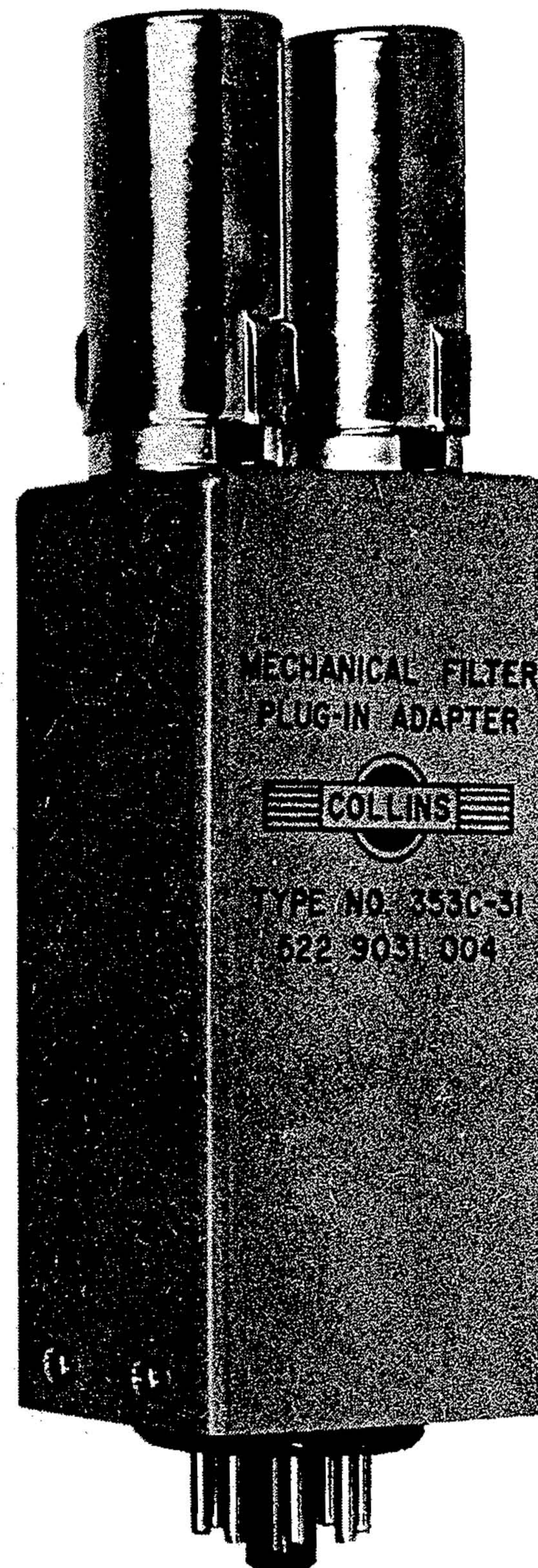




MECHANICAL FILTER PLUG-IN ADAPTERS

353C-14
353C-31

FOR USE WITH THE
COLLINS 75A-1 RECEIVER



COLLINS RADIO COMPANY



INSTALLATION INSTRUCTIONS
FOR THE
COLLINS TYPE NO'S 353C-14 AND 353C-31
MECHANICAL FILTER PLUG-IN ADAPTERS
FOR THE
COLLINS 75A-1 RECEIVER

COLLINS RADIO COMPANY
WESTERN DIVISION
BURBANK, CALIFORNIA

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I DESCRIPTION

The 353C Mechanical Filter Plug-In Adapter is a unit about the size of an i-f transformer, containing a Collins Mechanical Filter, two i-f amplifier tubes and an octal plug for inserting the unit into the socket of the first fixed i-f amplifier tube in the Collins 75A-1 Receiver. The adapter enables a Collins Mechanical Filter to be installed in the Collins 75A-1 Receiver with no modifications in the receiver. At any time the adapter may be removed and the receiver returned to its original condition. The 353C Adapter will not work in any other receiver.

