



Type 31/1 'Sweetheart'
Country of origin:
England

This supplement chapter is a follow up and should be read in conjunction with the Type 31/1 section in the 'Great Britain' chapter of WftW Volume 4.

DATA SUMMARY

Organisation: SOE
Design: Willy Simonsen.
Manufacturer: Hale Electronic Co. Ltd, London.
Year of Introduction: 1943.
Purpose: Easy to conceal miniature 'pocket' receiver for listening to BBC news broadcasts.
Circuit features: Regenerative detector, AF (2x).
Frequency coverage: 6-12MHz (Dial scale in metres).
AF Output: Hearing-aid type crystal earphones.
Valves: 1T4 (3x).
Power Supply: Standard 4½V torchlight battery for LT; a 30V hearing-aid HT dry battery.
Consumption: HT ½mA; LT 50mA.
Size (cm) and Weight (kg):

	Height	length	width	weight
Type 31/1 receiver	3	14	11	0.5
Battery unit	2½	10	8	0.4
Complete packed set	8	19	14	1.8

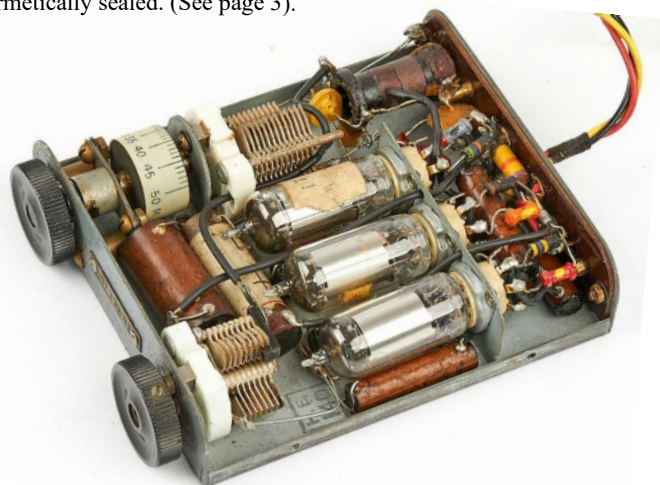
Accessories: Miniature earphones in a tin box, 10m aerial and 3m earth wire, 2 spare LT batteries, one spare HT battery and an instruction sheet.

