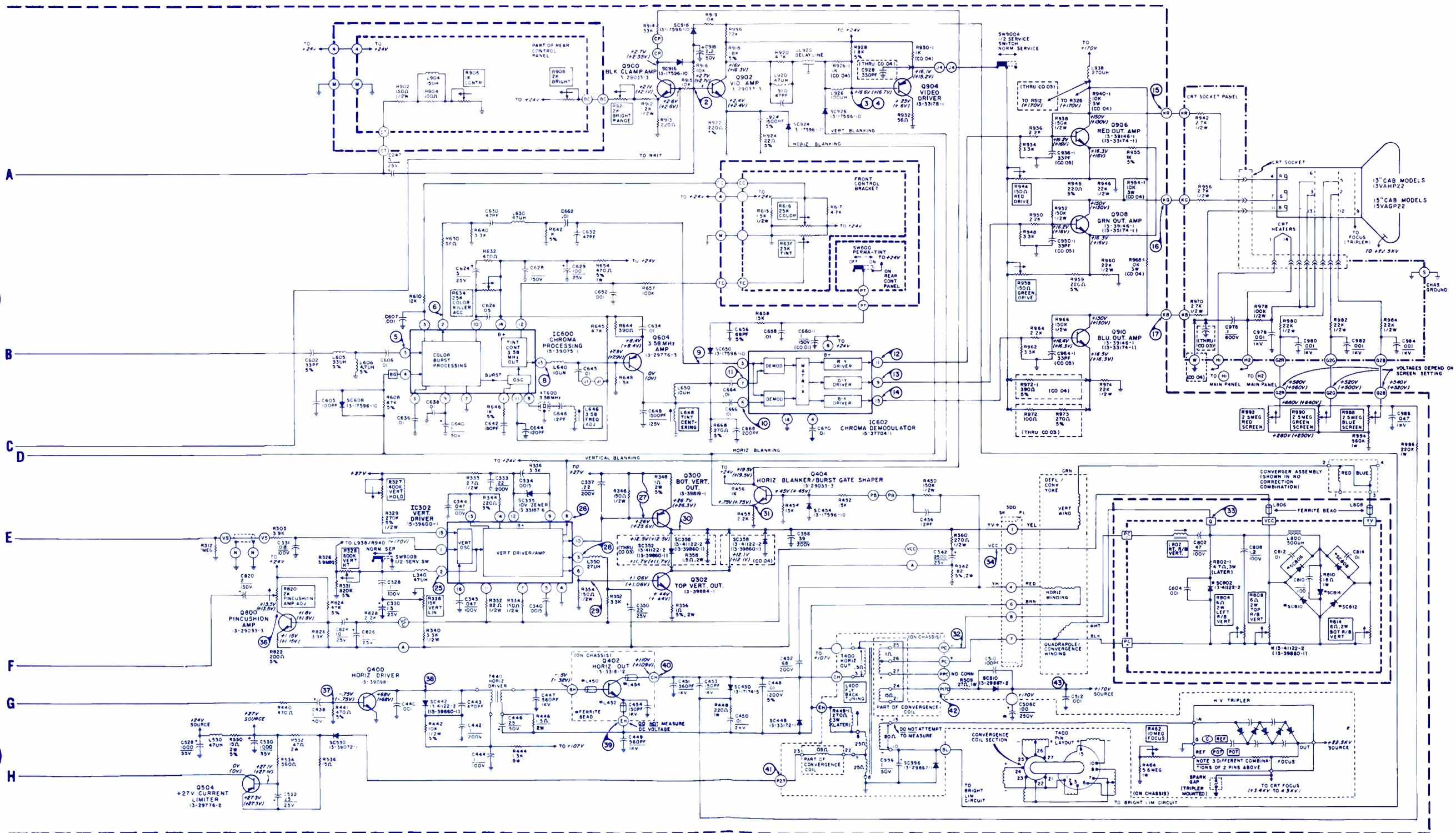
IC VOLTAGE CHART
(ALL IN VOLTS)

