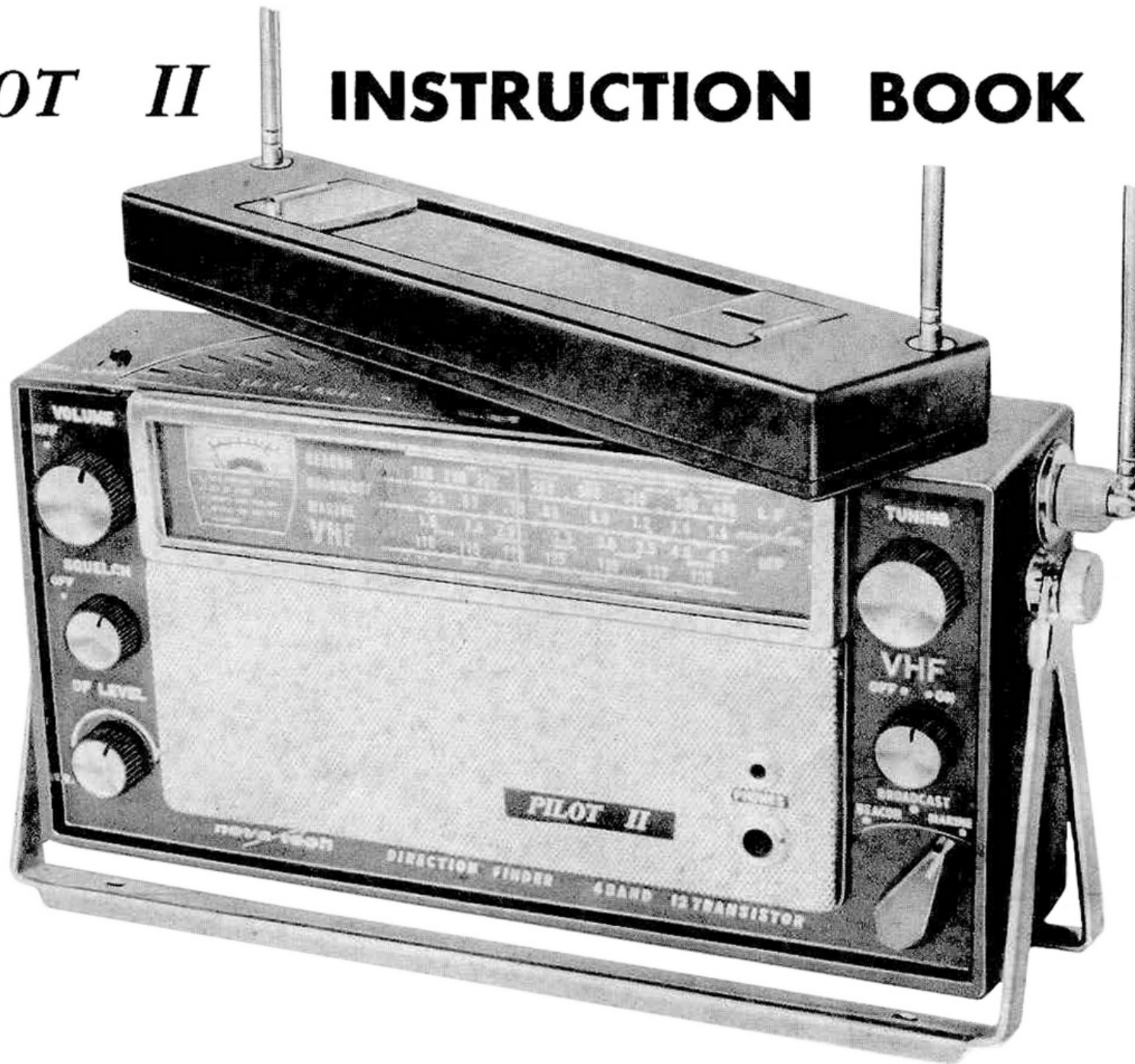


# *PILOT II* INSTRUCTION BOOK



## GENERAL DESCRIPTION

The *PILOT II* is an all transistorized VHF receiver designed and engineered to provide the best possible reception of aircraft frequencies. A built-in antenna receptical for either general purpose or the aircraft whip antenna may be used. A twin Plug-in Antenna Array is used for best airborne reception.

A positive squelch control is used to eliminate static and noise between transmissions making this an excellent standby receiver.

This receiver is cased in a high impact plastic cabinet for minimum weight when carried in the leather carrying case for portable use. For permanent installation, the carrying handle may be folded to form a permanent stand for the receiver in any position.

Power for operation of the receiver is derived from the self contained batteries cased in the cabinet or from EXTERNAL batteries or other DC power source.