Remarks

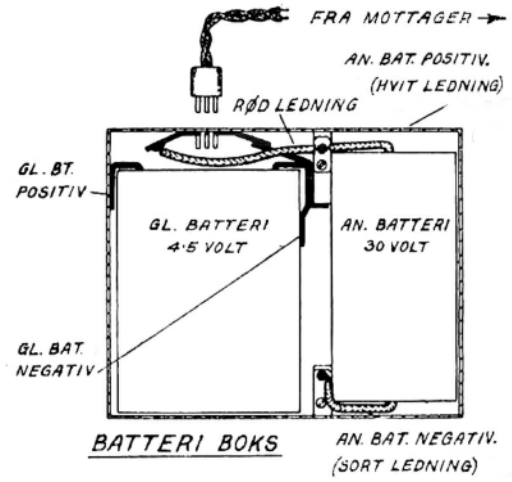
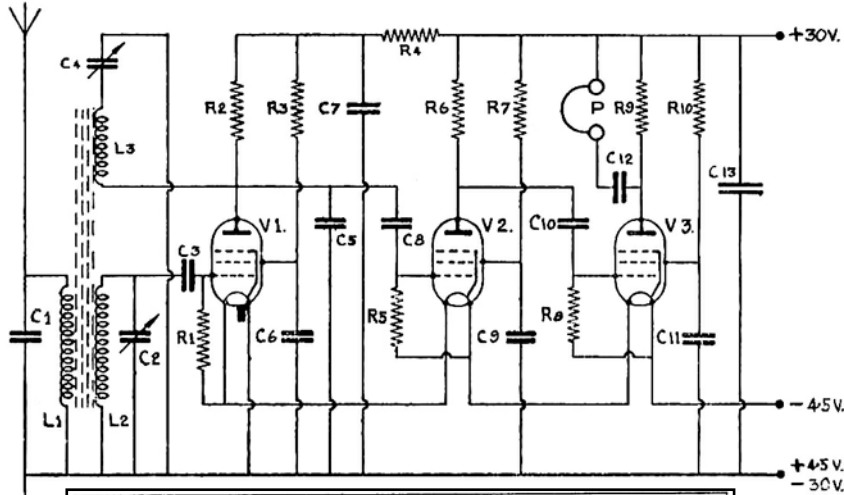
Type 31/1, affectionately known as 'Sweetheart', was a miniature radio receiver dropped in large quantities by SOE from early 1943 onwards into German occupied countries for listening to the BBC news broadcasts, transmitted on shortwave. The basic design of the Type 31/1 was extremely simple comprising a regenerative detector with two AF stages. The tuning dial was calibrated in metres and had a reduction gear assembly. The batteries were located in a separate metal box, connected to the receiver via a short cable and plug. There was no on/off switch, and it was disconnected by just removing the battery plug from the power pack. The receiver was powered by an easy to obtain 4½V electric torch battery for the filaments which had an operational life of about 50 hours. For the HT a 30V miniature hearing aid battery was used with a life of about 150-200 hours. The current was only 0.7mA, dropping to 0.36mA at 20V. This was a primary feature of its design which used resistance-capacitive coupling, avoiding an output transformer. A pair of piezo-crystal type hearing-aid earphones, produced in the USA by Brush, were used in place of normal high impedance headphones. This was not only a matter of further miniaturisation which eased the concealment of the receiver, but reduced the HT current by a factor three. The only drawback of this type of earphone was that it not withstand the low pressure in an aircraft at high altitudes when delivered by parachute. They were therefore packed into a small hermetically sealed tobacco tin preventing damage which would otherwise had occurred. The label on top of the Type 31/1 box read 'Not to be flown above 15,000 feet unless hermetically sealed. (See page 3).



Front panel (above) and rear panel view (below). Note the typical Brush hearing-aid earphones socket at the left hand side of the rear panel.



Internal view of the Type 31/1 receiver showing the three valves, tuning condenser with reduction gear and calibrated dial, and reaction condenser.



L1	85 μ H _y . 80 VIND. 36 S.W.G. D.S.C. B/LØSE VIKL. $\frac{1}{2}$ " INDRE DIA.		
L2	7.1 p H _y . 18.1/3 VIND. 30 S.W.G. D.S.C. ET LAG $\frac{1}{2}$ " INDRE DIA.		
L3	14.5 μ H _y . 25.1/3 VIND. 38 S.W.G. D.S.C. ET LAG $\frac{1}{2}$ " INDRE DIA.		
C1	10 pF. KERAMIK	C10	.01 μ F PAPIR
C2	100 pF. VARIABLE	C11	.01 μ F PAPIR
C3	100 pF. KERAMIK CYL	C12	.01 μ F PAPIR
C4	60 pF. VARIABLE	C13	1.0 μ F EL. LYT. 200V.
C5	25 pF. KERAMIK	R1	4 M Ω
C6	.01 μ F. PAPIR	R2	56 K Ω
C7	.1 μ F. PAPIR	R3	100 K Ω
C8	.01 μ F. PAPIR	R4	4.7 K Ω
C9	.01 μ F. PAPIR	R5	1 M Ω
		R6	.33 M Ω
		R7	1 M Ω
		R8	1 M Ω
		R9	.22 M Ω
		R10	.5 M Ω
		V1	1T4 R.C.A. MIN. RØR
		V2	1T4 R.C.A. MIN. RØR
		V3	1T4 R.C.A. MIN. RØR
		P	BRUSH KRYS TAL TELEFON

Circuit diagram, list of components and battery unit, taken from the Norwegian language user instruction sheet.



