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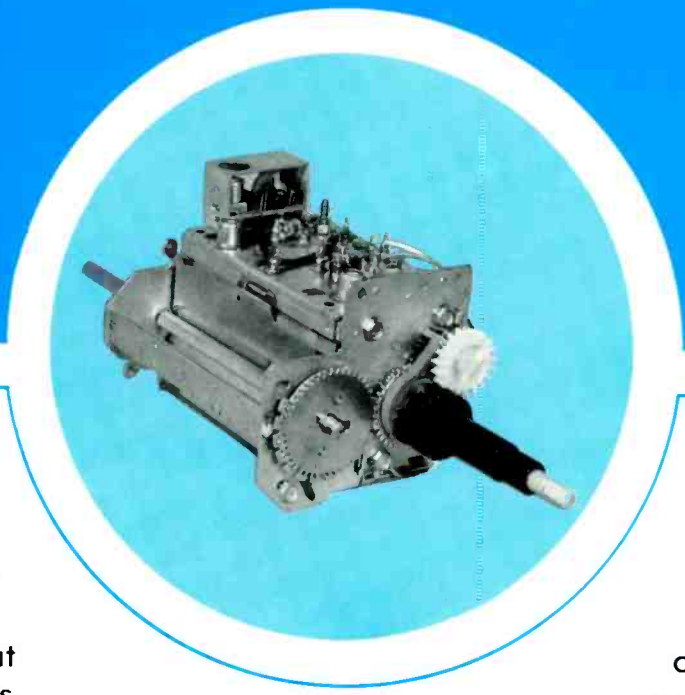

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EDITOR'S MEMO

The TV Set Population As Profiled by EIA Data

■ The Marketing Services Department of the Electronic Industries Association (EIA) on June 1 released the 1976 edition of its annual *Electronic Market Data Book,* a publication which many in the consumer electronics industry consider to be the most comprehensive and accurate compilation of data available about sales of and trends in consumer electronics.

The following profile of the trend in the composition of the TV set population during the past ten years and its present makeup is based on computations and comparisons of relevant data extracted from the *1976 Electronic Market Data Book:*

At the beginning of 1966, there were about 70.6 million TV receivers in use in this country, 92% (64.8 million) of which were monochrome receivers and 8% (5.8 million) of which were color receivers.

At the beginning of 1976 there were about 125.3 million TV receivers in use in this country, 53% (66 million) of which were monochrome receivers and 47% (59.3 million) of which were color receivers. Weighing these 1976 figures against those at the beginning of 1966 indicates that during the ten-year period 1966-1975 the number of monochrome receivers in use increased by only 1.9%, while the number of color TV receivers in use increased by 922%.

During the ten-year period 1966-1975 there were about 122.5 million TV receivers purchased by consumers in this country, 53% (65.4 million) of which were color and 47% (57.1 million) of which were monochrome receivers.

Adding the 122.5 million TV receivers purchased during 1966-1975 and the 70.6 million TV receivers in use as of the beginning of 1966 and then subtracting from the resultant total of 193.1 million the 125.3 million sets in use as of the beginning of 1976 indicates that there were about 67.8 million TV receivers scrapped during the ten-year period 1966-1975. Of the 67.8 million scrapped, 82% (55.9 million) were b/w receivers and 18% (11.9 million) were color receivers.

If the 2.8 million difference between the 125.3 million sets presently in use and the 122.5 million sets sold during the ten-year period 1966-1975 is indicative of the number of pre-1966 TV receivers in the present population, then about 98% of the present set population consists of sets purchased during 1966-1975. If so, the composition of 98% of the present set population is as follows:

- 53% (65.4 million) are color receivers and 47% (57.1 million) are monochrome receivers
- 71% (87.4 million) are either table or portable models and 29% (35.1 million) are either consol or combination models
- Of the 57.1 million *monochrome* receivers, 92% (52.7 million) are either table or portable models and 8% (4.3 million) are either consol or combination models.
- Of the 65.4 million color receivers, 53% (34.6 million) are either table or portable models and 47% (30.8 million) are either consol or combination models.

Copies of the *1976 Electronic Market Data Book* can be purchased for $20 each from: EIA Public Relations Dept., EIA, 2001 Eye Street, NW, Washington, DC 20006.

J.W. Phipps

J.W. PHIPPS
Editor
1 East First Street
Duluth, Minn. 55802
(218) 727-8511

ALFRED A. MENEGUS
Publisher
757 Third Avenue
New York, N.Y. 10017
(212) 754-4382

TOM GRENEY
Publishing Director

DONALD W. MASON
Managing Editor

JOHN PASZAK
Graphic Design

DEBI HARMER
Production Manager

BERNICE GEISERT
Production Supervisor

LILLIE PEARSON
Circulation Fulfillment

GENE BAILEY
Manager, Reader Services

ROZ MARKHOUSE
Classified Ad Manager

CONTRIBUTING EDITORS

JOSEPH J. CARR

DAVID NORMAN

DISTRICT MANAGERS

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

CHUCK CUMMINGS
Ad Space South/West
613 North O'Connor
Irving, Texas 75061
(214) 253-8678

ROBERT UPTON
Tokyo, Japan
C.P.O., Box 1717

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THE COVER: The waveform on the cover of this issue is the vertical interval reference (VIR) signal which TV stations optionally broadcast on line 19 of the composite video signal. Two of the chassis in GE's 1977 color TV line are equipped, on an optional basis, to detect, process and use the VIR signal to automatically adjust color saturation and tint. The receiver circuitry which performs this function is contained on a "VIR Module," which is shown in the insert photo on this month's cover and is analyzed in a two-part article series beginning on page 14 of this issue.

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NEWS OF THE INDUSTRY

NATESA Convention For 1976 To Be Staged in Illinois

The National Alliance of Television and Electronic Service Associations (NATESA) will hold their national convention this year at Pheasant Run Resort in St. Charles, Illinois. The dates are August 19-22. The event will open with a golf tournament, followed by the Executive Council meeting Thursday evening. On Friday, Saturday and Sunday, seminars on CB, video tape systems, warranty problems, VIR, business operations, and association operations will be held. In between times, all regular meal functions, starting with breakfast on Friday and ending with brunch on Sunday, will be sponsored by various manufacturers and marketers. There'll be several industry-sponsored hospitality suites, and Saturday evening there'll be a grand banquet and floor show. The Pheasant Run Resort is located in a suburb of Chicago, and is a totally-enclosed vacation/convention complex with swimming, golf, tennis, horseback riding, and an on-premises dinner theater.

The NESDA Convention, this year in San Antonio, (their program was covered by ET/D last month) precedes the NATESA convention by two days. It ends on August 17th.

Sony Breaks Ground For Huge Facility In Kansas City

Ground was broken at the end of June for a multi-million dollar distribution center and product testing facility in Kansas City, Missouri, for the Sony Corporation of America. Construction will be completed in 1977, and when complete, the facility will employ 100 people. It will bring to 800,000 square feet the total warehouse space Sony has in the U.S. The company also has large distribution centers in New York, Chicago and Los Angeles, along with a set manufacturing plant in San Diego and an audio and video tape facility now under construction in Dothan, Alabama.

CB Prices Expected To Drop Because Of Inventory Excess

Too much inventory and new technology could combine by this fall to bring down prices of CB radio, according to *Electronic News*. The comments were made by Richard Horner, president of E. F. Johnson. "There will be pockets of plenty and pockets of scarcity," Johnson said. "The Japanese are sending in over a million CB sets a month," Horner continued, "and that's in addition to more than 200,000 sets being manufactured each month in the U.S. This flood of instruments is bound to cause turbulence in retail prices, perhaps in as little as 3 months."

Nearly Seven Million CB License Applications Expected In 1977

FCC's Chairman Wiley told a Senate committee recently that 6,800,000 CB license applications are expected in 1977, compared to 4,800,000 in 1976. As reported in *Radio & Television Weekly,* the average application load per month next year will be 566,000. Processing time for licenses, according to Wiley, has now been reduced to less than 30 days, and the FCC goal is to bring that time down to 10 to 20 days.

Color TV Sales In Second Half Of 1976 Seen As Favorable

Although color TV sales this spring were below last spring, the industry appears to be facing a favorable second half, according to James I. Magid, research analyst for Drexel Burnham & Co., an investment and brokerage firm.

"Comparisons between this year and last year don't mean much," Magid explained. "Last year prices were going up, warranties were down, and products were essentially unchanged, but," he said, "this year prices are not going up, warranties are unchanged, and there are significant changes in most product lines for 1977. In the second half of this year," Magid concluded, "the elections and Olympics should also stimulate primary TV set demand."

Vacation Shutdowns Another Sign of Color Sales Pickup

Last year, when color TV sales were lagging, some set manufacturers, according to *TV Digest,* scheduled longer than normal vacation plant shutdowns, but this year most are sticking to the traditional 2-week period. Most manufacturers use the shutdown time to convert production lines to the new models.

Quasar Announces Entry Soon Into Home VTR Field

Quasar TV will make their entry into the home VTR field late this year or early in 1977 with a much simplified tape transport, according to an announcement by Quasar president Robert Bloomberg. The new unit, Bloomberg said, will be "priced to encourage volume home sales with a price under $1,000, or about $300 less than Sony's and Sanyo's

products." The new tape transport to be used in Quasar's VTR deck doesn't require that the tape be pulled out to meet the head. Instead, the tape head enters the cassette to meet the head.

New Firm—CablEquities Corp.—Formed By Vikoa Pioneers

Arthur and Robert Baum, the originators of Vikoa, have formed CablEquities Corporation, a new firm that will provide system brokerage and management services to the cable industry.

Robert Baum stated "We have the capability of purchasing new cable franchises and financing systems, or we will finance and manage existing systems." Headquarters are in Tenafly, N.J.

Tri-Potential Gun Is Common Denominator For New Picture Tube Offerings

Three of the major picture tube manufacturers—Zenith, Sylvania, and RCA—have now introduced their new TV picture tube products for 1976-77, all featuring a tri-potential electron gun, but differing in the deflection angle. Zenith was first with the "Able" tube, to be used in their 19-inch color line. It features a 100-degree deflection angle, which company spokesmen say makes possible a beam spot size only 60% of comparable 90-degree delta-gun tube design. Sylvania was next, also with a tri-potential gun and 100-degree deflection but with different glass design than Zenith's Corning-developed glass. Sylvania spokesmen, *TV Digest* reports, claim that "the Sylvania tube has improved center focus, with spot size 30% smaller than comparable delta tubes. Glass is of conventional design."

The latest to announce their new tube is RCA. They also have an in-line tri-potential electron gun, but use a 90-degree deflection, claiming that "the 90-degree deflection will provide significantly lower set costs, lower energy consumption and lower chassis temperature than 100-degree deflection. RCA will use the existing glass design (Mark III) and will feature it in a 25-inch tube.

An All-Industry Warranty Claim Form Is Now a Reality

The Executive Committee of NARDA (National Association of Retail Dealers of America) voted approval at their spring meeting of a single form that can be used in

making warranty labor claims for most of the electronic products sold in this country. This is in addition to the form already in use for making warranty labor claims for the largest part of appliance products sold.

NARDA president F. Hardy Rickbeil said "This is a tremendous breakthrough. It means that only one, or at the most two, forms will replace dozens that are now in use. It also eliminates one whole paperwork step."

The Pressure Is On To Curb Color TV Imports From Japan

According to *TV Digest,* American TV and parts manufacturers and unions are "combining" to launch the most massive attack ever to block what they feel is pending Japanese takeover of the color market in the U.S.

In addition to Sylvania's complaint before the International Trade Commission and the anti-trust damage suit filed by Zenith and NUE in Philadelphia, *TV Digest points out,* "the toughest drive may be yet to come—a two-pronged attack by the EIA Tube Division and the effort by a group of U.S. manufacturers and unions which has hired Washington's top protectionist legal firm to show them the way."

Hong Kong Stepping Up Production Of CB Radios

Hong Kong Colony's electronic firms have stepped up production of CB radios to meet increasing demand from the U.S. Only a handful of companies in Hong Kong are producing CB radios now, according to the Hong Kong Trade Development Council, but several additional radio manufacturers are looking seriously at getting into the swim. Companies now producing in the Colony are Atlas Electronics which will produce 25,000 sets in 1976, and Soundic Electronics which plans production of between 5 and 10,000 sets by September. In 1975, 1.78 million CB transceivers were exported, of which 87% went to the U.S.

CET Exam Used In Illinois Electronics Trouble-shooting Contest

Fifty-seven high school and college student took part recently in a radio and TV trouble-shooting contest sponsored by the Illinois Association of Electricity/ Electronics Educators. The exam for Certified Electronic Technician (CET) Associate

continued on page 10

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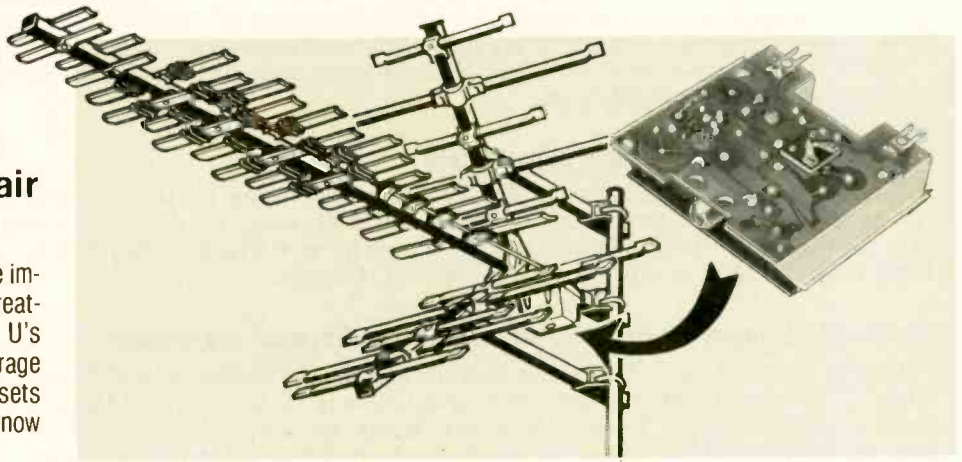
Don't say you can't get good UHF reception until you've tried this new combination by Winegard

New Super Lo-Noise Preamp With New Antenna Makes Poor Pictures Good and Fair Pictures Excellent

Good reception of UHF stations is more important than ever. Programming has greatly improved in recent years on the U's and many offer exclusive sports coverage viewers so eagerly want. If you sell sets or install antennas in UHF areas, you know what we're talking about.



Winegard AC-4990 Preamplifier Combined With CH-9095 Antenna Delivers Amazing UHF Reception.

The Problem

You also know what we're talking about when we say that reception of UHF stations in most areas is rarely as good as you get on the VHF stations. This is a major, universal problem.

Why the problem? For one thing, many UHF stations are not on full authorized power. And, transmission line losses at UHF frequencies present difficulties. But the biggest culprit of all is the high noise figure of the TV set tuners at UHF frequencies.

Generally speaking, you have to deliver *3 times* as much clean UHF signal to the set as you do VHF signal—in order to get comparable reception.

The quantity and quality of UHF signal you feed the set is greatly determined by the antenna and preamplifier you use.

SPECIFICATIONS	AC-4990
GAIN	
UHF	17.5db
BANDPASS (MHZ)	
VHF-FM	54 to 216
UHF	470 to 890
MAX. TOTAL OUTPUT (Volts)	
UHF	.882
MAX. TOTAL INPUT (Volts)	
UHF	.126
NOISE FIGURE	
UHF	2.2db

The Solution

A few months ago Winegard Company introduced a new line of Chromstar UHF antennas featuring a new Tri-linear director system. This configuration offers the highest gain we've ever seen on a UHF antenna and the field reports we've been getting from professional installers have been most enthusiastic.

Now Winegard Company is introducing another...and even bigger breakthrough. This is a super lo-noise UHF preamplifier, Model AC-4990.* It has a 6db signal-to-noise improvement over the best UHF preamps previously available.

Combine the AC-4990 with a Winegard CH-9095 Chromstar UHF antenna and you get a 9db improvement or *3 times cleaner signal.*

This means you can give good UHF pictures to customers who can barely get UHF now. It means you can deliver "excellent" reception to those who now receive just "fair" pictures.

*Pat. Pending.

In actual practice, good reception of all UHF stations is now extended up to 30 additional miles...in many cases nearly doubling the effective reception range.

New Sales Potential

Potential sales of CH-9095's and AC-4990's are greatly increased. This combo can be sold in areas where UHF reception hasn't been good enough to bother with *and,* as a replacement for customers who are only getting "fair" reception now.

Incidentally, the AC-4990 preamp has a VHF bypass so it can also be used with any Winegard V-U Chromstar antenna with excellent results.

Antenna dealers in UHF areas are advised to try this new Winegard antenna-preamp combination as soon as possible. Seeing is believing...and the new profit opportunities are tremendous.

NOTE: Due to demand, the AC-4990 preamp will be in short supply for a few months. An order should be placed now with your Winegard distributor.

WINEGARD COMPANY
3000 Kirkwood • Burlington, Iowa 52601

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

NEWS OF THE INDUSTRY

continued from page 7

Certificate was used to qualify those students who, after passing the exam, entered the trouble-shooting phase of the contest. Nine students made it. High schoolers worked on AM radios breadboarded by Energy Concepts. College students worked on color TV's supplied by Quasar Corporation. Prizes for the contest were supplied by Simpson, Tektronix, Hewlett Packard, Triplett, Paxton/Patterson, American Technical Society, Tab Books, Brodhead Garrett, Bobbs-Merrill Co., Delmar, Aidex and Goodheart Wilcox.

Gulf & Western Is a New Entrant Into Consumer Electronics

The huge international conglomerate, Gulf & Western Industries, plans to enter home electronics, according to *TV Digest*. One of the firm's first steps was acquisition of all assets in Muntz Home Theatre project TV. Actually, Sega Enterprises of Redondo Beach, California, bought the firm from Earl Muntz, but Sega is owned 95% by G & W. Projection TV & video games is expected to be the base of the new operation.

Gulf & Western is a collection of about 150 businesses, including Paramount Pictures and Simon & Schuster Publishing.

B & K-Precision Moves To New Headquarters

The new headquarters location for B & K-Precision Products of the Dynascan Corporation are at 6460 W. Cortland, Chicago, Illinois 60635. Myron E. Bond, VP of Marketing, says all orders and correspondence should be sent to the new location. The B & K Service Department remains at 2815 W. Irving Park Rd., Chicago.

The World's Longest-playing Long-playing Cassette Recorder Is Introduced

If there were a category for electronic equipment in the Guiness Book of Records, the Model LP-20 cassette recorder from Answerline Associates, Inc. of Mount Vernon, N.Y. would probably be listed. The new device is billed as "the world's first *20-hour* standard cassette recorder." It records at the speed of ¼ inch per second, providing 7 times the recording time of other recorders, 10 hours on each side. Uses would be for: court reporting, classroom and conference recording, data logging, etc. ■

GOT MODULARITIS ?

Suffering from module cross reference chart fatigue? YOU think modules are expensive to stock and tough to repair? WE both know modular TV's are here to stay.

All General Electric's 1976 25", 19", 17" and 13" diagonal color sets are modular in design; but they're designed to be serviced with or without modules.

GE Engineers work with top service industry experts to design TV's you can service — anyway you want to.

- JUST pop in a new module and forget it.
- OR sub a module to locate the problem, then repair the failed module and reinstall.
- OR repair the set without using modules . . . using the skills you've developed over the years.

The sets are loaded with plug disconnects and modules have abundant clear component and test point markings.

Troubleshooting charts and service aids guide you to locate defective modules and find the fault. And General Electric stocks the replacement parts you need to replace or repair modules.

How tough can it be? General Electric recommends that you stock only 16 modules to service GE 1973, '74, '75 and '76 lines of its modular color sets. That's right — only 16 modules!

You provide the expertise and common sense. We provide "three way" service capability.

Have it our way. Do it your way.

We're making it our business to make your business easier.

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TECHNICAL LITERATURE

Tax Forms For Business, that are available from V. W. Eimicke Associates, are detailed in their new Tax Forms Catalog. Included are W-2 Wage and Tax Statement Forms, 1099's, 941a's, and a W-4 Employees Withholding Allowance Certificate. The range of forms available covers simple 5-on-a-strip forms to continuous computer forms, mini-computers through high speed computer self-mailers. Available free from *Laurel Office Aids Division, V. W. Eimicke Associates, Inc., Bronxville, N.Y. 10708.*

C.B. Antennas, in full color, are detailed in the latest catalog from Avanti. Antennas included, and utilizing the Avanti principle of co-induction, are the omni-directional Astroplane and the directional efficiency of the Astrobeam, PDL-II, and Moonraker. Facts about CB mobile and base antennas, the principle of co-induction, and full specifications of the company's products are included. Available free from *Avanti Research & Development,* 340 Steward Ave., Addison, Ill. 60101.

Business Letters—They're Easier Than You Think—is the topic of a new booklet produced for electronic service shops by Dick Pavek of Tech Spray. While it has nothing to do with the company's products, it does provide a lot of good hints on effective business letter writing including collection letters, parts order communication and promotional letters. The suggestions in the booklet take the ineffective stuffiness out of traditional business letters. Free from *Tech Spray,* P.O. Box 949, Amarillo, Texas 79105.

An Electrolytic Guide and the 1976 general line catalog for professional electronic technicians and engineers is now available from Cornell-Dubilier. The 86-page catalog provides cross references, specifications and configurations. Included are twist prong, electrolytic (aluminum) film dielectric, AC, Mica dielectric, ceramic dielectric and DC Kraft. Information on CDE's relays, TV/FM antenna rotor systems and CB noise filters are also provided. Write to: William Carlson, *Cornell-Dubilier,* 150 Avenue L, Newark, N.J. 07101.

