

R5223 HF Receiver



The R5223 is an Australian made communications receiver, manufactured by TCA. (Telecommunication Company of Australia, a subsidiary of Philips). It was designed and made in Adelaide in 1961 for the Australian Army and called the Reception Set R5223. The receiver covers 1.5mcs to 30.5mcs in 29 bands, each band being 1mc wide and centered on the frequencies 2 to 30mcs. It is a 13 valve super heterodyne receiver using double conversion (the 2 lower bands are single conversion only), and is suitable for CW, MCW, and VOICE. It is in an aluminium watertight case, and even the speaker is waterproof. Flanges can be added to the side of the case to rack mount the unit. The power requirements can be selected to be 240VAC, 110VAC, or 12VDC.

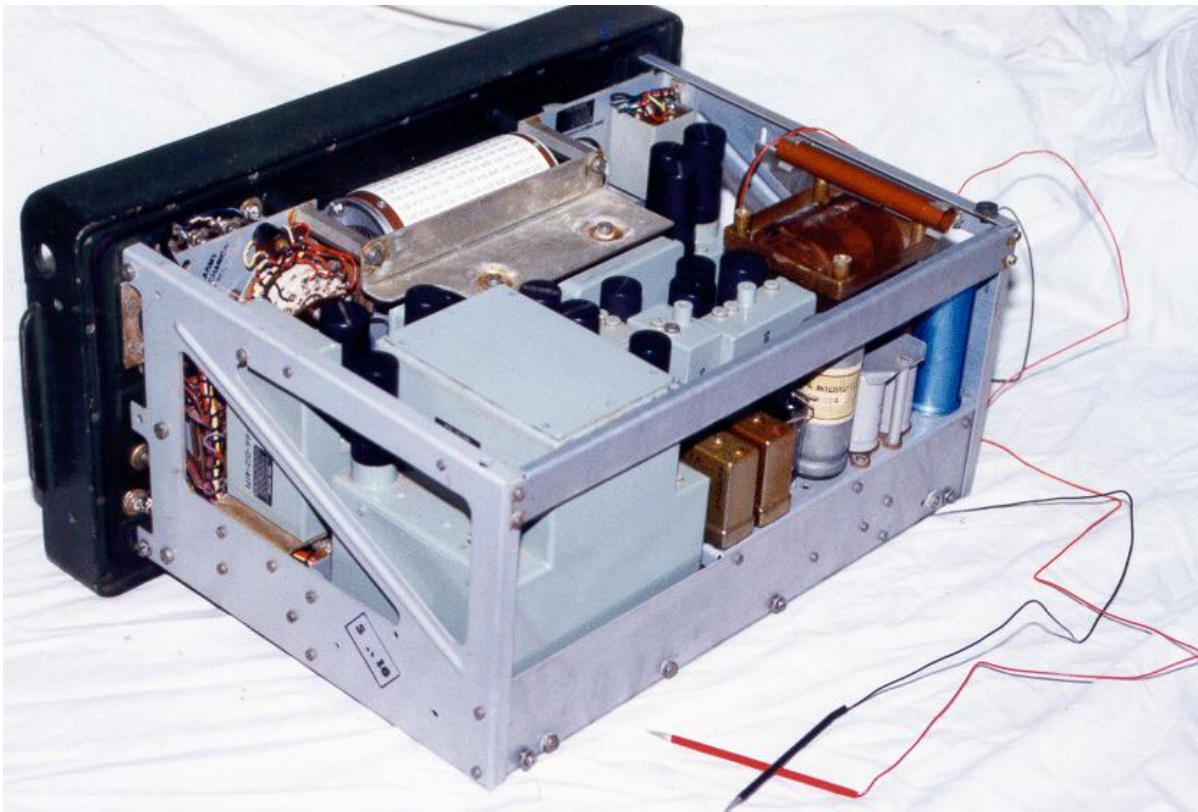


Figure 2: R5223 interior

The R5223 receiver was not suitable for operations with 547 Sig Tp. There were numerous failures and they were eventually replaced by the Collins R390.

Collins R390 HF Receiver

The Collins R390/391 Receiver replaced the R5223 and was used extensively by the Troop during the Vietnam deployment.



Figure 3: Collins R390



Figure 4: Collins R390

5. Technical Characteristics

Type of circuit	Triple-conversion superheterodyne on eight lowest frequency bands; double-conversion superheterodyne on all other bands.
Frequency range	0.5 to 32 mc.
Types of signals received.....	A1, cw; A2, mcw; A3, voice; A9, single sideband; F1, frequency-shift keying.
Type of tuning	Continuous; frequency read directly on counter-type indicator.
Method of calibration.....	Built-in crystal-controlled.
Calibration points	Every 100 kc.
Audio power output:	
600-ohm unbalanced line.....	500 mw, minimum.
600-ohm balanced line.....	10 mw, minimum.
Headphones	1 mw, minimum.
If selectivity	100 cps to 16 kc bandwidth in six steps.
Intermediate frequencies:	
First variable if (used on eight lowest frequency bands)	17.5 to 25 mc.
Second variable if (used on all bands)....	2.5 to 2 mc on lowest band; 3 to 2 mc on all other bands.
Third (fixed) if.....	455 kc.
Power source	115/230 volts ac $\pm 10\%$, 48 to 62 cps.
Power input:	
115/230 volts ac.....	225 watts total; 140 watts with OVENS switch turned to OFF.
Number of tubes.....	26 (including current-regulator tube RT510).
Antennas:	
Unbalanced	Straight-wire of random length or vehicular-mounted whip.
Balanced	125-ohm terminating impedance; matches 50- to 200-ohm balanced or unbalanced transmission lines by using adapters.
Temperature range	-40° C (-40° F) to 65° C (149° F).
Altitude	Up to 10,000 ft. above sea level.
Weight	75 lb.
Range of vfo.....	3.455 to 2.455 mc.

Racal RA217 HF Receiver

The RA217 were issued for the ARDF Kit, however, when additional spares became available some were installed in the Set Room.



Figure 5: Racal RA217¹

Country: Great Britain (UK)	Manufacturer / Brand: Racal Engineering (Racal Instruments) Ltd., Bracknell
Year: 1964	Type: Communication Receiver (also Amateur)
Semiconductors (the count is only for transistors)	Semiconductors present.
Principle	Superhet, double/triple conversion; ZF/IF 40000/2500 kHz
Wave bands	Broadcast plus more than 2 Short Wave bands.
Details	
Power type and voltage	Alternating Current supply (AC) / 100-125 / 200-250 Volt
Loudspeaker	- For headphones or amp.
Power out	
from Radiomuseum.org	Model: RA-217 - Racal Engineering Racal
Material	Metal case
Shape	Boatanchor (heavy military or commercial set).
Dimensions (WHD)	330 x 180 x 330 mm / 13 x 7.1 x 13 inch 1000 - 30000 kHz, AM / USB/LSB, CW with BFO, mechanic digital readout (1 kHz and interpolation).
Notes	Fully transistorized successor of the RA-17 using the "Wadley-loop" technique. Standard bandwidths are 0.2 / 1 / 3 / 13 MHz. IF outputs 1.6 MHz and 100 or 455 kHz.
Net weight (2.2 lb = 1 kg)	16 kg / 35 lb 3.9 oz (35.242 lb)
Mentioned in	Racal Handbook, Rinus Jansen
Literature/Schematics (1)	Funkschau 1964, Heft 17, Seite 454

¹ <http://www.tuberadio.com/robinson/museum/RA217/>

Receiver Radio RA-329

In 1968 the Troop also had two Receiver Radio RA-329 issued with the ARDF equipment².

The RA329 is an HF receiver covering the frequency range from 1 to 30 mhz. The receiver is a transistorised version of the RA17 receiver (which uses valves and shares the same architecture), being a triple conversion super heterodyne receiver, utilising the Wadley loop system. The RA329 has a mechanical digital frequency readout with 2 separate knobs for setting the frequency, one for kilohertz and another for megahertz. It receives AM, SSB, DSB, MCW, CW, and FSK phM and FM. It has variable IF bandwidths of 13 khz, 3 khz, 1 khz, and 200 hz. It weighs 18 kg in the rack cabinet.

The receiver was made by RACAL Electronics, Bracknell, Berkshire, UK, between 1969 and 1972. This RA329 main unit consists of an RA217D receiver, an FSK and terminating unit called the MA323, and a 19" rack frame called the MA322.³



Figure 6: Receiver Radio RA-329⁴

² AWM103 F38/71/22 Accounting Stocktakes Handover-Takeover 547 Sig Tp, 28 Aug 68.