The adapter schematic is shown in Figure 1. the plug (P201) is inserted into the socket of the 6SG7 first fixed i-f tube (V6) in the receiver. The 6BA6 (V201) in the adapter replaces the 6SQ7 removed from the receiver and drives the Mechanical Filter (FL201), which may be considered as an electrical bandpass filter with a voltage step down of 10 to 1 (A more detailed description of the filter is given in Part IV). The filter is followed by a 6AU6 (V202), which compensates for the loss in the filter, and is connected into the plate circuit of the tube the adapter replaces.

The gain of the adapter is the same as that of the tube replaced, but the selectivity of the Mechanical Filter is added to the receiver. The adapters are available in two bandwidths, 1.4 and 3.1 kc; the two are referred to as Type 353C-14 and 353C-31 Mechanical Filter Plug-In Adapters, respectively.

II INSTALLATION

The installation procedure consists simply of replacing one receiver tube with the adapter unit. Refer to Figure 2 to locate the 6SG7 first fixed i-f amplifier tube (V6) and remove it. Plug the adapter into the vacant tube socket. The lead capacity in the adapter may differ slightly from that of the tube removed; so, if necessary, repeal the i-f transformers on either side (T2 and T3) and reset the "S" meter. This is the same procedure that would be followed were any tube in the i-f strip is replaced. If necessary, carefully realign the entire receiver as outlined in the 75A-1 Instruction Book, to be sure of obtaining the best results from the Mechanical Filter Plug-In Adapter.

III OPERATION

The operating controls will function as before, but for some types of reception a slightly different tuning technique is suggested to take advantage of the improved selectivity. Tuning procedure and the unique advantages of the Mechanical Filter are outline in the following paragraphs for the common types of Amateur signals.

A. CW - The 353C-14 Adapter should be used for CW reception. Signals are tuned in the normal manner, but even without the crystal filter, the receiver will have true single-signal response. Transmitter drift or chirp may become more noticeable because of the increased selectivity of the receiver. The crystal filter may be used in conjunction with the Mechanical Filter for interference problems.

B. AM Phone - The 353C-31 Adapter should be used for phone reception. The adapter selectivity is wide enough to pass only one sideband and carrier of a phone signal. So, in tuning a signal, the receiver should be detuned from the center of the signal until the "S" meter reading begins to drop off. The receiver is now tuned to use sideband and the carrier. If detuned any further, the carrier will drop out of the passband, and the sideband will remain an unintelligible "monkey chatter". At this point the receiver will sound very noisy, since the AVC voltage will be reduced and the receiver gain will be at maximum. To minimize interference on one side of the signal, tune to the other sideband. If the interference is present on both sidebands or if the signal is undergoing heavy fading, local carrier re-insertion may be used. The signal is detuned in either direction to a point where the modulation just becomes unintelligible. Then the RF GAIN is backed off, the BFO switched on, and the AUDIO GAIN set on maximum. The BFO knob is rotated slowly until the modulation becomes readable. The RF GAIN is used to control volume, and the AUDIO GAIN always left at maximum.

C. Single Sideband - The 353C-31 Adapter should be used for single sideband suppressed-carrier reception. Set the AUDIO GAIN to maximum, the MAN-AVC-CW switch to MAN, and adjust the RF GAIN for comfortable volume. The station should be tuned for maximum volume and the BFO switched on. Rotate the BFO knob until the modulation becomes intelligible. For subsequent operations the BFO may be left in the same position and the station tuned in as if it were transmitting a full carrier.

D. FSK Teletype - The 353C-14 should be used for FSK Teletype reception. The signal is tuned in by the normal procedure, but the position of the signal in the passband of the receiver is much less critical than before.

IV THEORY OF OPERATION

A photograph of the Mechanical Filter is shown in Figure 3, and in Figure 4 the frequency response curves are compared to those obtained by conventional means.

