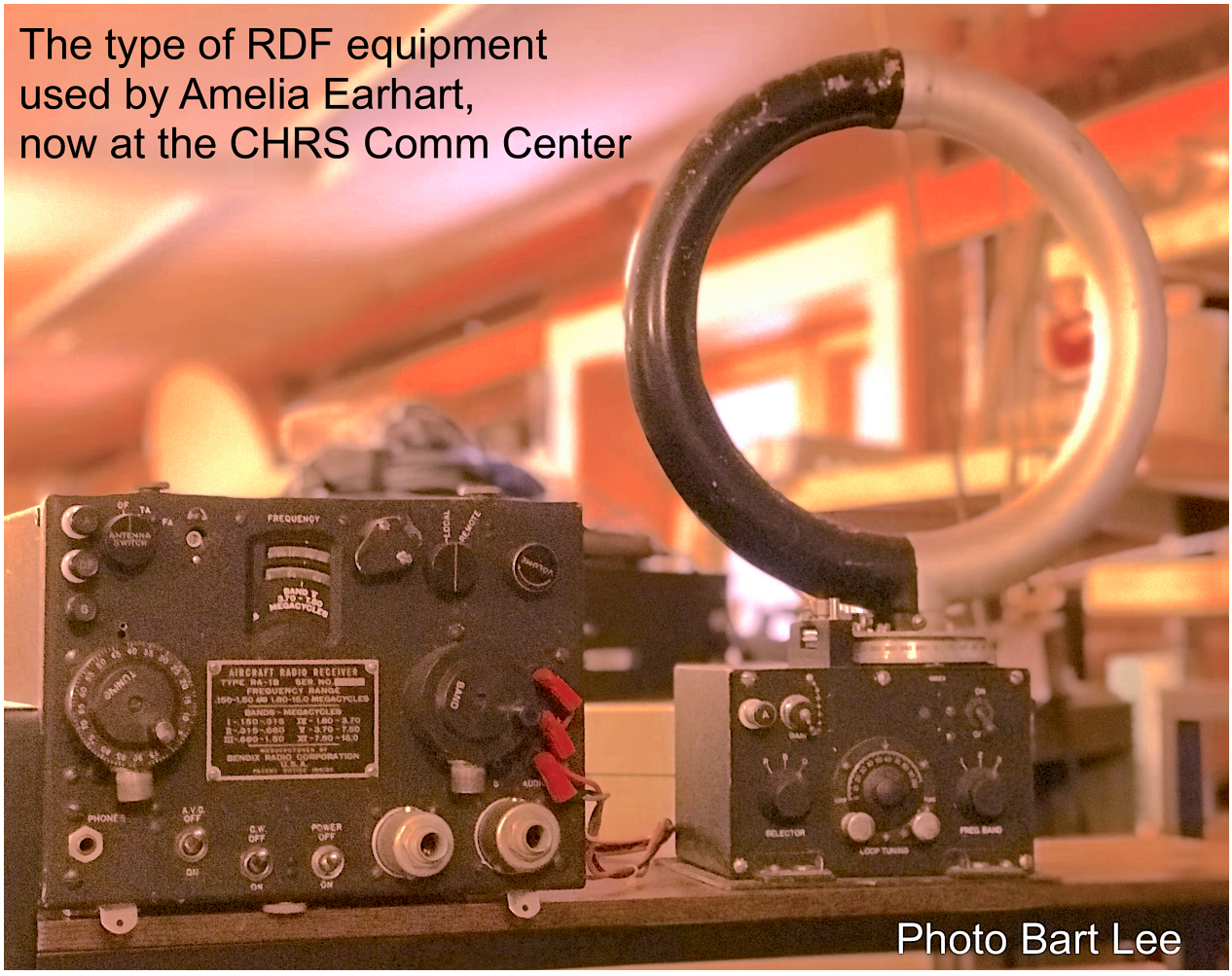
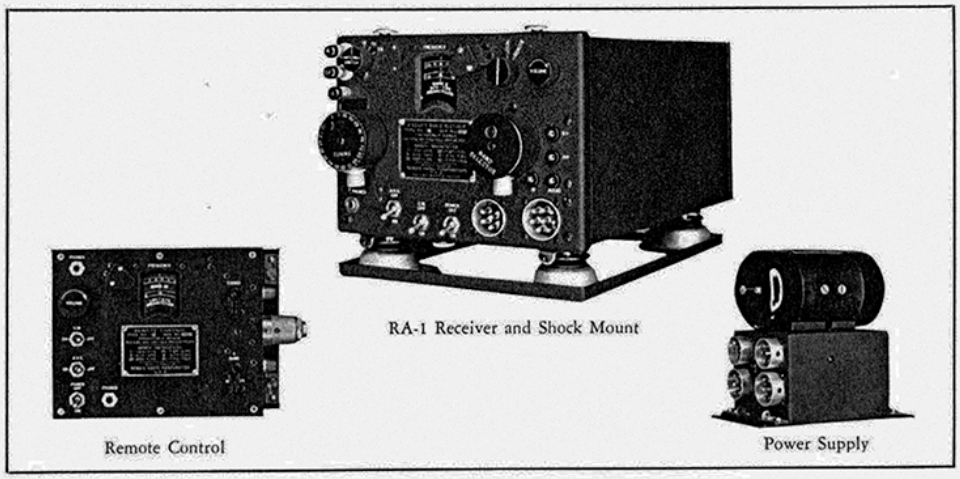
Amelia Earhart's Loop Antenna Receiver