PIN NO.	IC100	IC200	IC202	IC300 (-3 CH.)	IC302 (-3 CH.)	IC400 (-3 CH.)	IC302 (-2 CH.)	IC400 (-2 CH.)	IC600	IC602
1	+16.5 (+1.85)	+6.9 (+16.3)	+1.6 (+6.7)	+1.7 (+1.6)	+1.7 (+1.7)	+3 (+3.3)	+4.3 (+1.7)	+3 (+3.3)	+5.4 (+5.36)	
2	+13 (+1.85)	+8.5 (+12.2)	+4.1 (+8.5)	+2.4 (+4.1)	+2.4 (+2.4)	+0.4 (+.4)	+2.4 (+2.4)	+0.4 (+.4)	+7.6 (+8)	
3	+2 (0)	+8.5 (+8.5)	+4.3 (+4.3)	+11.4 (+11.4)	+1.75 (+1.75)	+11.4 (+11.4)	+1.75 (+1.75)	+1.75 (+1.75)	+6.6 (+6.4)	+3.6 (+3.6)
4	+2.7 (0)	+4.1 (+2.6)	+1.45 (+1.4)	0 (0)	+11 (+9.5)	0 (0)	+11 (+9.5)	+5.2 (+5.2)	+3.6 (+3.6)	

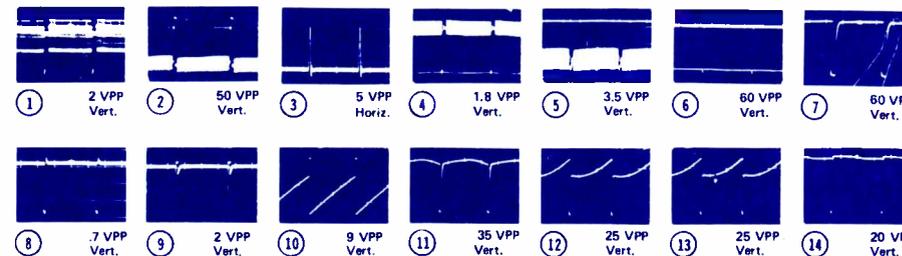
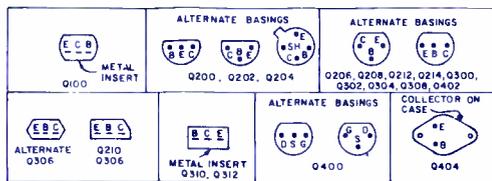
5	+5 (+11.5)	+17.2 (+17.2)	+2.8 (+.5)	+2.8 (+2.8)	-.2 (-1)	+2.8 (+2.8)	-.2 (-1)	+7 (+7)		
6	0 (+2.7)	+17.2 (+17.2)	0 (0)	+1.06 (+1.06)	+15.6 (+15.6)	+1.06 (+1.06)	+15.6 (+15.8)	+2 (+1.8)	+6.4 (+6.4)	
7	0 (+6)	+4.1 (+4.1)	+2.4 (+2.35)	+10 (+10)	+4.8 (+4.6)	+10 (+10)	+4.8 (+4.6)	0 (0)	+6.4 (+6.4)	
8	+16.6 (+5.3)	0 (0)	+6.5 (+6.5)	+1.1 (+1.0)	+7.5 (+7.5)	+1.1 (+1.0)	+7.5 (+7.5)	+4.2 (+4.4)	+24 (+24)	
9	+3.7 (+3.7)		+4.1 (+4.1)	+24.2 (+24)	+5 (+4.6)	+24.2 (+24)	+5 (+4.6)	+2.8 (+1.8)	+14.4 (+14.2)	
10	+3.7 (+3.7)		+0.3 (+2.6)	+26 (+25.6)	0 (0)	+26 (+25.6)	0 (0)	+7.4 (+8.2)		

11		+20 (+3.6)	+13.2 (+13.2)	+10.2 (+10.4)	+13.2 (+13.2)	+10.2 (+10.4)	+8.4 (+8.4)	+14.4 (+14.2)		
12	+5.1 (+5.1)	+8 (+8)	+26.9 (+26.8)	+18.6 (+18.6)	+26.9 (+26.8)	+18.6 (+18.6)	+8.4 (+8.4)			
13	+5.8 (+5.8)	+1.4 (+4.2)	+12 (+12)	+18.2 (+18.5)	+12 (+12)	+18.2 (+18.5)	+8 (+8)	+14.5 (+14.3)		
14	+1.7 (+1.7)	+3.5 (+1.8)	+12 (+12)	+3.3 (+3.3)	+12 (+12)	+3.3 (+3.3)	+9.4 (+9.4)	0 (0)		
15			+0.2 (+0.1)	+1.6 (+1.6)	+19 (+19)	+4.2 (+4.3)				
16		+1.4 (+1.4)	+20 (+20)	+5 (+5)	+20 (+20)					

