

No. 7D Series

April, 1934

7 Tube A. C. Broadcast and Shortwave Superheterodyne Receiver SERVICE MANUAL AND PARTS LIST

Form 769-J

Circuit

The series 7D is a broadcast and short wave receiver with a coverage of 530 to 1740 K. C. on the broadcast band and 5.8 to 18.3 M. C. on the short wave band. Dual band coverage is accomplished by means of dual sets of R. F. and oscillator coils and a three section double throw switch. The various circuits made and broken as this switch is thrown, are indicated in the schematic circuit diagram Fig. 1.

Referring to the antenna transformer in Fig. 1, T1 is the broadcast transformer and T2 the short wave transformer. The two primaries are connected in series. With the switch in the short wave position, the short wave secondary is connected to the grid circuit of the 6D6 R. F. amplifier tube and the broadcast secondary is short circuited. When the switch is in the broadcast position, the short wave secondary circuit is opened up and the broadcast secondary is connected to the grid circuit of this tube. The secondary being used, is tuned by the R. F. section of the three gang condenser. A separate variable trimmer condenser C2 is used for the short wave secondary.

The output of the R. F. 6D6 tube is fed through another R. F. transformer with tuned secondary into a second 6D6 tube which functions as the first detector. The first detector section of the three gang condenser is used for tuning this circuit. This interstage R. F. transformer consists of two portions shown as T3 and T4 on the diagram. T3 is the short wave transformer and T4 is the broadcast transformer. The connections to the two portions are made in the same manner as described above for the antenna R. F. transformer. A separate trimmer condenser C7 is used for the short wave secondary.

A type 76 tube is employed in a separate oscillator circuit. Referring to the diagram, T8 is the broadcast oscillator coil and T9 is the short wave oscillator coil. The coil being used is tuned by the oscillator section of the three gang condenser and these circuits are always resonant at 456 K. C. above the frequency to which the R. F. amplifier is tuned. When the switch is in the broadcast position, the connections are completed to the broadcast oscillator coil and the short wave oscillator coil is opened up. When the switch is in the short wave position, the connections are completed

NOTE: W AND C DESIGNATE SHORT WAVE AND BROADCAST POSITIONS OF SWITCH

R.F. AMP 6D6

1ST DET 6D6

I.F. AMP 6D6

2ND DET 6B7

I.F. FREQUENCY 456 K.C.

RECT. 80

110V. A.C.

SWITCH

SEE NOTE "A"

SEE NOTE "B"

OSC.

OUTPUT

SPEAKER

NOTE "A": FILTER CHOKES USED IN SERIES AT THIS POINT IN 1ST MODELS. NOTE "B": SERIES PADDERS USED IN SERIES AT THIS POINT IN 1ST MODELS. L₂ & C₂₁ WERE NOT USED.

Fig. 1—Schematic Circuit Diagram

to the short wave coil and the broadcast coil is connected between ground and the short wave tap in order to render it ineffective. A separate trimmer condenser C20 is used for the short wave oscillator coil. A 600 K. C. padding condenser C19 is used in conjunction with the broadcast oscillator and a 6000 K. C. padder C21 is used for the short wave oscillator circuit.

The oscillator potential is fed into the cathode circuit of the 6D6 first detector tube. This results in the intermediate or beat frequency of 456 K. C. being present in the plate circuit of this tube.

One stage of I. F. amplification is employed using a 6D6 tube. The primaries and secondaries of the first and second I. F. transformers are tuned by small trimmer condensers located in the I. F. coil cans.

A type 6B7 duo diode pentode tube functions as the second detector and a one stage audio amplifier. The two diode plates are connected together. AVC voltage is applied through isolating resistors to the control grid circuits of the R. F. and I. F. tubes. The audio voltage developed across volume control resistor R10 is applied through the movable arm to the control grid of the 6B7 tube. Resistance coupling is used between the first audio stage and the output stage which employs a type 42 output pentode tube. A type 80 full wave rectifier tube is used in the power unit.

It should be noted that 6 Volt tubes (except 80) and pilot lamps are employed in this receiver.

Condenser Alignment

Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal of 456 K. C. and accurately calibrated signals over the broadcast and short wave bands, 530-1740 K. C. and 5.8-18.3 M. C., is required. An output indicating meter is also necessary. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screw driver for the adjustments. The complete procedure is as follows:

Intermediate Frequency Adjustment

Set the signal generator for 456 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. The volume control should be at the maximum position. Attenuate the signal so that A. V. C. action is not obtained.

