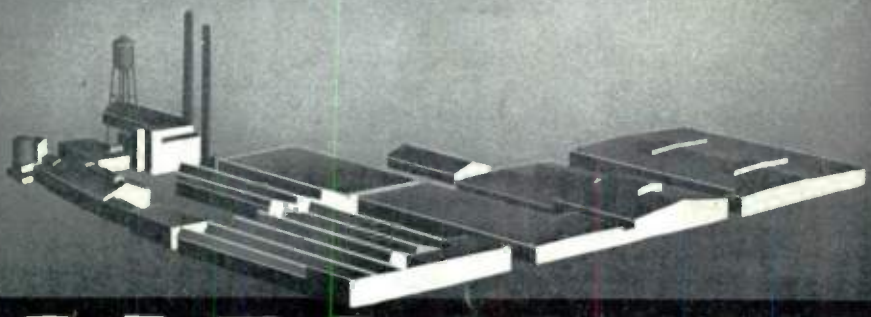
THE CD CAPACITOR



Vol. 4 JULY, 1940 No. 4

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SOUTH PLAINFIELD, N. J.

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Mr. George M. Beale
130 25th Ave.
San Francisco, Calif.

RADIO SERVICE HINTS

Practical Suggestions on Solution of Radio Servicing Problems Encountered in Actual Experience by Servicemen Everywhere

This section, conducted by our servicemen readers, will be a regular feature of the C-D Capacitor, and is intended to provide other servicemen with helpful notes on testing, locating troubles in specific models of sets, repairing them, or any other suggestions to simplify service work.

Cornell-Dubilier will pay $2.00 for each hint published in this section. Notes must be limited to 75 words, or less. Any number of hints may be submitted at one time. Unpublished items will not be returned. Be sure to give your name and mailing address. Send hints to: Editor, C-D Capacitor, Cornell-Dubilier Electric Corp., So. Plainfield, N. J.

Remove Defective Capacitors

A countless number of servicemen will simply place a new capacitor into a circuit of a set to be repaired where more capacity is required or a unit is found to be open, and then forget to remove the old unit.

Whenever a capacitor is found open and replaced with a new unit always remove or disconnect the old one as it may become leaky or noisy causing trouble to be traced all over again later.—*Pete Peterson, Anderson, S. C.*

Cut-off Time of Intermittents

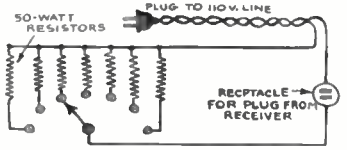
The period of time during which intermittent operation of standard receivers has a definite bearing upon various components of a circuit in locating troubles. The writer has tabulated in the following what he considers the causes of intermittents and the time periods of the cut-offs:

Time in Min.	*Probable Cause*
0-3	Tubes, or poor connections
3-5	Resistors, esp. cathode bias, also loud speaker fields.
3-5—on AC-DC sets	Resistors, series filament or heavy duty bias units.
Over 5	Power Transformers, or large bias resistors.

When cut-off time is erratic, it is usually caused by defective capacitors, especially coupling capacitors.—*Harold R. Kuntz, Brooklyn, N. Y.*

Line Resistor Test Box

One of the handiest test instruments about the shop, the writer informs us, is a resistor bank wired as shown in the accompanying diagram to check proper line resistance values for small sets employing 25Z5's.



It consists of several 50 watt resistors of standard values as used in most midget sets mounted in a box with bakelite panel. Each resistor is connected to a tap on an inductance switch.—*Ben's Radio, Boston, Mass.*

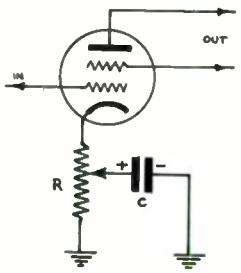
Fibre Socket Shrinkage Trouble

When oscillation occurs in many types of sets using fibre tube sockets the trouble can usually be traced to bad ground connections through lugs on tube socket rivets. The fibre insulation shrinks and causes rivets to loosen and make poor contact with the chassis or lugs.

The remedy for this condition is to remove the lugs from the rivets and make soldered connections directly to the chassis.—*James S. Hill, Cleveland Heights, Ohio.*

Variable Inverse Feedback

The diagram herewith shows a simple method of accomplishing a variable feedback control for single output pentodes or beam power tubes as the arm of the potentiometer is moved towards the ground, feedback is increased for tone quality. Moving the arm towards the cathode decreases the feedback.



R is the normal value of the self-bias resistor in the form of a wire-wound potentiometer, while C is a 10 to 25 mfd. 50 volt electrolytic capacitor.—*P. A. Ross, Hoboken, N. J.*

Knit Needle Prober

When probing for loose connections in set assemblies many servicemen will use anything such as a pencil, screwdriver, wrapped with tape or even their finger. This practice is not only a makeshift means of probing but careless and dangerous.

For probing around joints to locate loose connections, etc., the writer uses an ordinary wooden knitting needle about 12 inches long. It is surprising how convenient and effective this tool will detect defective joints and parts just by tapping them with the needle with the set current on.—*Harry C. Reed, Steelton, Pa.*

Firestone, S 7425-3 Auto Radio

Intermittent reception with an occasional weak signal coming through may possibly be traced to a poor connection of a braided wire lead connecting the output transformer to the speaker.

After spending some time checking the cause of this source of trouble, and finding everything else checked O.K., this was discovered to be the fault and was corrected by soldering the leads between the speaker and output transformer. — *T. Henshaw Marysville, Kan.*

1940 Ford 6 M-F490

If set is noisy and all tubes and voltages check O.K., check loctal sockets and tube prongs for loose or poor contacts. The prongs of loctal tubes seem to oxidize quite readily, and thus make poor contact with socket terminals.

