IN THIS ISSUE:

Field Findings
Checking Video & Synch Waveforms
Feedback & Phase Inversion
Tuned Filters
A New Phono Pickup
Income Tax—It's Easy!
High Temperature is Tough on LONG LIFE...

But

Mallory Capacitors Can Take It!

Long life in a capacitor is one thing—long life in high temperature is quite another matter. That's why the record of Mallory Capacitors is so impressive. Tests prove that the characteristics of Mallory Capacitors are practically unchanged after 2000 hours at a temperature of 185° F.

It takes materials of the highest purity to withstand heat like that. But purity control is one of the big points in the manufacture of Mallory Capacitors. They are untouched by human hands; production workers wear rubber gloves. Specifications on the chloride content of the gauze are even more rigid than on hospital gauze. This gauze is the base on which aluminum is sprayed to create the anode plate.

That's not all! Mallory Capacitors have longer shelf life—longer life in an inactive set—lower RF impedance—ability to withstand higher ripple current.

Mallory Capacitors cost no more than ordinary capacitors—they're easy to install, and when they're installed they're dependable... and that means the kind of service that satisfies customers. Order from your Mallory distributor.

New Improvements in Mallory FP Capacitors

... Feature stronger anode tabs—withstanding discharge currents—improved high surge separators—still greater heat resistance—extra heavy rubber seal—heavier cathode tab—special etched cathode.

Buy Mallory Assured Quality At Regular Price Levels

P.R. MALLORY & CO., Inc.

CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS

SYLVANIA ADVERTISING HELPS SERVICE DEALERS INCREASE THEIR SERVICE BUSINESS!

Read what these 3 dealers say about Sylvania’s Dealer Campaign for Summer and Fall

SYLVANIA’S FEBRUARY, MARCH AND APRIL CAMPAIGN IS NOW READY.

Here’s what it contains:

- 3 Postal Card Mailings — one for each month.
- 3 Window Displays — one for each month.
- 3 Window Streamers — one for each month.
- 6 Newspaper Ad Mats — two sizes for each month.
- Radio Spot Announcements — several for each month.

SEND FOR FULL INFORMATION NOW!

Remember, this campaign designed for your use ties up directly with Sylvania’s ad campaigns on a national scale. You pay only the postage on the government postal cards you mail. Sylvania supplies everything else free! Mail coupon today!

SYLVANIA ELECTRIC

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, LIGHT BUBBS; PHOTOLAMPS

RADIO SERVICE DEALER • JANUARY, 1949
Dual Speed Player Standards

The advent of dual speed record players, combination 78-33 1/3 rpm jobs, gave the industry a big, well needed boost. The original method of launching the new player units and records left much to be desired, but with passing time has become straightened out.

Dual speed players afford owners with many advantages such as improved quality and economy. Likewise, the units afford Service Dealers with an opportunity to make sales and replacements, otherwise not obtainable.

However, now there's a "fly in the ointment". It seems that one or two very big manufacturers did not jump on the 33 1/3 rpm slow-speed bandwagon, preferring to establish a slightly different standard, either 45 rpm or 59 rpm for the combination with 78 rpm. If their plans to bring out dual speed players with 78-50 rpm ranges, and if their plans to bring out new phonograph records that will play only at 50 rpm are carried through to a conclusion, obviously, a great deal of confusion will result. We believe that if the record and record-player buying public gets tangled in a maze of different speed ratings, the whole business may be jeopardized. Thus, as we see it, RMA should get all the factors together immediately and establish once and finally what are to be standards for dual speed players and slow-playing records.

Test Equipment Issue

A radical departure from our regular publishing practice takes place next month. For the first time since "RSD's" inception almost 10 years ago we will have a special issue in February. We will call it our Test Equipment Number.

Its purpose is to acquaint radio technicians, dealers and students with the fundamental characteristics, limitations and applications of the 11 basic types of test equipments required in present-day AM-FM and TV servicing. Thousands of radiomen are using obsolete test equipment and have been reluctant to make new purchases until they could learn from an authoritative source just what the score is. Our February issue will be outstanding because it will dispel all confusion in this regard.

"LIFE" Reviews TV Progress

The December 6th issue of "LIFE" reviews the progress of radio and video quite comprehensively. One must respect some of "LIFE"s" observations, to wit: it calls television, "America's newest big industry". Continuing, there were comments regarding television no longer threatened to bring theatre [Continued on page 48]
MAKES FRIENDS...AND KEEPS THEM!

GENERAL ELECTRIC
Electronic TUBE
MADE IN U.S.A.

GENERAL ELECTRIC
FIRST AND GREATEST NAME IN ELECTRONICS

RADIO SERVICE DEALER • JANUARY, 1949
Unusual TV Installation

Harry Ward, 2916 E. Anaheim St.,
Long Beach, Cal., Service Dealer and
active member of the Long Beach
Radio Technician's Ass'n., found a
unique way to make a satisfactory
TV set installation in a Barber shop
located across the street from his
store.

Conventional TV arrays failed to
give satisfactory reception, as in ev-
ey case there was excessive interfer-
ence due to auto ignition. Finally,
Mr. Ward rigged up a window screen,
as shown in the illustration, position-
ing it below the dipole. This trick
solved the problem—and now, through-
out Long Beach, one can see many
TV antennas with various types of
chicken wire or screen vertical-wave
absorption devices attached.

Another TV Antenna Bon

An Elizabeth, N.J. housing project
prohibits tenants from erecting roof
TV antennas. To get around this
ban some tenants installed aerials on
arms extending out of their windows.
This infuriated the Chairman of the
housing project. He not only claimed
that such-out-the-window installa-
tions were a violation of the local
law, (which we do not believe is
true), he also claimed such window
installations are fire hazards, (which
we are inclined to scoff at because
of the ridiculousness of the claim).
To top it off, the Chairman really
let the cat out of the bag when he
stated that if people are rich enough
to own a television set they are rich
eough to live in a higher rent type of
building project. That is sheer
nonsense, for if politicians don't
realize that even poor people can af-
ford to buy TV sets for as little as
$3.50 a week, they should learn more
about the facts of life.

In a nutshell, renters hate TV un-
less they can use it to squeeze a few
extra bucks out of the tenants. The
situation is one that R.M.A. and
N.A.B. should do something about
... and they should do it now!

by S. H. COWAN

California's contribution to the
problem of licking vertical pickup.

The New Video Wire Link

Effective January 12th the new
telephone company link that ties the
Eastern and Midwestern video net-
works into an integral unit brought
a claim and huzzahs from all
branches of the video industry. In
time, and that time should not be
too far off, this country will have
video links from Coast-to-Coast, so
that five-talent shows or sporting
events originating at Hollywood,
Chicago or New York can be tele-
cast in all cities having TV outlets
simultaneously.

Television's biggest weakness, since
its invention, has been the inferior
quality of the programs. Networks
are the first and most important step
in eliminating that shortcoming. For
example, the 1948 Baseball World
Series games were split into two
parts, from a video point of view,
as the games played in Boston could
only be seen on TV in the East, in
cities on the Eastern network, and
the Detroit games could only be tele-
cast to the Midwest cities situated
on the Midwestern net. Had the new
telephone company link been in oper-
ation at World Series time both
networks could have carried all the
games.

The time zone difference between
East and West is going to be af-
fected by TV and it will not be as
simple a problem to lick as it was on
conventional AM. It's much
too expensive to rebroadcast a live
talent video show to take advanta-
tage of the time difference, as is now
done on AM programs. From where we sit,
it would seem as though the West
Coast is the one that is going to
have to "push its viewing hours
ahead". There is now a two hour
time difference between Hollywood
and New York. (Normally there
would be a three hour difference but
the West Coast is still operating on
Daylight Saving Time due to the
drought). Thus, if zone times were
normal, a big show put on at New
York at 8 p.m., New York time, were
there a Coast-to-Coast link, would
be the time in California at 5 p.m.,
and that's a little too early. Full
advantages of national commercial
sponsorship would not be obtained.

Incidently, it is time that one ap-
preciated the new, true status of the
West Coast, in-so-far as population is
concerned. The next national census
may show that California has a pop-
ulation almost as big as New York's.
There has been, and there continu-
ously is an ever-increasing migration
towards the West Coast. There is a
greater shortage of radio technicians
out West than in the East or Mid-
west. So, if any readers have been
pondering about a trek to the West
in line with Greeley's sage advice,
you now have the facts. (It cannot
be denied, even by a stalwart Connecti-
cut Yankee like me, that the climate
and hospitality of the West are
factors quite definitely in its favor).

Business Conditions

We have entered a New Year and
what the future will bring only time
itself can tell. My prognostications
may or may not be borne out.
MORE HOURS OF SERVICE • MICROPHONE CABLES

Every Type for Every Service

Belden Radio WIRE
Antennas, Course Focus Coils, Deflection
petitively priced.

Essential units

visions a

to the

creases signal

ers have designed this

areas,

lead-in wire. Nothing

double-folded dipole

Sheet makes assembling

6

NO RADIOMEN..You

stallations.

Gives ideal

Features

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Table,

CONTINUOUS TUNING

Write for Dealer Folder

TECHNICAL KNOWLEDGE REQUIRED

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all -channel

Features

from anyplace

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TV KIT

EASY

ASSEMBLE

ASSEMBLE

 catalog.

EQUIVALENT

equivalent list prices. Jobbers

try

on, tunes, in stations, contr-

and brightness, turns set off. Ideal

for installations where the television

receiver is inoperable. Tuner unit is a high gain

all-channel unit with about 50 microvolt

sensitivity. Easy to assemble in about an

hour.

Model TVU, with 25 feet of cable

With cabinet

Net $69.00

$85.00

ASSEMBLE Your Own CABINETS

Transvision's "MODULAR" Cabinets come in

stocked, unpainted units, offering an un-

limited range of combinations, including even

a bar. Finish them off to suit your taste.

Transvision Remote Control Unit Kit

Will operate any TV receiver from a distance.

Turns on, tunes in stations, contrast and

brightness, turns set off. Ideal for installations

where the television receiver is inoperable.

Tuner unit is a high gain

all-channel unit with about 50 microvolt

sensitivity. Easy to assemble in about an

hour.

Model TVU, with 25 feet of cable

With cabinet

Net $69.00

$85.00

RADIOMEN...You Can GET INTO The

TELEVISION BUSINESS

IN A BIG WAY WITH the

TRANSVISION DEALER PLAN

Write for Dealer Folder D-1

TRANSVISION, Inc., Dept. RSD New Rochelle, N. Y.

In Calif.: Transvision of California, 6572 Santa Monica Blvd., Hollywood 46.

All prices 5% higher west of Mississippi; all prices fair traded. All Prices Subject to Change.

I can not see a War in the im-

mediate offing. To begin with, Com-

rade Stalin has purged his top army

brass again. I don't believe he would

take such steps if he believed

that war was imminent. It's too great a

risk. So, as I do not expect any

world-wide conflict, I do expect that

radio amateurs will again resume

great activity. They have been quite

dormant for over six months. With

resumed "hams" activities there must

be expected a resumption of gripes

in regard to TVI, (television inter-

ference). Likewise, when "hams"

are active as hobbyists, they also,

become (too) active as part-time radio

servicemen. Let's hope that "hams"

will stick to the rigs and leave profes-

sional radio servicing to the men

who devote their full time to this

business.

Radio servicemen's organizations

should contact their parts jobbers and

try to work out friendly arrange-

ments whereby the jobbers will agree

to give the standard trade dis-

to any recognized and desiring

lege radio servicemen, and not to
every Tom, Dick and Harry who

wants to buy some replacement radio

parts at a wholesale price. Replace-

ment radio parts, tubes, etc. have

established list prices. Jobbers should

charge all buyers, except profes-

sional radio servicemen and industrial

manufacturers (who generally buy from

jobbers) full list price. Will this-
one, simple-to-accomplish basic rule

of good business carried out by job-

bers, it would be of inestimable benefit
to the radio servicing field.

Service organizations, in turn,

should give jobbers a break by order-

ing their needed replacement parts,
tubes, etc. in sensible quantities.

Hand to mouth buying is not good

business practice. For example, every

time a service dealer makes a phone

call he spends a nickel. And every

call, or visit he makes to a jobber

represents a waste of time. It instead

of buying six items at a time the

service dealer makes six phone calls,

buying one item at a time, he must

not overlook the fact that he has paid

$6 more for those items. Such a

waste of money is never justified.

Buy right! Little things like this

make a big difference. Keep a proper

inventory. Running short of items

that results in slowing down bough

work represents businesses losses that
can never be reclaimed or recovered

At last the servicing industry as a

whole has come to recognize that the

radio set owning public is willing to

(Continued on page 10)
SIMPLI-FLEX means just what it says! SIMple to install ... FLEXible for any requirement! Its design allows it to be built up from the basic dipole to multiple stacked all-channel arrays by the addition of reflector kits and additional arrays as required when more stations get on the air.