³ <http://www.tuberadio.com/robinson/museum/RA217/>

⁴ Ibid.

R744A VHF Receiver (OA 1451/PRR)

The R744a was first noticed being used for VHF intercept in 1966. The July 1970 Stocktake listed the equipment as The Receiver Group OA 1451/PRR Qty 1. The OA1451 primarily consisted of R744A VHF Receiver.



Figure 7: RA-7441A VHF Receiver⁵

R-744A VHF Surveillance Receiver

General Notes

This small receiver was made by Arvin Industries for the US army during the early 1960s. Its dimensions are about 15 x 6 x 7 inches. Coverage is from 20 - 100MHz in one continuous range and it will receive AM, FM and CW modes. It uses sub-miniature pentodes types 6611 x 7 and 6612 x 3. Each of the 3 x IF stages, the calibration and BFO oscillators, AM detector and audio stage are separately housed in 8 small cylindrical cans about 2" high and 3/4" in diameter with a B9A tube base. The set is operated either by internal batteries or an external 24v vehicle power supply. There is no internal speaker, necessitating the use of headphones.



A variation seen is the R744(XE-3) made by Mallory, which doesn't have a bandspread knob. These sets were also used by the Australian Army, where the Contract Number under the makers name has been blacked out. There is also supposed to be a similar set covering 100 - 200 MHz. These sets were designed as surveillance receivers having continuously variable tuning to overcome the drawback that most field military sets were restricted to FM mode with only pre-set fixed frequencies at say 100kHz separation. The R744 was used in Vietnam and possibly other fields.

Country: United States of America (USA)	Manufacturer / Brand: MILITARY U.S. (different makers for same model)
Year: 1961 ?	Type: Radio - or past WW2 tuner
Valves / Tubes	13: 6612 6611 6611 6611 6612 6612 6611 6611 6611 6611 6611 6611 6611
Principle	Superhet with RF-stage
Wave bands	VHF/UHF (see notes for details)
Details	
Power type and voltage	Batteries / addl. power jack / 1,45 & 45 or 24 Volt
Loudspeaker	- For headphones or amp.
Power out	
from Radiomuseum.org	Model: OA-1451/PRR R744A - MILITARY U.S. different makers
Material	Metal case
Shape	Tablemodel, Mantel/Midget/Compact up to 14" width, but not a Portable (See power data. Sometimes with handle but for mains only).
Dimensions (WHD)	14.5 x 6.5 x 5.5 inch / 368 x 165 x 140 mm
Notes	All mode (AM, FM, CW) military VHF surveillance receiver covering 20-100 MHz in one band. Designed by Mallory, but made under contract by others as well. Many valves are in sealed pull out modules and cannot be accessed directly.
Net weight (2.2 lb = 1 kg)	15 lb (15 lb 0 oz) / 6.810 kg

⁵ http://www.radiomuseum.org/r/military_oa_1451pr_r744a.html

Reception Set R216

The unit had two Reception Sets R216 held in the Q store for intercept of Low Level (VHF) communications.⁶



Figure 8: Reception Set R216⁷

⁶ AWM103 F38/71/22 Accounting Stocktakes Handover-Takeover 547 Sig Tp, 28 Aug 68.

⁷ <http://www.wftw.nl/rsets.html>

Philips EL Tape Recorder



Figure 9: Philips EL Tape Recorder⁸

PRINCIPAL DATA (Subject to alteration without prior notice)

- ✦ Operates on the four-track system.
- ✦ All transistor: no warming-up time required.
- ✦ Four speeds: $\frac{15}{16}$, $1\frac{7}{8}$, $3\frac{3}{4}$ and $7\frac{1}{2}$ inches/sec.
- ✦ Adjustable to mains voltages of 110, 127, 200-250 V, A.C. 50 c/s. (Can be adapted for 60 c/s by your dealer.)
- ✦ The recorder is provided with a "stereo" output socket for the reproduction of pre-recorded stereo tapes, providing that a suitable pre-amplifier is connected to this socket. Also for "duo-play" and "multiplay" purposes.
- ✦ Mixing of microphone with Radio/Gramophone inputs.
- ✦ Can be used as an amplifier for microphone and record player.
- ✦ Suitable for long-play and double-play tape on 3 to 7 inch reels.
- ✦ Maximum playing time: 4 x 8 hours.
- ✦ Monitoring facilities during recording by means of headphones or via the built-in loudspeaker.
- ✦ Tape pause button.
- ✦ Connection for foot switch.
- ✦ Meter type modulation level indicator.
- ✦ Record safety interlock.
- ✦ Frequency range at a speed of
 $\frac{15}{16}$ inch/sec.: 60—4,500 c/s. ± 3 dB,
 $1\frac{7}{8}$ inches/sec.: 60—10,000 c/s. ± 3 dB,
 $3\frac{3}{4}$ inches/sec.: 60—13,000 c/s. ± 3 dB,
 $7\frac{1}{2}$ inches/sec.: 60—16,000 c/s. ± 3 dB,
- ✦ Built-in 2.5-W amplifier.
- ✦ Automatic stopping at the end of the tape when in the record, playback, fast wind or fast rewind position.
- ✦ Rapid winding in both directions: 1800 ft of tape in 180 seconds.
- ✦ Power consumption: approx. 55 W.
- ✦ Signal to noise ratio: better than 40 dB.
- ✦ Three inputs:

diode	0.02 megohm,	3 mV
record player	0.5 megohm,	150 mV
microphone	1000 ohms,	1 mV
- ✦ Four outputs:

diode	0.02 megohm,	1 V
loudspeaker	3-7 ohms,	2.5 W
headphones	1500 ohms,	200 mV
stereo	c. 300 ohms -	
	c. 0.4 mV at 1 kc/s	
- ✦ Dimensions: $16\frac{1}{2}$ " x $15\frac{1}{2}$ " x $8\frac{1}{4}$ ".
- ✦ Weight: 28 lbs.
- ✦ Tropicalized.

⁸ <http://raremanualdepository.blogspot.com.au/2015/04/philips-el3549-tape-recorder-manuals.html>

AN/PNH-4 Recorder Reproducer

The equipment list for 1968 shows Recorders AN/PNH-4 as being held.



Figure 10: Recorder, Reproducer Set AN/PNH-4 – Carry Case⁹



Figure 11: Recorder, Reproducer Set AN/PNH-4¹⁰

⁹ <http://www.antiqueradios.com/forums/viewtopic.php?f=1&t=266980>

¹⁰ Ibid.

Nagra Tape Recorder

The Nagra was the main tape recorder used in the Set Room and Processing area.



Figure 12: Nagra tape recorder

NAGRA III PROFESSIONAL TAPE RECORDER

- COMPLETELY SELF-CONTAINED FOR OUTDOOR SOUND RECORDINGS WITH STUDIO QUALITY
- THREE SPEEDS, THREE HEADS, FULL 1/4" TRACK, BUILT-IN AMPLIFIER, SPEAKER AND POWER SUPPLY
- ELECTRONICALLY CONTROLLED DIRECT DRIVE MOTOR FOR EXCELLENT SPEED STABILITY, WITH REMOTE START-STOP AVAILABLE
- COMPLETELY REDESIGNED SOLID STATE ELECTRONICS USING SILICON SEMICONDUCTORS
- REMARKABLY LOW NOISE, WOW, FLUTTER VALUES
- HIGHLY PORTABLE; POWERED BY TWELVE SIZE D FLASHLIGHT CELLS
- PROVISION FOR BUILT-IN PREAMPLIFIER FOR USE WITH SECOND MICROPHONE
- OPERATES FROM COMMERCIAL MAINS WITH OPTIONAL AC POWER SUPPLY ACCESSORY
- SPECIAL NEOPILOT MODEL AVAILABLE FOR "LIP SYNCHRONIZATION" OF SOUND WITH CAMERA IMAGE; PERFECT FOR ON-LOCATION MOTION PICTURE AND TV FILMING