The Mechanical Filter achieves this unusual selectivity by a combination of electrical mechanical elements. The filter is composed of three general sections: the input transducer, the resonant section, and the output transducer. The input and output sections of the filter are identical, and function to convert the electrical signal to a mechanical form and vice versa. The input signal is impressed on a small coil which surrounds a nickel wire. By means of magnetostriction, the magnetic field variations are converted to mechanical vibrations. One end of a nickel wire is welded to the first of a series of discs which comprise the resonant section of the filter. There are six of these resonant discs composed of a special alloy metal which has a very sharp resonance and excellent frequency stability. The vibrations of the nickel wire cause the end disc to vibrate, and these vibrations are coupled to the other discs by wires which are welded to their edges. The output end of the filter is identical to the input end and is composed of a nickel wire and a coil. Here the magnetostriction action of the nickel wire functions to convert the mechanical vibrations of the disc into a varying magnetic field. The coil intercepts this field and supplies the output voltage. The entire unit is housed in a hermetically sealed case smaller in size than a normal intermediate frequency transformer.

V MAINTENANCE

If a defect in the adapter is suspected, the adapter should be replaced with a 6SQ7 tube, and the receiver i-f realigned as mentioned in Part II. If the receiver now operates normally, the trouble is in the adapter.

The adapter voltage and resistance measurements shown in Table I will be an aid in locating trouble in the adapter. However, should obscure troubles arise, only a trained and competent communications receiver repairman should be allowed to service the receiver or adapter. The Mechanical Filter itself is a sealed unit, just as a vacuum tube is, and no attempt should be made to open the case.

TABLE I
Tube Socket Resistance and Voltage Measurements

- Conditions - 1. Voltage: No signal, Manual operation, RF GAIN full on, 80 meter band, B+ ON, NL OUT, Line Voltage 117AC 60cps, all measurements to ground.
2. Resistance: Same as above, AC switch OFF, all measurements to ground.

Meter Used: Simpson Model 260 VOM.

<u>Tube: V201, 6AU6, Amplifier</u>			
<u>PIN NO.</u>	<u>FUNCTION</u>	<u>RESISTANCE</u>	<u>VOLTAGE</u>
1	Grid	11k	0
2	Suppressor	330	1.5
3	Heater	0	0
4	Heater	0.2	6.3 ac
5	Plate	17k	55
6	Screen	19k	45
7	Cathode	330	1.5

Tube: V202, 6AU6, Amplifier

<u>PIN NO.</u>	<u>FUNCTION</u>	<u>RESISTANCE</u>	<u>VOLTAGE</u>
1	Grid	25	0
2	Suppressor	560	1.6
3	Heater	0	0
4	Heater	0.2	6.3 ac
5	Plate	35k	210
6	Screen	19k	45
7	Cathode	560	1.6
<u>353C Adapter Base With Adapter Plugged In</u>			
1	Ground	0	0
2	Heater	0.2	6.3 ac
3	Cathode	330	1.5
4	Input	11k	0
5	NC	330	1.5
6	B+	17k	53
7	Heater	0	0
8	Output	35k	210

