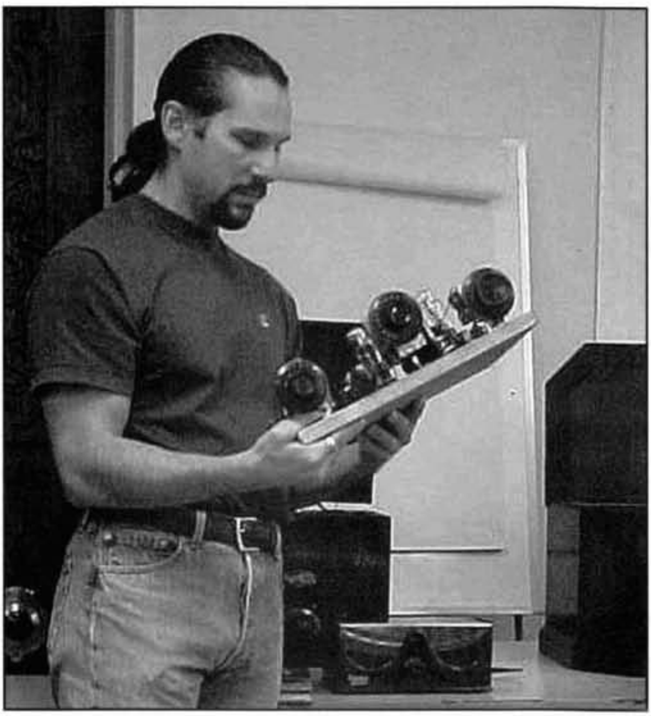
The Colorado Radio Collectors
Antique Radio Club

FLASH!

Volume 12 January ☺ February 2001 Issue 1



In this issue...

♦ CRC Membership Roster ♦ The Swiss Cable Radio History ♦
♦ Mark's "Grimes" Duplex Receiver ♦ Philco Condenser/Resistor Assemblies ♦

ABOUT THE COVER

You're looking at our illustrious VP and engineer extraordinaire Mark Dittmar, discussing his latest project the "Grimes" Duplex receiver, at the CRC November club meeting. Turn to page 11 and you too can learn about the old but clever duplex technology and how to build your own copy of this very hot receiver.

The Colorado Radio Collectors Antique Radio Club

Meetings: Unless otherwise noted in this journal, regular meetings are held on the second Sunday of every other month starting with January (except: 3rd Sunday of May) at 1:00PM at the VectraBank Building, Community Room, 1380 S. Federal Bl. The meeting normally includes business items, discussions, "show and tell", a raffle and a swap meet.

Membership: All dues are $12.00 annually. Joining dues are prorated to June 1st. Contact club for foreign rates. Send dues and membership inquiries to the CRC Treasurer, Robert Baumann, 1985 S. Cape Way, Lakewood CO 80227, (303)988-2089, RGBdenver@aol.com

Article Contributions: Submission of articles are always appreciated. This would include historical and technical items as well as stories about individual collections. Articles may be written or e-mailed, and need not be in final form. Submissions and requests for information should be directed to the CRC "Flash!" Publisher, Larry Weide, 5270 E. Nassau Cir., Englewood CO 80110, (303)758-8382 lweide@attglobal.net.

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Publishing Deadlines: All submissions must be submitted by the 1st of Feb, Apr, Jun, Aug, Oct and Dec. for publishing in the following months.

Thanks to the **Pressworks** for printing the Flash! - **(303) 934-8600**

Upcoming 2001 CRC Events
Regular Meeting, January 14th - Regular Meeting March 11th

Colorado Radio Collectors Antique Radio Club

Founded October 1988

Dedicated to the Preservation and Education of Wireless, Radio, Television and Associated Equipment.

Volume 12, Issue 1 **January/February 2001**

TABLE OF CONTENTS

** Don't forget **

The January meeting place has been changed to;
The Museum of the Americas
861 Santa Fe Ave., between 8th and 9th streets

WHY TWO KAY PLUS ONE

by Tom Kelley, CRC President

Hello again fellow club members,

Welcome to the *real* start of the 21st century! We have a new meeting place as well. Yes, on January 14th at 1:00 we will be meeting at the Museum of the Americas community room at 861 Santa Fe Ave. on the second floor. The entrance is between 8th and 9th streets. You may park on either side of Santa Fe Ave. or on 9th St. Since the room is large, and there's only a very small parking lot, tailgate sale items may be brought into the room. Be aware that arrangements are still in flux, and you are *strongly* encouraged to bring your own lawn or folding chair - at least for this first meeting.

I hope you've been finding radio deals right and left - I have. Ebay has been a wonderful source for me, and with the help of some club members I have found some hard-to-find models and colors of my favorite type of radio.

With the new year here, it's time to start thinking about our upcoming spring show and sales event. The "Timeline" theme last year was a great success. Let's talk about what we should do for a theme and/or featured radio brand this year? It looks like we will again have our show at the usual place and time - the Denver Collector's Fair in April. A lot more on this subject later.

