

*Collins*

**75A-4**

**AMATEUR RECEIVER**



**INSTRUCTION BOOK**

When a new product hits the market, be it an automobile or radio gear, the first question is "what does it have that last year's model didn't have?" The 75A-4 can't sport a 199 horsepower engine, or a panoramic windshield, but it does have a number of new features never before seen on an amateur receiver. One feature, PASSBAND TUNING, is so new that it was necessary to coin a new name to describe its function. Other new features include: separate detectors for SSB and AM reception, a Q-Multiplier Bridge-Tee filter in place of the crystal filter, a new AVC system that works on SSB, a new low cross modulation RF tube, a noise limiter that works on SSB, a built in crystal calibrator, and a new Permeability tuned oscillator--all built into a cabinet nearly 4" narrower than the 75A-3.

This new Ham Band Collins receiver retains many of the timeproven features of the earlier 75A series of sets. These features include: Double conversion, crystal controlled front end for high stability and good image rejection: Permeability tuned, sealed master oscillator for accurate dial calibration and long term stability; and mechanical filters in the IF circuits for the ultimate in selectivity.

It has been said that a ham is a radio manufacturer's most critical customer. A commercial or military customer will generally present a manufacturer with a detailed set of specifications to be met for a specific application. However, each phase of ham radio has its own special requirements, not necessarily compatible. A CW DX man wants very low noise and high selectivity. A phone man wants greater bandwidth with good skirt selectivity and low cross modulation. A single sideband man has his own special requirements for stability, selectivity and ease of tuning. The traffic man wants good dial calibration, stability, and breakin features. The 75A-4 does all this and without compromise.

dr SER. 3756  
B FILED F 432-10  
A " 1 27 1956

# Instruction Book

## 75A-4

### AMATEUR-BAND RECEIVER

SN 3856

**COLLINS RADIO COMPANY**  
**Cedar Rapids, Iowa**

**NEW YORK**

**BURBANK**

**DALLAS**

**520 5052 00**  
**1 March 1955**  
**2nd Edition, 1 July 1956**  
**3rd Edition, 1 December 1956**  
**Revised, 15 March 1957**  
Printed in the United States of America



# TABLE OF CONTENTS

<u>Paragraph</u>		<u>Page</u>
<b>SECTION I</b>		
<b>DESCRIPTION</b>		
1.	General . . . . .	1-1
2.	New Features . . . . .	1-1
	a. Detectors . . . . .	1-1
	b. AVC . . . . .	1-1
	c. Passband Tuning . . . . .	1-1
	d. "Q" Multiplier . . . . .	1-1
	e. Mechanical Filters . . . . .	1-1
	f. Noise Limiter . . . . .	1-1
	g. Crystal Calibrator . . . . .	1-1
3.	Specifications . . . . .	1-2
4.	Accessories . . . . .	1-3
<b>SECTION II</b>		
<b>INSTALLATION</b>		
1.	Unpacking . . . . .	2-0
2.	External Connections (See figure 2-1) . . . . .	2-0
	a. Antenna and Ground . . . . .	2-0
	b. Coaxial Antenna Connection . . . . .	2-0
	c. Output Connections . . . . .	2-1
	(1) Speaker . . . . .	2-1
	(2) Headphones . . . . .	2-1
	d. 500-Ohm Output . . . . .	2-1
	e. Standby . . . . .	2-1
	f. Muting . . . . .	2-1
	g. Power . . . . .	2-1
	h. Fuse . . . . .	2-1
3.	Installation of Mechanical Filters . . . . .	2-1
4.	"S" Meter Adjustment . . . . .	2-1
5.	Adjustment of Calibration Oscillator . . . . .	2-1
6.	Use of External Sideband Selecting Devices . . . . .	2-2
<b>SECTION III</b>		
<b>OPERATION</b>		
1.	Controls . . . . .	3-1
	a. Off-Standby-On Cal. . . . .	3-1
	b. Band Change . . . . .	3-1
	c. Megacycles - Kilocycles . . . . .	3-1
	d. AM CW-SSB . . . . .	3-1

TABLE OF CONTENTS (Cont.)