By Bart Lee, K6VK, CHRS Archivist

World Famous aviatrix Amelia Earhart flew into the South Pacific in 1937 and was never heard from again, as previously noted. She used a Bendix RDF radio using the Bendix loop antenna previously discussed, although, as previously noted, it didn't seem to do her much good. But as a result of a donation by CHRS supporter James Falls, we have that Bendix receiver (sort of … in the later Navy version). So special thanks to Jim Falls (K6FWT, Eureka): now from two donors we have the full Amelia Earhart RDF set-up.





RA-1 RECEIVER

General—Recognized as the ultimate in reliability, RA-1 receivers combine precision construction with hand-picked components. Wide frequency coverage, high stability and excellent calibration accuracy have won wide acceptance of this unit as a general purpose aircraft receiver for both commercial and military operations.

Circuit—8-tube superheterodyne. Intermediate frequency 1630 kilocycles. Beat frequency oscillator included for telegraph reception. Switch provided to select fixed, trailing, or direction-finding antenna.

Frequency Range—Six calibrated bands with an overlap of approximately 2% cover either one of the two following available frequency ranges:

(A)	150- 1500 kilocycles	2000-200 meters
	1800-15000 kilocycles	166- 20 meters
(B)	150- 1500 kilocycles	2000-200 meters
	2500-20000 kilocycles	120- 15 meters

Frequency Calibration and Stability—The dial is calibrated directly in megacycles with an accuracy of 1.5% below 1500 kilocycles and 0.75% above 1500 kilocycles. This accuracy is maintained under the following conditions:

1. Any 20°C variation in temperature between minus 20°C and plus 50°C.
2. Humidity variations between zero and 100%.
3. Battery voltage variation of 15%.
4. Normal vibration as encountered in aircraft.
5. Manipulation of sensitivity control from maximum to minimum.

A mask rotates with the band-change switch and covers scales not in use. A linear scale is always visible in addition to the calibrated scale in use. This linear scale moves one main division for each revolution of the tuning crank which is calibrated from 0-100. Thus the tuning adjustment may be reset to one part in 5000. The frequency can be reset within 0.1 per cent by using a previously calibrated setting.

Control—The receiver is designed to be operated locally, using the controls mounted on its front panel, or from any remote point within the airplane through the use of the MR-1 remote control unit which includes duplicate operating controls. Calibration accuracy is not as good with remote tuning controls and local control is recommended whenever possible.

Sensitivity—The C.W. sensitivity of the receiver is 2.5 microvolts or better for a 50 milliwatt output when the volume control is adjusted to give a noise output of 5 milliwatts with no carrier input. The sensitivity of the receiver is 5 microvolts or better for the standard output of 50 milliwatts into a 300 ohm load, with a signal-to-noise power ratio of at least 4 to 1, and an input signal 30% modulated at 400 cycles.

Selectivity—The total band width in kilocycles at various reference frequencies for an attenuation of 20, 40 and 60 decibels is as follows:

	250 Kilocycles	*500 Kilocycles*	*3000 Kilocycles*
20 Decibels	10	13	20
40 Decibels	17	22	33
60 Decibels	25	30	47

Power Output—50 milliwatts with less than 10% distortion. The maximum available power is greater than 1000 milliwatts. Models are available with either 600 or 4000 ohm output impedance.

Power Requirements—Available for operation from either a 12 or 24 volt primary power source. A separate dynamotor such as the MP-5 unit is required as a high potential source. When operated with Bendix TA-2 or TA-3 transmitters the combined MP-10 transmitter-receiver power unit is often used as a source of high potential for the RA-1. The overall power consumption of the receiver is:

4.5 Amperes at 14 Volts 2.3 Amperes at 28 Volts

Dimensions and Weights—

RA-1 Receiver, Shockmount and Tubes Weight—26.5 Pounds 12.0 Kilograms
Height ..... 8⅞ Inches—22.54 Centimeters
Width ..... 9⅞ Inches—25.08 Centimeters
Depth ..... 16⅛ Inches—40.96 Centimeters