Here is the most successful ... the best engineered antenna line in the field! The Radiart line of antennas is GUARANTEED to produce the ultimate in television and FM reception ... covering all 12 channels! Radiart Simpli-Flex antennas get the picture — where others fail ... so install RADIART... for TROUBLE FREE ... SPEEDY ... AND LESS COSTLY INSTALLATION!

IT'S RIGHT WHEN IT'S RADIART

THE RADIART CORPORATION
CLEVELAND 2, OHIO
MANUFACTURERS OF THE FAMOUS RED SEAL VIBRATORS
EXPORT... SCHEEL INTERNATIONAL... CHICAGO 18, ILLINOIS
Controls: With CRL's improved Adashift Radiohms you can carry a small stock of controls, yet be ready to handle almost any kind of control replacement problem. No wiggle, no wobble, no slip. Just insert shaft pilot in control stub shaft, and slip "C" washer into place. Available in all sizes for all model "M" volume control applications. Six types of shafts.

Switches: Centralab offers you a complete line of Tone, Rotary Selector, Lever Action and Medium Duty Power Switches, which features a wide variety in both laminated phenolic and steatite insulation. Available with shorting or non-shorting contacts. See your Centralab Distributor for further information, or write direct for new Catalog 26.
with Centralab parts

Three real advantages are yours when you use dependable CRL replacement parts in your shop. That's the word of successful servicemen everywhere. These men report — 1. Centralab parts are easy to stock . . . easy to identify. Many CRL components are packaged to give you more shelf space . . . neater displays. All are clearly labeled for quick identification. 2. Centralab parts are easy to use. CRL design speeds repairs by eliminating tricky bending or fitting operations. 3. Centralab parts provide performance that insures repeat orders . . . invites new customers. Yes — Centralab parts can help you build up your service business. Get the complete story from your CRL distributor.

— Phil A. Smith, owner of the Smith Radio & Appliance Company, Shorewood, Wisconsin, says, 'I've been in the radio-servicing business 21 years — using Centralab replacement parts from the beginning. During this period I've had plenty of opportunity to prove just how dependable CRL parts are.'

"Hi-Kaps": CRL line of ceramic By-pass and Coupling Capacitors gives you ceramic dependability and permanence at a new low price! Packaged in a convenient envelope of five, Hi-Kaps are clean, easy to stock and handle. Wide range from .000050 to .010000 mfd. Rating — 600 WVDC, 1000 VDC flash tested. Ask your Centralab Distributor for all the facts.

"Hi-Vo-Kaps": Just out! Centralab's new high voltage capacitors for television and high voltage applications. Made of Ceramic-X, Hi-Vo-Kaps combine high voltage and small size to give you convenient, dependable performance. 10,000 WVDC, flash tested. 20,000 VDC. Capacity — 500 mfd. See your CRL Distributor, or write direct.
FIELD FINDINGS
[from page 6]

pay for all services received. For example, there is no longer any need to test tubes free of charge. The money you receive for testing tubes during a year can be applied towards the purchase of much needed new test equipment. Test equipment wears out. When a customer asks you to test his tubes, he asks you to wear out your test equipment, and he is obligated to pay for that depreciation, not to mention your time or experience.

Which brings us to the premium deal that some Columbia (long-playing record) distributors are pulling. Full-page advertisements have been run in newspapers offering the public "absolutely free a $19.95 record player attachment with the purchase of six L-P 12" records." This sort of deal is all right for the dealers who handle Columbia records, and for the people who fall for it by buying the L-P records just to get the player attachments. But, when a record firm has to give away such premiums in order to sell its products, to our mind, it shows an inherent weakness in the product itself, meaning the L-P records. If the other claims made for L-P records are borne-out, then Columbia need not give away $19.95 attachments to clinch sales. Incidentally, every time one of these attachments is given away it prevents a radio dealer or serviceman from making a sale of such a unit, and, when you hit a dealer in his pocketbook you hit him where it hurts. So, as a result of Columbia's premium deal, I can visualize thousands of dealers and servicemen getting sore at Columbia. Losing the recommendation and good will factor of the Nation's Service Dealers is going to cost Columbia a lot more, over a period of time, than they'll get out of their premium deal.

As stated in this issue's Editorial, we are 100% for L-P records and dual speed player attachments because they afford Service Dealers and technicians a new, potential sales item that can represent a tremendous profit over a period of time. But no one can compete with give-aways, and we can only go on record that we are 100% against all such free offers. Let Columbia sell its line of records, and let our group of merchants be given the right to sell the attachments and the time and skill needed to install them and keep them in repair. Shame on Columbia!
Form A Group, Servicemen—
Subscribe to "RSD"—
SAVE Up to 50%

★ The more in a group the bigger the savings. 6 men in a group save $1.00 each; 4 men groups save $ .75 per man. Present "RSD" subscribers may participate in or form a group with co-workers, or even competitors. Still active subscriptions are automatically extended 1 year. Start a Group today! The timely and exclusive technical data appearing in future issues of "RSD" will make this the best investment you ever made. The special Group Rate offer may be withdrawn at any time—so hurry.

Use This Coupon For Convenience

(THE coupon below can be used for from 1 to 6 subscription orders. Use it today!)

RADIO SERVICE-DEALER MAGAZINE
342 Madison Ave., New York 17, N. Y.

Please enter 1 year subscription orders for the names given below. Our remittance is enclosed.

NOTE: If you do not wish to tear this order blank out, just print or type the information on a single sheet of paper, following the style given. Each subscriber's occupation must be clearly described.

Name.                        Address.

Describe Title or Position and Type of Business.

State whether a New Subscriber □ or Renewal Order □

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Describe Title or Position and Type of Business.

State whether a New Subscriber □ or Renewal Order □

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RADIO SERVICE DEALER • JANUARY, 1949
Woods Sept. Contest Winner

First prize in the September Hytron Servicemen's Contest was won by Casimir F. Woods of 54 North 7th Street, Newark, New Jersey. Hytron Rep. H. H. Friedman and Stanley Dudek, Radio Parts Division Manager of the Variety Electric Company, made the prize presentation, a Jackson Model 641 Universal Signal Generator.

Mr. Woods has been associated with Colonial Radio, Buffalo. At the present, he is attending a technical school for television and plans to open his own business in the near future.

RMA Fights Ordinances

The RMA Board of Directors appropriated funds and directed General Counsel John W. Van Allen to take whatever legal action is necessary to bring about modification or repeal of a New York City ordinance restricting the use of sound equipment and mobile radio equipment after it was explained that the municipal law is so broad that it bars the use of private auto radios, radio communication facilities for trucks or taxis, and aircraft and maritime radio facilities when operated within the confines of New York City.

Funds also were appropriated to enable Judge Van Allen to bring a test case challenging the constitutionality of a Pennsylvania state tax ruling imposing a tax on taverns equipped with television receivers. The action will be brought in Federal court and will contend that television broadcasting is inter-state commerce and consequently not subject to taxation by a state.

A constructive RMA program to deal with the problem of television antenna installations in apartment houses, proposed by the RMA Service Committee, is under consideration, including proposed cooperation with apartment house owners, managers, and the National Real Estate Board. The RMA program is designed to meet the needs of both apartment house tenants and owner-management interests, with master antenna systems developed under RMA auspices.

Included in the RMA program is a proposal for cooperative development by the RMA legal department with the National Real Estate Board of a standard apartment house lease covering television installations.

October Radio Tube Sales Up

October sales of radio receiving tubes by RMA member-companies totalled 19,521,368, an increase of more than one million over sales in September, the Radio Manufacturers Association reported.

A breakdown of October sales shows 14,101,695 tubes sold for new sets; 3,676,254 for replacements; 1,690,356 for export; and 53,063 sold to government agencies. Total receiving tubes sold by RMA manufacturers during the first 10 months of this year amounted to 164,531,340.

I.R.E. 1949 Convention

The 1949 National Convention of The Institute of Radio Engineers will be held from March 7 to 10 at the Hotel Commodore and Grand Central Palace in New York City. Radio, phonograph, radar, and television, the big new contribution to modern living, will be thoroughly covered.

Syracuse Gets TV

Syracuse, N.Y., dealers and technicians got the low-down on television during a recent meeting at General Electric's Electronics Park, Syracuse, N.Y., when station WGEN started program tests. G.E. supplied the transmitter and associated equipment for the station.

Typifying the wide-spread interest in practical television servicing more than 300 radio service dealers registered at the technical meeting Al Saunders conducted on behalf of Howard W. Sams & Co. in Dallas, Tex., in cooperation with jobbers.

Mallory Gets Citation

A citation for "outstanding achievements in human relations in labor" was awarded to P. R. Mallory & Co., Inc. at the sixth annual Executive Leadership Forum, sponsored by the Indianapolis Junior Chamber of Commerce on November 16.

Scientific TV Tube Tester

Sylvania Research recently built an automatic recording spectrosimeter for precise measurement of television viewing tube light output. Production of the instrument, which will be used in production quality control in commercial television tube production at Emporia, Pa., was under the direction of A. E. Martin, supervisor of the photonic section.

Battery Merchandiser

Burgess Battery Co., Freeport, Ill., announces a new counter battery merchandiser which displays 14 best-selling flashlights in 5 models. These retail from 98c to 82.30. The merchandiser builds repeat sales and acts as its own inventory guide. For details write Burgess direct.
ON INTERMITTENTS

One of the greatest single problems encountered by the radio technician in his daily work is the intermittent radio set.

However, when suitable instruments are used to monitor intermittent receivers, the regular shop schedule can be maintained. Other service jobs can be completed while monitor instruments stand watch for any change in the functioning of an intermittent receiver.

Less effective methods are also used to shoot intermittent trouble. In an attempt to save man-hours, some technicians habitually replace defective components. In such cases, man-hour costs are pyramided on top of component costs, if these costs are passed on to the customer, good will suffers.

Artificial acceleration of the intermittent cycle is helpful in some cases. High line voltage will hasten the breakdown of certain marginal components. Low line voltage frequently causes a defective oscillator to cease operation. Some intermittents can be speeded up by increasing the operating temperature of the chassis by placing it in a curing with an incandescent lamp.

Although all of these methods work at times, signal-monitoring techniques have been found to be the best answer to the intermittent problem. Occasional checks of the monitor indicators show whether gradual operating changes are taking place. After the intermittent occurs, it can be localized to a particular section of the receiver by analysis of the monitor instruments.

Monitoring instruments have the advantage of providing a continuous check of the oscillator frequency and voltage, of the intermediate signal frequency and amplitude, of the audio input and output, of the receiver power consumption, and of the arc supply voltage.

Oscillator frequency shift is one of the most elusive causes of intermittent operation. Other obscure intermittents are caused by defective power-supply components, which, in such cases, the monitor chiefly as a change in power consumption.

The RCA-162-C Chanalyst Electronic Analyzer solves once and for all the problem of time-consuming intermittents. It works for you unattended—and spots the fault in any receiver whenever it shows—leaving you free for other work. That's why the RCA Chanalyst more than pays for itself in the time it saves.

The RCA-162-C will give you a positive check of any fault which takes place in the receiver under test. Its four electron-ray tubes plus an electronic voltmeter give an immediate indication of any change when it occurs. Once the trouble is localized it is a simple matter to determine the cause.

Find out today how the RCA-162-C Chanalyst Analyzer can make more money for you. Ask your RCA Test and Measuring Equipment Distributor for the new bulletin on the 162-C, or write RCA, Commercial Engineering, Section 55AX, Harrison, New Jersey.

The RCA-162-C Chanalyst Electronic Analyzer makes the difference between profit and loss

This brief discussion illustrates the important fact that many hours of time can be saved if the receiver is divided into five main sections, or channels, which can be monitored continuously. These are the AF oscillator, the RF or IF channel, the audio system, the power supply, and the arc channel. After the intermittent has been localized to one of these sections, the instrument probes can be used to "close in" on the defective component.

Continuous monitoring places intermittent trouble-shooting on a firm technical basis.
"A Ford in your future?" There will probably be a fine new Ford radio receiver on the dash. Chances are good this receiver will be equipped with tubes by Hytron. For Hytron is a major supplier of Ford auto radio tubes. That is only natural. Hytron specializes in auto radio tubes — both GT and miniature. Close engineering co-operation with leaders like Ford help make Hytron auto radio tubes leaders, too. 'Nuff said. Hytron and auto radio go together.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921.
Checking

VIDEO & SYNCH WAVEFORMS Using a CRO

by SAMUEL MARSHALL

PART 2

Final installment of this series. Actual test set-ups are illustrated, together with the waveform shapes and amplitudes that might be expected a typical TV receiver.