<u>Paragraph</u>	<u>Page</u>
e. Selectivity . . . . .	3-1
f. RF Gain . . . . .	3-1
g. Audio Gain . . . . .	3-1
h. Passband Tuning . . . . .	3-1
i. Ant. Trim. . . . .	3-2
j. Noise Limiter . . . . .	3-2
k. AVC . . . . .	3-2
l. Rejection Tuning . . . . .	3-2
m. Zero Set. . . . .	3-2
2. Tuning AM Signals . . . . .	3-2
3. Tuning Single-Sideband Signals . . . . .	3-2
4. Tuning CW Signals . . . . .	3-3
5. Locally Reinserted Carrier . . . . .	3-3
6. Single-Sideband AM Reception . . . . .	3-3
7. Passband Tuning . . . . .	3-3
8. Rejection Tuning . . . . .	3-4
9. Frequency Measuring . . . . .	3-5

SECTION IV  
THEORY OF OPERATION

1. General. . . . .	4-0
2. Tuning . . . . .	4-0
3. RF Circuits . . . . .	4-0
a. RF Stage . . . . .	4-0
b. Crystal Controlled Oscillator and First Mixer . . . . .	4-2
c. Variable IF. . . . .	4-2
d. VFO and Second Mixer . . . . .	4-2
e. Mechanical Filter . . . . .	4-2
f. "Q" Multiplier . . . . .	4-2
g. 455 KC IF Amplifier . . . . .	4-3
h. AM Detector . . . . .	4-3
i. CW-SSB Detector . . . . .	4-3
j. BFO . . . . .	4-3
4. Audio Circuits . . . . .	4-3
a. Noise Limiter . . . . .	4-3
b. Audio Amplifiers . . . . .	4-4
5. RF Gain Control System . . . . .	4-4
6. "S" Meter . . . . .	4-4
7. AVC System . . . . .	4-4
8. Calibrator Circuit . . . . .	4-5

## TABLE OF CONTENTS (Cont.)

SECTION V  
MAINTENANCE

<u>Paragraph</u>		<u>Page</u>
1.	Trouble Shooting . . . . .	5-0
2.	Fuse . . . . .	5-0
3.	Test Equipment Required for 75A-4 Alignment . . . . .	5-0
4.	Preliminary Checks . . . . .	5-0
5.	455 KC IF Alignment . . . . .	5-1
6.	Rejection Tuning Alignment . . . . .	5-1
7.	BFO Alignment . . . . .	5-1
8.	Variable IF and 160-Meter Band Alignment . . . . .	5-2
9.	Alignment of Crystal Oscillator . . . . .	5-3
10.	RF Alignment . . . . .	5-3
11.	VFO Adjustment . . . . .	5-4
12.	Tweet Trap Adjustment. . . . .	5-4
13.	AVC Threshold (R-9). . . . .	5-4
14.	Dial Cords. . . . .	5-4
	a. Removing Front Panel . . . . .	5-4
	b. Pointer Cord . . . . .	5-5
	c. Drum Cord . . . . .	5-5

SECTION VI  
PARTS LIST FOR 75A-4 RECEIVER

## LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1-1	75A-4 Receiver and Block Diagram . . . . .	1-0
1-2	Type F-455J Plug-in Mechanical Filter . . . . .	1-2
1-3	75A-4 Selectivity Curves . . . . .	1-2
2-1	75A-4 Receiver, External Connections . . . . .	2-0
3-1	75A-4 Operating Controls. . . . .	2-2
4-1	Tuning Elements of RF and Mixer Stages, Simplified Diagram . . . . .	4-1
4-2	A Collins Mechanical Filter, Functional Diagram . . . . .	4-3
5-1	Dial Cord Replacement . . . . .	5-8
5-2	75A-4, Top View . . . . .	5-9
5-3	75A-4, Bottom View, Page 1 . . . . .	5-10
	75A-4, Bottom View, Page 2 . . . . .	5-11
5-4	75A-4, Front Panel Lowered . . . . .	5-12
5-5	75A-4 Receiver, Schematic Diagram . . . . .	5-13/14
5-6	Assembling Plug UG-21B/U to Cable RG-8/U . . . . .	5-15
5-7	Dial Divisions Table. . . . .	5-16
5-8	Assembling Plug UG-260/U to Cable RG-58/U. . . . .	5-17



## COLLINS AMATEUR EQUIPMENT GUARANTEE

The Collins Amateur equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship, or materials, and which are returned to Collins at its factory, transportation prepaid, provided:

- (a) Buyer has completed and returned to Collins promptly following his purchase the Registration Card included in the Instruction Book furnished with the equipment.
- (b) Notice of the claimed defect is given Collins within 90 days from the date of purchase and goods are returned in accordance with Collins' instructions.
- (c) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (d) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal and proper manner.
- (e) Any failure due to use of equipment in excess of that contemplated in normal amateur operations shall not be deemed a defect within the meaning of these provisions.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements contained in these paragraphs. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

**IMPORTANT!** It is necessary that the business reply card included herewith be filled out and mailed to the Company promptly in order for this guarantee to be effective.

