# ECHOPHONE RADIO CORPORATION
## 201 East Twenty-Sixth Street
## Chicago, Illinois

### INSTRUCTIONS FOR INSTALLATION, OPERATION AND SERVICE

# MODEL EC 3
## Echophone Commercial

9 TUBE AC-DC THREE BAND 550KC-30 MC RADIO RECEIVER

## Specifications

TUBES -

1 - 6SG7 R.F. Amplifier
1 - 6K8 Mixer - H.F. Oscillator
1 - 6SK7 Xtal 1st I.F. Amplifier
1 - 6SK7 2nd I.F. Amplifier
1 - 6H6 2nd Detector-AVC-ANL
1 - 6SC7 BFO - Monitor - 1st Audio
1 - 25L6GT Audio Output
1 - 25Z6 Rectifier
1 - BK29D Ballast Tube

Power Consumption - 46 watts
Power Source - 115 volts AC or DC
Power Output - One watt undistorted
Selectivity - Single signal crystal to broad I.F. in four steps
Intermediate Frequency - 455 KC
Frequency Range - 550 KC to 30 mc.

## Installation & Operation

Upon receipt of the EC-3 the owner should inspect the carton, the receiver, and the speaker for any sign of damage that might have occurred in transit. If damage is found, immediately file claim with the carrier stating the extent of the damage.

Plug the speaker into the socket provided on the rear of the receiver.

IMPORTANT:- This receiver, unless otherwise marked, must be operated from 115-125 volts - Alternating OR Direct Current power. If the set does not op-

erate in one minute when connected to Direct Current, reverse the power plug in the receptacle.

**ANTENNA:-** A wire approximately 50 to 75 feet long, including the leadin, will provide very satisfactory reception throughout the tuning range of the receiver. It should be connected to the $A_1$ terminal of the antenna terminal strip located on the rear apron of the chassis; the jumper between $A_2$ and G should remain in place. A good antenna of this type should be erected as high as possible; insulated from ground, and at right angles to interference producing power lines. A ground connected to the G terminal may be used if it is found to materially improve the operation of the receiver. DO NOT GROUND CHASSIS DIRECT.

A doublet antenna should be connected to terminals $A_1$ and $A_2$. The jumper may remain connected between $A_2$ and G or removed depending upon its favorable effect on reception.

**NOTE:-** If a ground is used it should always be connected to the G terminal, NEVER to the chassis itself.

**TUBES:-** The model EC-3 is shipped from the factory with all the tubes in their proper sockets. The types of tubes required and their position is clearly shown in the top chassis photograph. Each tube and its socket has the type number stamped on it. Should it be necessary to replace any tubes insert the center guide pin on the tube base into the center hole in the socket. Rotate the tube until the key on the guide pin drops into the notched portion of the socket hole. Push down on the tube until its base is flush with the socket.

**CONTROLS & THEIR FUNCTIONS:**

**A.F. GAIN:-** The ON-OFF switch is part of the A.F. Gain Control. Turning this knob to the right turns the receiver ON and increases the volume. Turning it all the way to the left decreases the volume until the switch clicks and the receiver goes off. The pilot lights indirectly illuminate the dial scale when the power is on.

**MAIN TUNING:-** The main tuning control, when rotated, will tune the receiver to any frequency throughout its range.

**R.F. GAIN:-** This control adjusts the sensitivity of the receiver by varying the cathode bias on the R.F. and I.F. amplifier. Maximum sensitivity will be obtained when this control is rotated as far as it will go to the right.

**BAND SWITCH:-** Turning this knob connects the proper coils in the circuit to tune the desired frequency range.

Band 1 - 550 to 2100 K.C.
Band 2 - 2.1 to 8.1 M.C.
Band 3 - 8 to 30 M.C.

**BAND SPREAD TUNING:-** The band spread control acts as an electrical vernier on the main tuning condenser. The 80, 40, 20 and 10 meter amateur bands are calibrated on the band spread scale together with a logging scale. To use these amateur band calibrations it is necessary that careful adjustment of the main tuning pointer be made; the most convenient way being to set the BAND SPREAD TUNING pointer to your transmitter frequency or some known receiver frequency, then adjust the MAIN TUNING pointer until the signal is heard. If this is not possible it will be necessary to locate the bands by setting the main tuning pointer at the high frequency end of the desired amateur band; then adjust the band spread pointer until amateur signals are heard. The band may then be scanned by the BAND SPREAD TUNING to check the calibration. Slight readjustment of the main tuning may be necessary for best accuracy of the BAND SPREAD scale.