The final installment in this series deals with the practical methods that may be employed in observing the various synch and signal waveforms on a cathode ray oscilloscope discussed in the first installment. Figure 8 illustrates a typical set-up for this purpose. When making these tests it is advisable to set up the receiver so that all test points are readily accessible.

In order to become familiar with the general procedures of these tests it is best to tune in a station pattern under normal operating conditions. A pattern of this type results in a constant video signal and lends itself readily to easy interpretation.

Initial Test Point

The most convenient initial point of measurement is the output of the second detector. The reason for this choice is that the signal voltage at this point is 1 or 2 volts, and lends itself to good observations on an oscilloscope. Remember that we are primarily concerned with measuring and observing the video picture signal and the synch pulses, and that these are first observable in their demodulated forms at the output of the second detector.

Figure 9 at the top right illustrates a combined video signal and vertical synch pulse obtained at the detector output. The sweep frequency of the CRO has been set at 30 cycles in order to permit two of these pulses to appear on the screen. The partial circuit diagram on the left illustrates the test points for this test. This corresponds to point E on the block diagram section discussed during the first installment. See Fig. 1. The complete front view of the cathode ray oscilloscope with all its settings, and the waveform appearing on the screen is at the top right.

To make this test a connection is made between the detector output and the vertical input connection on the CRO. Another connection is then made between the ground connections of the receiver and the oscilloscope. The detector output connection may be taken off at either side of the coupling condenser, C, whichever is most convenient. The receiver output is adjusted to its optimum level, thereby requiring a minimum setting of the vertical gain control on the scope. This will result in more accurate and satisfactory patterns.

RADIO SERVICE DEALER • JANUARY, 1949
Notice the amplitude A of the combined synch pulse and signal as compared with the signal amplitude itself shown as B. The middle line at B represents the blanking level, and the height above this level—in the slide this occurs below the blanking level because of the reversed phase of the pattern—is the region called "blacker-than-black."

The blanking level should be 75% of the total height, A, according to FCC standards.

Shown in the lower right-hand side of this illustration are the horizontal synch pulses and the associated picture signal. The same test point is used. However, the sweep frequency of the CRO is now adjusted to one half the incoming horizontal pulse frequency. This is 15,750 divided by 2, or 7,875 cycles.

Figure 10 shows the vertical and horizontal pulses at the output of the first video amplifier. Notice that the phase has been reversed 180° which is characteristic of vacuum tube action. The amplitude of the signal at this point is about 16 volts. Varying the gain of the receiver by means of the contrast control will produce corresponding variations in the height of the pattern.

As in the previous test, the sweep of the CRO is adjusted to portray two pulses. The test point may be made on either side of the coupling condenser, C, shown in the partial schematic at the left of the slide. The probe connection of the scope may be brought to the plate side of the coupling condenser if an isolating condenser is located in series with the vertical input terminal; and it usually is.

Proceeding now to the output of the final video stage, as shown in Fig. 11, we notice that the phase for both horizontal and vertical plates is again reversed, and that the amplitudes of the signal are considerably increased. In this case it is 45 volts. This output is fed directly into the grid of the CRT, and as previously pointed out, represents a positive picture phase.

Fig. 9—Waveforms, horizontal and vertical obtained at detector output.

Synch Circuit Section

A portion of the video signal is taken off the d-c restorer at the 0AT5 plate connection No. 2. The signal at this point, containing both video and synch components, with the video somewhat reduced, is fed into the first synch amplifier at a negative synch phase, or what amounts to the same thing, a positive picture phase.

This is shown in Fig. 12. The operating characteristics of this circuit result in a reduction of pulses due to noise and other interfering signals. The amplitude of the signal at the grid of the first synch amplifier is about one-fourth that of the output at the plate of the final video amplifier. This is due to the signal being taken off a point on a voltage divider connected across this circuit.
Figure 11—Horizontal and vertical pulses obtained at video output tube.

Figure 11 shows the horizontal and vertical pulses as they appear at the grid of the synch clipper or separator. Notice that the amplitude at this point is 80 volts, and that the signal still contains considerable picture components. Also, the signal now has a negative picture phase, or a positive synch phase.

We now shift our take-off point to the output circuit of this tube, as shown in Fig. 14. Observe that the picture signal has now been completely eliminated, and that only the synch pulses remain. The amplitude of these pulses at this point is 60 volts, and the synch phase is now negative.

The action in this circuit that produces this clipping of the picture signal results from the following:

1. The picture signal at the grid of the tube has a negative polarity.
2. The operating voltages on the tube are such that all negative portions of the signal are cut off.

Since the polarity of the video or picture portion of the signal is negative, and since all negative portions of the signal are clipped off, only the synch pulses remain.

The next test point is the plate of the third synch amplifier. The polarity of the synch signal at the grid of this tube is now negative. At the plate it becomes positive. The complete change taking place in the synch signal polarity in the three stages of the synch amplifiers is shown in Fig. 15. Here we see a negative synch pulse entering the grid of the first synch amplifier, and, after going through three complete 180° phase reversals, emerging from the last stage with a positive polarity.

This last synch tube, which is one half of a duo-triode, operates at low enough potentials so that an 80 volt signal applied to the grid drives the signal applied to the grid drives the peaks of the signal. This results in an additional clipping action, thereby further reducing noise and other interfering pulses.

Integrating Circuit

The amplitude at the output of this tube, which is shown as point 1 in Fig. 16 is 30 volts. The synch pulse phase is positive, and we are now in a position to inject this signal into the horizontal and vertical blocking oscillators for purposes of triggering them to the exact frequency of the incoming station pulses.

The signal at the output of the final synch amplifier contains both the horizontal and vertical pulses which we must separate from each other. This is done by the integrating and differentiating networks we mentioned in the first installment. These are shown more clearly in Fig. 16 as combination R-C filter circuits. The integrating circuit shown at the top left consists of a number of resistors and capacitors connected in such a manner as to short out the horizontal pulses and build up the amplitude of

Fig. 12—Pulses obtained at 1st synch amplifier on either side of C.
Fig. 13—Pulses obtained at input of 6SH7 synch separator. Note waveforms.

the vertical pulses. Notice the shunt capacitors, \( C_1, C_2, \) and \( C_3 \). These capacitors in addition to building up the amplitude of the vertical synch signal during successive pulses of the ser-rated vertical synch pulse, short out the higher frequency horizontal pulses, leaving only the vertical pulse to reach the grid of the 6J5 vertical oscillator.

Proceeding now to the differentiating circuit, the 100 mmf condenser connecting the output of the third synch amplifier to the input of the horizontal oscillator presents a high resistance to the low frequency vertical pulses as compared to high frequency horizontal pulses, so that the signal permitted to pass thru this condenser contains only the horizontal pulses.

If we apply the test probe of the CRO to point 1, both the vertical and the horizontal pulses appear. At point 2 only the vertical pulses appear, and at point 3 only the horizontal pulses appear.

We are now ready to trace the vertical pulses as they proceed from the output of the 6J5 oscillator to the input of the vertical deflecting coils. The lower left-hand portion of Fig. 17 is devoted to the block diagram of this portion of the circuit.

The upper left-hand portion of the figure is confined to a simplified partial schematic of this circuit. The four test points shown in the block diagram are indicated in the partial schematic by identical numbers. Thus:

No. 1 is the input of the vertical oscillator.

No. 2 is the output of the vertical oscillator, the amplitude of which is about 120 volts. This signal is acted upon by the discharge or peaking circuit. The object of this circuit is to obtain a wave at the output of the oscillator which insures the presence of a sawtooth current wave in the vertical deflecting coils. But, more on that shortly.

No. 3 is the output of the vertical deflecting coils. The potential at this point is about 65 volts.

No. 4 is the input to the vertical output tube, which is about 450 volts.

The corresponding waveforms for test points 1, 2, 3, and 4 are shown at the right of the screen.

No. 1 proceeding from top to bottom indicates the sharp steep discharge, and slow saw-tooth charge portions of the wave which are characteristic of the blocking oscillator.

No. 2 indicates the effect of the peaking, or discharge circuit on this waveform. Variations of this waveform may be produced by varying the vertical amplitude control. This is an excellent check on the operation of this circuit.

No. 3 indicates the waveform of the pulse at the plate of the vertical output tube, or the 6K6. Notice how high the pulse voltage is for the re-trace portion. This is necessary to insure a high retrace current rate on

Fig. 14—Horizontal and vertical pulses obtained at 3rd synch amp. input.
the vertical deflecting coils during the retrace period.

Peaking

The reader will recall, the formula relating to voltage, inductance, and the rate of change of current in coil given in the first installment. This formula is repeated again in two forms:

\[ e = L \times \text{Rate of change of current} \]
\[ \text{Rate of change of current} = \frac{e}{L} \]

During the retrace period the frequency is much higher than the 60 cycle frequency of the trace period. As a result, the reactance set up by the inductance in the coil is much higher than before. This affects the current considerably. From the formula shown above, in order to get a high and fast discharge of current during the retrace period the voltage amplitude must be high and its waveform steep.

Returning again to Fig. 17, and examining waveform No. 1 once again, we notice that the trace portion of the voltage curve is somewhat of a sawtooth. This is due to the fact that during the trace period, the inductance of the vertical deflecting coil is negligible as compared to its resistance. In a resistance, if we want a sawtooth current we must have a sawtooth voltage. This explains why, in the composite wave, the waveform of the retrace is a sharp high amplitude pulse, and the waveform of the trace is a low amplitude saw-tooth.

Horizontal Circuit

We can now proceed to the horizontal oscillator and the circuits devoted to the development of the horizontal sweep. Fig. 18 illustrates the partial schematic of this portion of the circuit in the upper left portion of the screen. Below it is the block diagram showing the test points numbered to correspond to the same points in the schematic above. These test points are as follows:

- The reader will recall, the formula relating to voltage, inductance, and the rate of change of current in coil given in the first installment. This formula is repeated again in two forms:

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Horizontal Circuit

We can now proceed to the horizontal oscillator and the circuits devoted to the development of the horizontal sweep. Fig. 18 illustrates the partial schematic of this portion of the circuit in the upper left portion of the screen. Below it is the block diagram showing the test points numbered to correspond to the same points in the schematic above. These test points are as follows:

- Fig. 15—Signal phase is reversed 180° as it passes through each tube.

No. 1 is the input of the horizontal oscillator.

No. 2 is the output of the horizontal oscillator, at about 120 volts.

No. 3 is the output of the horizontal discharge circuit, at about 45 volts.

No. 4 is the output of the horizontal output tube, at about 4,000 volts. The utmost caution should be used when measuring high voltages of this nature.

No. 5 is the output of the horizontal output transformer, which is about 500 volts, and represents the voltage waveform appearing across the horizontal deflecting coils. Notice the flattened characteristic of this waveform. It will be recalled that in order to obtain a sawtooth current wave in a circuit which is predominantly inductive, a flat top voltage wave is required. When measuring these high voltages a high voltage test probe should be used, and a capacitance voltage divider should be employed for the CRO to prevent damage to its input circuit.

Space does not permit further analysis of the many fine points each.

(Continued on page 47)

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Fig. 16—Waveforms obtained at horizontal and vertical separation points.
During our chores as servicemen and dealers we necessarily deal with feedback and phase inversion within audio amplifiers to a greater extent than we realize. It is therefore fitting that we thoroughly understand these associated subjects. It is important to remember that, careless replacement of some critical capacitor, resistor or inductance by one not having the identical value intended for the original, will cause phase shift distortion. The effect becomes cumulative when several careless replacements are made with the direct result that the original signal becomes considerably distorted.

In multistage amplifiers care must be taken to prevent unwanted feedback of signal voltage in the output stage from getting back into the input circuits. Should such feedback occur, the signal fed back may be of such phase relation as to either aid or oppose the original input signal. Feedback of an aiding nature is called positive or regenerative while that which opposes the input signal, that which is out of phase with it, is called negative, degenerative, or inverse feedback. When properly controlled the negative type can prove most useful; in fact is used to great advantage in modern audio amplifiers. More on that later.

Effects of feedback, positive and negative, and principles and applications of phase inversion are discussed in two articles, the first of which is presented in this issue.

Positive Feedback

Positive feedback has the same phase relation as the original signal; their positive half cycles are synchronized in time or phase relation with each other as are the negative half cycles. Such feedback was deliberately introduced in earlier regenerative sets where a tickler coil in series with the detector plate circuit was deliberately fed back to the preceding grid circuit.

Fig. 1—Tickler feedback.

Fig. 2—Diode detector feedback.

In phase for an increase of signal strength. (See Fig. 1). However, because of its unstable character this regenerative type of feedback is seldom intentional in amplifiers. More often in the servicing of amplifiers it is to be eliminated or at least held to a minimum. Therefore we list the following reasons which may cause its unintentional occurrence:

1. Inductive leakage coupling; insufficient shielding between inputs and outputs; lack of deocoupling; coils too close together or not at right angles to each other.