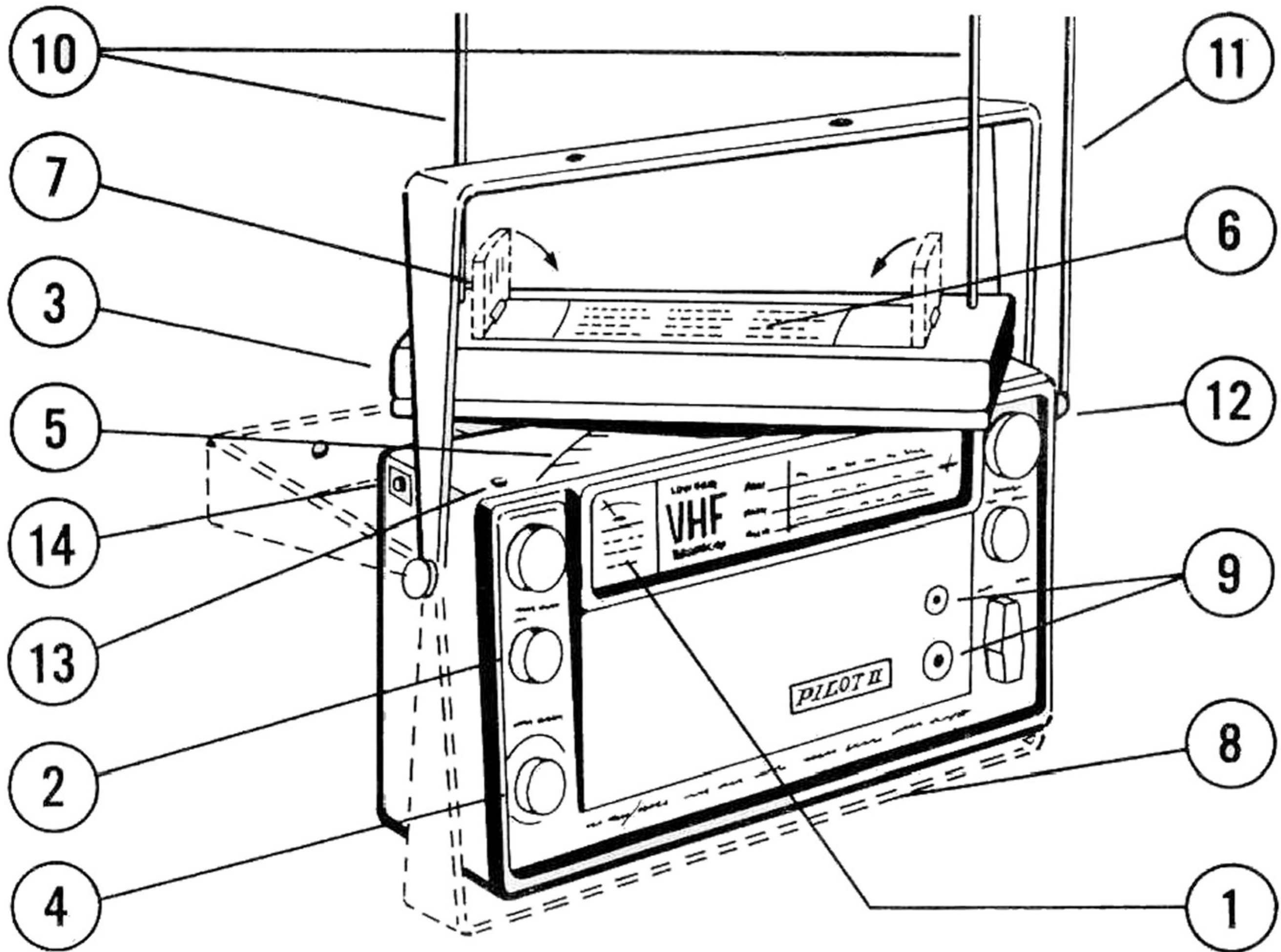
The *PILOT II* VHF receiver also combines a Long Range Radio Direction Finder to give a quick and accurate bearing from any Low Frequency Radio Range, Aircraft Beacon or from Standard Broadcast Stations.

## ELECTRICAL SPECIFICATION:

- |                                     |  |                   |                   |
|-------------------------------------|--|-------------------|-------------------|
| 1. Frequency Range                  | VHF  | 108 MC - 136 MC   |                   |
|                                     | LOW FREQ.  | 190 KC - 400 KC   |                   |
|                                     | BROADCAST  | 550 KC - 1,600 KC |                   |
|                                     | MARINE   | 1.6 MC - 4.5 MC   |                   |
| 2. Sensitivity ( 5 mw above noise ) | VHF  | 120 MC            | 15 $\mu$ V        |
|                                     | LOW FREQ.  | 300 KC            | 47 $\mu$ V/M      |
|                                     | BROADCAST  | 1,000 KC          | 35 $\mu$ V/M      |
|                                     | MARINE   | 3 MC              | 35 $\mu$ V/M      |
| 3. Image Interference Ratio         | VHF  | 120 MC            | 20 db.            |
|                                     | LOW FREQ.  | 300 KC            | 60 db.            |
|                                     | BROADCAST  | 1,000 KC          | 70 db.            |
|                                     | MARINE   | 3 MC              | 55 db.            |
| 4. S/N (Signal to noise ratio)      | VHF  | 120 MC            | 15 $\mu$ V 16 db. |
|                                     | LOW FREQ.  | 300 KC            | (2mV/M) 30 db.    |
|                                     | BROADCAST  | 1,000 KC          | (1mV/M) 30 db.    |
|                                     | MARINE   | 3 MC              | (1mv/M) 30 db.    |
| 5. Output power                     | 2 1/2" Speaker 150mW.  |                   |                   |
| 6. Power Supply                     | 4 Penlite Batteries ( Eveready 915 or equivalent ) or external 6 volt DC power source. |                   |                   |