SYLVANIA
Color TV Chassis
E20-2

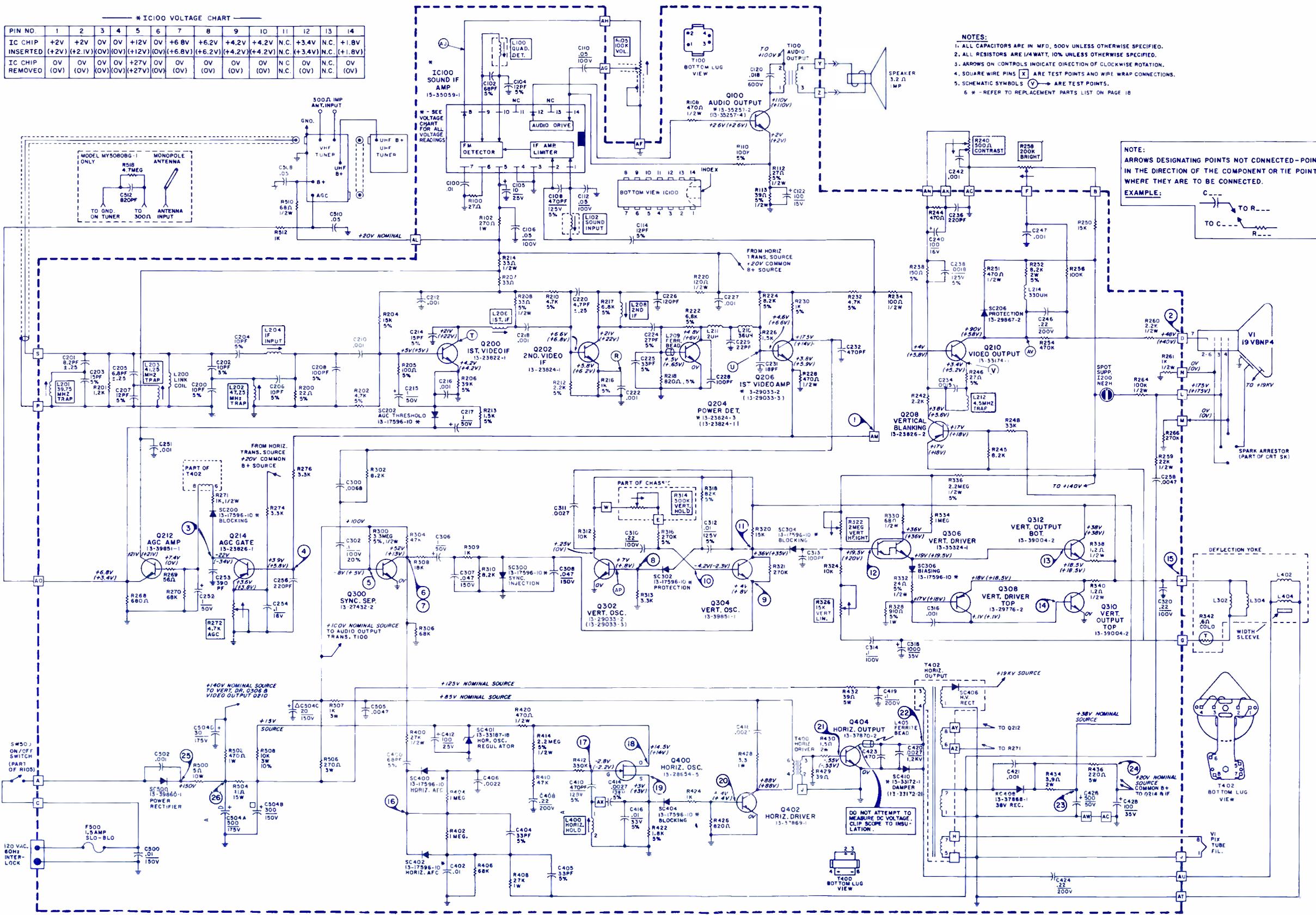


— BOTTOM VIEW—TRANSISTOR BASINGS —

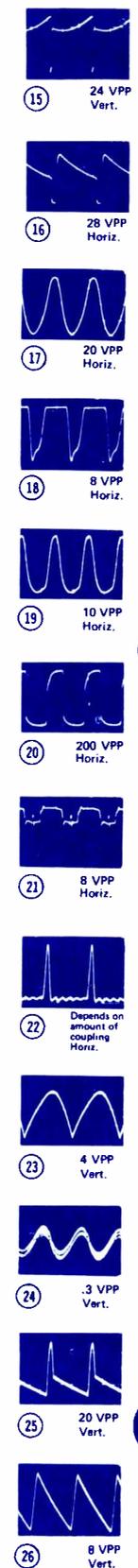
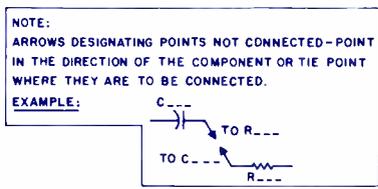


* IC100 VOLTAGE CHART

PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC CHIP INSERTED	+2V (+2V)	+2V (+2.1V)	0V (OV)	0V (OV)	+12V (+12V)	0V (OV)	+6.8V (+6.8V)	+6.2V (+6.2V)	+4.2V (+4.2V)	+4.2V (+4.2V)	N.C. (N.C.)	+3.4V (+3.4V)	N.C. (N.C.)	+1.8V (+1.8V)
IC CHIP REMOVED	0V (OV)	0V (OV)	0V (OV)	0V (OV)	+27V (+27V)	0V (OV)	0V (OV)	0V (OV)	0V (OV)	0V (OV)	N.C. (N.C.)	0V (OV)	N.C. (N.C.)	0V (OV)



- NOTES:
1. ALL CAPACITORS ARE IN MFD. 500V UNLESS OTHERWISE SPECIFIED.
 2. ALL RESISTORS ARE 1/4 WATT, 10% UNLESS OTHERWISE SPECIFIED.
 3. ARROWS ON CONTROLS INDICATE DIRECTION OF CLOCKWISE ROTATION.
 4. SQUARE WIRE PINS [X] ARE TEST POINTS AND WIRE WRAP CONNECTIONS.
 5. SCHEMATIC SYMBOLS (V) ARE TEST POINTS.
 6. * - REFER TO REPLACEMENT PARTS LIST ON PAGE 18



LEADER

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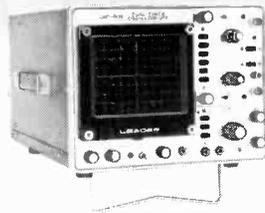
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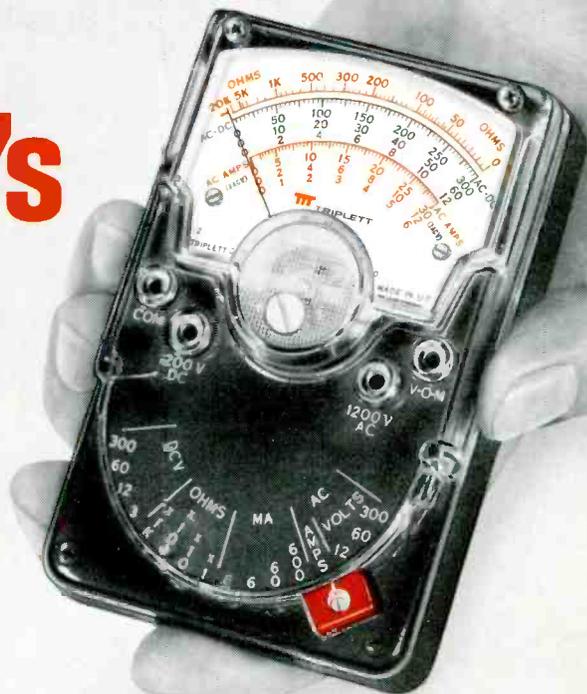
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