IN THE WORLD OF RADIO

Radio Secret of War Bared

Automatic Receiver Designed to Help A. E. F. Copy German Messages.

By FLOYD MARSHALL.

The signal corps operator behind the American lines let go an oath. But a moment before he was "copying" the enemy messages. Then right in the midst of a sentence came—silence. A hasty examination of the radio receiver showed everything in order. A rapid bit of tuning, and with it the truth was flashed. The German operators had changed the wave-length! Enter a new problem, how to keep up with the radio stations behind the German lines.

They sent for R. E. Thompson a few days later in Washington. For Pershing had so ordered. And what Thompson was able to do forms one of the most interesting stories of the world war. Outwitting the enemy is the chapter heading.

Necessity is truly the mother of invention and in this case the invention was an interesting device manufactured by the Wireless Improvement company, which is now a subsidiary of the R. E. Thompson Radio corporation. This device was an automatic or uncontrolled radio receiver designed by the Wico at the urgent request of the American expeditionary forces to enable the operators of the signal corps in France to keep track of the radio stations operating behind the German lines.

It was found to be extremely important to listen in on the German stations but the German engineers, taking advantage of the considerable time which they knew was required to tune the ordinary receiver to another or different wave length, proceeded to rebuild their transmitters so that they could be instantly switched to different wave-lengths and by using combinations known to their receiving operators would change a number of times during a message. American operators, listening in, would hear only brief and unintelligible parts of the message. The American, moreover, would not know where to look for a station that had changed and usually by the time the station had again been found on the receiver tuner another change would have been made.

Pershing Asks Action.

When this condition became serious, Col. L. R. Krumm, who was in charge of the radio division under General Russell, remembering that he had heard R. E. Thompson, now president of the R. E. Thompson Manufacturing Co., and then chief engineer of the Wireless Improvement company, speak of an automatic tuner which he had invented, caused General Pershing to send a cablegram to the chief signal officer in Washington asking him to get in touch with Thompson and arrange, if possible, that the Thompson automatic tuner be immediately manufactured and shipped to France. Thompson was forthwith called to Washington and accepted an order to design and build these sets for the particular wave-length range required by the army.

In an exceptionally short time these receivers were constructed and were on their way to France where they were put to work immediately to keep track of the German "skipping" stations.

Uni-Control Receiver.

By an ingenious arrangement, Thompson was able to cause the receiver to be tuned to all the wave-lengths from 200 to 4,000 meters gradually and over and over again by the turning of a single crank. He then connected to this control a small specially constructed electric motor. This caused the receiver to constantly pass through the range of wave-lengths from 200 to 4,000 meters. And any given wave-length was passed through every 10 seconds.

When a signal was being received the mechanism was, of course, stopped at the position corresponding to the proper tune. When the station's signals disappeared a button was pushed and within 10 seconds the same station would be found at some other wave-length when the mechanism was again stopped until another shift was in order.

For listening in purposes the motor was permitted to constantly drive the tuning mechanism over the entire range so that regardless of what wave-length a German station decided to open upon, the American operators were on to him within 10 seconds. From then on they skipped when he skipped. The joke of the thing was that the Germans kept this up during the whole of the war, their engineers being under the impression that they were getting away with it. Owing to the extreme secrecy whiche surrounded the manufacturing and delivery of these sets in France, the fact that they had been employed did not come out until long after the war was over.

Round Corners of Wires.

A sharp bend in a wire not only offers a good point for energy to be radiated from, but it also changes the resistance of the wire. All wires should be led directly to the proper terminal without bending, if possible. Where it is necessary to bend a wire at right angles, use round-nose pliers or some other tool to make the curve a large one.

Window Top for Lead-in.

It is often better to place a lead-in at the top of the window, where it will be out of the way and there will be no danger of disturbing it by opening the window. It is better protected from the window in this manner, and the lead-in does not show in front of the window.

Weakness of Most Reflexes Overcome in Set That Is Selective

By WILLIAM A. SCHUDT, Jr.,

A reflex set that will tune out one station and not cause interference with another station operating on a wave length close to the first is something to be looked forward to. Selectivity often can be had with reflex, not by decreasing the volume but by increasing it. When the selectivity is improved and the volume increased, however, true efficiency is obtained.