Then adjust the four I. F. trimmer condensers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis and are in the round I. F. cans—See Fig. 2. The openings to the trimmer condensers are covered over by a small cover plate which is held in position by a screw. Loosen these screws until the cover plates can be swung around.

Broadcast Band Adjustment

The broadcast short wave switch should be in the broadcast position. Set the signal generator for 1740 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Attenuate the signal so that A. V. C. action is not obtained. Adjust the oscillator broadcast trimmer until maximum output is obtained. This trimmer is on the tuning condenser and its location is shown in Fig. 2.

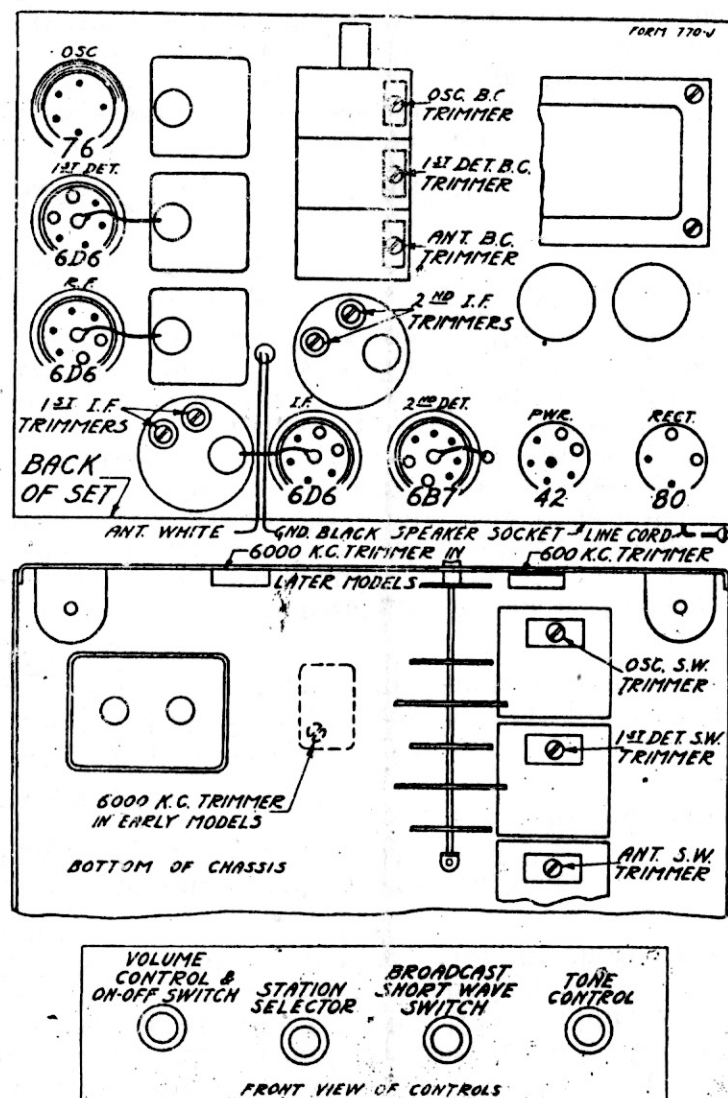


Fig. 2—Tube Arrangement and Location of Trimmers

Then set the signal generator for 1500 K. C. Turn the rotor until maximum output is obtained. Loosen the pointer screw and set the pointer at the 1500 K. C. mark on broadcast band scale. Retighten pointer screw. Then adjust the antenna and 1st detector broadcast trimmers until maximum output is obtained.

Next set the signal generator for 600 K. C. and adjust the 600 K. C. trimmer. The adjusting screw is reached through a hole in the front panel of the chassis as shown in Fig. 2. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting at the same time adjusting the 600 K. C. trimmer screw until the highest output is obtained.

Short Wave Band Adjustment

CAUTION—After the broadcast band alignment as described above has been made, do not change the adjustment of any of the broadcast band trimmers.

Turn the broadcast short wave switch to the short wave position. Turn the rotor to the full open position. As explained above, the volume control should be at the maximum position and the signal should be attenuated to prevent A. V. C. action. Set the signal generator for 18,300 K. C. Then adjust the oscillator short wave trimmer for maximum output. This trimmer is reached from under the chassis and its position is shown in Fig. 2.

Next set the signal generator for 15,000 K. C. Turn the rotor until the dial pointer is at the 15,000 K. C. mark on the short wave portion of the dial scale. Then adjust the antenna and 1st detector short wave trimmers until maximum output is obtained.