Tom

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Antique Radio Club
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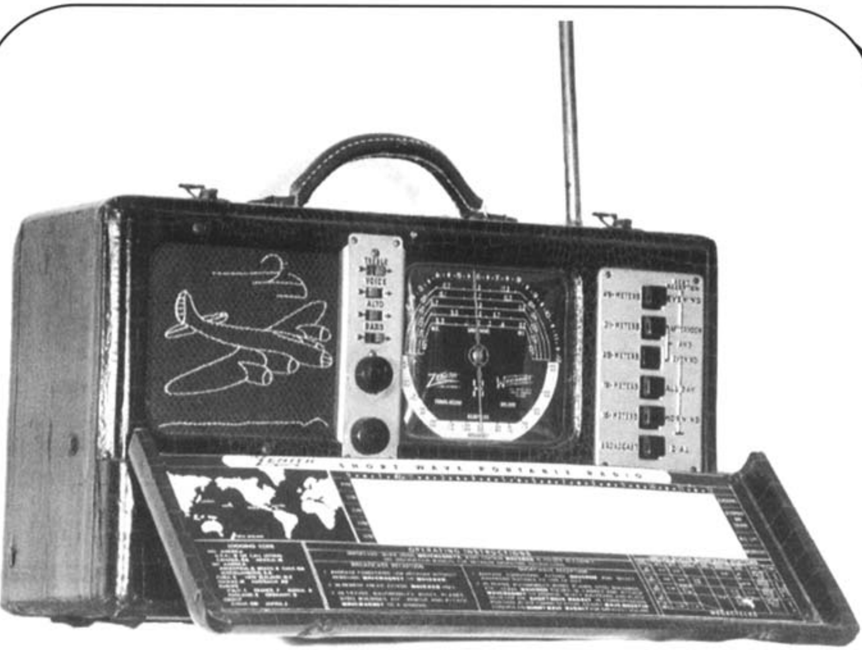
Radio of the Month



Zenith Model 7G-605 "Bomber" - 1941

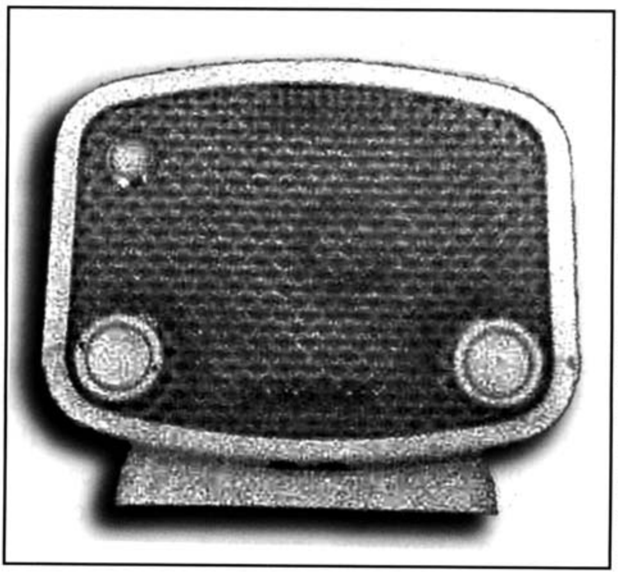
Owned by Bob Stutzman, CRC Member

A BRIEF HISTORY OF THE SWISS CABLE RADIO SYSTEM

by Wayne Gilbert, CRC Member

The following article was originally written by Walter Haring of Belp, Switzerland, in response to my questions regarding the history and use of the Swiss cable radio he sent me - see below). Although Mr. Haring is not a native English speaker, his original article was very readable and only slightly altered to use a more common syntax. - Wayne

Beginning in 1931, radio programs were being broadcast at low (audio) frequency on cable by Switzerland's PTT (the Post Telephone and Telegraph Co.), a national governmental agency. The implementation of this cable radio service allowed the average citizen to connect an inexpensive cable receiver directly to his telephone line. With this receiver he could select from the five different radio broadcasts being transmitted simultaneously from PTT's central broadcasting station. (The decision as to which stations were to be selected for transmission was made by the PTT.)



The success of the concept of cable radio was due to several different things. First of all, Switzerland's geography generally made the reception of wireless radio transmissions difficult and in some areas impossible. Also, Switzerland already had a very comprehensive telephone network by the early years of the twentieth century. (An advantage to this dependence upon wired technology was the continual significant innovations including the development, by the Swiss, of the world's first completely automated telephone system in 1959.)

Because of the cable system's ease of usage, its low subscription price, and the good tone quality (for the era) of the receivers all helped make the TR (Telefonrundspruch) devices quickly acceptable, and by 1932 the PTT was busily modifying all of Switzerland's telephone exchanges to accommodate the wireless radio system. These inexpensive cable radios were especially appreciated in hospitals, hotels, and other businesses that required many receivers.