Electronic Test Instruments are displayed and described in full color in the newest catalog from Sencore. Included are descriptions of the Sencore 'family' of "Cricket" transistor tester/analyzers, the "Big Henry" multimeters, the "Mighty Mite" tube tester, the "Big Mack" and "Super Mack" CRT testers and restorers, and the "Little Huey" digital color bar generator, plus the full line of other electronic test equipment. Prices are included. Available free from *Sencore Instruments,* 3200 Sencore Drive, Sioux Falls, S.D. 57107.

"The Scanner Business—A Primer For Retailers" is the subject of a new 16-page booklet from The Electra Company. The booklet was introduced at the PC '76 Show in Las Vegas. It is a primer which explains the basics of scanner retailing "from the beginning." It includes kinds of scanners, how to set up a scanner department, and how to advertise and promote scanners. Available free from *The Electra Company,* 300 East County Line Road, Cumberland, Indiana 46229.

Handtools for Electronic Assemble & Production are pictured and described in EPE catalog No. '76. Information is provided on handtools for wire cutting, bending, cutting and bending, cut and swage or crimp, component lead formers, pneumatic cutters, thermal wire strippers, and dispensers for flux and solvents. Available free from *EPE Corp.,* 6 Kane Industrial Dr., Hudson, MA 01749.

59 Ways to Save Time and Money Designing and Testing in Electronics is the name of a new full-color 32 page catalog of electronic prototype breadboarding and test equipment now available from Continental Specialties Corporation. Included are descriptions of a low-priced, precision digital pulse generator, a selective-threshold test instrument which tests and indicates logic states of all popular digital IC families up to 16 pins, and a compact, circuit-powered multi-function test tool with a memory. The catalog also features helpful hints on the use of solderless breadboarding sockets and breadboards. Available free from *Continental Specialties Corporation, 44 Kendall Street, P.O. Box 1942, New Haven, Connecticut 06509.*

A New Entertainment Semiconductor Replacement Guide providing cross references to GE universal replacement semiconductors is now available to electronic service technicians. Featured in the newly revised and updated catalog, ETRM-4311, besides cross reference guide are application and technical data on the devices and outline drawings with di-

mensions. Also included are 52 new entertainment semiconductor devices recently added to the GE line for TV, FM, and FM stereo applications. Suggested user prices are also included. Suggested price is $1 at *GE distributors*.

A Two-volume Set Of Solid State Data Books is now available on RCA's line of linear integrated circuits, COS/MOS integrated circuits, microprocessors, memories, discrete MOS devices, power transistors, silicon-controlled rectifiers, triacs, rectifiers, diacs, RF and microwave power devices, and high-reliability integrated circuits and discrete devices. The set—SSD-200D—contains 1,232 pages, and may be ordered by volume at $6.00 each, or the two volumes for $10.00. Send checks or purchase orders to *RCA Solid State Division*, Box 3200, Somerville, N.Y. 08876.

A Replacement Guide & Catalog For Semiconductors, with almost 106,000 types listed, has been issued for 1976 by GTE Sylvania. Included in the new 220-page catalog are descriptions, circuit drawings, and a cross-reference guide to transistors, diodes and rectifiers, SCR's, TRIAC's, special purpose devices, quartz color oscillator and burst filter crystals, modules and integrated circuits, and accessories. The new catalog is now available at *GTE Sylvania* distributors, or *GTE Sylvania Advertising Services Center*, 70 Empire Drive, West Seneca, N.Y. 14224.

Electronic Test Instruments, with photos, specifications, and prices, are covered in the newest catalog from Heath-Schlumberger. Included are: oscilloscopes, chart recorders, power supplies, frequency counters, function generators, CRT rejuvenator-testers, digital multimeters, VOM's and VTVM's and accessories. The new catalog is available free from *Heath/Schlumberger Instruments*, Department #526-205, Benton Harbor, Michigan 49022. ■

UPCOMING IN SEPTEMBER ET/D

- Intro To Quasar's New "Super Module" Color TV Chassis
- Troubleshooting Pincushion Circuits In Color TV
- Factors To Weigh When Selecting CB To Sell & Service
- How To Analyze Balance Sheets

GE's "Broadcast-Controlled" Color System Part 1

Analysis of a new color control system which uses the TV station vertical interval reference (VIR) signal to automatically adjust the receiver's color saturation and tint*

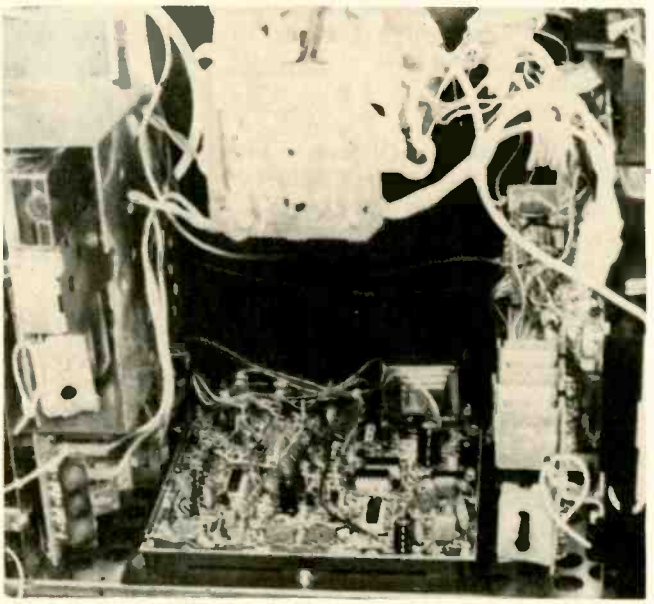

Fig. 1—VIR Module shown mounted in GE's new YM color TV chassis.

■ General Electric has introduced in its 1977 line of color TV receivers two new chassis—the YM and YC-2—which are equipped, on an optional basis, with a revolutionary new color control system which uses the broadcast station-originated vertical interval reference (VIR) signal to automatically adjust the receiver's color saturation and tint to compensate for changes in the amplitude and phase of the station's color signal which might otherwise cause unwanted variations in the color saturation and tint displayed by the receiver.

GE's "Broadcast Controlled" color system is computer activated by a two-position "VIR" switch on the front panel of the receiver. When the VIR switch is in the ON position and a VIR signal is being received from the station, a VIR indicator light on the front panel of the receiver is illuminated, the receiver's manual COLOR and TINT controls are "disengaged," and the saturation and tint of the color displayed by the receiver are automatically controlled by the VIR-activated color control system. If *both* of these conditions are not satisfied—VIR switch ON *and* VIR signal being received—the receiver will remain in the manual mode of operation and color saturation and tint will be dependent on the settings of the manual COLOR and TINT controls, respectively.

The circuits which detect and process the VIR signal and develop from it the control voltages required to automatically adjust color saturation and tint are contained on a single plug-in "VIR" module, shown installed in a YM chassis in Fig. 1. This module, which is equipped with five plug-in integrated circuits (ICs) and thirty transistors, is connected to associated circuits and other modules in the receiver by a system of plugs and slip-off connectors which permit removal of the VIR module without the use of a soldering iron.

The composition of the VIR signal and how it is detected, processed and used by GE's "Broadcast Controlled" color system to automatically adjust color saturation and tint are described in the following paragraphs.

THE VIR SIGNAL

To provide a means of monitoring the performance of their broadcast equipment and various parameters of their program material, TV broadcasters transmit within the composite TV signal two types of test signals—the VIT and the VIR. As illustrated in Fig. 2, both types of test signals are transmitted at the *vertical interval* rate and, to prevent interference in the picture displayed by the receiver, both types are transmitted during a portion of the scanning time occupied by the vertical blanking bar, which contains the first 21 scanning lines of each of the two interlaced fields which make up a complete TV vertical frame.

One type, called the *vertical interval test* (VIT) signal, is transmitted on either line 17, 18 or 20 of each of the two vertical fields. The principal purpose of the VIT signal is to monitor the performance of the station's transmitting equipment and the other components of its broadcast system.

The other type of broadcaster-originated test signal is called the *vertical interval reference* (VIR) and, in accordance with an October 1975 ruling by the Federal Communications Commission (FCC), is transmitted only on line 19 of each of the two interlaced fields. The principal purpose of this test signal is to monitor the parameters of the actual TV program material being transmitted. It is this signal—the VIR—which GE's "Broadcast Controlled" color system detects and uses to automatically control the receiver's color saturation and tint. (The FCC ruling that line 19 be used only for VIR transmission did *not* make VIR transmission

* *Material for this article supplied by the Television Business Department, General Electric*

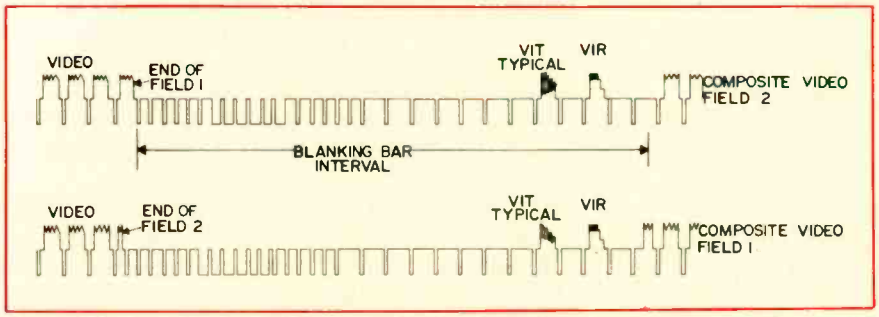

Fig. 2—Representative illustrations of the blanking bar portion of the two interlaced fields which make up a TV vertical frame. The 19th line of both fields is reserved for transmission of the VIR signal.

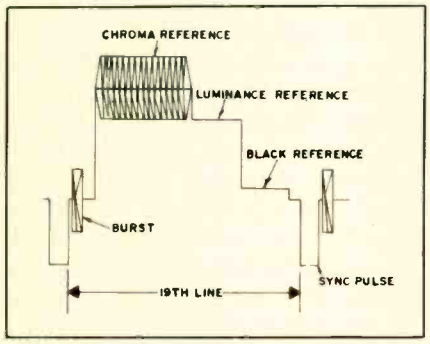

Fig. 3—The vertical interval reference (VIR) signal as it appears on line 19.

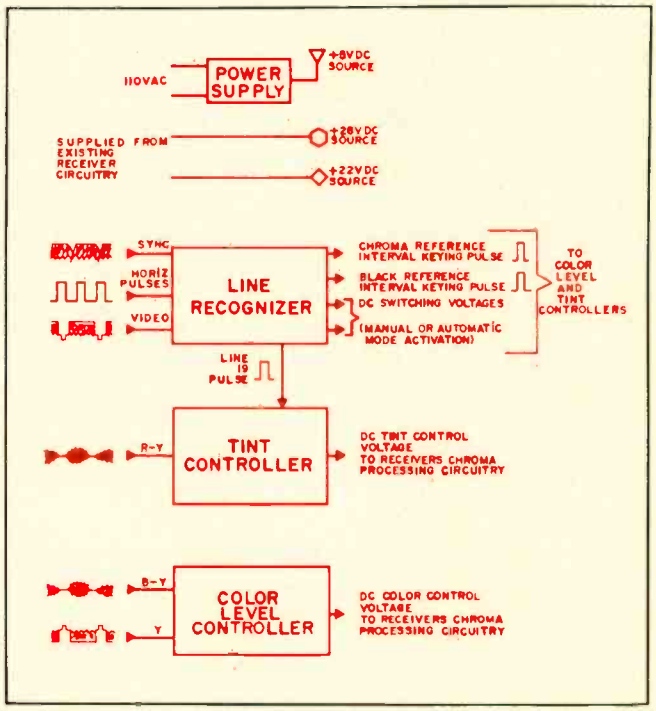

Fig. 4—Simplified block diagram of the VIR Module.

by TV stations *mandatory*; consequently, not all TV stations presently transmit the VIR signal.)

Fig. 3 shows the VIR signal as it appears on the 19th line of each television field. The signal itself consists of a chrominance reference, a luminance reference, and a black level reference. Through the use of mathematical formulas beyond the scope of our explanation, it has been determined that *when chrominance reference and black level reference are equal in amplitude at the receiver's R-Y output, chroma phase (tint) conforms to that of the transmitted reference signal.* Likewise, *when the same two parameters are equal at the receiver's Blue Drive output, chroma level (color) is matched to the reference signal.* These relationships are the operational basis of GE's new "Broadcast Controlled" color system.

OVERVIEW OF VIR MODULE OPERATION

The VIR Module performs three basic functions: 1) It detects the 19th line of each transmitted video field and recognizes the presence of a VIR signal. 2) It developes a DC color-controlling voltage by processing the VIR related portion of the receiver's simulated Blue Drive signal. 3) It developes a DC tint-controlling voltage by processing the VIR related portion of the receiver's R-Y signal.

Fig. 4 is a simplified, overall block diagram of the VIR Module.

THE LINE RECOGNIZER

Fig. 5 is a detailed block diagram of the line recognizer stages of the VIR Module. The line recognizer receives three inputs from the television receiver: sync pulses, horizontal retrace pulses, and composite video. Five outputs, which are applied to the module's controller stages, exit from the line recognizer: 1) A 63-microsecond keying pulse corresponding to the 19th line of each composite video field; 2) a 15-microsecond keying pulse corresponding to the chrominance reference interval of the VIR signal occurring on line 19; 3) a 35-microsecond keying pulse corresponding to the black reference interval of the VIR signal occurring on line 19; and 4 & 5) two DC switching voltages that are developed in response to the presence or absence of a VIR signal on the 19th line of the composite video information.

Fig. 6 shows the three inputs to the line recognizer. Transistor Q2, an impedance matching emitter follower, receives clipped sync pulses from the receiver's Horizontal Oscillator Module. From the emitter of Q2 the sync pulses enter an integrator network composed of R3 through R7 and C3 through C6. After integration, the sync pulses appear at the base of transistor Q8.

Q8 is normally operating in an "on", or saturated, condition. The negative-going integrated sync pulse serves to turn off Q8, driving it into cutoff.

The collector of Q8, which is near 0 volts while the transistor is in saturation, rises quickly to about +2 volts when Q8 is cut off. Therefore, Q8 functions as a pulse generator, producing a series of 2-V P-P pulses dependent on the timing of the integrated sync pulse applied to its base.

The integrated sync pulse present at the base of Q8 actually starts the timing sequence for the entire line recognizer. R7, the "Delay Adjustment" allows adjustment of Q8's base current. This, in turn, determines the point of the integrated vertical sync pulse at which Q8 will cut off. *This con-*

trol of the triggering action of the integrated sync pulse governs the critical timing sequence for the entire line recognizer.

The positive pulses generated at the collector of Q8 are applied to the base of Q10. Like Q8, Q10 also operates in a switching mode: it is either saturated or cut off. Normally, Q10 is cut off and its collector is near +5 volts. With the occurrence of a positive pulse at its base, Q10 saturates and its collector potential rapidly falls to near 0 volts. Thus, Q10 can also be viewed as a pulse generator. Its collector voltage is a series of negative-going pulses about 520 microseconds wide, occurring at a 60-Hz rate, governed by the previously mentioned integrated sync pulse.

Counter Enabler

The pulses developed by Q10 are applied directly to a triggering input of the Counter Enabler, an industry type 74123, monostable multivibrator. The monostable multivibrator, being a TTL (Transistor-Transistor Logic) digital device, interprets the inputs from Q10 as HIGH or LOW states. In TTL, +5 volts is considered to be HIGH state and 0 volts is considered to be LOW state. (More precisely, +2.4 volts to +5.0 volts is HIGH state and 0 to .8 volts is LOW; but we will work with +5 and 0 in our analysis.) In its circuit configuration, the Counter Enabler will respond to a HIGH-to-LOW transition at the input. The falling edge of Q10's pulse is applied to pin 9 of the monostable multivibrator, driving it into its "unstable state." The Q output from the Counter Enabler is applied directly to a controlling input of the next stage, an industry type 7493, 4-bit binary counter. The counter enable pulse, like the outputs from all monostable devices, is controlled in time duration (pulse width) by the external RC time constants connected to its multivibrator. In the Counter Enabler stage these external timing components are R12 and C12. They determine that the Q output of the Counter Enabler will go LOW for exactly 1.4 milliseconds each time the multivibrator is triggered by a falling pulse edge.

Binary Counter

Fig. 7 shows the next three stages of the line recognizer. The first stage is the Binary Counter (IC20). The Counter receives two inputs. The first, applied to a controlling input (pin 2), is the previously analyzed counter enable pulse. This pulse, in its LOW state, allows the Counter to count. The second input, applied to the Counter's Clock input (pin 14), consists of a continuous train of horizontal retrace pulses from the receiver's Chroma/Video Module. The Clock input of the Counter responds to the falling edge of the applied horizontal pulses.

When enabled, the Counter, which is initially set to binary 0000, begins to count the horizontal pulses. It counts in binary to its maximum capability of 15 pulses or counts. At this time, its Q outputs are all HIGH state (binary 1111).

Decoder

The Q outputs from the Counter are all connected directly to the inputs of the Decoder (½ of IC30). The Decoder is an industry type 7420, four-input NAND gate, TTL integrated circuit. The output of a NAND gate is LOW only when all its inputs are HIGH. When the Counter reaches its maximum count of 1111, it places a HIGH state on all four inputs of the Decoder. The output of the Decoder, thus, goes LOW for a time interval of one horizontal line. On the next pulse the Counter resets itself back to 0000 and attempts to count another sequence of 15 lines. But, the enabling pulse at pin 2 returns to the HIGH state and both resets and inhibits the Counter before the maximum count can be achieved again. Thus, *the Counter and Decoder produce a single pulse, one scan-line wide, for each field of composite video information.*

Inverter

The pulse produced by the Counter and Decoder is fed directly to the Inverter (½ of IC30). This stage is an industry type 7420, four-input NAND gate, with all its inputs tied together. In this configuration, the NAND gate performs simple inversion: the negative-going pulse applied to the inputs becomes a positive-going pulse at the output.

The result of integrating, enabling, counting, decoding, and inverting is a positive-going pulse that corresponds exactly to the 19th line of each field of video information.

The critical timing effect of the integrated sync

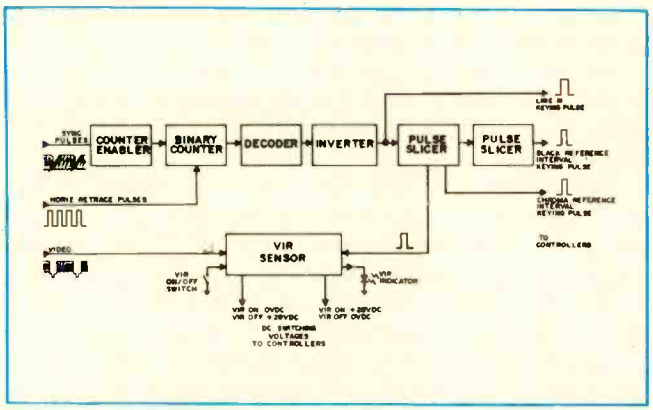

Fig.5—Block diagram of the Line Recognizer section of the VIR Module, which detects the presence of a VIR signal on line 19 and produces pulses and voltages which control the operation of the color and tint controller stages.

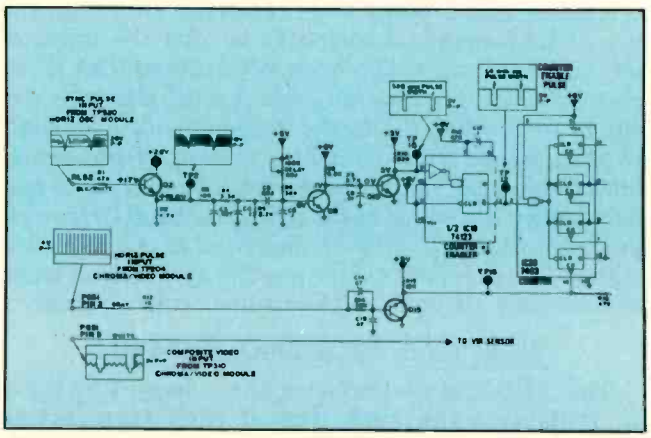

Fig. 6—Input stages of the Line Recognizer section. The base circuit of Q8 initiates the critical timing sequence of the "Broadcast Controlled" color system.

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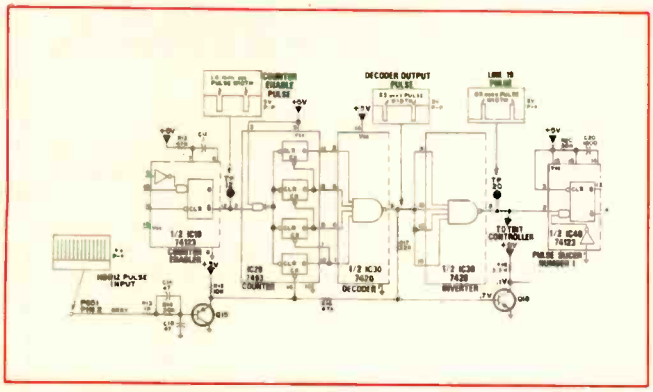

Fig. 7—The binary counter, decoder and inverter stages of the Line Recognizer section produce a keying pulse which corresponds to the 19th line of each composite video field.