In aligning the short wave band of the receiver, it will be noted that the signal will be heard with the signal generator set at two points 912 K. C. apart. That is, if the receiver

is tuned to 15,000 K. C. a signal will be heard when the signal generator is set at 15,000 K. C. and again at approximately 15,912 K. C. This is due to image reception or the fact that a 456 K. C. beat is obtained when the signal is 456 K. C. lower than the receiver oscillator and also when the signal is 456 K. C. higher than the receiver oscillator. Care should be taken to see that the receiver is tracked with the signal generator adjusted to the lower of the two frequencies at which a signal is heard, in order that the oscillator in the receiver will be 456 K.C. higher in frequency than the signal.

Next set the signal generator for 6000 K. C. and adjust the 6000 K. C. trimmer. In the first models of this receiver, this condenser was located at the point shown in Fig. 2 in dashed lines. In the later models it is reached through a hole in the front panel of the chassis as shown in the same illustration. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 6000 K. C. trimmer screw until the highest output is obtained. In the early models this adjustment is broad while in the later models it is more critical.

Caution

The can of electrolytic condenser C16 is not at ground potential. Therefore in any work on the chassis, care should be taken not to touch this can and any other grounded point such as the other electrolytic condenser can.

Replacing Drive Cord

Remove chassis from cabinet.

Take off the pilot light assembly by lifting off the two sockets and spring clips.

Detach the large pointer by removing the screw at the center of the dial.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then lay the complete dial assembly face downward in front of the chassis. It is not necessary to remove the volume control and tone control collars which hold the indicator cords of these two controls in position.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 3.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as

Voltages at Sockets LINE VOLTAGE — 115 ANTENNA SHORTED TO GROUND

Type of Tube	Function	Across Fila. or Heater	Plate to Cath.	Screen to Cath.	Control Grid to Cath.	Normal Plate M. A.
6D6	R. F.	6.3	246	100	3.6(1)	5.3
6D6	1st Det.	6.3	237	97	8.0(2)	3.4
76	Osc.	6.3	115		0	4.8
6D6	I. F.	6.3	246	130	3.6(1)	8.3
6B7	2nd Det.	6.3	50(3)	40(3)	0	2.7
42	Power	6.3	230	245	17.0(4)	33.0
80	Rectifier	5.0				37.0 per plate

- (1) Cathode to ground
- (2) Subject to variation
- (3) Read with 1,000,000 ohm meter
- (4) As read across R15

shown in Fig. 3. Insert one end of the drive cord from the outside through the hole in the eyelet in the drive drum.

Tie the end of the cord which has been inserted in the hole to one end of the tension spring.

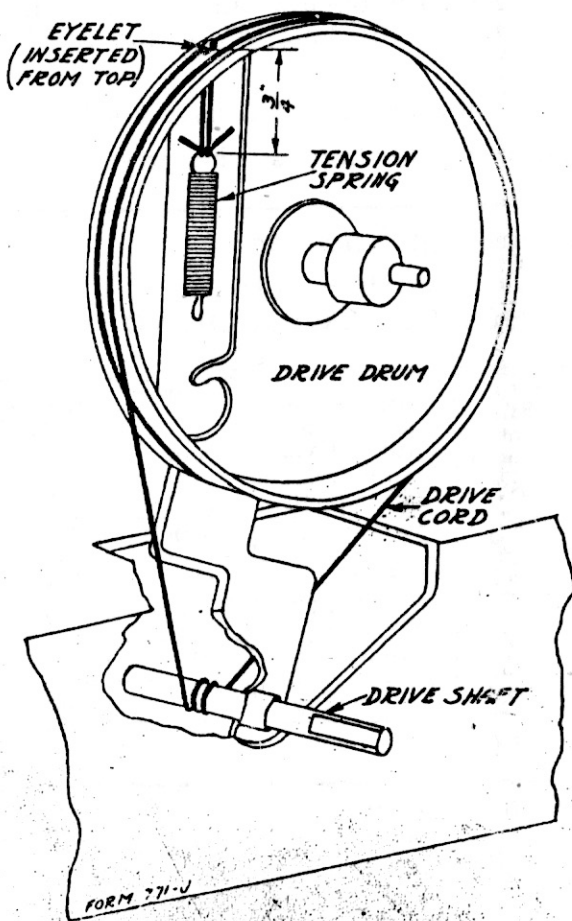


Fig. 3—Drive Cord Replacement

Wrap the cord in a clockwise direction (facing front of chassis) around the drive drum approximately one-half turn.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one-half times around the drive shaft as shown in Fig. 3.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one fifth turns in a clockwise direction until it is up to the hole in this drum as illustrated.

Insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring, when hanging free, should be approximately $\frac{3}{4}$ " from the flange of the drum as shown in Fig. 3. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Replace the dial assembly and pointer.

Replace the pilot light assembly after which the chassis may be reinstalled in the cabinet.

Changes in Early Models

There are two points at which the early models of this receiver differ from the present models. These points are indicated in Fig. 1 and described below.

Power Unit

In the early models a separate filter choke was used in series at the point indicated in note A in Fig. 1. The values of the two filter condensers C16 and C17, were less than as used at present. The values of the old and new condensers are shown in the parts list. A different power transformer was also used with the early filter system and this is likewise shown in the parts list.

The two power transformers are not interchangeable and care must be taken in ordering for replacement purposes to order the correct one. The original chassis can be identified by the separate filter choke.

Short Wave Oscillator

Referring to Fig. 1 it will be noted that there is a tracking coil L2 and a trimmer condenser C21 connected in series between the short wave oscillator coil and ground. In the first models of this receiver these two units, which are required for tracking the short wave oscillator, are not used. Instead a series padding condenser was used at the point in the circuit indicated by note B in Fig. 1.

At the time this change was made a change was also made in the oscillator assembly and care must be taken in ordering for replacement purposes to order the correct one. Early models with the original oscillator assembly have no spot of paint or a green spot of paint on the 80 socket rivet. Later models with the new oscillator assembly and new tracking system have a red spot of paint on the 80 socket rivet.

Twenty-five Cycle Receivers

The twenty-five cycle receiver differs from the sixty-cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle chassis can be operated satisfactorily from a sixty-cycle power supply. However, the reverse is not true, the sixty-cycle receiver cannot be operated from a twenty-five cycle power supply.

A 110-220 Volt, 40-60 cycle Power Transformer is also available for this model.

REPAIR PARTS LIST FOR 7 TUBE BROADCAST AND SHORT WAVE RECEIVER

When ordering parts be sure and give the part number. Also give the series number which will be found in the License Notice label. If there is a spot of paint on the chassis, give this color.

Part No.	Item	List Price
P-1885	No. 6D6 Socket	\$.15
P-2022	No. 76 Socket .....	.15
P-1944	No. 6B7 Socket .....	.15
P-1884	No. 42 Socket .....	.15
P-2025	No. 80 Socket .....	.15
P-1637	Speaker Socket .....	.10
P-40445	Tube Shield for 6D6 & 6B7 Tubes .....	.15
P-40444	Tube Shield for 76 Tube .....	.15
P-40443	Tube Shield Bases .....	.10
*P-50634	Power Transformer 115 Volts, 60 Cycles	3.00
*P-50635	Power Transformer 115 Volts, 25 Cycles	4.50
*P-50636	Power Transformer 115-230 Volts, 40-60 Cycles	3.25
†P-50646	Power Transformer 115 Volts, 60 Cycles	3.25
†P-50647	Power Transformer 115 Volts, 25 Cycles	4.50
†P-50648	Power Transformer 115-230 Volts, 40-60 Cycles	3.75
*P-50637	Filter Reactor .....	.85
P-50599-A	Output Transformer T 10	1.15
P-5176	Antenna R.F. Trans. less can T1 & T2	1.80
P-5177	Inter-Stage R. F. Trans. less can T3 & T4	1.75
*P-5178	Oscillator Coil Assembly Less can T8 & T9	1.70
†P-5183	Oscillator Coil Assembly Less can T8 & T9	1.70
P-40433	Cans for the above Assemblies .....	.15
†P-5190	High Frequency Oscillator Tracking Coil L2 .....	.35
P-5179	1st I. F. Assembly Complete with Can T5	2.15
P-5180	2nd I. F. Assembly Complete with Can T6	1.75
P-30342-A	Grid Cap Only10
P-70702	AC Cord & Plug70
P-1504	8 Terminal Mounting Strip10

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Part No.	Item	List Price
P-1441	Double Mounting Strip10
P-1421	Single Mounting Strip10
P-2060	Knob Small .....	.20
P-2062	Knob Large .....	.20
P-10337	Small Tone & Volume Control Disc .....	.10
P-20912	Pointer, Large .....	.20
P-2012	Pilot Light Bulb 6-8 volt .....	.15
P-10272	Rubber Mounting Feet .....	.10
P-10320	Glass Crystal .....	.15
P-20875	Crystal Retainer Ring .....	.10
P-2090	6" Speaker Mantel Sets L1 - 1250 ohm	6.00
P-2091	8" Speaker Console Sets L1 - 1250 ohm	6.75
	8" Black Drive Cord (V. C. or T. C. Ind.) .....	.05
	29" Black Drive Cord (Cond. Drive) .....	.10
P-2126	Pilot Lamp Socket & Clip Assembly .....	.10
P-2101	Broadcast-Short Wave Switch	1.88

