'76 NESDA Convention August 13-17
(Agenda in this issue)

Troubleshooting TV Sync Separators
Distortion In Car Radios
State Of The Art Of FM Detectors
CB Theft Prevention: A New Dealer Aftermarket
NEWCOM Wrapup Report
From the beginning, our goal has been to provide the best tuner service—never the cheapest. You get what you pay for in business and tuner service is no exception. The extra dollar you might pay at PTS is peanuts when you consider the added reliability and the standards of excellence we apply to every job. Thousands of PTS customers must agree or we wouldn’t be the world’s largest tuner service company.

When you are comparing tuner service companies, price alone doesn’t tell the story.

SAME DAY SERVICE • ORIGINAL PARTS • ONE YEAR GUARANTEE

WE REPAIR THEM ALL . . . COLOR, BLACK & WHITE, TUBE, TRANSISTOR OR VARACTOR . . . ANY MAKE OR MODEL.

VHF or UHF . . . $10.95     UV-Comb. . . . $17.95
(MAJOR PARTS AND SHIPPING EXTRA — DEALER NET)

PTS ELECTRONICS, INC.
PRECISION TUNER SERVICE
General Headquarters: P.O. Box 272, Bloomington, IN 47401

THE COMPLETE LIST OF ALL PTS SERVICE CENTERS APPEARS ON THE NEXT PAGE.

...for more details circle 102 on Reader Service Card
THE COVER: The National Electronic Service Dealer Association (NESDA) is staging its annual convention this year, August 13-17, at the Palacio del Rio Hilton Hotel and the Convention Center in San Antonio. A full schedule of business meetings, banquets and seminars is planned (see Page 26) with a lot of fun events included. Our cover this month is a photo taken during a seminar at last year's convention.

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JULY 1976 • VOLUME 98 NUMBER 7
August Is NATESA & NESDA Convention Time—Give Yourself A Tax-Deductible Vacation By Attending Either Or Both Conventions

The National Alliance of Television & Electronic Service Associations (NATESA) and the National Electronic Service Dealers Association (NESDA) will be holding their annual conventions next month.

If you have not already taken your summer vacation and have not yet committed yourself to definite, unalterable vacation plans, we at ETiD suggest that you give serious consideration to including one or both of the national electronic service association conventions in your vacation itinerary.

You don’t have to be a member to attend either convention. And, in addition to the obvious benefits of being able to meet and “compare notes” with other owners and managers of electronic sales and service businesses from throughout the nation, your transportation costs to and from the conventions and most of your other convention expenses will qualify as legitimate tax-deductible business expenditures.

NATESA’s annual convention is being held Aug. 19-22 at the Pheasant Run resort complex in St. Charles, Illinois, a picturesque river town on Illinois Route 64 about 25 miles west of downtown Chicago. (For those traveling by air, seven-times-per-day limousine service is available between Chicago’s O’Hare Airport, the Chicago Loop area and Pheasant Run.)

The Pheasant Run resort complex, which also was the site of the NATESA Convention last year, offers a full range of indoor and outdoor recreational activities, including golf on a championship course, tennis, horseback riding, indoor/outdoor swimming, and a variety of dining and “evening recreational” facilities (including a dinner theatre and an “indoor Bourbon Street”)

The registration fee for the four-day NATESA Convention is $25 per person and includes the costs of the convention banquet/floor show, all “sponsored” convention meals, refreshments, hospitality suites and business meetings and seminars. The special daily room rate at Pheasant Run for NATESA Convention attendees is $32 for single or double accommodations.

Complete details about NATESA Convention activities and registration can be obtained by writing or calling Frank Mock, Executive Director, NATESA, 5908 S. Troy St., Chicago, IL 60629 (phone: 312-476-6363).

NESDA’s annual convention, which is being held this year in conjunction with the annual conventions of the International Society of Certified Electronic Technicians (ISCET) and the Texas Electronics Association (TEA), is scheduled Aug. 13-17 at the Palacio del Rio Hilton Hotel and the San Antonio Convention Center in San Antonio, Texas.

A complete agenda of the activities scheduled for the joint NESDA/ISCET/TEA Convention appears on pages 26 and 27 of this issue. (Because the NESDA Convention will take place before some of our readers receive their August issue of ETiD, we decided to publish the agenda for it in this issue. Conversely, because the NATESA Convention is scheduled later in August, after all ETiD readers should have received their August issues, a complete agenda of NATESA Convention activities will be published in the August issue.)

The registration fee for the NESDA/ISCET/TEA Convention is $40 per person and includes the costs of all activities listed in the schedule of events in this issue, with the exceptions of the registration fees for the “Profitable Service Management” seminars—which are $20 for NESDA members and $30 for nonmembers—and the entry fee for the NESDA Open Golf Tourney, which is sponsored this year by ETiD Magazine. Daily rates at the Palacio del Rio Hilton are $27 for single and $38 for double accommodations.

Other “optional” activities scheduled for the NESDA/ISCET/TEA Convention include a tour of the WW II Air Museum in nearby Harlingen, Texas, and a special post convention side trip on Aug. 18 or 19 to the beautiful Palo Duro Canyon area near Amarillo, Texas, during which tour members will attend a Texas barbeque and musical drama in the canyon’s natural amphitheater and, while in Amarillo, will visit the Tech Spray Company, whose president, Dick Pavek, will be your own special host on this post convention side trip.

Additional information about NESDA Convention activities and registration can be obtained by writing or calling Dick Glass, Executive Vice President, NESDA, 1715 Expo Lane, Indianapolis, IN 46224 (phone: 317-241-8160).

Details about the Palo Duro Canyon/Amarillo post-convention tour can be obtained by writing to Dick Pavek, President, Tech Spray, P.O. Box 949, Amarillo, TX 79105.

If you decide to include one or both of the national electronic service association conventions in your vacation plans—or make either or both your complete vacation—I can assure you that you will not only broaden and enrich your knowledge of what profitable servicing is all about, but you and your family will also enjoy yourselves and meet a lot of warm and friendly people in the process—plus you’ll save a bit of vacation expense because much of your cost of attending the conventions will be tax-deductible.

We at ETiD hope to see you at either the NATESA or NESDA convention, or at both if you have the time.

J.W. Phipps
IN 1970, WE SAID WE WERE GOING TO TAKE OVER IN DIGITAL VOLTMETERS.

At the time, it was not an industry-shaking announcement. In fact, there were a few laughs from our competitors.

Technology-for-technology was still king and everybody bought all the digits, resolution, accuracy and features they could squeeze out of their budget.

We listened. We made some predictions.

A change was on the way.

While our competitors were touting bigger and bigger boxes and more and more digits, we were designing the new DVM for a different electronics industry.

A little while later, we introduced the Fluke 8000A digital voltmeter.

In 1972, it seemed awfully small in comparison to our competitor's behemoths. It only had 3 1/2 digits. It looked different.

The industry's reaction caught everyone by surprise.

Except us.

You could say the Fluke 8000A is just now getting its legs and becoming the performer we always intended it to be.

It's had to. Because of our foresightedness, a whole new segment of the DVM market emerged. Suddenly, everyone was building a low-cost DVM.

Others now ask you to compare them to us.

But they're sort of selective about what they ask you to compare.

Problem is that the average DVM lets you down in one performance area or another.

Not the Fluke 8000A.

It's got overload protection for all ranges. Twenty-six ranges of volts, amps and ohms. Common mode rejection of 120 dB with an unbalance resistance of one kilohm. Auto zero. The best accuracy statement of any 3 1/2-digit DVM—0.1% accuracy±1 digit.

It also performs, day after day. We'll guarantee one year of accuracy on all key parameters. Every unit comes with a one-year, no-nonsense warranty. If something does go wrong, we've got over 30 Fluke service centers that'll guarantee quick turnaround on your repairs.

And while those other DVM's have been scurrying to catch the 8000A, we've been improving and adding important, new options. Options that add additional measurement capability to the basic 8000A. There's a low-ohms model with 0.001-ohm resolution. A high current model for measurement up to 20 amps. A milliamp-second model. An analog meter model for peaking and dipping measurements. A high voltage probe for 1 KV to 40 KV measurements, RF probes for ac measurements to 500 MHz, a clamp-on ac current transformer for 2 to 600 A measurements, rack mount kits, test lead kits, dust covers and carrying cases.


There's a reason the 8000A is the world leader in DVM sales.

And to all those people out there who are claiming this and that about which DVM you should own, ask them why the 8000A leads in sales at $299.*

They won't laugh it off.

For data out today, dial our toll-free hotline, 800-426-0361.

John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace, WA 98043

Fluke (Nederland) B.V., P.O. Box 5053, Zevenheuvelenweg 53, Tilburg, Netherlands. Phone: (013) 673-973 Telex: 52237

*Domestic price only.
Introducing the RCA Color TV Test Jig Adapter.

Now you can update your older test jig—or make your own—to service most color TV consoles including sets of 45 different brands, whether tube, hybrid or solid state. The RCA Color Test Jig Adapter 10J107 offers you the same key feature as the RCA Color Test Jig 10J106: the unique horizontal and vertical matching transformer with rotary selector switches. With them, you can match impedances to a wide range of TV receivers with just a single test jig. And do so without the need for transformer adapters and plug-in switch units.

The RCA Color Test Jig Adapter comes with a Low-Impedance Deflection Yoke, Yoke Extension Cable, Ground Lead and Test Jig Yoke Cable. Imagine the increased profits you can gain for only the small optional user price of $89.00.

CB Manufacturer Predicts End of CB Boom In One Year

The "Boom-type" growth of CB radio will end in 1977, and sales will stabilize to around 15 million to 18 million sets per year, according to a prediction made by William I. Thomas, president of the Pathcom Corporation. In a statement to the company's stockholders, reported in Electronic News, Thomas said Pathcom "is diversifying into marine and business two-way radio equipment to prepare for an end to the explosive growth of the past 4 years and to hedge against price pressure." He said "he expects that sometime this summer supply will come into balance with demand, and as supplies become more plentiful this fall we will probably have several people drop out of the CB radio business."