Milorg members listening to the news from London on a Type 31/1 receiver.



'Sweetheart' in packing carton less batteries.



The piezo-crystal earphone assembly was originally developed to be used as part of an hearing aid. Being fragile and easily damaged the individual earphones could be removed and replaced.



Battery box with an original 4.5V LT and 30V HT battery.



Top view of original packing cartons for a Type 31/1 'Sweetheart receiver'. The large black letters on the left hand side indicated their destination: the carton on the left was intended for Norway (T= text; N= Norwegian); the carton at the right was for other countries (T= text; E= English)

References:

- WftW, Volume 4, *Clandestine Radio*, Louis Meulstee, 2004, Wimborne Publishing Ltd., ISBN 0952063 36 0.
- *Miniatyr Mottager Type 31/1*, Instruction leaflet in Norwegian language, n.d.
- 'Sweetheart', Miniature Receiver Type 31/1, Erling Langemyr, Radio Bygones Issue No. 29, 1994.
- 'Illegale norske Modtagere, Hallo-Hallo, 1985-1.

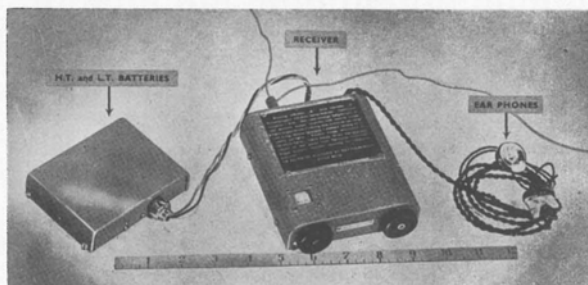
- Many thanks to Erling Langemyr and Tore Moe Namsos for their assistance during the preparation of this Chapter.
- Part of the photos were taken of a (Norwegian text) Sweetheart held the collection of the CryptoMuseum in Holland with kind permission.
- Photographs of the Simrad W.T.2, W.T.3, VHF-6AM and Nera W.T 2A courtesy Norsk Teknisk Museum, Oslo.
- Store Norske leksikon: Norsk biografisk leksikon, W. Simonsen.

**R.C.D. RECEIVER, TYPE 31/1
PROPAGANDA SET**

GENERAL DESCRIPTION.

The R.C.D. type 31/1 is a pocket receiving set, employing three battery-operated miniature valves in a T.R.F. circuit. It is suitable for radio telephone and C.W. Morse reception, on the 25—50 metre band (6 to 12 Mcs.) The receiver and batteries (H.T.—L.T.) are housed in separate steel boxes, sprayed with grey crackle cellulose. The controls provided are "Tuning" and "Regeneration," the drum tuning scale being calibrated in metres. High and low tension supplies are connected when the receiver power cable is plugged into the correct socket on the battery box. The very sensitive telephones are of the miniature crystal deaf-aid type, which fit into the ear.

The receiver has been designed for operation in temperate or sub-tropical climates, primarily Western Europe, in which good reception should be obtainable from any of the short wave B.B.C. news transmitters. The mechanical construction is such as to ensure a high degree of durability.



DIMENSIONS AND WEIGHT.

	Length.	Width.	Depth.	Weight.
Receiver	3½"	4½"	1½"	1 lb. 2 ozs.
Battery unit (including H.T. and L.T. batteries)	4½"	3½"	1"	1 lb.

POWER SUPPLY.

Miniature 80 V. H.T. Dry Battery. Standard 4.5 V. L.T. Dry Battery.

POWER CONSUMPTION.

H.T. 0.5 m.A. L.T. 50 m.A.

BATTERY LIFE.

The H.T. and L.T. batteries will give useful service for 100 and 30 hours respectively, if used for a period not exceeding 1 hour and then given approximately the same interval of rest. Continuous operation will reduce these figures to 50—60 hours H.T. and 8 hours L.T. In temperate climates batteries should be put into service within 6 months from the date of manufacture. This period will be shorter in hot damp climates.