2. Linkage of inputs and outputs through the use of common grounds or common power supplies. Plate and screen a-c currents must not flow through a common positive supply to all tubes. Filtering will correct this.

3. A shorted by-pass or shorted deocoupling filter condenser will conduct positive feedback from output to input or supply circuits.

Phase Inversion

Example 1—For one of the simplest examples of phase inversion, refer back to Fig. 1 to the regenerative tickler coil discussed under Positive Feedback. When the tickler's magnetic flux cuts across the preceding grid coil in such a manner as to induce voltages which are in agreement or of the same polarity as that of the incoming signal, the coupled voltages are in phase. When the leads or ends of such a tickler coil are reversed, while it remains in the same physical relation, it's phase becomes inverted. The two voltages oppose each other and the original positive feedback becomes inverted to negative feedback.

Fig. 5—Block schematic principles
INVERSION
by C. A. TUTHILL

PART I

Example 2—Many are the ingenious methods to obtain phase inversion but to better understand the simple necessity for its use, let us study another plain example of application as in Fig. 2. Here phase inversion is easily derived from the diode circuit of the detector tube T-1. It is known that the opposite ends of the diode load resistor, which amounts to R1 and R2 in series, will have opposite polarity at its ends since a pulsating direct current will travel through the combined resistor. Then, if the center tap between R1 and R2 be grounded, voltages of opposite polarity required for the push-pull stage may be fed to the grids of V-2 and V-3 from the opposite ends of this total resistor.

Example 3—We also find phase inversion within a push-pull stage. More often this stage is transformer fed as in Fig. 3. When a sine wave is introduced to the input terminals the first or positive half cycle causes the upper half of the secondary winding of T-1, and hence the grid of V-1, to become positive. Similarly the lower half of the secondary winding and the grid of V-2 become negative. This action is aided or bucked by the grid bias voltage applied to the mid-point of the same secondary winding mentioned above. It follows that the plate current of V-1 increases while the plate current of V-2 decreases. The resultant variations in plate current are therefore 180° out of phase—another case of phase inversion.

Example 4—Often an extra vacuum tube is introduced wholly to serve as a phase inverter in a resistance coupled amplifier. (See Fig. 4) The plate of a conventional driving tube A is coupled to one of the two tubes of a push-pull stage in the usual manner. A resistor tap across part of the output voltage of driving tube A is fed to the grid of phase inverter tube B which in turn feeds the grid of the second push-pull tube. Since the alternating plate and grid voltages of tube A are out of phase by 180°, so then is the grid of tube B in relation to that of the grid of tube A. Thus the plates of tubes A and B are displaced the required amount to drive a push-pull stage. The only other requirement is that values of components be so adjusted that the driving voltages from tubes A and B be identical.

As will be shown later, the great advantage of inverse feedback (a phase inversion of 180°) in an amplifier, lies in the fact that the gain and frequency response of the amplifier become almost independent of changes occurring due to aging tubes, variations in supply voltages, temperature changes or mechanical vibration. The gain and frequency response of a feedback amplifier depend greatly upon the feedback circuit which employs but a few resistors and capacitors hence remains stabilized over a great period of time. Inverse feedback is therefore employed in modern a-c operated vacuum tube voltmeters, d-c amplifiers, and other equipment where a constant gain or reliable performance is mandatory.

Negative Feedback (Voltage)

Although 180° out of phase with the input signal, and therefore opposing it, negative feedback may prove highly beneficial when properly controlled and applied to audio amplifiers. The more usual gains derived from negative or inverse feedback of the voltage type are the following:

1. It counteracts or nullifies such unintentional content of positive feedback as may exist and thereby stabilizes an amplifier.
2. It reduces distortion within an amplifier and better its frequency response as we will see later.
3. It improves the dynamic characteristics of an amplifier in that it

[Continued on page 45]

Fig. 3—Push-Pull amplification.

Fig. 4—Extra tube phase inverter.
Tuned filters for transformerless half-wave power supplies

The subject of this article. Various types are discussed.

A positive way to clean up the power supply from a half-wave transformerless unit is to use a half-wave transformerless power supply (either tube or selenium rectifier) in a small amplifier, tuner, or test instrument. This type of power supply is well known.

A typical arrangement of filter with tuned section is shown in Fig. 1. The tuned section is designed for elimination of the 60-cycle ripple and the unwanted section takes care of the hum harmonics (20 cycles or less) in the conventional section. The L and C values in the tuned section (Fig. 1) are not critical and can be any choke and capacitor, respectively. The tuning arrangement is done with series tuning in certain cases, or with parallel tuning in others. The type of tuning used will to a large extent be determined by the circuit in which the filter is to be used, and also by the degree of ripple and hum that it must handle.

Fig. 2—Series-Tuned Section

For circuits having a high impedance at the power supply, series-tuned sections are used. The tuned section consists of a series-tuned section (Fig. 2) parallel to the load. The method used is to connect the circuit in parallel with the load and to use the values of inductance and capacitance shown in Table 1 for the series-tuned section. The total inductance required is obtained by adding the inductance of the series-tuned section to the inductance required for the parallel-tuned section. The required capacitance is obtained by subtracting the total capacitance of the series-tuned section from the total capacitance required for the parallel-tuned section.

Fig. 3—Parallel-Tuned Section

For circuits having a low impedance at the power supply, parallel-tuned sections are used. The tuned section consists of a parallel-tuned section (Fig. 3) connected in parallel with the load. The method used is to connect the circuit in parallel with the load and to use the values of inductance and capacitance shown in Table 2 for the parallel-tuned section. The total inductance required is obtained by adding the inductance of the parallel-tuned section to the inductance required for the series-tuned section. The required capacitance is obtained by subtracting the total capacitance of the parallel-tuned section from the total capacitance required for the series-tuned section.

Table 1 lists the inductance values and capacitance values for various minimum ripple and hum values. The inductance values are given for a given capacitance as the primary inductance of the d.c. choke is undesirable here. The hum may be tuned out very easily by adjusting the type of tuning used.

Table 2 lists the inductance values and capacitance values for various minimum ripple and hum values. The inductance values are given for a given capacitance as the primary inductance of the d.c. choke is undesirable here. The hum may be tuned out very easily by adjusting the type of tuning used.

TUNED FILTER TYPES of tuned filters which are applied most easily present in a considerable additional circuit are caused by the presence of the hum harmonics (20 cycles or less) in the conventional section. The L and C values in the tuned section (Fig. 1) are not critical and can be any choke and capacitor, respectively. The tuning arrangement is done with series tuning in certain cases, or with parallel tuning in others. The type of tuning used will to a large extent be determined by the circuit in which the filter is to be used, and also by the degree of ripple and hum that it must handle.

Fig. 1—Basic arrangement of filter with tuned section followed by simple untuned section.
FILTERS

by RUFUS P. TURNER

Table 1

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Bridged-T Section

Two identical capacitors, \( C_1 \) and \( C_2 \), are required in this type of tuned filter section, shown in Fig. 4. Their values, for a given choke inductance, are obtained from Table 2. These capacitors may be matched closely enough by means of a service-type capacitance bridge or microfarad meter. Choke \( L \) must be rated to carry the full d-c load current. Rheostat \( R \) may be provided with a slotted shaft for screwdriver adjustment, and is "tuned" for complete hum elimination.

Parallel-T Section

In the parallel-T R-C tuned circuit (See Fig. 5), the constants have been (Continued on page 44)
A New
PHONO PICKUP
by RALPH M. BARUCH

A new discovery has been made which should have great effects upon the pickup manufacturing industry, and other allied industries such as hearing aids, loudspeakers, etc. It is a new pickup cartridge containing the first man-made material acquiring the necessary piezo-electrical properties for proper sound reproduction. Piezo-electricity is the name applied to that branch of science dealing with the conversion of mechanical pressure into electrical power.

Properties of Titanate

The material employed in the manufacture of this new pickup cartridge is a ceramic called, "titanate," which, when properly processed, acquires all the qualities necessary for good record reproduction. The first research, as pointed out by the manufacturer, in the field of ceramics in the audio field was undertaken in conjunction with a program of research for hearing aids started several years ago. At that time the discovery was made showing that this ceramic was suitable, in some cases, in uses involving piezo-electrical properties. The more the material was studied the more advantageous it was found. Research engineers followed the lead and have completed development and consumer tests of the first news in pickup design and pickup production since the development of the crystal.

Titanate in its initial state does not possess all the properties which would make it usable for pickup manufacturing. These properties are acquired by putting it through a relatively simple but precise process. The material is first mixed into a heavy paste, spread on a moving belt, and conducted through a furnace where it is baked and thereby acquires great rigidity and hardness. The result is a long strip of material, about one hundredth of an inch thick, which is subsequently cut to the proper size. Then each piece is silvered on both sides. Two of these small slabs are put together and a sapphire point attached through an arm at an end. The whole is encased in a metal container and equipped with screw holes for mounting. The

The characteristics of a new type of phono cartridge made of titanate, a piezo-electric ceramic, are discussed here.
complete cartridge assembly is said to weigh only slightly more than two thirds of an ounce. See Fig. 1.

Properties of Pickup

Features of this new pickup cartridge are: Wide frequency response—high signal output—high capacitance cartridge—high needlepoint compliance—sapphire needle point—low needle point pressure—excellent temperature and humidity resistance—small size—needle guard—low distortion—compactness.

The frequency response of the "Titone" pickup is said to range from 50 cycles to at least 10,000 cycles. In the graph shown in Fig. 2, the frequency response can be seen as taken with the Columbia test record #10004-M. The solid line shows the output when loaded with 0.5 megohms: the broken line represents the output when operating into 2 megohms; the dash and dot line represents the open circuit voltage.

The latter shows excellent displacement properties over its entire frequency spectrum. It must be remembered that good pickup frequency response can only be judged with amplification systems and loudspeaker reproducing units able to reproduce the frequencies that are to be tested. You cannot get something reproduced from a record by a pick-up, which cannot be handled by the amplifier or the speaker. Therefore make sure that both are up to par in frequency response with the pick-up to be tested.

The generated voltage of the pick-up cartridge is sufficient in amplitude to drive the average audio frequency amplifier. A value of 0.8 volt is generated at 1000 cycles per second on the Columbia test record 10004-M. On frequencies below 1000 cycles, the open-circuit voltage generated is directly proportional to the amplitude of the recording.

The nominal capacitance is such that the new ceramic pickup can be mounted directly into apparatus constructed to handle the conventional Rochelle salt crystal thereby replacing the old type crystal. The value of this nominal capacitance is 1000 microfarads.

Properties of Needle

A very important factor in the development of pickups is the needle point impedance, or the sensitivity of the needle to side motions and its resistance to it. The parts in most pickups are springy and move in accordance with the sound picked up by the needle. This needle, and particularly its point, is a very small object and is thrown back and forth between five and fifteen thousand times per second according to the frequency reproduced. In the pickup discussed, the claimed lateral needle compliance is approximately 0.5 x 10^-6 cm. per dyne, and the effective moving mass is said to be very small. The heavier or larger the moving mass the faster the record grooves will be worn out by the back and forth movement of the needle point. A small moving mass therefore would give the advantage of low record wear. The vertical needle compliance of the arm and pickup is of the order of 1.5 x 10^-6 centimeters per dyne. This would allow the arm to move freely up and down when records are warped and thereby eliminate any loss of fidelity sometimes caused with other pickups by this warpage. This fact would also contribute to lower record wear. Needle talk, similarly, is said to be greatly minimized in this new pickup. Records could consequently be played in open type cabinets without surface noise or needle noise, both of which are sometimes so annoying.

The needle point contained in the cartridge is a permanent sapphire point. Both the needle point radius and the cone angle, two other factors important for low record wear, are said to be held to rigid tolerances thereby also assuring good reproduction in all frequency ranges. The cartridge was designed to operate with a needle point pressure of 22 grams.

Temperature Characteristics

The Titone pickup is made, in part, from a form of transducer element quite different from the piezo electrical crystals such as Rochelle salt or ammonium phosphate used in the conventional pickups. The new elements introduced are said to be able to withstand temperatures ranging from -65 degrees Fahrenheit to +200 degrees without suffering any permanent damage. This should have far reaching effects in regions of this country or abroad where extreme climatic conditions prevail. It is the damping material used in the manufacturing of the cartridge which actually limits the temperatures that can be withstood by the pickup.

In some tests made previously, the cartridge was immersed in a glass of hot water, installed in an ordinary pickup arm and reproduced many disks without any apparent damage suffered by the cartridge or the records. It should be borne in mind that this heat resistance can be an important asset when the case arises where the record player or the combination amplifiers generate a great deal of heat.