Self-adjusting Color Is Major Promotion Point of Three Of The Top TV Set Manufacturers

Three of the major TV set manufacturers—GE, RCA and Sylvania—have included varying forms of automatic color control in their 1977 TV lines, and are utilizing this feature in their major promotional efforts.

GE calls its new feature VIR (vertical interval reference) and has included the feature in five of its 1977 color sets. "These broadcast-controlled color sets sense a color-reference signal used until today only by broadcasters," said Fred R. Wellner, general manager of GE's Television Business Department. "GE's broadcast-controlled sets now complete the chain from studio to home by sensing when the VIR signal is present; decoding the color intensity and tint information; and automatically producing a broadcast-adjusted color picture," Wellner explained.

RCA's automatic color control system—ColorTrak—was introduced last fall in eight of their console models. This year ColorTrak is now included in 18 RCA consoles and 8 table models. In an advertising campaign recently announced (from TV Digest), RCA offers a simplified explanation of how ColorTrak works, "Before you see the color, the ColorTrak system grabs it, aligns it, defines it, sharpens it, tones it and locks the color on track."

Sylvania has actually included a "self-adjusting color" feature in their TV lines for the past four years. Called "GT-Matic", the control system has now been included—as of this year—in Sylvania's complete color line. According to a report in TV Digest, the firm is
Introducing your opportunity to name it.

We need a name for the new RCA Color Test Jig Adapter and you can be the one to give it to us. It's simple for you to win this beautiful RCA 25" ColorTrak Console TV model GA 708 by coming up with the winning name. There are 2 second place prizes—RCA ColorTrak Table TV model FA 475, and 10 third place prizes—Skil Cordless 3/8" Reversing Drills and Screwdrivers.

There's nothing for you to buy and you may submit as many names as you like, but each name must be on a separate entry. Your RCA Test Jig Distributor has all the details, including the entry forms you'll need for all the names you're probably thinking of. Get in touch with him and enter the contest today.

RCA Distributor and Special Products Division

...for more details circle 125 on Reader Service Card

"promoting its 4-year-old GT-Matic and newer GT-Matic by claiming it accomplishes more than others and calling its two competitors "Johnny-come-latelies" in the automatic color field."

All three firms—GE, RCA and Sylvania—indicate that their "automatic color control" features are part of an effort this year to capture the replacement TV sales market, which, according to TV Digest, is estimated at from 33 to 50% of the color TV market.

Fantastic Growth Of CB Is Reflected In Number Of Licenses Granted

In a memo to its distributor members, the Electronic Industries Association (EIA) uses the FCC's monthly CB application reports to indicate the rapid growth of the CB market, pointing out that because of the number of unlicensed operators, multiple sets operating under the same license, etc., the actual volume of new CB sets sold is probably a lot larger. Still, as the Memo says, the FCC monthly figures may "indicate the current status and trends in the marketplace."

According to the Memo, the FCC reported 378,066 CB licenses granted in 1974, compared to 1,727,000 in 1975. A total of 1,040,048 licenses existed in 1974, compared to 2,659,000 in 1975. And to show the ever-increasing growth of applications, here is a comparative breakdown of CB applications in the first three months of 1975 and the first three months of this year:

<table>
<thead>
<tr>
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<th>JANUARY</th>
<th>FEBRUARY</th>
<th>MARCH</th>
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<tr>
<td>1975</td>
<td>73,000</td>
<td>62,000</td>
<td>146,000</td>
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<tr>
<td>1976</td>
<td>515,000</td>
<td>476,000</td>
<td>566,000</td>
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On-The-Job Training In Electronics To Be Available to 600 Jobless Or Underemployed People

In a continuation of a cooperative program with industry, the International Union of Electrical, Radio and Machine Workers is arranging on-the-job training for 600 jobless or underemployed people in 19 states, according to an announcement from Assistant Secretary of Labor William H. Kolberg. Companies with which the IUE has collective bargaining arrangements will train these people for jobs—both entry-level and advance—in electronics, electrical and allied manufacturing. Wages will range from $2.50 to $5.50 per hour.
TECHNICAL LITERATURE

A New Solid State Replacement Guide that cross references more than 112,000 domestic and foreign solid-state devices can be replaced by 313 RCA SK semiconductors is now available from RCA. The guide also features an index of RCA SK-Series semiconductors and accessories, significant characteristic and application information which specifies areas of operation and capability of specific RCA types, line drawings of dimensional outlines and terminal arrangements and a listing of mounting hardware. The 160 page book—SPG-209S—costs $1.00 at RCA distributors or from RCA Distributor and Special Products Division, P.O. Box 85, Runnemede, N.J. 08078.

New CB Filters and Communications Accessories are described in a new brochure available from Bell Industries. The filters described have been designed to eliminate or greatly reduce virtually any type of interference that CB operators might encounter. Included are high pass, low pass, audio interference, power line and TV set antenna filters, and alternator and generator suppressor kits. A selection of connectors, plugs and cable assemblies to facilitate easy installation also is described. It's free from Operations Manager, Bell Industries, W. Miller Division, P.O. Box 5825, Compton, California 90224.

How To Reduce Impulse Noise in CB Transceivers was the subject of a recent presentation of an E. F. Johnson Company executive before the 1976 Automotive Engineering Congress. In his presentation, John W. Foster outlined how a manufacturer of two-way radio communications equipment copes with the problem of electrical impulse noise. He noted that noise is undesirable because it reduces communication range, annoys the listener, induces operator fatigue and creates dissatisfaction with the product. Copies of Foster's presentation—Paper No. 760277—are available free from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096.

A Catalog of Quick-Disconnect Hardware that provides examples and diagrams for the easy use and ordering of terminal boards, terminated circuits, and other quick-disconnect hardware, is now offered by Keystone Electronics. The new catalog—No. 794—is designed primarily for manufacturers and users of this type of hardware. Available free from Keystone Electronics Corp., 49 Bleecker Street, New York, N.Y. 10012.

Electronic Test Accessories, such as molded banana plugs, molded patch cords, cable assemblies, test socket adaptors, space molded accessories, mold test leads, connecting leads and IC test clips, are illustrated and described in a new 25th Anniversary catalog from ITT. Special charts cover the IEEE index of cross index of cross reference guide, part number and wire description, and an alphabetical and numerical index. Available free from ITT Pomona Electronics, 1500 E. 9th St., Pomona, Calif. 91766.


An Associate CB Dealer Member program of the Communications Equipment Distributors Association (CEDA) is described in a new brochure being distributed to retailers of CB radio equipment. The brochure highlights the benefits of CEDA membership such as special publications, training programs, seminars and clinics. Also described is the CEDA Clearing House, a program now being developed to act as a mediating andombudsman service, working with other industry associations. The brochure is free from CEDA, P.O. Box 1118, Carbondale, IL 62901.

Electronic and Electric Connecting Devices, and other products for terminating, splicing and programming circuits are illustrated and described in the 1976 edition of quick reference guide from Amp Special Industries. The 24-page catalog is available free from Amp Special Industries, P.O. Box 1776, Paoli, Pa. 19301.

Electronic Test Instruments are illustrated and described in full detail with specifications in a new 40-page catalog available from B & K Precision. The full line of the company's test
Cash in on the booming CB repair business. Get your Mallory big profit package now.

It's an introductory offer with an unbeatable combination.
A huge assortment. With the Mallory CB parts replacement package, you can service the electronics in almost every type of CB radio made. Because, unlike limited-coverage programs, you get more than 370 of the most commonly used semiconductor and other replacement parts.
And a hefty discount off column pricing. Which can add up to a whopping profit in CB repair — up to 25 times the cost of the parts to you.
Plus, free Mallobin® cabinets, the great space-saving organizers — seven rugged plastic 15-drawer units with each Mallory CB package you buy. And a free CB Component Cross-Reference booklet covering the semiconductors and controls used by the major manufacturers of CB radios.
What a deal for a very modest investment. Under $200, in fact. It's a profit opportunity you just can't afford to pass up.
Act now. Fill in and mail the coupon today.

TO: Dept. 102, Mallory Distributor Products Co. Box 1284, Indianapolis, IN 46206
☐ I want to take advantage of your introductory offer now. Send one complete CB replacement package through my Mallory distributor. It is my understanding that I will be billed by my Mallory distributor.
☐ Send more information on the Mallory CB profit package.

Name ___________________________
Company ___________________________
Address ___________________________
City __________________ State ______ Zip ______
Telephone ___________________________

MALLORY DISTRIBUTOR PRODUCTS COMPANY
Division of P. R. MALLORY & CO. INC.
Box 1284, Indianapolis, Indiana 46206. Telephone: 317-868-3731
Batteries & Capacitors & Controls & Security Products & DURATAPE® & Resistors & Semiconductors & SONALERT® & Switches & Fastening Devices DURATAPE® and SONALERT® are registered trademarks of P. R. Mallory & Co. Inc.
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Whatever your transformer requirements, there's a Triad transformer to satisfy them exactly. Triad manufactures one of the most complete lines in the industry — including power, audio and filament transformers, filter chokes, width and linearity, vertical outputs, blocking oscillators, deflection yokes, flybacks and more. And they're all available worldwide. Write Triad today for your free catalog.

American Technology Corporation
225 Main Street, Dept. 78, Canon City, Colorado 81212

...for more details circle 101 on Reader Service Card
PHENOMENAL BREAKTHROUGH
IN UHF RECEPTION!

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.

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.