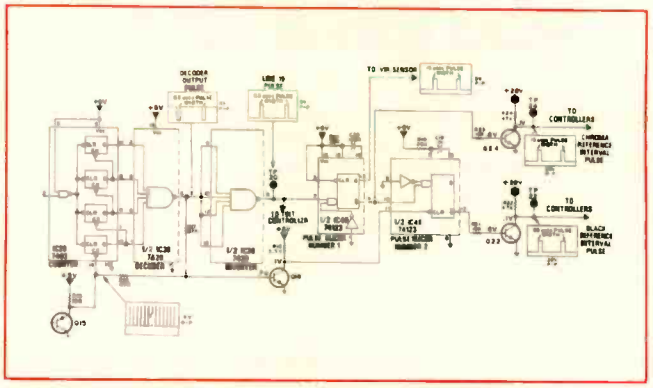

Fig. 8—The pulse slicer stages of the Line Recognizer section produce keying pulses which correspond to the chrominance reference and black level reference intervals of line 19.

pulse that started the entire chain of events now can be appreciated more fully. To identify the 19th line of each field, the line recognizer must begin to count on the horizontal retrace pulse that corresponds to the *5th* line. This requirement is made even more critical when the effect of interlaced scanning is considered. Field 1 and Field 2 of the composite frame are offset ½ line. Therefore, the sync pulse must initiate the chain of events for both interlaced fields in the time interval between the *4th* and *5th* scan lines. The Delay Adjustment, mentioned earlier, is used to position the triggering action of the integrated sync pulse so that both fields execute their counter enable function between scan lines 4 and 5.

Thus far, the line recognizer has fulfilled part of its function: *It has "recognized," or detected, the 19th line of each field of video information by producing a keying pulse that corresponds to that line.*

Pulse Slicers

The line 19 keying pulse is fed directly into the Pulse Slicer stages of the line recognizer, Fig. 8. The Pulse Slicers are industry type 74123, TTL, monostable multivibrators. Pulse Slicer number 1 (½ of IC40) is connected in a configuration that will trigger on a *rising* pulse edge. When the line-19 keying pulse at its input (pin 2) rises from a LOW to HIGH state, the monostable's Q output (pin 4) falls from its HIGH to LOW state for a period of 15 microseconds. Again, as in all monostable multivibrators, the output pulse width of Pulse Slicer number 1 is determined by its external RC timing components, R20 and C20.

The Q output from Pulse Slicer number 1 is applied directly to the input (pin 10) of Pulse Slicer number 2, which is also connected in a configuration that responds to a *rising* pulse edge. After remaining LOW for 15 microseconds, the Q output of Pulse Slicer number 1 returns to the HIGH state. The LOW-to-HIGH transition triggers Pulse Slicer number 2. The Q output from Pulse Slicer number 2 falls from its HIGH state to a LOW state for a period of 35 microseconds before returning to the HIGH state again. The output pulse width of Pulse Slicer number 2 is controlled in two ways: The external timing components (R19 and C19) determine that the pulse width will last at least 35 microseconds. The circuit composed of R16, R17, R18, and Q18 insure that the pulse width does not exceed 35 microseconds. Q18 and its associated circuitry are connected to the CLEAR input (pin 11) of Pulse Slicer number 2. As long as the CLEAR input is held in a HIGH state, Pulse Slicer number 2 is free to trigger. If the CLEAR input goes LOW, the multivibrator will reset itself and its Q output will immediately revert to a stable HIGH state.

Q18 actually performs the function of a 2-input NOR gate. Its base is connected to both the output of the Decoder (IC30, pin 6) and to the emitter of Q15 through resistors R17 and R16. Q18's collector voltage will be HIGH state (+5 volts) only when *both* inputs to its base are *LOW* state (near 0 volts). This condition (LOW states on the base) occurs only during the interval of line 19, when the Decoder output goes LOW. At that time Q18's collector produces a HIGH state on the CLEAR input of Pulse Slicer number 2, freeing it to trigger. But, the base of Q18 does not stay LOW for the entire 19th line. The R16 input from Q15 couples a positive-going horizontal retrace pulse (HIGH state) to the base of Q18 just prior to the end of line 19. This pulse saturates Q18, pulling its collector voltage back to 0 volts (LOW state) and resetting Pulse Slicer number 2. In this way, Q18 precisely controls the time that Pulse Slicer number 2's Q output turns off.

Switchers

The HIGH to LOW transitions (pulses) from the Q outputs of both Pulse Slicers are fed to the bases of switching transistors Q24 and Q22, respectively. Q24 and Q22 are normally saturated, with their collector voltages near 0 volts. During the interval that the "sliced" pulses are applied to their bases, Q24 and Q22 turn off, producing a +28-volt pulse at their collectors. The voltage at the collector of Q24 is a series of +28-volt pulses, 15 microseconds in duration, occurring at a 60-Hz rate. The waveform at the collector of Q22, likewise, is a series of +28-volt pulses, each of which is 35 microseconds wide.

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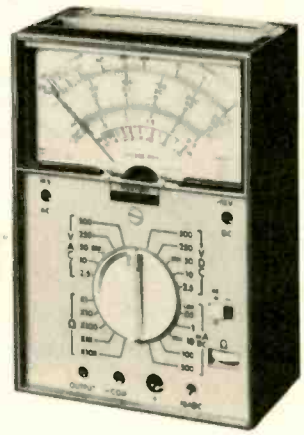

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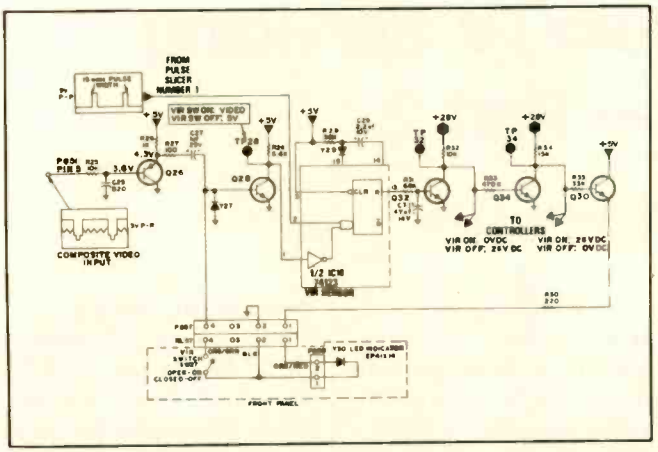


Fig. 9—The VIR sensor stages of the Line Recognizer section sense the presence or absence of the VIR signal on line 19.

These two pulses, which correspond to the chrominance reference interval and black reference interval of the VIR signal on line 19, are fed to the controller stages of the VIR Module.

VIR Sensor

Up to now, the line recognizer has identified the 19th line of each video field. It has "sliced" the 19th line into a chrominance reference interval and a black reference interval. Only one other basic function remains for the line recognizer to perform: *to identify the presence or absence of the actual VIR signal.* This function is performed in the VIR Sensor stage of the line recognizer, Fig. 9.

Two inputs are applied to the VIR Sensor stage. The first input is a positive-going, 15-microsecond pulse from the Q output of Pulse Slicer number 1. This pulse is applied directly to a triggering input of an industry type 74123, TTL, monostable multivibrator (½ of IC10). The second input, composite video from the receiver's Chroma/Video Module, is first processed and then applied to the other triggering input of the same monostable multivibrator.

The VIR Sensor monostable multivibrator responds to a *falling* pulse edge on pin 1 when pin 2 is HIGH. The only time that pin 2 is HIGH is during the first 15 microseconds of line 19, when the positive pulse is present. If, during this time, a VIR signal is present on line 19, it will appear as a *falling* transition in the video signal applied to pin 1. The combination of the recognized 19th line and the intelligence contained on that line combine to trigger the monostable multivibrator. The monostable's Q output, which is LOW in the stable state, rise to a HIGH state for a period of time determined by the external timing components, R29 and C29.

The time constant of R29 and C29 is longer than one frame of video. The long time constant insures that, when triggered, the monostable multivibrator will produce a HIGH at its Q output (pin 13) for a period of time greater than one field. Hence, *during VIR reception, the output of the VIR Sensor will be a continuous HIGH state because the device is triggered by each field before it can return to the LOW state.*

The output of the VIR Sensor monostable multivibrator is applied to a series of switching transistors; Q32, Q34, and Q30. In non-VIR operation, Q32 is cut off and its collector potential is near +28 volts. The HIGH state produced by the VIR Sensor drives Q32 into saturation, bringing its collector down to near 0 volts. Q34, controlled by the collector voltage of Q32, develops an exactly opposite switching action. *In the VIR reception mode the collector at Q34 is near +28 volts and in the non-VIR mode its collector goes to 0 volts. These two coincidence switching voltages, answering the question "Is a VIR signal being received?", are fed to the controller stages of the VIR MODULE.*

VIR ON/OFF Switch & Indicator

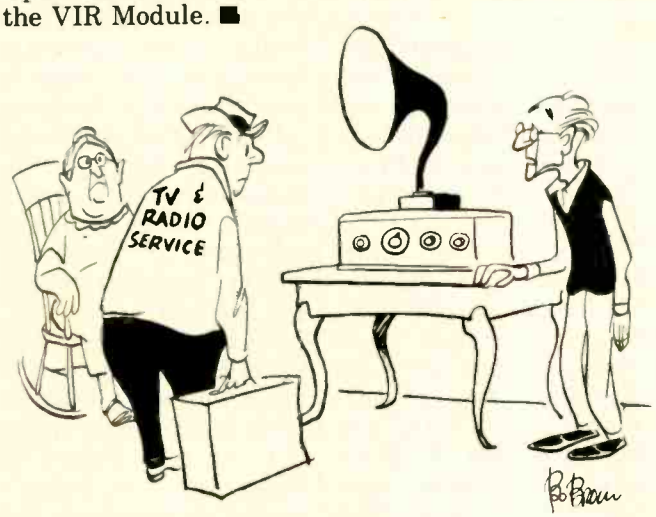
The VIR Sensor stage of the line recognizer also contains the VIR ON/OFF switch and the circuitry to illuminate the VIR indicator, a light-emitting diode (LED). The indicator is illuminated by the switching action of Q30, which is simply saturated by the high collector potential produced when Q34 is switched to *cutoff* in response to the presence of VIR.

The VIR ON/OFF switch is in the base circuit of Q28, where composite video is processed prior to being applied to the VIR Sensor monostable multivibrator. Q28 receives composite video from the impedance matching emitter follower, Q26. Diode Y27, at the base of Q28, clamps the composite video, effectively shifting the DC level of the composite video to a constant reference (near chassis ground). *This insures that Q28 will be driven into conduction by the rising edge of the VIR signal information.*

The VIR ON/OFF switch shorts the base of Q28 to ground when it is closed (VIR OFF), allowing no intelligence to enter the VIR Sensor monostable.

NEXT MONTH IN PART 2...

Operation of the tint and color controller sections of the VIR Module. ■



"It gave us good service for about 15 years, but we've had nothing but trouble with it since 1937."

Regulation Of Radio/TV Servicing In Indiana — Part 2

By Don W. Mason, ET/D Managing Editor

■ In the May issue of ET/D we introduced you to the Indiana "Television and Radio Licensing Act." We took a look at how and when it started, what it does, and who is involved. In Part Two, we will examine how the Board of Examiners investigates violations of the Act and enforces the law. We'll also take a look at the activities of the three field investigators, and the attitudes of some of Indiana's licensed technicians and service dealers towards the "Licensing Act."

To properly set the stage, let's review very briefly what was covered in Part One.

Indiana is one of eight states with some form of direct regulation of the electronic service industry—and it is the first state to have both technician licensing *and* service shop registration. Technician licensing began in Indiana in 1967, and in 1971 the Act was amended to include registration of shop owners.

The law covered by the Act is administered by a five-member Board of Television and Radio Examiners, an executive secretary and three field investigators. Those currently serving on the Board are: Acting Chairman Frank Tesky, who replaced Ray E. Wood several months ago; Charles Wilhelm, who replaced Dean R. Mock this past spring; Ralph V. Rader; and Arval Donovan, who recently replaced Elbert E. Powers. The executive secretary of the Board is Harold Calvert, who also oversees another Indiana state regulatory body, the Watch Repairmans Board. Field investigators are Cecil W. Larson, James Baker, and David E. Box, all of whom are former operators of electronic service businesses and are Certified Electronic Technicians (CET's).

The Board is authorized by the Licensing Act to set rules and regulations for Indiana's TV/radio service technicians and shops; develop and administer examinations for new technicians; issue, revoke or suspend licenses, and enforce the requirements of the law. As set down by the Act, the function of the Board of Examiners and its staff is "to protect the public of the State of Indiana from financial losses and other hazards resulting from irresponsible service methods, unethical practices, inferior installation, maintenance and repair of television and radio, including antenna receiving systems."

Now—almost ten years since the inception of the Licensing Act—we have interviewed members of the Board of Examiners, the Board's executive secretary, the field investigators, and TV/radio technicians and shop owners in both the small towns and large cities in Indiana who must work within the rules and regulations of the Act. We asked—"Is the Board performing the function of "protecting the public?"—"How is the law being enforced?"—and —"What do Indiana's TV/radio servicers think about the law and the agency which directly regulates their businesses?"

IS THE "PUBLIC BEING PROTECTED?"

One measurement of whether a regulatory law is actually "protecting the public" is the comparative frequency of consumer complaints. By that measure, Indiana's Licensing Act seems to be working. According to several sources we talked to, several Better Business Bureaus in Indiana have reported a sharp decrease in the number of consumer complaints about TV/radio service since the Act went into effect. According to Ray E. Wood, former member of the Board of Examiners and owner of a radio service business in Anderson, Indiana, radio/TV service complaints were at the top of the Indianapolis Better Business Bureau list at one time. But, says Wood, "During the past several years, since licensing has been in effect, complaints about TV and radio technicians are way down, down below home improvement companies, painters and plumbers." Cecil W. Larson, CET, one of the Board's three field investigators, suggested that "anyone who doubts the effectiveness of the Licensing Law should check with the manager of the Northwest Indiana Better Business Bureau in Gary. He'll tell you that until this license law, their biggest volume of complaints came in about TV repair."

In talking to technicians and shop-owners in Indiana, we asked if the Licensing Law had had any effect in their relations with their customers. Most of the technicians interviewed said as far as they could notice, it hadn't changed anything. However, John Komechak, owner of Teletronix TV Service in Gary said he thought customers seem to like the idea of "licensed" technicians. "They seem to feel better about bringing their TV in for repair," Komechak said, "when they know you've got a license from the state." A different benefit of the licensing law was noted by Lou Diller, manager of Tele-Quick Service in Fort Wayne. Diller said that since TV and radio technicians have had to qualify for a license he no longer receives so many "dog" sets in his shop. "Evidently," Diller explained, "the law has eliminated most of the incompetent ser-

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vicers who would butcher a customer's set during the repair effort."

BOARD OF EXAMINERS HAS ENFORCEMENT POWERS

A trade-regulating law is generally considered useless unless the government agency that administers the law has the necessary means to enforce the law. By that criteria, it seems that the Indiana Licensing Act *is* an effective law.

The Board of Television and Radio Service Examiners is empowered by the Act to investigate all consumer complaints and other violations of the law and to *revoke, suspend* or *refuse to issue* or *renew* a license or registration certificate to an applicant or holder who does not meet or who has violated the provisions of the Act. Furthermore, the Board has the power to recommend to the State Attorney General an indictment or other suitable court action for violators of the law.

Section 15 of the Licensing Act spells out what are considered as violations of the law. The Board can revoke, suspend, or refuse to issue or renew a license if the applicant or holder of a license: (1) Has been convicted of a felony, as verified by a certified copy of the record of the court of conviction; (2) is engaged in any unethical practice or conduct, as reasonably defined by the Board, which includes any conduct of a character likely to mislead, deceive or defraud the public or the Board; (3) has advertised in any manner which includes untruthful or misleading statements; (4) has performed any service in pursuance of such untruthful or misleading advertising; (5) violated any of the provision of the Act or any rule or regulation of the Board promulgated under this Act: (6) failed to display conspicuously all licenses and badges as required in the place of business where service is performed; (7) performed any service or caused any service to be performed in an unworkmanlike manner attributable to negligence or carelessness.

The Licensing Act also allows the Board to go one step beyond revocation, suspension and non-issuance of licenses. In Section 17 of the Act it states that "for action or inaction declared illegal or unlawful, injunction of a mandatory or restraining nature shall also be granted by any circuit court in the state upon application to the Attorney General of the State of Indiana. The application shall be tried in the same manner and under the same rules of procedure as other civil actions are tried." And in Section 18 the Act states that "any person who violates any of the provisions of this act shall be guilty of a misdemeanor, and upon conviction thereof, shall be fined in a sum of not less than one hundred dollars nor more than five hundred dollars, or imprisoned not to exceed six months, or both."

In addition to providing the Board of Examiners with the powers of enforcement, the Indiana TV Service Licensing Act also incorporates some very important safeguards for the fair treatment of TV/radio technicians and service shops. According to Section 16 of the Licensing Act, "In no case shall the board refuse to issue a license or to suspend or revoke a license without first having given the applicant or licensee an opportunity to be heard in his own defense—and reasonable time to prepare for that defense by mailing to the applicant or licensee a copy in writing of the grounds on which such application or license may be denied, suspended or revoked."

Even the chain of events, or procedure, which takes place when the Board receives a complaint from a customer, or in some other way learns of a suspected violation of the law, encourages a fair hearing for everyone concerned.

To make a complaint about a technician or a service shop, the customer must file a written complaint with the Board of Examiners. If there is a bill for services and parts involved, that bill must first be paid by the customer before the complaint is accepted for consideration by the Board. At this point, one of the Board's three field investigators will contact both the customer and the technician or shop owner and will atempt to resolve the problem. If the problem cannot be resolved through this informal personal contact, an *informal* hearing before the Board will be scheduled, and a registered letter will be sent to the technician or shop owner informing him of the time and place of the informal hearing. An attempt will again be made to resolve the problem without official action by the Board. If the technician or shop owner doesn't show up for the informal hearing or for some other reason the complaint cannot be resolved, a *formal* hearing of the Board is scheduled and another registered letter is sent to the technician or shop owner. At the formal hearing the Board is expected to take some action in the case—either revocation, suspension or refusal to issue a license, application to the Attorney General for further legal action, or dismissal of the case.

Receiving and resolving consumer complaints and acting on suspected violations of the Indiana Licensing Law is usually a long, drawn-out process—but from all the evidence and comments we've seen in the preparation of this series, it does seem that the License Law is working, at least in the task of providing a check on unethical and sometimes fraudulent or otherwise illegal TV/radio servicing practices. The Board and its three field investigators seem to have almost "bent over backwards" to insure that every technician and shop owner suspected of a violation of the law gets a complete and fair hearing, and that no one is deprived a license to operate without just cause.

HOW THE "REGULATED" FEEL ABOUT THE REGULATION

Even though the Board of Examiners seems to have been successful in their enforcement of the law, trade-regulating laws are never very popular with independent businessmen—and the Indiana technicians and shop-owners we talked with are no exception.

Attitudes toward the License Act among technicians and shopowners varied more or less according to the size of community in which they were located. Al-

though they didn't like the idea of government regulation, those in the larger cities such as Indianapolis and Fort Wayne admitted that the law had done a good job of cleaning out the crooked types from the profession. Technicians and shop-owners in the smaller towns and villages considered the license fees ($10 for technicians, $15 for the service shop) a waste of their money.

For example, Louis Diller, who runs the Tele-Quick shop in Fort Wayne, admitted that no one wants more government regulation, "but sometimes it does have its advantages." Diller said, "We had one crooked operator in Fort Wayne that I remember, but the Board closed him down and removed a real eyesore." Diller said that the Licensing Law seems to have also helped raise the level of income for technicians. "Because of the license law we've been able to work fewer hours for more money," Diller explained, "and now most of us are making a reasonable living."

One shop owner in Indianapolis had a different attitude towards the effect of the law on the price of TV/radio service. He said the license law has caused technician wages to "go out of this world." As he put it, "When a guy goes to school and gets his license he really thinks he's something—and wants too much money to start with." He concluded that the license law had not improved the quality of help.

A technician and shop-owner in Gary, John Komechak of Teletronix TV, felt that the results of the License law were generally good—that customers seem to like it better when technicians have to have a license. "However," Komechak said, "I'm not hypersensitive about the moonlighter-technician, or part-time worker, like some guys are. I had to start the same way back in the beginning." Komechak was unhappy that the cable television company installers did not have to have a license. (Senate Bill 99, recently passed, exempts cable installers from the License Act.) "As for the cable people," Komechak said, "I think what's good for one should be good for another. Either you're going to have a license law or you're not going to have one."

In smaller Indiana towns there seemingly isn't much enthusiasm for the bill. At best, the small-town technicians we talked to thought the license fees charged were a waste of money, and at worst, a "rip-off." Robert Zimmer of Bremen, Indiana, said he is definitely not for the idea. "I don't think licensing makes an honest man," Zimmer said. "Every guy in the business I've talked to," Zimmer continued, "feels it's a big rip-off for the state. All you get for your money is a piece of paper. It might have some advantage in the larger cities, but in the small towns everybody knows everybody else and a crooked operator could only pull a crooked stunt once."

In Remington, Indiana, Larry Sommers, owner of Larry's TV/Radio Service, had about the same attitude towards licensing. "I think the yearly fees are too much money for what you get back," Sommers said. His other complaint was about a field investigator. "I had an inspector come in one time—and if he'd come back again I think I'd call my lawyer to get rid of him," explained Sommers. "I had just painted my shop and my license was on a shelf under the counter because I hadn't had time to put it back on the wall," Sommers continued, "and when he found that he jumped up and down like he'd just caught me in a criminal act."

Perhaps the best summation of the effects of, and attitudes towards, Indiana's TV Service License Act came during our interview with Ray Wood, owner of Ray's Auto Radio Shop in Anderson, and former member of the Board of Examiners. Ray was opposed to licensing in the beginning and fought the Act in the legislature for about 20 years. "I thought society had to have degenerated pretty badly," Wood said, "when you've got to have regulation. So when the Governor asked me to serve on the Board, I refused. But then," Wood continued, "the governor explained that they needed people on the Board to keep those 'government beavers' from running away with the whole idea, so I reconsidered and accepted. I'm glad I did. It was a good experience. And I'm glad we had Harold Calvert as executive secretary because he knew how to keep the thing from getting lost in the bureaucratic jungle."