This is one of the most common causes of noises and intermittents in other sets also. Therefore, too much emphasis cannot be placed on checking for bad contacts at socket connections which cause high resistance circuits and other troubles.—*Jimmy Means, North Little Rock, Ark.*

Philco 37-602

Here is an unusual source of trouble which came up with this model set which might occur in other sets as well as this model.

To correct speaker rattle, cement the two rubber grommets, through which the voice coil leads pass, to the speaker frame with "dope" (cement). These rubber grommets become brittle with age and cause the speaker to rattle at certain tone frequencies. — *Warren F. Steely, Reading, Pa.*

(*Continued on page* 13)

A Free Market-Place for Buyers, Sellers, and Swappers.

These advertisements are listed FREE of charge to C-D readers so if there is anything you would like to buy or sell; if you wish to obtain a position or if you have a position to offer to C-D readers, just send in your ad.

These columns are open only to those who have a legitimate, WANTED, SELL or SWAP proposition to offer. The Cornell-Dubilier Electric Corp. reserves the right to edit advertisements submitted, and to refuse to run any which may be considered unsuitable. We shall endeavor to restrict the ads to legitimate offers but cannot assume any responsibility for the transactions involved.

Please limit your ad to a maximum of 40 words, including name and address. Advertisements will be run as promptly as space limitations permit.

FOR SALE—Maytag gasoline motor, good condition, $7.00; orthophonic sound chamber suitable for P.A. system, $1.50; auto-radio power supply, enclosed, complete except 84 tube, $3.00; send for list of other parts. W. H. Mitsch, Bethany Pike, Woodsdale, Wheeling, W. Va.

POSITION WANTED—Experienced radio service man, graduate Radio Technical Institute, age 21, desires situation in any branch of radio servicing. Harold Harmon, Zionsville, Ind.

FOR SALE OR SWAP—Diamond Point, Jr. tube checker, Rider's Manuals, 2 and 3, new condition; Jewell 199 and Rider's Manual No. 1 used but in good condition. Want camera equipment, guns or cash. Thos. Donahue, 58 S. George St., York, Pa.

FOR SALE—Supreme Diagnometer, model 585, and Hickok oscillator, model OS-7 with direct reading output meter. Both instruments equipped with necessary adapters, cables, etc. Oscillator $20. Diagnometer $45, F.O.B. M. L. Parsons, Kramer, N. D.

WANTED — Clough-Brengle model OMA frequency modulated signal generator, model CRA cathode ray oscillograph, model 79-A beat note audio oscillator. Must be in A-1 shape. State lowest price. Robert B. Fuller, 129 S. Main St., White Hall, Ill.

WILL SWAP — Complete I.C.S. general radio course (original cost $135), RCA Institute supplementary lessons included. Rider's Vol. 2, and "Electrical Measuring Instruments" for cathode-ray oscillograph. Joseph Horay, 27 Yale Ave., Gloucester Heights, N. J.

WANTED—Used Rider's Service Manuals. Give full particulars as to condition and price asked. Write H. H. Pickens, Box 87, Ft. Payne, Ala.

FOR SALE—Wide assortment of electrical, radio parts and technical magazines, all at fractional cost. Send card for list and price. Philip Rosenblatt, 280 Wadsworth Ave., New York City.

SALE OR SWAP—Brand new ¾ h.p. Pioneer 6 v. 20 amp. farm light or battery charger, ¾ h.p. Johnson Iron Horse with 500 watt, 110 v. 60 cycle generator, two B batt. eliminators, 180 volts. Want P.A. trumpets, speakers, instruments, or what have you. G. A. Marken, Box 158, Church Point, La.

FOR SALE—1940 Triplet portable lab., like new, $35. Radio book by Rider, Ghirardi and other authors $8.00 (worth $10.26). De Vry hand operated motion picture projector 16 mm. $8.00. R. Hartlein, 2643 S. Pershing St., Philadelphia, Pa.

WANTED—Weston model 776 direct reading oscillator. Write giving lowest price and condition of instrument. Harry Woodall, 1611 Prospect Ave., Plainfield, N. J.

FOR TRADE—Complete Radio Technical Institute course and "Radio Servicing Short Cuts." Trade both for small AC-DC midget set late model. Archie Penquite, 513 S. 5th St., Marshalltown, Iowa.

FOR SALE OR SWAP—6 x 9 cm. "Avus" camera, Kalart flash, rangefinder, filters, tank, etc. Wilbur Flaherty, 860 So. 17th St., Ft. Dodge, Iowa.

(Continued on page 14)

TESTING POWER SUPPLIES*

In practically every type of electronic equipment the section that "makes the wheels go round" is the source of DC power.

Receivers and amplifiers must have a steady, hum-free, and well regulated operating voltage. Electrodynamic speakers need a DC magnetizing current.

The major types of power supplies used in radio and PA amplifiers can be grouped into, 1. tube-transformer types, 2. "transformerless" half-wave and voltage doubling circuits, 3. vibrators and rectifiers supplied from DC sources, 4. metallic rectifiers.

Let's take a look at some of the things that go wrong with tube-transformer power supplies and some of the methods for quickly finding the trouble.

Capacitor Troubles

Because of the simplicity of the power supply circuit, it is likely to be overlooked as a source of trouble, when the set is "haywire." Cases of distortion, motorboating, and hum modulation may be traced to poor voltage regulation and loose laminations in transformer or choke cores.

The most common power supply failure point is the filter capacitors.