<table>
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<tr>
<th>SPECIFICATIONS</th>
<th>AC-4990</th>
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<tr>
<td>GAIN</td>
<td>17.5db</td>
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<tr>
<td>UHF</td>
<td></td>
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<tr>
<td>BANDPASS (MHZ)</td>
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<tr>
<td>VHF-FM</td>
<td>54 to 216</td>
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<tr>
<td>UHF</td>
<td>470 to 890</td>
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<td>MAX. TOTAL OUTPUT (Volts)</td>
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<tr>
<td>MAX. TOTAL INPUT (Volts)</td>
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<td>NOISE FIGURE</td>
<td>UHF</td>
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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 132 on Reader Service Card
NEWCOM '76 Wrap-up

New Orleans' new Superdome plays host to successful NEWCOM Show—and ET/D was there

Even though the annual NEWCOM Show, held this year in New Orleans May 4-6, is designed to present to the nation's electronic parts distributors the manufacturers' newest offerings in a wide range of electronic products, it was obvious after our first walk around the exhibit floor at the huge, recently-completed New Orleans' Superdome that the present "darling" of the electronic industry—CB radio—had captured much of the attention. Although an increase in the number of exhibitors was noted in all the categories—replacement parts, antennas, test instruments and sound and stereo products—the biggest increase occurred in the area of CB communications, with over 50 companies showing CB transceivers, antennas and accessories.

The NEWCOM show this year was a record breaker on all counts—more exhibits, greater attendance, and 128 brand-new exhibitors. On top of that, NEWCOM '76 was the first major convention to be staged at New Orleans' new Superdome, billed as "the largest 'people place' in the history of man."

The future of NEWCOM as a showplace for CB products is clouded, however, according to TV Digest, because "many CB suppliers are saying the pressure of three trade shows (PC-76, NEWCOM, CES) in a 2½ month period is forcing them to reexamine future participation. Pace, who says it will drop out of the 1977 NEWCOM Show and focus attention on PC-77, said, "The needs of our customers can further be served by concentrating their time and efforts, as well as ours, on one or two shows instead of the five major trade shows we have participated in."

Although PC-76, held in Las Vegas just one month before NEWCOM, did steal most of the new CB product "thunder", several new CB items were introduced in New Orleans, including two new PLL CBs and three new scanners from Channel Master, two new PLL CB units from RCA, a new JFD Electronics Corp. "carry-home" color antenna kits

among new TV products introduced at NEWCOM is a new line of "cool hand" color antenna kits from the JFD Electronics Corp. The kits include a full-sized TV antenna, with foldable elements, a band splitter, mount, mast, lead-in wire, standoffs and hardware in ready-to-take home carton. A new series of rectifier fuses, designed to protect silicon-controlled rectifiers and similar solid-state devices was also introduced at NEWCOM by Littelfuse, Inc. The NEWCOM show will return to Las Vegas for a four-year stint as of May 1st, 1977. It'll have to go some to top the success of the New Orleans show, which smashed all records in the 40-year history of the NEWCOM-type shows. Total registration this year was around 10,000, compared to last year's attendance of 7,600, and there were 354 exhibitors compared to 279 at last year's show in Las Vegas.
Electronic Technicians are giving tuners a BIG BATH
(and taking advantage of a special premium offer)

BIG BATH is a superior quality tuner cleaner and degreaser, specially formulated to:
- penetrate dirt, dust and gunk
- protect tuners from corrosion
- improve positive contacts
- high pressure chemical stream cleans thoroughly
- safe for plastics, will not detune

BIG BATH is for electronic technicians who count on dependable quality products.
- economical 24 oz. aerosol can
- easy to use pinpoint applicator
- available from electronic distributors everywhere

---

SPECIAL PREMIUM INTRODUCTORY OFFER:

Receive Free Universal Color TV Alignment Kit

Includes:
- Zenith Alignment Tool
- Hex Wrench - 5"
- Hex Iron Core Tool
- Double End Tool
- Shaft Extension

Five of the most frequently used alignment tools for all standard adjustments in color TV. All tools are constructed of Delrin in various colors for easy identification and comes in a convenient pocket saver pouch.

Technician/dealers mail 5 Premium Labels from 24 oz. Big Bath directly to:
GC Electronics 400 S. Wyman
Rockford, IL 61101 ATTN: Dept. RK

Cat. No. 84E4

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JULY 1976, ELECTRONIC TECHNICIAN/DEALER / 11
In years past there were only two widely used FM demodulation circuits: The Foster-Seeley discriminator and the ratio detector. While both of these are still widely used, other designs are also seen far more than was previously the case. Some of these are brand new and others are existing designs which have been made economically more appealing and easier to use by advances in integrated circuit technology.

**A REVIEW OF FUNDAMENTALS**

In frequency modulation (FM) systems, the carrier frequency of a radio transmitter is varied by an audio frequency modulating voltage. Fig. 1 shows the relationship of carrier frequency and the modulating audio voltage.

When the value of the audio sine wave (Va) is zero, the transmitter frequency is at Fc. As the audio signal voltage increases in the positive-going direction, the carrier frequency increases until point F2 is reached, at which the audio voltage is at its maximum value. The carrier frequency then will begin to decrease back to Fc as the audio voltage also decreases back to zero.

On negative-going excursions of the audio signal, the carrier frequency decreases to F1.

The "true FM" transmitter modulating action previously described probably will not be found in actual use. Because of the difficulties in designing a "true" FM transmitter which has the stability the FCC demands of radio transmitters, plus other problems, most FM transmitters use a slightly different (but from the receiver's point of view, functionally equivalent) system called phase modulation, or "PM". In this system, the carrier frequency is held constant while its phase is varied by the audio modulating signal. This allows the carrier to be generated in a highly stable, oven-controlled crystal oscillator. Phase variations occur in the reactance modulator, which follows the crystal oscillator.

There are several concepts and definitions associated with both FM and PM systems which are often misunderstood. For example, deviation is the amount of change in carrier frequency between the unmodulated value, Fc, and one of the extremes, either F1 or F2. Deviation is stated in either Hertz or Kilohertz. Frequency swing, on the other hand, is the total frequency shift from the lower to upper extremes (F2-F1) and is a measure of the channel width. The relationship between swing and deviation is dependent upon the symmetry of the modulating signal. For a perfectly symmetrical modulating waveform, like the sinewave in Fig. 1, deviation is exactly one-half the total swing.

Neither deviation nor swing is affected by the modulating frequency in a straight FM system, but this is not true of PM. The PM modulator has a 6 dB/octave rising (pre-emphasis) characteristic, while straight FM is essentially flat, unless the audio stage itself is given pre-emphasis. In "true" FM transmitters, the audio frequency determines the rate at which the carrier swings through its excursion. The amount of deviation is a function only of the amplitude of the modulating signal.

Full, or 100 percent, modulation of AM transmitters occurs when the audio signal causes the carrier amplitude to double on positive peaks and drop to zero on negative peaks. FM, however, has no such easily recognized carrier amplitude features, so the term "100 percent modulation" is dependent on other factors, such as the allowable bandwidth of the modulated FM signal. In the 88-108 MHz FM broadcast band, 100 percent modulation is defined as +75 KHz deviation. For the FM carrier which is the TV sound channel, however, +25 KHz deviation is "100 percent modulation." In the mobile and marine VHF/UHF two-way radio field, a deviation of only +5 KHz is sufficient to be called "100 percent."

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a great deal of pre-emphasis to the higher audio frequencies in an effort to improve the signal-to-noise ratio at the receiver end of the system. The receiver detector circuit includes a 75-microsecond RC de-emphasis network which re-establishes the proper audio frequency response.

**SLOPE DETECTION**

Fig. 2 illustrates a crude but effective method of FM demodulation which is shown here mostly to emphasize one of the primary requirements of any FM/PM detector: a frequency response which varies as a function of input frequency. This method, called “slope detection,” requires a receiver with a relatively narrow passband. The center of the carrier is tuned so that it lies on the downslope of the IF response curve. The incoming signal then “sees” an IF frequency response which varies as the carrier frequency varies.

**FOSTER-SEELEY DISCRIMINATORS**

Fig. 3A shows the circuit of the Foster-Seeley discriminator used for many years in a variety of FM receivers. Note that RF choke L₁ is common to both the primary and secondary windings of transformer T₁. In fact, it is in series with the secondary and in parallel with the primary. (If you doubt this last statement, take a look at Fig. 3B.) This common connection of L₁ allows the use of its voltage and current as references. When the IF signal applied to the primary of T₁ is unmodulated, it will be at a frequency equal to the resonant frequency of the T₁ secondary tank circuit. This causes the voltages across Lₛ₁ and Lₛ₂ to be equal and currents I₁ and I₂ to also be equal. Since these currents flow in opposite directions, however, they tend to cancel each other and the new output voltage is zero.

Fig. 4A shows the voltage and current vectors relationships in the discriminator when the frequency of the input signal increases above Fₛ. Because the secondary tank circuit takes on inductive properties, secondary current Iₛ lags behind voltages Eₛ₁ and Eₛ₂ by 90°. Since the voltages and currents in an inductive circuit are out of phase, they must be added vectorially to find the resultant. These are labeled E_d₁ and E_d₂ in Fig. 4A. In this case, the
function without a limiter.

**IC QUADRATURE DETECTOR**

Integrated circuit technology has revived for audio products a type of detector once used extensively in TV receivers—the quadrature detector. Once popular using the 6BN6 gated-beam tube, the quadrature detector has made a comeback in the form of several integrated circuits; examples are the MC1357P and the ULN2111. Fig 7 shows the block diagram of a typical IC quadrature detector (ICQD). The input stages are a wideband, high-gain, limiting preamplifier whose output is a series of square waves. These are fed to two places: to one input of the gated synchronous detector, and to a quadrature (90°) phase shift network external to the IC. The output of this network is brought back inside the IC, as shown in Fig. 8, and is connected to the alternate input of the gated detector. This detector produces output pulses with constant amplitude but whose periods vary with the modulating signal. These are integrated to recover audio.