In 1939, the PTT improved the system with the HF-TR (high frequency Telefonrundspruch with frequency multiplexing). And again, beginning in 1941, through 1947 they upgraded this service with high frequency carriers in the long wave range. In doing so, they achieved another great improvement of the tone quality and the new system allowed the simultaneous transmission of radio broadcasts and regular telephone usage.

Later the Swiss Radio and Television Company, known as the SRG (Schweizerische Radio - und Fernsehgesellschaft), another governmental agency, was assigned the duty of making the selection of the transmitted programs. They increasing the variety of programs selected for broadcast by altering the source broadcasters, finally picking 16 stations, including some wireless stations and some that were international. In fact, the BBC (British Broadcasting Company) had great ratings with the Swiss.

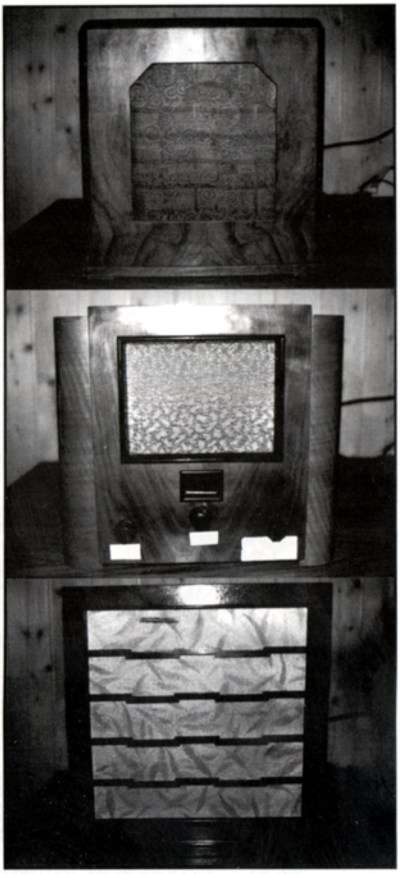
In 1955 the service was enlarged to include a 6th channel. Since this one was always dedicated to music, it was very popular as background music for public rooms such as warehouses.

In 1985, there were 360,000 licensed users, including 20,000 hotels and hospitals with an average of 40 devices each. In the best times the Telefonrundspruch had nearly half a million licensed users, with millions of people in Switzerland listening to their cable radios daily.

The license fee to connect to the radio service was purposely kept low, and in the end it was at CHF 2 (appx. $1) per month (not including the "normal" license fees for radio and television reception - these were and are much higher).

Cable radio systems were also used successfully in Italy, Spain and Brazil. However, as wireless technology improved and with the advent of FM stereo broadcasting, the quality and quantity of the programs increased extremely and the use and need for the Telefonrundspruch system went into decline. It was only because of their introduction of line programs that the Telefonrundspruch system stayed attractive for many.

The end of the Telefonrundspruch system finally came with the change in technology. ISDN and Telefonrundspruch were not compatible on the same net and the Telefonrundspruch had to say good by to its listeners. Since the three kings day, the 6th of January 1998, the Swiss Telefonrundspruch, probably the greatest wire broadcasting net fell silent.



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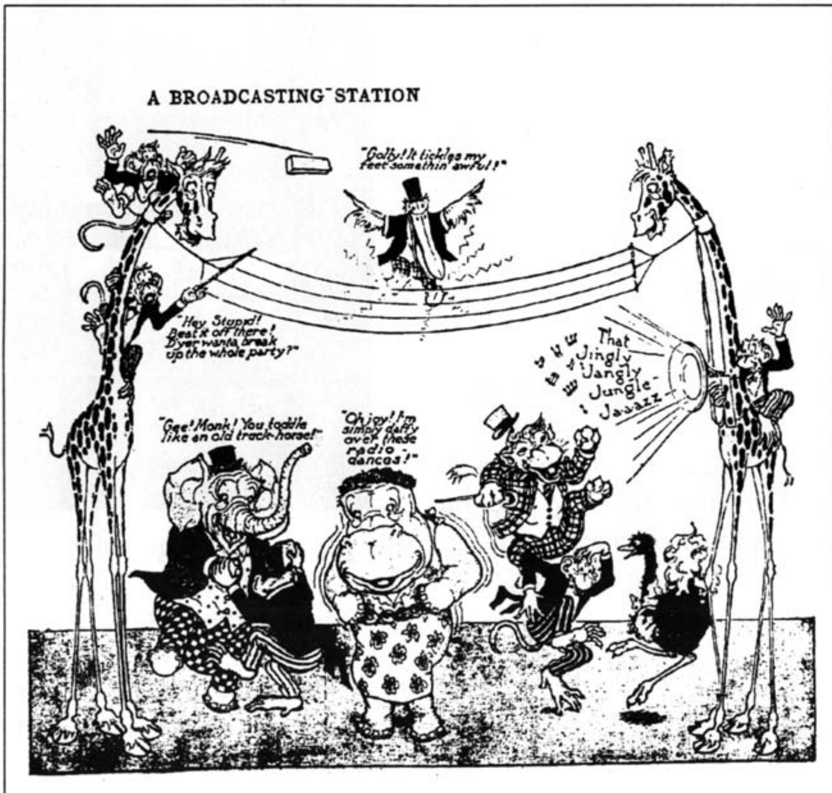
To the right are example of early TR-receivers. On top it is the first ever built "radio" by Biennophone, followed by the Albis IV and on bottom you find a Siemens.

