

A technical history of
Radio Communication Equipment
in clandestine and special forces operations

WIRELESS *for the* **WARRIOR**

*by Louis Meulstee and Rudolf F. Staritz
with Jan Bury, Erling Langemyr
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VOLUME 4
CLANDESTINE RADIO



First published September 2004 by
Wimborne Publishing Limited
408 Wimborne Road East
Ferndown
Dorset BH22 9ND, England

© 2004 Wimborne Publishing Limited

British Library Cataloguing-in-Publication Data.
A catalogue record for this book is available from the British Library.

ISBN 0952063 36 0

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Typesetting, design and layout by G C Arnold

Printed in England by Hertfordshire Display plc, Ware, Herts

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The order in which the various countries of the world have been placed is based on the system used in British Admiralty radio publications: Great Britain, Northern Europe, Baltic, Scandinavia, France, Spain, Northern Mediterranean, Balkans, Africa, Indian Ocean, Malaysia, Far East, Australia, New Zealand, Pacific, North America, South America

Radio Transmitters and Receivers

Great Britain

Mk.II
Mk.III
Mk.V
Mk.VI
Mk.VII ('Paraset')
Mk.X
Mk.XIV
Mk.XV and Mk.16
Mk.18
Mk.XXI
Mk.XXIV
Mk.26
Mk.33
Mk.119
Mk.121
Mk.122
Mk.123
Mk.124
Mk.128
Mk.214
Mk.217
Mk.301
Mk.328
Type 31/I ('Sweetheart')
Type 36/I (MCR1)
Type 46/I and 48/I ('Jedburgh')
Type 51/I
Type 53/I
Type A Mk.I
Type A Mk.II
Type A Mk.II*
Type H 15a
Type A Mk. III
'Early Type 3'
Type 3 Mk.I (B 1)
Type 3 Mk. II (B 2)
Type 3 Mk.III (B 3)
MI9 P.O.W. Sets
- Sub-miniature Receiver
- Cigar Case Receiver variation 1
- Cigar Case Receiver variation 2
- VHF Transmitter
- Cigarette Case Transmitter
- Cigarette Case Receiver
TRD (Auxiliary Units Sets)
Eddystone Model 730/1A
PCR
PRM 4150
'Royal Signals' Transmitter
UK/PRC-316

Belgium

MCR-1 (MBLE)
RST-101

Holland

NEI II/III
OD Transmitter
OD Receiver
Z.O. 47/01

Germany up to 1945

Adapter Transmitter
Pocket set
Radione R3/RS20M
RSHA/SD set
SE 76/15
SE 85/14
SE 88/5
S 89/80
SE 90/40
SE 92/3
S 93/250
SE 96/30
SE 98/3
SE 99/10
SE 100/11
SE 109/3

Germany after 1945 (*Germany (W)*)

B2M
FS-5000
'OG' Transmitter
- 'OG Modular' set
SP 15
SP 20
'Training Set'
'UHU'
12 WG
41
Eastern Germany (GDR)
HV A
- WSA 6
Stern
'Type 1-4'
VVS B307 and TSS-2

Denmark

Telefonbogen

Poland

'Pipsztok' A Series
- A 1 ('Nelka')
- A 2
- A 3
- AP 4
- AP 5
AP 7
B 1 and B 2
BP 3
BP 4
BP 5
KR 1000
Miscellaneous Polish
MR 2 and MR 3
NP 3
NS and NSP
OP 3
OSB I and II
'UB'

USSR

Belka M-2
Jack 1-5
Miscellaneous USSR
- BR-3U
- 'Svir'
- Zemla
- Electron
- GR 56A
- 'Late 1950s'
Nabla
'NKVD'
Partisan-1
R-350 M
R-353
R-354
R-394 KM
RPO
Sever
Signal
Tensor
'VHF Suitcase'
190AB84

Radio Transmitters and Receivers (continued)

Finland

Kyynel M 4
Kyynel M 5
Kyynel M 7
Kyynel M 10 and M 11
Kyynel M 12
Töpö
VR 17

Sweden

'Apparat 7/11'
MA 444
Ra 190
'Tx/Rx 20W'
'VHF'

Norway

'D-15'
'Kongshavn'
'Lisbeth'
Model 6-1 ('Andrea')
Model 231
Model SR523
'Olga'
'TPTG'