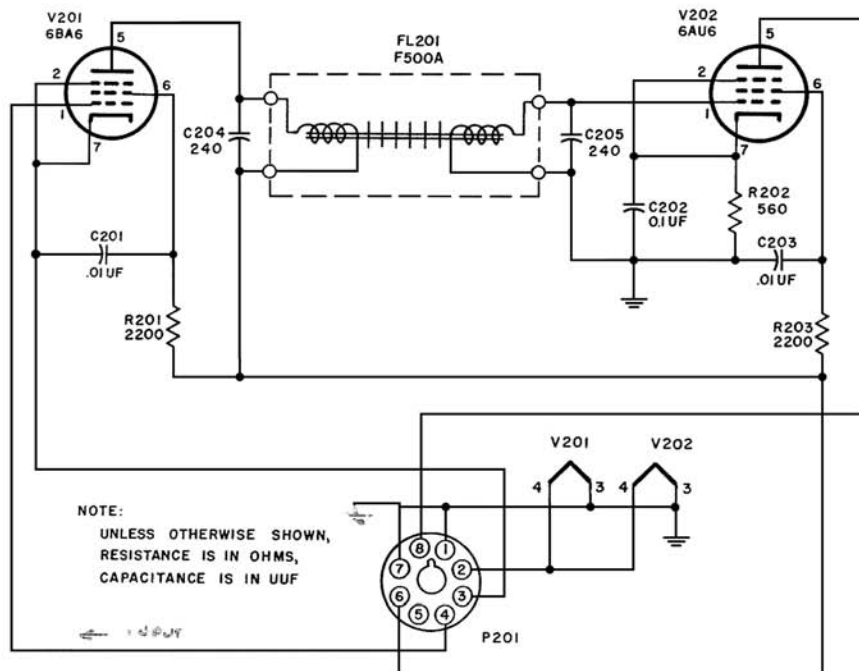


Figure 1. 353C Series Adapter Schematic

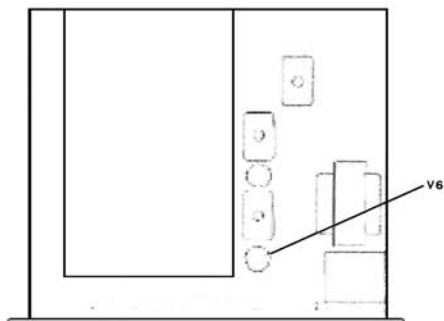


Figure 2. 75A-1 Receiver - Top View

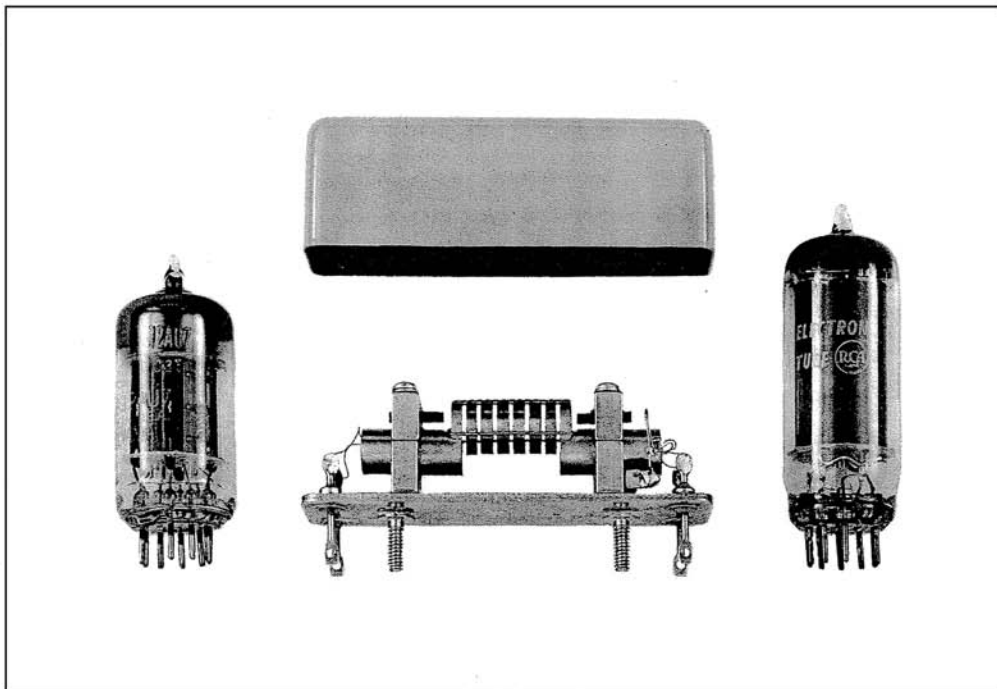
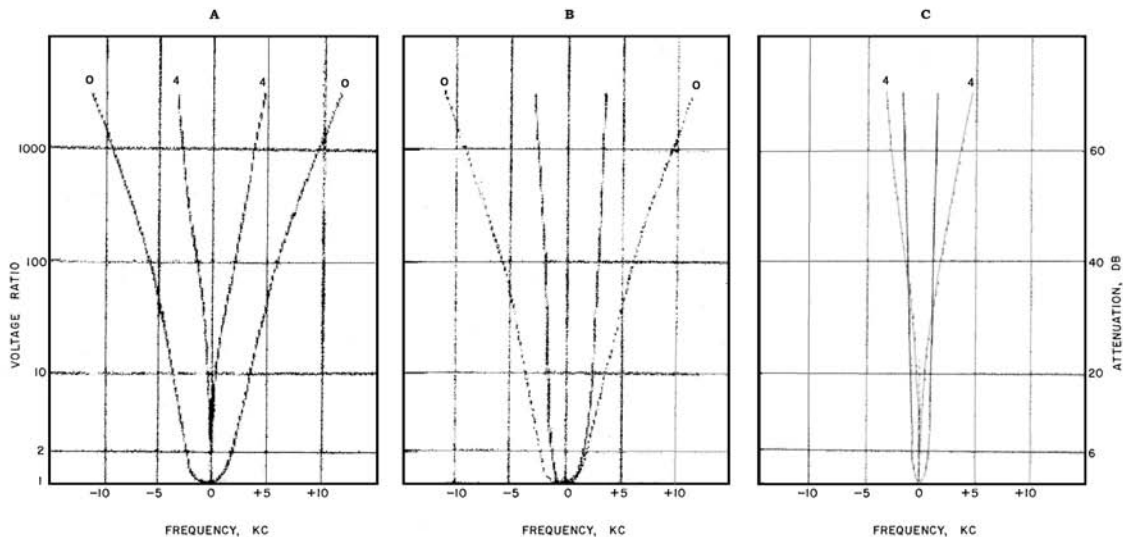