NACKA III TAPE RECORDER

Tape Speeds: 15, 7½ and 3¾ ips, changed by easily accessible rotary switch. **Reel Size:** 7" dia. max. **Equalization:** Ampex and CCIR. **Frequency Response:** (Recording at level of -20 db): At 15 ips, ±1 db, 30-18,000 cps (±1.5 db, 30-16,000 cps). At 7½ ips, ±1 db, 40-15,000 cps (±1.5 db, 50-12,000 cps). **Harmonic Distortion:** 2% of 3rd harmonic; 0.5% of 2nd harmonic on record and playback. **Signal-to-Noise Ratio:** At least 70 db on playback at 15 and 7½ ips; mike preamp noise level, about -125 dbm. **Wow and Flutter** (DIN 45507 standard): ±0.08% or ±0.1% min. peak-to-peak at 15 ips; ±0.12% or ±0.15% min. peak-to-peak at 7½ ips. **Absolute Speed Stability:** ±0.1% at 15 and 7½ ips, factory adjusted. **Speed Variation:** ±0.1% or ±0.2% from beginning to end of 7" reel. **Inputs:** 50- or 200-ohm microphone; 100,000-ohm 0.5 to 10-volt line signal and 2,500-ohm 10 mV to 1-volt line signal for bridging. **Output:** Balanced line;

with load not less than 600 ohms, 4.4 volts (±15 db). Monitoring output unbalanced, with load not less than 50 ohms (0.3 volt). Feeds balanced broadcast lines from normally recorded tape, or may be used as remote pickup amplifier to feed line. **Controls:** Record or Playback Mode Switch; Mike Level; Line Level and Playback combined. **Size:** Case, approx. 12½" w. x 8¾" d. x 4½" h.; overall, approx. 14" w. x 9½" d. x 4½" h. **Weight:** Less batteries, 13 lbs. 13 oz.

ARDF

Racal RA217 HF Receiver

See Set Room above.

Akai X-V Tape Recorder

The Akai Tape Recorders were issued with the ARDF Kit.



Figure 13: Akai X-V Tape Recorder

Description

The Akai X-V features 4-track stereo/monaural recording/playback system, cross-field head, brushless motor, 7" reel capacity (with adaptor) and 8 hours HiFi recording with a 5" tape.

Specifications

Tape speed: 15/16, 1-7/8, 3-3/4 and 7-1/2 ips

Wow and flutter: less than 0.15% (7-1/2 ips)

Frequency response: 40 to 20,000Hz (7-1/2 ips)

Signal to noise ratio: 50dB (DC power), 45dB (AC power)

Output power: 4 watts total

Transistors: 30

Dimensions: 280 x 130 x 300mm

Weight: 5.5kg (without battery)

ARDF Communications - Ground

The RT-524s were contained in the ARDF Ground Control Console to communicate with all ARDF aircraft. The RT-524 was coupled with the Nestor KY-8 for voice security. The Collins 390 Receiver was used for target guidance.

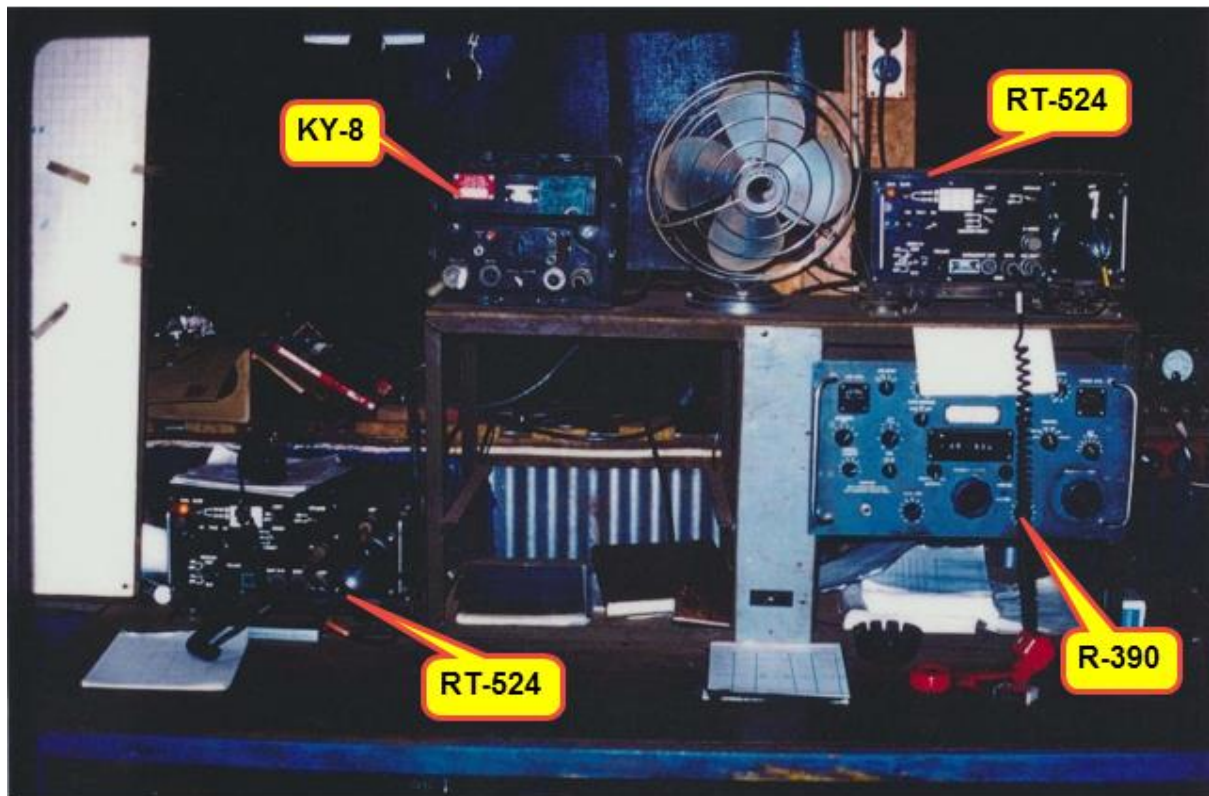


Figure 14: ARDF Ground Control Console

RT-524 (AN/VRC46)



Figure 15: RT-524

Specifications

Receiver-transmitter, FM, 30-74.95MHz, 50 KHZ spacing, 920 channels. Manual tuning version of RT-246/VRC with built-in loud-speaker. The RT-524/VRC is the major part of AN/VRC-12 vehicle radio station typically used in M151 Truck, Utility ¼-Ton, 4x4 Mutt Jeeps series of vehicles as well as in older Humvee's and tanks.

Operates from 24 VDC vehicle battery or power supply. Transmitter output power 8W (low) and 35W (high).

RT-524/VRC Specifications:	
Frequency range	30.00 to 75.95 MHz
Channel spacing	50 kHz
Number of Channels	920 Channels
Mode of Operation	Voice frequency modulated (FM)
Receiver stability	Crystal controlled, + 3.5 kHz of nominal frequency
Receiver Sensitivity	0.5 μ V for 10 dB (S+N+D)/(N+D) for 8.0 kHz deviation
Transmitter output power	35 W "High Power" and 8 Watts "Low Power"
Transmitter deviation	8.0 \pm 2 kHz nominal
Circuit	Super-heterodyne single conversion
Image Rejection	Greater than 85 dB
IF Bandwidth	32 kHz minimum @ 6 dB. 85 kHz maximum @ 60 dB
Squelch	150-Hz tone-operated or noise-operated, with RF signal having 10 dB (S+N+D)/(N+D) ratio
Limiting	Less than 1 dB change in audio output for RF input from 1 μ V to 100,000 μ V
Distortion	Less than 8% from 500 to 3000 Hertz
Audio Output	500 mW into 600-Ohm speaker 150 mW into 600-Ohm headphone
Volume Control	Adjustable from less than 0.25 mW to 1.0 W maximum
Audio Pass-band	500Hz-3000Hz
X-Mode	Provided
Operating Temperature	-40°C to +65°C (-40°F to +14°F)
Power Requirement	24-28 VDC @10.0A
Dimensions	6"H x 15"W x 13"D. (15.2 cm x 38.1 cm x 33 cm)
Weight	58 lbs. (26.3 kg)

KY-8 Voice Security Device

The ARDF ground station communications were covered by KY-8 Speech Security Equipment.



Figure 16: TSEC KY-8

Aircraft Communications

The AN/PRC 77 Radio Set

The PRC-77 was used in the aircraft for air to ground communications by the ARDF operator. The set used an external antenna on the aircraft.

Normally the AN/PRC-77¹¹ was 'coupled' with a KY-38 for secure speech.