Present day receiving sets employing any form of radio frequency (tuned R. F.) usually combine several variable condensers so that they can be controlled by one shaft, thereby bringing the number of controls down to one. Such a practice is a right for medium, results, but beyond that it is a failure. Local stations can nearly always be tuned at the same dial reading when more than one variable condenser is used. Therefore, if local reception is the only object in view, all the variable capacities can be coupled to one shaft.

Tuning in distant stations with all of the condensers controlled by one dial is quite a task, since you cannot possibly get resonance unless each one of the radio frequency circuits is tuned separately and carefully. Of course, it is another thing when each coil is designed for use with a special condenser and all condensers in turn connected up to the one shaft. Even in this manner utmost efficiency is not obtainable, because various objects surrounding the coils and condensers tend to prevent any standardization of such units. On the other hand, several prominent manufacturers of radio equipment have solved the problem to a certain extent and can successfully operate several variable condensers on one shaft, but as was stated before, the utmost of efficiency is not obtainable at the present time.

Avoid Coupling Condensers.

It is seen, then, that in designing the reflex set so that really good selectivity will be had one must not couple the two variable condensers. In this case only one is used and therefore the set is actually one of single control.

The receiver about to be described embodies a special form of reflex which is far more efficient than just the straight reflex set. Greater selectivity is obtained, ease of control, and greater volume is had with three tubes.

All of the apparatus can be mounted on a 7x18 inch panel.

Necessary Parts.

A list of the parts necessary for the construction of this super reflex set follows:

One three circuit low-loss tuner.
One 23-plate .0005 mfd. variable condenser (low-loss type).
One iron core radio frequency transformer (untuned).
Three low radio audio transformers.
One crystal or mineral detector (fixed preferable).
Three tube sockets.
Six binding posts mounted on rack.
One double circuit jack.
One single circuit jack.
Two variable grid leaks.
One battery switch.
Three 30 ohm rheostats.
One .001 mfd. fixed condenser.
One panel, 7x18 inches.
One baseboard, suitable for use with, 7x18 inch panel.
Necessary dials, bus bar and supports.
One knob to be used on sensitizer shaft to match up with knobs of rheostats.
One cabinet, 7x18 inches.

The panel should be laid out before anything else is done.

A piece of white cardboard the exact size of the panel is procured. With the aid of a ruler and compass the panel template is laid out to suit the builder. A very good lay-out is shown in the drawing elsewhere on this page.

The variable condenser is mounted in the center of the panel with two of the rheostats on the right-hand side, while one rheostat and the sensitizer control are placed on the left-hand side. The jacks and battery switch are clearly shown mounted below the large dial in the center.

As soon as the panel template is finished, fasten it to the front of the panel by means of clamps to prevent them from marring the panel. Then impress the markings upon the face of the panel with a center punch.

The baseboard is mounted or fastened to the panel first, following it by the condenser and rheostats. Care should be given to correct placing of the three-circuit tuner. It is placed so that its magnetic field does not take in any part of the variable condenser.

The placement of the various transformers, tube sockets and other instruments is clearly shown in the drawing.

Novel Wiring Method.

Once all of the apparatus is in place the wiring should be started. In this case there are bound to be quite a few changes made before the set will be in proper working order. On account of this latter reason we are presenting a novel method of wiring so that it will be easier for the builder.

It may have occurred to many builders of radio sets after they have finished wiring with heavy bus bar to reverse a few transformer leads or try placing a certain lead at another point of vantage to see if it will increase the signal strength. If it has occurred to them they undoubtedly spent a few hot, blue, smokish minutes trying to bend or stretch the heavy connectors to their new positions. In order to save this excess energy and to be able to reverse one or all leads that can be reversed, the set should be wired with No. 28 D. C. C. wire. Of course, this is only temporary and will be replaced, wire for wire, with heavy bus bar, just as soon as the correct reversals are found.