## **FEATURES OF THE *PILOT II*:**

1. "NULL" METER. Operates on all bands.
2. SQUELCH CONTROL eliminates noise and static between VHF transmissions.
3. ROTATING ANTENNA gives sharp, clean nulls to give accurate bearings. No need to rotate entire set.
4. DF LEVEL CONTROL adjusts needle sensitivity. Also prevents overload from strong signals which could prevent sharp, accurate nulls.
5. 180 degree LEFT - RIGHT BEARING SCALE gives accuracy of 10" diameter compass rose even though set is only 2½" thick.
6. MORSE CODE, a handy guide to help identify beacon signals.
7. CALIBRATED OPTICAL SIGHTS on the rotating antenna flip up for taking visual bearings.
8. REMOVABLE BRACKET is adjustable for horizontal or vertical mounting and can be used as carrying handle.
9. TWO EXTERNAL HEADPHONE JACKS, one for standard headphone, one for miniature earpiece (included with receiver).
10. TWIN PLUG - IN EXTENDABLE ANTENNAS for VHF reception.
11. LONG RANGE EXTENDABLE REMOVABLE WHIP provides maximum VHF signal input.
12. BUILT - IN EXTERNAL VHF ANTENNA JACK for roof top or cartop antenna. Provides greater range. Air-plane whip antenna can also plug in.
13. PUSH BUTTON DIAL LIGHT illuminates entire slide rule calibration scale for easy and accurate tuning at night.
14. BATTERY SAVER SOCKET. External batteries can be plugged in which disconnects the internal batteries thus prolonging their life until needed for portable operation. House current ADAPTER available (extra charge).



## **GENERAL OPERATING INSTRUCTIONS :**

Prior to putting the *PILOT II* into operation open the back cover of the receiver by using a coin to turn the two slotted screws on the back. Remove the cover and insert the batteries packed with the set. Make sure that the batteries are inserted with the proper polarity as marked on the battery case. Replace back cover and tighten the slotted screws and follow instructions for operation.

## **VHF RECEPTION :**

1. Take out VHF whip antenna from the antenna pocket on the side of the leather carrying case. Insert the plug end of the whip into the antenna receptical on the side of the receiver cabinet. Extend whip and place into vertical position.
2. Set VHF knob to ON position.
3. Rotate volume control clockwise to halfway position.
4. Set DF LEVEL control to RADIO position.
5. Turn SQUELCH knob so that the internal hiss noise of the receiver is just audible.
6. Turn the TUNING knob to desired frequency and tune for maximum.
7. Readjust VOLUME control to desired volume after reception of transmission. Between transmissions the receiver remains quiet or when tuning from station to station.
8. Standard or accessory earphone may be used by inserting earphone plug into the front panel jack for individual reception. Loudspeaker is cut out when earphone is plugged into the jack.

## **LOW FREQUENCY OR BROADCAST OPERATION:**

1. Set VHF knob to OFF position.
2. Set band selector switch to BROADCAST or the LOW FREQUENCY band
3. Set DF LEVEL control to RADIO position.
4. Rotate VOLUME control knob clockwise to halfway position.
5. Turn TUNING knob to desired station and tune for maximum volume
6. Readjust volume control for desired volume.
7. For individual reception use earphone.

## PROCEDURE FOR DIRECTION FINDING :

1. Turn the VOLUME control clockwise to turn on power and increase to halfway position.
2. Set VHF knob to OFF position.
3. Select station on the LOW FREQUENCY or BROADCAST band and tune in signal for maximum volume.
4. Turn DF LEVEL knob and set meter to DF LEVEL. Retune by turning the TUNING knob for maximum deflection on meter. Should the meter indicator go past the DF LEVEL reset meter to DF LEVEL by use of the DF LEVEL knob. Rotate antenna for maximum deflection of the meter and again reset to DF LEVEL.
5. Rotate antenna LEFT or RIGHT for minimum reading on the meter ( This is the "null" point of the signal )  
CAUTION: Do not grasp the antenna housing, just slightly push or pull one end of the antenna as the hand will cause error in meter deflection. The rotating antenna on the *PILOT II* moves only 180°. Do not force the antenna past 180° or damage will be done to the antenna housing.
6. When the rotating antenna reaches the "null" or the bearing position the meter deflection will get weaker and at this null point it is generally desirable to increase DF LEVEL slightly so that, when the antenna is rotated a few degrees either side of the null, there will be a noticeable increase in meter deflection. When doing this, it is desirable to adjust DF LEVEL to get the sharpest "null" on the meter.