The weight of the cartridge has been reduced to 18 grams and because of its small size allows for construction of pickup arms having graceful shapes and designs. Figs. 3 and 4 illustrate top and side views of the cartridge. A novel arrangement providing a needle guard is included. In this particular cartridge a force of three ounces is enough to cause the needle guard to touch the record. The guard was installed with sufficient width to bridge the lands of successive grooves. The pickup cartridge is also provided with easy to use compact tip sockets of rugged construction eliminating the need of soldering in places sometimes hard to reach. This will facilitate faster installations and replacements of the cartridge.

Installation

Here are some of the installation instructions and suggestions as given by the manufacturer:

[Continued on page 42]
# TV Picture Tube Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Dimensions (in)</th>
<th>Raster Size</th>
<th>Base</th>
<th>Socket Connect.</th>
<th>Bulb Context</th>
<th>Solid Deflec. Angle</th>
<th>Type of Deflec.</th>
<th>Type of Focus</th>
<th>Deflection Factor</th>
<th>Heater (V)</th>
<th>Hor. Deflec. Coil Ma. (m)</th>
<th>Ion Trap</th>
<th>Ion Trap Me. (mA)</th>
<th>Grid Bias Cut-Off (d)</th>
<th>Grid Drive Volts</th>
<th>Grid No. 2 Volts</th>
<th>Grid No. 2 eA</th>
<th>Anode No. 1 Volts</th>
<th>Anode No. 2 Volts</th>
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<td></td>
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<td>M</td>
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<td>M</td>
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<td>Mag. 109</td>
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<td></td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
</tbody>
</table>
(a) Due to the extremely high light intensity produced on the tube face, protective circuits should be incorporated in the television chassis. This should be done to prevent line burn on the phosphor screen, in the case of sweep circuit failure.

(b) For standard focus coil J&H, or equivalent.

(c) 250 ohm coil-120 ma; 11,000 ohm coil-20 ma.

(d) Visual extinction of unselected focused spot. Adjust supply to ± 40% of indicated value.

(e) For standard ion trap coil.

(f) Supply should be adjusted to ± 40% of indicated value.

(g) With combined grid-No. 1-base voltage and video-signal voltage adjusted for a highlight brightness of a 2 feet-lambert on a 1 3/4 x 2 1/2 picture area.

(h) For standard deflection coil.

(i) Approximately 55% of grid No. 2 voltage is required for current cutoff when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.

(j) Designed to replace 14AP4 used in pre-war TV receivers.

(k) Various slightly with different manufacturers.

(l) Plus or minus 10%.

(m) For anode No. 2 current of 200.

(n) Anode No. 3, 8,500 volts.

**TV Picture Tube Manufacturers**

Allen B. DuMont Labs, Passaic, N.J.
General Elec. Co., Schenectady, N.Y.
 Lectrovision, Inc., New Rochelle, N.Y.
 North American Philips Co., Inc., N.Y.C., N.Y.

Radio Corporation of America, Harrison, N.J.
Rauland Corp., Chicago, Ill.
Sylvania Elec. Products, Inc., N.Y., N.Y.
Tel-O-Tube Corporation of America, Paterson, N.J.
Zetka Lab, Inc., Clifton, N.J.

**- Tube Base Connections -**
Gared 11FMP

This 10 tube, a-c operated, receiver functions on both AM and FM bands. The i-f used on FM is the customary 10.7 mc. An unusual feature, however, is the use of a resistance coupled stage.

Following a 6BA6-6BE6-6C4 combination of r-f-mixer-oscillator, a conventional dual i-f stage (employing a 6BA6 tube) functions at either 455 kc or 10.7 mc. The 455 kc signal is extracted after this stage.

The 10.7 mc FM signal is further amplified in a 6AU6 tube, the first shown in the partial schematic. The plate load for this tube is a 4700 ohm resistor. A 47 µuf capacitor couples the output to the grid of the following stage. Another 6AU7 is employed to bring the signal up to sufficient level to drive a 6AU6 limiter stage. Detection takes place in a 6AL5 discriminator. Conventional dual-tuned transformer coupling is used between the last i-f stage and the limiter.

Westinghouse H-186, H-187

A circuit which indicates unusual care with regard to elimination of sources for distortion and instability is shown. The tubes employed are high-current, low-voltage type 6Y6G. Series resistors of 100 ohms and 35 ohms are used in each grid and plate lead, respectively. These tend to prevent generation of high transient or oscillatory voltages being generated within the stage.

Additional stability is obtained by a well-regulated screen grid supply source. A voltage divider provides 165 volts for the screens.

Note the small value of the cathode bias resistor, correct because of the high current drain of this type of tube.

The grids are fed from a conventional first audio and phase inverter arrangement, the latter deriving its signal from the point A at the junction of the network in the grid circuit of the output tubes.

Philco Model 49-1613

In the Philco Model 49-1613 a new tube type, 7R7, is used to perform the combined functions of i-f amplifier, a-m detector and a-v-c rectifier. A partial schematic is shown, illustrating details of the circuit.

Resistance-Coupled i-f stage employed in Gared Model 11FMP receiver.

The 455 kc AM i-f signal or the 9.1 mc FM i-f signal, whichever has been perviously selected, is applied to the pentode grid via a conventional series transformer arrangement. Amplification takes place, and the voltage de-

dveloped on the plate, whichever function is in use, is applied to one of the diode plates. Rectification ensues and the d-c thus developed is applied to the first i-f stage and mixer for a-v-c purposes.

When the instrument is switched to phono position, a set of contacts opens the cathode lead of the 7R7, thus effectively preventing radio signals from being developed in the audio system.

[Continued on page 34]
SERVICE-DEALER ASSOCIATIONS

If any Association's name does not appear here, such omission is due to the fact that we do not have any information about the association and its officers. Please supply same for subsequent listing. We also welcome Service-Dealer association proceedings and news for insertion in this column which will be a regular monthly feature of RSD. — Ed.

Phoenix Radio & Electronic Club.
514 N. 2nd St.
Phoenix, Ariz.
R. C. Noll, Pres.

Radio Ser. Assn. of Tucson
2216 S. 6th Ave.
Tucson, Ariz.
Howard Claims, Pres.

Radio Servicemen's Assn. of Hot Springs Nat'l Park
1115 Basket St., Hot Springs Nat'l Park, Ark.
Wilber Mainel, Secy.

Radio Technicians Assn. of Burbank
P.O. Box 391
Burbank, Calif.
Arnold J. Myer, Pres.

Long Beach Radio Technicians Assn., Inc.
P.O. Box 4965
Long Beach 4, Calif.
G. L. Holloway, Pres.

Radio & Electronic Servicemen's Assn., Inc.
844 N. Serrano Pl.
Los Angeles 27, Calif.
Paul E. Heiser, Pres.

Bureau of Radio & Elec. Appliance Dealers of San Diego County
Electric Building
San Diego, Calif.
A. K. Chamberlain, Pres.

Radio & TV Dealers Assn., Inc. of San Francisco
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San Francisco, Calif.

Pueblo Radio Assn.
54 Vanderlane Ave., Pueblo, Calif.

Bridgeport Radio Serv. Assn.
Bridgeport, Conn.
Thomas Caruso, Pres.

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P.O. Box 1773
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Decatur, Ill.
P. R. Hollingsworth, Pres.

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331 E. Iowa St.
Evansville 11, Ind.
Victor J. Wolf, Secy.

Indiana Red-Elec. Tech's Assn., Inc.
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S. Bend, Ind.
John E. Lackman, Pres.

Rad. & Electronic Techs. Assn. of Ind., Inc.
525 E. Colfax Ave.
G. E. Bogert, Pres.
John J. Pine, Secy.

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Des Moines, Iowa
Howard Roberts, Pres.

Assn. of Radio Technicians
1724 Central Ave., Ft. Dodge, Iowa
Homer L. Davidson, Pres.

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Cass & W. 2nd Sts.
Ottumwa, Iowa
Frank Swanson, Secy.

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Russell Mayer, Pres.

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Sallisbury, Md.

Radio Techs Guild, Whittington City
108 Topham St.
New Bedford, Mass.
Al Wobeyke, Pres.

Detroit Radio Servicemen's Assn., Inc.
1218 W. Milton
Detroit, Mich.
J. Burchat, Pres.

Radio Service Men of Amer. Inc.
1919 Second Ave. South
Minneapolis, Minn.

Assn. of Rad. & TV Service, Inc.
1108 First Nat'l Bank Bldg.
Minneapolis, Minn.

The Elec. Assn. of Kansas City
106 W. 14th St.
Kansas City 6, Mo.

Lincoln Electronics Ser., Inc.
244 S. 11th St.
Lincoln, Neb.
T. B. Duffield, Pres.
N. J. Rad.—Appliance Dealer's Assn.
1154 Springfield Ave., Irvington, N. J.

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111 Concord Ave.
Trenton, N. J.

Radio Research Club of Portland
610 W. 48th St.
New York, N. Y.

T. L. Hamy, Pres.
Member of Rochester BTG
(New York State's Federation)

TV & Radio Appl. Dealers Assn.
925 Kings Highway
Brooklyn, N. Y.

1044 Rutland Rd.
Brooklyn, N. Y.

Radio Service Men of Amer.
25-27 Sunset Sts.
Binghamton, N. Y.
Aaron A. Baldwin, Secy.

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637 Broadway
Buffalo, N. Y.
Theodore Telak, Pres.

Cataskill Radio Service Men's Assn.
Delhi, N. Y.
A. H. Hayes, Pres.

Assn. of Rad. Serv. Engineers
522 East 2nd St.
Jamestown, N. Y.
Leo Burt, Pres.

Kansas Radio Serv. Men's Assn.
10 Light Radio Store
Parkway N.

Hudson Valley Radio Servmen's Assn.
For R. Hicken Music Co.
Market St.

Radio Techs Guild, Rochester Chap.
114 St. Paul St.
Rochester, N. Y.
T. J. Taxany, Pres.

Radio & Electronic Tech's Assn.
258 Isabel St.
Greenboro, N. Car.
George Kiser, Pres.

Akon Rad. Tech's Assn.
41 S. High St.
Akon, Ohio
George Phillips, Pres.

Radio Dealer's Assn.
2522 S. High St.
Columbus 2, Ohio
Leo Loomer, Pres.

Ohio City Radio Serv. Assn.
329 S.W. 27th St.
Cincinnati City, Ohio.
E. B. Connell, Pres.

Tulsa Radio Service Men's Assn.
1225 N. Elmwood
Tulsa 6, Okla.
E. J. Bollens, Pres.

Radio Research Club of Portland
610 W. 48th St.
New York, N. Y.

Mid-State Radio Serv. Assn.
1154 Springfield Ave., Irvington, N. J.

Tulsa Radio Service Men's Assn.
1225 N. Elmwood
Tulsa 6, Okla.
E. J. Bollens, Pres.

Radio Research Club of Portland
610 W. 48th St.
New York, N. Y.

Lehigh Valley Radio Servmen's Assn.
528 W. Broad St.
Bethlehem, Pa.

Robert W. Kies, Pres.

Mid-State Radio Serv. Assn. of Pa.
245 North St.
Harrisburgh, Pa.
T. L. Clarkson, Pres.

Philadelphia Radio Servmen's Assn.
631 S. 6th St.
Phila., Pa.
Richard G. Devaney, Pres.

Federation of Radio Servmen's Assn. of Pa.
(Pennsylvania's State Federation)
209 S. 7th St.
Phila., Pa.
Dave Krantz, Pres.

Rad. Serv. Assn. of Pittsburgh
910 East St.
Pittsburgh, Pa.
Bert A. Dregerson, Pres.

Reading Rad. Servemen's Assn.
1117 N. Ninth St.
Reading, Pa.
LeRoy J. Link, Pres.

Lockeawanna Rad. Tech's Assn.
P.O. Box 196
Scranton, Pa.
Leon J. Helfk, Pres.

Rad. Ser. Assn. of Luzerne County
133 Bradford St.
Wilkes-Barre, Pa.

1018 W. 3rd St.
Williamsport, Pa.
A. R. Guild, Pres.

Rhone Island Radio Men's Bus. Assn.
P. O. Box 130
Providence, Rh. I.
G. G. Costello, Pres.

340 Isabel St.
Greenboro, N. Car.
C. E. Heitkamp, Pres.

Dallas Radio Sales & Service Assn., Inc.
1945 McMillan Ave.
Dallas 6, Texas
T. P. Robinson, Secy.

Everett Rad. Serv'men's Club
1129 1st St.
Shoemaker. Wash.
M. H. Nutley, Pres.

Monongahela Rad. Assn., Inc.
Clarkeston, Pa.
E. W. Randolph, Pres.

Rad. Technicians Assn., Inc.
617 Adams Ave.
Huntington, W. Va.
Scott Adams, Pres.