Heat and surge voltage are the two enemies of filter capacitors. The natural moisture of the electrolyte is gradually dried out by the heat from the rectifier tube and transformer. These high temperatures increase the leakage current and lower the capacity when continued for long periods of time. The whole process continues to reduce the efficiency of the filter until the hum level becomes so high it is almost impossible to use the set.

Wet electrolytics will "boil out" at high temperatures. Any time a green or white crust is visible around the vent holes, the capacitor should be tested for DC leakage current, capacity, and power factor.

Voltage Ratings

Test should be made for variation in capacity of the filter capacitors. The DC leakage current should be less than 2.5 MA for wet and 1 MA+ .06 MA per mfd. for dry electrolytic capacitors.

Replacement filter capacitors should be selected by three electrical classifications: capacity, working voltage, and surge voltage. (Peak ripple Voltage is also important in half-wave rectifiers but these are uncommon in receivers.)

The voltage rating of electrolytic capacitors is a function of the character of the anode film, the voltage at which the film was formed, and the type of electrolyte used. The DC working voltage is the maximum direct current potential at which the capacitor will operate continuously within its normal temperature range. The normal temperature range of dry electrolytics is 32° to 140° F. The surge voltage is the maximum voltage a capacitor will stand for a period of five minutes when applied through a series resistance of 20,000 ohms divided by the capacity in microfarads. The surge voltage encountered when the set is first turned on may be sufficient to destroy the filter capacitors, especially the input unit.

* *By courtesy of "Radio Today."*

TESTING POWER SUPPLIES

(Continued)

Important power supply characteristics are voltage regulation, purity of output voltage, and the magnitude of the voltage.

Voltage Regulation

The per cent voltage regulation is the no-load voltage less the full-load voltage divided by the full-load voltage, the quantity multiplied by 100. Thus a power supply delivering 250 volts at full-load and 300 at no-load has a regulation of (300-250)/250 x 100 or 20 per cent.

Poor regulation due to changes in line voltage may be cause of "motorboating" in audio amplifier stages. The rising voltage causes the tubes to draw more current which flows through the load resistance and depending upon the frequency of voltage fluctuation the pulses are amplified giving a "motorboat" noise. Improving the regulation with bleeder resistances, larger power transformer, and low resistance chokes is the solution.

Find Faults

The oscilloscope is a handy device to use in checking the operation of power supplies. In Fig. 1 a typical power supply is shown with switches added to connect and disconnect filter capacitors and load. These switches are used *only to set up the conditions of open input, open output capacitors, shorted choke, etc.* They *need not be added* to a receiver power supply to make these tests. The six oscillograms shown were obtained with the circuit shown. The vertical plates were connected to AB, BC, or CA as indicated under the corresponding graph. The sweep was internal and the frequency range was set to cover 60 and 120 cycles. Controls remained set during the test with the exception of graphs No. 3, 5, and 6 where the gain on the vertical oscilloscope amplifier was advanced to the limit.

No Filter

Oscillograph 1 is the conventional full-wave voltage out of the rectifier under a load of 13 ma. The oscillo-

(Continued on page 11)

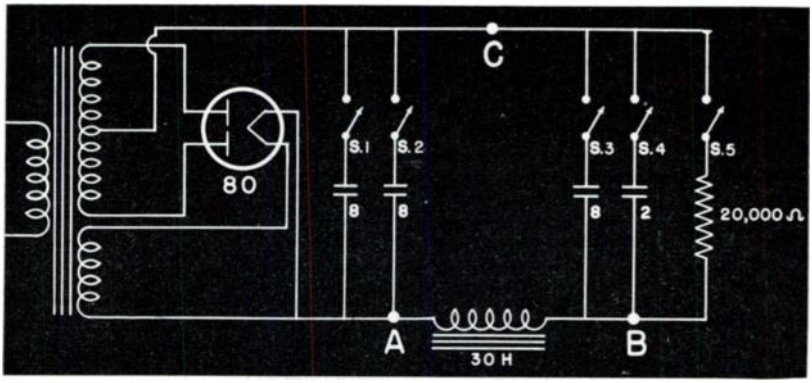


Fig. 1—Typical receiver power supply used to obtain oscillographs. Open capacitor conditions were duplicated with switches. A, B, and C are points to which vertical plates of oscilloscope are connected for testing any supply.

INTERFERENCE ELIMINATION FOR AUTO-RADIOS IN 1940 CARS*

WHEN installing an auto-radio receiver be sure to select an aerial which will give the best results with the set being used, for auto-radio sets, being very sensitive, often are designed to operate with a certain type of aerial. Some sets have separate connections for different types of aerials while on others an adjustment must be made to compensate the set for the aerial being used. It is also easier to install some types of aerials on certain cars and following the manufacturer's recommendations will save time and eliminate difficulties in making an installation.

The recommended list of where the installation of the suppressors, condensers, ground straps and static collectors will normally result in clear reception on each car is shown in the accompanying table. After they have been installed as described the set should be tested to see if they sufficiently eliminate interference. Conditions may vary on two cars of the same model and in some cases additional interference eliminators may have to be installed. The heads of the table suggest additional places where the installation of a condenser or ground strap may do some good. To make a test, connect the lead of a by-pass condenser with a capacity of 0.5 mfd. to the hot side of the suspected unit. A higher capacity unit, i. e., 1 mfd., may be employed for severe cases of interference on large generators or other equipment. Ground the condenser case or the second lead on a metal part of the car. When the position is found where the condenser clears up the interference, make the installation of the condenser permanent.