The AN/PRC-77 is a manpack, portable VHF FM combat-net radio transceiver manufactured by "Associated Industries" and used to provide short-range, two-way radiotelephone voice communication.

Freq range: 30-75.95 MHz (920 Channels using 50kHz steps)

Range: up to 8km

Power Output: 1.5-2.0W



Figure 17: AN/PRC-77



Figure 18: AN/PRC-25 (later model 77)

¹¹ AN/PRC translates to "Army/Navy, Portable Radio, Communication."

KY-38 Voice Security Device



Figure 19: KY-38

The KY-38 is the manpack variant of the NESTOR family of voice security devices. Used during the Vietnam War, this family included the KY-8 vehicular unit, the KY-28 aircraft unit, and the KY-38 manpack unit. These devices permitted secure voice communications over radio.

This particular unit has been demilitarized; that is, all of the cryptographic hardware has been removed from the unit before it was released as surplus, leaving only the case, power supply, interface circuitry, and an interesting electromechanical keying device. The battery box is also missing.

The cryptographic key is entered with a KYK-38 keyfill device (which I do not have). Opening the small door on the front panel of the KY-38 reveals a collection of holes. Two large holes allow long pins on the KYK-38 keyfill device to set the spring-loaded mechanical zeroizing mechanism inside the KY-38, and 64 smaller holes allow the keying switches to be set by corresponding pins on the KYK-38. Behind each of the small holes is a multi-position slide switch which can be set to any of a number of positions by inserting a metal pin into its hole to the correct depth. The switches are all reset to their initial positions (closest to the front panel) by the mechanical zeroizing mechanism.

The zeroizing mechanism's powerful springs are cocked while entering the desired key, and the mechanism is then armed once the front panel door is closed. The springs are released when the door is opened, the manual zeroize knob is turned, or an electrical zeroize signal is applied through a connector on the front panel. Once released, the springs return all of the keying switches to their initial positions, thus erasing the entered cryptographic key.



AN/PRC-64

Two AN/PRC-64 were issued to the Troop and they were primarily used as beacons for calibrating the ARDF equipment.

USA Spy Radio Set¹²

The AN/PRC-64 was a true spy radio set, developed by Delco in the USA in the early 1960s as a possible successor to the AN/GRC-109 (RS-1). It was intended for use by Special Forces (SF) and for espionage activities. The design was based on the Delco 5300 that was used by the CIA. It was extremely popular with the Special Operations Group of the Australian Army in Vietnam.

During their operational life, most of the PRC-64 units were upgraded to PRC-64A, which allowed faster burst transmissions in combination with the AN/GRA-71 burst encoder that was connected to the 7-pin morse KEY socket.

The PRC-64 was an extremely compact unit for its time and measures only 25 x 13 x 12 cm. Even when packed together with the accessories in the canvas carrying bag, the set measures less than 35 x 14 x 14 cm and weighs less than 3.5 kg including the battery. The unit is powered by an internal battery and is switched on by opening the top lid. The small size however comes at a price, as the HF output power is no more than 5 Watt (CW morse) or 1.5 Watt (AM voice).

Frequency selection of the PRC-64 is crystal controlled, limiting its operation to 4 preset channels. Receiver and transmitter each have their own set of 4 crystals to allow split-frequency operation. The frequency range is from 2.2 to 6.0 MHz. RX and TX frequencies are usually written in a table inside the top lid. The crystals were stored in a compartment behind the table



Figure 20: AN/PRC-64

Note

*The troop was allocated three crystals:
Serial Nos 5752, 4490, 5185 that relate to frequencies*

¹² <http://cryptomuseum.com/spy/prc64/index.htm>

Antenna RC292

Antenna Equipment RC-292 is an elevated, wide-band, modified ground-plane antenna designed to increase the distance range of radio sets in 30 to 76 mHz range. The RC-292 is a VHF Low Band 1/4 wave vertical antenna with ground plane. RC stands for Radio Component and this antenna was the successor to the RC-291.



Figure 21: Antenna RC292¹³

Antenna Dorne-Marglin AS-2236

The AS-2236 is a highly directional VHF Antenna that provides increased gain as opposed to other VHF antennas and can be used in vertical or horizontal mode.



Figure 22: Antenna AS-2236

¹³ <http://radionerds.com/index.php/RC-292>

COMMUNICATIONS CENTRE

AN/GGC-3 Teleprinter

PURPOSE OF EQUIPMENT: Teletypewriter Sets AN/GGC-3(*) and AN/GGC-53(*) are lightweight, transportable units which can be used in either fixed or mobile teletypewriter stations. They provide facilities for manual transmission direct from keyboard and for tape transmission from transmitter-distributor. Received messages are printed and perforated on paper tape for later transmission.

Teletypewriter Reperforator-Transmitters TT-76(*)IGGC are used to send and receive over direct current (dc) wirelines carrier, or radio systems when used with Telegraph Terminal TH-5/TG, or similar line terminating devices.

Teletypewriter Reperforator-Transmitters TT-699(*)IGGC are used to send and receive over dc (6-volt polar) signal circuits only.

AN/GGC-3

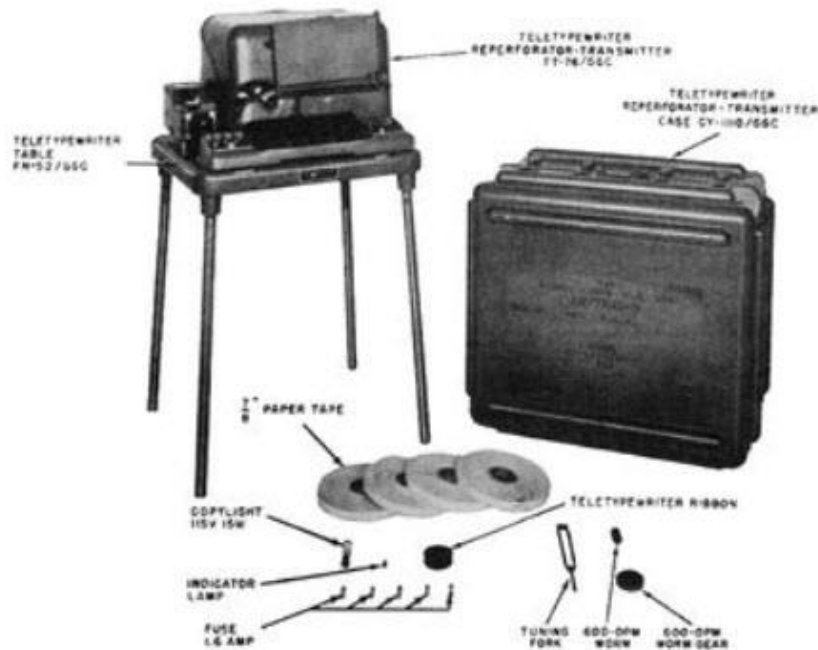




Figure 23: AN/GGC-3

Teleprinter TT-4c/TG

1-7. Purpose and Use

a. *Purpose.* Teletypewriter Sets AN/PGC-1 and AN/PGC-3, Teletypewriters TT-4(*)/TG, TT-335/TG, TT-698(*)/TG, and TT-722(*)/TG are used to transmit teletypewriter messages in the form of direct-current (dc) teletypewriter signals and to convert received dc signals into messages printed on a roll of recording paper. Teletypewriter TT-537/G is used primarily to receive low-voltage Baudot teletypewriter signals from a field artillery gun direction computer (FADAC) and to record the received messages on 8½-inch-wide recording paper.