The ICQD has been used extensively by Delco in their car radio designs for the past several years and by a number of hi-fi equipment manufacturers. Be aware, though, that an IC FM detector is not always a quadrature detector. A number of ICs are used which are high-gain IF amplifiers and have the diodes needed for ratio detection or a discriminator built into the same IC package. RCA is one manufacturer of this type of IC design. (Philco used the RCA CA3043 in the FM car radios they built for Ford.)

**RATIO DETECTORS**

Fig. 6 shows a typical ratio detector circuit. The major difference between this circuit and the Foster-Seeley discriminator is that the diodes are connected in series in the ratio circuit. This allows the voltages across C1 and C2 to add rather than cancel. When the input signal is at its unmodulated frequency, voltages across these two capacitors will be equal. When the carrier is deviated to a higher frequency, however, the voltage across C2 increases and that across C1 drops. Just the opposite occurs when the deviation is in the other direction: E1 rises while Ec2 drops. This, of course, results in a DC voltage level which varies as the modulation causes the frequency of the carrier to deviate above and below the center frequency.

Capacitor C3 has two functions: 1) It stabilizes the voltage across series combination C1/C2 so that the ratio can be taken, and 2) it suppresses any AM, including noise, which may be on the carrier. It is this last function which makes it possible for ratio detector-equipped receivers to will not drive the signal into the non-linear extremes of this curve.

**PHASE LOCKED LOOP (PLL) FM DETECTORS**

Although developed in the '30s, when oddly enough it was invented as an AM detector, the PLL has only come into its own with the recent introduction of PLL integrated circuits. Fig. 9 shows the block diagram of a typical PLL chip. Although it is used for other purposes as well, here we shall describe the circuit action as if it were exclusively an FM detector. A phase detector in the chip receives two inputs: one from an internal voltage-controlled oscillator (VCO), and the other from

**Fig. 7—Block diagram of the integrated circuit quadrature detector (ICQD).**

**Fig. 8—Partial schematic of an FM detector using the ICQD. This circuit is identified as a quadrature detector by the presence of the "phase coil" and not by the fact that an IC is used.**

**Fig. 9—Block diagram of a typical phase locked loop (PLL) FM detector IC.**

**Fig. 10—Circuit of an FM detector equipped with the Signetics 5608 IC PLL.**
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the FM IF amplifier. Under conditions where the carrier is unmodulated, the IF and VCO frequencies are equal and the DC output from the phase detector is zero. As the IF signal deviates, this equality is lost and a DC error signal is developed and is proportional to the frequency difference between the IF and VCO signals. This is fed through a low-pass filter, to remove residual RF, and then on to a DC amplifier (DCA). The output of the DCA controls the VCO frequency. This pulls the VCO to the new input frequency from the IF. Since the IF signal is always deviating about the center frequency, the VCO will always be trying to "catch up." The control voltage will be continuously varying at the rate of the audio which modulates the carrier. This voltage is used as the recovered audio.

Fig. 10 shows an actual IC PLL FM demodulator using the Signetics 560B chip. IF signal is coupled to the chip via capacitor C7 and pin 12. The frequency of the VCO is set to its approximate range by capacitor C4. Since internal resistances normally vary +20 percent, this capacitor will most likely be a trimmer. The input signal level required must be between 2 millivolts and 15 millivolts. Below 2 mV, the PLL may have difficulty in tracking the IF signal, while above about 20 mV the AM suppression is lost. RC networks R1/C1 and R2/C2 form the low-pass filter between the phase detector and DCA. The output signal is obtained from pin 9 and is coupled through RC network R3/C3 to the following circuits. The function of capacitor C6 is de-emphasis. It has a value selected to give the required 75-microsecond time constant when the internal resistor at pin 10 is 8000 ohms.

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CB Theft Prevention Methods & Equipment

By David Norman

A service to the customer—and a new aftermarket for dealers

Everybody’s getting into the CB marketing act these days, including thieves. With more than 400,000 new CB applications coming into the FCC each month, this lucrative CB black market for rip-off artists and petty thieves has been created, with the problem now so widespread that CB insurance has become very costly. In fact, some insurance companies now offer no coverage at all. Although this rapidly increasing incidence of CB mobile unit theft is one spin-off of the CB boom we could all do very well without, it does create a new aftermarket, so to speak, for CB dealers in the sale of anti-theft devices.

Not long ago, when someone asked about removing a unit from a car, we would tell them not to bother. The wear and tear of excessive handling was a greater risk than was the risk of loss—but no more. Now our recommendation is to thoroughly secure the unit or else remove it. Just locking the doors is no longer a good enough deterrent. In some cases, an owner who has locked his car doors in broad daylight has returned an hour or so later to find himself “10-7.” However, locking the car is at least a good beginning. It may not deter a pro, but it will discourage “crimes of opportunity” by amateurs.

Unattended vehicles should be left in well-lighted areas, preferably in plain view of houses and people. Parking an auto containing a CB unit or stereo out of sight behind trees and leaving it there for several days is asking for trouble. In fact, in some areas you would be lucky to find your tires still on the car. If a vehicle must be left for several days and there is no locked garage available, the best compromise might be at the home of a friend—with the electronics removed and stored in a safer place. If the equipment must be left with the car, your best bet is to lock it in the trunk. In other words,
recovery through proper marking of the equipment.

THEFT PREVENTION TECHNIQUES

Each unit should have its serial number recorded in a safe place among the owner's other important papers. However, since so many units are produced with easily removable serial number labels, other steps should be taken. This is where you, as a dealer, can really help your customer. Plainly marked units are stolen far less often than are those units with somewhat hidden markings.

Few thieves care to risk being caught with something that screams "hot".

Two different marking procedures that can be offered by the dealer—vibro-engraving and ultra-violet marking—improve the recovery chances. But please bear in mind, nothing is foolproof; if it can be bought, it can be stolen and resold. The fact that nothing works all of the time, however, is not excuse for not doing all that can be done.

Quick Disconnecting And Locking Mounts

Even before theft prevention became important, a quick-disconnect mount appeared on the market to facilitate the swapping of CB units and stereos between vehicles. Although removal of CB and stereo from standard mountings usually requires removal of just a couple of bolts and the power cable, the new quick-disconnect mounts allow removal or reinstallation in seconds rather than minutes.

To avoid theft of their newly own equipment.

With the above items available, the enterprising dealer can offer each prospective customer four additional incentives for buying their CB equipment from him rather than from the competition:

1) He can offer to record the units serial numbers, cross-referenced under the customers name for easy access.

2) He can offer to engrave the customer's name, address, phone number, driver's license number, etc. on the unit in the location preferred by the customer.

3) And as a back-up, he can offer to record the same information in an invisible ink, sensitive only to ultra-violet light, in a different location on the unit.

4) He can provide the customer with a decal that states that all equipment in the vehicle is permanently marked. These decals, which would be placed in a conspicuous place on the outside of the vehicle, can be made to order in any form desired, and can be easily sold at a profit.

THEFT PREVENTION EQUIPMENT

With the exception of the marking devices and decals, the steps suggested so far are preventive efforts. In some cases—and in some areas—stronger measures are taken. This will entail additional investment for the customer, and it means that the dealer has to become familiar with the many theft-discouraging items and features now making their appearance on the CB accessory market. To be of service to the customer, and to take advantage of this unique aftermarket, it means stocking some of this theft-prevention equipment.

Few thieves care to risk being caught with something that screams "hot".

Two different marking procedures that can be offered by the dealer—vibro-engraving and ultra-violet marking—improve the recovery chances. But please bear in mind, nothing is foolproof; if it can be bought, it can be stolen and resold. The fact that nothing works all of the time, however, is not excuse for not doing all that can be done.

Quick Disconnecting And Locking Mounts

Even before theft prevention became important, a quick-disconnect mount appeared on the market to facilitate the swapping of CB units and stereos between vehicles. Although removal of CB and stereo from standard mountings usually requires removal of just a couple of bolts and the power cable, the new quick-disconnect mounts allow removal or reinstallation in seconds rather than minutes.

To avoid theft of their newly
purchased CB equipment, a lot of CB'ers start with the intention of removing the unit each night when they leave the vehicle. After a few days, with the standard mount, this in-and-out bit gets to be such a hassle that most give up the idea—which explains the increasing popularity of the newer quick-disconnect mounts.

One of the newest quick-disconnect mounts on the market is from RCA—called the quick release mounting bracket, Model 14T170 (Fig. 1). The bracket can be mounted either under the dashboard or on the vehicle's floor. Connection to the power source is made with spring-loaded brass contacts, and the antenna circuit includes a shielded connector for coaxial cable.

At least one CB manufacturer, Craig, is supplying quick-disconnect mounts as standard equipment with several models. Removal is as simple as pulling out on the case and disconnecting the coax connector.

Actually, any unit can be converted to quick-disconnect by simply substituting large knurled bolts for the standard mounting bolts, and then installing one of the new pull-apart electrical connectors that are now available for power source connection (Fig. 2). Another way to provide a safe power connection for a quick-disconnect arrangement is to install male/female crimpots in the power line. If two wires are necessary, simply put the male clip on the lead coming from the vehicle's primary power and the female clip on the other lead. Then, by reversing this male/female hookup on the leads coming from the unit, there is little danger of accidental polarity reversal. All wires look grey in the dark, so color coding of power leads is not enough.

A more sophisticated hookup can be made using trailer connectors which already have several polarized contacts. In fact, trailer connectors will permit the addition of PA or external speaker wires to the hookup. One source of these inexpensive trailer connectors is the local U-Haul or other trailer-rental dealer.

There is another type of mount available now from most elec-

Fig. 6—This whip antenna from Breaker has a magnetic base encapsulated in ABS to prevent surface scratching. It is quickly removed for theft prevention.

Fig. 7—A locking collar on this removable CB antenna from Antenna Specialists permits only the user to remove the whip and the coil.