OLDE TYME HUMOR



RADIO NEWS, July, 1922

Mark's Corner

The "Grimes" Duplex Receiver

by
Mark Dittmar, CRC Member

In the early 1920s, when tubes were expensive and the current drain from "A" batteries was high, a receiver design known as the "reflex" receiver briefly gained in popularity among the broadcast listener. Originally invented in 1917 by Marius Latour in France, the reflex receiver economized on tube usage by requiring each tube in the circuit to serve in a dual capacity- as a simultaneous RF and AF amplifier. So, for example, in the simplest case, that of a single tube reflex receiver, the sole tube would serve first as an RF amplifier, followed by a conventional crystal detector. The recovered audio from the crystal detector would then be fed back into the grid of the tube, and amplification at audio frequency would occur. Two tubes for the price of one! The trick was to keep the two different frequencies "separate" within the circuit. There were quite a few variations of the reflex circuit that were put forth - an excellent summary of most of these designs can be found in the classic Henley's 222 Radio Circuit Designs.

Being curious as to how well the reflexed triode designs worked, I decided to study the available designs and breadboard one of these radios. Ultimately, the design I chose to build was the "Grimes Inverse Duplex", a three tube set with a unique routing of the signal paths between the tubes. The circuit is the equivalent of five tubes - two stages of RF amplification, two stages of AF amplification, and one grid leak detector stage. Before getting into the "nuts and bolts" of this particular breadboard project, I would first like to briefly discuss the essential principles behind the reflex design - particularly, how are the RF and AF signals kept separate? Incidentally, another excellent resource on the reflex receiver, as well as many other 1920s radio designs, can be found in the book, Behind the Front Panel

Figure 1 shows the basic "reflexed" triode amplifier. RFT1, RFT2 are air core RF transformers, and AFT1, AFT2 are standard (3:1 or whatever) audio frequency transformers. C1 and C2 are RF bypass capacitors. RF from the preceding stage (or antenna) is introduced to RFT1 via its primary.

RF coupled from the primary is fed to the grid of the triode via the secondary of RFT1. The RF circuit is completed to the filament via the RF bypass capacitor C1. The DC plate supply voltage is fed through the primary windings of AFT2 and RFT2. The amplified RF appears in the secondary of RFT2. Again the RF portion of the circuit is completed via the RF bypass capacitor C2. C1 and C2 are chosen to have a very low reactance (ie, opposition to current flow) at radio frequencies, and generally have values in the neighborhood of .001 to .005 uf. This forces the RF to flow through the bypass capacitors and around the windings of the audio transformers. Audio is introduced into the tube grid circuit via the secondary of AFT1, and through the secondary of RFT1. The secondary of RFT1, with its air core and relatively few windings, has low reactance at audio frequencies and presents little opposition. The grid circuit for AF is completed through the secondary windings of AFT1. C1 has very high reactance at audio frequencies, forcing the AF to travel through the windings of AFT1. The AF output of the tube passes through the primary windings of RFT2 with very little opposition due to the low reactance of the RFT2 primary at audio frequencies. C2 is a very high reactance at audio frequencies, so the audio is forced through the primary windings of AFT2. The amplified audio appears in the secondary of AFT2.

So, there are always two paths for the grid voltages and two paths for the plate voltages in all of the reflexed tubes. One path has high reactance to RF and low reactance to AF, while the other path has high reactance to AF and low reactance to RF. This is the fundamental principle behind the operation of reflex receivers.