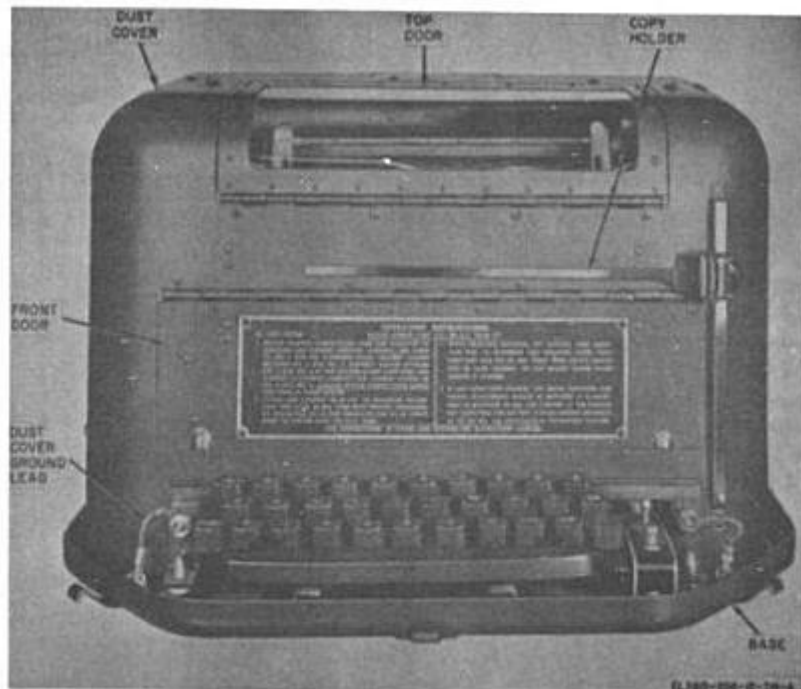


Figure 1-7. Teletypewriter TT-4(*)/TG or TT-698(*)/TG, dust cover installed, front cover.

Figure 24: Teleprinter TT-4C¹⁴

¹⁴ https://books.google.com.au/books?id=DcgXAAAYAAJ&pg=SA1-PA16&source=gbv_selected_pages&cad=2#v=onepage&q&f=false

MOD-19 TTY



Figure 25: MOD - 19 TTY

Direction Finder Set AN/PRD-1

The PRD-1 was used by 121 Signal Squadron (Singapore) on several exercises in Malaya in 1962. It was found to be very successful if you could see the target.

The US Army used the the PRD-1 extensively in the early stages of the war. On several occasions 547 Sig Tp borrowed a set to assist in some of their operations¹⁵.

AN/PRD-1 Specifications¹⁶

The Direction Finding Set AN/PRD-1 is designed for use a mobile and portable radio direction finder. The basic equipment consists of a loop antenna, a superheterodyne-type receiver, and power supply unit. The equipment covers a frequency range of 100k kc (kilocycles) to 30 mc (megacycles) in seven overlapping bands. The set is capable of receiving cw (continuous wave), icw (interrupted continuous wave), and a-m (amplitude modulated) signals throughout the frequency range, and of receiving f-m (frequency modulated) signals in the range of 12.5 to 30 mc. The complete equipment consists of Antenna AS-536/PRD-1, Antenna AT-301/PRD-1, Radio Receiver R-395/PRD-1, Dynamotor Power Supply DY-79/PRD-1, Battery Box CY-947/PRD-1, Direction Finder Tripod MT-870/PRD-1 and a number of additional components. Direction Finder Set AN/PRD-1 is used to determine the direction of arrival of transmitted radio signals from friendly or enemy source. By orienting the antenna and operating the receiver, the direction can be determined easily by using a null method

Frequency coverage: 100 kc - 30 mc. in seven bands
Type of signals: cw – icw – am – fm (15 – 30 mc)
IF: 455 KHz
Tubes Rx: 6 x 1U4, 1 X 3Q4, 2 X 1U5, 2 X 6AK5, 1 X 1R5, 1 X 6C4
Tubes Dynamotor: 1 x 6AK5, 2 X 12AU7
Dynamotor Power Supply: DY-79/PRD-1
Battery Box: CY-497/PRD-1
Power supply: 24V 7A
Dimensions: Case CS-80 16 5/32 x 12 9/16 x 10 11/16 inc.
Weight: 63.5 lb.
Manual: TM 11-677

¹⁵ See the story of DODO.

¹⁶ Extract from: <http://www.radiomilitari.com/prd1.html>

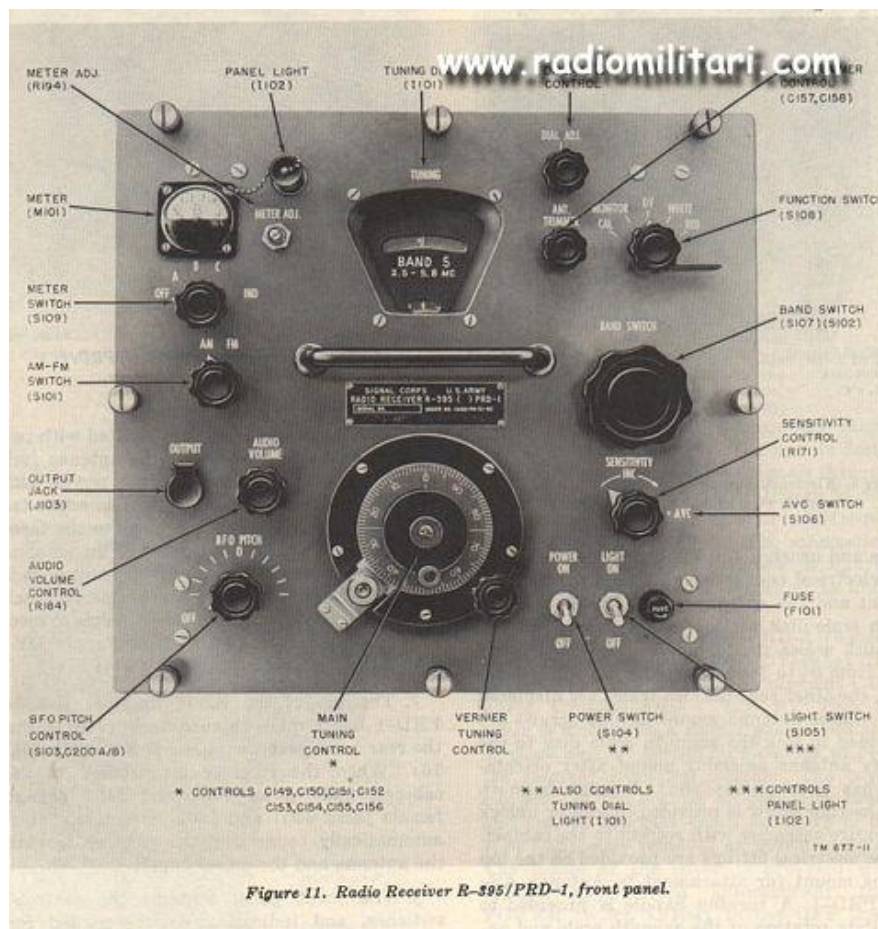


Figure 11. Radio Receiver R-895/PRD-1, front panel.



Figure 27: PRD-1 front panel



Figure 28: PRD-1 setup



Figure 29: ASA's Green Berets— Soldiers of the 403rd RR SOD (Abn) in Vietnam (Photo: INSCOM)¹⁷

¹⁷ Long, Lonnie M.; Gary B. Blackburn (2013-05-14). *Unlikely Warriors: The Army Security Agency's Secret War in Vietnam 1961-1973* (p. 228). iUniverse. Kindle Edition.

Extract from the book *Body of Secrets*¹⁸:

On a typical mission, the PRD-1 would be transported by jeep to what was thought to be a good spot from which to locate Vietcong in the Delta. Once at the site, a tactical DF post would be established. A bunker made of double or triple sandbags would be set up, then encircled with rolls of barbed wire and concertina wire, perhaps fifteen feet across. A variety of antennas would be set up and warning signs would be posted. "Signs telling," said Parks, "that this was a classified site and not to enter on pain of death and according to some regulation or another." In the center, sitting on a tripod, would be the PRD-1, which was about eighteen inches square and crowned with a diamond-shaped antenna that could be rotated. At its base was an azimuth ring marked off in degrees. Once he was set up, the DF operator would put on his earphones and begin listening for enemy signals. "Timeto get on the knobs and kill a Commie for Mommy," said Parks. In order to cover the operational area, a "net" of three DF sites would have to be set up. This would allow the operators to triangulate the enemy signals and get a fix on their exact locations. "'Find them, fix them, and fuck 'em over!' was our unofficial motto," said Parks. "'Better Living Through Electronics' was another one." Once a DF station picked up an enemy transmission, the operator would take a bearing on it. The information would then be encrypted and sent up the chain of command and an attack order would frequently be given. Heavy artillery fire would then plaster the site, and the infantry would sweep in. Unfortunately, the Vietcong were wise to the game; they knew the United States was probably listening and they avoided transmitting as much as possible. Or they would place their transmitting antenna up to a mile from the actual transmitter, in order to avoid fire. "It was a great and intricate game of fox and hounds played silently between us," said Parks. "Each side aware of the other though we never met. It was a life-or-death game for them, too. To place it bluntly, the DF teams were there to aid the 199th in its task of killing those Vietnamese radio ops and all of their buddies, if at all possible. We hounded them unmercifully. . . . Their radio ops became worse as time went by due to the better-trained ones having been killed." But DF missions were a double-edged sword, as Specialist Davis had discovered. Since the range of the PRD-1 was only about five miles— on a very good day— the Sigint soldiers had to be almost in the enemy's camp to locate them. "They were practically in our lap most of the time," said Parks. "Once, we DF'd a transmission that was coming from a grass hut not three hundred yards from me— easy rifle shot if I could have caught him coming out of the hut."