When we asked Wood if the License Law was working he replied that, as a result of the law, "TV and radio service complaints had dropped from the top of the list at Better Business Bureaus in the state and were now down below complaints received from the home improvement companies, painters and plumbers, and I think that most servicemen in Indiana now accept the law. We had good men on the Board who played things pretty straight," Wood continued, "and after all, most of them were still in the radio/TV service business, or had been some time in the past."

During the interview we asked Wood if there was difference in the need for licensing between the larger cities and the small towns. He replied that "if you'd have taken the metropolitan areas out of the picture in the beginning, you probably would have had no need for licensing. After all, in a small town you can't operate with the attitude of getting them just once, because if you don't continue to service the old man, his kids, the in-laws and all his friends," Wood explained, "You'd be a dead pigeon in no time flat. In the larger cities it's a different situation. People don't often know their servicemen in advance. They're dependent on the Yellow Pages or a sign in the window."

Finally, we asked Wood what he'd learned from his experience on the Board of Examiners, and he replied that he was "surprised to find out what some people will do to get an extra buck out of a customer. We shook a lot of 'ding-bats' out of the bushes during the past several years, but," he concluded, "somebody had to do the job. When I went on the board and heard the complaints from customers about things that had actually happened, I knew that something had to be done." ■

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Instructor Mike O'Brien assists a Basic Electronics & Communications student during hands-on training in the Student Applications Lab of E.F. Johnson's Technical Education Center in Waseca, Minnesota.

Training for Two-Way Communications Servicers- E.F. Johnson's Approach

By J.W. Phipps

■ "Any company which manufactures a product that ultimately might require service should not ignore the necessity of providing technical education for those who must be depended upon to service that product. And, equally important, those who assume the responsibility for servicing a company's product owe it to their customers and to themselves to be as proficient as possible."

This statement, By Daryl J. Thompson, director of E.F. Johnson's Technical Education Center, summarizes that company's attitude about service technician training—an attitude based on the concept that "servicer-oriented training is a need and responsibility which should be shared by both the manufacturer and the servicer, because both can, and do, benefit from it."

The E.F. Johnson Company, headquartered in Waseca, Minnesota, a small community in the Southeastern part of that state, is not the only manufacturer of two-way communications products that offers effective service technician training. But it does seem to offer a greater variety of servicer-oriented training programs aimed at, and open to, not only the servicers of its own products but two-way communications servicers in general, regardless of the brand(s) of products they service.

E.F. Johnson presently offers servicers three general types of training programs: resident courses, at its Technical Education Center in Waseca; Johnson Educational Training Packages (JET PACs), for at-home or in-shop study; and product-familiarization seminars, at key locations throughout the U.S.

RESIDENT TRAINING

Three servicer-oriented resident courses are presently offered by E.F. Johnson at its Technical Education Center, located ten blocks from the company's headquarters in Waseca.

Basic Electronics & Communications Course

This six-week, entry level, resident course is designed principally for individuals with an occupational goal of ultimately becoming FCC-licensed servicers of CB and/or land-mobile two-way communications equipment but who have no prior knowledge and experience in any phase of electronics.

The course begins with basic electronic and radio theory, proceeds to analysis of circuits in E.F. Johnson two-way equipment, and then introduces the student to test instruments and practical troubleshooting techniques, using both lecture and "hands-on" teaching methods.

Because this course is oriented to the goal of providing the student with a basic working knowledge of electronics theory, circuit operation, test instrument usage and practical test techniques, and does not dwell on FCC rules and regulations, graduates typically are not prepared to immediately pass the FCC 2nd Class Radiotelephone License test. However, the course does familiarize students with the use of Question & Answer (Q&A) manuals which cover the FCC rules and regulations applicable to the 2nd Class Radiotelephone license and, according to Thompson, many graduates successfully pass the 2nd Class test within as little as 90 days after completing the course.

Basic electronics & Communi-

cations classes begin every eight weeks and are limited to a maximum of ten students per class. The cost of individual enrollment is $1200 and includes room accommodations and meals during the six-week period.

Basic Technician School

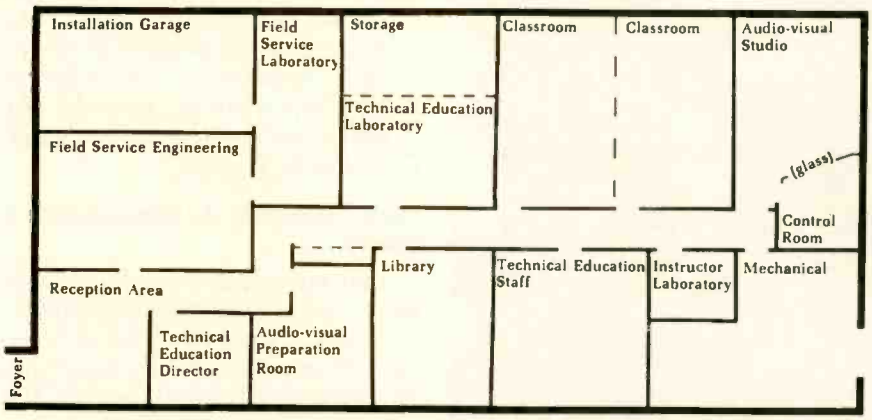
This three-week resident course is designed for individuals with a working knowledge of electronics but who have had no practical experience in servicing two-way communications equipment.

The course begins with a brief but thorough review of circuit and radio theory, general trouble diagnosis techniques and test instrument usage, and then concentrates on practical techniques for troubleshooting two-way communications equipment, using the tried and proven "learning-by-doing" teaching method.

The Basic Technician School is conducted about six times per year, as demand warrants, and is limited to a maximum of eight students per class. The enrollment fee is $100, with the student paying for his own room accommodations and meals while in Waseca.

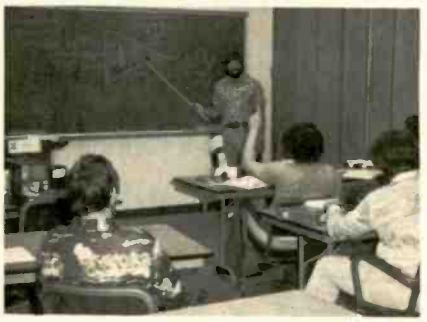
Advanced Technician School

This intensive, one-week resident course is designed for experienced two-way communications technicians who want to become more familiar with the most proficient methods of servicing E.F. Johnson products.



A "tour" of E.F. Johnson's Technical Education Center with the center's director, Daryl Thompson: "Our classrooms are designed to be comfortable as well as functional. Plenty of table-top space is available for each student so that large schematics can be spread out and easily used. Comfortable, relaxing chairs are provided for each student, adhering to the principle that 'the mind can absorb only what the posterior will allow it to.' Each classroom is also equipped with a variety of audio/visual formats, including chalk boards, overhead projector, slide projector, 16mm film and video tape. Three types of classroom lighting with variable controls are available, to allow the instructor to set the light level best suited to the type of teaching activity being conducted at that time. The two classrooms are separated by a −40dB Sonicwall which allows them to be joined for large meetings. Across the hall from the classrooms is the student library. A great deal of reference material and some "just interesting reading" is available for student use. It also is a quiet place to get away and study. In one corner of the library is an amateur radio station for students' use and a two-position study 'carrel' for students to take advantage of some of our individualized instructional packages (JET-PACS). The student applications laboratory contains eight individual test stations. Each test station is slightly different for a very good reason: We felt that it is important that the student become familiar with all of the various types of test equipment he might encounter in the field. It also provides a good opportunity for those who are considering investing in equipment to use all of the various models available in our lab. This comparison of features and performance, coupled with price considerations, makes their decision easier. A complete audio/video productions studio is also housed within the Technical Education Center. This studio is used for the production of self-instruction A/V Packages for distribution to the field, and video tapes used to facilitate both in-house and field seminar training."

A student in the six-week, resident Basic Electronic & Communications Course is shown here using one of two audio/visual-equipped, independent study facilities in the student library of E.F. Johnson's Technical Education Center.



Basic Electronics & Communications students being taught the operational theory of IC quadrature detectors by instructor Mike O'Brien in one of the modern class rooms at E.F. Johnson's Technical Education Center.

(Left) Instructor Bob Lenertz points out the location of a service control in an E.F. Johnson transceiver during the taping of an audio/visual training program in the Audio/Visual Studio of E.F. Johnson's Technical Education Center, while instructor Lynn Anderson does double-duty on the camera. (Right) Control room of the Audio/Visual Studio.

Daryl J. Thompson, Director, E.F. Johnson Technical Education Center: "We try to make technical training as interesting and pleasant as possible, without compromising comprehension and retention—and our students tell us we're succeeding."

In its present format, 80 percent of the course time is devoted to classroom instruction; however, a new format for the Advanced Technician School, with up to 90 percent of the course time spent in hands-on bench training, is being planned for implementation early in 1977. To assure that all enrollees meet at least the minimum knowledge and experience prerequisites which E.F. Johnson believes are necessary to obtain optimum benefit from the new Advanced Technician School, applicants will be required to pass a pre-enrollment test or they must have successfully completed a JET PAC course on the E.F. Johnson products covered in the school.

Six to eight Advanced Technician Schools are conducted each year, depending on the number of applicants, with class size limited to a maximum of ten students. Enrollment in the Advanced Technician School cost $50, excluding the cost of room accommodations and meals.

JET PACS

Johnson Educational Training Packages (JET PACs) are individual audio/visual training programs which technicians or shop owners may purchase and keep for at-home or in-shop training on specific lines of E.F. Johnson two-way communications products and general service-related topics such as "Techniques For Selling Service."

The JET PACs, which cost about

$25 each, come in a variety of audio/visual formats, including film strips with audio tape cassettes, *Microfiche* with audio tape cassettes, 3M *Soundpage* slides with synchronized audio, and video tape with sound.

FIELD SEMINARS

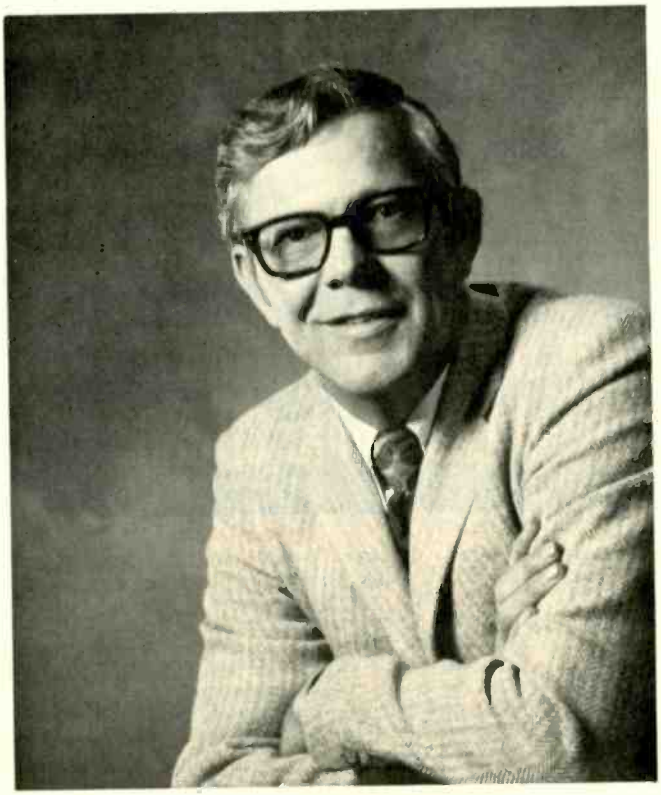
Approximately thirty product-familiarization service training seminars are conducted by the E.F. Johnson training staff each year at "central" locations throughout the country. The principal purpose of these seminars is to acquaint service shop owners and technicians with the circuits and operational features of E.F. Johnson products and the most proficient methods of aligning and troubleshooting them.

Although the shorter time element and concentrated format of these field seminars and the relatively large number of technicians (20 to 50) which typically attend each seminar inherently preclude the opportunity for on-the-spot practical application of recommended alignment and troubleshooting techniques, as is emphasized in the E.F. Johnson resident courses, they nevertheless have proven to be a relatively effective and convenient method of increasing technical proficiency.

FOR MORE INFORMATION

Individual technicians and owners of service businesses who are interested in taking advantage of the various two-way communications technician training programs offered by E.F. Johnson's Technical Education Center can obtain additional information about JET PACs and the content, starting dates and enrollment procedures for specific courses, classes and field seminars by writing or calling Daryl J. Thompson, Director, E.F. Johnson Technical Education Center, Waseca, Minn. 56093 (phone 507-835-2050).

As stated by Thompson, "Time, effort and dollars devoted to service technician training are in reality a no-risk investment in 'human capital'—a type of investment which always pays high returns to the manufacturer, the technician and the service business. ■



Financial Statements Made Easy

Part One—Profit and Loss Statements and how to analyze them

By Paul F. Dontje, C.E.T.

■ Financial statements are—to the successful businessman—what schematics and service information are to the successful electronic technician. If you wish to run a successful electronic service business, you must have a working knowledge of both the schematics *and* the financial statements. Assuming that you have already mastered the schematics and service information, we'll confine ourselves in this two-part series to the understanding and proper utilization of financial statements.

By financial statements, we're not speaking of the debits and credits and the journals and ledgers which are kept according to the peculiarities and needs of each individual business. These are important financial records, but they are easily kept and serve only as the source for the data that is used to prepare the financial statements we are concerned with, namely the profit-and-loss (or operating) statement and the balance sheet. We'll show you how these statements are prepared and will attempt to take the "black magic" out of analyzing these statements. We'll try to provide you with a simple approach to understanding what your accountant provides you with, and how to use these statements to improve your business and, as a result, make more money.

THE PROFIT-AND-LOSS STATEMENT

The P & L (profit and loss) statement is technically the statement of income and expense and is also sometimes referred to as "Income Statement" or "Operating Statement." It is a history, or summary, of a period of time, one month, one year, or whatever period of time you want it to cover. The simplest form of a P & L statement is as follows:

Revenue (income)	$6,649.00
Less Expenses	6,079.00
Net Profit	$ 570.00

If all we wanted was a P & L statement this would suffice. However, we need more information that this provides. It is surprising how many small businessmen only look at those three figures—revenue, expenses and net profit. Actually, the P & L statement should provide as much information as possible about income and expense. If we are going to manage the business, we would like to know where the revenue came from, as well as the expenses involved to obtain this revenue. For example, you might want to break up your income as shown in Chart A.

When you do it this way it is easy to see that warranty labor, for example, represented 8.2% of our total income and service calls represented 15.5% of the income. If last year service calls were 20% of the income and carry-in labor was only 10% and this year service calls were 15.5% and carry-in labor was 15.9% then the trend of the business is for people to bring sets to you rather than you going to them. If that trend was true for the past two or three years, you might decide not to buy a new truck and you might be better off buying more equipment for the shop and modernizing the customer area to accommodate those carry-in customers.

The next thing you might want to know is how much gross profit you made on parts and labor. Common with many small businessmen is the failure to recognize the difference between "gross profit" and "net profit." *Gross profit* is the difference between what we pay for something and what we sell it for. *Net profit* is what you have left after you have paid all overhead expenses, including your salary, and, in the authors opinion, also taken a minimum return on your investment and paid income taxes on the earnings. If you'd like to know how much gross profit (GP) you made on parts and labor you would develop the figures in a spot directly under our income portion, as shown in Chart B.

Also, as a manager, you might like to have

PAUL F. DONTJE is president and general manager of Paul Dontje Radio & TV, Inc., in Wheat Ridge, Colorado. He started the company in 1953 with capital of only $150. He is also chairman of NESDA's Education and Training Committee and has conducted Business Management Seminars in many states, and was instrumental in forming the NESDA Professional Service Management Schools. He is a graduate of the Financial Management By Analysis course at Denver University.

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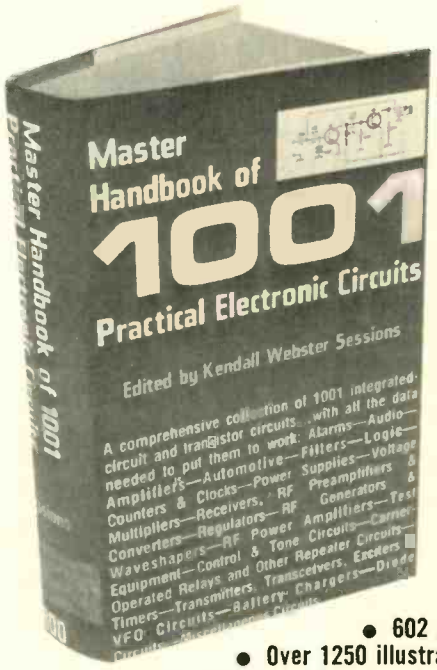

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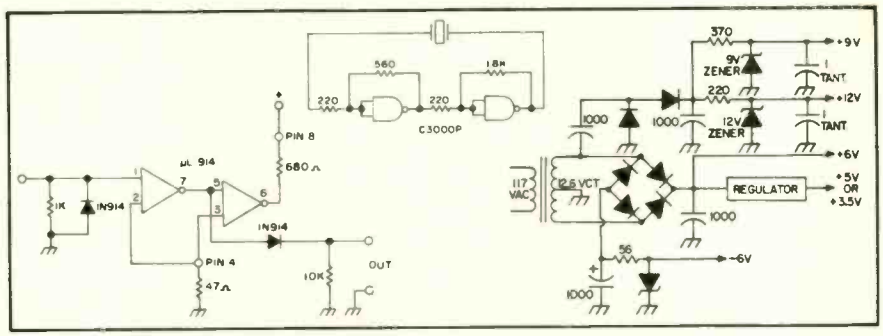
The circuits included are completely up-to-date—they're transistor and integrated-circuit schematic diagrams that have been designed, built, tested, reworked as necessary, and perfected by technicians and applications engineers of the top semiconductor manufacturers. Whatever your forte, regardless of your electronic specialty, you'll find any circuit you're ever likely to need in the pages of this rich volume. Want to build a fire alarm or moisture detector? A 4-channel stereo decoder? A roomful of practical test instruments? A complete repeater? A digital computer? Audio or RF filters? Or how about a burglar alarm—you'll find a wide range of them here for home, shop, or car! The list of circuits in this GIANT 602-page volume is practically endless: whatever you need, you're going to find a selection of just-right circuits for it here. And nothing has been spared to bring you the best possible circuits using the fewest possible components, with more than enough data to insure that the version you build will work exactly the way you want it to—the very first time you breadboard it!

This is not a book of words. The only reading you'll do when you open the pages of this Master Handbook will be within the captions of only those circuits of direct and specific interest to YOU. The schematics are classified according to general application, and the Sections themselves appear in alphabetical order—Alarm Sensors and Triggering Circuits, Audio Conditioning Circuits, Audio Amplifiers, Automotive Circuits, etc. (See *Contents* for a complete listing of all the circuit-diagram categories included in this invaluable reference.)

The Section on test equipment includes circuits for almost any instrument you can imagine, from simple range multipliers for your VOM to sophisticated frequency counters. The Section on receivers and RF preamplifiers gives you a rich choice of circuits from which to choose in order to improve reception of any type of signal in any part of the radio frequency spectrum; it's an extremely simple and effective way to get "metropolitan" performance from a "fringe area" TV installation. If you're in the business of servicing/repairing commercially built electronic equipment (TV receivers, stereo amplifiers, CB transmitters and receivers), you're going to especially appreciate the comprehensive Appendix of IC substitutions, which includes base diagrams for most popular ICs, and gives you all the info you need to adapt the IC packages of one manufacturer to the circuit applications of another. Another Appendix is a pictorial listing of common electronic symbols.

Partial List of Contents

Alarm Sensors & Triggering Circuits; Audio Conditioning Circuits; Audio Amplifiers; Automotive Circuits; Filters; Logic Circuits, Counters & Clocks; Power Supplies & Voltage Multipliers; Receivers, RF Preamplifiers & Converters; Regulator Circuits; RF Generators & Waveshapers; RF Power Amplifiers; Test Equipment; Control & Tone Circuits, CORs & Other Repeater Circuits; Timers; Transmitters, Transceivers, Exciters & VFOs; Battery Chargers; Diode Circuits; Miscellaneous Circuits; Appendix A: IC Substitution Guide; Appendix B: Electronic Symbols.



Each of the over 1250 schematic illustrations—with all components clearly labeled—is accompanied by all the data you need to construct the circuit!

...for more details circle 113 on Reader Service Card

AN EXTRAORDINARY OFFER...

CHART A
Breakdown of Income

INCOME		
Parts Sales	$2,560.00	38.5 %
Service Calls, labor	1,028.00	15.5 %
Bench Labor	965.00	14.5 %
Carry-in Labor	1,056.00	15.9 %
Warranty Labor	545.00	8.2 %
Antenna Labor	495.00	7.4 %
TOTAL INCOME	$6,649.00	100.0 %

CHART B
Parts & Labor Gross Profit

GROSS PROFIT			
Parts Sales	$2,560		
Parts Cost	1,250		
Parts Gross Profit		$1,310	
Labor Sales	4,089		
Wages	2,248		
Labor Gross Profit		1,841	
TOTAL GROSS PROFIT			$3,151
EXPENSES			2,581
NET PROFIT			$ 570

CHART C
Breakdown Of Overhead Expenses

EXPENSES		
1/2 Owners Salary		$600.00
Office Salary		325.00
Employees Benefits		35.00
Utilities		125.00
Rent		225.00
Depreciation		175.00
Office Supplies		25.00
Advertising		230.00
Truck Expense		195.00
Telephone		78.00
Insurance		96.00
Dues & Subscriptions		25.00
Travel & Entertainment		36.00
Taxes		225.00
Repairs		35.00
Bad Debts, Collections		115.00
Misc.		36.00
Total Expenses	$2,581.00	38.8 %

the overhead expenses broken down. This is usually done from the check register or accounts payable journal and could contain 10 or 20 separate items. A typical expense portion of a P & L statement is illustrated in Chart C.