**HOW TO RETURN MATERIAL OR EQUIPMENT.** If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Type number, name, and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins' number ( and name ) of unit sub-assemblies involved in trouble
- (J) Remarks

**HOW TO ORDER REPLACEMENT PARTS.** When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)

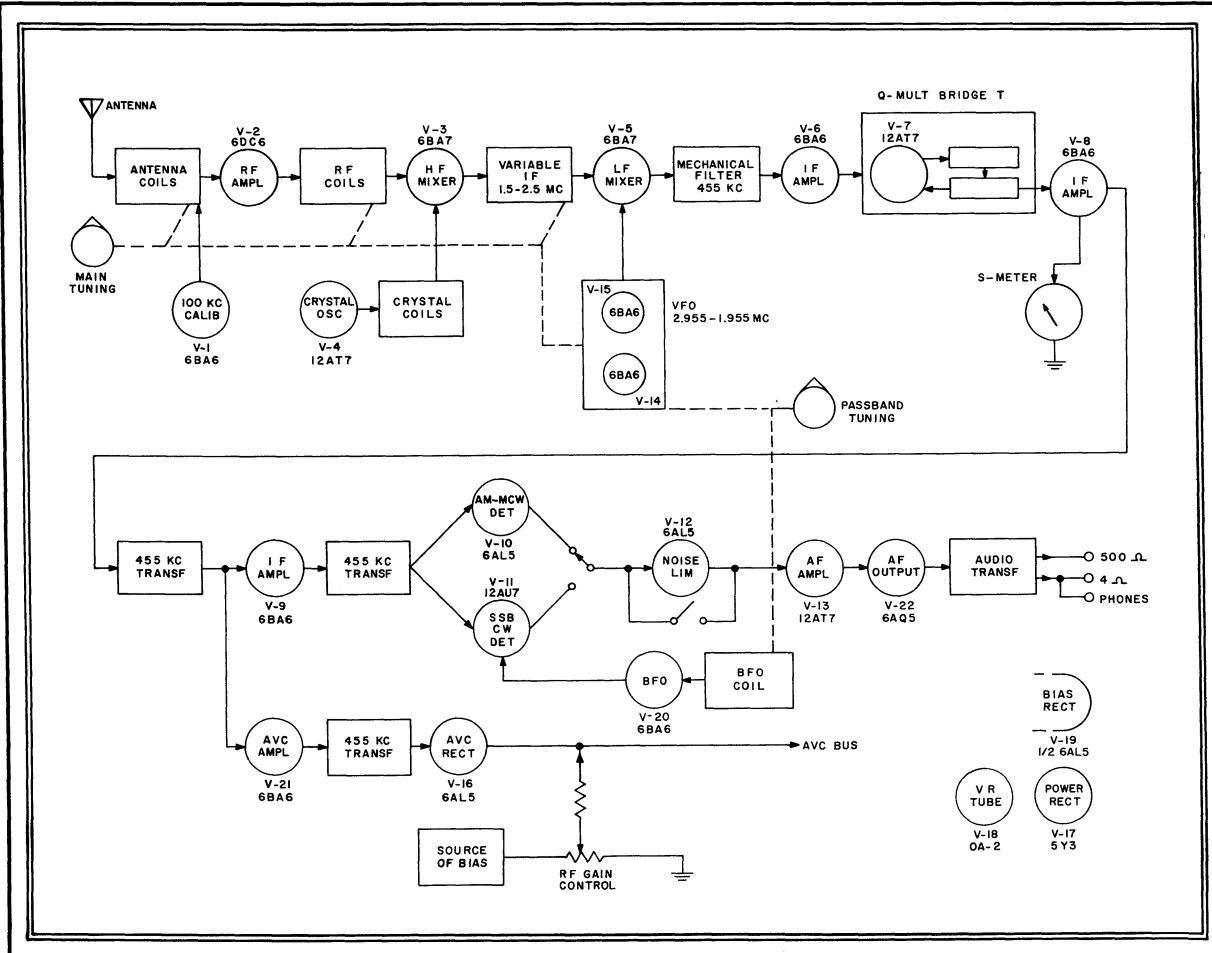


Figure 1-1. 75A-4 Receiver and Block Diagram

## SECTION I DESCRIPTION

### 1. GENERAL.

The Collins 75A-4 receiver is designed primarily for amateur reception on the seven HF amateur bands. It retains many of the time-proven features of the earlier 75A series of receivers. These features include:

- a. Double conversion, crystal controlled front end for high stability and good image rejection even on the 10-meter bands.
- b. Permeability tuned, sealed master oscillator for accurate dial calibration and long-term stability.
- c. Mechanical filters in the IF circuits for the ultimate in selectivity.