RESISTORS

Part No.	Code	Resistance	Watts	Type	List Price
P-98016	R1	200 ohm	.2	Flex. Wire Wound	\$.15
P-B93303	R2	30,000 ohm	.5	Carbon .....	.20
P-B94602	R3	6,000 ohm	.5	Carbon .....	.15
P-A95205	R4	2.0 megohm	.2	Carbon .....	.15
P-98020	{ R5	16,000 ohm	1.5	Armored wire wound .....	.65
	{ R6	25,000 ohm	1.0		
P-A94203	R7	20,000 ohm	.2	Carbon .....	.15
P-B94603	R8	60,000 ohm	.5	Carbon .....	.15
P-B94254	R9	250,000 ohm	.5	Carbon .....	.15
P-96014	R10	500,000 ohm		Vol. Control & Switch	1.05
P-A94252	R11	2,500 ohm	.2	Carbon .....	.15
P-A94104	R12	100,000 ohm	.2	Carbon .....	.15
P-A95504	R13	500,000 ohm	.2	Carbon .....	.20
P-A94104	R14	100,000 ohm	.2	Carbon .....	.15
P-98015	R15	235 ohm	2.0	Flex. Wire Wound .....	.15
P-97011	R16	150,000 ohm		Tone Control .....	.75

* Used in early Models. See Article on changes in this Manual

† Used in Later Models. See Article on changes in this Manual

CONDENSERS

Part No.	Code	Capacity	Volts	Type	List Price
P-80919	C1	.00025 mfd.		Moulded	\$.20
P-2102	C2	3-40 mmfd.		Ant. S.W. Trimn...	.15
	C3	(See 3 Gang Cond.)		Gang Trimmer	
P-80862	C4	.05 mfd.	200V.	Tubular .....	.15
P-80888	C5	.25 mfd.	200V.	Tubular .....	.25
P-80890	C6	.05 mfd.	400V.	Tubular .....	.20
P-2102	C7	3-40 mmfd.		1st Det.S.W. Trim...	.15
	C8	(See 3 Gang Cond.)		Gang Trimmer	
P-1386-B	{ C9	90±30 mmfd. }		Dual Trimmer	
	{ C10	90±30 mmfd. }		Part of I. F. Asse	
P-81034	C11	.25 mfd.	300V.	Tubular .....	.30
P-1386-B	{ C12	90±30 mmfd. }		Dual Trimmer	
	{ C13	90±30 mmfd. }		Part of I. F. Asse	
P-81040	C14	.25 mfd.	400V.	Tubular .....	.35
P-80977	C15	.0001 mfd.		Moulded .....	.20
†P-81043	C16	18.0 mfd.	300V.	Electrolytic Wet	1.30
*P-80916	C16	8.0 mfd.	450V.	Electrolytic Wet	1.25
*P-81032	C17	8.0 mfd.	500V.	Electrolytic Wet	1.30
†P-81042	C17	14.0 mfd.	400V.	Electrolytic Wet	1.45
P-80862	C18	.05 mfd.	200V.	Tubular .....	.15
P-2112	C19	300-500 mmfd.		600 K.C. Trimme...	.45
P-2102	C20	3-40 mmfd.		Osc. S.W. Trimn...	.15
†P-1685	C21	70±30 mmfd.		6000 K.C. Trimme...	.35
	C22	(See 3 Gang Cond.)		Gang Trimmer	
P-81005	C23	.000035 mfd.		Moulded .....	.15
P-80914	C24	.002 mfd.	600V.	Tubular .....	.20
P-80981	C25	.01 mfd.	400V.	Tubular .....	.20
P-81044	C26	.03 mfd.	400V.	Tubular .....	.15
P-80914	C27	.002 mfd.	600V.	Tubular .....	.20
P-81033	C28	.25 mfd.	400V.	Tubular .....	.35
P-80887	C29	.1 mfd.	400V.	Tubular .....	.20
P-80890	C30	.05 mfd.	400V.	Tubular .....	.20
P-80887	C31	.1 mfd.	400V.	Tubular .....	.20
P-81027-B	3 Gang Condenser				3.35
*P-2113		600-1200 mmfd.		6000 K.C. Trimme...	.61