France

ER-TG-2B
'French 1950s' sets
- '1950s 6L6 Transmitter'
- '1950s Miniature' set
- '1950s Suitcase' set
- '1950s Miniature Transmitter'
- '1950s Modular Suitcase' set
- TRBP 3A
T.A.L. 6
TR-TG-2A

Austria

Cunzi BE 20/2

Switzerland

Type 105TG

Italy

RC2
RN-3
RN-5
- Receiver 'RN-5'
RN-6
TXO-OC0
TXO-OC3

Hungary

AK-20
Koffa Rádió

Czechoslovakia

Marjánka
Simandl

Bulgaria

R 24

Australia

3B
3BZ
ATR 4A
MTR-1 Mk.II

USA

AN/GRC-109
AN/PRC-1
AN/PRC-5
AN/TRC-77
AR-11
Briefcase Set
Delco 5300 (AN/PRC-64)
MBM
RBZ
RS-1
RS-6
RS-49
RS-511
RT-1-B or URT-11
RT/A-3
RT-4
SCR-195
SSTR-1
SSTR-4
SSTR-5
TAR-224
'Village Radios'

RDF Equipment and Intercept Sets

RDF Reception Set 'D'
RDF Receiver GPO
RDF Receiver Wien
RDF Receiver Fu H P.Ek u3 'Kapsch'
RDF Receiver 'Gürtelpeilgerät'
RDF Receiver PE 484/2
RDF Receiver SCR-504-A
Intercept Receiver RP-19
Intercept Receiver R1110
Intercept Receivers USSR
SSR-201
Telegon IV
Type 2026.1
Eddystone Model 930
Surveillance Transmitter ST-2A

Power Generators

Battery Charging
Hand/Pedal Generator Mk.810A
Hand Generator PSU-5M
Pedal Generator 52/I
Steam Generator ALCO
Steam Generator Mk.814

High Speed Keyers

GRA-71
Squirt
Telma

Special Equipment

Rebecca Mk.II
Rebecca AN/APN-2
Eureka Mk.I and Mk.II
Eureka Mk.IIIB
Eureka AN/PPN-1A
Eureka AN/PPN-2
S-Phone Ground
S-Phone Air
S-Phone Ship
S-Phone Suitcase
'Joan-Eleanor'

APPENDIX - List of Abbreviations

Introduction

by Louis Meulstee

It might have been about 1991, that I made a pleasant three-day visit to the home of the late John I. Brown (G3EUR) in South Ockendon. Following a lengthy conversation we came to the conclusion that it might be a good idea to compile a manuscript for a reference book or 'technical encyclopaedia' on clandestine radios and related equipment used by agents, resistance, partisans, special forces and the like from all countries in the world from pre-World War II up to the 1980s.

A couple of years earlier, during a holiday vacation with my family in Bavaria, Germany, I had met Rudolf F. Staritz (DL3CS) in his home at Bamberg, and knew that he was very interested in such a publication of which he had already prepared a preliminary draft manuscript, principally about German agents sets. It must be noted here that during World War II Rudolf worked on the design of German agents' radios for the Abwehr, whilst John had developed radios for the British SOE.

John, who had a similar manuscript in mind, but principally dealing with SOE sets only, was of the opinion that it would be very difficult to find a publisher prepared to take the risk of publishing such a book, which would have a rather limited interest to the general public.

It was quite a blow when we received the sad news of John's decease in 1993 and the original plans of getting John Brown and Rudolf Staritz together could not be fulfilled.

After the publication of Volume 1 of the *Wireless for the Warrior* series, and while working to get Volume 2 to the presses, I happened to meet Rudolf Staritz again in 1996. During this meeting he said plainly that '... none of us is getting younger, so what about the proposed book on clandestine radio?'

Together we worked out the possibilities and after consulting our editor and publisher Geoff Arnold it was agreed that we would make a manuscript proposal. But it was not until August 1998 that we came together again, along with Geoff Arnold and other (mainly German-speaking) experts, to discuss the possibilities, scope of contents, title, layout and many more details. This was at the premises of the historic Dutch short-wave transmitting station Kootwijk Radio (at that time still fully operational), as the guests of the station manager Martin Nieuwenhuizen, one of my colleagues at what was then PTT Telecom, now KPN Telecom.