## **LONG RANGE DIRECTION FINDING:**

### **THEORY OF OPERATION.**

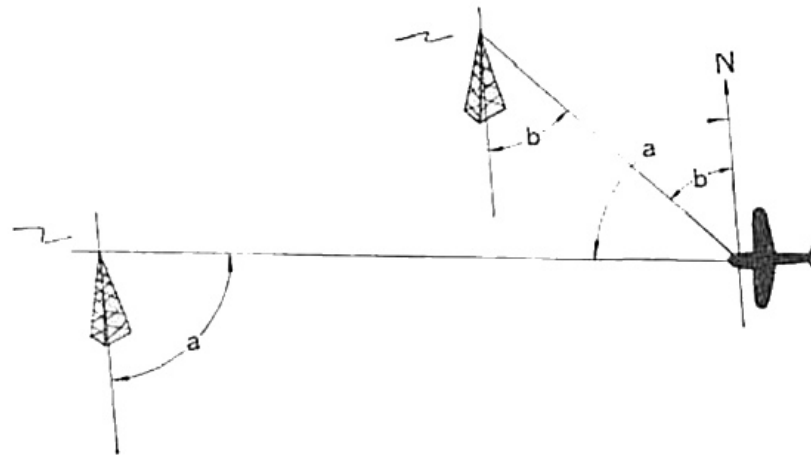
When the incoming signal strikes the broadside of the antenna the antenna has the maximum pickup strength and the reception is the loudest. When either end of the antenna is aimed towards the transmitting station the reception is weakest. With the antenna in this position it will be observed that a small change in the antenna angle provides a relatively large change in signal. For this reason radio bearings are always taken at a minimum signal position ( null ) for greatest accuracy.

### **LEFT AND RIGHT BEARING SCALE :**

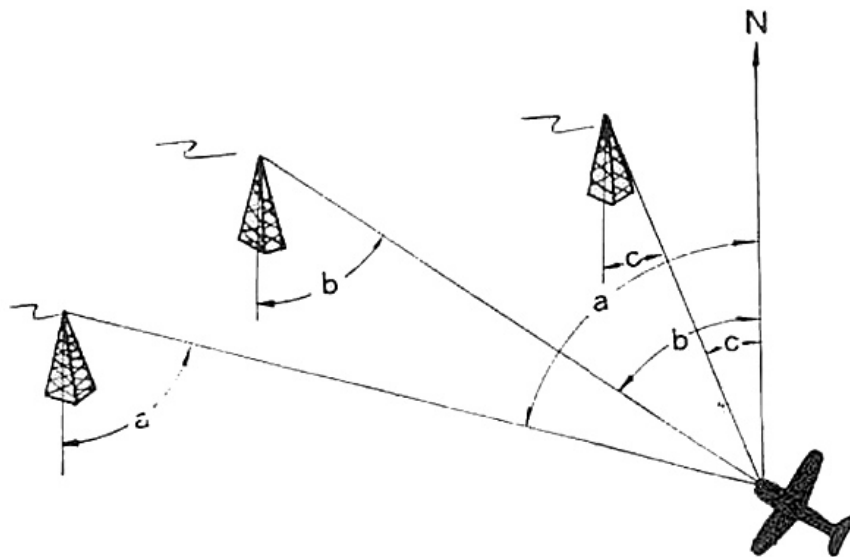
The LEFT and RIGHT BEARING scale is calibrated in degrees 0 to 90 both LEFT and RIGHT from the side of the antenna and is located on the top of the receiver under the rotating antenna housing. This scale is used for locating stations or objects in relative position to the broadside of the receiver. The view and sight finders are snapped up into vertical position to form a pelorus. This calibrated optical sight on the rotating antenna may be used for taking visual bearings. Sighting through the slit and viewing through the calibrated view finder the exact number of degrees left or right may be determined on the LEFT or RIGHT BEARING scale.

## INSTANT POSITION :

To determine the general direction of the incoming signal, an understanding of the following procedure is essential. The rotating antenna gives two nulls, on any signal, each 180 degrees apart. To eliminate this 180 degree ambiguity, when the general direction of the signal is not known but the station can be identified; use the direction finder azimuth scale in conjunction with the magnetic compass. Read the number of degrees on the LEFT BEARING scale if the null point should be on the LEFT or the opposite side if the null is on the RIGHT. Correlate this angle to the compass magnetic North. Take another signal and determine its direction by obtaining the null point and read the azimuth angle on the BEARING scale, the two readings or angles must be in the same quadrant. Identify these two stations on the aviation chart or map with the angle readings taken at the null points; this gives an instant "fix" of position, SEE FIGURE.

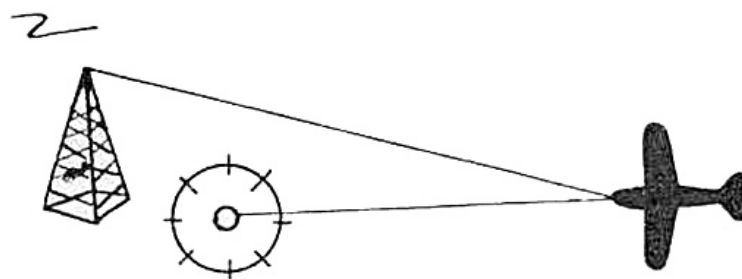


A third station may be also plotted to obtain a more exact position. SEE FIGURE.