When we put all three sections of our profit-and-loss statement together, as shown in Chart D, we have what could be considered a complete operating statement. All percentages have been developed in relation to total income, and from a technical standpoint, the "income section" of this format is really a "source of income" statement and as such is not found on accounting formats of most typical P & L statements. We will go into the importance of these percentages later in the article when we discuss the ratio analysis of operating statements.

Remember, if you understand what is basically needed you can break your operating statement up into as many sections as you feel you need as a manager. For example, you might want to expand the P & L even more to show gross profits on other departments such as sales of new TV sets, rental department or any other special department. If we did add set sales and rentals, the income and gross profit sections would appear on our operating statement as shown in Chart E.

When we analyze the gross profit figure of $4,023 in Chart E it becomes obvious that labor is the big contributor. However, we should note that the gross profit for the rental department is almost net profit for that department because we have deducted rental advertising and depreciation as a cost of sales.

It is also possible to break up the expense section of your operating statement into "operating expenses" and "administrative expenses." If you used this method, the expense portion of your P & L would appear as in Chart F. You could also break down the expense section by departments, if you, as manager feel this type of information would be valuable to your operation.

The thing you must guard against is that you may decide that one segment of your business is unprofitable by looking at the figures, when,

CHART D
Operating Statement For One Month, Ending July 31, 1976

INCOME			
Parts Sales	$2,560.00		38.5 %
Service Call Labor	1,028.00		15.5 %
Bench Labor	965.00		14.5 %
Carry-in Labor	1,056.00		15.9 %
Warranty Labor	545.00		8.2 %
Antenna Labor	495.00		7.4 %
Total Income		$6,649.00	100.0 %
GROSS PROFIT			
Parts Sales	$2,560.00		
Parts Cost	1,250.00		18.8 %
Parts Gross Profit		1,310.00	19.7 %
Labor Income	4,089.00		
Labor Cost	2,248.00		33.8 %
Labor Gross Profit		1,841.00	27.7 %
TOTAL GROSS PROFIT		$3,151.00	47.4 %
EXPENSES			
1/2 Owners Salary	600.00		
Office Salary	325.00		
Employee Benefits	35.00		
Utilities	125.00		
Rent	225.00		
Depreciation	175.00		
Office Supplies	25.00		
Advertising	230.00		
Truck Expense	195.00		
Telephone	78.00		
Insurance	96.00		
Dues & Subscriptions	25.00		
Travel & Entertainment	36.00		
Taxes	225.00		
Repairs	35.00		
Bad Debts, Collections	115.00		
Misc.	36.00		
Total Expenses		2,581.00	38.8 %
Net Profit, before taxes		$ 570.00	8.6 %

in fact, that may not be completely true. For example, let's say that 20% of your income came from TV sales, and so you decide that 20% of the expenses should be borne by the TV department. However, 20% of $2,581 is $516.20, so the TV department would have suffered a net loss of $189.20. On the other hand, if we eliminated TV sales, would our expenses go down by 20%? Probably not, because most of the expense items such as rent and owner's salary would be the same without any TV sales. And you must determine, also, how much service business you get through your efforts at TV sales.

It's my belief that you should break down expenses by departments and pro-rate them on a percentage basis to the various departments. Before you make major changes, however, you need to consider all of the

CHART E
Operating Statement, Including TV Sales & Rental

INCOME				
TV Department	$1,920.00			20.6 %
Rental Department	774.00			8.3 %
Service Department				
Parts Sales	2,560.00			27.4 %
Service Call Labor	1,028.00			11.0 %
Bench Labor	965.00			10.3 %
Carry-in Labor	1,056.00			11.3 %
Warranty Labor	545.00			5.8 %
Antenna Labor	495.00			5.3 %
Total Income		$9,343.00		100.0 %
GROSS PROFITS				
Parts Sales	$2,560.00			
Parts Cost	1,250.00			
Parts Gross Profit			1,310.00	
Total Labor income	4,089.00			
Labor Cost	2,248.00			
Total Labor Gross Profit			1,841.00	
TV Department				
New Set Sales	1,570.00			
Used Set Sales	350.00			
Total Sales		1,920.00		
Less Cost of Sales				
Beginning Inventory	2,320.00			
Plus Purchases	1,160.00			
	3,480.00			
Less Ending Inventory	2,105.00			
Cost of Sets	1,340.00			
Total Gross Profit, TV Dept.			545.00	
Rental Department				
Rent of Sets	760.00			
Rent of Stands	14.00			
Total Rental Income		774.00		
Rental Costs				
Advertising	78.00			
Collections	56.00			
Service	67.00			
Rental Depreciation	246.00			
Total Rental Costs		447.00		
Rental Dept. Gross Profit			$ 327.00	
TOTAL GROSS PROFIT			$4,023.00	

factors involved.

Finally, in the development of the P & L statement, we should try to include what are known as "year-to-date" figures, which is simply a matter of totaling each of the items on the statement from the beginning of the business year to, and including, the current month. As shown in Chart G, these "year-to-date" figures and percentages are positioned on the statement to the right of the one-month figures to allow for easy comparison. Chart G, then, is an example of a typical, complete P & L, or operating, statement.

RATIO ANALYSIS OF THE OPERATING STATEMENT

Each time we attend a Service Management School the instructors talk about standard-format operating statements, or profit and loss statements—and they talk about the use of percentages, or ratios, as a management tool. Some of these are overhead burden percentage, gross parts profit percentage, and direct labor cost percentage, to mention a few.

There are many important reasons for looking at your business in percentages. The most important is to have a realistic unit of measurement of the trends in your business. You've probably noticed that when you talk to a banker he wants to see your financial statements for the last three years, including the balance sheets and profit and loss statements. He is looking for the long term trends of your business. He'll also look at the solvency ratios and liquidity, which can also indicate trends. In this part of our article we will investigate the trends that we can use for better management of our business.

A good example of how information taken from past P & L statements can reveal business trends is shown in Table 1. As you'll notice, the gross parts profit in January 1973 was 56% in January 1974 it was 50% and in January 1975 it was 46%. Therefore, you know that the parts profits have been on a gradual decline, and a way is needed to reverse the trend.

The trend shown is probably true in most TV service businesses due to high-profit tube sales declining and lower-markup transistor and module sales increasing. If you want to do something about that trend, we suggest that you *don't use suggested list prices!* With today's cost of doing business, a 30% or 40% discount on parts may not pay today's operating costs. Decide what mark up or gross profit you need for your business and price your parts accordingly. It is also possible that you haven't been turning in warranty parts for credit, or haven't been getting credit for warranty parts. Or, maybe, you have inventory that's disappearing through pilferage or shoplifting. The point is: the percentages tell you that there is a problem, and now you can take some kind of corrective action.

Now, for another example of how ratio analysis can reveal problems, take a look at Table 2. Suppose that your overhead burden percent (overhead expense divided by direct labor cost) had been 115% in 1973, 135% in 1974, and 165% in 1975. From this you can see that your costs have gone up and you

CHART G

OPERATING STATEMENT

(Including Year-to-Date) Period Ending July 31, 1976

INCOME	MARCH		%*	3 Months, year to date		%*
Parts Sales	$2,560		38.5 %	$ 7,890		40.0 %
Service Call Labor	1,028		15.5 %	3,056		15.5 %
Bench Labor	965		14.5 %	2,545		12.9 %
Carry in Labor	1,056		15.9 %	3,275		16.6 %
Warranty Labor	545		8.2 %	1,675		8.5 %
Antenna Labor	495		7.4 %	1,275		6.5 %
Total Income		$6,649	100.0 %		$19,716	100.0 %
GROSS PROFIT						
Parts Sales	$2,560			$7,890		
Parts Cost	1,250		18.8 %	3,947		20.0 %
Parts Gross Profit		$1,310	19.7 %		$3,943	20.0 %
Labor Income	4,089			11,826		
Labor Cost	2,248		38.8 %	5,869		29.8 %
Labor Gross Profit		1,841	27.7 %		5,957	30.2 %
TOTAL GROSS PROFIT		$3,151	47.4 %		9,900	50.2 %
EXPENSES						
1/2 Owners Salary	$ 600			$1,800		
Office Salary	325			975		
Employee Benefits	35			105		
Utilities	125			395		
Rent	225			675		
Depreciation	175			525		
Office Supplies	25			68		
Advertising	230			635		
Truck Expense	195			672		
Telephone	78			234		
Insurance	96			288		
Dues & Subscriptions	25			73		
Travel & Entertainment	36			158		
Taxes	225			675		
Repairs	35			67		
Bad Debts & Collections	115			115		
Misc.	36			56		
Total Expenses		$2,581	38.8 %	$	$7,516	38.1 %
NET PROFIT, Before Taxes		$ 570	8.6 %		$2,384	12.1 %

* All percentages are in relation to total income.

need to investigate the reasons. Solutions to this kind of a problem are not as simple as a decline in gross part profit. First, we are talking about a ratio of overhead expense to direct labor cost. If, for example, you employed technicians at $2.00 per hour, a 250% burden might not be too high; on the other hand, if you paid technicians $20 an hour, a ratio of 75% might be O.K. So we need to look at the overhead as a percentage to total sales (see Table #3) for the same period, and the direct labor cost as a percentage of total sales (see Table 4) for the same period to find out which one has gotten out of balance. Also, for further analysis, we need to look at the labor gross profit percentage (see Table 5) for the same period.

Now, looking at Tables 3, 4 and 5, we find that overhead expense has gone down by 2.6%, and labor cost have risen 10.4%, while gross profit on labor has dropped 17.7%. The problem is in the labor profit. Either we have too much non-productive time, or our labor rates are too low, or possibly you could cut your technicians wages (which doesn't seem too practical). The obvious conclusion is, in the three years costs have risen 30 to 35% (national inflation figures), and we are selling labor at the same prices.

If overhead has not gone up more than the inflation we probably can't do much about it, but you should go over each expense item and question it, anyway. If it appears that the largest problem area is labor gross profit, then remember, two factors control this—*Productivity* and *Prices*. The

CHART F
Expenses Breakdown by Operating & Administrative Categories

Operating Expenses		
Employee Benefits	$ 35.00	
Utilities	125.00	
Rent	225.00	
Depreciation	175.00	
Advertising	230.00	
Truck Expense	195.00	
Telephone	78.00	
Taxes	225.00	
Repairs	35.00	
Misc.	36.00	
Total Operating Expenses		$1,359.00
Administrative Expenses		
1/2 Owners Salary	600.00	
Office Salary	325.00	
Office Supplies	25.00	
Insurance	96.00	
Dues & Subscriptions	25.00	
Travel & Entertainment	36.00	
Bad Debts & Collections	115.00	
Total Administrative Expense		1,222.00
TOTAL OPERATING & ADMINISTRATIVE EXPENSES		$2,581.00

TABLE 1
Developing Gross Parts Profit Percentage

Month/Year	Parts Sales	–	Parts Cost	=	Gross Parts Profit	Gross Parts Profit Percent*
July, 1974	$5,465	–	$2,405	=	$3,060	56 %
July, 1975	5,980	–	2,990	=	2,990	50 %
July, 1976	6,560	–	3,542	=	3,018	46 %

* The gross parts profit percentage is parts profit divided by parts sales

TABLE 2
Developing Overhead Burden Percentage

Year	Overhead Expense	÷	Direct Labor Cost	=	Ratio	×	100	=	Overhead Burden Percent
1974	$64,687	÷	$56,250	=	1.15	×	100	=	115 %
1975	$74,390	÷	$55,104	=	1.35	×	100	=	135 %
1976	$96,829	÷	$58,684	=	1.65	×	100	=	165 %

TABLE 3
Developing Overhead Expense Percentage

Year	Overhead Expense	÷	Gross Sales (Parts & Labor)	=	Overhead Expense Percent
1974	$56,250	÷	$191,186	=	29.4 %
1975	$55,104	÷	$198,922	=	27.7 %
1976	$58,684	÷	$218,967	=	26.8 %

obvious questions are—Are we wasting our time, or being inefficient—and what can we do to improve the number of units we service in the same amount of time? We also have to ask—Have my prices gone up with costs? If the answer to that last question is no, and you are charging the same as you were three years ago, and your technicians are being paid more, then you need to adjust your labor prices.

The point of all this is—if you will look at your six or eight key percentages each month, and then compare them with the year-to-date percentages for the past three or four years, you'll know which areas of your business need improvement. When you make an adjustment you'll be able to see it reflected in the percentages and ratios in following months and will know if the adjustment was right or if more is needed.

The key percentages that will help your analysis are:

1. Parts cost percentage (parts cost divided by gross sales)*
2. Labor cost percentage (labor cost divided by gross sales)*
3. Gross profit percentage (gross profit divided by gross sales)*
4. Overhead expense percentage (overhead expense divided by gross sales)*
5. Net profit percentage before taxes & after owners draw (Net profit divided by gross sales)*

*Gross sales includes both parts and labor.

Additional percentages that will be helpful include:

1. Gross parts profit

continued on page 49

TECHNICAL DIGEST

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

CHASSIS: RCA CTC68

TROUBLE SYMPTOM: Beat pattern in picture

CAUSE: Open AFT filter capacitor G4002, on the tuner mounting assembly.

CHASSIS: Magnavox T985/986/991

TROUBLE SYMPTOM: Continual or intermittent loss of video and sound

CAUSE: Open or intermittently open coil L1, which physically is on the tuner control assembly and electrically is in series with the B+ supply to the VHF tuner. Absence of B+ on the tuner side of the coil confirms probability that an open L1 is the cause of video and sound loss. Replace only the coil (Magnavox Part No. 360676-21), not the complete tuner control assembly.

CHASSIS: Magnavox T981/982/987

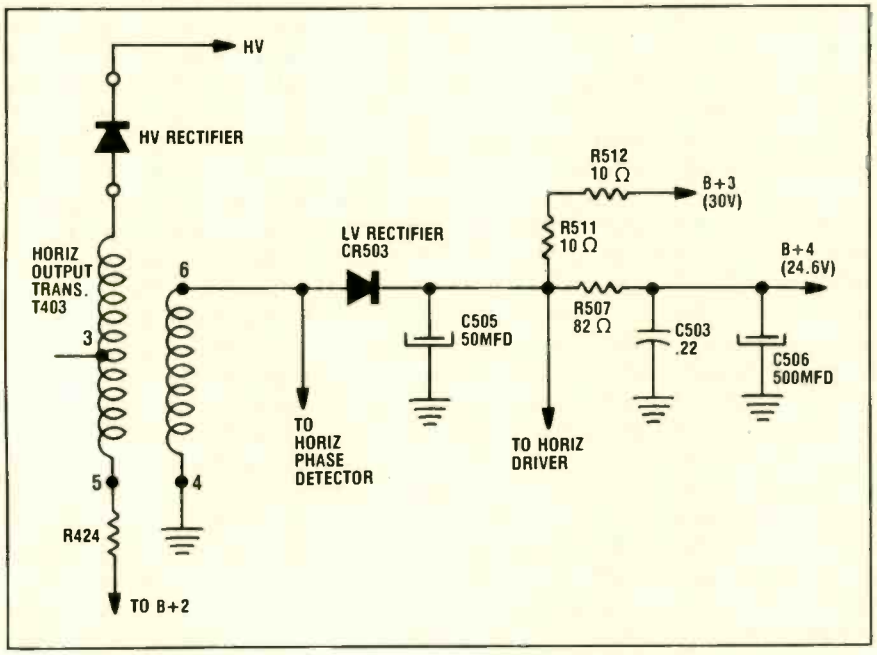
TROUBLE SYMPTOM: Spot burned into center of the picture tube

CAUSE: If the high voltage is interrupted three or four times in rapid succession it might cause a burn spot in the center of the picture tube. The type of defect most likely to cause repeated, rapid interruption of the high voltage, and the resultant CRT burn spot, is an intermittent malfunction in the horizontal drive or sweep section. The most probable cause of this type of trouble symptom are improperly soldered stakes on which the socket of the Horizontal Oscillator/Driver module is mounted on the main printed-circuit board. Before replacing a burned picture tube in these chassis, resolder the associated stakes on the master printed-circuit board. Improperly soldered connections on the Horizontal Oscillator/Driver module socket or improperly soldered components on the module itself are also "probable" causes.

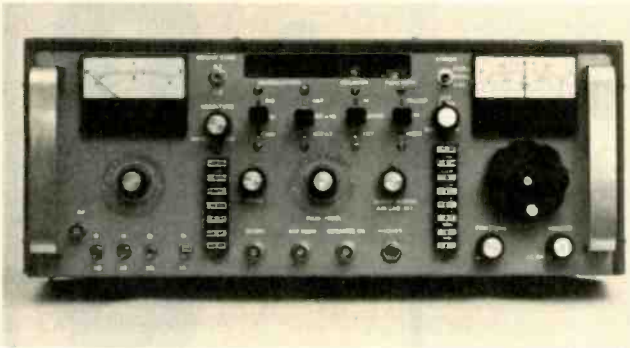
CHASSIS: Admiral K8

TROUBLE SYMPTOM: Raster, video and sound missing

CAUSE: Failure of the B+3/B+4 scan-derived power supply, which, driven off the horizontal-output transformer, provides B+ to the sound, vertical and video circuits of the K8 chassis. In addition to failure of low-voltage rectifier CR503 or capacitor C505, other probable causes of loss of raster, video and sound are failures in the horizontal sweep circuit, such as the horizontal oscillator, horizontal driver or horizontal-output transistors, which not only would eliminate the high voltage but also would remove B+ from the sound circuit. ■



TEST INSTRUMENT REPORT



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

COMMUNICATIONS SERVICE MONITOR

■ The Lampkin Model 109 Communications Service Monitor combines in a single test instrument the functions of an RF signal generator (AM, FM and CW), a digital frequency counter, a single-sideband monitor, and an AM/FM modulation meter.

The "add on" design of the Model 109 makes it possible to "customize" its signal generating and measuring capabilities to match almost any combination of frequency ranges and test functions a shop might require, now or in the future, for troubleshooting and aligning AM, FM and SSB two-way communications equipment operating in the frequency range from 20MHz to 500MHz.

The "base" version of the Model 109 includes:

• 1) a CW/AM RF signal generator which covers the 20-30 MHz (CB) band and which can be amplitude modulated from zero to 100% either by the 109's build-in, continuously variable, two-band audio source (50 to 600Hz and 500 to 6000Hz) or by any 50-to-10,000Hz audio source capable of delivering a 3-volt (RMS) signal into a 600-ohm load

• 2) an eight-digit, LED-equipped frequency counter capable of measuring frequencies in the range from 50Hz to 30MHz, with an accuracy of better than + 0.0001% (1 part per million) and a maximum resolution of + 1Hz

• 3) an AM modulation meter.

Optional features which can be added to the "base" version of the Model 109—either by the manufacturer at the time of initial purchase or later by the purchaser—include provisions for: 1) extending the RF signal generating capability of the Model 109 up to 500MHz, in up to nine additional pushbutton-selectable frequency bands; 2) variable frequency modulation of the RF output up to a peak deviation of 25KHz; 3) simultaneous measurement, via an analog error meter, of carrier frequency error and FM deviation; 4) peak FM deviation monitoring via a two-scale meter (0-2KHz and 0-6KHz) plus a front-panel SCOPE output for scope viewing of the demodulated FM waveform; and 5) generation of frequency-swept RF output signals, with up to 1-MHz sweep width.

The "base" version of the Model 109 weighs 17 lbs., is 6¾ inches high by 17 inches wide by 11 inches deep, operates from any nominal 120 VAC, 50-400Hz power source, and is priced at $1,550. (A provision for operation from a 12VDC source also is available on an optional basis.)

CB IN-LINE TESTER

If you want digital readout of the four prime performance parameters of CB transmitters—frequency, power output, standing-wave ratio (SWR) and percent of modulation—and you don't want to manipulate more than one control nor waste a lot of time connecting, disconnecting and reconnecting a "rat's nest" of coaxial cables—then Hickok's Model 388 CB In-Line Tester might be what you are looking for.

This time-and-motion-saving test instrument, which is the first of Hickok's new series of *CommLine* CB test instruments, requires connection of only two cables—the CB transceiver's output cable is attached to the 388's back-panel INPUT connector, and the cable leading to the transceiver's antenna or dummy load is attached to the 388's back-panel OUTPUT connector—and you're ready to measure all four transmitter performance parameters merely by rotating the 388's front-panel FUNCTION switch to the appropriate position. The 388's built-in cable matching and coupling circuits and automatic decimal positioner eliminate the need for other setup connections and controls, and an automatic calibration feature, which Hickok calls "dynamic ratio," eliminates the need for manual recalibration when output power is varied or fluctuates during SWR and percentage-of-modulation measurements.

In the FREQUENCY position of the FUNCTION switch, the 388 provides a seven-digit readout of frequency within the range from 10Hz to 80MHz, with an accuracy of 10 parts per million (ppm) and a resolution of 10Hz.

The two POWER positions of the 388's FUNCTION switch—one for measurement of up to 10 watts and the other for measurement of from 10 to 100 watts—provide a three-digit readout accurate to within a nominal +5% of scale, +1 count, in the 10-watt range and +5% of scale, +1 count, in the 100-watt range.

In the % MOD position of the FUNCTION switch, the 388 provides three-digit readout of percentages of modulation in the range from 0 to 100%, in 1% increments and with a nominal accuracy of +5% of scale, +1 count. In addition, a front-panel jack labeled AM MONITOR provides an output for scope viewing of the

modulation envelope.