When installing a condenser or ground strap all dirt or paint must be cleaned from the contacting surfaces and the connection must be tight. When a condenser is installed on a generator be sure to connect its lead to the generator armature terminal for should it be connected to the field terminal it will cause pitting of the voltage regulator points which will prevent the unit from operating properly. When installing static collectors in the front wheels, the inside of the dust caps and the center of the front wheels spindles must be clean and free from grease to give good results.

* Courtesy of "Motor" Magazine.

Interference Elimination for Auto-Radios in 1940 Cars

The installation of the receiver and speaker depends upon the make and type of set being used and the radio manufacturer's recommendations should be followed, bearing in mind of course that on most every car there is some accommodation already in the car for the receiver.

Ed. Note:

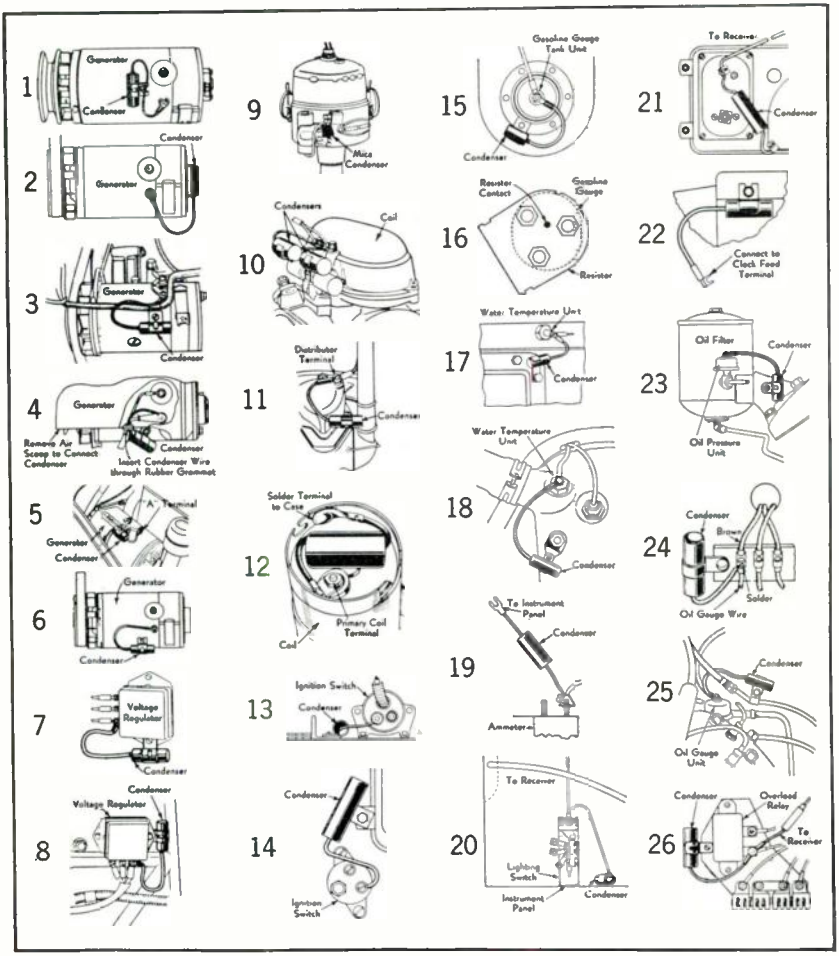
The caption to the accompanying illustrations of capacitor installations gives the C-D type numbers for the various applications.

This 4-page section has been so arranged that it may be removed from this issue and inserted in your copy of "The C-D Capacitor Manual for Radio Servicing."

INTERFERENCE ELIMINATION CHART	Battery terminal grounded	Distributor suppressor	CONDENSERS											GROUNDS						
			Water temperature gauge	Oil pressure gauge	Ignition coil	Generator	Ignition switch	Voltage regulator	Ammeter	Gasoline gauge	Distributor	Clock	Circuit breaker	Front wheels	Cylinder head	Hood	Dash controls	Muffler	Steering column	Heater hose
Buick	N	39			12	6								36						
Cadillac	P	39			12	4								36			33			
Chevrolet	N	37				6	14		21					36	29			30		
Chrysler	P	39				5				16						31	32			
DeSoto	P	39				5				16						31	32			
Dodge	P	39				5				16						31	32			
Ford	P			25				7			11									
Graham	P	40				3	*													
Hudson	P	38	17			2	13			15					*					
LaSalle	P	39			12	4								36			33			
Lincoln-Zephyr	P		18	23				8		15	10		26							
Mercury	P			25				7			11									
Nash	P	38				5										31				
Oldsmobile	N	37				6			19					35						
Packard	P	38				5	*		*			22								
Plymouth	P	39				5				16						31	32			
Pontiac 6	N	37				6			20					36	27					34
Pontiac 8	N	37				6			20					36	28					34
Studebaker Champ	P	38				1				16							32		*	
Studebaker Comm	P	40				1														
Studebaker Pres	P	40				1					9									
Willys	N	38		24		6														

Numbers refer to illustrations on following pages. Star * indicates unit is used but not illustrated.