**"STDBY-RECEIVE-MONITOR"-** This switch must be in the RECEIVE position for normal operation of the receiver. The STANDBY position renders the EC-3 inoperative for standby purposes. The MONITOR position places the CW MONITOR in operation to allow the C.W. operator to listen to his keying.

**BFO-ON-OFF:-** This switch removes the AVC and places the BEAT FREQUENCY OSCILLATOR in operation for the reception of CW signals, and for locating weak DX signals. Code signal intensity should be adjusted by the R.F. GAIN CONTROL.

**PITCH CONTROL:-** Allows adjustment of the beat note obtained from the BEAT OSCILLATOR to a pitch most pleasing to the listener.

**ANL-ON-OFF:-** The AUTOMATIC NOISE LIMITER switch will effectively minimize ignition and similar types of interference which would be objectionable to short wave reception. Best results are obtained with the R.F. Gain full on and the A.F. Gain set near minimum.

**SELECTIVITY:-** This switch allows four step selectivity to meet all receiving requirements.

**CRYSTAL PHASING:-** This control is in the circuit only when the SELECTIVITY switch is in the "CRYSTAL SHARP" or "CRYSTAL BROAD" positions. The function of the PHASING control is to eliminate the unwanted interfering sideband signal.

**PHONES - SPKR:-** On the rear apron of the chassis will be found two phone tip jacks. Headphones may remain permanently connected to the receiver. The PHONES-SPKR switch makes it possible to select either.

## Further Operating Instructions

Amateurs who operate on C.W. will find the MONITOR circuit in the Ec-3 an aid to easier and more efficient operating

A short wire must be connected to the single MONITOR PICKUP TERMINAL at the rear of the receiver to allow a small amount of R.F. energy to be picked up from the transmitter by the monitor circuit. The length of this wire and its proximity to the transmitter can only be determined experimently, because it depends entirely on the power of your transmitter. Too much coupling is indicated by a raspy note when the monitor circuit is in operation.

The value of the "CRYSTAL SHARP" SELECTIVITY position will be apparent when it is desired to receive CW signals on any of the amateur bands. The tremendous sideband interference encountered will be reduced to a minimum when the SELECTIVITY knob is in the "CRYSTAL SHARP" position and the CRYSTAL PHASING control is adjusted for maximum reduction of unwanted signals. Since tuning becomes easier with decreasing selectivity the receiver should not be set at a SELECTIVITY greater than is necessary. Thus, for best fidelity on the Broadcast band the SELECTIVITY should be "IF BROAD". For amateur phone work the SELECTIVITY may be "IF SHARP" or "CRYSTAL BROAD" as the interference dictates.

**IMPORTANT:**

Should at any time your receiver become inoperative check -

**FIRST:-** See that the tubes are in their sockets correctly. Make sure the tubes are lighted by noting filament glow in the glass tubes. If the metal tubes are warm it may be assumed they are operating.

**SECOND:-** Be sure there is power at the socket. This may be checked by inserting any handy lamp appliance.

**THIRD:-** If the receiver is being used on direct current reverse the plug.

**FOURTH:-** Make sure the antenna is not grounded at some point, and is securely connected to the antenna terminal.

**FIFTH:-** The speaker wires may not be plugged into the speaker terminal strip. Be sure the PHONES-SPKR switch is in the SPKR position and the STANDBY switch is in the RECEIVE position.

**SIXTH:-** Have the tubes tested.

**SEVENTH:-** If the receiver still does not operate explain your difficulties to the distributor from whom you purchased the receiver.

# Alignment Procedure

**EQUIPMENT NEEDED FOR ALIGNING AND PRELIMINARY ADJUSTMENTS:**

An all wave signal generator which will provide an accurately calibrated signal at the test frequencies listed.
Output indicating meter
Non-metallic screw driver
Dummy antenna 400 ohm, 200 mmf. and 0.1 mfd.
Connect signal generator ground to ground terminal (G) of receiver.
Set bandspread at 100.
Connect output meter across primary of output transformer.
Gain controls - Maximum all adjustments.

