

THE COMMUNICATION RECEIVER

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THE NAVY MODEL RAS RECEIVER: A THINLY DISGUISED HRO JUNIOR?

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A prime example of the high-quality communications gear produced for the U. S. Navy by the National Company before and during WWII was the Radio Receiving Equipment, Models RAS-1 through -5. This receiver, an offspring of the National HRO, was designed to meet a Navy requirement for a high-quality receiving station tuning continuously from 190 kHz to 30 MHz.

The RAS was impressive to see (or lift), with the receiver panel dominated by the HRO-style PW dial. Clad in a gleaming black crackle finish, with its four component units mounted in a 39-1/2" table rack, the assembled unit weighed in at 119 lbs. Included were the receiver, power supply, seven coil sets, and a Rola 8" PM speaker. The equipment required only an antenna and a 115-VAC power source for operation.

Aside from the apparent quality of National products of the 1930s, the features demanded by the Navy included copper plating of all steel parts, a separate output transformer for headphones, and sealed oil-filled bypass capacitors. The RAS was ruggedly constructed of the best materials and components of the day.

While this radio was produced for about five years, an RAS in original form is seldom seen. W3VVS, an authority on the set, gives us an overview of the set and its history. -K3ZJW-

During World War II thousands of National receivers were manufactured for the war effort in many different configurations. One of the best-known at the time was the Model RAS.

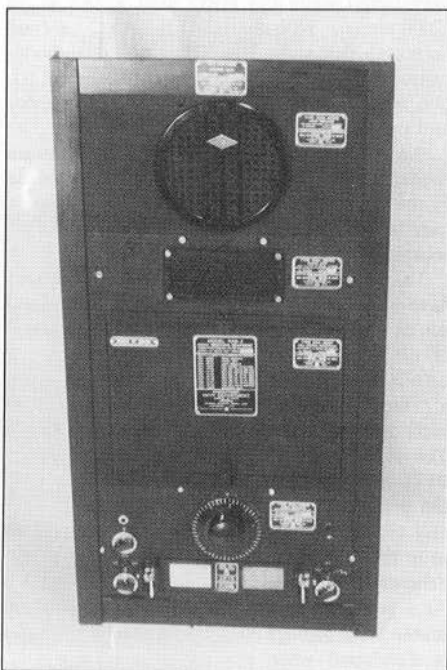
In the late 1930s, the National HRO had found wide acceptance as a reliable communications receiver by the Civil Aeronautics Administration, the airlines, state police departments, and the military. However, the Navy questioned the need for the crystal filter for monitoring purposes. Further, the HRO did not cover important maritime frequencies.

Delving back into HRO history, in February 1936 the HRO Junior was advertised "for those who require the high performance of the Stan-

dard HRO but do not need its extreme versatility." The circuitry and mechanical details of the HRO Junior were identical to those of the Standard HRO (later termed the HRO Senior), but the lower priced Junior omitted the Lamb crystal filter and the "S" meter, and employed general-coverage coils with two amateur bands per set. The RAS bears a striking resemblance to the HRO, and at first glance is often identified as a "Navy HRO," but the RAS can better be considered an outgrowth of the HRO Junior design.

The RAS-1 was first made for the Bureau of Engineering of the Navy Department by the National Company for the prime contractor, the General Electric Supply Corp., Washington, DC, with a contract date of December 7, 1939. Subsequent contracts for Models RAS-2 through -5 were let from 1940 through 1943, with National becoming both the prime contractor and the manufacturer in 1943 for the Bureau of Ships.

The receiver was intended for use both at sea, where a 60-Hz source was readily available, and at shore stations, some of which still used 25-Hz



power. For the latter (for example, the Panama Canal Zone and parts of Hawaii), a 25-Hz power pack was provided. The set could even be operated with batteries, with the most economical power coming from a 180-volt B supply. (Nominal requirements are 240 VDC at 70 mA and 6.3 V at 3.4 A.)