As I had at the time just started with Volume 3 of *Wireless for the Warrior*, I pointed out that it would take some time until this was completed as I could not work on two manuscripts at the same



The Clandestine Radio 'kick-off' meeting took place at the premises of the historical Kootwijk Radio short-wave transmitting station on 9 and 10 September 1998. In this picture the participants are assembled in the impressive Art-Deco entrance of the main hall of the station, built around 1921. From left to right: Gerhard Strößner, Rudolf Staritz, Günther Fietsch, Mrs Arnold, Mrs Fietsch, Mrs Staritz, Louis Meulstee, Otto Prellwitz and Geoff Arnold. At the time of completing Clandestine Radio (2004), the station has been abandoned by KPN Telecom and, being an important historical monument, transferred to another party



Mk.V suitcase variation, receiver section on the left and transmitter with built-in AC mains power unit right

Mk.V

Country of Origin:
England

DATA SUMMARY

Organisation: MI6 SIS (also used by SOE)

Design/Manufacturer: SIS Section VIII (Whaddon Hall/Little Horwood)

Year of Introduction: Believed about 1941/42

Purpose: Agents, probably resistance organisations

Receiver:

Circuit Features: RF, Regenerative Det, AF output (AM R/T and CW)

Frequency Coverage: 3.7–7.5MHz and 7–16MHz. Covered by two sets of plug-in coils

AF Output: High-impedance headphones

Valves: 6SK7 (3x). Variation has 6SK7 (2x)

Additional Data: The detector may be brought into oscillation for reception of CW signals

Transmitter:

Circuit Features: CO, RF power amplifier (CW only)

Frequency Coverage: 2.9–18MHz. Covered by three plug-in coils

RF Power Output: About 20–25W

Valves: 6V6 and 832

Additional Data: Frequency doubling in RF power amplifier on frequencies above 8MHz

Power Supply: AC Mains 100–250V. Rectifier valve 5Z3 or 5T4

Size (cm) and Weight (kg): Complete set in suitcase: height 18, length 27.5, width 43, weight 15

Antenna: Wire antenna. 30m length supplied

Accessories: Headphones, crystals, plug-in coils, spare valves, antenna wire, earth lead, earth spike

Remarks

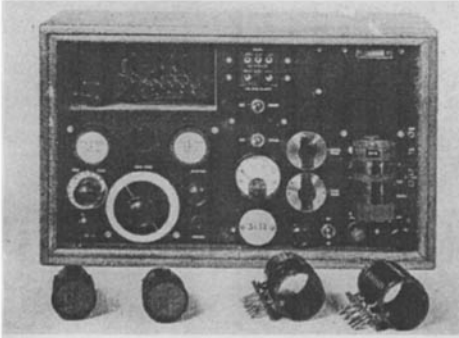
The Mk.V transmitter receiver is comprised of a transmitter with built-in AC mains supply unit and a receiver. It has been produced in a number of variations. Noted are the assembly of both transmitter and receiver in a suitcase, a similar arrangement fitted in a wooden box, and the transmitter and receiver mounted in separate wooden boxes.

Tuning ranges of transmitter and receiver are covered by plug-in coils, for the transmitter marked 80, 40 and 20m.

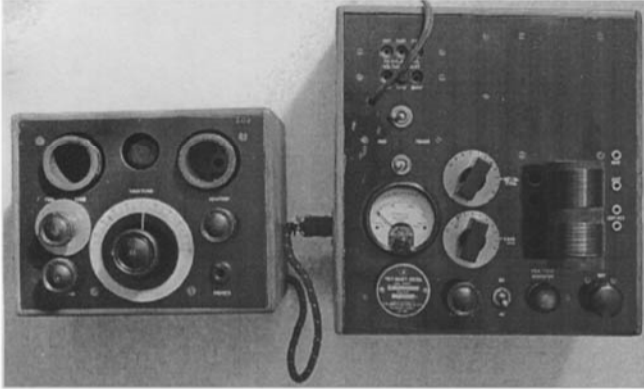
Associated Publications

'CRUX, den illegale radiostasjonen', by Erling Langemyr LA3BI, *Hallo Hallo*, No. 5, 1987, pp12-16.