Interference Elimination for Auto-Radios in 1940 Cars

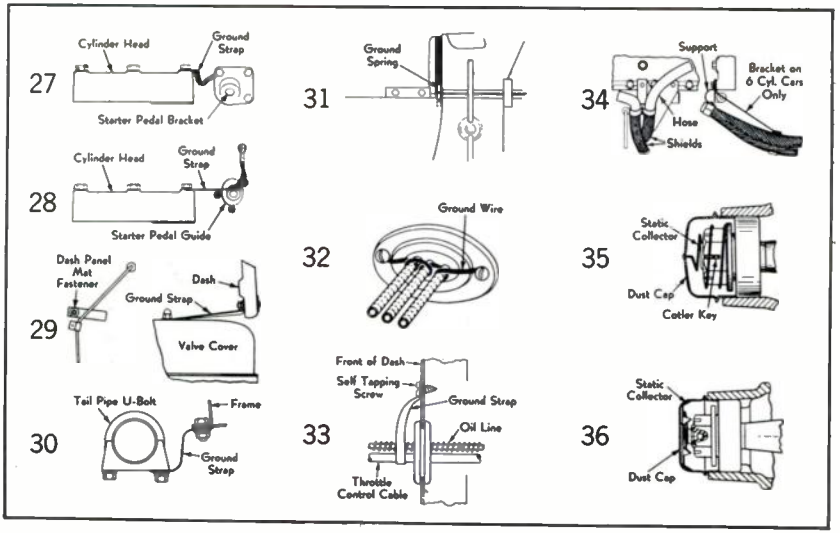


Cornell-Dubilier Auto-Radio Capacitor Type Numbers for the Above Applications Are as Follows:

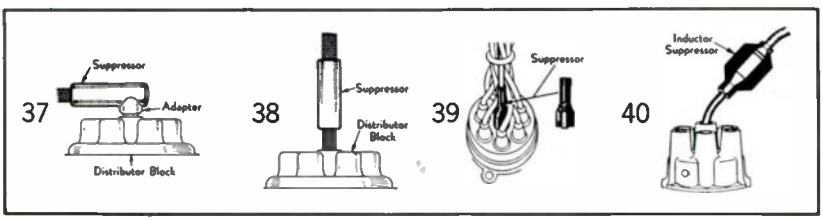
1. IC-2P5C	8. IC-2P5C	13. IC-2P5C	20. IC-2P5C
2. IC-2P5C	9. IC-2P5C	14. IC-2P5C	21. HC-870E
3. IC-2P5C	and	15. ICS-2S5A	22. IC-2P5C
4. IC-2P5C	IW-5D2 Mica	17. IC-2P5C	23. IC-2P5C
5. IC-2P5C	10. 2-IC-25C	18. IC-2P5C	24. IC-2P5C
6. IC-2P5C	11. IC-2P5C	19. HC-870E	25. IC-2P5C
7. IC-2P5C	12. HC-870E		26. IC-2P5C

For Complete Listings and Prices of These Units, See Page 10.

Interference Elimination for Auto-Radios in 1940 Cars



Above shows grounds required for cars as listed in chart on page 8.



Above shows distributor suppressors for cars as listed in chart on page 8.

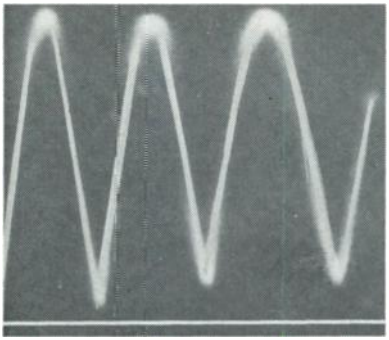
C-D AUTO-RADIO CAPACITORS

Special care is taken in the design of C-D auto radio capacitors to insure against damage by the high temperatures and excessive vibration which these units are subjected to in motor car installations. Special units listed herewith are designed for certain particular installations. For instance Type FC-2P5A is designed for Ford 1938 cars, Type FC-2P5V for Ford 1939 cars, etc. Type 1CH2W1A is designed for heavy duty applications where severe interference makes it necessary to employ a larger capacity unit.

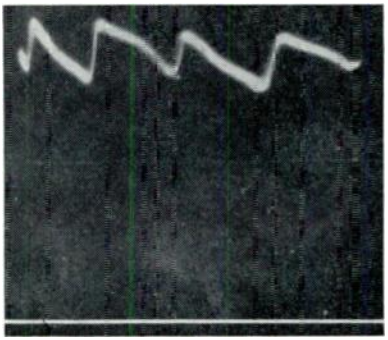
Cat. No.	Cap. Mfd.	Size—Inches Length x Dia.	List Price	Net Price
Generator Units				
ICS 2S5A	.05	1 1/4 x 7/8	$0.50	**$0.30**
IC 2P5C	.5	1 1/8 x 1 1/8	.50	**.30**
FC 2P5A	.5	1 1/8 x 1 1/8	.50	**.30**
FC 2P5V	.5	1 1/8 x 1 1/8	.50	**.30**
IC 2P55	.5-.5	2 x 7/8	.75	**.45**
ICH 2W1A	1	2 7/16 x 1	.70	**.42**
Ammeter Unit				
HC 870E	.5	2 x 3/4	$0.45	**$0.27**

TESTING POWER SUPPLIES

(*Continued from page 6*)



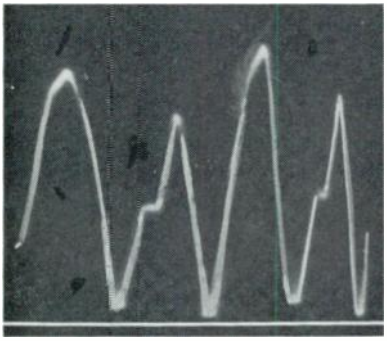
1. Oscilloscope connections; A-C. This is voltage wave with open filter capacitors and shorted choke. Line at bottom is zero axis.



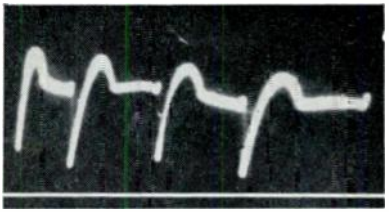
2. Oscilloscope connections; A-C. Voltage wave with input filter capacity good. Same wave with good or shorted choke.