ACCESSORIES AND SPARES.

Miniature Crystal Telephones, wire for aerial and earth, 2 spare L.T. batteries and 1 spare H.T. battery are provided.

PACKING.

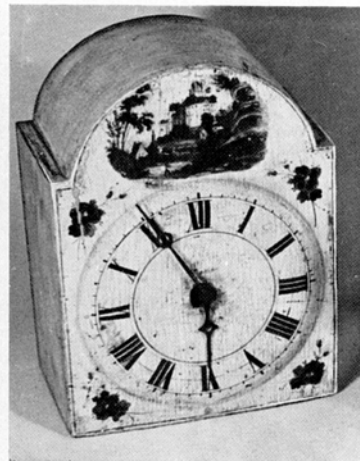
The crystal 'phones are sealed in a small tinned-steel container; this, together with all other items, including accessories and spares, are placed in cardboard wrappers, and then packed in a cardboard box. This method of packing is suitable for road and rail transport, and may be flown, provided the altitude does not exceed 15,000 ft.

When carried at higher altitudes, or transported by sea, it is essential that the cardboard box be placed in a tinned-steel container and hermetically sealed.

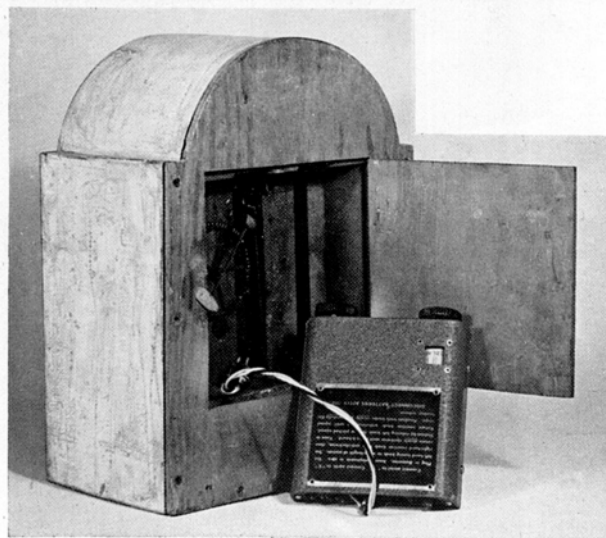
SIZE WHEN PACKED. 7½" x 5½" x 3". **WEIGHT.** 3½ lbs.

**CONCEALMENT
OF M.C.R.'s**

The following pages of illustrations showing various devices used for the concealment of Miniature Communication Receivers.



Antique German Clocks copied from originals, and suitably aged and painted are illustrated on this page. On the right, showing the front view, and below, the back view, with concealment chamber sufficiently large enough to accommodate an M.C.R.



Two pages from the descriptive SOE 'Catalogue of Special Devices and Supplies', Vol 2, Wireless Section, 1944.

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Willy Simonsen, a tribute to the designer of the 'Sweetheart' receiver.



Willy Simonsen at his home in 1992, a photo taken by Tore Moe Namsos at an interview for the journal of the Norwegian Historical Radio Society.

Willy Cristian Simonsen was Born in 1913 in Oslo. He studied electrical engineering in Dresden, Germany, where he graduated in 1938.

When Norway was invaded by the Germans in 1940, he joined the resistance, the later Milorg ¹⁾. He led a project to eavesdrop on German telephone communications between Oslo and Bergen, and provided this information by radio to allied forces in England until he was arrested in 1941.

Members of these groups were issued with two pills which were hidden e.g. the clothing. One would make the taker very ill and the second would kill. When Simonsen was arrested he took the pill which made him very ill, and was henceforth transported to a hospital in Oslo. Rescued from the hospital by Norwegian friends wearing German military uniforms, he escaped to Sweden in February 1942. From Stockholm he was taken to England by plane.

From his work and experiences in the resistance he was well informed of the communication requirements in Norway.

