

Equipment History File

Wireless Set C12 (British Army 1955)



The 'temporary replacement' for Wireless Sets No. 19

1. Introduction

Wireless Set C12 (C12) was a post WW2 mobile HF transmitter-receiver designed by Pye Ltd in Cambridge to replace the 'A' set and intercom functions provided by the war-time Wireless Sets No. 19 (WS19). Since 1941 WS19 had provided radio communications for Armoured Fighting Vehicles (AFV) and other general purpose vehicular applications in the British Army.

The C12 was intended by the Army to be only a temporary equipment, required due to delays in other programmes, however the final in-service life was from 1955 to 1979. The equipment was later given the Larkspur designation Station Radio C12.

2. Equipment History

Wireless Set C12 was originally designed between 1948 and 1950 as a private venture by Pye Ltd. Prototypes were shown to the Ministry of Supply but the design was not accepted for use by the British Army due to the Ministry preference for a new generation of hermetically sealed equipments which later came to be known as the Larkspur series.

Station Radio C13 by BCC Ltd of Wembley was planned to be the official replacement for WS19. However, in the early 1950s the C13 design program ran late and the Pye C12 was re-considered for use by the British Army as a temporary substitute for the C13 in the Royal Armoured Corps (RAC). When the C13 became available much later, the C12 was transferred to other RAC vehicles for general use, just as WS19 had been in earlier times.

Due to subsequent defence cut-backs affecting the purchase of new equipment, the C12 actually remained in service from 1955 until the late 1970s. It was manufactured for Pye Ltd at a facility in the Richard Garrett Engineering Works, Leiston, Ipswich UK, and by Pye Scottish Telecommunications, Airdrie.

Although most British C12 equipment bear the date 1955, the equipment was first demonstrated by the Army in July 1953 at a 3-day exhibition held at the Royal Aircraft Establishment, Farnborough by the Radio Communications and Electronic Engineering Association, and sponsored by the Ministry of Supply. A total of 726 C12 transceivers were delivered to the Ministry of Supply between 1955 and 1957, when production for the British Army ended. The C12 was also offered for sale internationally to other governments and police forces etc, finally being withdrawn from the Pye Telecom sales catalogue in 1965.

Today, examples of Wireless Set C12 are hard to find due to the small quantity of units ever supplied to the British Army. Also, like Pye Wireless Set 62 before it, the C12 ATU was wound from silver wire and after disposal by the Ministry of Defence, many units were cannibalized for the silver by dealers.

3. Technical Description

Like the earlier WS19, WS C12 provided internal crew intercommunications as well as external medium range HF radio communications for AFVs. In the post-war communications era of the 1950s, the short-range VHF communication path between AFV and the Infantry was provided by separate Larkspur Series equipments, Station Radio B47 or B48.

The C12 equipment was constructed along similar lines to the earlier Pye WS19, WS22 and WS62, and had similar overall external dimensions. The complete station consisted of a waterproof and dustproof main transceiver unit, a separate power supply unit and an external aerial tuning unit (ATU). The equipment could be connected to either WS19 type or Larkspur type interconnection wiring harnesses. It is pictured above with the WS19 type single drop-lead adapter fitted for direct connection of a WS19 type microphone and headset assembly without the use of a control harness or control boxes.

The frequency range covered was 1.6 to 10.0 MHz, and the equipment utilized an electrical two-channel "flick" tuning operation by means of switched main tuning capacitors, each with its own colour coded dial mechanism. The ATU had twin tuning inductors switched by relays under control of the radio unit. Radio-telephony (RT) transmit power output was 5-7.5 Watts AM at 95% modulation and telegraphy output 4-8 Watts. The equipment was intended to work into vertical rod aerials of length between 8 and 32 feet, but would also operate into a 100 foot wire for longer range communication. It was claimed that due to the high level of modulation achieved, the station was equivalent to the combination of a WS19 and HP Amplifier No. 2 (which gave about 25 Watts RF output, but with low level modulation).

Different external power supply units were provided for 12 Volt systems or 24 Volt systems. Each used an electro-mechanical vibrator circuit to provide the 250 Volt HT supply to the receiver, and a rotary transformer (motor-generator) to generate the 400 Volt supply for the transmitter. Transistorised versions of the PSU were introduced in the early 1960s. Early versions of the 24 Volt PSU were found to overheat, and so a manually controlled cooling fan was incorporated, attached to the front panel and enabled by opening a small ventilation door.