This wave is characteristic of output filter capacitor open. If the choke were shorted the wave would remain practically the same.

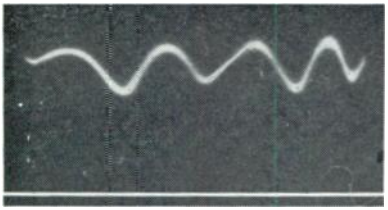
The next time you get a set on the bench with a sick power supply, put the 'scope on it before unsoldering half the wiring. It will help you spot open inputs, outputs and bad chokes quickly.



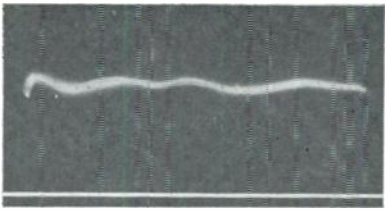
3. Oscilloscope connections; B-C. Enlarged picture of voltage wave with input capacitor good, choke good, and output capacitor open.



4. Oscilloscope connections; A-B. This is voltage wave with no input filter capacitor. Choke and output filter capacitor good. Same wave at no load.



5. Oscilloscope connections; B-C. Wave with no input capacity, choke good and output filter capacitor ok. Ripple remaining with choke input.



6. Oscilloscope connections; B-C. Voltage wave with input and output capacitors good, and choke good. All graphs made with supply under load.

scope leads were connected to A-C. Just which lead is connected to A and which to C is not important. If the wave is upside down with respect to the traces shown in Fig. 2, the leads may be reversed to right it. No filter capacitor or choke was in the circuit.

If the load from the rectifier is removed, as would be the case with an open choke or series speaker field, the wave on the 'scope becomes very irregular and has the appearance of half-wave rectification. The tops and bottoms of the wave will have a saw tooth pattern.

Input Capacity

If all the filter capacitors are open but the set is drawing current, the picture on the oscillograph will appear as number 1. This should be the first check on a power supply using the 'scope.

Number 2 is a graph of the voltage across A-C. Switches S_1 and S_2 were closed giving 16 mfd. input capacity. The load on the supply was 18.5 ma. and the choke was shorted out of the circuit. This wave is the typical saw tooth voltage condition across a capacitor supplied from a rectifier.

If the output filter capacitor is open, the wave will appear as in number 2 when the connections are as described. The addition of the choke to the circuit does not change the wave shape.

Diagram 3 has the oscilloscope leads connected to B-C. This graph shows the wave of voltage across the load of 18.5 ma. with S_1 and S_2 closed and the 30H. choke in the circuit. The gain on the oscilloscope vertical amplifier was advanced to its maximum position. The choke has smoothed out the saw tooth wave to a ripple. The hump in alternate lobes of the wave shows that 60-cycle voltage is being introduced through capacity or magnetic coupling.

Choke Input

Number 4 was taken with the oscilloscope connected across A-B or the choke. The load on the rectifier was 14 ma. S_1 and S_2 were open while S_3 and S_4 were closed. This put 10 mfd. across the output and gave 30H choke input.

Graphs 5 and 6 were taken with 'scope connected across B-C. Number 5 is for choke input and 10 mfd. capacity on the output. For both of these graphs the oscilloscope gain was maximum.

Five shows the small ripple voltage that is left when the input capacitor is open.

Number 6 shows the output voltage with all capacity and inductance in the power supply. The load in this case was 18 ma.

Hum Troubles

Another easy check to make when trying to locate hum is to connect a pair of phones through 1000-volt 0.1 mfd. (approximately) to the output of the power supply. The hum level should be low enough not to be heard.

Mercury vapor rectifiers such as 82 and 83 can stir up trouble in the form of "hash" in the loud speaker. Small equalizing resistors or RF chokes in the plate leads will do the trick.

NOTE: Listing of Renewal Batteries for Portable Radios appearing in the June issue of "The C-D Capacitor" was re-compiled from data in "Radio Today," March.

RADIO SERVICE HINTS

(*Continued from page 3*)

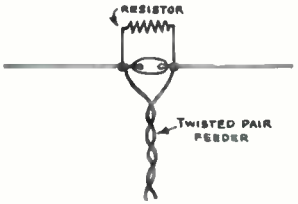
An Improvised Screw-Holder

When not having handy a screw-holder type screwdriver in order to set screws in an inacessible place of a deep chassis, here is a way the writer solved the problem quite easily.

Slip a piece of spaghetti over the blade and shank of the screwdriver, and cut the spaghetti off about a quarter of an inch longer than the blade. The head of the screw is then forced into the end of the spaghetti so that the blade will engage the screw slot and is ready for placement.—*F. Taylor, Point Independence, Mass.*

Resistor Shunt for Antenna Feeders

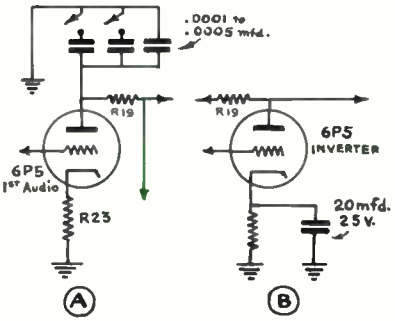
Where twisted-pair feeders are employed with noise reduction antennas for television and F.M. dipoles, one or both of the leads may be open as the result of swaying in the wind or other causes, and it is impossible to trace it by any convenient method.