Figure 2 is a diagram of the signal

REFLEX AMPLIFIER

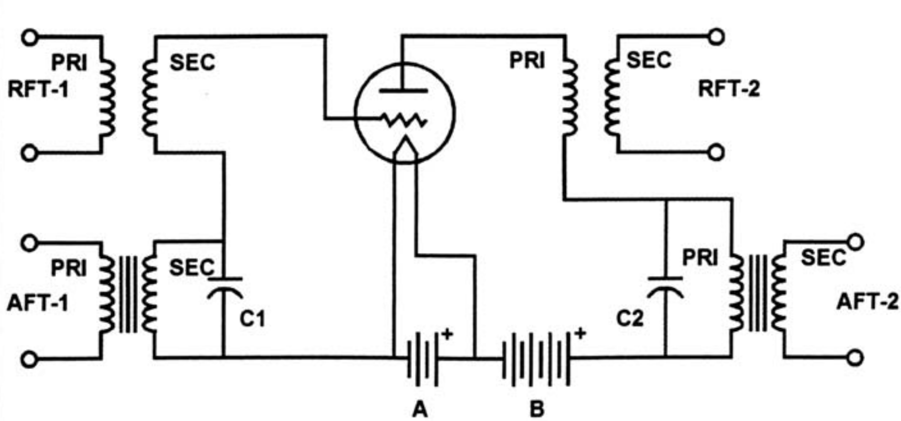


FIGURE 1

flow through a conventional three tube reflex circuit. V3 is the detector tube. So, V1 is the first RF stage, V2 is the second RF stage. Recovered audio from detector V3 is fed back into V1, which is the first audio stage, and then into V2, which is the second audio stage. So, the strongest RF signal and the strongest AF signal appear in V2 - this is the first tube to overload on strong signals, and is a particular drawback to the standard reflex circuit. Another problem with the standard reflex design can occur when there is some residual RF floating around after the detector circuit. This RF can get fed back through to the first RF stage via AF1 and then get subsequently amplified by V1 and V2 forming an RF oscillator, so one ends up with a transmitter instead of a receiver!

Figure 3 is a diagram of the signal flow through the "Grimes Inverse Duplex", a variation of the standard reflex design. This circuit, developed by David Grimes, an electrical engineering student at the University of Minnesota, overcomes the signal overload problem by feeding back the recovered audio from the detector V3 into the preceding tube V2 via AF2. The amplified audio from V2 is fed into the first tube V1 via AF1. Therefore, V1 is the FINAL audio

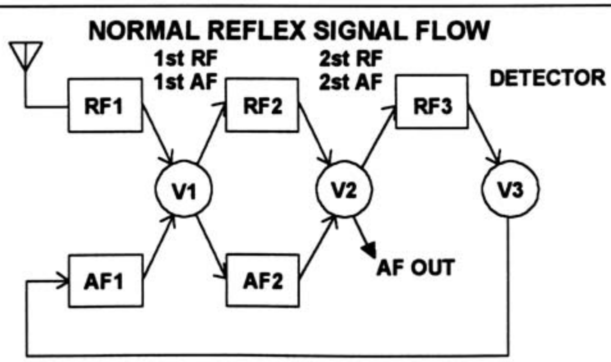


FIGURE 2

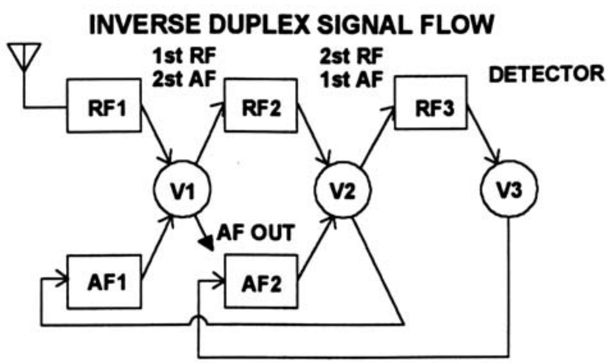


FIGURE 3

THE "GRIMES INVERSE DUPLEX"