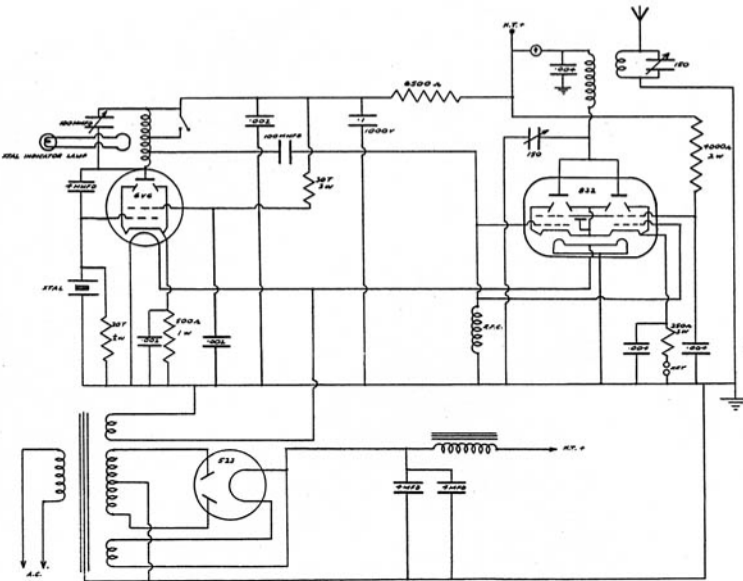
'Information held on Allied Clandestine Equipment', a summary by Pat Hawker G3VA, Mar. 2000. This document is incorporated in *The Secret Wireless War*, (Appendix 6: Agents' Sets) by G. Pidgeon, ISBN 1-84375-252-2, UPSO, 2003.



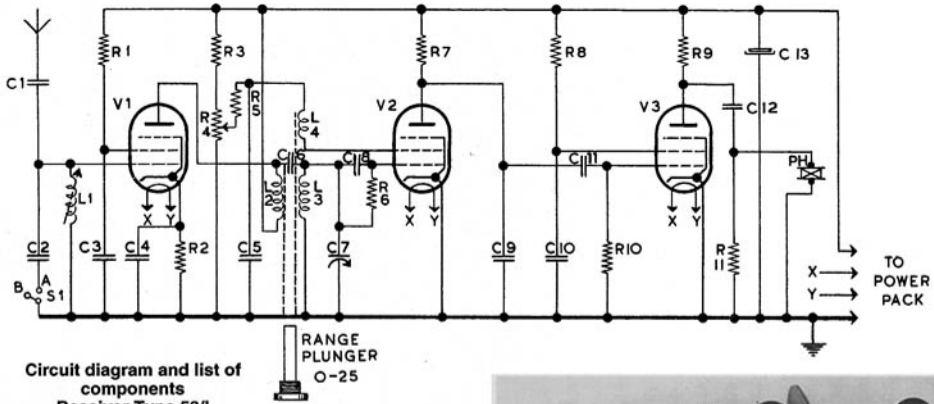
Mk.V fitted in wooden box (above left). Note plug-in coil units for different frequency ranges. Mk.V receiver, probably a stand-alone variation with associated AC power pack (above right)



Another variation of the Mk.V with separate receiver (left) and transmitter with built-in AC mains supply (right) fitted in wooden boxes



Circuit diagram of Mk.V transmitter and AC mains supply



**Circuit diagram and list of components
Receiver Type 53/I**

C1	10pF	PH	Crystal earphones
C2	50pF	V1	9001
C3	0.01μF	V2	9001
C4	0.01μF	V3	9001
C5	0.1μF	R1	120kΩ
C6	1pF	R2	100Ω
C7	5-135pF variable	R3	82kΩ
C8	50pF	R4	100kΩ pot.
C9	100pF	R5	56kΩ
C10	0.01μF	R6	2.2MΩ
C11	0.001μF	R7	150kΩ
C12	0.001μF	R8	390kΩ
C13	4μF electrolytic	R9	220kΩ
L1	10-50μH	R10	3.9MΩ
S1	A-B switch	R11	2.2MΩ



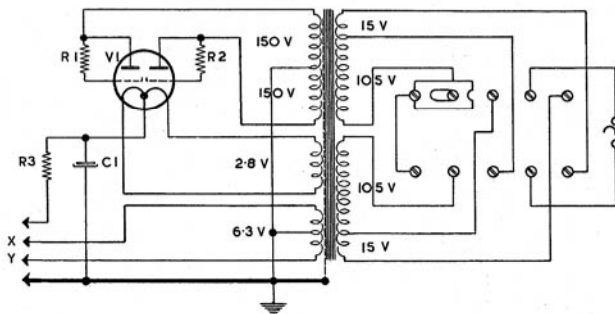
Internal view of Midget Receiver Type 53/I showing the three type 9001 valves, tuning capacitor and its associated reduction gear (centre), tuning coil and reaction control potentiometer (right)