However, by a 10,000 to 50,000 ohm half-watt resistor shunt across the feeder junction as shown in the sketch herewith, test can easily be made to check feeder continuity for opens and shorts with an ordinary ohmmeter. Of course, such a resistor does not have any appreciable effect on the performance of the receiver as the usual twisted pair has a surge impedance of approximately 100 ohms.—*Phil Rosenblatt, New York City.*

Midwest 17 Tube 1940 Model

On this particular model, when tone buttons are pressed down excessive oscillation is set up in the circuit, especially if the alto and tenor buttons are pushed down.



To correct this condition, connect a .0001 to .0005 mfd., 400 volt tubular capacitor from the plate of the first A.F. tube to ground at the point where the alto and tenor switches and capacitors are connected as shown in circuit A.

Early productions of this model also require a 20 mfd., 25 volt capacitor connected between cathode and ground of the 6P5 inverter as shown in diagram B.—*Joseph Schiller, Scranton, Pa.*

Ferrodyne, R-137, R-138

Oscillation and lack of sensitivity on low frequency band and failure to align properly at the low frequency (600-kc.) may be traced to a defective mica capacitor which is connected to and across the oscillator shunt padder trimmer, the capacity value of which is .00001 mmfd.

The remedy for this is simply to replace this unit with another capacitor of the same value.—*George F. Baptiste, Howard, R. I.*

THE RADIO TRADING POST

(Continued from page 4)

POSITION WANTED—As motion picture projectionist. Have eight years experience operating and servicing sound equipment. Graduate of RCA Institute. F. R. Magee, Salem, N. Y.

WILL TRADE—New and used receivers, test equipment, books on radio. Want code machine, electrical and aeronautical courses and books, two transceivers complete. D. J. Foard, 1419 Reed St., Kalamazoo, Mich.

POSITION WANTED — Young man, 22, about to complete N.R.I. radio servicing course. Experienced in radio servicing. Desires work in any branch of radio or electronics field. Dayton Comstock, R. D. No. 2, Syracuse, N. Y.

FOR SALE — Transmitter, steel shielded, works all bands, with two Bliley crystals; floor stand mike, sky wire, coils with accessories. Also engineers and radio books. Transmitter never been used. Write for information. Henry H. Dees, 1200 E. 8th St., Brooklyn, N. Y.

WANTED — RCA Institute "Home Study Radio and Sound Course," good condition for cash. Will wire remittance. State most reasonable price. John B. Rodgers, 2422 Juliet St., Los Angeles, Calif.

FOR SALE—Linotype practice keyboard. Cost $28 new, will sell for $15 with touch system instructions if desired. D. Del Bruno, Box 254, Thorndale, Texas.

FOR SALE—Rider's manuals, 1 to 9 incl., $60 complete only. Perfect condition, marginal notes and 15 years accumulation of notes and data sheets on all early makes and models are included with the lot. W. A. Cobb, 71 N. 17th St., East Orange, N. J.

SALE OR TRADE — Brand new battery charger, 5-3 amps. $3. Want a volt or milliammeter or both, or a tube tester. Floyd Paul, 773 N. Alexandria St., Los Angeles, Calif.

WILL TRADE—3" RCA oscillograph, model 155, and oscillograph 150, used only a short time. A. C. electric welder 110-220 volts. Omnigraph to learn code. Other items. Write for list. Want Hickok 155 Traceometer, or Clough-Brengle racks and instruments. Emil J. Giara, 1704 Dunn Ave., Corbin, Kentucky.

WANTED—Vols. Nos. 5, 6 and 7 Rider's Service Manuals. Please state lowest prices and condition of books. Also want "Radio Physics Course." Will pay cash. Bryan K. Reynolds, 2nd and Commerce Sts., Glasgow, Mo.

FOR SALE — Complete identical set of Video I F transformers as described in "Electronics" Lab. Television Receiver $4. Also 5 new W.E. 211-E's $5. P. A. Ross, P. O. Box 905, Hoboken, N. J.

FOR SALE—6 tube amplifier $8.00, all complete except case. Model 411 volt ohm mill. meter, like new for only $14.00. Abe Ochstein, 335 E. Lewis St., Ft. Wayne, Ind.

WANTED—Jewell 199 analyzer, and 444 analyzer. Also Jewell model 57 D.C. voltmeter—0-50 amps., 0-50 volts, all in one. Test-O-Phone testing unit. Back issues of Radio News, Radio Today, and Radio-Craft. All copies 1920-1940. Also want Zenith model 7 J 232 (110 or 6 v.). Howell's Radio Service, Anna, Texas.

WANTED—Rider's manuals from 1935 to 1940. State condition and best cash price. Jessup Radio Shop, Monticello, Florida.

FOR SALE—Rider's Manuals Vols. 1 to 6 incl. $24. Supreme 385 automatic, Supreme 189 sig. generator, all in excellent condition. Dynamic speakers all brand new at half off catalog prices. Geo. L. Adams, 87 Ft. Greene Place, Brooklyn, N. Y.

FOR SALE OR TRADE — Jensen 13" dynamic model L-10-AC. Handles 25 watts. Also Jensen high-frequency tweeter. Want cash, audio oscilloscope, radio engineering texts, Rider's manuals 9 and 10 or what have you to offer. C. E. Mervine, 615 W. Arch St., Pottsville, Pa.

FOR SALE — Supreme 89 tube and volt ohmmeter, good condition, $15.00. Wilcox Auto and Radio Service, Coloma, Mich.

WANTED—Rider's Manuals 4, 5, 6, 7, 8, 9 and 10. Please state what condition books are in. Price must be reasonable. Century Radio Service, 10,008 So. Main St., Los Angeles, Calif.