The receiver circuit is essentially "HRO," but with important differences. There is no S-meter or crystal filter. The intermediate frequency is 175 kHz, versus the conventional 456 kHz. The seven coils provide continuous coverage from 190 kHz to 30 MHz, while the nine coil sets for the HRO cover 50 kHz to 30 MHz with a 430-480 kHz gap. Because of the differing IFs, RAS and HRO coils are *not* interchangeable. The RAS coil sets as issued consisted of matched coils, each with the same serial number, but sets from one RAS model can be used in any of the others. The only difference is in the thickness of the mounting plates, the early versions being assembled on 3/16" aluminum while the later models used 1/16" steel.

The output tube is a 6V6 (5000-ohm load impedance) while the HRO used a 2A5 or 42 (7000 ohms). With the HRO the AVC - second detector - first audio is a 2B7 or 6B7 dual-diode-pentode; the RAS used instead a 6F8G dual triode, which functioned as a triode-biased detector and an amplified delayed AVC stage.

An optional subchassis, the CKB-50142 noise limiter, became available in the mid-1940s. Made by the Mission Bell Radio Co. of Los Angeles, it used a 6SN7 and 6SQ7. Plugged into the 6F8G socket, it was left in place permanently.

The first and second 175-kHz IF transformers have one-megohm swamping resistors connected across the full secondary windings, while the grid of the following IF tube is connected to a tap on the secondary winding. The output of the BFO is coupled to the grid of the second detector as well as to the grid of the delayed-AVC tube. As a result, considerable AVC voltage is developed when the BFO is on, re-

COMPLETE MODEL RAS EQUIPMENT

Radio Receiver	CNA-46080
Power Unit, 60-Hz	CNA-20090
Power Unit, 25-Hz	CNA-20089
Loudspeaker	CNA-49105
Loudspeaker*	CNA-49106
Mounting Rack	CNA-10036
Coil Container	CNA-10037
Coil Set, 190-450 kHz	CNA-47156
Coil Set, 450-900 kHz	CNA-47157
Coil Set, 0.9-2.0 MHz	CNA-47158
Coil Set, 2.0-4.0 MHz	CNA-47159
Coil Set, 4.0-7.0 MHz	CNA-47160
Coil Set, 7.0-14 MHz	CNA-47161
Coil Set, 14-30 MHz	CNA-47162

*Optional unit for table mounting, 10-1/4" W X 9-3/8" H X 7-1/4" D.

ducing the sensitivity unless the AVC switch is turned off.

The headphone circuit differs from that of the HRO in that a separate sealed output transformer provides 10 mW of 600-ohm audio from the 6V6, the regular transformer being mounted with the loudspeaker.

The choice of a 175-kHz IF came from the need to receive Government, point-to-point, maritime and aircraft frequencies in the radio spectrum between 195 and 550 kHz. Neither the HRO Senior nor the Junior will tune through the 430-480 kHz range because of the

456-kHz IF. Furthermore, any second detector generates harmonics of the applied IF signal. With a power detector handling high signal voltages, harmonics (up to the third) can represent a large portion of the fundamental IF signal applied to the detector. The third harmonic of 175 kHz is 525 kHz, which, in the event of leakage from the second detector back to the first detector, could cause "birdies" (spurious responses). However, 525 kHz is safely above maritime frequencies (500 kHz in particular) and below the BC band of 540 kHz and above, so 175 kHz represents a good compromise. Image response at high frequencies suffers, of course.

The RAS power unit used a 5Z3 rectifier and a capacitor-input filter with 17-Hy reactor and paired 4-uF capacitors. The tube and fuses are accessible through the removable front grille.

During the war and afterward the RAS was used to monitor strike frequencies during naval operations, to listen to air-sea rescue channels, and as a control-tower monitor at locations not served by the Army Airways Communications System (AACS). Radio-repair facilities of individual land-based naval aircraft squadrons, Carrier

Aircraft Service Units (CASUs), and Marine Air Groups (MAGs) usually managed to latch onto an RAS to listen to Armed Forces Radio, and, depending on location, to BC stations from the continental United States.



Rear view of the power unit. [Photos: KB2EVN]