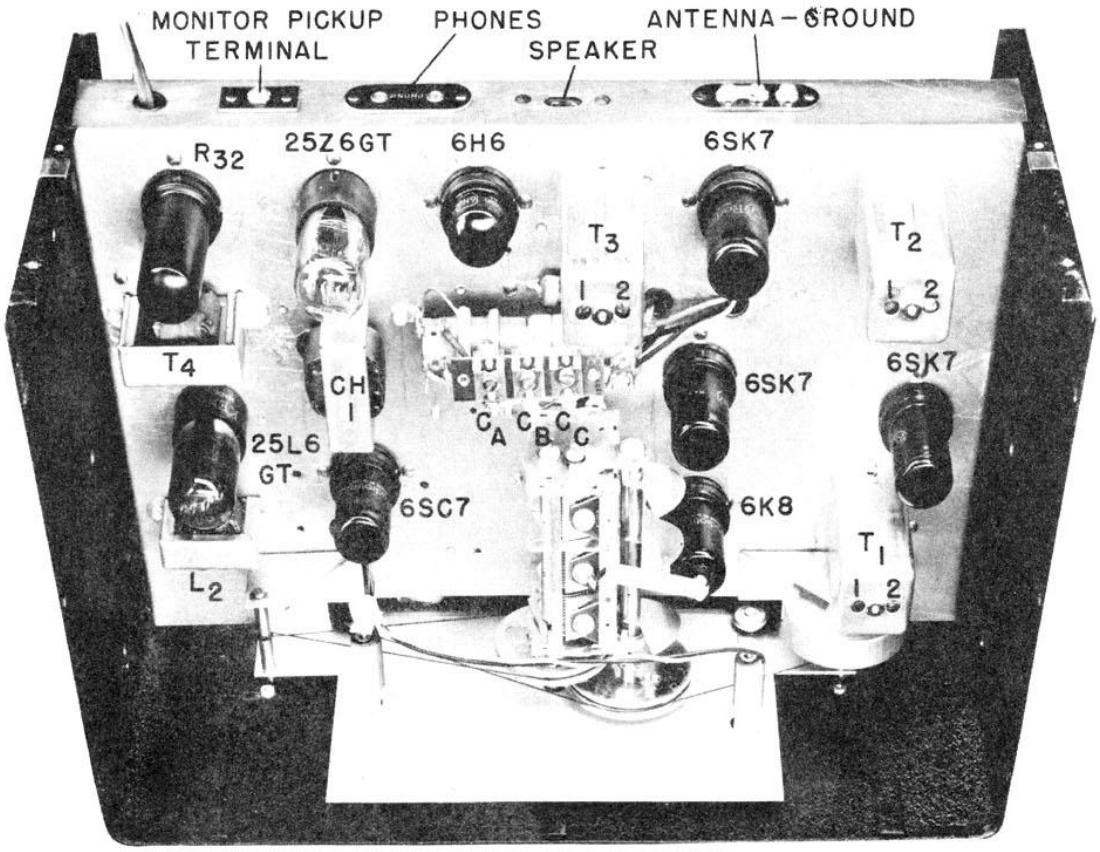
**I.F. ALIGNMENT**

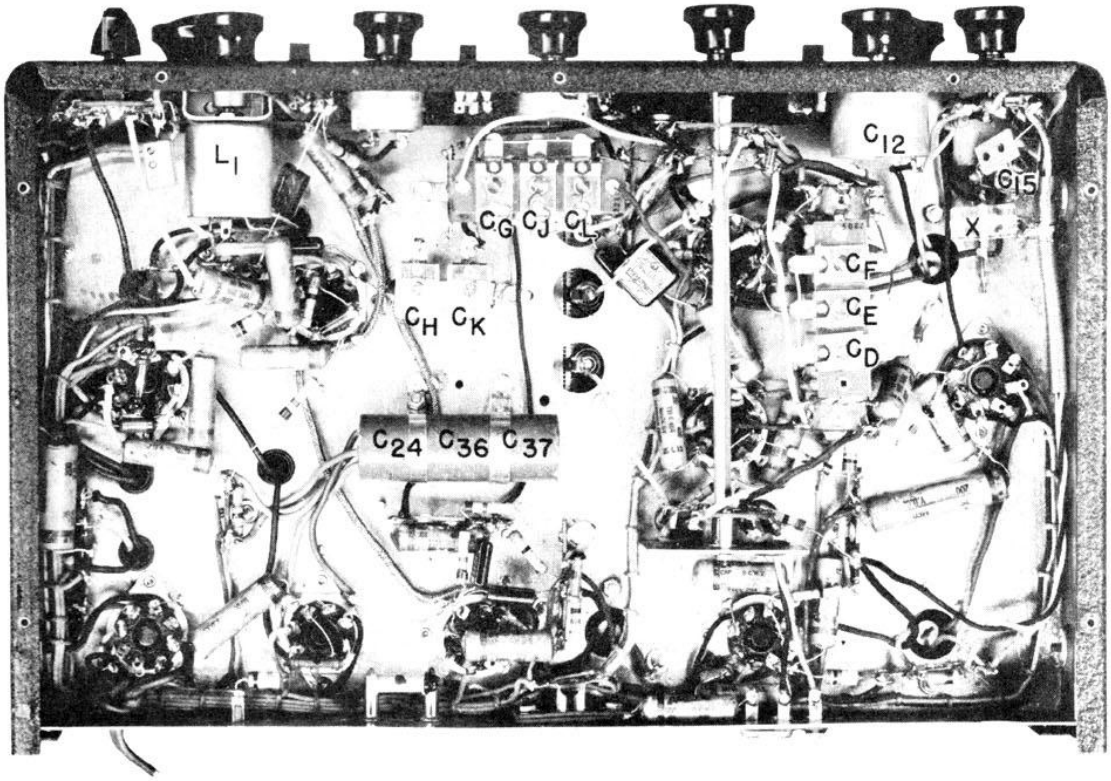
Connect 0.1 mfd. dummy antenna between high side of generator and 6K8 grid.
Set signal generator to 455 kc.
Set receiver selectivity in "I.F. SHARP" position.
Adjust all trimmers on $T_1$, $T_2$ and $T_3$ for maximum output.
Remove knob from PITCH CONTROL ($L_1$) and loosen the set screw holding the shaft extension. This is located on the underside of the chassis.
Adjust the BFO control to give a beat note with the 455 kc. I.F. signal.
If necessary, change the setting by adjusting the screw located under the PITCH CONTROL knob.
Tighten the set screw holding the extension shaft and replace the knob.
Place the SELECTIVITY switch in the CRYSTAL BROAD POSITION.
Detune the signal generator so that a high pitched note is heard (BFO "ON").
Adjust the crystal phasing control for maximum rejection or until minimum volume is obtained.