### 2. NEW FEATURES.

Increased amateur activity on single sideband has revealed a need for a receiver designed especially for single sideband reception. The 75A-4 incorporates several new features which considerably improve the ease of reception of a SSSC signal. They include:

- a. DETECTORS. Separate detectors for double or single sideband signals. The sideband detector is a mixer type detector, which greatly reduces the distortion which is generated when a conventional diode detector is used for detecting a SSSC signal. A diode detector is used for conventional double sideband signals.
- b. AVC. A fast attack, slow release AVC system is fast enough to respond to the first few cycles of a sideband transmission and does not require the presence of a carrier for operation. A fast and slow release time are available on a panel switch. The "fast" is used normally for AM reception. The "slow" is used during sideband and CW reception and prevents the receiver from "opening up" between words and characters.

- c. PASSBAND TUNING. A passband tuning system is used in the 75A-4. In this system the receiver BFO is mechanically ganged and tracked with the main tuning dial. Once a SSSC signal is tuned in, it can be moved relative to the passband of the receiver without losing intelligibility of the signal. This feature is especially useful for "switching" sidebands and for dodging interfering signals. In CW reception, the desired signal can be moved around in the passband without changing the pitch of the received beat note, and at the same time, interfering signals can be pushed off the edge of the passband.

- d. "Q" MULTIPLIER. A combination "Q" multiplier and bridge T-filter are used in the 75A-4. This circuit replaces the conventional crystal filter and has several features which make it superior to the crystal filter. It has a deep, narrow notch which has equal effectiveness anywhere in the passband. Conventional crystal filters become inoperative at frequencies several hundred cycles on either side of the resonant frequency of the crystal. The "Q" multiplier does not seriously distort the shape of the IF passband as does a crystal filter. This results in much less loss of intelligibility while still doing a superior job of eliminating heterodynes.

- e. MECHANICAL FILTERS. Space has been provided for 3 mechanical filters. This allows the operator to tailor his set to his requirement. An 800-cycle filter is available for CW use and a 6-KC filter for double sideband AM reception. The 75A-4 is normally supplied with one 3-KC filter as standard equipment.

- f. NOISE LIMITER. A new noise limiter circuit which is effective on AM, CW or SSSC signals is used in the 75A-4. This limiter is designed to clip both the positive and negative peaks of the detected signal. By means of a panel control the operator can select the degree of clipping desired.

- g. CRYSTAL CALIBRATOR. A crystal calibrator circuit is an integral part of the 75A-4. No adapters are needed. Calibration signals are present every 100 KC at the flip of a panel switch.

Section I  
DESCRIPTION

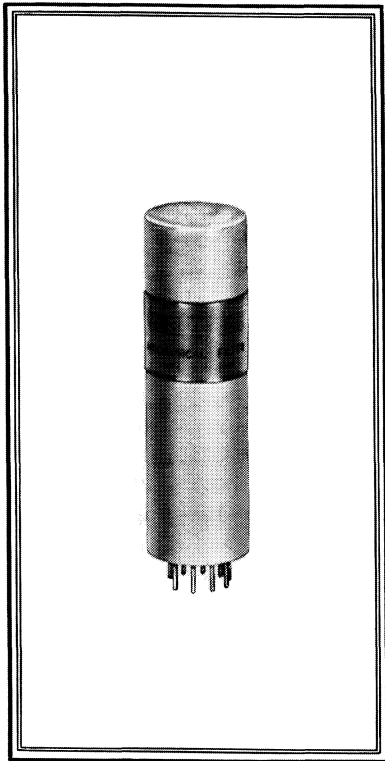


Figure 1-2. Type F-455J Plug-in Mechanical Filter.

**3. SPECIFICATIONS.**

<u>Frequency Range:</u> -	<u>Band (meters)</u>	<u>Range (mc)</u>
	160	1.5 to 2.5
	80	3.2 to 4.2
	40	6.8 to 7.8
	20	14.0 to 15.0
	15	20.8 to 21.8
	11	26.5 to 27.5
	10	28.0 to 29.0
	10	29.0 to 30.0

Size: - 10-1/2" high x 17-1/4" wide x 15-1/2" deep.