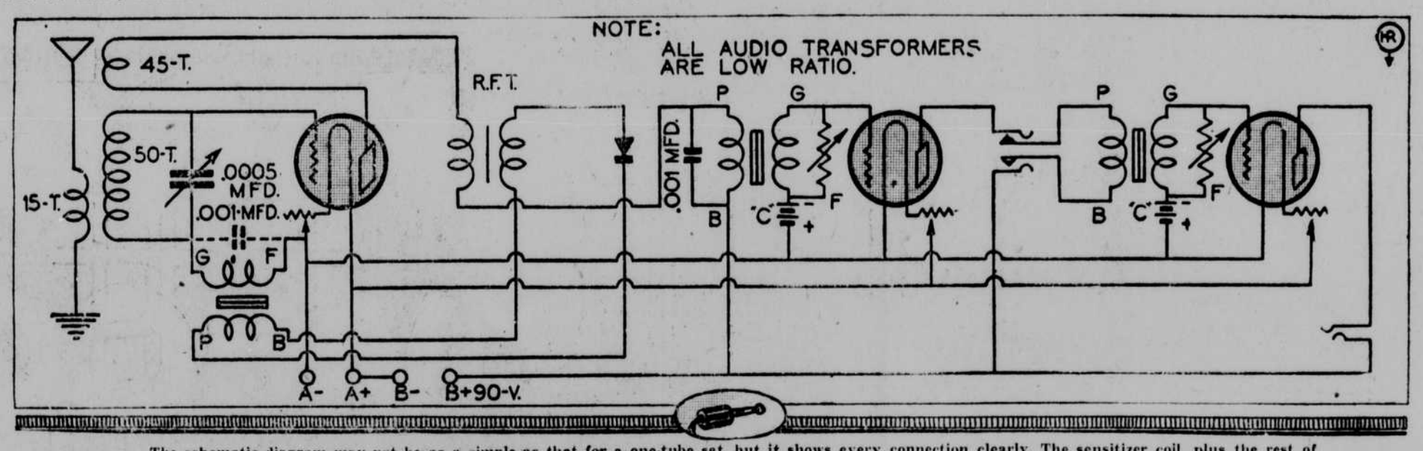
Step by Step Process.

Following is a word diagram of the reflex set, the schematic diagram being shown at the bottom of the page.

Connect first with the No. 28 wire, replacing later with bus bar.

From the binding post marked ANT a wire is connected to the top end of the primary coil. Now run a lead from the post marked GND to the other end of the primary.

Now comes the secondary circuit, and one must take great care here, for a mistake will end in complete failure. The end of the secondary nearest the tickler rotor is connected to the fixed plates of the variable condenser and also to the grid post of the first tube socket. The other end of the secondary is brought to the rotary plates of the variable condenser and to one end of the audio transformer. The other end of the transformer goes to the "A" minus lead.



The schematic diagram may not be as a simple as that for a one-tube set, but it shows every connection clearly. The sensitizer coil, plus the rest of the radio frequency circuit, is similar to the wiring of an ordinary three- circuit tuner.

Before wiring the primary circuit of the audio transformer one will find it much easier to finish up the plate circuit of the first tube. From the plate post on the first tube socket a wire is run to one end of the sensitizer coil, which is known as the tickler coil of the three circuit tuner. Now run a lead from the other side of the sensitizer to one side of the radio frequency transformer. Continuing the wiring, connect a lead to one side of the primary of the second audio transformer from the other side of the untuned radio frequency transformer.

Other Connections.

As we transform our energy into the secondary of the radio frequency transformer let us also continue wiring this part of the set. The top end of the secondary is connected to one end of the crystal detector, while the other end of the crystal detector is connected to one side of the primary of the first audio frequency transformer, the opposite side of the audio transformer being placed in connection with the other side of the untuned radio frequency transformer. (Reference should be made to the schematic diagram from time to time.)

Going back to the second audio transformer, connect a wire to the vacant post on the primary side to the binding post marked "B" plus. This "B" plus is also connected to the lower prongs of the two jacks. A fixed mica condenser of .001 mfd. is connected across the primary of this audio transformer.

It hardly seems necessary to go into word diagram for the rest of the audio frequency amplifier, since it is of conventional design, except for the two variable resistances which are shunted or connected directly across the secondaries of the audio transformers.

All of the grid return leads are connected together and in turn connected to the filament circuit and then to the "A" battery minus binding post. The other filament posts on the three sockets are connected together and then to the binding posts marked "A" plus and "B" minus. So much for that.

A by-pass condenser may have to be shunted across the secondary of the first audio frequency transformer. In fact, it is not a bad plan to try this condenser both in and out of the circuit.

Try Reversing Leads.

The leads to the first audio frequency transformer should be reversed to find the best operating polarity. This is very important, and when the correct wiring for the whole row of transformers is found the frail wires should be replaced by strong bus bar.