Figure 3. Mechanical Filter, Case Removed



- A. Selectivity of standard 75A-1 Receiver at broadest (0), sharpest (4) positions.
 B. Selectivity of standard 75A-1 Receiver with 353C-31 Adapter. Normal broadest (0) curve is shown for comparison.
 C. Selectivity of standard 75A-1 Receiver with 353C-14 Adapter. Normal sharpest (4) curve is shown for comparison.

Figure 4. 75A-1 Receiver - Selectivity

TABLE II
Parts List

SYMBOL	PART NO.	DESCRIPTION	FUNCTION
C201	913-1188-00	Capacitor, ceramic; 0.01 μ f, 600 wv	V201 screen bypass
C202	931-0425-00	Capacitor, paper; 0.1 μ f, 100wv	V202 cathode bypass
C203	913-1188-00	Capacitor, ceramic; 0.01 μ f, 600 wv	V202 screen bypass
C204	912-0531-00	Capacitor, mica; 240 μ mf \pm 5%, 500 wv	Resonates FL201 input
C205	912-0531-00	Capacitor, mica; 240 μ mf \pm 5%, 500 wv	Resonates FL201 output
FL201	522-9023-002	FILTER, mechanical; Type F500A-14	Bandpass filter, 1.4 kc bandwidth
	522-9023-002	FILTER, mechanical; Type F500A-31	Bandpass filter, 3.1 kc bandwidth
P201	373-3011-00	PLUG, octal	Connects adapter to receiver
R201	745-1100-00	RESISTOR, carbon; 2200 ohms \pm 10%, 1/2 w	V201 screen decoupling
R202	745-1036-00	RESISTOR, carbon; 560 ohms \pm 10%, 1/2 w	V202 cathode biasing
R203	745-1100-00	RESISTOR, carbon; 2200 ohms \pm 10%, 1/2 w	V202 screen decoupling
V201	255-0185-00	TUBE; type 6BA6	Amplifier
V202	255-0202-00	TUBE; type 6AU6	Amplifier

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