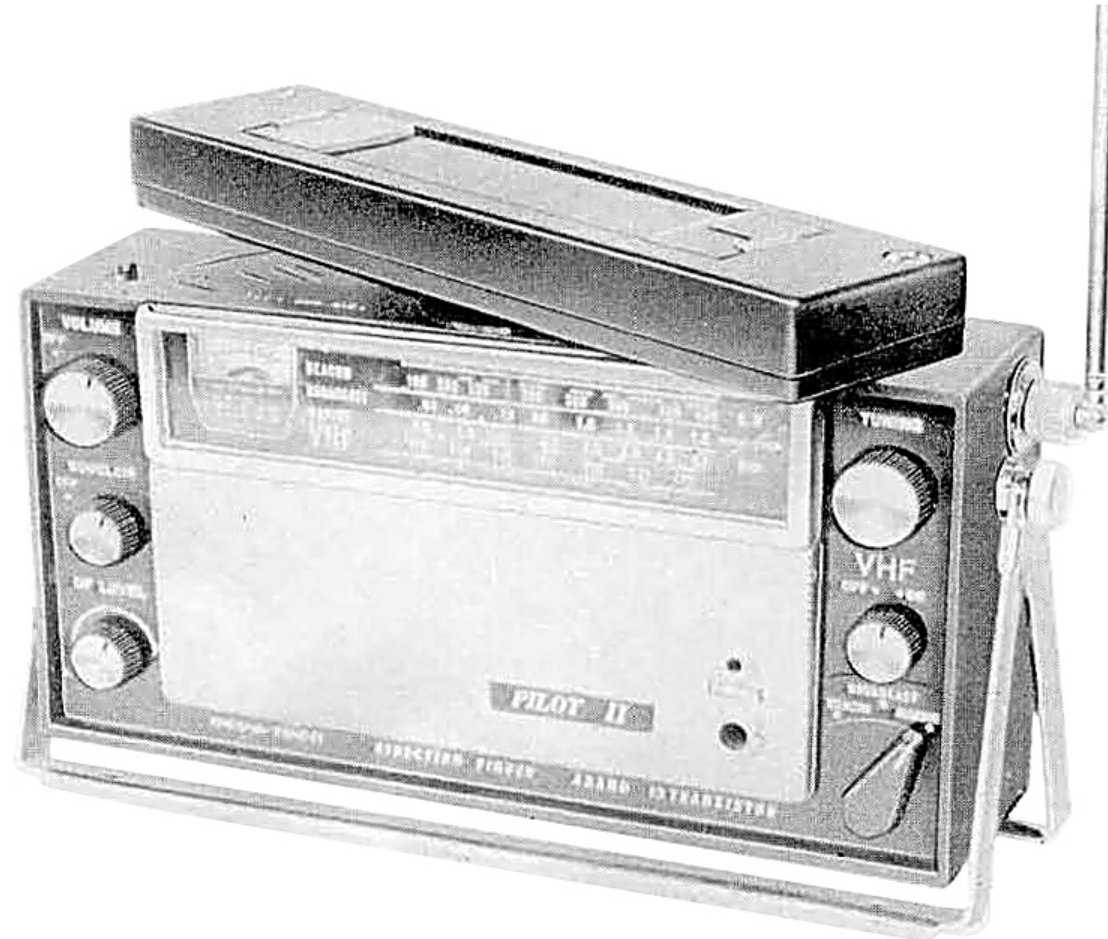
## HOMING :

The *PILOT II* is an ideal instrument for use as a "homing" device. The rotating antenna is set to the null point of the signal and by watching the DF LEVEL meter and by following the course set on the BEARING SCALE, one will be directed toward the transmitting station. For aural use the earphone or the loudspeaker can be used in conjunction with the meter. The null is evidenced by the position of minimum volume as well as smallest reading SEE FIGURE.