Adjust #2 trimmer on $T_1$ noting that the output reaches a maximum, goes through a dip and then back to maximum. Wobbulate the signal generator tuning adjustment and align to the dip between the two peaks. A distinct change in the crystal note to a swishy sound will be noted when the correct adjustment has been reached.
Now readjust the other trimmers for maximum gain without changing any other adjustments.
Set the selectivity switch to the I.F. Sharp position and adjust the trimmer ($C_{15}$) under $T_1$ for maximum output.

**R. F. ALIGNMENT**

The following table indicates R.F. Alignment procedure.

| Band | Signal Generator | | Pad | Trimmers | Adjustment |
|---|---|---|---|---|---|
| | Frequency Setting | Dummy Antenna | | | |
| 1 | 600 kc | 200 mmf | $C_H$ | none | maximum output |
| | 1800 kc | 200 mmf | none | $C_A$ $C_E$ $C_G$ | maximum output |
| 2 | 2.5 mc | 400 ohm | $C_K$ | none | maximum output |
| | 7.0 mc | 400 ohm | none | $C_B$ $C_D$ $C_J$ | |
| 3 | no padding condenser on this band | | | | |
| | 28 mc | 400 ohm | | $C_C$ $C_F$ $C_L$ | maximum output |


MONITOR PICKUP TERMINAL
PHONES
SPEAKER
ANTENNA – GROUND
R32
25Z6GT
6H6
6SK7
T3
T2
1 2
1 2
T4
CH 1
6SK7
6SK7
CA CB CC
25L6 GT-
6SC7
6K8
T1
1 2
L2