If it be not too late, we might stress that the audio transformer should be of the lowest possible ratio.

Because of the use of a crystal detector, the clarity of this particular set is as nearly perfect as any radio set tested by this department.

In a pinch one rheostat can be used to control all three tubes, thereby eliminating two dials from the panel. Of course it is always best to have a rheostat to control each separate tube.

As in the construction of all radio receiving sets, the results obtained depend entirely on the quality of apparatus used in it, and this cannot be advised any too strongly with this reflex receiver. Use good transformers, especially the untuned radio frequency transformer, which is of the iron core type and should be of the very best quality.

The set when adjusted properly will not be critical at all and will give surprisingly good volume and selectivity.

Above is the front view, showing the panel layout of the Schudt Reflex set. Note the single control. Sets of the future will be designed along these lines.

FOREIGN INTEREST IN RADIO GROWS

Another problem which is beginning to take on importance with radio officials and which may some day be the basis of international complications is the increase in interest in broadcasting in Canada, Mexico and Cuba.

The increased interest, it is believed, may result in an increase in the number of powerful broadcasting stations in these three countries. This would either result in a lot of interference or else cut down the number of wave lengths available to American stations.

The entire wave length band (from 200 to 545 meters) best adapted at present for broadcasting purposes is occupied by American stations. In order to prevent interference these stations are separated by 7, 8, 9 and 10 kilocycles.

Obviously if powerful stations (of 500 watts or over) are erected in Canada or Mexico they must be placed on the same wave length as American stations. Because of the short distance between the countries, interference will be bound to result.

Novel Yet Efficient Shaft.

A celluloid knitting needle makes an efficient vario-coupler or variometer shaft. If heated in boiling water it can be bent in any shape desired.

RADIO ANNOUNCER TO KANSAS CITY

Gene Rouse, "G. R.," chief announcer of radio broadcasting station WOAW, Will go to Kansas City Sunday to be the guest of "The Merry Old Chief," Leo Fitzpatrick, Chief announcer of the Kansas City Star WDAF station at the Kansas City Radio show in convention hall.

That newspaper is paying the expenses of a dozen announcers from all over the country, chosen by the fans as the most popular in the recent canvass conducted by the Radio Digest.

George Hay of WLS, Chicago; Lambdin Kay of WBS, Atlanta, "Gawgia" and "The Hired Hand" of WBAP, Fort Worth, Tex. are among the invited guests of the Star.

Loud Speaker Connections.

In connecting a loud speaker to the set, it must be done with the right polarity combination. The permanent magnet in the speaker has a fixed field, and the current which passes through the field coils from the set must be in the right direction, otherwise it will produce a bucking electromagnetic field and the speaker will not function well. Regardless of the excellence of the loud-speaking unit itself unless the horn is designed according to correct acoustic principles and has ample proportions, the full effect of the signal will be lost.

INTERFERENCE PUNISHABLE

Malicious interference with radio reception of neighbors will be prosecuted vigorously, according to officials of the radio bureau of the Department of Commerce.

One such case has already developed. The inspector at New Orleans received a number of complaints of interference from Knoxville, Tenn. An investigation revealed that an amateur was using an unlicensed spark coil transmitter without a receiver, which, he admitted, was being done for the sole purpose of creating interference with a listener across the street.

As the action was in violation of the law, the case was reported to the district attorney and came up before Federal Judge Hicks. The amateur pleaded guilty and was sentenced to pay a fine.

Under the law the penalty for operating an unlicensed transmitter is a fine not exceeding $500, and the apparatus is forfeited to the government. The penalty for operating a transmitter without an operator's license is $100 or imprisonment for two months or both. The penalty for malicious interference is a fine of $500 or a sentence of one year or both.

All Up to Detector.

A vacuum tube regenerative set, using only one tube, will bring in signals from nearly the same distance as a set having an audio-frequency amplifier. The amplifier serves to increase the strength of signals brought in by the detector tube, for the purpose of operating a loud speaker or making the signals louder in the phones.

RADIO BUSINESS BOOM IN CANADA

All previous Canadian sales records for radio sets and accessories were surpassed during this year's Christmas business, Assistant Trade Commissioner T. W. Donnelly reports to the Department of Commerce from Ottawa.