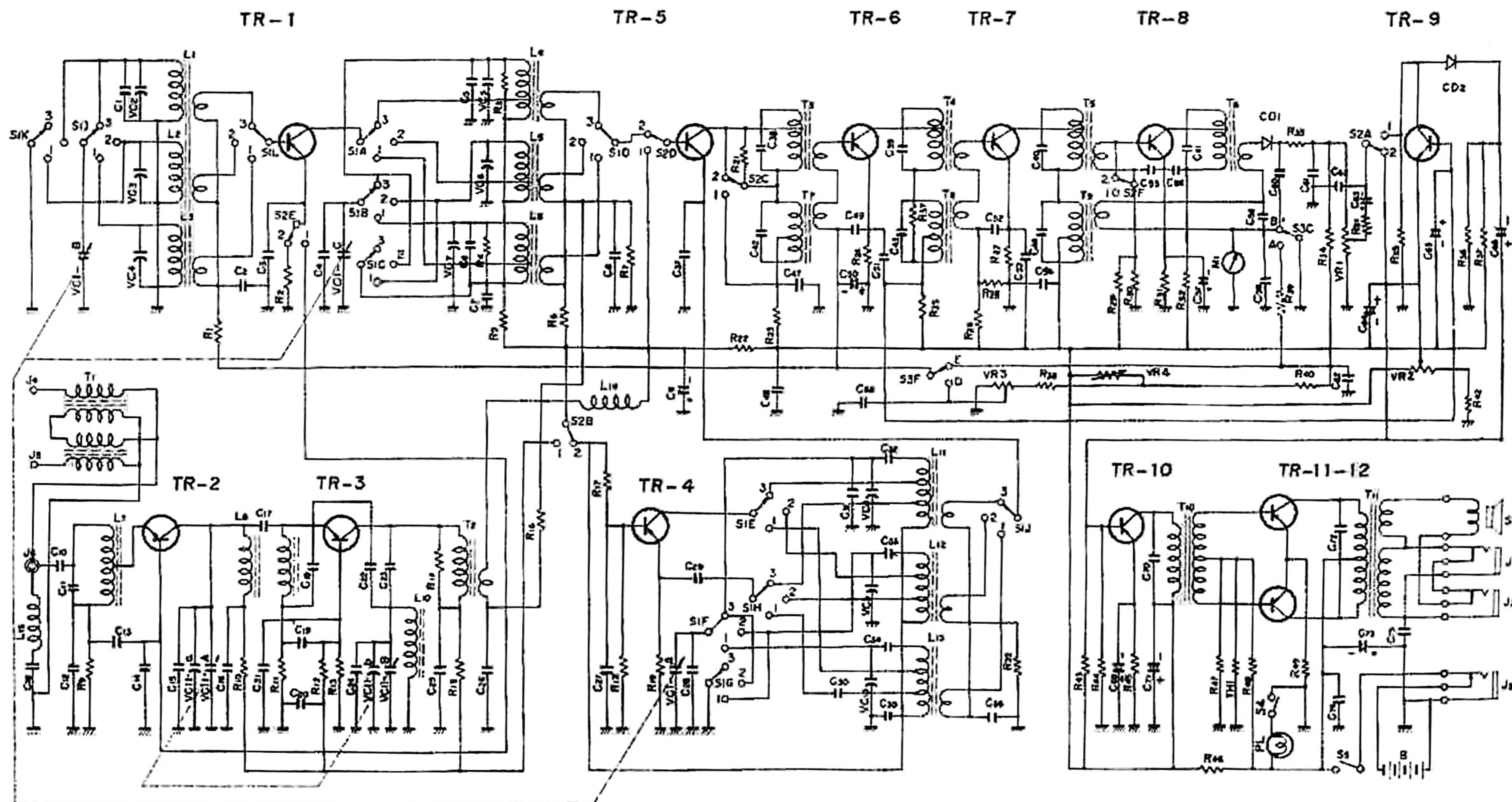


## PERMANENT INSTALLATION :

The radio must be so located that the incoming signals are not shielded from the rotating antenna. Loosen and remove the two thumb screws holding the carrying handle to the receiver. Spread the handle to the stops and fasten with wood or machine screws through the mounting holes in the handle. Replace radio to the installed handle and tighten thumb screw so that the radio is in vertical position. SEE FIGURE.