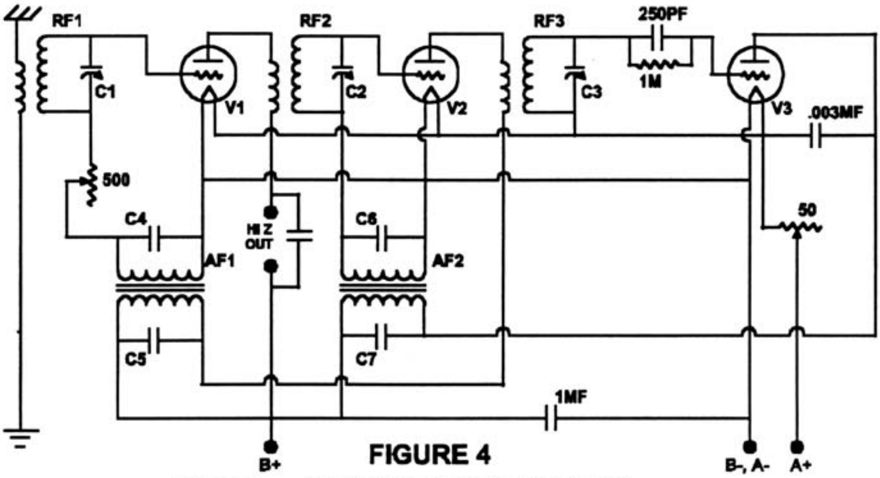
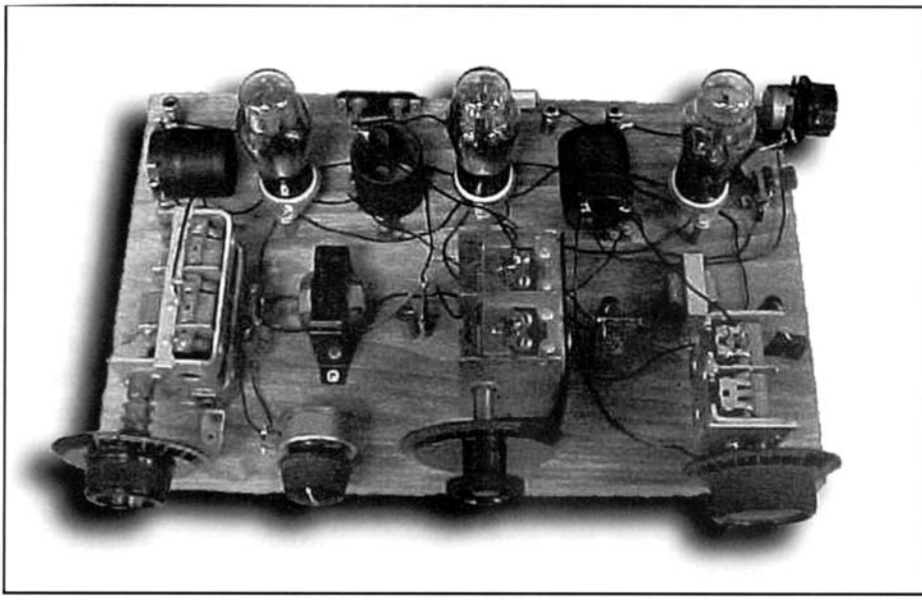


FIGURE 4

C1, C2, C3:	365-500PF MAX VARIABLE CAPACITORS
C4, C5:	.001uF - SEE TEXT
C6, C7:	.005uF - SEE TEXT
RF1, RF2, RF3:	TRF RF TRANSFORMERS, OR SEE TEXT
AF1, AF2:	3:1 AUDIO TRANSFORMERS
V1, V2, V3:	TYPE 30 TRIODES

stage and FIRST RF stage, while V2 is the FIRST AF stage and the FINAL RF stage. This arrangement equalizes the gain load across the tubes and lessens the possibility of overloading. The probability of forming an RF oscillator is also greatly reduced by this design, since the output of the detector is connected to the preceding stage, thereby reducing the overall gain back to the detector. The term "inverse" in this type of reflex circuit refers to the unique signal flow path. I can only assume that "duplex" refers to the dual RF and AF paths in the tubes. Of course, the inverse principle can be extended to more than two reflexed stages.

A schematic diagram of my version of the "Grimes Inverse Duplex" appears in Figure 4. A photo of the finished breadboard is shown in figure 5. I built the circuit on a 9" wide by 15" long piece of cherry-stained poplar. I used type 30 triodes in my rendition, but any old battery triode will work here (01A, 199, 1G4, 1H4, etc) with appropriate attention to filament requirements. The RF transformers came from my junkbox, and no doubt were liberated from an un-restorable TRF chassis. They are standard RF transformers designed to be used with 350 - 500 pf variable capacitors. If you don't have any of these RF transformers lying about your



workbench, it is a simple task to roll your own. I suggest the following for use with standard 365 pf broadcast capacitors: On a 1-7/8" diameter coil form, wind approximately 40- 50 turns of 28 ga. enamel wire to serve as the primary. It should occupy 5/8" or so of space on the former. The secondary is wound starting about 1/8" away from the primary. Wind in the same direction as the primary. The secondary will require about 75 turns of 28 ga wire and will occupy slightly over an inch on the former. All the windings are close wound. As seen in the photograph, the RF transformers are mounted perpendicular to each other to minimize stray RF coupling between stages. With respect to audio transformers, I used standard single-ended plate-to-grid 3:1 audio transformers. You can get these at Antique Electronic Supply in Tempe, Arizona. The air variable tuning capacitors in my set are around 450 pf maximum capacitance - they are not ganged together. The grid leak and grid capacitance in the detector circuit are 1 megohm and 250 pf respectively. The 500 ohm potentiometer shown between the secondary of AF1 and RF1 is referred to in Henleys as a "stabilizing" control. Its purpose is to reduce the appearance of "objectionable oscillations". It is basically controlling the level of audio signal into the second AF stage (tube V1). A 50 ohm potentiometer is in the filament supply line to drop the voltage from my 3 VDC battery supply to the required 2.0 VDC of the type 30 filaments. The three tubes will draw 180 ma of filament current at 2.0 VDC. There is a .0015 uf cap across the headphone/speaker jack to bypass RF around the headphones/speaker.