Weight: - 35 pounds.

Finish: - St. James gray wrinkle enamel.

Cabinet: - Table mounted with provision for relay rack mounting.

Power Input: - 105-125 volts AC, 50-60 cps; 85 watts.

Number of Tubes: - 22, including rectifier and voltage regulator tubes

Types of Reception: - AM, CW, SSB, MCW.

Sensitivity: - 1.0 microvolt for 6 db signal-to-noise ratio with 3 KC bandwidth.

Antenna Input: - Accommodates wide range of antenna impedances; designed for 50-150 ohms terminal impedance; coax connector provided.

Selectivity: - The selectivity is determined entirely by the choice of mechanical filters. Provision is made for use of three filters. Filters are available in bandwidths of 0.8 KC, 3.1 KC and 6 KC. Use only the filters here listed: F-455J-05 (Part No. 526 9154 00) for 500 cps; F-455J-31 (526 9089 00) for 3.1 KC; F-455J-60 (526 9091 00) for 6 KC. Receiver supplied with 3.1 KC filter (F-455J-31).

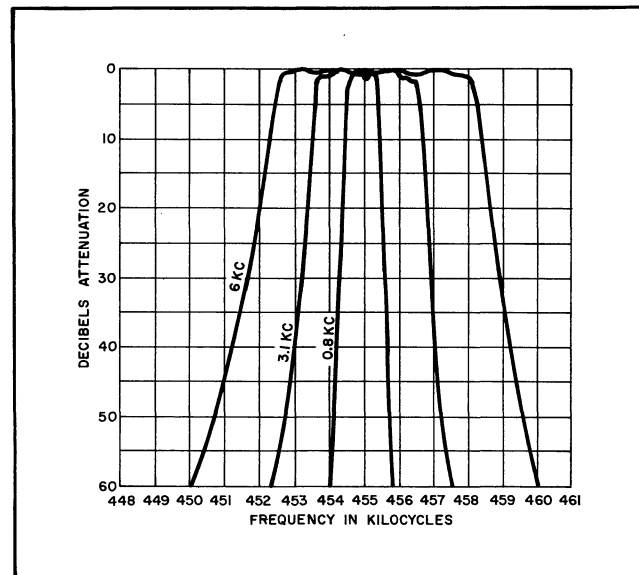


Figure 1-3. 75A-4 Selectivity Curves

AVC Characteristics: - Audio rise less than 3 db for inputs of 5 to 200,000 uv.

AVC Time Constants: -

	<u>Fast</u>	<u>Slow</u>
Rise Time	.01 sec.	.01 sec.
Release Time	.1 sec.	1 sec.

IF and Image Rejection: - All greater than 50 db down.

Audio Characteristics: -

Output - .75 watts with a 3.0 uv signal, 30% modulated.

Output impedance - 500 ohms, 4 ohms.

Response of audio circuits -  $\pm 3$  db 100 cps to 5000 cps.

Distortion - Less than 10%.

Noise Limiter: -

AM - Adjustable clip point, automatic carrier reference.

CW-SSB - Adjustable clip point. Clip reference controlled by flat AVC.

Muting: - Provisions for muting the receiver during key-down operation is provided. A muting voltage of +20 volts must be supplied by the transmitter or a separate contact on a keying relay and a 20 volt "B" battery.

Frequency Stability (at 14.5 mc): -

Temperature - Not more than 1200 cycles drift, from 0 degrees to +60 degrees centigrade.

Warmup - After 30-minute warmup, drift during any 10-minute period does not exceed 100 cps.

Voltage - For line voltage changes of  $\pm 10\%$ , the frequency does not change more than 100 cps.

Humidity - For humidity changes of from 0 to 90%, the frequency does not change more than 50 cps.

Dial Accuracy - (After calibration)

All Bands -  $\pm 300$  cps.

#### **4. ACCESSORIES.**

In addition to the mechanical filters listed in paragraph 3 above, the following accessories are available:

Speaker - 10" speaker in matching cabinet, speaker cabinet 15" wide, 11-1/8" high, 9-1/8" deep. Type No. 270G-3. Part No. 522 0149 00.

Rack Mounting Bracket Assembly: - To adapt the receiver for standard relay rack mounting. St. James Gray wrinkle finish. Part No. 540 4628 00.