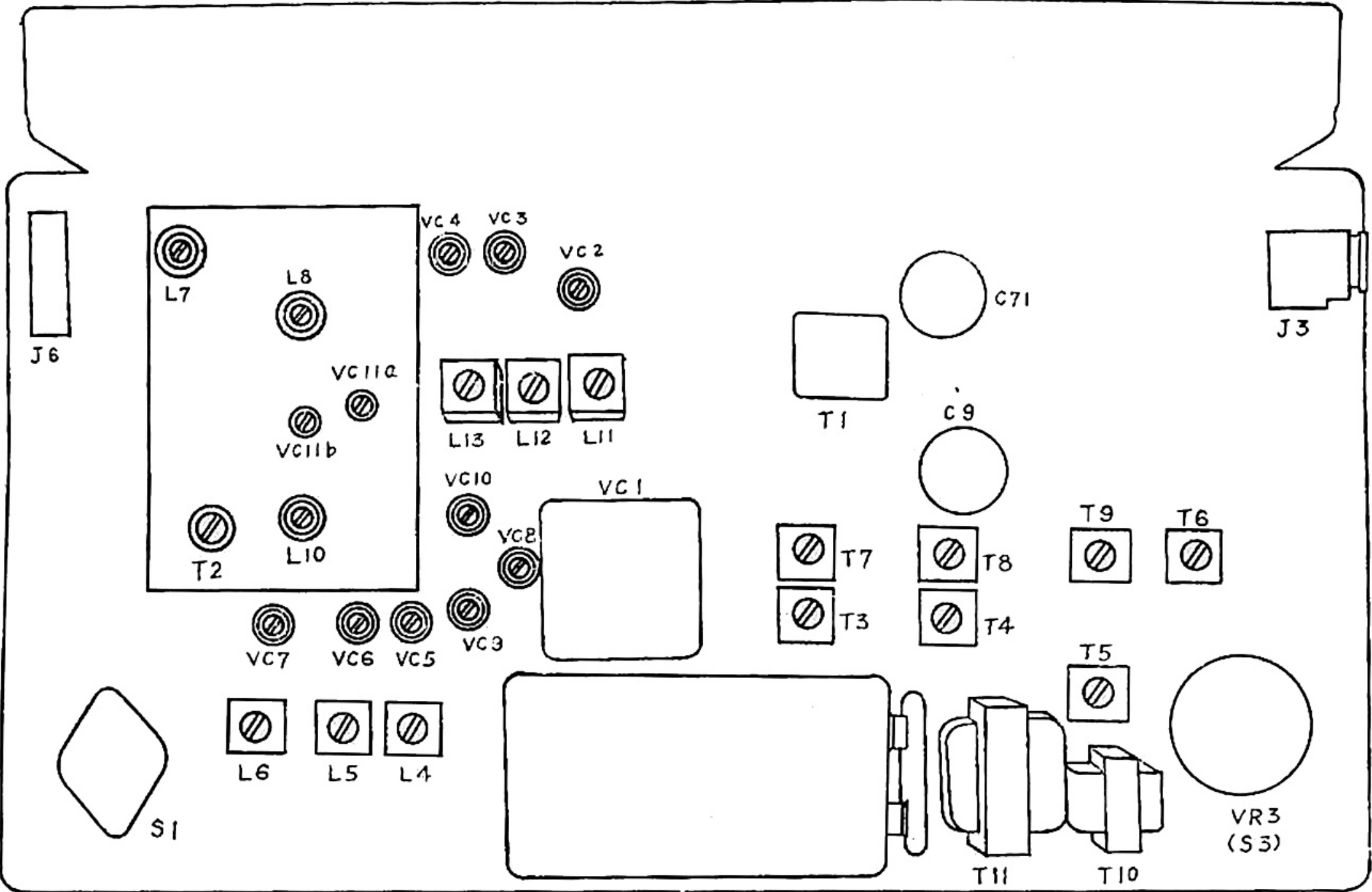


# SCHEMATIC DIAGRAM



- NOTES.
- S1 : BAND SWITCH  
(Shown in Beacon band position)
  - S2 : VHF SWITCH  
(Shown in off position)
  - S3 : LF RADIO SWITCH  
(Shown in normal receiving position)
  - S4 : PL SWITCH
  - S5 : POWER SWITCH
  - J1 : HEAD PHONE
  - J2 : EAR PHONE
  - J3 : EXT PHONE
  - J4 : ANT A+2
  - J5 : ANT B

# VARIABLE PARTS LAYOUT



# PILOT II PARTS LIST

TR1	Transistor	2SA-286	or EQUIV.	L8	RF coil
TR2	"	2SA-162	"	L9	RF choke
TR3	"	2SA-403	"	L10	OSC coil
TR4	"	2SA-160	"	L11	"
TR5	"	2SA-286	"	L12	"
TR6	"	"	"	L13	"
TR7	"	"	"	L14	RF choke
TR8	"	2SA-216		L15	"
TR9	"	2SD-25	or EQUIV.	T1	Matching Transformer
TR10	"	2SB-113		T2	IF Transformer 10.7MC
TR11	"	2SB-220	or EQUIV.	T3	" "
TR12	"	"		T4	" "
CD1	Diode	SD-46		T5	" "
CD2	"	"		T6	" "
TH1	Thermistor	D-32S		T7	IF Transformer 455KC
L1	ANT coil			T8	" "
L2	"			T9	" "
L3	"			T10	Input Transformer
L4	RF coil			T11	Output Transformer
L5	"			C1	Capacitor ceramic 50PF 50V $\pm 5\%$
L6	"			C2	" " 0.05 $\mu$ F " +100% -0
L7	ANT coil			C3	" " " " "
				C4	" " 7PF " $\pm 0.5PF$

C5	Capacitor ceramic	47PF	50V	$\pm 5\%$
C6	" "	5PF	"	$\pm 0.5PF$
C7	" "	0.05 $\mu F$	"	+100% - 0
C8	" "	"	"	"
C9	" chemical	200 $\mu F$	6V	
C10	" ceramic	100PF	50V	$\pm 10\%$
C11	" "	30PF	"	
C12	" "	0.005 $\mu F$	"	+100% - 0
C13	" "	"	"	"
C14	" "	"	"	"
C15	" "	15PF	"	$\pm 5\%$
C16	" "	0.005 $\mu F$	"	+100% - 0
C17	" "	6PF	"	$\pm 0.5PF$
C18	" "	20PF	"	$\pm 5\%$
C19	" "	100PF	"	$\pm 10\%$
C20	" "	0.005 $\mu F$	"	+100 - 0
C21	" "	"	"	"
C22	" "	4PF	"	$\pm 0.5PF$
C23	" "	56PF	"	$\pm 5\%$
C24	" "	15PF	"	"
C25	" "	0.005 $\mu F$	"	+100% - 0
C26	" "	"	"	"
C27	" "	0.05 $\mu F$	"	"

C28	Capacitor ceramic	10PF	50V	$\pm 5\%$
C29	" mylar	0.01 $\mu F$	"	$\pm 20\%$
C30	" "	0.003 $\mu F$	"	"
C31	" ceramic	68PF	"	$\pm 5\%$
C32	" "	180PF	"	"
C33	" styrol	350PF	25V	"
C34	" styrol	1000PF	25V	"
C35	" ceramic	0.05 $\mu F$	50V	+100% - 0
C36	" "	"	"	"
C37	" "	50PF	"	$\pm 5\%$
C47	Capacitor ceramic	0.01 $\mu F$	"	+100% - 0
C48	" "	0.005 $\mu F$	"	"
C49	" "	0.01 $\mu F$	"	"
C50	" chemical	10 $\mu F$	3V	
C51	" ceramic	0.05 $\mu F$	50V	+100% - 0
C52	" "	0.01 $\mu F$	"	"
C53	" "	0.05 $\mu F$	"	"
C54	" "	0.01 $\mu F$	"	"
C55	" "	"	"	"
C56	" "	"	"	"
C57	" chemical	10 $\mu F$	3V	
C58	" ceramic	500PF	50V	$\pm 10\%$
C59	" "	0.05 $\mu F$	"	+100% - 0