The availability of the leading broadcasting station in the United States and the principal stations in Canada affords local enthusiasts greater scope for operation. The rapid advancement of the science in the United States is responsible in a very large measure for the rapidly growing interest in this country. Although the broadcasting stations in this country are modern in every respect and have interesting programs, the number is limited.

Consequently the operator, as is true the world over, experiments and is not satisfied until he has connected with a distant station in the United States. Only on rare occasions is it possible to tune in on Toronto from Ottawa. This is due chiefly to atmospheric conditions.

UNIVERSITY TAKEN TO RURAL SCHOOLS

Manhattan, Kan., Feb. 13.—The 9,000 country schools of Kansas are going to be radioized.

A state-wide campaign is being planned for the equipment of these schools with receiving sets so that they may listen in on education and other programs from station KSAC, conducted by the Kansas State Agricultural college here.

RADIO

Program for February 28.
By Associated Press.

WPG, Atlantic City (299.8): 8, recital; 9, concert, orchestra.
WEEI, Boston: (Silent).
WMAQ, Chicago News (447.5): 6, orchestra; 8, Russell Pratt, Fred Daw; 8:30, photologue; 9, Chicago theater.
WGN, Chicago Tribune (370.2): 6, organ; 6:30, ensemble, quintet; 8, chorus; 10, dance, orchestra.
WLS, Chicago (344.6): 7, trip to Australia; 7:20, national barn dance; 11 Senate theater.
WBBH, Chicago Post (370): 7, orchestra; 9, dance, readings, vocal; 11, orchestra, songs, readings.
KYW, Chicago (535.4): 7, concert; 8, musical; Youth's Companion; 9:35, congress classic; 12, carnival; 1 a. m., Insomnia club, Nighthawks.
WLW, Cincinnati (422.3): 6, concert, quintet, latafone.
WTAM, Cleveland (389.4): 8, dance.
WOC, Davenport (483.6): 6:30, Sandman; 7, religious discussion; 9, reader, vocal, pianist; 11, dance, songs.
KOA, Denver (322.4): 10, dance.
WWJ, Detroit News (352.7): 7:30, concert.
WHO, Des Moines: (Silent).
PWX, Havana (400): 7:30, concert.
KTHS, Hot Springs Park (375): 8:30, cellist, pianist; 9:15, organ; 10, frolic.
WOS, Jefferson City (440.9): 8, musical.
WDAF, Kansas City Star (365.6): 6, school of the air; 11:45, Nighthawks.
WHAS, Louisville Journal (399.8): 7:30, concert, readings, pianist.
KHJ, Los Angeles Times (404.9): 8, orchestra; 8:30, children; 9:30, talk; 10, trip to Mount Lowe; 2-4 a. m., Lost Angels.
KNX, Hollywood (336.9): 8:15, instrumental; 10, vocal, instrumental; 12, orchestra; 1, celebrities of Hollywood.
WMC, Memphis Commercial Appeal (499.7): 8:30, musical.
WCCO, Minneapolis-St. Paul (416.4): 8, philosophies; 8:15, talk; 8:30, musical; 10, dance; saxophone quartet.
CKAC, Montreal (427): 6:30, concert; 7:30, entertainment; 9, dance.
WEAF, New York (492): 6-11, entertainment, dance.
WHN, New York (361.2): 6:30, health talk; 6:35, orchestra; 7:30, dance; 8:45, tenor, pianist, entertainers; 10:30, dance.
WNYC, New York (526): 6:30-9:30, orchestra, instrumental, vocal music.
WJZ, New York (455): 6-10:30, entertainment, talks, dance.
WOAW, Omaha (526): 6, dramatic; 6:30, announced; 6:45, program; 9, pianist; 11, Nightingales.
WTAY, Oak Park (256): 6:30-7:30, classical program; 8:10, popular program; 12-1:30, organ concert.
KGO, Oakland (361): 6, concert; 10, band, vocal, address; 1, dance, soloists.
WFI, Philadelphia (394.5): 5:30, orchestra; 7, concert.
WIP, Philadelphia (508.5): 5:05, orchestra; 6-7, talks; 8, talk; 8:15, concert; 9:05, dance; 11:05 recital.
WCAE, Pittsburgh (461.3): 6:30, Uncle Kaybee; 6:45, special; 7, road talk; 7:30, concert.
KDKA, Pittsburgh (309.1): 5, concert; 6:45, Bible hints; 7:30, band.
KGW, Portland Oregonian (492), 12, Melody men, solos.
WGY, Schenectady (379.5): 8:30, dance, songs.
KFOA, Seattle (455): 8:45, program; 10:30, dance; 12:05, orchestra.
WBZ, Springfield (213.3): 6:15, history sketches; 6:30, trio; 7:15, trio, vocal; 8:30 baritone; 8:45, play, musical.
KSD, St. Louis Post Dispatch (545.1): 8, symphony.
CJHC, Toronto (250): 8, orchestra.
KFNF, Shenandoah (266): 6:30, concert.
WOC, Davenport (484): 9, concert; 11, orchestra.