He offered his knowledge to the War Office and was employed at the Inter Services Research Bureau where he designed the Type 31/1 radio receiver, affectionately known as 'Sweetheart'.

The components he was allowed to use for this project were restricted to non-preferential, and no employment of experienced craftsmen for assembly of the radio receiver.

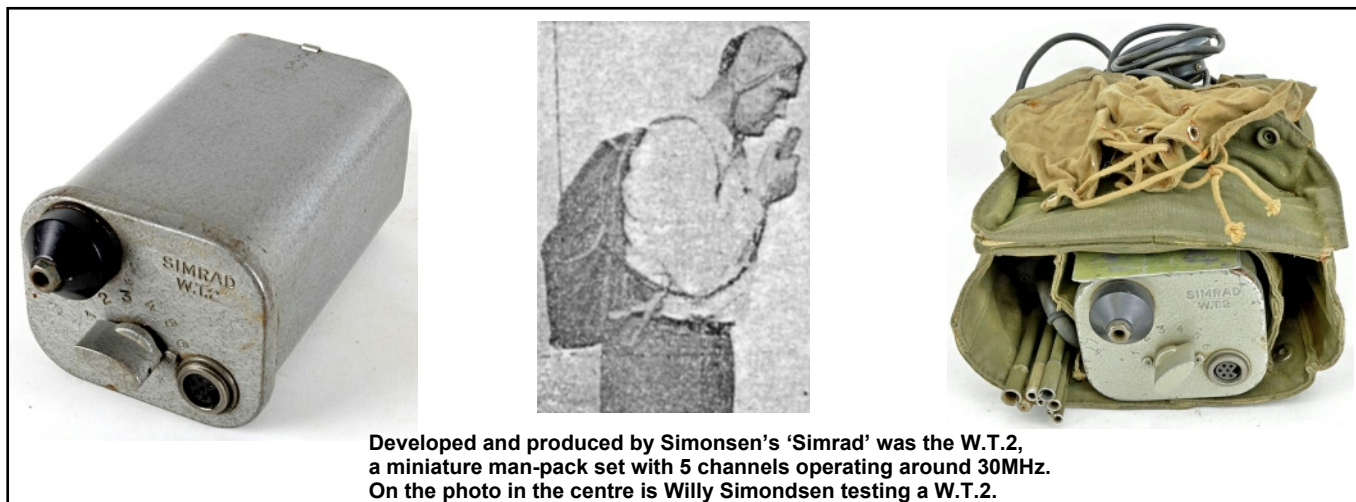
The Sweetheart was produced from 1942 onwards by Hale Electric in London at a cost of about 8£ each. A total of about 50,000 receivers were eventually build, of which 5000 for the Norwegian Government in exile.

Sweetheart receivers intended for Norway came by parachute or boat from early 1943 onwards. It should be noted that the text on the metal instruction plate, and the instruction sheet for these receivers was in the Norwegian language, all other receivers had English text. The name 'Sweetheart' came from a girl who worked on the project with Simonsen. '...remember I was a young man then...' he told much later at a lecture to members of the Norsk Historical Radio Society.

After the war Simonsen returned to Norway where he founded Simrad AS, a firm that developed and produced marine electronics, in addition to small man-pack VHF radios for the Norwegian Army.

He later founded Simonsen Elektro AS, which produced NMT cellular mobile telephones. Willy Simonsen died in December 2003 at the age of 90.

¹⁾ Milorg (abbreviation of Militær Organisasjon – military organization), established in 1941 was the main Norwegian resistance movement during World War II).



Developed and produced by Simonsen's 'Simrad' was the W.T.2, a miniature man-pack set with 5 channels operating around 30MHz. On the photo in the centre is Willy Simonsen testing a W.T.2.



Later produced Simrad man-pack transceivers for the Norwegian Army were the W.T.3 (left) and the VHF-6AM (centre), both amplitude modulated, operating on 30MHz. The man-pack radio at the right was a W.T.2 A made by NERA, which was a later transistorised replacement of the Simrad W.T.2.