Fig. 8—This Model M-450 from Antenna Specialists allows only the whip to be removed from a base-loaded antenna. A downward push and twist on the knurled adapter releases the whip.

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Antennas
can be removed.

cast antenna but works on AM, FM, and CB. The
concealment devices to CB that allow the user to
by this antenna that looks like a regular broad-
ten r a front Deep South Marketing.

Enterprises. and Fit

lock the antenna inside the car trunk when not in
use. Fig. 10 is the Stowit antenna from Holly
Enterprises, and Fig. 11 is the Tok-a-Way an-
tenna from Deep South Marketing.

CB Burglar Alarms

A different method of discouraging CB and stereo theft from vehi-
cles is provided by a number of devices that warn of tampering with,
or removal of, equipment from a vehicle, by sounding the car-horn or
other noisemaker. These devices, which can be either dealer or
customer-installed, fall into three basic categories:

The first type is the auto burglar alarm which sounds if one of the
doors is opened after the device is armed. Expert thieves can cir-
cumvent this device if they care to take the time, but all in all, this
type is relatively effective. One example of this type, now on the
market, is Kar-Safe, manufactured by James Electronics, of
Chicago (Fig. 4). This unit operates by detecting increases in elec-
trical current. When the unit is turned "on", opening the car door,
hood or trunk, or ground wire interrup-
tion will sound the car's horn 60 times per minute. It's
programmed, however, to wait for
7 or 12 seconds to assure that false
entry has occurred before the car
horn sounds off.

The second type is simply a sen-
sitive mercury switch which
sounds the alarm when the vehicle
is jiggled such as would be the case
if someone got into the car. The
principle drawback to this type is
that it is subject to accidental acti-
vation from the wind shaking the
car, or someone touching the car
quite innocently.

The third type is unique in that
it protects only the unit and not
the rest of the vehicle. Fig. 5 shows
such a device manufactured by
Breaker Corporation, the Model
13-188 CB Burglar Alarm. This
device is installed between the CB
unit and the antenna and sounds
the alarm if the ground connection
to either is broken. In addition to
protecting the unit itself, some
protection also is given the an-
tenna. Unfortunately, most an-
tennas can be removed without
breaking the coax ground.

Perhaps the best protection
against theft is a combination of
the devices; for example, a burglar
alarm and a locking mount. If an
enterprising thief was able to
somehow get around the alarm, he
would have a second obstacle in
his way—the locked mount. It
might be enough of a deterrent to
discourage him from his goal.

Removable Antennas

Prior to the current wave of CB
thefts, the magnetic antenna
mount almost died from lack of in-
terest. There was a tendency for it
to pull loose from the car body at
high speed and go bouncing down
the highway by itself—and the
coaxial cable tended to chafe the
paint job (as does the mount it-
self); and most magnetic mounts
do n't perform as well as properly
grounded antennas. Without a
special design to compensate for a
good body ground, the antenna can
appear electrically too long for
tuning and some standing wave
ratio (SWR) remains even after
the antenna is trimmed to reso-
nance. This is mostly because the
feedpoint impedance is other than
50 ohms.

Some of the newer designs in
magnetic-mounted CB antennas
seem to have eliminated some of
the old problems. For example, a
line of 39-inch Liberty series whip
antennas from the Breaker Corpo-
ration (Fig. 6) feature magnetic
bases that have a 40-lb.-holding-
power magnet that is said to
eliminate crawling or dislodge-
ment—and the magnet is ABS en-
capsulated to prevent surface
scratching.

Other types of removable CB
antennas have been introduced
recently to help solve the theft
problem. Two designs developed
by The Antenna Specialists Com-
pany allow the user to remove the
continued on page 46

JULY 1976, ELECTRONIC TECHNICIAN/DEALER / 25
Schedule Of Events/Joint Annual Convention

National Electronic Service Dealer Association (NESDA), with International Society of Electronic Technicians (IS CET) and Texas Electronics Assoc. (TEA)

August 13-17, 1976 Palacio del Rio Hilton Hotel and San Antonio Convention Center
San Antonio, Texas

Friday, Aug. 13
7:00 A.M.—Electronics Manufacturers/Dealers Open Golf Tournament
Place: Pecan Valley Golf Course
Sponsor: Electronic Technician/Dealer Mag.
Host: Al Menegus, Publisher, ET/D Coordinator: Kurt Wertheim, TEA
2:00 P.M.—Texas Electronics Association (TEA) business meeting
Place: La Vista Room, Palacio del Rio Hilton Hotel
3:00 P.M.—National Electronic Service Dealers (NESDA) executive council meeting
Place: Princesa Room, Palacio del Rio Hilton Hotel
7:30 P.M.—"Welcome To Texas" Barbecue and TEA awards ceremony
Place: To Be Announced
Master of Ceremonies: Kurt Wertheim, TEA
9:00 P.M.—Cocktails and Hospitality
Place: To Be Announced
Sponsor: RCA

Saturday, Aug. 14
8:00 A.M.—Keynote Breakfast
Place: Fiesta Room, San Antonio Convention Center (SACC)
Sponsor: GTE Sylvania
Host: James Tobin, Sales Promotion Mgr., GTE Sylvania
Master of Ceremonies: Gerald Hall, Wisconsin Electronic Service Association
Keynote Speaker: Toby Mack, Staff VP, Dist. Prod.'s Div., Electronic Industries Association (EIA)
9:30 A.M.—International Society of Certified Electronic Technicians (IS CET) annual meeting and elections
Place: SACC
11:00 A.M.—5:30 P.M.—"Mercado Electronics '76" Electronic Trade Show
Place: Hemisfair Plaza, SACC

Sunday, Aug. 15
8:00 A.M.—IS CET Breakfast (IS CET awards & installation of officers)
Place: Fiesta Room, SACC
Master of Ceremonies: Larry Steckler, Chairman, IS CET
9:00 A.M.—Manufacturer Panel Discussion
Place: To Be Announced
Theme: "The Role of 'Service' in Today's Electronic Industry"
A.M.—5:30 P.M.—Technical & Business Management Seminars
Place: SACC
Seminar Topics:
- Oscilloscope Applications Workshops—Stan Prentiss (AM)
- CB Profits and You—Forest Belt (AM)
- The Parts Disaster—John Sperry (AM)
- Your Salesman: The Service Technician (AM)
- Two-Way Communications: Its Place in Your Business—Chuck Anderson (AM)
- License Board Seminar—Bob Harrison (PM)
- Howard Sams Photofact Tour (slide program)—Joe Groves (PM)
- New TV Service Techniques—Carl Babcock, Editor, Electronic Servicing magazine (PM)
- Industry Relations—Dick Pavek (PM)
- "Better State Conventions"—Dick Pavek (PM)
- How to Fix CB Radios Fast—Forest Belt (PM)

Monday, Aug. 16

8:00 A.M.—Breakfast
Place: International Ballroom, Palacio del Rio Hilton Hotel
Sponsor: Panasonic & Sony

9:00 A.M.—NESDA Annual Business Meeting & Election of Officers
Place: Corte Real Room, Palacio del Rio Hilton Hotel
A.M.—Technical Seminar
Place: To Be Announced*
Topic: "Digital Logic & Your Test Equipment"
Presenter: Stan Prentiss
9:00 A.M.—NESDA Annual Business Meeting & Election of Officers
Place: Corte Real Room, Palacio del Rio Hilton Hotel
A.M.—Technical Seminar
Place: To Be Announced*
Topic: "Digital Logic & Your Test Equipment"
Presenter: Stan Prentiss

10:30 A.M.—To Be Announced*
Place: Palacio del Rio Hilton Hotel
Sponsor: Magnavox

12:30 P.M.—Luncheon
Place: International Ballroom, Palacio del Rio Hilton Hotel
Sponsor: Magnavox

2:00 P.M.—To Be Announced*
Place: Palacio del Rio Hilton Hotel
Sponsor: Magnavox

Tuesday, Aug. 17

8:00 A.M.—NESDA Executive Council Meeting
Place: To Be Announced*

9:30 A.M.—12 NOON—NESDA "Profitable Service Management" Seminars
Place: Palacio del Rio Hilton Hotel (rooms and instructors as indicated below)
PSM-1: La Princesa Room, J. Kelly
PSM-2: La Duquesa Room, J. Hopson
PSM-3: La Reina Room, P. Don'te

10:00 A.M.—12:00 NOON—Women's Business Management Seminars (Free)
Place: To Be Announced*
Topics: "Bookkeeping For A Service Shop" and "Better Telephone Procedure"

12:00 NOON—Luncheon
Place: To Be Announced*

1:00 P.M.—5:00 P.M.—NESDA "Profitable Service Management" Seminars
Place: Palacio del Rio Hilton Hotel (rooms and instructors as indicated below)
PSM-1: La Princesa, G. Simpson
PSM-2: La Duquesa, F. Grabiec
PSM-3: La Reina, B. Villont

*Place to be posted at convention
Troubleshooting Sync Separator/Noise Limiters

The following operations are performed by the sync separator/noise limiter system:

1) Removes all picture information from the composite signal and leaves only the sync pulses. Also removes all of the black level pedestals.
2) Amplifies the sync pulses to required level for solid picture locking action.
3) Clips the sync pulses to a uniform value and removes any pulses due to noise or interference. These circuits are referred to as sync clippers or limiters.
4) Shapes the horizontal sync pulses into sharp pips in order to operate the horizontal phase detector circuit and control horizontal oscillator frequency.
5) Develops the vertical pulses into relatively long sync pulses which will be used to trigger and lock-in the vertical sweep oscillator. RC differentiating and integrating filters are used for this purpose.
6) Produces the correct sync pulse polarity that is required to trigger the sweep oscillators or AFC control system.