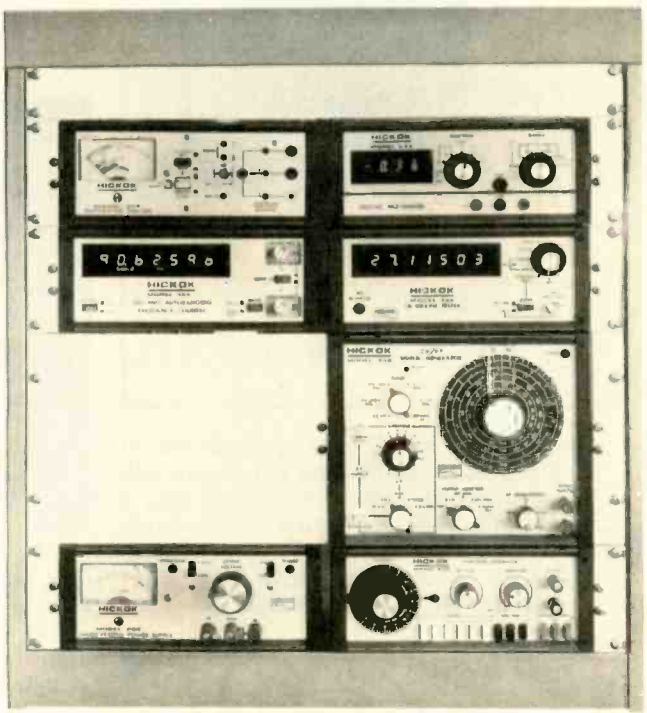
The SWR position of the 388's FUNCTION switch provides a four-digit readout of standing-wave ratios in the range from 1.00:1 to 20.00:1, with a resolution of .01 ratio point.

To permit measurement of the frequencies of other stages and sections in the transceiver without disconnecting the back-panel in-line connections, the 388 is equipped with a front-panel BNC type connector which functions as the input when the INPUT pushbutton is pressed in and the FUNCTION switch is in the FREQUENCY position.

The digital display of the MODEL 388 is provided by 0.3-inch light-emitting diodes (LEDs) and includes an automatically positioned decimal point.

The "standard" version of the Model 388, which is priced at $349, has an internal time base stability of .1 ppm for +10% variations of line voltage and 10ppm for ambient temperatures from 0°C to 50°C, and a time base aging rate of 5 ppm per year. A TIME BASE EXTERNAL/INTERNAL switch and associated BNC type connector on the back panel permit use of an external time base frequency reference.

Model 388X, which is priced at $475, is identical to the "standard" 388 except that it is equipped with a temperature-compensated crystal oscillator (TCXO) time base frequency reference, which, according to Hickok, guarantees a frequency measurement accuracy of 1 ppm and an aging rate of only +1 ppm per year.



...for more details circle 137 on Reader Service Card

Both versions of the Model 388 are 8½ inches wide by 4 inches high by 6 inches deep, weigh 4 lbs., and come equipped to operate from either a 105-125 VAC or 210-250 VAC source (50-400Hz), with provisions for operation from a 12-14 VDC source after a simple internal modification.

As illustrated in an accompanying photo, the Model 388, and the other soon-to-be-announced instruments in Hickok's new *CommLine* series of CB test instruments, can be mounted in a side-by-side rack-mount, which fits any standard 19-inch equipment rack and is available in kit form from Hickok. ■

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.

NOISE CANCELLATION CB MICROPHONE 138

A new noise-cancelling CB microphone designed for truck drivers is being introduced by *Astatic Corporation*. Named the Trucker II, the new mike has been tested in the field by

truckers and is said to eliminate all cab noises to produce only clear talk in transmission. Trucker II has a transistor amplifier and an adjustable output over a range of approximately 40dB. It converts easily from "electronic" to "relay" operation.

CB TRANSCEIVER 139

A new, highly compact 23-channel CB transceiver is being introduced by *Zodiac Communications*. Model M-5023 measures only 8¼ x 2¼ x 6½ inches and can be installed in a car's glove compartment to minimize risk of theft. It can be used, however, as

either a mobile unit or base station. It is designed to work from a 12 volt DC source, either positive or negative ground, but it can also be used with a 6-volt source and a DC convertor, or can be powered by a line-voltage converter for base station use. The Model M-5023 weighs only 2 lbs. and is housed in a durable, dust-proof, damp-proof steel container, and is delivered with crystals for all 23 channels. Includes external speaker, microphone and selective call unit jacks, an illuminated front panel meter and is fully solid state. Priced at $129.95.

CORDLESS TELEPHONE SYSTEM 140

A new cordless telephone system that provides extended range up to 2,000 feet has been introduced by *Gutzmer International, Inc.* With highly sensitive electronic circuitry and telephone-quality performance, the new Model 500 Handifone features optional push-button to dial pulse conversion permitting operation through any telephone exchange, a "last-dialed" memory system for use when busy signals are encountered, and a battery saver system that provides up to 10 hours of constant talk time, or two weeks standby time. The Handifone includes a standard desk-

type telephone set with a telescoping antenna and walnut-finished Transponder base station that plugs into any standard telephone extension jack. It uses two frequencies for duplex operation and six operating channels. Suggested retail price is $595.

CB REPLACEMENT COMPONENTS 141

A 20-drawer metal cabinet full of the most commonly used CB radio replacement components is now available from *Mallory Products*. The component collection also includes a cross-reference guide for semiconductors and controls showing the component's original number or type designation and the appropriate Mallory replacement component. There are three different component collections in the series. No. CBSC 2001A contains PTC transistors, diodes and integrated circuits. No. CBSC 2001B

contains ceramic, tantalum and VTT electrolytic capacitors, and No. CBSC 2001C contains EWF film capacitors, SX polystyrene capacitors, TT and TC electrolytic capacitors, MTC and UA controls and accessories. The cabinets are available singly or in No. CBSC 2003, which is a 60-drawer service center.

TV/FM INTERFERENCE FILTER 142

A new line of interference filters that are compact and easy to install is being introduced by *Electronic Specialists, Inc.* The filters are de-

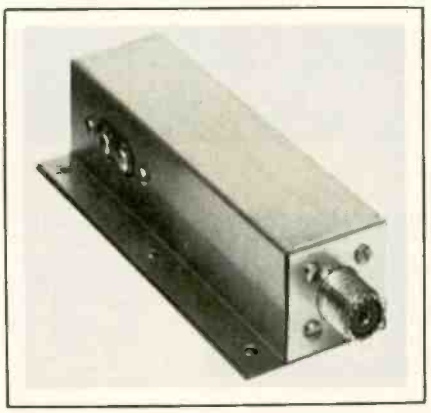
signed for CB operators who need to eliminate CB interference with TV or FM in their neighborhood or family. The three models available include one tunable model, and two factory-tuned models, one of which installs directly on the affected TV or FM receiver.

DIVIDER NETWORKS FOR TV 143

Two high-voltage divider networks that replace 52 industry part numbers used in color TV receivers have been added to the ECG semiconductor line of GTE Sylvania. The devices, designated ECG HiDiv-1 and ECG HiDiv-2, are used to derive focus voltages in some color TV sets. ECG HiDiv-1 is 240 megohms tapped at 40 megohms, and ECG HiDiv-2 is 244 megohms tapped at 46 megohms. Overall dimensions of both dividers are: 2.75 inches high, 2.292 inches wide and 0.875 inches deep.

CB CHANNEL MONITOR 144

A new CB product that works in conjunction with a car radio and a CB transceiver to monitor the CB channels has been introduced by *EICO*. The Model CM-2 monitor terminates car radio reception when a CB call is

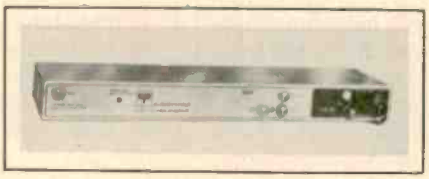


heard. After a short delay, following the call, the device returns the car radio to normal operation. Because the CM-2 is sensitive to both audio and

RF, it also silences the car radio when the operator transmits on CB. It will operate with any car radio that has an external speaker, and any CB, marine or ham radio equipped with an external speaker jack. It comes equipped with all necessary mounting hardware and full instructions. Price at $29.95

VHF TV STRIP AMPLIFIER 145

A new high-output vhf single-channel strip amplifier for MATV and CATV headends has been introduced



by *Blonder-Tongue*. The amplifier, Model HMCA-b, is used to increase the signal and stabilize the level of a single TV channel, and features high gain, low noise and a wide-range automatic gain control circuit. Each HMCA-b consists of three modular sections which can be removed easily for servicing or for channel changing. Modules are: a 6-MHz wide-input amplifier with variable gain for agc; a main amplifier with five broad-band rf stages as well as power supply and agc control circuitry; and an output module consisting of a directional filter diplexer to permit mixing of alternate channels in a system. Strip amplifiers are designed for rack or surface mounting.

COMPONENT SERVICING KITS 146

Six different capacitor and resistor service kits, with a total of 520 components, are now available through distributors from *International Components Corporation*. Included in the kits are: aluminum electrolytic, tantalum, ceramic disc, metalized polyester film and polyester film capacitors as well as carbon composition fixed resistors. Each type is in a different kit consisting of compartmentalized box with locator card. Dealer cost for all six kits is $59.70.

FINANCIAL STATEMENTS

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TABLE 4
Developing Labor Cost Percentage

Year	Direct Labor Cost	÷	Gross Sales (Parts & Labor)	=	Labor Cost Percentage
1974	$64,687	÷	$191,186	=	33.8 %
1975	$74,390	÷	$198,922	=	37.4 %
1976	$96,829	÷	$218,967	=	44.2 %

TABLE 5
Developing Labor Gross Profit Percentage

Year	Labor Sales	–	Labor Cost	=	Labor Profit	Labor Gross Profit Percentage*
1974	$125,606	–	$64,687	=	$60,919	48.5 %
1975	$127,162	–	$74,390	=	$52,772	41.5 %
1976	$139,887	–	$96,829	=	$43,058	30.8 %

* Labor Gross Profit Percentage = Labor Profit ÷ Labor Sales

percentage (parts profit divided by parts sales)

2. Gross labor profit percentage (labor profit divided by labor sales)

3. Overhead burden percentage in relation to direct labor cost (overhead expense divided by direct labor cost)

Each one of the key percentages we've suggested points to a specific area of your business. Like trouble-shooting a TV set, you use these percentages to diagnose the trouble to the section or area, and then to the stage and, finally, the part. With ratios or percentages you can find the area and then dig into the things that make up that percentage.

Next month, we'll tell you how a balance sheet is developed and the benefits of balance sheet analysis. ■

CLASSIFIED

RATES: 40¢ per word: 50¢ per word Bold Face Type. Add $3.00 if you wish Box Number. Minimum $10.00 charge. Classified Display Rate billed $43.00 per inch, 1 inch minimum. Remittance must accompany order. Mail ad copy to: Roz Markhouse, ET/D, 757 3rd Ave., N.Y., N.Y. 10017

Business Opportunities

Virgin Islands family-run shop needs solid-state audio & TV bench techs. CB experience helpful. Send resume to Glentronics Inc., Box 6-L Sunny Isle, St. Croix, U.S. Virgin Islands 00820. 8/76

REBUILD PICTURE TUBES: Save 50 to 75% by rebuilding your own picture tubes. You can purchase a plant from us to rebuild from one to 50 tubes per day with one week of schooling and follow up instructions in your plant. Factory Outlet, 951 E. Hudson St., Columbus, OH 43211, 614-263-0645. TF

Get Late Model Color TV's (rebuildable) for $10-$20-$30. All you need. Simple legal method earns to $100 day plus for TV techs. Detailed method, instructions, $10 pp. Economy TV Rentals, Box 2890, Denver CO 80201. TF

ELECTRONICS/AVIONICS EMPLOYMENT OPPORTUNITIES. Report on jobs now open. Details **FREE.** Aviation Employment Information Service, Box 240 Y, Northport, New York 11768. 6/77

FOR SALE—complete TV-Radio-CB store (appl. available) Sales & Service—28 years in Wauchula. 44x82 CB building. Want to retire. Land, store, stock, equipment all free and clear. Zenith-Admiral-Quasar, real nice and profitable if you try at all. Loyd Rutland, 123 North Seventh Avenue. Wauchula, Fla. 33873 Move to sunny Fla. 813-773-9744 8/76

SURPRISE! SURPRISE! Digital Piano Tuning Device tunes **ALL** musical instruments Accurately! Perfectly! Inexpensively! Tuner Construction—Piano Tuning Instruction **PLAN SET** Complete $12.98 Airmailed Postpaid! Moonlighting quickly repays $40 electronics investment!! **GREEN BANK SCIENTIFIC,** Box 100W, Green Bank, WV 24944. TF

TV Sales and Service in same location 15 years. Nets over $25,000. Retiring. Including truck, equipment, & inventory 25,000. A. Bolin, 6361 Balsam Lake, San Diego, CA 92119. TF

Vermont Radio-TV Sales—Service. Long established. New building w/rental space. Private parking. Price $280,000. Details to qualified principle(s) only. Marble City Realty, P.O. Box 265, Rutland, Vermont 05701. 8/76

TV shops: Increase your income. Repair and update MATV Systems with patented method. $200.00 day possible. Training available. P.O. Box 809, Boynton Beach, Fla. 33435. 12/76

PICTURE TUBE MACHINE

We buy and sell NEW AND USED CRT rebuilding machinery. COMPLETE TRAINING. Buy with CONFIDENCE from the ORIGINAL MFGR. For complete details, send name, address and zip code to:

LAKESIDE INDUSTRIES
3520 W. Fullerton Ave., Chicago, IL 60647
Phone: 312-342-3399

BUSINESS FOR SALE - TV SALES AND SERVICE. ESTABLISHED. RCA AND ZENITH. CONTACT JACK EDDE. P.O. BOX 53, LYNCHBURG, TENNESSEE 37352. 9/76

Construction Plans

SURPRISE! Free Catalog! **WE SELL THE MOST UNUSUAL CONSTRUCTION PLANS USING NUMERICAL READOUTS!!** Digital Plans: Capacitance Meter, VOM, Frequency Counter, Oral Thermometer, Automobile Tachometer, Speedometer, Sobriety Tester. ALSO: Ten Band Graphic Equalizer, LED Volume Indicator, Human Pluse Tachometer, TV Video Ping-Pong Game. **PLAN SETS** are $3.49 each or **ALL** eleven for only $15.98 Airmailed Postpaid! **GREEN BANK SCIENTIFIC,** Box 100X, Green Bank, W.Va. 24944. TF

JAPANESE TRANSISTORS -All Transistors Original Factory Made. Free Catalog. West Pacific Electronics, Box 25837, W. Los Angeles, CA 90025. 12/76

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ELECTRONIC TECHNICIAN/DEALER CLASSIFIED

CONVERT YOUR B & K 465 OR 466 REJUVENATOR to a powerful c.r.t. restorer system. Step by step plans with pictures $8.00. James Chancellor, 1708 Edgerly, Albany, Ga. 31707. 9/76

NEGATIVE Ion Generator. Construction plans $5.00 or send $1.00 for information on completely assembled unit, refundable on purchase. Golden Enterprises, Box 1282ET, Glendale, Arizona, 85311. 8/76

For Sale

TRANSISTOR TESTER. Convert Transistor Radio Into In-circuit Transistor Tester. Tone Indicates Good Transistor. Plans $2.00. SZA Electronic Systems Inc., 3 Bayberry Lane, Levittown, NY 11756. 10/76

BURGLAR ALARM DIALING UNIT automatically calls police. Easy to program and easy to install. Immediate delivery $29.95. Free literature. S&S Systems, 5619-E. St. John, Kansas City, Mo. 64123. (816) 483-4612. 8/76

REPAIR TV TUNERS-High earnings, Complete Course Details, 12 Repair Tricks, Many Plans, Two Lessons, all for $2. Refundable. Frank Bocek, Box 3236, Ent., Redding, CA 96001. TF

ADVERTISING PACKAGE FOR TV service shops. Inexpensive eye catching ads contain personal message from you-build customer confidence. Keeps your name before the public weekly. PROVEN RESULTS. Thirty ads with instructions. $19.95. Sample $1.00 refundable. TV TIPS, 430 South Jefferson, Lebanon, Mo. 65536. 10-76

FOR SALE or TRADE: B&K 1077B, Television Analyst. Asking $400.00. Will take almost anything of equal value in trade. Bernard Eger, Box 75, BAFS, Baudette, MN 56623. 8/76

RCA factory service data for TV, radio, etc. for 1951-1964, preferably complete in binders for each file year. Also RCA sales spec sheets, any year to present. Carleton Sarver, 256 West 88th Street, New York, NY 10024. 8/76

SONY PARTS—Tuners, Cabinets, Antennas, Knobs, Speakers, Earphones, Switches, Pots, Components and Cheater Cords available at 50%-75% savings. All parts have been removed from new Trinitron color sets. Parts available for every Trinitron ever produced. Price list available. World Video, Inc., Box 117, Boyertown, Pa. 19512. 8/76

ELECTRONIC TEST EQUIPMENT FOR SALE. Reconditioned or repairable, from Aerospace Industry and DOD. $0.50 for catalog. James Walter Test Equipment, 2697 Nickel Street, San Pablo, CA 94806. 8/76

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COLLECT YOUR OVER-DUE BILLS—NO COLLECTION FEES. Unique, effective collection system. Satisfaction guaranteed. Free guide. Audit Controls, Inc., 103 Brookside Ave., Fair Lawn, NJ 07410. TF

LEARN BASIC DIGITAL TROUBLESHOOTING by correspondence. Information Free. Educational Technologies, Dept. ETD, Box 224, Reynoldsburg, Ohio 43068. 9/76

Heath Test Equipment: 5 MHZ Triggered Sweep Scope, $200. 2½ Digit DVM, $80. Color Bar Pattern Generator, $100. All calibrated and in excellent condition. Tom Henry, 5825 Bird Cage Street, Citrus Heights, CA 95610. 8/76

MOVING? BE SURE TO LET US KNOW YOUR NEW ADDRESS

TEST JIGS FOR COLOR TELEVISION SERVICING. A full line of yoke adaptors, convergence plugs, yoke CRT and convergence extension cables for all color test jigs. We also have focus power supplies and solid state matching transformer systems. Write for free catalog to: JEM ELECTRONICS, 5401 OXFORD AVE., PHILADELPHIA, PA 19124. 8/76

LINEAR AMPLIFIER for C.B., 2-meter, walkie-talkie. Tiny Solid-State Portable Unit produces 100 Watt PEP from Milliwatts and can be inserted inside existing unit. Build for about $20. Send $5.00 for plans to: J. Martin Peter, P.O. Box 07071, Milwaukee, WI 53207. 1/77

Sencore: UPS164 Power Supply 39G42 Module Master new condition $175.00. FS134 Field Strength Meter new/warranty $275.00. Nutone, 612 Range End Road, Dillsburg, PA 17019. 1-717-432-5918. 8/76

NEW ADJUSTABLE THREE OUTPUT REGULATED POWER SUPPLY, plus 900 parts worth $400.00 list. Solid state CARTRIVISION television recorder electronic unit. Schematics, parts cross reference HEATHKIT television transistor substitutions. Power CB radios. MICROPROCESSORS. $17.95 plus $3.50 S&H. USA. Free Brochure. MADISON ELECTRONICS COMPANY, INCORPORATED, Box 369, D88, Madison, Alabama 35758. 10/76

REPLACEMENT COLOR YOKES-DEALERS ONLY Zenith 95-2501-2532-2638-2667-S89633 etc. $14.95 Magnavox 361380-1 $13.95 etc. Sylvania, G.E. etc. $13.95 to $19.95. Request for price list on your letterhead. David Sims Enterprises, Inc., 71 Alpine Way, Huntington Station, N.Y. 11746. 8/76

READER SERVICE INDEX

ADVERTISER'S INDEX

This index is furnished for the readers' convenience. However, the publisher can not guarantee its accuracy due to circumstances beyond our control.