Remarks

Receiver Type 53/I, also referred to as 'Midget' Receiver in its instruction handbook, consists of two units: the Receiver Unit with power lead, and its associated Power Pack with AC mains lead attached. Each unit is housed in a tin case. The frequency coverage of 3-12MHz is covered in two ranges, the tuned RF stage by means of a switch and the main tuning stage by the use of an iron dust core (Range Plunger) which can be inserted in the tuning coil through an aperture in the top of the case. When the Range Plunger is removed (frequency range 6-12MHz), it is stowed in the storage provided in the Power Pack to avoid loss or damage. The tuning of the RF stage is effected by an aerial tuning slider moving an iron core in the aerial coil. A roughly calibrated frequency scale

engraved on the cover shows the approximate setting of the slider which is slightly dependent on the length of the antenna.

The main tuning knob projects from the side of the receiver and is operated by the thumb. The graduations of the tuning dial may be seen in a square window on top of the set. An individually calibrated frequency chart is provided for the approximate setting of the tuning dial. Reaction is controlled by a similar thumb wheel which when turned clockwise brings the detector in an oscillating state for the reception of CW signals. The earphones are of the high impedance hearing-aid crystal type. On the side of the Power Pack case is located the mains voltage selector panel, covered by a Paxolin strip which is engraved 'VSP'.

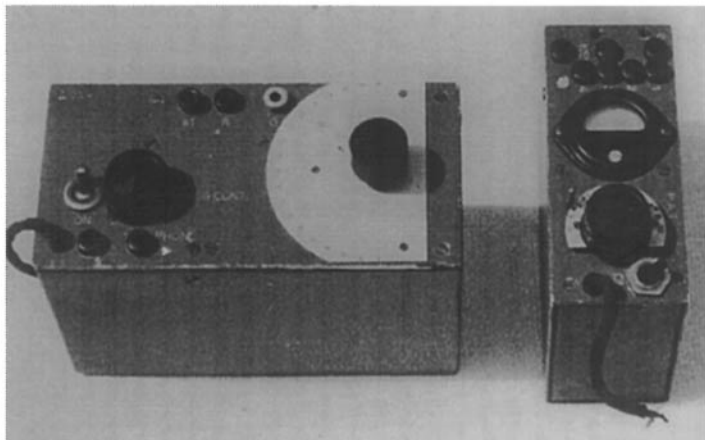


Circuit diagram of mains Power Pack for Receiver Type 53/I. Note that V1 is a 3A5 dual-triode battery valve strapped as a full-wave rectifier

R1, 2 - 1kΩ R3 - 15kΩ C1 - 8μF

**Associated
Publications**

Instruction handbook for Receiver Type 53/I, n.d.



SE 98/3

Country of Origin: Germany

DATA SUMMARY

Organisation: OKW Amt Ausland/Abwehr**Design:** Abt II, OKW-Aussenstelle Berlin-Stahnsdorf**Manufacturer:** Stahnsdorf until 1942, OKW-Aussenstelle Wurzen from 1942**Year of Introduction:** 1941**Receiver:** E 98**Circuit Features:** 1RF, Detector, 1AF (AM R/T and CW)**Frequency Coverage:** 2.1-8.2MHz**Valves:** DF11, DAF11, DL11**Transmitter:** S98/3**Circuit Features:** Crystal oscillator 3W RF (CW only)**Frequency Coverage:** 3-8MHz**Valves:** KL2**Power Supply:**

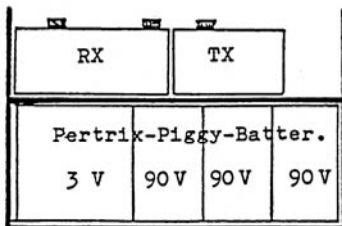
Dry batteries, Pertrix 'piggy' batteries, 3x 90V, 1x 3V

Size (cm) and Weight (kg):

	height	length	width	weight
Receiver:	10	8.5	17	1.05
Transmitter:	13	10	5.2	0.75
Complete set in case:	10	28	38.5	4

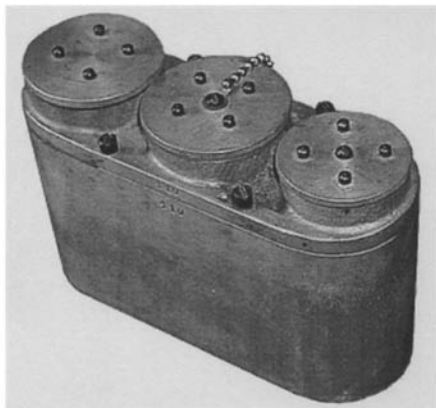
Antenna: Wire antennas fitted with insulators.