Green Bay Electronics Serv'men's Assn.
Green Bar, Wis.

Assn. Rad. Tech's of Brit. Columbia
914 Rogers Blvd.
Vancouver, B. C., Canada
W. Manton, Pres.

Assn. Rad. Tech's of Alberta
1012—108 9 St.
Edmonton, Alberta, Canada
Fred Nell, Pres.

32 Bridge St. East
Belleville, Ontario, Canada
Harry Fletcher, Pres.

Orangeville Dist. R.E. Tech's Assn.
Orangeville, Ont., Canada
James Musselman, Pres.

Guild of Radio Serv. Engineers
37 York Road
Edinburg 5, Scotland
David C. Marshall, Secy.

Rohden-On-Sea
INCOME TAX

It's Easy!

by BETTY LEE GOUGH

A clear discussion of the knotty problems the Radio Service Dealer encounters in making out his income tax returns.

This fellow prefers the worst fading job to filing his income tax return.

Short And Long Forms

Let's look at all the things a radio service dealer must consider in filling out his income tax return. When you refer to the returns as "long form," "short form," and "capital gains form," they seem less formidable than when they carry Treasury Department code numbers. (We'll omit any discussion of the methods of filing corporations and partnerships income tax returns. These are truly complicated. They require the services of a lawyer or an attorney to unravel. But it is definitely possible for the ordinary businessman to file the income returns for his individually-owned firm—and do it without a great deal of bother.)

In the case of an individually-owned store, there are only three forms to worry about—the long form, the short form, and the capital gains form. You use only two of them at the most and, if you didn't make anything in the way of stock profits and losses or other capital gains, you have to fill out only one form.

What is the difference between using the long form and using the short form? Essentially, it is a question of whether you take your personal and family deductions one way.

[Continued on page 38]
Precision Rounds Out "600" Line

Precision Apparatus Company, Inc., 92-47 Horace Harding Blvd., Elmhurst, L.I., N.Y., announces that their "600" line of test equipment has now been rounded out completely with the addition of their latest unit, designated as Series 654. A combination of a cathode conductance tube tester, dynamic (under-load) battery tester and high sensitivity a-c d-c circuit tester (20,000 ohms-per-volt d.c.), Series 654 is designed to meet the specific needs of the modern electronic service-maintenance technician.

This instrument handles all modern tubes with full anti-obsolence features and circuit tests all AM and FM units as well as TV sets up to 30,000 volts with the addition of the Series TV-2 test probe. It also offers full rotary selective ranges and functions and requires use of only 2 pin jacks for all standard ranges. The instrument incorporates a wide-angle, 4-1/2", 50 microampere meter, also 1% wirewound and film-type resistors. All circuits are insulated from the power line for operational safety. Available in 4 models to suit individual requirements.

New-Type Soldering Tip

A soldering tip that gives more heating area, forms easily into any shape desired and does not overload transformer - is the newest development of Weller Manufacturing Company, Easton Pa., makers of Weller Soldering Guns. Designed especially for use with Weller Guns, and sold under the trade-mark "duratip", this new tip already has proved in exhaustive tests and actual soldering use that tip life is increased 300 to 400 per cent. Also, because of its chisel shape, duratip offers more soldering area, thereby considerably increasing the amount of heat transferred to the work, which in turn increases the soldering efficiency.

It can be bent easily into any shape, to go around corners or into tight spaces. It draws rated current, heats in only 5 seconds, and cannot overload, damage or burn out the transformer. Also, since the working slug at tip end is an integral part of loop tip, slug cannot come loose or drop off. Available from authorized distributors in packages of 2.

Hi-Lo Rotatable Antenna

For dealers whose volume does not warrant the variety permitted by the Brach Flexi-Kits, individual kits featuring the latest refinements are available to fill a wide variety of needs. Stark among the complete individual antenna kits is the Hi-Lo Rotatable TV Antenna, developed to provide excellent low-band reception and solve the difficulties of receiving a quality image on Channel 13 at the same time. All parts packed in the Flexi-Kits may be ordered as individual replacements, and may be used in conjunction with those of the individual kits as well. A complete description of the entire new Brach antenna line is available in the Brach Catalog No. 1304, available on request from L. S. Brach Mfg. Corp., Newark 4, N. J.

New Microphone Desk Stand

A new Model 426 shockproof microphone desk stand is announced by Electro-Voice, Inc., Buchanan, Mich., manufacturers of microphones, phonograph pickups, stands as well as accessories. It combines modern streamlined "teardrop" design with functional utility. Provides balanced, stable microphone support.

Newly developed shock mount, with dual Lord shear-type mountings, is built into the base—provides double shock absorber action—prevents reproduction of external shocks and undesirable stand vibrations—reduces side-sway of microphone.

Pressure cast base rests firmly on desk or table. Finished in rich gray hammerloid. Bottom is fitted with waffle-type non-skid rubber shoe. Designed with adapter to fit all standard 1/4"-27 thread microphones and permit easy connect or disconnect of cable. The Model 426 Desk Stand complete with shock mount is 6-1/4" long, 4-3/4" wide, 4-5 1/16" high.

Sylvania Multiplier For Polymeter

A new dc voltage multiplier for the Sylvania Polymeter, which extends dc voltage measurements to 10,000 volts, has been announced by the Radio Tube Division of Sylvania Electric Products Inc., 500 Fifth Avenue, New York 18, N. Y.

The new multiplier extends the applications of the Polymeter, Sylvania's multi-purpose vacuum tube voltmeter, to television high voltage supplies; transmitter plate circuits; experimental power supplies; industrial electronic equipment; electronic flash tube circuits; and many other high voltage dc circuits.

The compact unit consists of a 48" plug-in flexible lead tested for 22,000 volt breakdown; nickel-plated brass contact pin mounted in tapered polystyrene rod 13/4" long; a removable
IN every type of service Racon Speakers, Horns and Trumpets operate at higher efficiency than conventional makes through ADVANCED ENGINEERING. Do not be misled by similarity in outward appearance. Only Racon, embodying special features of internal construction, can give you the outstanding superior performance of a Racon unit.

Racon Double Re-Entrant Trumpet
Designed to deliver highly concentrated sound over long distances with highest efficiency. Free from resonant effects, Seven models in bell diameters from 10½" to 25½". Also four radial models in widths from 9" to 36".

Racon Double Re-Entrant Marine Speakers.
Made from a heavy aluminum spinning with heavy aluminum casting for base. Waterproof; not affected by extreme temperature changes. Four models in bell diameters from 6½" (Miniature marine) to 14" (regular marine). Designed for long range reproduction and pick-up in all types of service. Regular, Midget and Miniature Models approved by Bureau of Marine Inspection and Navigation and Dept. of Commerce, for shipboard use.

Permanent Magnet Horn Units
These units, highly popular in all types of service, embody many improvements. Two groups, one with Alnico V Magnets and one with Alnico Blue Dot Magnets. All steel parts plated to prevent corrosion. Also fitted with corrosion proof metal or plastic diaphragms. Voice coil impedance on all units: 15 ohms. Special ohmages on request.

Write for Catalog of Complete Line
RACON ELECTRIC CO., INC.
52 E. 19th Street, New York 3, N. Y.

baked safety flange 2" in diameter; and varnished bakedite handle, 4½" long, enclosing dropping resistor tested at 36,000 volts.

When used in place of the standard Polymer low-voltage probe, it multiplies each of the present dc voltage ranges by a factor of 10.

New IRC Resistors
To meet the increased requirements of radio service technicians, IRC has announced the addition of 91 new ranges to its current line of Power Wire Wound Resistors. This provides servicemen with a full range of ratings, sizes and terminal types.

Special "climate-proof" cement coating provides maximum heat dissipation and humidity protection. These full-size heavy duty resistors will operate continuously at full rating; no derating is required in high ranges.

Supplemental catalog sheet listing all ranges in fixed and adjustable types, available terminals, tolerances and list prices may be had at no charge by writing International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Now G.E. TV Antenna
Two new high band adapters and a one package high-low antenna for television have been announced by the Receiver Division of General Elec-

$1.00 to $5.00 PAID for "SHOP NOTES"

Write up any "kinks" or "tricks-of-the-trade" in radio servicing that you have discovered. We will pay from $1 to $5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor," RADIO SERVICE DEALER, 342 Madison Ave., New York 17, N.Y. Unpublished manuscripts cannot be returned unless accompanied by stamped and addressed return envelope.
The Most Complete REPLACEMENT VIBRATOR LINE IN THE WORLD

Reputation is not built overnight! Radiant's reputation has grown over the years because of its many points of superiority! Beyond the fact that the quality and design of every one of the 82 types of Radiant Vibrators... is beyond compare... the solid completeness of the line makes them the favorite wherever good vibrators are sold FOR MOST EVERY NEED TO ORIGINAL SPECIFICATIONS... there is a CORRECT Radiant replacement vibrator! NO OTHER VIBRATOR MANUFACTURER CAN MAKE THAT STATEMENT! Guess work is eliminated... all good jobbers carry most all numbers in stock... if your jobber does not have the number you want... he can get it, FAST... as special orders are given speedy attention... with immediate shipment of his order! Insist on Radiant for the EXACT REPLACEMENT Vibrator...

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LEADING THE FIELD SINCE 1935

THE RADIANT CORPORATION
CLEVELAND 2, OHIO
EXPORT... SCHEEL INTERNATIONAL... CHICAGO 18, ILLINOIS

RADIO SERVICE DEALER • JANUARY, 1949
RADIO SERVICE DEALER MAGAZINE
434 MADISON AVE., NEW YORK 17, N.Y.

Please send me the back numbers checked here.

|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|

NAME
ADDRESS
CITY
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STATE

The one adapter #UKT-902, designed primarily for use with the G-E folded dipole antenna with reflector, may also be used with the folded dipole without reflector. Where only high band signals are available it may be used as an antenna by itself. The other adapter #UKT-903, is designed for high gain operation in conjunction with the G-E stacked array high gain antenna. The high-low antenna consists of a folded dipole with reflector, packaged with the high band adapter, in one complete unit, including all accessories. As all G-E TV antennas, these adapters are made of hard drawn aluminum, and terminal blocks are of Textolite plastic, formed under pressure.

Further information on the G-E line of TV antennas is available from the Parts Section, G-E Receiver Division, Electronics Park, Syracuse, N.Y.

New Transvision TV Units
Transvision, Inc., New Rochelle, N.Y., makes available a number of new TV units to the trade. Among these is the Model No. 6G, sweep sweep generator, shown below for TV and FM alignment.

Features of this new piece of test equipment include: frequency range from 8-227 mc. . . dial calibrated in frequency . . . a sweep width from 0-12 mc completely variable . . . self-contained markers readable directly on the dial to 5% or better (no external generator required to provide the marker signals) . . . crystal controlled output makes possible any crystal controlled frequency from 5-250 mc. . . high output . . . directly calibrated markers, 20-30 mc for trap, sound, and video if alignment . . . unmodulated r-f signal to provide marker pipe simultaneously with the main variable oscillator . . . phasing control.

CIRCUIT COURT

(from page 28)

Crosley 65T series

Many schemes have been used in different a-c/d-e receivers to eliminate the power frequency hum which seems to choose such instruments for special attention. Half wave rectifiers and lack of filter chokes contribute to the problem. Large filter con-
G-E VARIABLE RELUCTANCE CARTRIDGE

with the replaceable stylus for
Conventional and Long Playing Records

NOW—in one small unit—all the sales and performance advantages of the G-E Variable Reluctance Cartridge plus this additional consumer economy feature—the Replaceable Stylus.

Negligible needle scratch and needle talk, minimum record wear, wide frequency response, freedom from resonance peaks, realistic reproduction—these are maintained at all times, simply, easily, economically with the Replaceable Stylus.

No more changing of the entire cartridge means more frequent replacement of stylus by the consumer because he can do it himself so easily.

Four simple steps—and presto! The worn stylus is replaced and maximum high quality performance is restored for the critical listener.

Note, too, these additional features:

- New notched design...one-third smaller...improved shape...more generally adaptable to various tone arms.
- More clearance for record changers.
- Higher lateral compliance for more faithful tracking.
- More economical for the customer—more sales for the dealer.
- Cartridges available for LP records with 1 mil stylus; for conventional records with 3 mil stylus.

For complete information on the new Variable Reluctance Cartridge write: General Electric Company, Electronics Park, Syracuse, New York.

You can put your confidence in—

GENERAL ELECTRIC

RADIO SERVICE DEALER • JANUARY, 1949
dangers are the rule in most sets.

The Crosley 56T sets utilize an ingenious method of making the hum lift itself by its boot-strap. The circuit is a conventional 5 tube receiver covering only the AM broadcast band. A partial circuit indicates the portions of the schematic in question.