This set is designed for a high impedance headphone or speaker. Bypass capacitors C4 through C7 should be in the range of .001 to .005 uf. Some experimentation with these values will be necessary to find the values that keep the set from becoming a big audio oscillator. I started with .001 uf for all the bypass capacitors, only to be greeted by a loud howling from the headphones when power was applied. After a bit of fiddling, I arrived at the following values for my particular layout - C4 and C5 = .001uf, C6 and C7 = .005uf. Don't forget the 1uf audio bypass across the plate supply. For a plate supply, I settled for 40-45 VDC from a string of 9V batteries. I just tied the detector and amplifier tube B+ supplies together and ran them both at 45 VDC. The old schematics will show 22.5 VDC on the detector and 45 VDC or higher on the amplifier plates. That will work fine too. I suggest staying below 70 VDC or so - the higher plate voltages are totally unnecessary, especially with the 30 triode. Incidentally, I was able to run the plates as low as 17 VDC and still get usable audio.

With my 67' inverted L antenna and copper rod ground, this set is very sensitive and has more audio than you could possibly need. Headphones just were not practical, so I used my Peerless Reproducer instead. The set tunes just like any of the conventional three dialer TRF sets of the 1920s. With the capacitors and RF transformers I had on hand, the set covers from about 500 khz to 1100 khz. Audio levels can be reduced by adjusting the filament control. In retrospect, it would have been good to run the detector at a fixed filament voltage and put rheostats in series with the amplifier filaments as a more effective volume control. The "stabilizing" control did not seem to have much effect except for weaker signals. It really behaved more like a volume control with limited range. I noticed a tendency for the audio to get "mushy" and overloading to occur with the super-strong locals during the day. De-tuning the antenna capacitor slightly solved this problem easily. The set has sufficient gain that a small indoor wire antenna can be used with it. I used a 6' long piece of hookup wire strung up along some shelves in my basement as a test. The set was better behaved on the stronger stations with the short antenna.

Overall, this set is a good performer and through its construction I gained some insight into the practical design of reflexed triode sets. It has given me even more respect for the radio designers of the 1920s - the multiplexing of tube functions is quite ingenious.

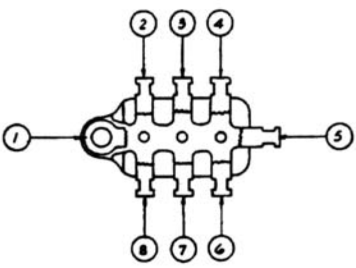
Aside from the Crosley Trirdyne and the radios produced by David Grimes' company, I am not aware of other manufactured reflex sets. If you know of commercially manufactured reflex sets, please drop me an e-mail at mark_dittmar@maxtor.com. If there is interest I'll include the list in my next article. Mark

Philco Condenser/Resistor Sub-Assemblies

By Larry Weide, CRC Member

[This is a reprint of an article originally printed in September of 1998 - Ed.]

For those who are fortunate enough to have a copy of "Rider Perpetual Trouble Shooter's Manual Vol. II", you will find therein a detailed description of Philco's resistor/capacitor assemblies that were sealed in tar-filled bakelite cases. These assemblies were very commonly used in radios built during the thirties. Although these units were great for keeping the under-chassis wiring clutter to a minimum and for providing strong, convenient tie-points, after 60+ years they are quite prone to failure - particularly the capacitor components. Some persnickety folks will do a wholesale replacement of the capacitors by unsoldering and unbolting the assemblies, removing the 'caps and inserting new 'caps inside the bakelite covers for authenticity. Others will just break the 'cap wires loose from the tie-points and put the new 'caps on the outside of the covers. In any case, it's ***very*** important to be sure that the old 'caps are no longer in the circuit, and to be careful about not breaking the fragile cases.



Above is the generic component assembly as viewed from the underside of the chassis. Note that pin #1 is always bolted to the chassis, and that some pins may be there just to be used as tie-points. Additionally, not all pins are present on all assemblies.

The following is a list of these component assemblies. You will find the part numbers molded into the side of the bakelite cases. Be ***sure*** to pay attention to the required minimum voltage ratings of the 'caps by referring to their use in the radio's circuit diagram.