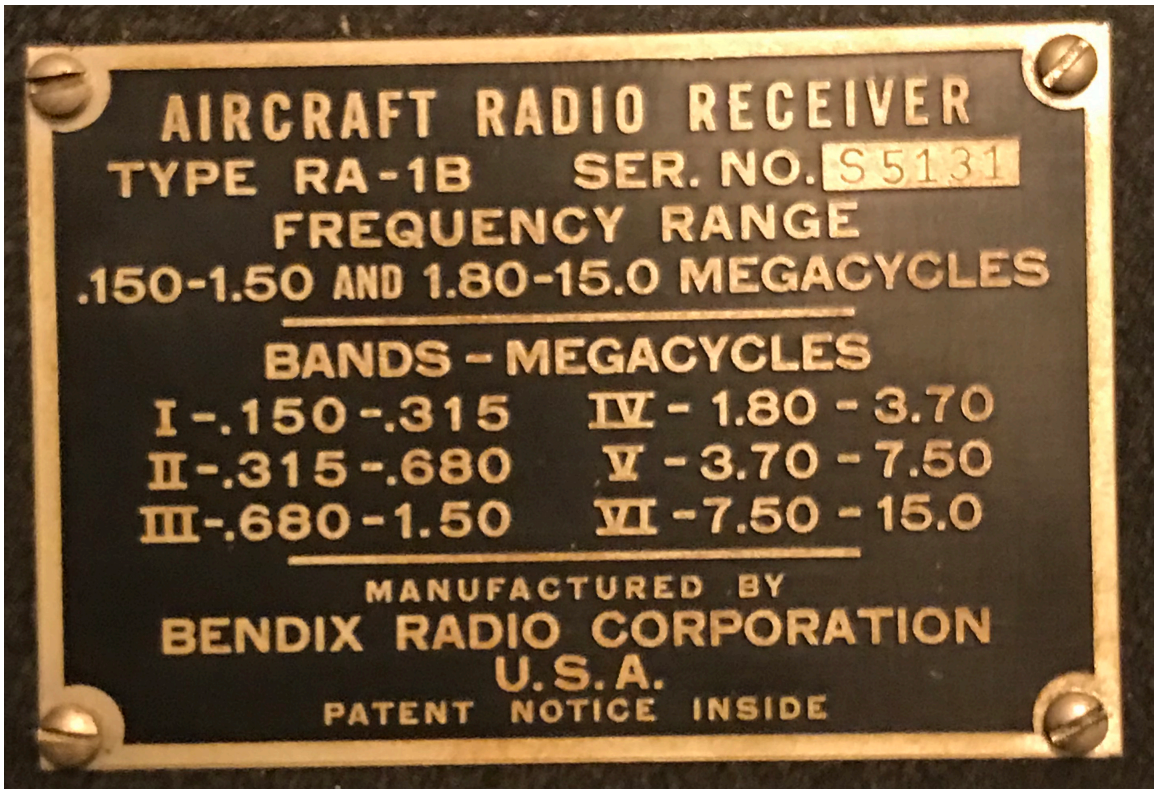
MR-1 Remote Control Unit Weight— 4.4 Pounds 2.0 Kilograms
Height ..... 7⅛ Inches—18.10 Centimeters
Width ..... 9¾ Inches—24.76 Centimeters
Depth ..... 3¼ Inches— 8.25 Centimeters

MP-5 Power Supply Unit Weight— 8.9 Pounds 4.0 Kilograms
Height ..... 7½ Inches—19.05 Centimeters
Width ..... 7⅜ Inches—18.73 Centimeters
Depth ..... 4⅜ Inches—11.11 Centimeters

Remarks—An antenna selector switch is provided on the front panel of all RA-1 series receivers and permits the choice of operation with either a fixed or trailing antenna, or with a direction-finding shielded loop antenna. To operate with the latter, the MN-13 direction finding accessories may be employed as shown on another page of this catalog.

From: https://www.radiomuseum.co.uk/ra1b.html

This is the Navy nameplate on the Bendix shortwave RDF receiver, RA-1B, in the Jon Winchell Communications Center:



This receiver covered the then marine and aeronautical bands at Low Frequency, 150 KHz to 315 KHz, as well as HF shortwave up to 15 MHz. RadioMuseum.Org notes:

"The receiver can be operated locally and remote via bowden-cables, connected to the tuning-knob and the band-switch knob. Reception of AM/CW signals. Tube no.8 is the BFO. Audio output 500 ohm. Long wave and medium wave signals were used in conjunction with direction finding equipment."

There follows a very atmospheric photograph of the associated Bendix loop antenna, from the Smithsonian Institution:

From the Smithsonian:

Bendix Radio Direction Finder

*** The loop worked by manually turning the crank on the controller until a “null” or point of low-signal strength was found.

CAPTION:

[Amelia] Earhart used an antenna similar to this later model in her attempt to locate Howland Island. **TYPE:** Artifact

IMAGE DATE: 2012 **CREDIT:** National Air and Space Museum, Smithsonian Institution **ORIGIN:** National Air and Space Museum, Smithsonian Institution

CREATOR: Dane A. Penland NASM2012-02106

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