The first audio stage uses the triode portion of the 12SQ7 and the final audio tube is a 50L6. The d-c output of the 3526 rectifier is applied directly to the plate of the 50L6, a 60 µf condenser acting as filter. This is followed by a 1200 ohm resistor and a 20 µf final filter. This voltage is applied to the 50L6 screen and all other tubes in the set.

The plate load of the 12SQ7 triode consists of a 470K ohm unit. It is inevitable that some hum will be remaining to be applied to the plate, and be subsequently amplified by the output tube. The trick employed is to couple some of the plate circuit hum into the grid circuit of the triode. This is accomplished by tapping part way up on the grid return, in this case up 22K ohms in series with 5 meg.; the 180 degree phase change in the tube acting to buck out the hum in the plate circuit by cancellation. A .02 µf capacitor will be seen providing the feedback voltage.

Motorola 107F series

This ten tube, a-c, FM and AM chassis has, among other interesting features, a novel method of obtaining out-of-phase audio to actuate the 6V6 output tubes. A variety of circuits have been developed to achieve this result and it seems that there is no end to the possible variations.

A portion of the schematic is shown, illustrating the details of the output stage. The previous tube in the circuit is a 6SQT, whose triode section acts as the first audio stage. The output is coupled to the grid of the first 6V6 in the usual R-C manner, the grid circuit being supplied fixed bias through the 470K ohm resistor.

After amplification in the 6V6, the
“It’s KNOW-HOW that counts!”


Leading Servicemen from Coast-to-Coast
Build Better Business with

RIDER MANUALS

A ready-reference for all sets from 1930 to 1948 — Volumes 1 to 18 are at your Jobber’s now. He also has Volume 1 of the Rider Television Manual.

Bud Ward is an invalid paralyzed from the neck down. He mastered radio and repairs with his “voice”... by directing the hands of an ex-Marine apprenticed to him under the G-I Bill. Though handicapped, Bud Ward is known as a radio wizard around Norwichtown and has built up a mighty successful servicing business. “My Rider Manuals are my bible of radio servicing,” says Bud. “Having to use someone else’s hands to do my work, the clear and concise service data is a ‘must’ with me.”

Your Jobber Has It!

RIDER PA MANUAL

The first industry-wide public address equipment Manual incorporating the amplifier production of 147 manufacturers from 1933 to 1948. 2024 Pages PLUS “How It Works” Book which explains theory of various PA circuits and method of rapidly locating faults. $18.00 including Index.

RIDER MANUALS

Television Manual, Volume I, (plus How It Works and Index) $18.00
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Volume XVI 18.00
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(six volumes) 104.10
Volume VI 12.50
Abridged Manuals 1 to V
(one volume) 19.80
Record Changers and
Recorders 12.50
Master Index, Covering
Manuals, Vols. 1 to XV 6.00

Your Rider Manual is as important to you as are a pair of pliers. Rider Television Manuals contain the OFFICIAL, AUTHENTIC, RELIABLE DATA supplied by the set manufacturers. You don’t have to guess... you know immediately what’s wrong and what to do. Each Manual includes GIANT SIZE Schematics to guide you and your men to a quick solution of any TV servicing problem.

RIDER MANUALS mean SUCCESSFUL SERVICING


RADIO SERVICE DEALER • JANUARY, 1949
upper one in the print, the signal appears across the upper primary coil of the output transformer. Note that the bottom of this coil does not connect directly to the B voltage source, but is isolated from it by a 300 ohm resistor. The audio drop across this resistor is fed through a .01 mfd. capacitor to the grid of the second 6V6 tube. Having been reversed 180 degrees in the first 6V6 it is now in the proper phase to excite the second tube. Bias is again via a 470K ohm resistor from the fixed source.

The only special item needed to incorporate this method of operation are the transformer with separate primaries for the two tubes, and the 300 ohm resistor. If relacement is needed it would be necessary to observe proper polarity in the two primaries.

**INCOME TAX**

(from page 30)

one or lumped together into a ready-made package. On the short form, the government allows you roughly ten percent of your "adjusted gross income" (which is your business net profit) for personal expenses that are legal income tax deductions. On the long form, you roll your own. You list them individually. The government allows you no blanket deduction. If you think that more than ten percent of your net business income (your "adjusted gross income" on the forms) was spent for such deductable things as medical attention and state or city gasoline tax on your personal driving, then you'll make money by using the long form.

Many radio service dealers and other business men mistakenly believe that it is necessary to use the long form in order to take all of their business expenses as tax deductions. This is not so. You can take all of your business overhead items off a short form return as well as a long form return. The long form is used only when you wish to itemize personal and family deductions. That's why so many tax accountants and attorneys advise their clients to forget about the long form altogether.

Until the passage of the new Revenue Act that lowered income taxes slightly, there was a drawback that prohibited business men who made fairly sizable incomes from using the convenient short form. Only those whose incomes were below $5000.00 were permitted to take the blanket 10% deduction allowed on the short return. Now, however, the standard deduction has been extended to those making up to $10,000. The law allows $1000 or ten percent of the income.

**Joint Returns**

However, if you plan to take advantage of the new community property provision in the Act, which extends the privilege to all taxpayers regardless of the laws of the state in which they live, watch out! In a joint return, or in the return of a single man, the $1000-or-ten-percent is allowed, but it is different with married persons sending in separate returns. Each is allowed to take off no more than $800 for the standard blanket deduction.

Extending the community property privilege to citizens of all states, at least as far as income tax is concerned, allows the appliance dealer whose net business profit was $10,000 or under to use the short form. Citizens of the thirteen community property states have been able to do this all along. Thus, if you made $9980.00, you report $4940 as your net income, and $4940 as your wife's net income—making you eligible for...
**Now AIR KING "Know How" makes possible this outstanding Portable WIRE RECORDER**

Complete with AMPLIFIER

*$99.95*

Slightly higher in Zone 2

**Only Experience can build fine WIRE RECORDERS**—and only AIR KING experience could build this moderately priced, matchless Wire Recorder with Amplifier. As pioneers, AIR KING has achieved and maintained the leadership in the magnetic recorder industry. Glamorous consoles... compact portables... radio-phono-wire recorder combinations: every one is AIR KING experience-built. It's the know-how that counts!

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Export Address: Air King International, 75 West Street, New York 6, New York

**These Selling Advantages**

- Complete with amplifier
- Records direct from radio, phonograph or telephone
- Automatic shut-off at end of play or rewind of wire
- Crystal mike for hand, table or stand and plug-in mike cord
- Rewind speed: 6 times forward speed
- Plug for cable to record from radio or phonograph
- Erases automatically when recording over used wire
- Safety lock prevents accidental erasure
- Covered in leatherette
- One piece chassis
- Luggage-type carrying case
- 5" Alnico V P.M. Speaker
- TUBES: 2 - 50L6, 1 - 1280, 1 - 6AG6 plus selenium rectifier
- WEIGHTS: 211/2 lbs.
- MEASURES: 13½" long by 12" wide by 9" high

AIR KING RADIO

Division of HYTRON RADIO & ELECTRONICS CORP.

RADIO SERVICE DEALER • JANUARY, 1949
The most important thing to any business man is an exact knowledge of what he may deduct as business expense, and what he may not.

Roughly speaking, anything you pay out in order to run your business is a business expense.

Here is what the Treasury Department has to say about business expenses: "Business expenses may include reasonable salaries and wages paid, interest on business indebtedness, taxes on business and business property, loss arising from business operation, bad debts arising from sales or services (provided the income portion of the amount due has previously been reported in income), depreciation, obsolescence, depletion and rents, repairs and other expenses."

The Treasury also points out that: "Other items are management expenses, commissions, labor, supplies, advertising or other selling expenses, and insurance premiums paid."

Also included are the upkeep and depreciation on cars and trucks used in the business' membership in trade associations, other clubs and Chambers of Commerce where it is sometimes good business to belong, subscriptions to publications (like this one) that you use to help you conduct your business, the cost of supplies, postage, etc., equipment that has only a short life, depreciation on equipment and fixtures that has a life longer than one year, any entertainment that actually helps the business and, finally, travel and transportation expenses.

There is one item of business expenses you'll find tricky. Many dealers have written off the cost of materials they purchased—and later found themselves coughing up back tax payments plus, on occasion, interest as well. This is because anything you have in your inventory is not a business expense. You still have it. Until it leaves your physical possession through sale, or until it is definitely written off useless, it's an asset, not an expense.

When you take a deduction for bad debts, the Treasury insists that your return show: "(a) the nature of the debt; (b) name and family relationship if any of the debtor; (c) when the debt was created; (d) when it became due; (e) what efforts have been made to collect the debt; and (f) how it was determined to be worthless."

Uncle Sam wants all of this information because of the opportunities for fraudulent deductions that dishonest taxpayers have when they claim bad debt losses. Bills rendered that have remained unpaid are not necessarily bad debts in an income tax sense. A deduction for a bad debt loss is allowed only if you have previously reported the sum due you as income. In other words, the debt must have been reported as income at some time or you can't take it off as a loss.

Depreciation

How do you figure depreciation? Supplies and other incidental purchases that have a short life only—

12 WAYS TO CUT CONTROL INVENTORIES

You can reduce your stock of replacement controls, and profit in time and money with these 12 IRC Tap-In Shafts. IRC engineered for easy installation and dependable performance with IRC Tap-In Shaft Controls, they cut both service time and costly stocks of exact duplicates.

Accurately tapered sockets in IRC Tap-In Shaft Controls readily receive the closely machined shaft ends. A firm hammer tap permanently "freezes" the two units. "C" washers and other cumbersome locking arrangements are entirely eliminated. IRC Tap-In Shafts are quick, easy...and secure!

IRC Tap-In Shafts can be conveniently cut to desired lengths before being installed. In crowded chassis, they can be installed after control is assembled—eliminating any necessity to remove other parts.

There's an IRC Tap-In Shaft for most radio and television requirements. Used with IRC Tap-In Shaft Controls, you are sure of smooth, quiet, trouble-free service. Ask your distributor for IRC Controls—with the dependable Tap-In Shaft feature. International Resistance Company, 401 N. Broad Street, Philadelphia 8, Pa. In Canada: International Resistance Co., Ltd., Toronto, Licensee.

INTERNATIONAL RESISTANCE CO.
Wherever the Circuit Says —
1 Heathkit VACUUM TUBE VOLTMETER KIT

Everything you want in a VTVM. Waterproof solid plastic meter face, automatic meter protection in buzz-out proof circuit, push pull electronic voltmeter circuit ensuring maximum stability. Linear DC, and AC scales. AC and DC full scale ranges of 0-100V DC, 0-1000V, 0-1000V. A total of 24 ranges. Isolated DC test probe for signal tracing and measurements of voltage while instrument is in operation. An ohmmeter tests accurately measuring resistance of 0 to 200 ohms to one billion ohms with internal battery. Extremely high input resistance. 7 megohms on all ranges DC and 3.5 megohms on AC. All these features and more are the reason hundreds of radio and television schools are using Heathkit VTVM's and recommending them to all students. Like all Heathkits, the VTVM kit is complete, 110V. 60 cycle power transformer, 200 microamp meter, tubes, grey crackle cabinet, panel, etc leads, 1% ceramic precision divider resistors and all other parts. Complete instruction manual. Better start your laboratory now.

Shipping weight 8 lbs. $24.50

2 Heathkit SINE AND SQUARE WAVE AUDIO GENERATOR KIT

The ideal instrument for checking audio amplifiers, television response, distortion, etc. Supplies excellent sine wave 20 cycles to 20,000 cycles and in additional supplies square wave over same range. Extremely low distortion, less than 0.01%. Large calibrated dial. Beautiful 2 color panel, 1% precision calibrating resistors. 110V. 60 cycle power transformer, 5 tubes, detailed blueprints and instructions. R.C. type circuit with excellent stability.

Shipping weight 15 lbs. $34.50

3 Heathkit CONDENSER CHECKER KIT

Checks all types of condensers, paper mica — electrolytic — ceramic over a range of 0001 MFD to 1000 MFD. All the readable scales that are read directly from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarity of voltage of 20 to 900 volts provided. Measures power factor of electrolytics between 0% and 90%. 110V. 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why pay for the quality and capacity of a condenser when you can pay for less than a twenty dollar bill.