T in Cap. value column means twin capacitors in assembly

Part	Cond.	Lugs	Wire	Resis.	Cond.
3615-AA	0.05	1-3-5-8	• • •	• • •	1-5
3615-AB	0.05	1-4-7-8	• • •	• • •	1-4
3615-AC	0.05	1-5-7-8	• • •	• • •	1-7
3615-AD	0.05	3-5-8	• • •	• • •	3-5
3615-AE	0.05	1-7-8	• • •	• • •	7-8
3615-AF	T.05	4-7-8	• • •	• • •	4-8 & 7-8
3615-AG	0.05	1-3-5	• • •	• • •	1-5
3615-AH	0.05	1-5	• • •	• • •	1-5
3615-AJ	T.05	1-3-6-8	• • •	• • •	1-3 & 1-6
3615-AK	0.05	1-5-7-8	• • •	• • •	1-7
3615-B	0.05	1-3-5	250	3-5	1-5
3615-C	0.05	1-5-7	250	5-7	1-5
3615-D	0.05	1-3-5	• • •	• • •	1-5
3615-E	0.05	2-5	• • •	• • •	2-5
3615-F	0.05	2-3-5	• • •	• • •	3-5
3615-G	0.05	5-8	• • •	• • •	5-8
3615-H	0.05	3-5-8	• • •	• • •	5-8
3615-J	0.05	1-5-7	• • •	• • •	1-5
3615-K	0.05	3-5-8	250	3-5	5-8
3615-L	0.05	1-5	• • •	• • •	1-5
3615-M	0.05	2-5-7	• • •	• • •	2-5
3615-N	0.05	1-4-7	• • •	• • •	1-4
3616-P	0.05	1-4-7	250	4-7	1-4
3615-R	0.05	1-5-7	250	5-7	1-5
3615-S	0.05	1-4	• • •	• • •	1-4
3615-T	0.05	1-5-7	150	1-7	1-5
3615-U	0.05	1-5-7	• • •	• • •	1-7
3615-W	0.05	1-2-5	• • •	• • •	1-5
3615-X	0.05	1-2-5-7	150	1-7	1-5
3615-Y	0.05	1-2-5-7	150	1-5	1-7

Part	Cond.	Lugs	Wire	Resis.	Cond.
3793-B	0.015	5-7	• • •	• • •	5-7
3793-C	0.015	2-4	• • •	• • •	2-4
3793-D	0.015	2-6	• • •	• • •	2-6
3793-E	**T**.015	1-5-7	• • •	• • •	1-5 & 1-7
3793-F	0.015	5-7-8	• • •	• • •	7-8
3793-G	0.015	2-3-6	• • •	• • •	2-6
3793-H	0.015	1-3-5	• • •	• • •	1-3 & 1-5
3793-J	0.015	2-5-7	• • •	• • •	2-5
3793-K	**T**.015	1-3-5-8	• • •	• • •	1-3 & 1-5
3793-L	**T**.015	5-7-8	• • •	• • •	7-8
3793-M	**T**.015	5-7-8	• • •	• • •	5-8 & 7-8

Part	Cond.	Lugs	Wire	Resis.	Cond.
3903-F	0.01	3-5	• • •	• • •	3-5
3903-G	0.01	2-4-7	• • •	• • •	2-4
3903-H	0.01	5-8	• • •	• • •	5-8
3903-J	0.01	2-5-7	• • •	• • •	2-5
3903-K	0.01	1-2-4-7	• • •	• • •	1-7
3903-L	0.01	3-5-8	• • •	• • •	3-5
3903-M	0.01	4-7-8	• • •	• • •	4-8
3903-N	0.01	3-5-8	• • •	• • •	5-8
3903-P	0.01	2-5-7	• • •	• • •	2-7
3903-R	0.01	4-7-8	• • •	• • •	4-7
3903-S	**T**.01	1-5-7	• • •	• • •	1-5 & 1-7
3903-T	0.01	5-7-8	• • •	• • •	7-8
3903-U	0.01	1-2-5-7	• • •	• • •	1-7
3903-W	0.01	2-4-7	• • •	• • •	2-7
3903-X	0.01	3-5-8	• • •	• • •	3-8
3903-Y	0.01	3-5	• • •	• • •	3-5

Part	Cond.	Lugs	Wire	Resis.	Cond.
4989-B	T.09	1-3-5	• • •	• • •	1-3 & 1-5
4989-C	T.09	1-5-7	• • •	• • •	1-5 & 1-7
4989-D	0.09	1-5	• • •	• • •	1-5
4989-E	0.09	1-5-7	250	7-5	1-5
4989-F	0.09	1-5-7	• • •	• • •	1-5
4989-G	T.09	1-4-7	• • •	• • •	1-4 & 1-7
4989-H	T.09	1-5	• • •	• • •	1-5 & 1-5
4989-J	0.09	3-5	• • •	• • •	3-5
4989-K	T.09	3-5	• • •	• • •	3-5
4989-L	0.09	3-4-8	200	3-8	4-8
4989-M	T.09	4-7-8	• • •	• • •	4-8 & 7-8

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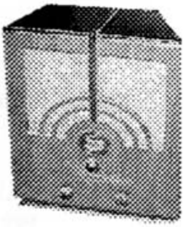

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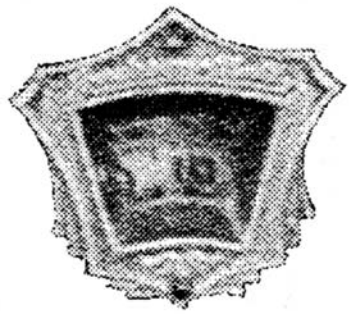

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