GENERAL TROUBLESHOOTING PROCEDURES

Always keep in mind that the sync and AGC circuits are very closely related and a sync trouble may look like an AGC problem and vice versa. If adjustments of the contrast and AGC controls do not produce a normal picture, then what looks like sync trouble may actually be a fault in the signal section of the chassis, prior to sync take-off, or an AGC circuit malfunction.

Consider the following factors when troubleshooting the sync system:

1) If both the vertical and horizontal sync is lost, the trouble is probably in a common sync handling stage, such as the sync separator.
2) If the picture will not lock in horizontally, but is vertically stable, it is then probable the fault is not in the common sync stage. The prime suspect would be the horizontal AFC circuits, horizontal oscillator, and any associated feedback circuits.
3) Should the picture be only vertically unstable, then the sync circuits past the sync branch-off stages should be checked first, along with the vertical oscillator or output stage or any of its associated feedback networks.

Because the sync, AGC, and noise control circuits all must work together to keep a stable picture on the screen, you just about have to troubleshoot all three actions at the same time. In some sets, all three circuits are found in one tube or on one module.

In some modular solid-state chassis—Zenith, for example—the sync clipping, AGC, and noise immunity circuits are all located on one module. Several components are used in both systems and the noise immunity system is used by both AGC and clipping circuits. For this reason it becomes very practical to service and observe (with an oscilloscope) the sync clipping action first.

SEPARATING THE SYNC FROM VIDEO

Sync clipping is the action of removing from the composite video those parts not required for the synchronization process. The unwanted portions are as follows:
- All video picture information.
- All blanking information.
- The top and bottom sections of the actual horizontal and vertical sync pulses. (The top section of the pulses is undesirable because noise pulses would be present at this point, while the bottom part would be too close to the blanking and video areas. The only "want-
In many TV receivers the sync clipping action is coupled to the AGC operation. The reason for this can be seen by referring again to Fig. 1. If the DC level of the signal changes, or the amplitude varies, the predetermined clipping action is defeated. In one instance this can be seen by referring again to Fig. 1. If the DC level of the clipping action is coupled to the sync pulse as illustrated in Fig. 1.)

AGC troubles can be detected by observing the sync information at the output of the sync clipper. The only active component in the sync stage in Fig. 2 is NPN transistor Q401.

In the sync separator system in Fig. 2, the input signals are fed through a dual time constant filter to the base; with proper biasing parameters, sync clipping will occur. The clipped sync (Fig. 3) will be seen at terminal B12, the collector of Q401. There is always a good possibility that, due to an AGC fault, the clipped sync section is not operating properly.

To add more probable faults to these systems, many color sets use noise immunity circuits. In Fig. 2, this circuit has been added around the sync clipper Q401, and consists of noise driver Q403 and noise gate Q404. These transistors and associated circuitry have the specific function of making the horizontal and vertical oscillators less susceptible to noise pulses. However, since these circuits are connected to the sync clipper, they can, if defective, upset the sync clipper action. (More details about this circuit operation later.)

Sync separation and amplification is performed by the sync limiter transistor Q401. During the following description of this sync operation, refer to the circuits in Figs. 2 and 4. The emitter of Q401 is "grounded" (collector of noise gate transistor). The collector is connected to the 24-volt supply through CR404. Composite video (positive-going) appearing at test point C3 is fed to the base of the sync limiter through capacitor C401 and a parallel RC combination consisting of R403/C402 and diode CR404. This dual-time-constant filter provides the sync limiter with a high degree of immunity to aircraft flutter. A small amount of forward base emitter bias is applied to Q401 through R402. However, if the stage were to conduct at all times, video as well as sync information would be coupled to the horizontal and vertical sweep circuits. This is overcome by having a small amount of reverse bias (negative voltage on the base) that is proportional, but not equal to, the amplitude of the incoming sync pulses. This negative voltage is developed as follows:

The positive composite video is coupled through C401 and C402 and appears at the base of Q401. The base-emitter junction acts as a rectifier to the sync pulses, developing a net negative charge on the base side of capacitor C401. The negative charge is reduced somewhat by the positive voltage dropped across the 820K resistor. The negative voltage reduction is designed so that just the uppermost positive excursion of the sync tips overcomes the reverse bias, causing the transistor to conduct and amplify only the sync information.

**NOISE LIMITING**

Noise immunity for the sync and AGC stages in Figs. 2 and 4 is provided by two transistors, Q403 and Q404, and their associated circuitry. These transistors are termed the "noise gate," and the "noise gate driver."

The bias conditions for the noise gate transistor are as follows: The emitter is returned directly to ground. The base receives a positive voltage coupled through R414, thus keeping the stage in saturation. The collector is coupled to the emitter of the sync limiter and the base circuit of the AGC gate. With the transistor in saturation, the collector voltage is very low (0.6 volt), thus providing a low resistance to ground for normal operation of the sync and AGC stages in absence of any noise pulses.

The emitter of the noise gate driver receives DC bias and video (negative sync) information from test point C1 of the IF module. The collector is returned to +24 volts through R413. The base bias for this stage is developed at the col-
The symptom of complete loss of both vertical and horizontal sync usually points to a fault in the sync or AGC circuits. However, in the Zenith chassis in which the circuits in Figs. 2 and 4 are used there is an exception because voltage checks during the noise pulse duration. (Remember, the collector is the ground return for the AGC and sync stages.) Shunting down the sync limiter in this way keeps the noise pulses from tripping the vertical and horizontal oscillators.

**SYNC/NOISE SYSTEM SERVICING**

The symptom of complete loss of both vertical and horizontal sync usually points to a fault in the sync or AGC circuits. However, in the Zenith chassis in which the circuits in Figs. 2 and 4 are used there is an exception because voltage checks during the noise pulse duration. (Remember, the collector is the ground return for the AGC and sync stages.) Shunting down the sync limiter in this way keeps the noise pulses from tripping the vertical and horizontal oscillators.

**SYNC LIMITER/NOISE BIAS CIRCUIT**

Let's look at the operation of the combination sync limiter and noise bias circuit shown in Fig. 5. Sync is extracted from the incoming composite video by Q404. This stage is designed so that the uppermost positive portions of the sync tips cause the transistor to conduct. The sync pulses are clipped from the composite video information and coupled to the vertical and horizontal circuits.

The action of the sync limiter stage will be covered first because the noise bias circuit is essentially a short on a strong signal.

The emitter of Q404 is connected to ground. The collector is connected to the +24 volt supply through R419. Positive-going composite video from the collector of Q406 is clipped through C406 and a parallel RC combination, consisting of C405 and R418, to the base of Q404.

The base-emitter junction acts as a rectifier to the positive sync pulses, producing a negative charge on the base side of capacitor C406. This negative voltage sets the operating point for the...
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limiter, so that only the positive parts of the sync tips overcome the reverse bias, causing conduction of the transistor and amplification of only the sync information.

On weak signals, noise pulses riding on the sync can shift the operating point of the sync limiter so that clipping occurs on the noise, and sync is lost. To prevent this from happening, noise bias transistor Q405 is used.

The action of the noise bias transistor is as follows: The voltage divider consisting of resistors R424 and R426 provides about +5.5 volts, which appears on the anode of CR403. The cathode is fed the +5.6 volts from the +24-volt supply via R425. This positive voltage on the base keeps transistor Q405 in saturation, effectively shorting the collector of Q405 to ground. Noise pulses that appear on the sync cause the cathode of CR403 to become negative with respect to the anode. When this happens, CR403 conducts and a bias voltage opposed to the positive bias is fed to the base of Q405 to bring it out of saturation. As conduction decreases, the voltage on the collector increases. This voltage change is fed to the base of the sync limiter to oppose the increase in negative bias caused by the noise on the sync. This bias change keeps the limiter at the proper operating point, so that clipping occurs on the sync and not on the noise pulse.

**Troubleshooting the Sync Limiter/Noise Bias System**

For a symptom of complete loss of both horizontal and vertical sync, make the following checks:

- Measure the base and collector voltages of sync limiter Q404. With a strong signal, base voltage should be around -2 volts. Collector voltage should be around +23 volts. If voltage on the base is zero or slightly positive, composite video is not reaching the base circuit. Check capacitors C407, C406 and the collector voltage at Q406. If C407 is leaky or the value of R420 has increased, the video driver stage may be clipping on the sync pulses.

- For a symptom of marginal horizontal sync accompanied by picture pulling on a strong signal, short the collector of noise bias transistor Q405 to ground. If the problem clears, Q405 may be defective or some other defect exists in the noise bias stage.

With a symptom of poor horizontal and vertical sync on weak signals, check Q405, CR403 and associated components.

**Tech Book Review**

*Title: Simplified TV Trouble Diagnosis (TAB BOOK No. 633)*

*Author: Robert L. Goodman*

*Publisher: TAB BOOKS, Blue Ridge Summit, PA 17214*

*Size: 320 pages, 292 illustrations*

*Price: $5.95 paperback; $8.95 hardbound*

This service technician-oriented text provides concise yet thorough descriptions of how the circuits in tube, hybrid and all-solid-state color and b/w TV chassis function, what their failure modes and related trouble symptoms are, and how to quickly pin down defects in them when they fail.

For convenient reference use, complete circuit analyses of and troubleshooting procedures for each TV functional section are contained in a single chapter, eliminating the need to switch back and forth among chapters when you are concerned with only one functional section of a receiver.

The text is amply illustrated with schematic diagrams, screened photos and other "real life" illustrations of the actual circuits and waveforms encountered in existing TV receivers, and even includes a special foldout section which contains troubleshooting flowcharts and complete schematic diagrams of four representative color TV chassis.

Most cases of audio distortion in car radios are caused by a defect in the audio amplifier section. However, there are certain types of defects in other stages which can, and occasionally do, cause audio distortion. Following are some of the most frequently encountered types of these "non-audio" sources of audio distortion.