Transmitter: antenna with counterpoise, cut for lowest frequency in use

Accessories: Headphones type 'Rosinski', 'Mouse' type miniature Morse key, connectors from battery-box to RX and TX unit, spare valves, calibration table, crystals. Transport was either in a leather attache case or a canvas bag

Side view (left) and top view (right) of SE 98/3 aluminium transit case with equipment and batteries fitted.

A detachable mounting frame was used for fixing the dry batteries and transmitter and receiver units. The free space beside the transmitter unit (right-hand unit) was used for stowing ancillaries such as Morse key, crystals, etc. The case could be hermetically sealed with a special top cover. It was normally packed in a reddish-brown leather attache case or canvas bag.



Kyynel M 4

Country of Origin: Finland

DATA SUMMARY

Organisation: Military Intelligence

Design: Capt. Holger Jalander and other radio amateurs

Manufacturer: Finnish Army Depot Company Munkkiniemi (near Helsinki)

Year of Introduction: 1940/41

Purpose: Long range intelligence and guerrilla patrols

Circuit Features: Self-excited push-pull oscillator (CW only)

Frequency Coverage: 3.5–6MHz

RF Power Output: 0.15W

Valve: DDD11

Additional Data: LT battery is stowed in a holder beneath one of the three threaded covers, the HT battery is carried separately

Power Supply: Batteries 1.5V LT (A size) and 90V HT. Consumption LT 100mA, HT 15mA

Size (cm) and Weight (kg): Height 10, length 5.7, width 15, weight 1.5 (approximately)

Antenna: Dipole 2 x 21m which is adjustable to 10 different lengths to suit the frequency in use

Accessories: Morse key, two antennas on reels, HT battery in box, tuning dial calibration/antenna length setting charts

The first model was initially known as 'The tear of backwoods spruce', later simply 'Tear' which is a translation of the original Finnish 'Kyynel'. It is believed that this name was given due to its chirpy tone, as the transmitter is self-excited. Both Kyynel M 4 and M 5 are housed in similar die-cast aluminium cases with three threaded covers and are nearly watertight. Certain sources note that some early sets were equipped with a detonator and that unauthorised opening of a certain threaded cover would cause an explosion.

Initially the Kyynel was used without a receiver and messages to the base were transmitted 'blind' at pre-arranged times. Very soon a separate miniature long wave broadcast receiver (Töpö) was provided. This made it possible to listen for code-words representing orders transmitted by the long-wave broadcast transmitter Lahti. At the end of 1941 the Kyynel transmitter was supplemented by the Kyynel M 7 receiver; a combination of the Kyynel transmitter M 4, together with receiver M 7 was known as 'VRHAB'. Many of the components of the Kyynel sets were manufactured in the Army's own workshops, including the tuning capacitors and the aluminium housing.

Associated Publications

Kyynel oli sotasalaisuus, Into Jyläsoski and Kuvat Arvo Haakana, *Tekniikan Maailma*, No. 5, 1971.

Im Rücken des Feindes - Der finnische Nachrichtendienst im Krieg, Jukka L Mäkelä, Verlag Huber, Stuttgart, 1967.

Kyynel-radio välitti viestin kotiin, Juhani Kolomainen, *Satakunnan Kansa/Viikonvaihte*, Sunnuntai 28, Elokuuta 1994.

Unpublished document by Reijo Halkola (OH3RH).

Salaperäinen Kyynel, Jorma Janhunen, OH7OJ, 1994.

Kyynel ja Töpö, Sakari Pajunen, Viestimies, 2/1990.

Suomen radiotiedustelu 1927-1944, Erkki Pale, 1997, ISBN 952-90-9473-X.