Shipping weight 7 lbs. $19.50

4 Heathkit SIGNAL TRACER KIT

Reduces service time and greatly increases profits of any service shop. Uses crystal diode to follow signal from antenna to speaker. Locates faults immediately. Internal amplifier available for speaker testing and internal speaker available for amplifier testing. Connection for VTVM on panel allows voice tracing and gain measurements. Also sects phonograph pickups, microphones, PA systems, etc. Frequency range to 200 mc. Completely ready to assemble. 110V. 60 cycle transformer operated. Supplied with 3 tubes, diode probe, 2 color panel, all other parts. Easy to assemble, detailed blueprints and instructions. Small portable. 9" x 6" x 1 1/4". Shipping wt. 10 lbs. $19.50

5 The NEW 1949 HEATHKIT 5-1/2" OSCILLOSCOPE KIT

New Improved model of the famous Heathkit Oscilloscope. Building an oscilloscope is the finest training experience you can get in the newest servicing technique and you save two-thirds the cost. All the features and quality of instruments selling for $100.00 or more. Supplied complete with cabinet, two color panel, 3BP1 tube, 2 4Y5 tubes, 2 6E7 tubes and 884 generator tube. Power transformer supplies 1000 volt negative bias on positive input. Sweep generator 15 cycles to 50,000 cycles. Has vertical and horizontal amplifiers. Oil filled filter condensers for long life. Complete blueprints and instructions included. Shipping weight 23 pounds. Express only $39.50

6 Heathkit FM AND TELEVISION SWEEP GENERATOR KIT

A necessity for television and FM. This Heathkit completely covers the entire FM and TV bands 2 megacycles to 230 megacycles. The unit is 110V. 60 cycle transformer operated. Uses two 6J6 tubes, two 6CA4 tubes and a 6X5 rectifier. An electronic sweep circuit is incorporated allowing a range of 0 to 10 MC. A sawtooth horizontal sweep wave, visual and audio information on oscillator are provided for the oscilloscope.

The coils are ready assembled and precision adjusted to examine FM and TV signals. As in all Heathkits, the best of parts are supplied. Mallory filter condenser, 0.01%, precision resistor, all punctured and formed parts, grey crackle cabinet, 5 tubes, test leads, etc. Better get it now and be ready for the FM and TV business. Shipping wt. 6 lbs. $24.50

7 Heathkit SIGNAL GENERATOR KIT

Every shop needs a good signal generator. The Heathkit fulfills every servicing need. furnishes laments from 150 kc to 50 megacycles with swing harmonics over 100 megacycles covering the new television and FM bands. 110V, 60 cycle transformer operated power supply. 100 cycle audio available for 30% modulation or audio testing. Uses 6SN7 as RF oscillator and audio amplifier. Complete kit has every part necessary and detailed blueprints and instructions enable the builder to assemble it in a few hours. Large pre-soldered calibration. Complete range 9" x 6" x 1 1/4". Shipping wt. 7 lbs. $19.50

ORDER DIRECT FROM THIS AD.
WE WILL SHIP C.O.D.
ADD POSTAGE FOR WEIGHT SHOWN

HEATH COMPANY
BENTON HARBOR 12, MICHIGAN

HAVE ALL THE FUN
SAVE 2/3 THE COST

BUILD YOUR OWN TEST EQUIPMENT

RADIO SERVICE DEALER • JANUARY, 1949 41
usually less than one year—can be taken off as direct expenses, but equipment, fixtures, machinery and such—things that last a long time—cannot be claimed in whole during the year they are purchased. You must depreciate them. The depreciation time should be roughly the normal life of the item.

Thus, for example, a desk that cost $1000 could be expected to last ten years. At the end of that time, it would have a resale value of perhaps $100. So you would depreciate the desk nine dollars each year for the decade.

If you use a car for both business and pleasure, figure the part of its life that is devoted to business uses. Then take that percentage of its value. Depreciate the figure you have in the same way that the desk above was figured.

The Collector of Internal Revenue won't raise Cain about how you carry depreciation on the books, provided you use any recognized accounting method, figure on a reasonable life, and use the same depreciation procedure consistently.

**Interest**

In writing down the interest you pay on a business debt, be sure that you do not put down interest on any personal loans you might have made. Your business loan is an expense you incur in making money, but your personal loan is not. You can take off personal loan interest, but only if you use the long form in filing your return. Business loan interest comes off in computing the "adjusted gross" income figure.

**Taxes**

You can take off taxes you have to pay for doing business but, again, you may not take off taxes on your home or on the cigarettes you smoke—unless you use the long form and deduct them from the "adjusted gross." Like the interest on a business loan, the taxes on your business (and only on your business) are deducted from gross income to arrive at the "adjusted gross" figure, which is no more than the net profit shown on your year-end profit and loss statement.

**Other Expenses**

Where do these various business expense items go in the conglomeration of spaces, boxes and blanks on the long or short income tax form? The easiest way to handle them is to list them just as you would in a regular profit and loss statement, then write this remark across the various "schedules" provided on the forms: "See attached schedule listing expenses." Be sure that the special profit and loss statement is firmly attached to your tax report. Don't just clip it on. Staple or glue it to the top of the return so it can't get lost in the shuffle of thousands of forms that pour into every Collector's office during January, February and March.

What about other money you might have taken in, such as from the sale of a house, or the dividends paid on corporation stocks, or the profit on a sale of stocks you owned? These three all come under the heading of capital gains (or losses). They should be separately reported on the form that comes with each income tax return. You pay a different tax rate on capital gains.

Briefly, "capital gains" applies to any money you made from the sale, liquidation, etc. of some long-term investment. The purchase of a home is a long term investment. If, during the year, you sold your home for $1000 more than you paid for it five years ago, you have made a capital gain of $1000. This is not included in the regular listing of business profits and expenses.

In next month's issue, we'll look at the matter of deductions that govern your decision on using the long form or the short form. We'll cite examples of good income tax figuring.

**PHONO PICKUP**

[from page 25]

The Titone cartridge can be used directly as replacement for a crystal cartridge. It will operate satisfactorily into a half to a ten megohm load. For average use a one megohm load is recommended. Where more bass is desired a higher resistance load is required.

To install: First remove the two screws holding the cartridge to be replaced in place. Detach the terminals from the old cartridge. If connections were soldered, solder the wires to the clips of the ceramic pickup cartridge provided in the installation kit. A word of caution: Do not solder wires while clips are attached to the new cartridge. This is a very important point and should always be observed. Plug clips onto the terminal adapter with the ground lead on left hand pin, (looking from...
the front of the cartridge when it is in playing position). Another precaution: On ac-de sets it is necessary to unground the cartridge. This can be easily accomplished by pushing back the rubber sleeve slightly, then cutting the ground strap (see Fig. 5).

Fig. 5—Constructional details.

All the parts of metal resulting from this cutting operation should be removed from all parts of the pickup.

Mount the new cartridge into the arm using the size of screws matching the threads of the old mounting holes. The best use of the pickup and the least record wear is obtained with a needle force at the point of ¾ of an ounce. This may seem minute but the pressure carried by the actual point is sometimes in excess of several tons to the square inch. If needle point force is too great, try to adjust the counterweight or the counterbalance spring at the rear of the pickup arm. Remove needle guard and pickup is ready for operation.

If upon completion of the installation the volume output is insufficient it may be due to the use of an equalizer network in the input circuit which is not necessary with this new pickup material. If that is the case, remove the equalizer network and make the connection directly.

The pickup cartridge has not had any publicity up to the present time until it was found to give satisfaction in practical field and user tests. These tests indicate excellent results on both expensive and low priced phonographs and record players. The pickups have been produced on a commercial basis since March, 1947, and several hundred thousand pickup cartridges have already been delivered to a number of phonograph manufacturers. They are now or will be shortly available to the public as replacements on pickups now being used on phonographs in literally millions of homes throughout the world. This point is of utmost importance to the serviceman.

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In view of its evident superior characteristics, to wit: light weight and high fidelity, this pickup offers an excellent medium of introducing new sales opportunities for Radio Service Dealers. One does not have to stretch his imagination to any great extent to realize the additional income producing potentialities of an item of this nature.

A most logical procedure is to contact known owners of phono units by postcard, circular, or phone, and to acquaint them with the merits of the new pickup. It is certain that a large percentage of responses will be obtained as a result of this procedure. In fact, many of these responses will be due to unsatisfactory operation of the existing equipment due to service requirements.

It then becomes merely routine for the Service Dealer to put the equipment in first class condition first, following which the "Titone" unit is installed. No doubt, mechanical difficulties will arise—but so far none has been insurmountable. The end result will be a customer who is satisfied for two reasons: first, because of the better condition of his unit, and second, because of excellent pickup used.

TUNED FILTERS
(from page 23)

chosen so as to allow relatively low resistance values for R1 and R2. This is desirable, since the total d-c load current must flow through these two resistors in series, and a high total resistance value would introduce an undersirable voltage drop. Since C1, C2, and C3 are electrolytic capacitors, they must be connected in the polarity shown in Fig. 5. The capacitors and resistors must be selected as closely as possible to have the values given in Fig. 5. However, slight differences in both capacitance and resistance are compensated by adjustment of rheostat R1. In order to obtain the resistance values given for R2 and R3, these units may be wire wound resistors with their sliders set to the indicated values by means of an ohmmeter. Rheostat R1 may be provided with a slotted shaft for screwdriver adjustment, and may be set closely for very effective elimination of hum.

Installation of the Tuned Section
The tuned sections shown in Figs. 2 to 5 will remove the 60-cycle half-wave ripple from the power supply output voltage (or will attenuate it
to an unnoticeable level) in the most troublesome of cases. They do not affect the hum harmonics, however, and for this reason the tuned section must be followed by a simple untuned section (See Fig. 1). The untuned section may be made up with any available choke which will carry the full direct output (load) current, and any available high-capacitance filter capacitor. A common combination, for example, is 20 henries and 10 microfarads. The values are not at all critical in the untuned section which is a brute-force circuit.

The parallel-T section (Fig. 5) is not susceptible to magnetic fields, nor does it radiate any, and so may be placed without too much concern in any convenient part of the power supply section of the chassis. When the tuned section includes a choke, such as those given in Figs. 2, 3, and 4, care must be taken to mount the tuned choke so that its core is at right angles to the choke in the untuned filter section. Care also must be taken to keep the tuned choke well away from audio transformers in the supplied circuit.

We believe that the comparatively simplicity and other advantages of tuned filter sections will recommend them readily to the builders of equipment using transformerless power supplies of the half-wave type. We believe they are equally useful to the radio servicemen who should consider the installation of a tuned section to correct stubborn hum troubles.

FEEDBACK
(from page 21)

compensates for load changes across the amplifier output. Under ordinary operating conditions, these load changes vary continuously and greatly through a wide dynamic range.

In the first case above, when the content of negative feedback exactly equals the content of positive feedback, we have an ideal condition. An original pure undistorted signal, somewhat amplified, may be taken from the amplifier. In this we have a stabilized condition sometimes called a balanced condition.

In the second case above, a similar distortion to that known to exist in the original, but of lesser magnitude and opposite in phase, is fed back into the input circuit with the immediate result that the original distortion is reduced through opposition. Thus, waveform or harmonic dist-

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SYNCH WAVEFORMS

[Continued from page 191]

of the circuits abound in television technology. Television technicians have a powerful tool in waveform analysis, for in reality it is dynamic analysis applied to the video and synch portions of the television receiver. Acquiring himself with its techniques the TV technician will add to his stock-in-trade a very powerful ally in helping him lick those "difficult" TV service problems.

Fig. 17—Waveforms obtained at various test points in vertical circuit.

Fig. 18—Waveforms obtained at various points in horizontal sweep circuit.

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FEEDBACK

[from page 46]

back. In the above \( A = 100 \) and \( F = -9/100 = .09 \) then,
\[ Gain = \frac{10}{100} - \left[ \frac{100}{x \cdot .09} \right] = \frac{10}{100} + \frac{100}{x} = 10 \]

Sensitivity Gain

There is one more small benefit not to be ignored. An amplifier becomes more sensitive to weaker signals when negative feedback is employed. Here is what happens. The output voltage naturally falls off as an input signal becomes weaker. Since the feedback circuit is connected directly across the output circuit of an amplifier, any fall in voltage there naturally reduces the amount of feedback. Then, any lack of opposition to a weaker input signal, due to that reduced feedback, results in an effective gain in signal input.

EDITORIAL

[from page 2]

to the home, it delivered" . . . "so many stars are taking flings at TV that on good video nights a chair at home is often better than an orchestra seat on Broadway."

Admittedly TV is still in its earliest infancy. Less than 50 stations and a million TV sets are in operation and yet it is estimated that audiences of almost 4 million are now viewing nightly programs.

Video's biggest step toward maturity occurred January 12th when the Bell System East Coast and Midwest networks were linked, joining Boston, New York, Philadelphia, Baltimore, Washington, Richmond, Pittsburgh, Cleveland, Buffalo, Toledo, Detroit, Chicago, Milwaukee and St. Louis. Having had the opinion that Eastern TV programs were so much firmer and more captivating than Midwestern shows, we will now await the reaction of Midwesterners who are, for the first time, being given a break. We predict that Midwesterners, being of a naturally more conservative disposition, will immediately discern the improvement and accordingly will give TV wholehearted acceptance, which it has not had from them as yet.

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