**AM DETECTOR DEFECTS**

A shorted detector diode usually causes complete loss of audio output. However, if the output of the second IF amplifier is unusually strong, it can feed right through the shorted detector, through the 10-KHz filter (the 10K ohm and 1K ohm resistors and .01mfd capacitor in Fig. 1) and be rectified by the "diode" of the base-emitter junction of the audio preamplifier transistor. The result, if the audio amplifier section has sufficient gain, is a weak, distorted output.

Another "non-audio" source of distortion can occur in car radio detector circuits in which the detector diode is normally reverse biased, as shown in Fig. 2. This is done to provide the diode a higher load impedance, which, in turn, develops a higher output voltage. In such designs, if one of the resistors in the reverse-bias supply network changes value, the reverse bias applied to the diode might become sufficiently excessive to prevent rectification except on only the most positive peaks of the second IF output. The result, again, is weak, distorted audio.

**DISTORTED FM, NORMAL AM**

With the exception of some of the Delco AM/FM receivers produced in the mid-'60s, in which a shorted audio coupling capacitor caused distorted audio during FM reception but did not affect the audio during AM reception, most such cases involving distorted FM reception but normal AM are caused by either a defective diode, open transformer or some other

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**Fig. 1**—A shorted AM detector diode does not necessarily mean no audio output. Strong signals can feed through shorted detector, be rectified by the base-emitter "diode" of Q4 and produce weak, distorted audio output.

**Fig. 2**—A defect which increases the reverse bias across the normally-reverse-biased audio detector shown here can cause weak, distorted audio.

**Fig. 3**—Typical car radio automatic gain control (AGC) system. Defects in this system can cause audio distortion whose degree varies with received signal strength.

"Non-Audio" Sources of Distortion In Car Radios

By Joseph J. Carr

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defect in the FM demodulator or, in quadrature detectors, an open phase coil.

**AGC-RELATED DISTORTION**

An automatic gain control (AGC) system typical of that used in many car radios is shown in Fig. 3. Signals from the IF amplifier collector are applied to a half-wave diode rectifier followed by an RC filter network. This creates a DC level proportional to the signal strength. This control voltage is applied to the base of the RF amplifier and is of a polarity that "bucks" the normal RF amplifier bias current. This reduces the gain of the RF amplifier and, thus, the amplitude of the RF signal. Although any such feedback system may tend to be a little unstable during changes or transitions from one steady state to another, it soon stabilizes and keeps the amplitude of the output signal relatively constant.

AGC-caused audio distortion can be particularly difficult to troubleshoot, especially if there are a number of strong local radio stations. Fortunately, AGC-caused distortion is almost exclusively an AM radio problem and seldom occurs in FM receivers.

The audio distortion produced by AGC defects usually sounds like that produced by an audio amplifier with about 25% total harmonic distortion (THD). Although AGC-related audio distortion often is accompanied by audio "howling" as a result of feedback oscillation, this is not always the case.

If AGC rectifier D1 in Fig. 3 shorts, the result will be audio distortion whose level varies with the strength of the received signal. On strong local stations, the RF amplifier will saturate, producing audio distortion. On weak stations, however, little or no distortion will be produced. Consequently, this type of distortion-causing defect can be pinpointed by simply tuning the receiver across the AM band and noting whether or not the distortion seems to disappear on weak stations. If it does, you probably have a shorted AGC rectifier. If the distorted audio also is accompanied by "zero beat" howling, you have even more evidence of an AGC defect—in many such cases, an open AGC bypass capacitor.

**RF AMPLIFIER DEFECTS**

Another source of car radio audio distortion which varies with the strength of the received signals is excessive leakage between the collector and base of the RF amplifier transistor (Fig. 4), particularly those which are equipped with PNP germanium types.

As was the case with AGC-related distortion, that caused by excessive leakage between the collector and base of the RF amplifier might be barely perceptible or completely absent during reception of weak stations, yet quite evident during reception of stronger signals. Regardless of whether or not it causes perceptible distortion, RF amplifier collector-base leakage usually produces abnormal DC voltages in that stage.

One of the most information-laden indicators of performance in a car radio is the collector or emitter voltage produced by conduction in the RF amplifier. If it is normal and varies as the radio is tuned across the dial, you can tentatively assume that all is well in the RF, IF, and converter stages. In sets equipped with PNP transistors and a negative ground, the degree of conduction is indicated by the RF transistor collector voltage, while in NPN stages it is common to use the emitter-to-ground potential. In PNP radios, incidentally, no other stage will have a resistance value high enough between the collector and ground to produce a measurable voltage. Converter and IF amplifier stages tend to have collector voltages below 1 volt, often only a fraction of a volt. In the RF stage, however, conduction usually produces a voltage up to several VDC between collector and ground (PNP) or between emitter and ground (NPN) and this will vary significantly as the radio is tuned across the AM dial. If the PNP RF amplifier collector voltage does not vary much as the radio is tuned, a defect must be assumed. In the distortion cases discussed so far, the voltage might be near the correct maximum value or a little higher, but it usually does not vary at all as the radio is tuned. In cases where the RF transistor has a high collector-emitter leakage current there will be considerably higher-than-normal voltage on the collector and the radio usually will be inoperative, not just distorted.

**IF OSCILLATION**

Another difficult-to-find, "non-audio" source of distortion is internally generated oscillation in the IF amplifier, which usually overdrives the RF amplifier sufficiently to cause distortion.

Unlike the audible oscillation produced when an AGC bypass capacitor opens, the oscillation related to defects in the IF amplifier often is not audible because the sum and difference heterodyne signals produced by it and the output of the converter are above the range of the human ear.

Another non-audible but nevertheless distortion-producing spurious signal would appear in the IF amplifier section if the capacitor inside the 2nd IF transistor...
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TECHNICAL DIGEST

CHASSIS: Admiral M10
TROUBLE SYMPTOM: Left side of raster darker than right side, possibly accompanied by marginal vertical sync and/or lines streaking or flashing across raster.

CAUSE: Defective capacitor C305 (5mfd, 50VDC) in AGC circuit. If defect is verified, replace C305 with Admiral Part No. 67A200-509-7.

CHASSIS: Admiral M24, M25 & M30
TROUBLE SYMPTOM: Raster and stable picture takes longer than normal time to appear after receiver is turned on.

CAUSE: Slow stabilization of horizontal oscillator as result of increase in the value of resistor R816 (470 ohm, 10%, 1/2 watt). Replace R816 with Admiral Part No. 60A105-471 (470 ohm, 5%, 1/2 watt).

CHASSIS: Zenith 19GB1
TROUBLE SYMPTOM: Bending and/or 60-HZ hum bars in picture.

CAUSE: Inadequate contact between grounding pads on printed-circuit board and the chassis frame. To remedy, remove the board from the frame and clean the grounding pads and, if necessary, use a light soldering iron to make the pads of even height. Additionally, if the circuit board does not already have a jumper wire connected between the grounded sides of C702 and C802, install one. This jumper provides more even distribution of ground circuits.

CHASSIS: Zenith receivers equipped with Space Command 1000 remote-control systems
TROUBLE SYMPTOM: Failure of the remote-control system to function even after the remote transmitter, mic/amplifier assembly, receiver board and power module all have been substituted. In some such cases, the remote-control system will alternate between normal and abnormal operation over a period of time.

CAUSE: Presence of the AC power line of even harmonics (120 Hz and 240Hz) of the 60-Hz power line frequency. The following modifications of the remote system clock circuit will restore normal operation in the presence of such AC power line interference:

- Remove R204 Diode Part No. 103-142-02
- Add In Same Holes C202 Diode Part No. 103-142-02
- CR207 Capacitor Part No. 22-6447-01

Although these modifications do not prevent normal operation of the remote system in the absence of even-harmonic line interference, they should be made only after it has been determined that failure of the remote system to operate is not caused by other defects. For example, a trouble symptom similar to that caused by line interference will occur if a temperature-affected open occurs in bridge diode CR204; although the receiver can be turned on manually, the remote system will remain inoperative until the diode cools enough to "close." In this and other instances of complete failure of the remote system, restoration of normal operation after substitution of the remote system compo-
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CAUSE: Leakage in either of the differential amplifier transistors, Q4 or Q5, on the vertical module. A limited quantity of transistors of a type subject to leakage after warmup were used in the Q4 and Q5 positions in some of these chassis. These transistors have an unusual rectangular shape, have their part number stamped on the back, and have the letter "H" followed by a four-digit date code stamped on the front. Although Magnavox's service warranty policy stipulates module replacement, in this case Magnavox states that "the servicer may elect to replace these transistors (Q4 or Q5) if they are found to be defective."

CHASSIS: Magnavox T982
TROUBLE SYMPTOM: Raster gradually shifts either up or down as much as 3 inches after up to two or three hours of operation.

CAUSE: Partially shorted vertical output choke, L1 (Magnavox Part No. 320124-23). The resistance of L1 should be 9 to 10 ohms. A resistance reading of less than 7 ohms indicates a possibly shorted choke. (The resistance of these chokes actually found to be partially shorted measured about 3 ohms.).

CHASSIS: Magnavox T995
TROUBLE SYMPTOM: "Unusual" vertical scan trouble symptoms, including vertical scanning of only one-half the screen, with or without retrace lines. The height and linearity controls produce normal changes in the raster but will not fill out the screen. Positioning the vertical hold control so that the vertical oscillator is off frequency might fill the screen with a single, not double, frame.

CHASSIS: Any Admiral all-solid-state color chassis
TROUBLE SYMPTOM: Repeated failure of horizontal output transistor, accompanied by overheating of horizontal output transformer.

CAUSE: Excessive current through horizontal output transistor and transformer as result of defective high-voltage tripler. Always check and, if found defective, replace the tripler before installing a new output transistor.

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A new 30,000 ohm/volt VOM, Model WV-518B, has been introduced by the VIZ Test Instruments Group. The WV-518B is the first of several scheduled new products to be announced since VIZ acquired the RCA test instrument line.