¹⁸ Bamford, James (2008-09-04). *Body Of Secrets* (Kindle Locations 5829-5850). Random House. Kindle Edition.

Telefunken PE-484 Miniature Direction Finder

The 547 Sig Tp 1 July 1970 Stocktake¹⁹ contained two Telefunken Equipment Portable²⁰. It is believed that the PE-484 was only used once operationally by the Troop²¹.

Specifications²²

The PE-484 was a body-wearable miniature direction finder (Kleinstpeilempfänger) with a wide range of accessories, introduced around 1958 by [Telefunken](#) in Germany. It could be carried inconspicuously under the operator's clothing and was intended for tracking down clandestine radio stations. In some countries the PE-484 was used until the early 1980s.

The PE484 is a beautifully crafted receiver with a body made of Bakelite. It has a very ergonomic design with metal support pins at either side, allowing it to be strapped to the body with the supplied canvas belt. It is fully self-contained and is powered by three internal rechargeable batteries.

Special body-wearable antennas were supplied, allowing the entire setup to be hidden under the operator's clothing. A thin wire, hidden in the sleeve of the coat, connected to a field strength meter that was carried on the left wrist.



The PE-484 came with a lot of dedicated accessories, such as the much sought after wrist-watch field strength indicator, packed together in a leather briefcase. An extended version came with even more accessories, and was packed in a large leather suitcase (see below).

The receiver covered all frequencies between 0.057 and 20.6 MHz, with the exception of the 0.443 to 0.498 MHz section, divided over 10 frequency ranges. Each frequency range had its own tuning could that also acted as the frequency scale. It was inserted from the side of the receiver. When strapped to the body, the tuning scale could be observed by the user.

¹⁹ AWM103, R838/1/19 Accounts Stocktakes 547 Sig Tp.

²⁰ It is not known when the equipment was first issued.

²¹ See May Tao SAS Excursion.

²² Extract from: <http://www.cryptomuseum.com/df/telefunken/pe484/>



Figure 30: Wearable Antenna



Figure 31: Transportation Case

Single Station Location System

Operators Console

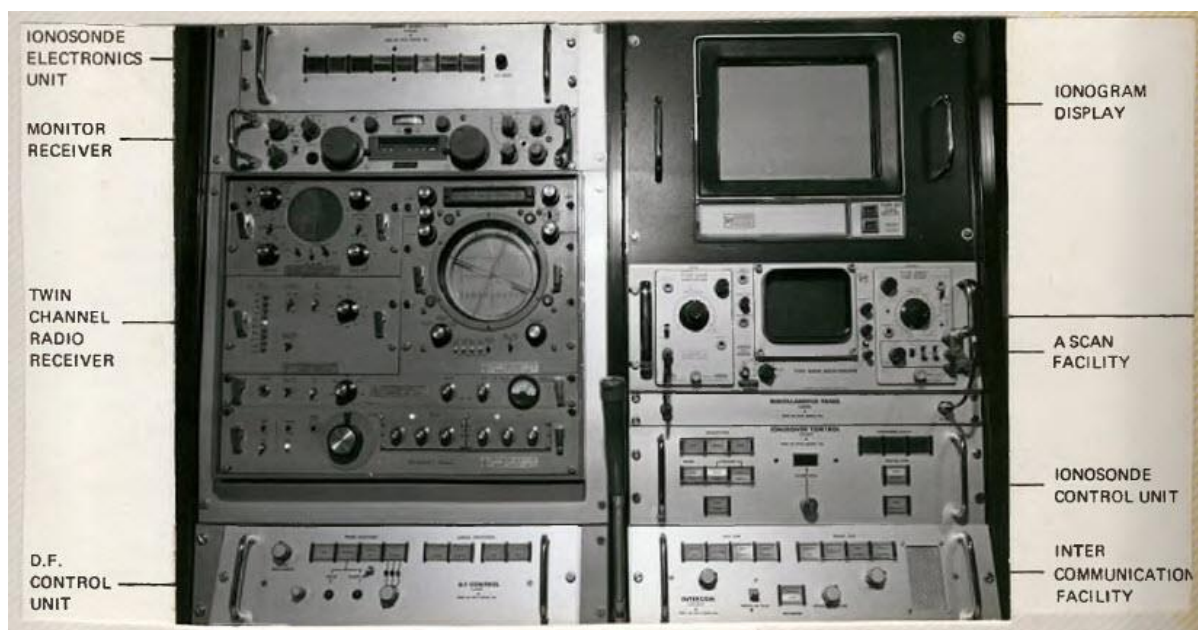


Figure 32: Part of the Operators Console

The monitor receiver shown here is a Racal RA-1217.



Double conversion, I.F. 47,21 MHz, 455 kHz

Digital frequency display, mechanical, 1 kHz

AM, SSB, FM

980 kHz - 30 MHz

Selectivity -6 dB
13 / 6 / 3 / 1 / 0,2 kHz

Sensitivity
0,5 uV SSB


RF Gain, four step attenuator

Figure 33: Racal RA-1217²³


²³ <http://www.shortwaveradio.ch/radio-e/racal-ra-1217-e.htm>

The twin-channel radio receiver shown has not been identified but in later correspondence (1971) a RA-153 was mentioned as being a receiver in use.

Twin Channel Receiver RA-153



Uploads & questions ▾ My model ▾

ID = 106290 [Help](#) 

Country: Great Britain (UK)	Manufacturer / Brand: Racal Engineering (Racal Instruments) Ltd., Bracknell
Year: 1967–1969 ?	Type: Commercial Receiver (may include amateur bands)
Semiconductors (the count is only for transistors)	Semiconductors present.
Principle	Superhet, double/triple conversion
Wave bands	Broadcast plus more than 2 Short Wave bands.
Details	
Power type and voltage	Alternating Current supply (AC) / 100-125 / 200-250 Volt
Loudspeaker	- For headphones or amp.
Power out	
from Radiomuseum.org	Model: Twin Channel Receiver RA-153 - Racal Engineering Racal
Material	Metal case
Shape	Rack
Dimensions (WHD)	480 x 530 x 570 mm / 18.9 x 20.9 x 22.4 inch
	Coverage 980 - 30000 kHz, AM/SSB with BFO, linear analog readout (ca. 1 kHz). Bandwidths are 0,1 / 0,3 / 0,75 / 1,2 / 3 / 8 kHz -6 dB. Professional twin channel receiver used for direction finding and radio propagation studies. The set consists of two RA-117 receivers with common VFO's, but separate signal paths. Variants: RA-153A with a single AF stage switchable two both receivers and RA-153B with twin AF stages, one for each channel. Options: MA-126 Phase and Amplitude Compensation Unit, MA-190 Indicator and Balancing Unit and a Direction Finding Unit.
Notes	
Net weight (2.2 lb = 1 kg)	59 kg / 129 lb 15.3 oz (129.956 lb)

Figure 34: RA-153 details²⁴



Figure 35: RA-153

²⁴ http://www.radiomuseum.org/r/racal_twin_channel_receiver_ra.html

Several receivers were used in the SSL over the years.

Receiver Racal RA17



Figure 36: Racal RA17

DETAILS OF THE RECEIVER

1.1 ELECTRICAL DETAILS

Frequency Range

0.5 to 30 Mc/s covered in 30 bands 1 Mc/s wide. Frequencies below 1 Mc/s will be received with slight degradation of performance.

Tuning

An effective scale length of approximately 145 feet, with substantially constant frequency increments, provides excellent discrimination, *i.e.* 6 inches of scale corresponds to 100 kc/s, calibrated at 1 kc/s intervals.

Calibration

Scale checkpoints at 100 kc/s intervals

Aerial Input

75Ω unbalanced.

I.F. Output

100 kc/s :—

- (a) 75Ω approximately 180mV R.M.S.
- (b) High impedance.