L1
C12
C15
CG CJ CL
X
CF
CE
CD
CH CK
C24 C36 C37

# ECHOPHONE
# MODEL EC-3
# PARTS LIST

## CONDENSERS

| SYMBOL | CAPACITY | VOLTAGE | TYPE | SYMBOL | CAPACITY | VOLTAGE | TYPE |
|---|---|---|---|---|---|---|---|
| C1 | Main Tuning & Bandspread | | | C21 | 50 mmf | | Mica |
| 2 | .01 mfd | 400 | Paper | 22 | .01 mfd | 400 | Paper |
| 3 | .05 mfd | 200 | Paper | 23 | .005 mfd | 400 | Paper |
| 4 | .05 mfd | 200 | Paper | 24 | 40 mfd | 150 | Electrolytic |
| 5 | .02 mfd | 200 | Paper | 25 | Twisted Leads | | |
| 6 | 5-6½ mmf | | Ceramicon | 26 | .02 mfd | 200 | Paper |
| 7 | .05 mfd | 200 | Paper | 27 | .02 mfd | 200 | Paper |
| 8 | 25 mmf | | Mica | 28 | .0001 mfd | | Mica |
| 9 | .05 mfd | 200 | Paper | 29 | .0054 mfd | | Mica |
| 10 | .05 mfd | 200 | Paper | 30 | .0005 mfd | | Mica |
| 11 | .02 mfd | 200 | Paper | 31 | 25 mmf | | Mica |
| 12 | 25 mmf | Variable | | 32 | .05 mfd | 200 | Paper |
| 13 | 4-5 mmf | | Mica | 33 | .02 mfd | 400 | Paper |
| 14 | .02 mfd | 200 | Paper | 34 | .02 mfd | 600 | Paper |
| 15 | 1-9 mmf | Variable | | 35 | .05 mfd | 400 | Paper |
| 16 | .05 mfd | 200 | Paper | 36 | 30 mfd | 150 | Electrolytic |
| 17 | .25 mfd | 200 | Paper | 37 | 30 mfd | 150 | Electrolytic |
| 18 | .05 mfd | 200 | Paper | 38 | .0054 mfd | | Mica |
| 19 | 50 mmf | | Mica | 39 | .25 mfd | 200 | Paper |
| 20 | .05 mfd | 200 | Paper | | | | |

## RESISTORS

| SYMBOL | OHMS | WATTAGE | SYMBOL | OHMS | WATTAGE |
|---|---|---|---|---|---|
| R1 | 50,000 | 1/3 | R18 | 2 meg | 1/3 |
| 2 | 30 | 1/3 | 19 | 4,000 | 1/3 |
| 3 | 200 | 1/3 | 20 | 1 meg | 1/3 |
| 4 | 1,000 | 1/3 | 21 | 100,000 | 1/3 |
| 5 | 10,000 | 1/3 | 22 | 250,000 | 1/3 |
| 6 | 50,000 | 1/3 | 23 | 250,000 | 1/3 |
| 7 | 50,000 | 1/3 | 24 | 500,000 | Audio Gain #25-048 |
| 8 | 30 | 1/3 | | | |
| 9 | 100 | 1/3 | 25 | 5 meg | 1/3 |
| 10 | 300 | 1/3 | 26 | 50,000 | 1/3 |
| 11 | 1 meg | 1/3 | 27 | 10,000 | 1/3 |
| 12 | 10,000 | R.F.Gain #25-066 | 28 | 250,000 | 1/3 |
| | | | 29 | 500,000 | 1/3 |
| 13 | 400 | 1/3 | 30 | 150 | 1/3 |
| 14 | 200 | 1/3 | 31 | 300 | 1/2 |
| 15 | 100 | 1/3 | 32 | Ballast Resistor | BK 29D |
| 16 | 300 | 1/3 | | | |
| 17 | 1,000 | 1/3 | 33 | 15 | 1/2 |
| | | | 34 | 1,000 | 1/3 |

## MISCELLANEOUS

| SYMBOL | DESCRIPTION |
|---|---|
| T1 | 1st I.F. Transformer |
| T2 | 2nd I.F. Transformer |
| T3 | 3rd I.F. Transformer |
| T4 | Audio output transformer |
| $CH_1$ | Filter Choke |
| $L_1$ | B.F.O. Coil |
| $L_2$ | Monitor Oscillator coil |
| $SW_1$ | Power switch on audio gain control |
| $SW_2$ | Selectivity switch |
| $SW_3$ | Send-Receive-Monitor switch |
| $SW_4$ | BFO-AVC switch |
| $SW_5$ | Speaker-Phones switch |
| $SW_6$ | ANL switch |

ECHOPHONE RADIO COMPANY

MODEL EC-3