The Model WV-518B measures AC and DC voltages from 0 to 1000 volts with ±3% full-scale accuracy. It has four resistance ranges (X1, X10, X100, and X1K) and five DC current ranges, from .05mA up to 5A full scale. All switch-selectable ranges are fuse-protected against burnout. A separate input jack is used for the 5A AC or DC current range.

The VOM has a large, 100°, mirror scale, a taut-band meter, and color-coded scales and function switch. Its ABS high-impact case is equipped with a built-in tilt stand which makes upright use convenient. The easy-open, snap-off back provides screwdriverless access to the instrument's batteries and protective fuse.

The detent-type function-selection switch of the Model WV-518B is equipped with double ball bearings and a double-action wiper.

The VOM is 5-1/2 inches high, 3-1/2 inches wide, 1-3/4 inches deep and weighs a mere pound. The price is $39.95.

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

A new 60-MHz frequency counter, Model LDC-821S, has been introduced by Leader Instruments Corp. Minimum frequency response of the Model LDC-821S, within an accuracy of 5 parts per million over an ambient temperature range of 32°F to 104°F, is 60-MHz, although the instrument will respond to and readout frequencies in excess of 90-MHz with a relatively slight degradation of accuracy. The minimum sensitivity of the LDC-821S is 50 mV and the nominal input impedance is 1 megohm.

Digital readout of frequency is provided by a 2-inch-high Nixie display, which is clearly legible even in high ambient light conditions. Four switch-selectable time bases, which cover the range from 2 milliseconds to 2 seconds, permit seven-digit resolution from the LDC-821's five-digit readout.

The Model LDC-821S is equipped with a dual power supply, which can be operated from either a 115-VAC or 230-VAC source, and is housed in a metal case which prevents spurious radiation and interference from external RF fields. The price of the LDC-821S, complete with all essential accessories, is $299.95.

...for more details circle 134 on Reader Service Card
SEMICONDUCTOR TESTER

B&K-Precision's Model 530 Semiconductor Tester combines the versatility of a lab-quality instrument with the ease of operation of a service-oriented test instrument.

The Model 530 performs not only in- and out-of-circuit good/bad tests and lead and type identification of diodes, bipolar transistors, field-effect transistors, and silicon-controlled rectifiers—all without the need for "setup data"—but it also performs more definitive measurements of operating characteristics such as the beta and leakage of bipolar transistors and the transconductance (Gm) of FETs.

In addition, the Model 530 measures and provides an analog meter readout of the cut-off frequency (Ft) of transistors, up to 1500-MHz. This exclusive feature is particularly useful for pre-installation verification of the Ft of replacement transistors employed in circuits which process signals in the HF, VHF and UHF frequency ranges.

High drive currents at a low duty cycle enable the Model 530 to perform reliable in-circuit testing of power transistors—even the new power FETs, both enhancement and depletion types, can be tested with the 530.

During good/bad testing, the illumination of either of two light-emitting diodes (LEDs) indicates the transistor (PNP or NPN) or FET (N- or P-channel) type and, in conjunction with an audible tone, it also indicates that the device is capable of normal operation.

For out-of-circuit tests, the 530 measures transistor beta in two ranges (20-200; 20-600), and Gm of FET's in two ranges (.4-12 millimhos; 4-400 millimhos). The accuracy for beta and Gm tests is to within 10%.

The price is $250. For more details circle 136 on Reader Service Card.
Laughing It Off...

"It's probably the thing-a-ma-bob or the whatchamacallit. We just replaced the do-hickey and the thing-a-ma-jig last week."

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"Hi! It's football time again, so here I am to give your TV its pre-season physical."

"Here's a list of things my husband thinks he found out weren't wrong with it!"
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.

MATV AMPLIFIER 137

A new UHF-VHF-FM with a built-in 4-way splitter for MATV systems is introduced by AVA Electronics. With a bandwidth of 50 to 900 MHz, the new amplifier can be used on up to 16 TV sets. It has an input of 75 ohms and output of 75 ohms per splitter, is powered by a 117V AC 60 Hz transformer isolated with an output capability to 30 dB. Designated the A515-4UV, the new model features built-in surge lighting protection. It lists for $49.95.

ANTENNA INSTALLATION KIT 138

Burr-free holes in autos, trucks, campers, or vans can now be drilled for mobile CB antenna installations with a new Conectit kit introduced by GC Electronics. The kit includes two tools that drill holes from 1/4 inch to 13/16 inch and from 5/8 inch to 1-3/16 inches, cutting compound, an assortment of fibre hole gauges and a vinyl carrying pouch. Holes can be drilled in almost any thin material—steel, sheet metal, tubing, conduit, plastic, or formica, and need no center punch or pilot hole.

ATTACHE TOOL CASE FOR FIELD SERVICE 139

An assortment of hand tools and a cordless soldering iron and charger are contained in a new attache tool case from Weller-Xcelite that is designed for in-the-field operation by technicians, servicemen and field engineers. The new case contains 23 individual tools, interchangeable screwdriver/nutdriver blades and handles, 10 ft. and 50 ft. measuring tapes, soldering iron, solder, and recharger. It has removable pallets in the lid and see-thru plastic tool pouches. Additional tool space is provided in the partitioned base.

CB NOISE SUPPRESSION FILTER 140

A new heavy-duty feed-thru filter to suppress alternator and generator noise in mobile CB radios installed in large trucks, tractors and other farm equipment has been introduced by Sprague Products. Designated as Type QX1-600, the new filter is rated .5 mfd @ 600 VDC, and has a current-handling capability of 200 amperes. Capable of suppressing up to 30 dB of unwanted noises at 4-30 MHz, the new filter is hermetically-sealed in a metal case for protection against mechanical damage, moisture, dirt and grease. It is pre-packaged with a 7 ft accessory cable and complete installation instructions.

COPPER-LOADED WIRE SOLDER 141

A new wire solder has been developed by Multicore Solders to prevent the dissolving of fine gauge copper wires and thin copper foils used on circuit boards. The new product is a copper-loaded, tin/lead alloy wire solder.
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- TOTALLY SHIELDED NETWORK
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"NON-AUDIO" DISTORTION

former in Fig. 5 opened or if the transformer winding attached to the "high" end of the capacitor opened. This type of defect permits the RF amplifier to pass the output of the local oscillator.

Detection of this type of non-audible IF oscillation or spurious signal feedthrough can best be accomplished by placing either a digital frequency counter or scope probe on the collector of the IF transistor and checking for a heterodyne signal at a frequency equal to the sum and/or difference between the car radio IF (usually 262 kHz) and the local oscillator (usually 1200 to 1900 KHz in the top third of the AM broadcast band).

POWER SUPPLY DEFECTS

Audio distortion also can be caused by insufficient operating voltages. For example, if capacitor C1C in the AM car radio power supply in Fig. 6 develops leakage, the power supply output voltage will drop, causing the RF, IF and converter stages to operate nonlinearly, which, in turn, produces a distorted audio output.

A similar source of audio distortion can occur in car FM radios, the RF amplifiers of which typically are supplied regulated B+ from a Zener-controlled source. If the Zener develops a "partial short," the regulated voltage supplied to the tuner drops below normal, producing not only distorted audio but also a shift in the local oscillator frequency which, in turn, affects the tuner dial calibration.

CB MAGNETIC-MOUNT ANTENNA 146

A new CB antenna with magnetic mount for easy, fast removal is now available from Hy-Gain Electronics. The newest addition to the firm’s antenna line, the Hellcat 2 features a 48 inch stainless steel whip that’s tapered for lower wind loading. The whip is mounted on a high impact base that adjusts 360° horizontally and 180° vertically to allow an upright position for efficient radiation and a low take-off angle for mounting on a sloping body panel. The whip can also be laid down for car washes. The antenna base contains an Alnico magnet for all flat, ferrous metal body surfaces. A plastic shield covers the magnet to protect painted surfaces. Comes with 18 feet of coaxial cable and a PL-259 connector.

CB THEFT

continued from page 25

antenna whip and the coil from the base, for protection against theft and damage from car washes. Model M-460 (Fig. 7) uses a combination lock on the antenna collar with 8 possible settings to discourage theft. The locking collar and base is inserted between the antenna’s coil and mount, permitting only the user to remove the coil and whip. Model M-450 (Fig. 8) allows only the whip to be removed from a base-loaded antenna. A downward push and a twist on the knurled adapter causes the antenna’s whip to release from its base.

Another design from Antenna Specialists attempts to confuse the would-be CB thief by a new 3-in-1 antenna—Model MR264 (Fig. 9)—which looks like a conventional broadcast antenna but works on AM, FM and CB. The MR264 is said to be identical to the A/S "police disguise" antennas. The stainless steel whip removes easily to accommodate car washes.

A different method of concealing CB antennas when the car is unattended involves a movable bracket which, when attached to the trunk lip of the car, allows the user to either move the antenna into operating position, or stow the antenna in the trunk—out of sight—when not in use. Two versions of this method are shown in Fig. 10 and 11. The product shown in Fig. 10 is the Stowit, manufactured by Holly Enterprises of Addison, Texas, and the Tuk-a-Way, from the Deep South Marketing
The CB dealer can do much to lower the loss rate from theft and thereby provide a genuine service to his customers if he will take the time to educate his customers, keep an inventory of the various theft prevention items, and keep his own eyes open.

Units which are suspected of having been stolen can be checked in minutes by calling the unit's serial number and description into the nearest National Crime Information Center (NCIC), which has computer terminals at most law enforcement agencies. For example, if a stranger sounds as if he doesn't know too much about what is lower the loss rate from theft and to aid law enforcement agencies. For his own eyes open.

Time to educate his customers, to his customers if he will take the time to educate his customers, keep an inventory of the various theft prevention items, and keep his own eyes open.

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