POSITION WANTED—Graduate of a two-year Radio and Refrigeration Trade course at a state trade school. Experience gained in school shops, which were run on production basis. Everett M. Anderson, State School of Science, Wahpeton, North Dakota.

FOR SALE—P.A. outfit—1 Turner crystal mike with floor stand, 1 amplifier using 57, 53 and pair of 2A3's and 80. 2 P.M. speakers with 24" horns. All for $35. Rowley Radio Service, 722 N. Horsman St., Rockford, Ill.

THE RADIO TRADING POST

(*Continued from page* 14)

POSITION WANTED — Young man 28, member Radio Training Association of Amer., married, desires position in any branch of radio servicing. Alva L. Crouch, 633 W. Main St., Thorntown, Ind.

POSITION WANTED—Sales position where technicel knowledge of radio and television will be an asset. Graduate of NRI and NRTI, also studied salesmanship. Age 23, willing to apply methods proven successful by others. H. E. Bergen, Essex, Ia.

POSITION WANTED—Radio serviceman, married, 2 children, B.S. graduate Illinois Wesleyan '30, graduate N.R.I. '32, Sprayberry advanced course. Owns modern Hickok and Dynalyzer equipment, Rider's Manuals, tools, car. 10 years practical servicing. Desires opportunity with real active store or shop. Good references. Joseph C. Wunderlich, 802 E. Webster, Clinton, Ill.

POSITION WANTED — Young man, 20; graduate W.P.A. radio service class, with practical service shop experience (2 years). Has driver's license. Wants position in Brooklyn or Manhattan, N. Y. Bernard Goldberg, 282 So. 3rd St., Brooklyn, N. Y.

WANTED—Rider's Manuals, vols. 5, 6, 7, 8, 9, and 10. State lowest cash price. Have for sale, De Luxe Mac key like new, $5.00. Paul Wunsch, Jr., 387 Clifton Ave., Clifton, N. J.

WILL TRADE—New Royal portable typewriter, cost $49.50; 25 watt W.E., P.A. system; Electronic relay photo electric unit; complete Electrical Engineering Course. Want up-to-date test equipment. What have you. Fred. Madlinger, 680 Seneca Ave., Brooklyn, N. Y.

WANTED—160 meter transmitter, 75 watt input, complete with power supplies, but less modulator. Crystal controlled. Have all kinds of modern test equipment to trade. Give complete description of X-mitter and I will send list of test equipment. Halvorson Radio, Vance Block, Crookston, Minn.

WANTED—Rider's Manuals 2, 3, 7, 8 and 9. Will pay cash. I have an ultra precision signal generator to sell cheap. Ben's Radio & Elec. Service, 2659 Atlantic Ave., Brooklyn, N. Y.

FOR SALE OR SWAP—W. E. 242 A tube (new); American El microphone (new); RCA 913 tube (used); Hallicrafter 5 tube TRF S.W. receiver. Want test equipment or Rider's Manuals. W. G. Huhn, Willard's Radio and Elect. Service, Georgetown, Del.

WISE AND OTHER-WISE

Mamma: "Robert, I told you to count 50 before you did anything to little brother. And now I find you holding him in the closet."

Robert: "Yes, mother, I'm counting 50, but I want to be sure I know where he is when I get through."

◆

Employment Mgr.: "Well, Sam, what can I do for you?"

Sam: "Yo' all don't know nobody what don't want to hire nobody to do nothin', does yuh?"

◆

She: "I have a confession to make, dear. I can't cook."

He: "Don't let that worry you, honey, I can't make a living, so there won't be anything to cook."

◆

"Do you serve crabs here, waiter?"

"Yes, sir!—We serve anyone—be with you in just a minute."

◆

A dusky lady went into a drug store and asked for one-cent's worth of insect powder.

"But that isn't enough to wrap up," said the clerk.

"Nemind 'bout wrappin' it up. Jess blow it down ma back, dassall."

◆

Mrs. Jiggs (at movies): "Is your seat comfortable, dear?"

Jiggs: "Quite, my love."

Mrs. Jiggs: "And do you have a good view of the picture?"

Jiggs: "Perfect, dear."

Mrs. Jiggs: "Are you bothered by that awful noise outside the exit?"

Jiggs: "No, darling."

Mrs. Jiggs: "Then trade seats with me, you selfish little weasel!"

—*Trumball Cheer.*

OVER 20,000,000 IN 1939!

Read the facts about capacitor performance. Learn why etched foil electrolytic capacitors last year outsold all others by 20 to 1.**

TAKE the number of radios built last year. Something over 10 million. Consider that radio set manufacturers specified in 1939, more than 20,000,000 etched foil electrolytics and then remember that C-D, as the world's largest manufacturer of capacitors, produced more units in 1939 than any other manufacturer and is still leading the industry! That's convincing proof of the dependability and surviving economy of C-D electrolytics!

It's a preference born of experience. For capacitors look alike. The difference — and the superiority of the Cornell-Dubilier etched foil capacitor—lies hidden in the ingredients.

Radio manufacturers found — just as you will find—in Cornell-Dubilier's hidden ingredients longer capacitor life, matchless dependability and surviving economy. That's why it pays to specify C-Ds . . . and why there are more Cornell-Dubilier capacitors in use today than any other make.

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- C-D electro-chemical etching process —eliminates corrosion
- Hi-pressure centrifuge impregnation —results lower power factor
- C-D super purity cellulose separator —gives longer life expectancy
- Double ageing — assures uniform and stable characteristics
- Special venting—eliminates danger of high internal pressures.
- Hermetically sealed aluminum container—ideally suited for operation under conditions of high relative temperature and humidity

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