ELECTRONIC TECHNICIAN/DEALER TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 4 NEW SETS

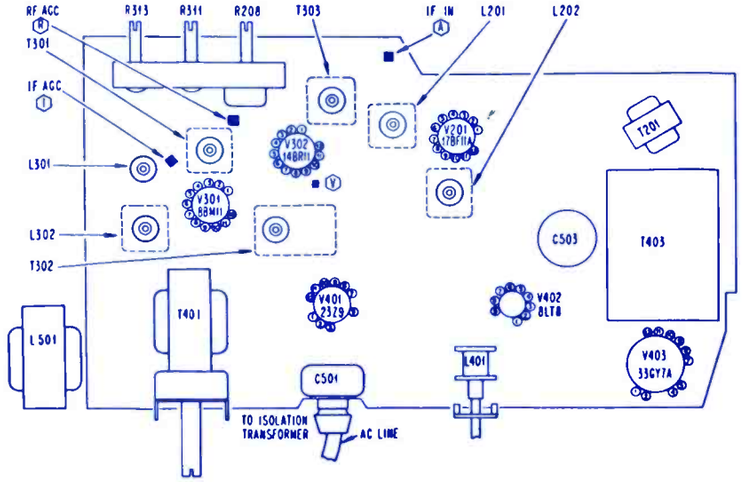
GROUP 288

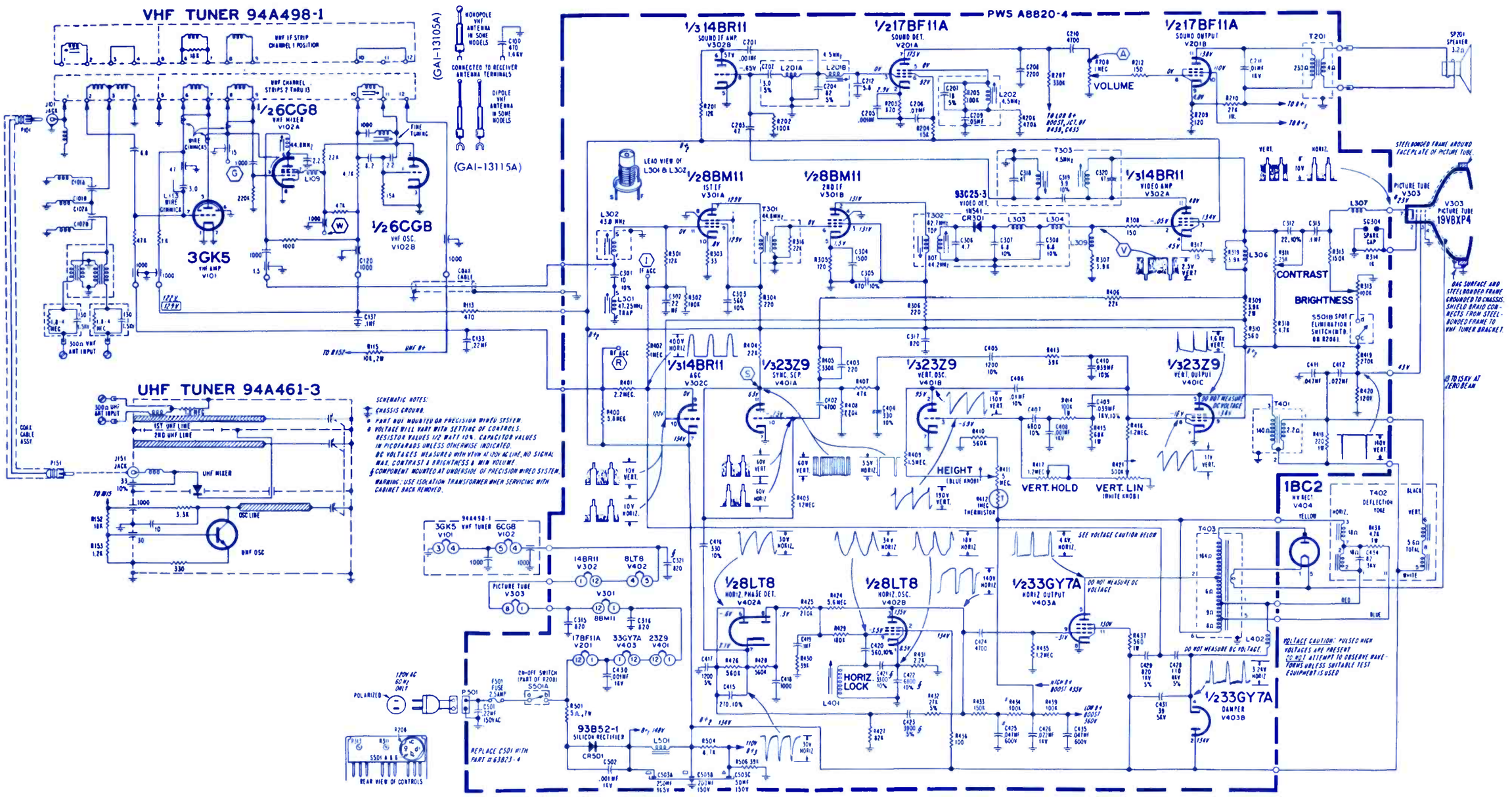
	SCHEMATIC NO.		SCHEMATIC NO.
AIRLINE B/W TV Chassis T35H4-2A, -2B	1653	GENERAL ELECTRIC B/W TV Chassis XA-2	1656
GENERAL ELECTRIC Color TV Chassis YM	1654	PANASONIC Color TV Chassis NMX-P3B	1655

1653

AIRLINE
B/W TV Chassis
T35H4-2A, -2B

AUGUST • 1976





1654
GENERAL ELECTRIC
Color TV Chassis
YM

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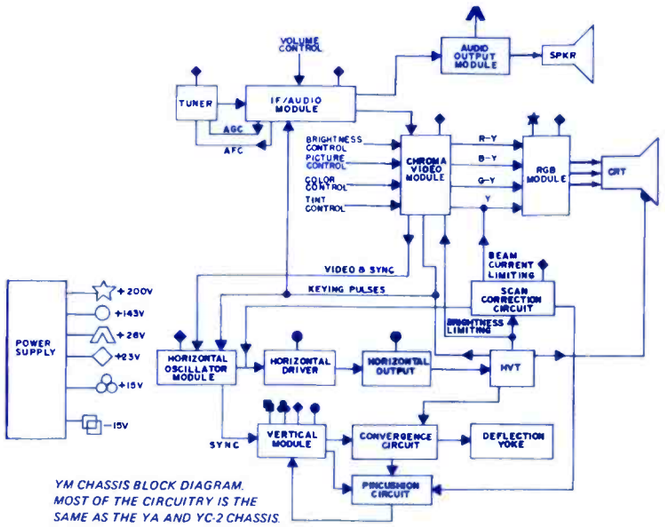
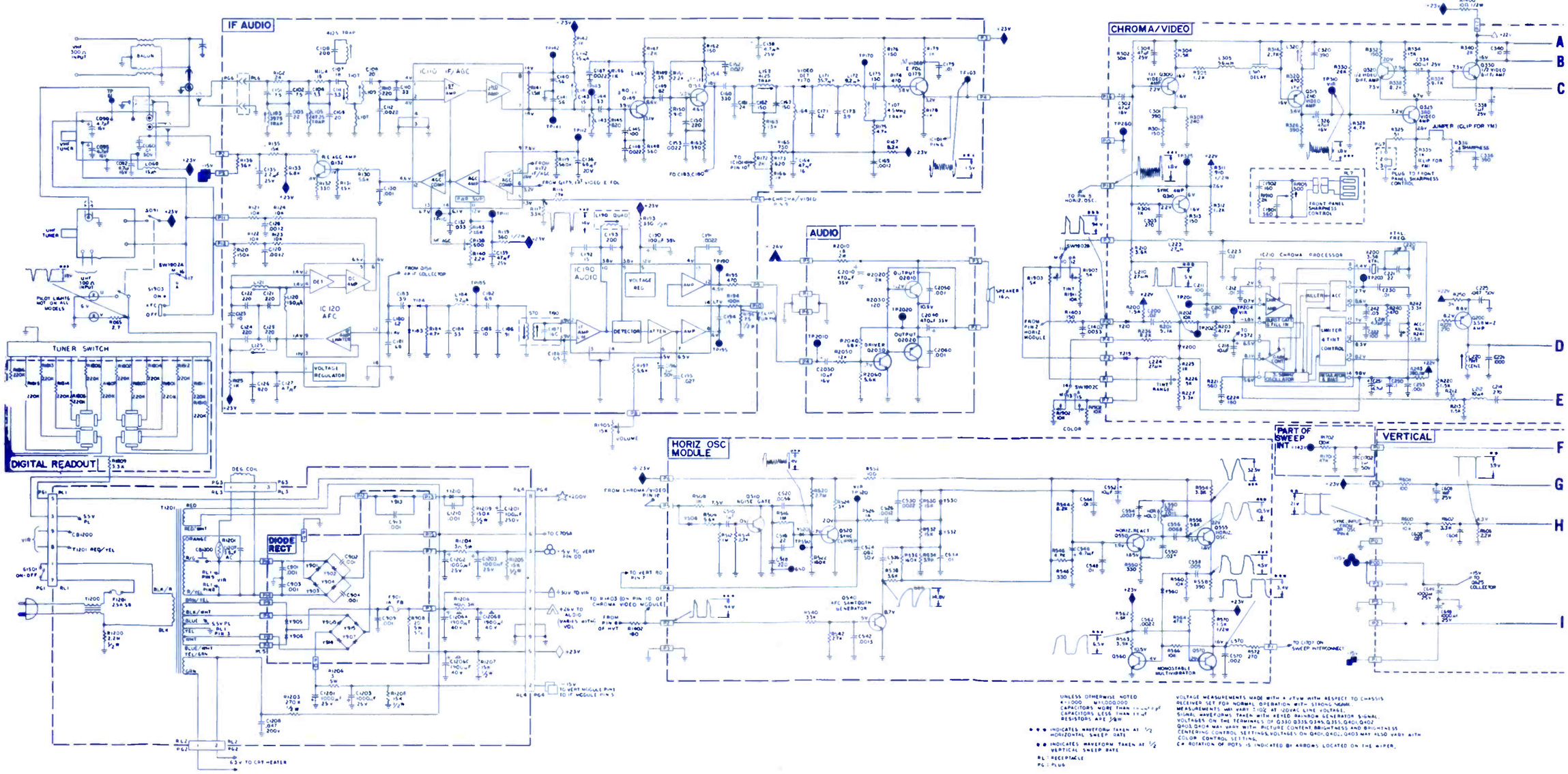
ELECTRONIC TECHNICIAN/DEALER TEKFAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 4 NEW SETS



YM CHASSIS BLOCK DIAGRAM. MOST OF THE CIRCUITRY IS THE SAME AS THE YA AND YC-2 CHASSIS.



UNLESS OTHERWISE NOTED
K = 1000 M = 1,000,000
CAPACITORS MORE THAN 1 pF
CAPACITORS LESS THAN 1 pF
RESISTORS ARE 1/4W

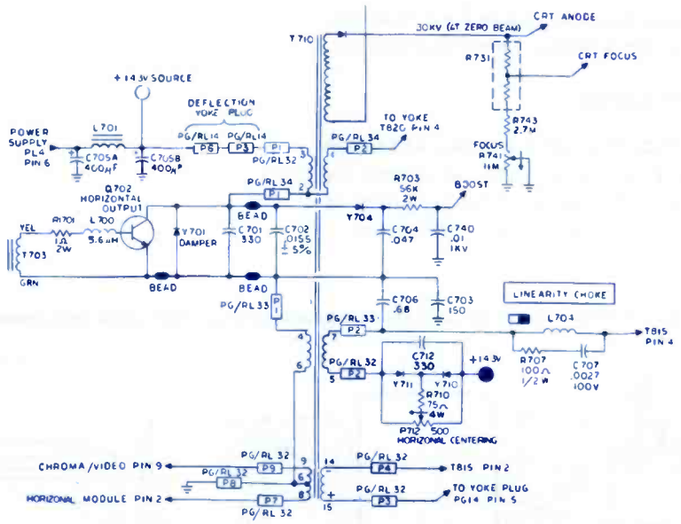
*** INDICATES WAVEFORM TAKEN AT 1/2 HORIZONTAL SWEEP RATE

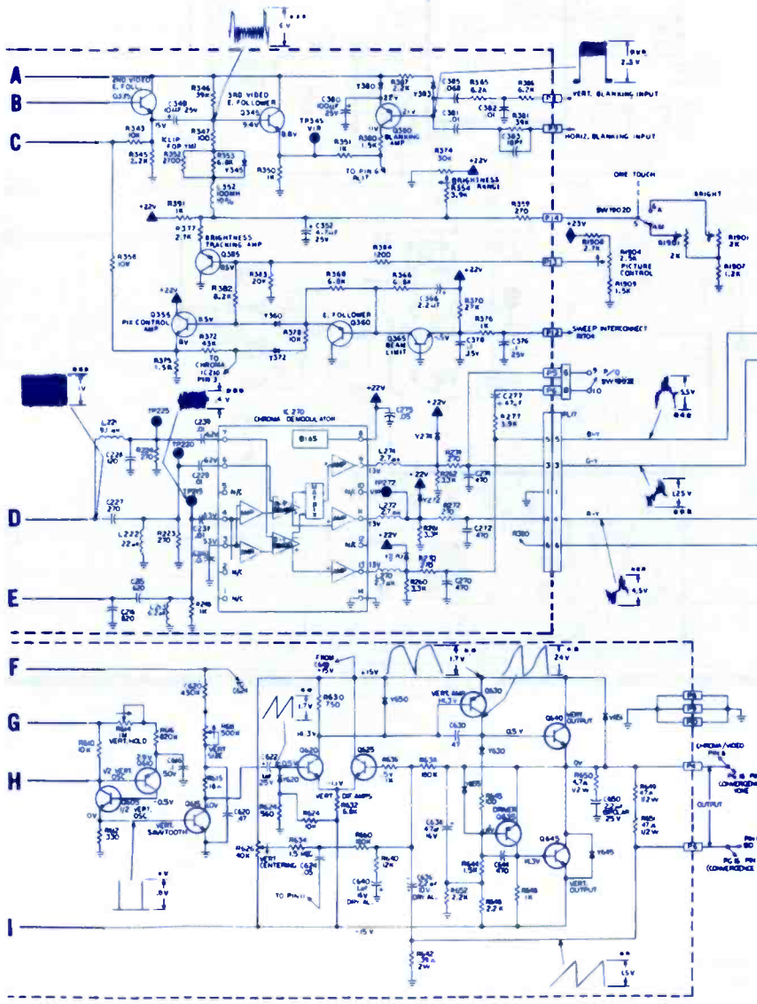
** INDICATES WAVEFORM TAKEN AT 1/2 VERTICAL SWEEP RATE

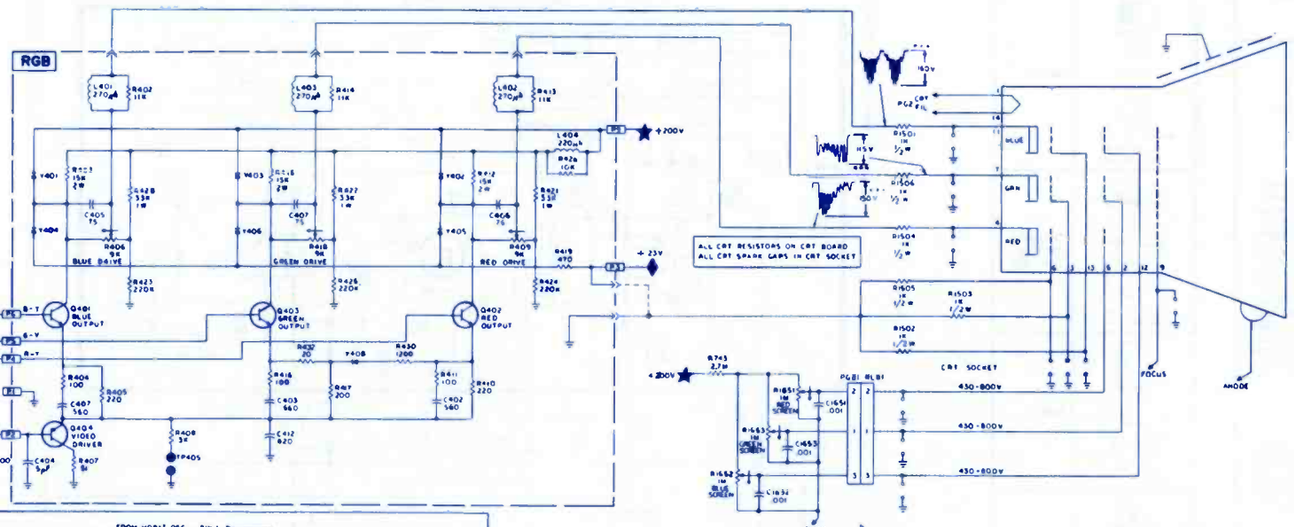
RL = RECEPTACLE
PG = PLUG

VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS
RECEIVER SET FOR NORMAL OPERATION WITH STRONG SIGNAL.
MEASUREMENTS MAY VARY ± 10% AT 120VAC LINE VOLTAGE.
SIGNAL WAVEFORMS TAKEN WITH KEYED RAINBOW GENERATOR SIGNAL.
VOLTAGES ON THE TERMINALS OF Q330 Q335 Q345 Q355 Q401 Q402 Q405 Q406 MAY VARY WITH PICTURE CONTENT BRIGHTNESS AND BRIGHTNESS CENTERING CONTROL SETTINGS. VOLTAGES ON Q401 Q402 Q403 MAY ALSO VARY WITH COLOR CONTROL SETTING.
C♣ ROTATION OF POTS IS INDICATED BY ARROWS LOCATED ON THE WIPER.

GENERAL ELECTRIC
Color TV Chassis
YM







1655

PANASONIC
Color TV Chassis
NMX-P3B

AUGUST • 1976

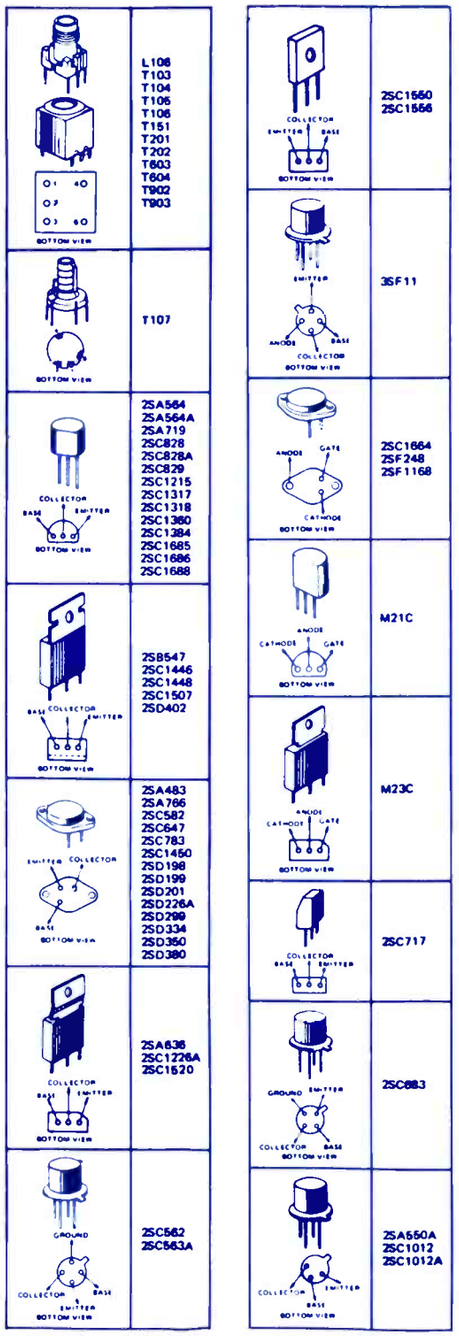
ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

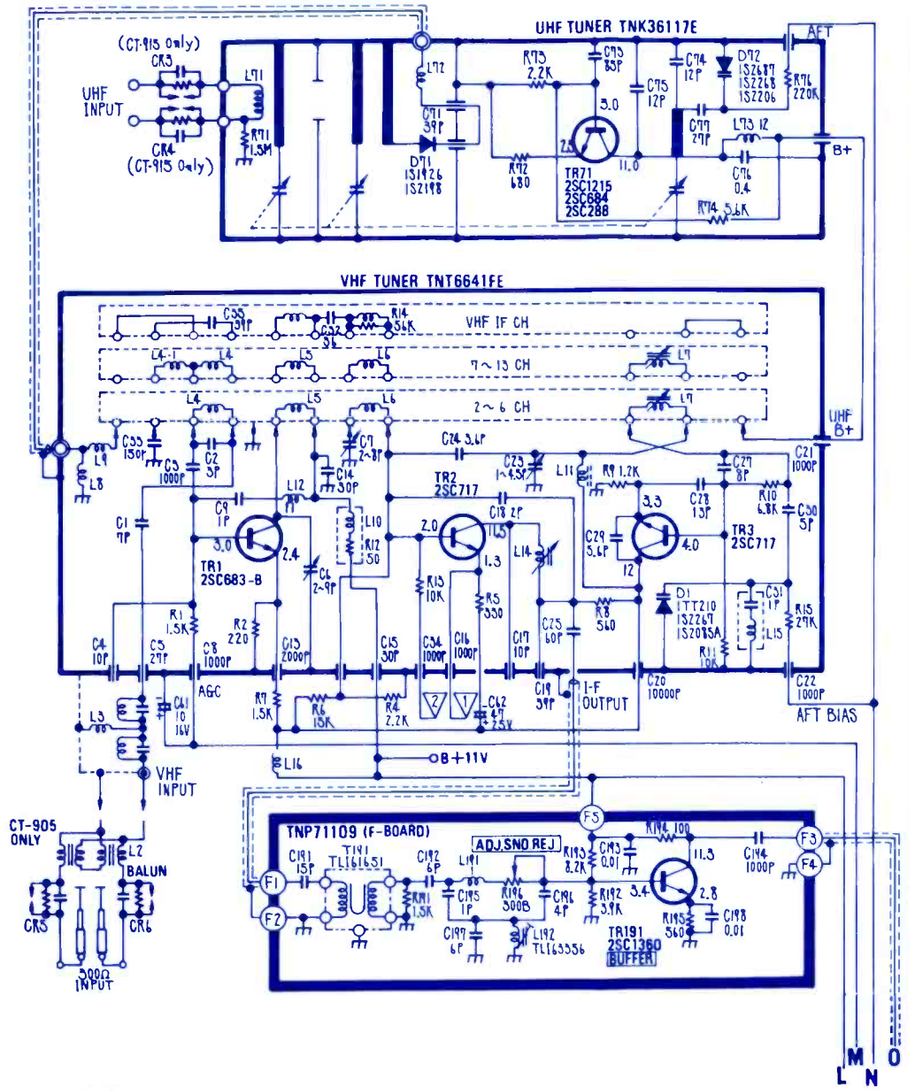
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 4 NEW SETS

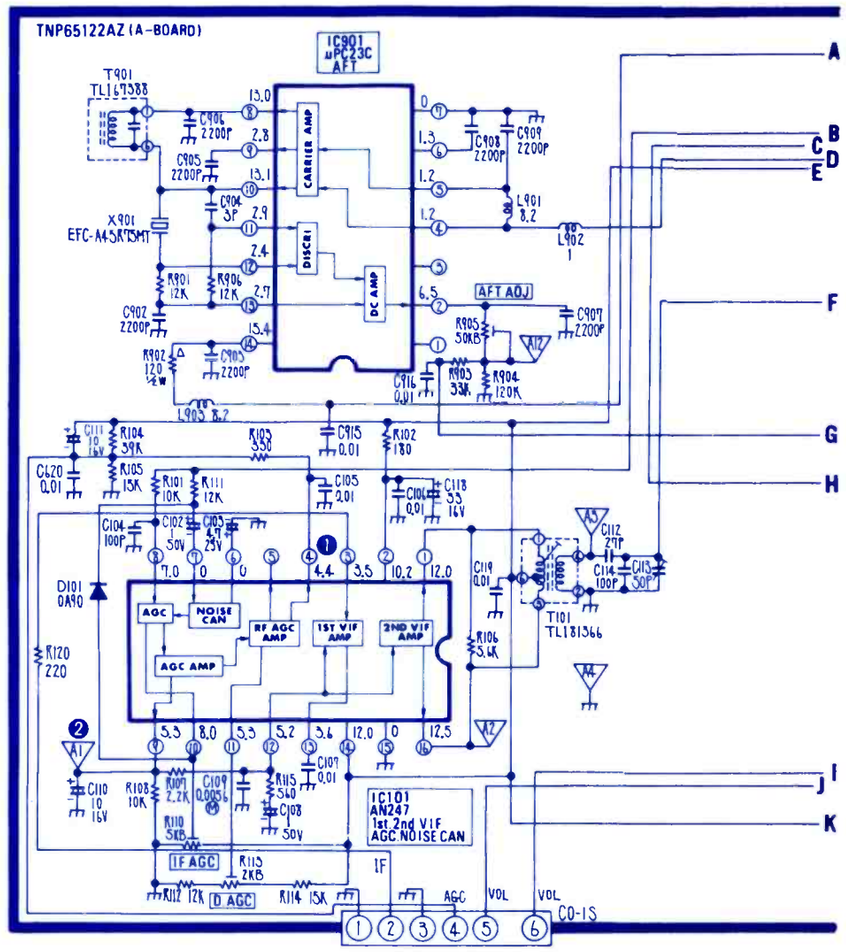
Note: * These three components are altered by the running change. It is essential that these three components are altered simultaneously, and if any of them is replaced, it should be replaced with the same type number of the component used.