Audio Outputs

	<i>Impedance</i>	<i>Level</i>	<i>Distortion</i>
(a) (i)	3Ω	50mW	5% max.
(ii)	600Ω	3mW	5% „
(iii)	600Ω	3mW	5% „
(iv)	600Ω	3mW	5% „
(b)	600Ω	10mW	5% „

The level of output (b) is not dependent on the setting of the audio gain control but may be separately adjusted.

Power Supplies

100–125 volts or 200–250 volts. 45–65 c/s.
Consumption—85 watts approximately.

1.2 MECHANICAL DETAILS

The receiver is designed for both table or rack mounting. The front panel, normally painted Light Admiralty Grey to British Standard Specification 381C colour 697, has been carefully designed to minimise operator fatigue and combines utility with pleasing appearance.

The dimensions of the $\frac{1}{8}$ -in. thick steel front panel conform with the requirements for mounting in a standard 19-in. rack.

For table mounting, the receiver is fitted in a robust steel cabinet which is slotted at the rear to enable the operator to gain easy access to the mains input socket and fuse, and the termination strips.

A dust cover is provided with both models, thereby keeping the dust intake to a minimum.

The chassis are of cast construction ensuring maximum rigidity and effective electrical screening.

1.3 DIMENSIONS AND WEIGHT

Rack Model

Width	19-in. (48·3 cm)
Height	10 $\frac{1}{4}$ -in. (26·7 cm)
Depth overall	20 $\frac{1}{4}$ -in. (51 cm)
Depth behind panel	18 $\frac{1}{4}$ -in. (47·6 cm)
Weight	67-lb. (30·5 kg)

Table Model

Width	20 $\frac{1}{2}$ -in. (52 cm)
Height	12-in. (30·5 cm)
Depth	21 $\frac{1}{4}$ -in. (55·6 cm)
Weight	97-lb. (44 kg)

Ionosonde

An **ionosonde**, or **chirpsounder**, is a special radar for the examination of the ionosphere. An ionosonde consists of:

- A high frequency (HF) transmitter, automatically tunable over a wide range. Typically the frequency coverage is 0.5–23 MHz or 1–40 MHz, though normally sweeps are confined to approximately 1.6–12 MHz.
- A tracking HF receiver which can automatically track the frequency of the transmitter.
- An antenna with a suitable radiation pattern, which transmits well vertically upwards and is efficient over the whole frequency range used.
- Digital control and data analysis circuits.

The transmitter sweeps all or part of the HF frequency range, transmitting short pulses. These pulses are reflected at various layers of the ionosphere, at heights of 100–400 km, and their echos are received by the receiver and analyzed by the control system. The result is displayed in the form of an ionogram, a graph of reflection height (actually time between transmission and reception of pulse) versus carrier frequency.²⁵



Figure 37: Ionosonde Control Panel

²⁵ <http://en.wikipedia.org/wiki/Ionosonde>



Figure 38: Ionosonde Transmitter and Amplifier



Figure 39: Ionosonde Antenna similar to this

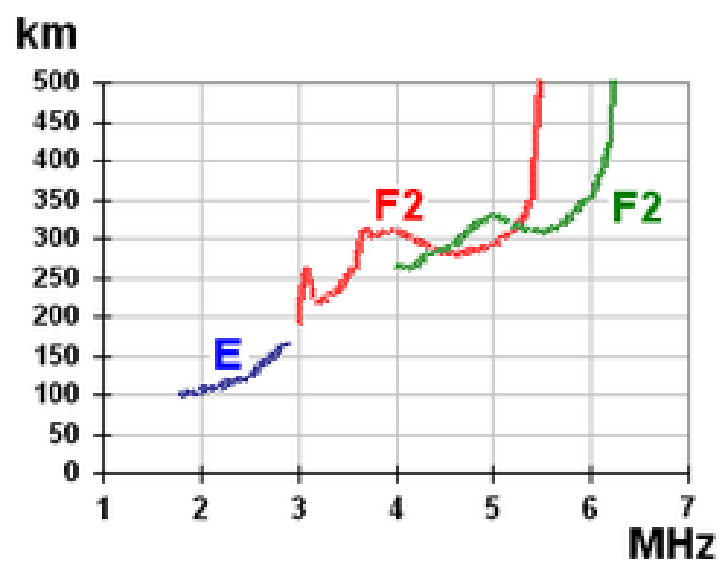


Figure 40: Ionogram display example

Olivetti Programma 101 Computer

The Olivetti Programma 1101 Computer was the first used in the SSL.



Figure 41; Olivetti Programma 101 Computer

The Programma 101 was the first commercial "desktop computer" Produced by Italian manufacturer Olivetti and invented by the Italian engineer Pier Giorgio Perotto. It was launched at the 1964 New York World's Fair, A futuristic design for its time.

The Programma 101 was able to calculate the basic four arithmetic functions (addition, subtraction, multiplication, and division), plus square root, absolute value, and fractional part. Also clear, transfer, exchange, and stop for input. There were 16 jump instructions and 16 conditional jump instructions. 32 label statements were available as destinations for the 32 jump instructions and/or the four start keys (V, W, Y, Z).

Each full register held a 22-digit number with sign and decimal point.

Its memory consisted of 10 registers: three for operations (M, A, R); two for storage (B, C); three for storage and/or program (assignable as needed: D, E, F); and two for program only (p1, p2). Five of the registers (B, C, D, E, F) could be subdivided into half-registers, containing an 11-digit number with sign and decimal point. When used for programming, each full register stored 24 instructions.

It printed programs and results onto a roll of paper tape, similar to calculator or cash register paper.²⁶

²⁶ http://en.wikipedia.org/wiki/Programma_101

PDP-8 Computer

The PDP-8 computer replaced the Olivetti and was used to calculate all the SSL results.

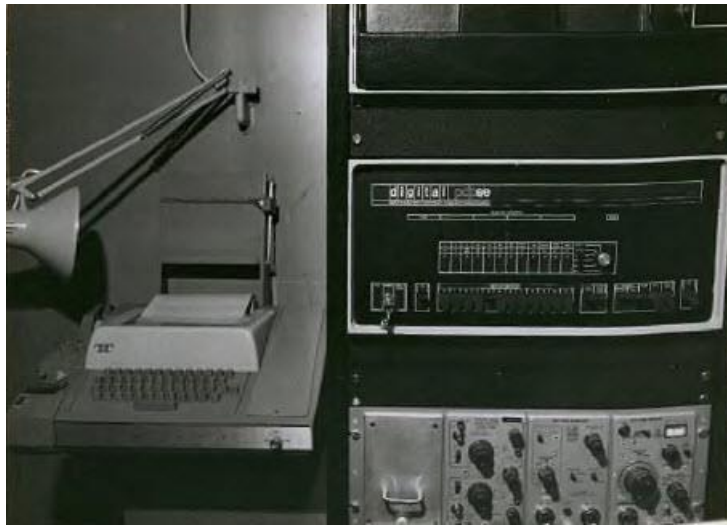


Figure 42: PDP8 Computer and Printer



Figure 43: PDP8 Computer²⁷

What is a PDP-8?²⁸

The PDP-8 family of minicomputers were built by Digital Equipment Corporation between 1965 and 1990, although it is worth noting that the term minicomputer first came into prominence after the machine was introduced. The first use of the term appears to have been made by the head of DEC's operations in England, John Leng. He sent back a sales report that started: "Here is the latest minicomputer activity in the land of miniskirts as I drive around in my [Austin] Mini Minor." The term quickly became part of DEC's internal jargon and spread from there; the first computer explicitly sold as a minicomputer, though, was made by Interdata.

²⁷ <https://www.grc.com/pdp-8/pdp-8.htm>

²⁸ Ibid.

CAPTURED NVA/VC RADIO EQUIPMENT

Communications of the VC/NVA were extremely austere—especially when compared with the extensive use of AM and FM radios by the Allied forces.* An NVA or main-force VC infantry company had only one **radio** for maintaining communications with its battalion headquarters. This was supported by a field telephone wire system laid between battalion and each company when the units were stationary for any length of time.⁸ If time and assets were available, the telephone wire network was extended to the platoons.