C60	Capacitor	ceramic	0.01 $\mu$ F	50V	+100% - 0
C61	"	"	"	"	"
C62	"	"	0.05 $\mu$ F	12V	$\pm$ 20%
C63	"	chemical	1 $\mu$ F	6V	
C64	"	"	10 $\mu$ F	"	
C65	"	"	3 $\mu$ F	"	
C66	"	"	1 $\mu$ F	"	
C67	"	ceramic	0.002 $\mu$ F	50V	+100% - 0
C68	"	"	0.005 $\mu$ F	"	"
C69	"	chemical	30 $\mu$ F	3V	
C70	"	mylar	0.0068 $\mu$ F	50V	$\pm$ 20 %
C71	"	chemical	200 $\mu$ F	6V	
C72	"	mylar	0.1 $\mu$ F	50V	$\pm$ 20 %
C73	"	chemical	30 $\mu$ F	6V	
C74	"	ceramic	0.005 $\mu$ F	50V	+100% - 0
C75	"	"	0.01 $\mu$ F	"	"
C76	"	"	100PF	"	$\pm$ 5%
R1	Resistor	fixed	RA1/10CZ RA1/ 8BZ	2.2K $\Omega$	$\pm$ 10%
R2	"	"	"	1.2K $\Omega$	$\pm$ 5%
R3	"	"	"	150K $\Omega$	$\pm$ 10%
R4	"	"	"	47K $\Omega$	"
R5	"	"	"	2.2K $\Omega$	"
R6	"	"	"	47K $\Omega$	"

R7	Resistor	fixed	RA1/10CZ RA1/ 8BZ	12K $\Omega$	$\pm$ 10%
R9	"	"	RA1/10CZ	100 $\Omega$	$\pm$ 5%
	(For 2SA-376)		"	220 $\Omega$	"
R10	"	"	"	1 K $\Omega$	$\pm$ 10%
R11	"	"	"	680 $\Omega$	"
R12	"	"	"	5.6K $\Omega$	"
R13	"	"	RA1/10RL	2.2K $\Omega$	"
R14	"	"	"	5.6K $\Omega$	"
R15	"	"	"	100 $\Omega$	"
R16	"	"	"	2.2K $\Omega$	"
R17	"	"	RA1/10CZ RA1/ 8BZ	22K $\Omega$	"
R18	"	"	"	5.6K $\Omega$	"
R19	"	"	"	1K $\Omega$	"
R20	"	"	"	2.2K $\Omega$	"
R21	"	"	"	5.6K $\Omega$	"
R22	"	"	"	100 $\Omega$	"
R23	"	"	"	2.2K $\Omega$	"
R24	"	"	"	1K $\Omega$	$\pm$ 5%
R25	"	"	"	3.9K $\Omega$	"
R26	"	"	"	18K $\Omega$	$\pm$ 10%
R27	"	"	"	470 $\Omega$	"

R28	Resistor fixed	RA1/10CZ RA1/ 8BZ	-2.7K $\Omega$	$\pm 10\%$	R49	Resistor fixed	RA1/10CZ RA1/ 8BZ	4.7 $\Omega$	$\pm 10\%$
R29	//	//	18K $\Omega$	//	R61	//	//	470 $\Omega$	//
R30	//	//	2.7K $\Omega$	//	VC1	Capacitor	variable		
R31	//	//	470 $\Omega$	//	VC2	//	trimmer		
R32	//	//	100 $\Omega$	//	VC3	//	//		
R33	//	//	330 $\Omega$	//	VC4	//	//		
R34	//	//	10K $\Omega$	$\pm 5\%$	VC5	//	//		
R35	//	//	10K $\Omega$	$\pm 10\%$	VC6	//	//		
R36	//	//	6.8K $\Omega$	//	VC7	//	//		
R37	//	//	//	//	VC8	//	//		
R38	//	//	56K $\Omega$	$\pm 5\%$	VC9	//	//		
R39	//	//	10K $\Omega$	$\pm 10\%$	VC10	//	//		
R40	//	//	33K $\Omega$	$\pm 5\%$	VC11	//	variable		
R42	//	RA1/10CZ RA1/ 8BZ	-4.7K $\Omega$	//	VR1	Resistor	//	3K $\Omega$ (D)	
R43	//	//	22K $\Omega$	$\pm 10\%$	VR2	//	//	3K $\Omega$ (B)	
R44	//	//	4.7K $\Omega$	//	VR3	//	//	10K $\Omega$ (B)	
R45	//	//	470 $\Omega$	//	VR4	//	//	20K $\Omega$ (B)	
R46	//	//	100 $\Omega$	//	J1	Head phone jack			
R47	//	//	330 $\Omega$	//	J2	Ear phone jack			
R48	//	//	6.2K $\Omega$	$\pm 5\%$	J3	EXT PWR jack			
(For 2SB-328)		//	5.1K $\Omega$	//	M1	Signal Level meter			
					SP	Speaker			
					PL	Pilot Lamp			

## **BATTERY REPLACEMENT :**

Replacement of batteries should be 1.5 volts each. Batteries with lower rating will reduce less than maximum signal reception.

## **BATTERY SAVER PLUG AND CORD :**

The end of the cord terminates in 2 bare wires that can be attached to any 6 volt DC source or other 6 volt batteries.

Copper colored wire to positive ( + ), Silver colored wire to negative ( - ).

CAUTION : DO NOT USE VOLTAGE HIGHER THAN 6 VOLTS OR RECEIVER WILL BE DAMAGED. WHEN RECEIVER IS NOT IN USE OR STORED FOR ANY LENGTH OF TIME TAKE OUT BATTERIES AS BATTERIES MAY LEAK AND CAUSE CORROSION IN THE SET.

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