IMPORTANT SAFETY NOTICE

THE SHADED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SHADED AREAS OF THE SCHEMATIC.





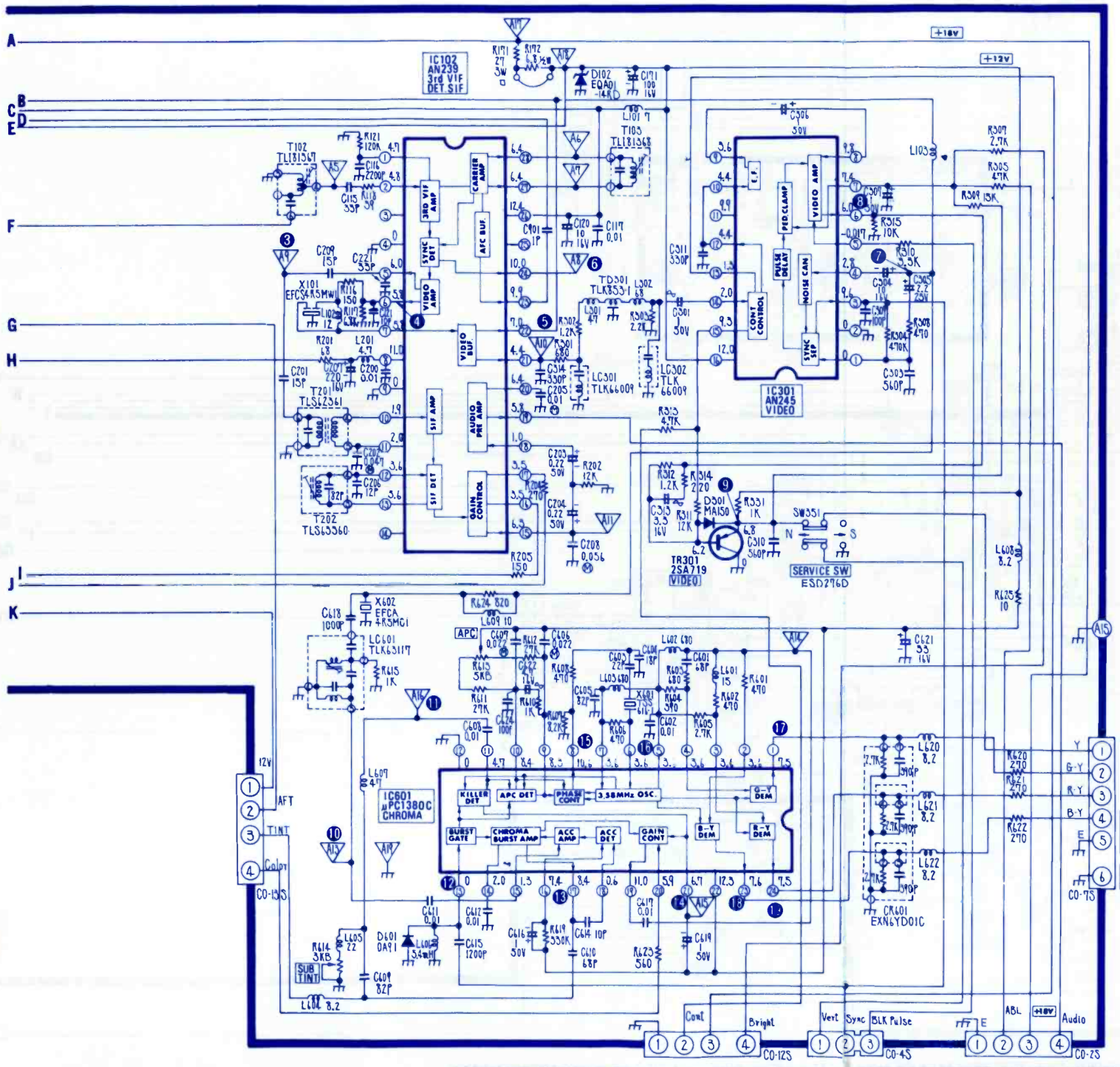


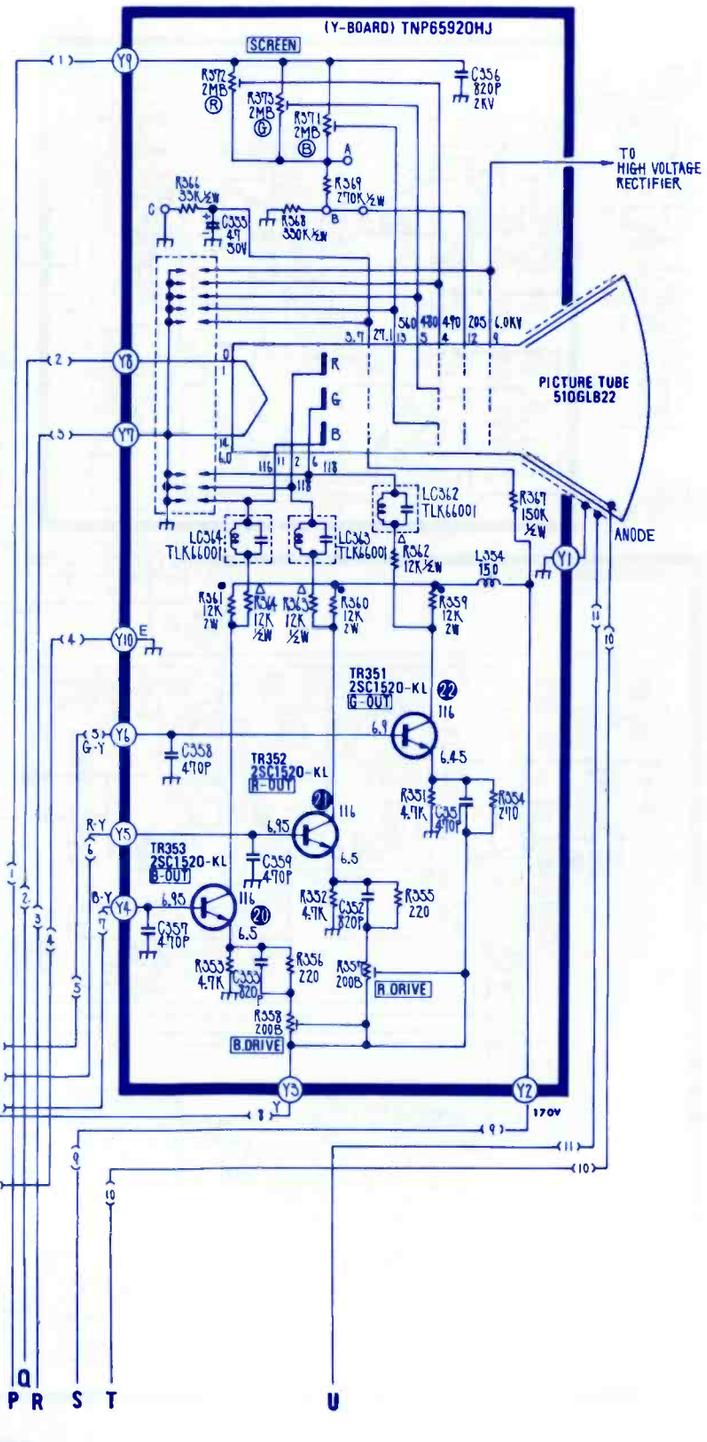
NOTICE

1. RESISTOR
   All resistors are carbon 1/4W resistor, unless otherwise noted the following marks.
   Unit of resistance is OHM (Ω). (K : 1,000, M : 1,000,000)
   △ : Solid resistor
   ● : Metal oxide resistor
   □ : Wire wound resistor
   ~W~ : Thermistor
   ~W~ : Fuse resistor
2. CAPACITOR
   All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks. Unit of capacitance is uF, unless otherwise noted.
   M : Polyester capacitor
   S : Polystyrene capacitor
   ⊣⊢ : Electrolytic capacitor
3. COIL
   Unit of inductance is uH.
4. TEST POINT
   ▽ : Test point position. (TPA2)
5. VOLTAGE MEASUREMENT
   Voltage is measured by a volt ohm meter with DC 20K OHM/V receiving color bar signal, when all controls are set to the maximum position.
6. Number in red circle indicates, waveform number. (See main manual.)
7. When arrow mark (↗) is found, connection is easily found along with the direction of an arrow.
8. When schematic diagram of a board is described in more than two places, they are encircled with dotted line —·—

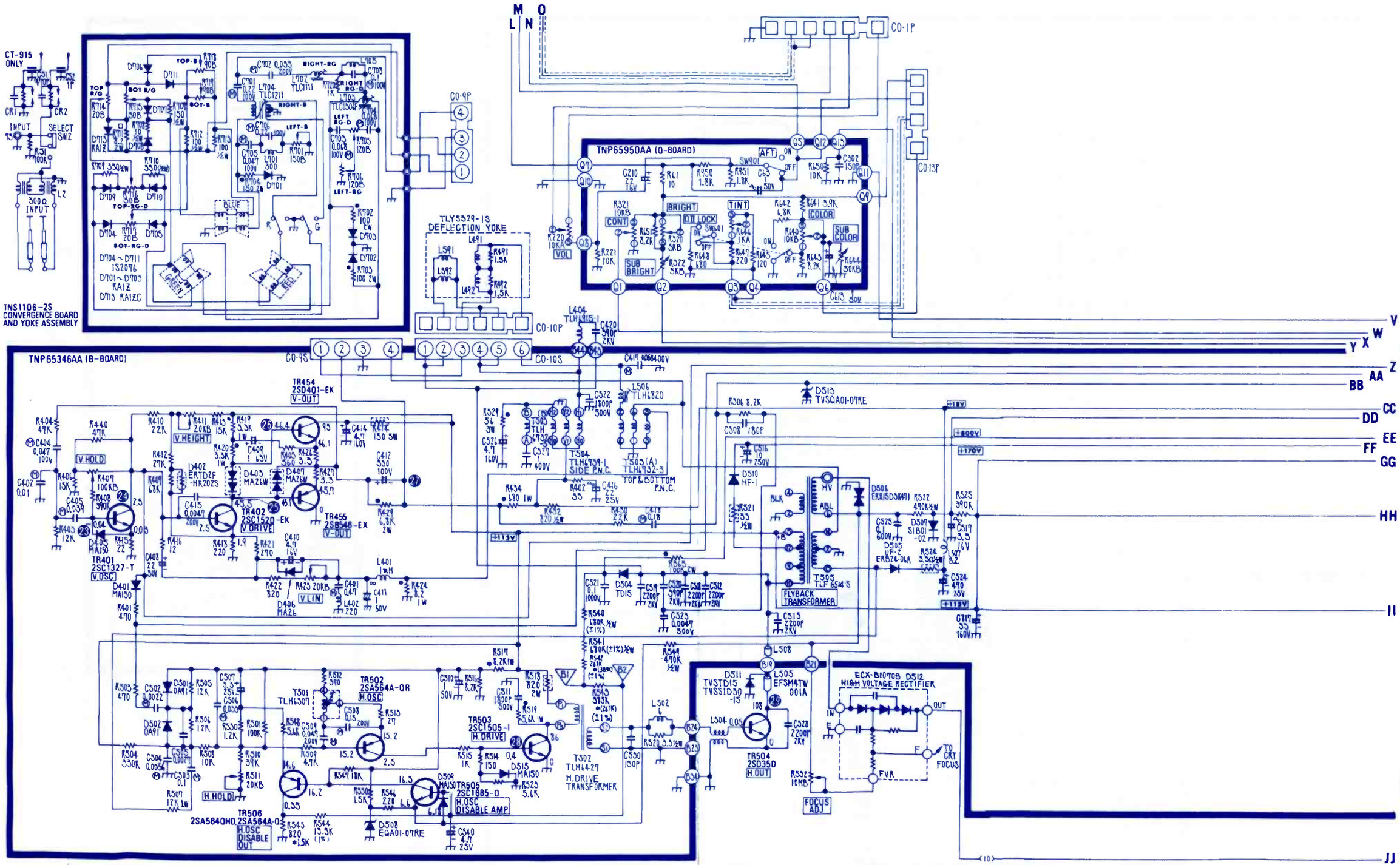
ADDITIONAL INFORMATION NEXT PAGE

PANASONIC
Color TV Chassis
NMX-P3B

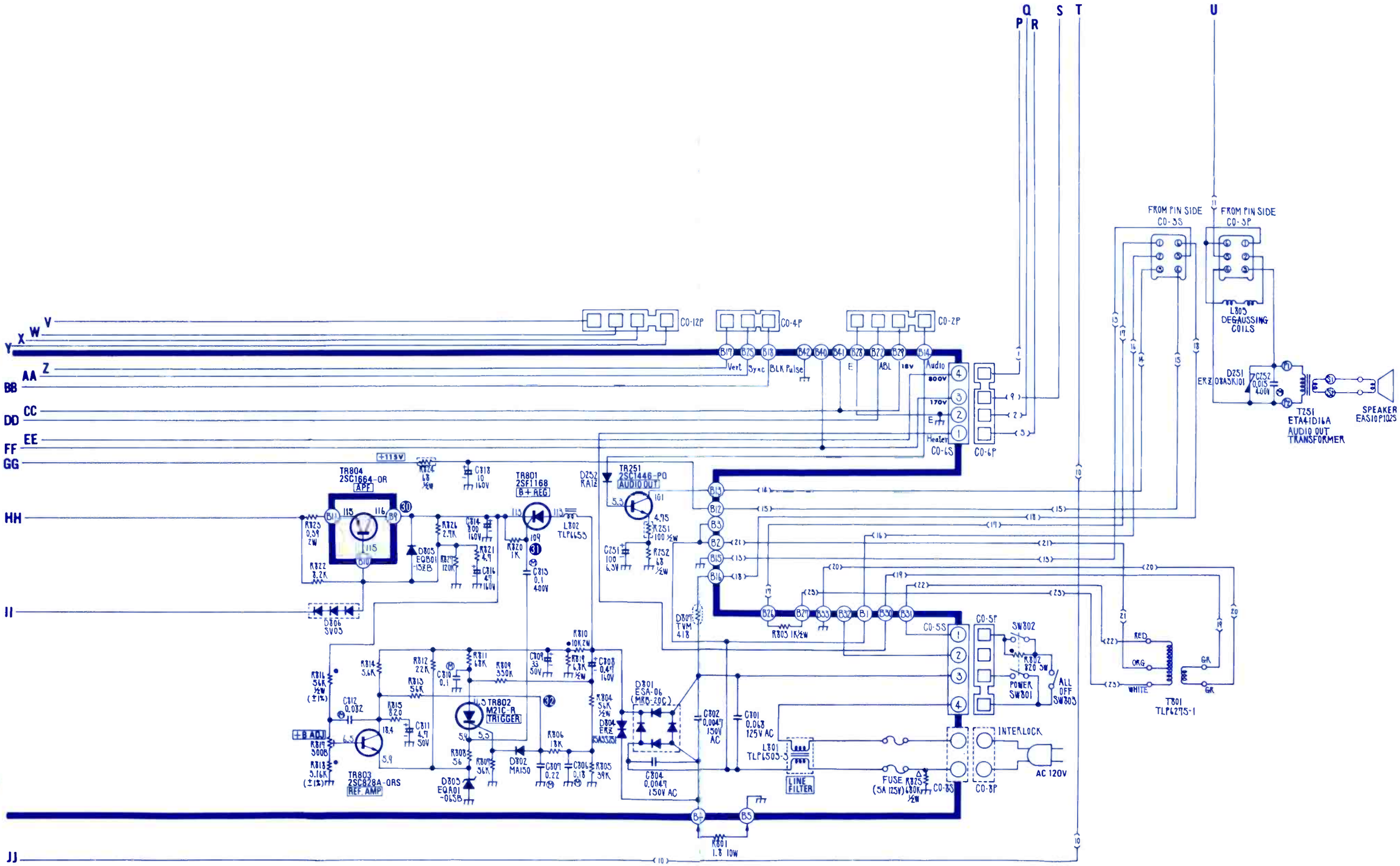




PANASONIC
Color TV Chassis
NMX-P3B



PANASONIC
Color TV Chassis
NMX-P3B

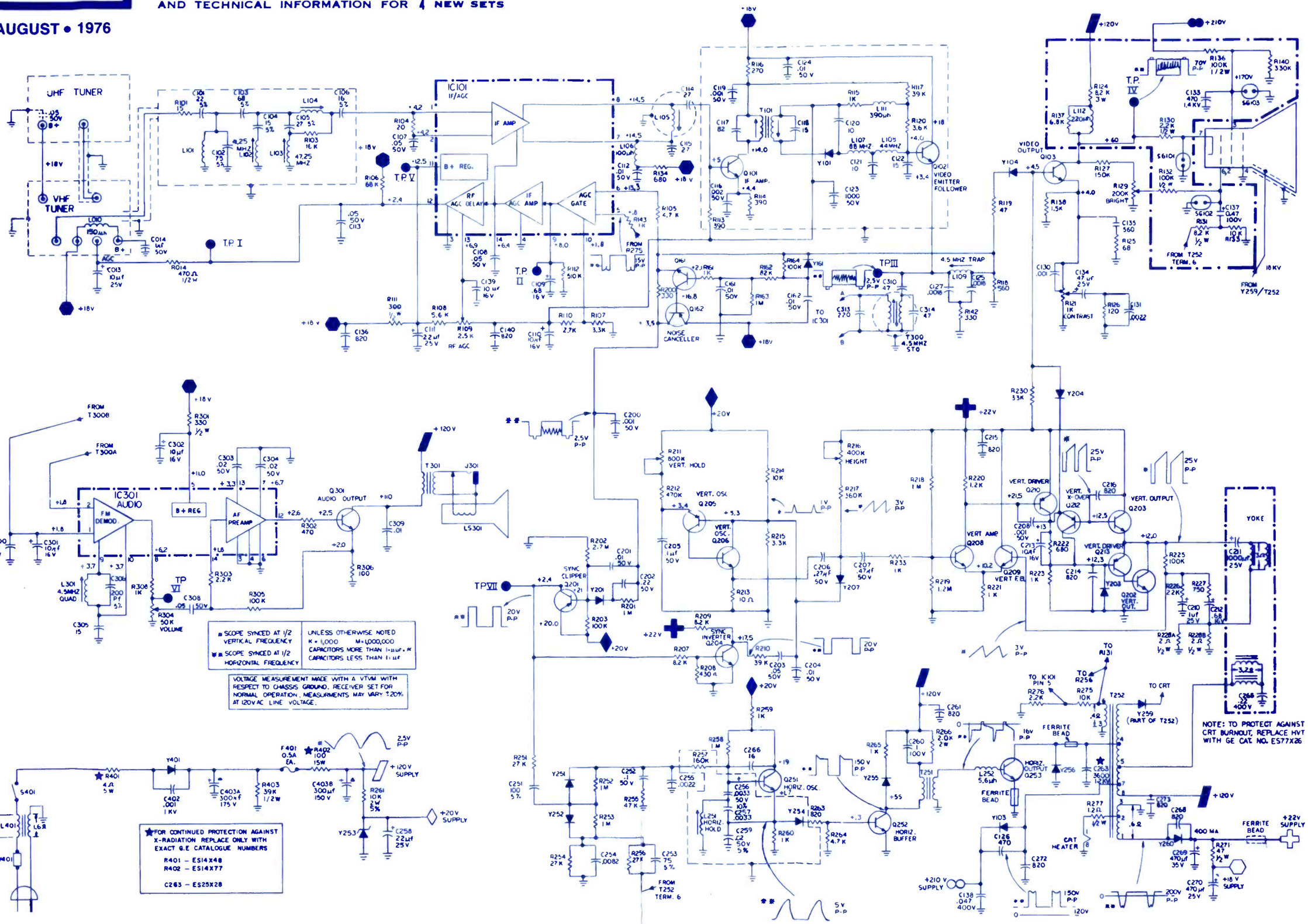


1656
GENERAL ELECTRIC
B/W TV Chassis
XA-2

ELECTRONIC TECHNICIAN/DEALER TEKFAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 4 NEW SETS

AUGUST • 1976



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