The primary tactical voice communications **radio** used by the VC/NVA at the battalion-to-regiment level was the **Chicom Type 71 B** transceiver, which had a range of approximately fifty kilometers. This **radio** was replaced in the mid-1960s by the improved **Chicom Type 63** transceiver. For communications from regiment to higher echelons, the VC/NVA relied on the **Chicom radio** set, Model 102E, which had an estimated range of one hundred twenty-five kilometers. Soviet equivalents of these radios were also employed. Communications equipment captured or stolen from the Allies, particularly FM PRC 10s, 25s, and 77s, were also used. However, these U.S.-made radios were not frequency-compatible with the **Chicom** and Soviet models and were therefore limited in their use.⁹

Telephone wire included U.S.-made WD-1, which was frequently left behind when Americans abandoned fixed positions and fire bases. A gray plastic-coated wire made in China was also used. The telephones themselves were U.S.-made TA-312s or similar sets of Soviet design—Suchotsk Model TA 1-43 or **Chicom** models E0754 and Q-07.1.

The limited number of radios and telephones were backed up by the principal means of communication—couriers. In actual combat, virtually all messages by both main-force VC and the NVA were transmitted by this method. Runners carried verbal and written reports and requests from platoon to company and orders from company to platoon. Company messengers performed similar missions between their unit and battalion.

Some of the enemy equipment captured by Australian and US forces and presented to the Troop.

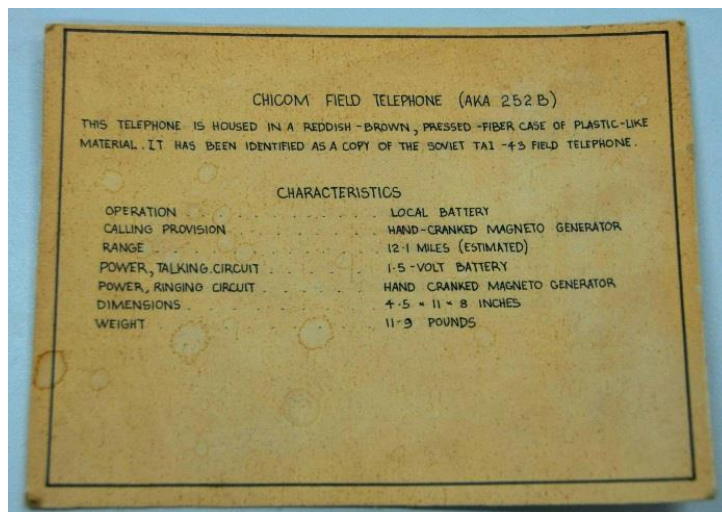


Figure 44: Chicom Field Telephone (AKA 252B)



Figure 45: Chicom Field Telephone (AKA 252B)



Figure 46: Plaque

Chinese Type 102E / XD 6 Radio Station



Figure 47: Chicom Model 102E

One of the most often captured radios was the Chicom Model 102E which was man-packed or mounted in vehicles. This set was a copy of the U.S. AN/GRC 9 set with a few changes. The transmitter took up more space and the outer carrier, a metal chest housed the transmitter, receiver and a space for the D81 dry battery. The transmitter required a 6410 hand cranked generator or a 964IE Dynamotor. The hand-cranked generator looked just like the U.S. versions but had a built-in voltmeter, an idea first seen in WW II Japanese generators. The set was a 15 watt set with a range of 75 miles, and covered 2-12 MHz. The complete set with accessories weighed 105 lb. The receiver and transmitter alone weighed 38 lb. This set was being replaced by the XD 6 set which had the same technical characteristics.²⁹

²⁹ http://www.armyradio.com/arsc/customer/pages.php?pageurl=/publish/Articles/William_Howard/Chinese_Radios.htm#Chinese Type 102 E / XD 6 Radio Station

CHICOM 102E RADIO (aka 55B, 81, 103, 15-watt radio)

The ChiCom 102E is a low power (15 watts), tactical pack or vehicular, high frequency AM transmitter-receiver used by ground forces. It is an electronic copy of the US Army AN/GRC-9 radio with minor changes in the front panel controls and in the positions of the components.

CHARACTERISTICS:

Receiver Frequency Coverage: 2-12 mc (3 bands)

Type of Reception: Voice, MCW, CW

Power Source: Battery--1.4, 90 volts

Transmitter Frequency Range: 2-12 mc (3 bands)

Type of Emission: Voice, CW

Frequency Control: Master oscillator or crystal

Power Source: 12-volt battery and dynamotor,
hand cranked generator. (6.3, 425 volts)

Range: Voice--80 km, CW--200 km

Antennas: 64m long wire, 32m inverted "L", 4.8m whip (5 sections)

Dimensions: 38.1 x 20.95 x 33 cm

Weight: 18.38 kg (without battery)

Chinese Type 71B Radio



Figure 48: Chinese Type 71B Radio



Figure 49: Chinese Type 71B Radio

CHICOM 71B RADIO (aka 2-3 watt radio)

The ChiCom 71B is a low power (2-3 watts) AM transceiver, professionally designed and well constructed. It is primarily used by ground forces between battalion and regiment and between company and battalion.

CHARACTERISTICS:

Receiver Frequency Coverage: 1.9-7.2 mc (2 bands)

Type of Reception: Voice, MCW, CW

Power Source: Battery, D71--1.4, 90 volts

Transmitter Frequency Range: 1.9-7.3 mc (3 bands)

Type of Emission: Voice, CW

Frequency Control: Master oscillator or crystal

Power Source: Battery, D71--1.4, 7.5, 150 volts

Range (est): 4.82-48.27 km

Antennas: 1.92m whip or 10.06m long wire

Dimensions: 29.21 x 15.54 x 18.72 cm

Weight: 15.44 kg (with battery)

³⁰ http://www.armyradio.com/arsc/customer/pages.php?pageurl=/publish/Articles/William_Howard/Chinese_Radios.htm

Type K-63 Back Pack Radio



Figure 50: Type K-63 Back Pack Radio

The Type 63 manpack set was the newest item supplied by China. This set was probably intended as a replacement for the Model 71 B radio. This set looked like a copy of the U.S. W.W.II Walkie-talkie but when the RT unit was removed from its case, it looked more like an AN/PRC 10. It weighed 35 lb, was 3 1/2" x 10" x 16" and was powered by a D-63 dry battery with taps at 3V, 27V, 90V and 178.5 volts. It was estimated to be a 2 watt transmitter and covered 1.5 to 6 MHz. Unlike the U.S. counterparts this set had a built-in key for CW operation.³¹

³¹ http://www.armyradio.com/publish/Articles/William_Howard/Pictures/Type_63-01.jpg

Unknown Types



Figure 51: Unidentified

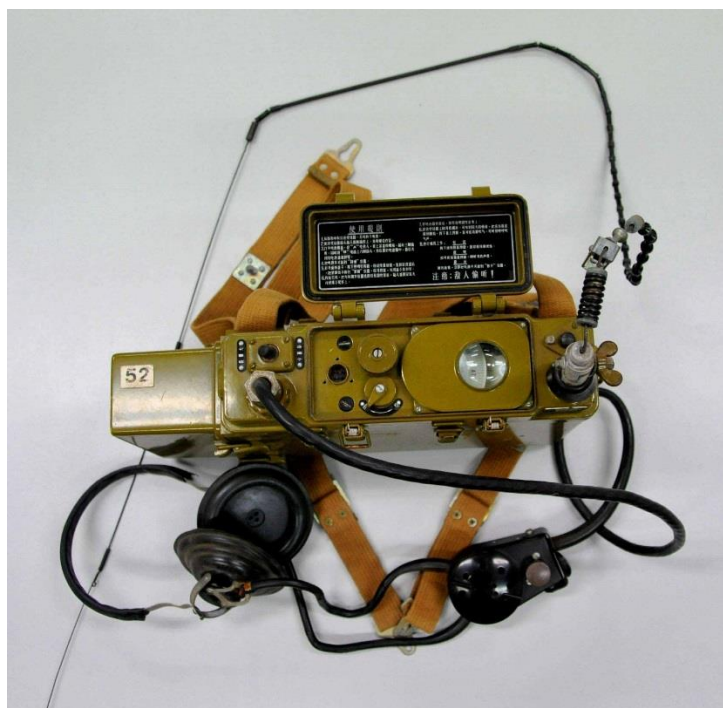


Figure 52: Unidentified



Figure 53: Unidentified

Chicom Transceiver 702 D



CHICOM TRANSCIEVER
TYPE 702D
FREQ RANGE 26.1 - 37 MHz
RANGE 1 - 6 MILES

Figure 54: Chicom Transceiver 702 D