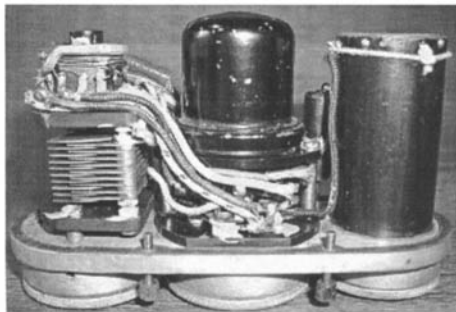
Kaukopartiomiesten Kyynel, Antero Tanninen, OH1KW, 1996.

Remarks

A group of Finnish Army radio experts, mainly all licensed radio amateurs led by Captain Holger Jalander, developed a series of miniature lightweight radios for communication from Finnish long-range patrols to their base.

Kyynel M 4 - 2

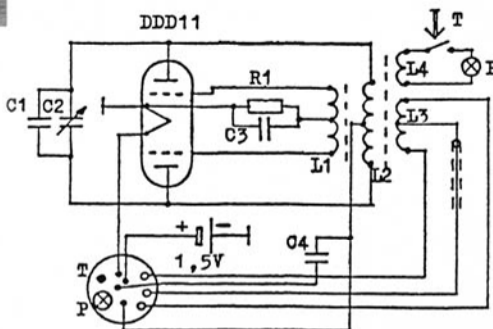
Wireless for the Warrior – Volume 4



Internal view of Kyynel M 4:
tuning capacitor and coil (left),
DDD11 valve (centre) and
holder for 1.5V filament battery (right)

Circuit diagram of
Kyynel M 4 transmitter

C1, 2, 3	100pF
C4	0.05μF
R1	50kΩ



Kyynel transmitter M 4 and receiver M 7 combination (also known as 'VRHAB') with accessories packed in a cardboard transport case having a leather-effect paper covering and reinforced corners. Note antenna reel, cipher dial (round object in centre) antenna length setting chart and calibration charts for receiver and transmitter tuning dials



SSR-201

Country of Origin: USA

DATA SUMMARY

Organisation: OSS

Design/Manufacturer: OSS personnel (believed)

Year of Introduction: Late WWII

Purpose: Wide-band surveillance receiver

Circuit Features: Aperiodic circuit (AM R/T and CW)

Frequency Coverage: Wide-band, estimated 10kHz to >30MHz

Valves: 1G4, 6SQ7, 6J5, 6G6 (2x), 6SL7 (2x), 6V6, 6G5, VR105 (2x)

Additional Data: The set has a distinct civilian appearance

Power Supply: 110V AC mains or external 6V DC vibrator HT power unit

Size (cm) and Weight (kg):

Height 13, length 25, width 43, weight 8.4

Antenna: Length of wire

Remarks

Very little is known of the Aperiodic SSR-201 wide-band surveillance receiver. Although its existence is noted, until recently it was thought that all equipment of this kind was destroyed shortly after the end of WWII at the disbandment of the OSS organisation.

The SSR-201 appears to have been manufactured in a limited quantity by a small workshop having only semi-professional facilities. The serial number of this surviving unit is 45.

No specifically military components are used in its construction, but rather US commercially-branded parts are found. The black crackle sprayed cabinet (fitted with a removable metal cover over the front panel to protect the controls during transit) looks like a standard unit widely available from the trade at that time.

The general appearance of the receiver is quite inconspicuous, resembling a civilian audio amplifier for public address.

An interesting feature of this receiver is the availability of a pair of relay contacts terminating in a socket at the rear to trigger an alarm if it receives a signal. Modulated signals may be monitored aurally from the built-in loudspeaker, and visually on a tuning indicator valve, the latter providing a crude form of signal strength indication. For the reception of CW signals an internal tone generator is triggered by the incoming signals.

An aperiodic radio receiver features wide-band tuning and is designed to have very broad response to incoming signals. It is believed that this 'receiver' covered the frequency ranges normally used by clandestine stations. It may have been designed for 'stalking' radio signals and used by RDF stations and other parties who are trying to locate the station and put it out of operation.

A (clandestine) radio station who has reason to believe that he is being stalked will change frequency frequently to make it harder for the DF station to get a 'fix' on it. The aperiodic receiver is so broadly tuned that even when the station changes frequency, it will still be received. A broadly tuned receiver is not very sensitive and requires that the signal being pursued should be quite strong and at least stronger than others which are transmitting at the same time in that area. It is estimated that in practice its use is restricted to about 100-500 metres range, much depending on the radiated power and frequency.