WOAW Program

Saturday, February 28.

5:45 P. M.—Public news period, conducted by Eugene M. Konecky.
6 P. M.—Dramatic hour, Davis Studio of Expression. Selected readings from well-known authors and poets.
6:45 P. M.—Eddie Kuhn's orchestra at Brandeis Store restaurant.
9 p. m.: Program from University of Omaha piano department. Arranged by Corinne P. Thorson, assisted by voice pupils from University of Omaha, Louise Jansen Wylie, instructor, and violin pupils of Robert Cuscaden.

Piano—"Prelude C Sharp Minor" ..... Rachmaninoff
Helen Bethazel.
Voice—"Joy" ..... Cyril Scott
Jeannette Cass.
Piano—"Juba Dance" ..... Dett
Irene Gibson.
Piano—"Canzonetta" ..... Schuett
Dorothy Ramsey.
"Sylvia" ..... Speaks
Mary Anne Hellmer, Mrs. Mary Bailey, Fonda Waldorf, Angeline Tarbox Senie Gillespie, Lorine Sleeper, Ruth Gutting, voice pupils of Mrs. Louise Jansen Wylie.
Piano—"Aegeria" ..... Krueger
Lois Day.
"Musettas Waltz Song" ..... Puzzini
Mrs. Hugh Finnerty.
Piano—"Romance" ..... Sibelius
Ruth Schwager.
Aria from "Traviata" ..... Verdi
Mrs. J. W. Arnold.
Piano—"Country Gardens" ..... Grainger
Lois Loegler.
Voice—"The Moon Behind the Cottonwood" ..... Cadman
Mrs. Hugh Finnerty.
"Vecchio Minuetto" ..... Szambati
Catherine Stigbers.
(a) "Minuet in G" ..... Beethoven
(b) "Evening Song" ..... Schumann
(c) "March" ..... Karganoff
University of Omaha String quartet.
Alice Horn, Jeanette Reeves, Marian Kyde, Helen Bassett, punils of Robert Cuscaden.
Piano—"Love's Dream" ..... Liszt
Helen Malone.
Voice—"Rain" ..... Gay
Jeanette Cass.

Remote Control Radio Program

WOAW and Phone Company to Broadcast Musical Numbers From North Platte.

One of the longest attempts ever made to broadcast a musical program from remote control by radio will be made next Thursday evening when WOAW and the Northwestern Bell Telephone company combine to present a community program from North Platte.

The program will be given under the auspices of the Kiwanis and Rotary clubs from the Keith theater at North Platte.

The music will be conducted by long distance telephone for 300 wire miles or 281 air line miles to the WOAW studio where it will be rebroadcast through Omaha.

Officials of the WOAW and telephone company will prepare a stunt in the North Platte theater while the program will be given.

DRIVE AGAINST INTERFERENCE

A determined campaign against the elimination of the man-made interference to radio reception will shortly be started by the road bureau of the Department of Commerce, it is expected.

The budget bureau has approved an additional appropriation for this service which may allow the field force of radio inspectors and supervisors to be doubled. While it is not yet definitely known what the amount will be, it is believed it will be more than $100,000.

The recommendation for an additional appropriation for the radio service will be sent to congress within the next few days, where speedy action on it is anticipated. Inasmuch as the recommendation has the approval of President Collidge, it is believed there is little doubt as to its adoption.

Changing Tubes.

By merely changing the tubes around in different sockets, the efficiency of a set will be increased as much as 50 to 75 per cent. First tune in a signal, and then take two of the tubes from the sockets and reverse them, putting them each in the other's socket. Keep on doing this in various combinations until the particular combination that gives the loudest results is found.