A slightly modified version of Crystal Calibrator No. 10 (from Wireless Set No. 62) was used as an external frequency reference. The equipment could send and receive both radio-telephony (RT) signals and continuous wave (CW) Morse code signals.

Wireless Set C12 used 17 miniature all-glass valves (termed tubes in the USA) and some of the functions of the valves were shared between receiver and transmitter. It was a true transceiver, and conceptually similar to WS62. The receiver was a conventional single superheterodyne

type receiver ('single superhet') with an IF of 460 KHz. Broad RF selectivity was provided by the ATU, followed by an RF Amplifier, Mixer, separate Local Oscillator, two I.F. Amplifier stages, Signal and A.V.C. Detectors, an Audio Frequency Amplifier to drive headphones and a Beat Frequency Oscillator (also part of the TX circuit) for the reception of CW signals.

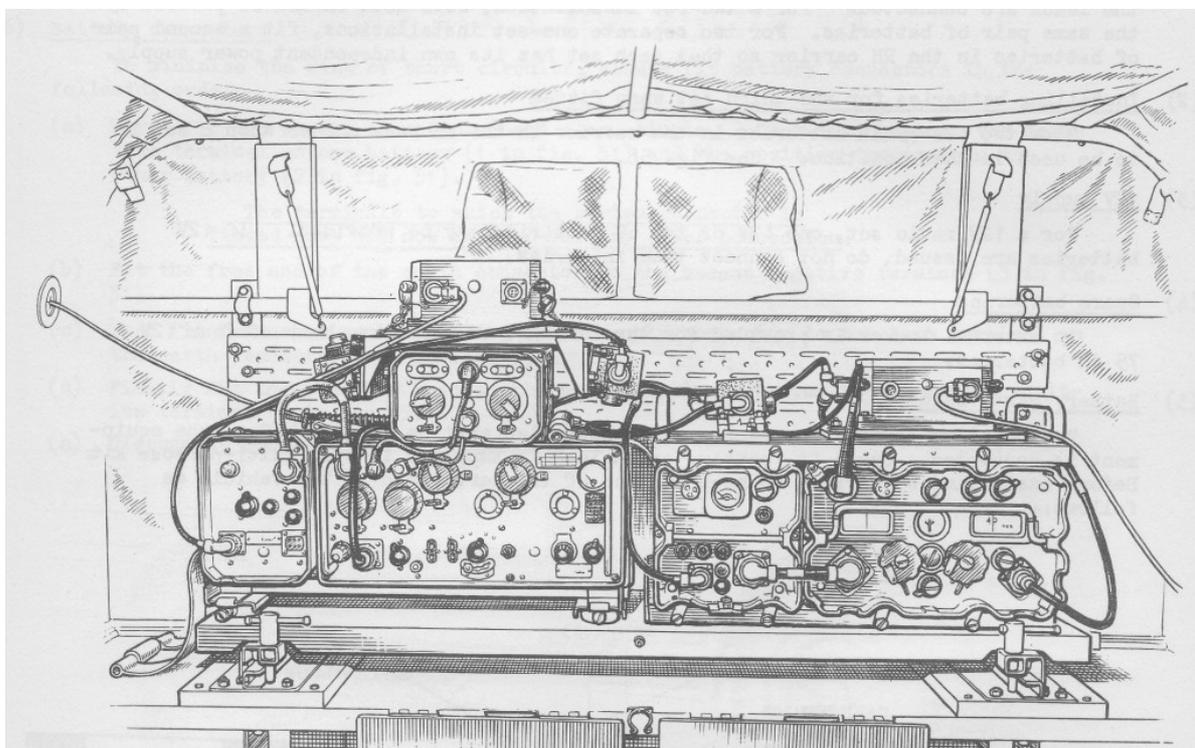
The same tuneable local oscillator drove both the receiver and the transmitter circuits, thus ensuring that the two sections of the equipment were aligned to the same frequency at all times. The local oscillator operated 460KHz above the incoming signal frequency and subtractive mixing produced the receiver Intermediate Frequency (IF), which is where the bulk of the receiver amplification and selectivity took place.

The transmitter radio frequency circuits consisted of the Local Oscillator (shared with the receiver and operating 460 KHz higher than the desired transmit frequency), a Sender Mixer, a 460 KHz Transmit Oscillator (which was also the receiver Beat Frequency Oscillator), a Buffer Amplifier and the final transmitter Power Amplifier. A push-pull Speech Amplifier raised the level of the microphone output to drive the Modulator valves. High level anode and screen modulation was employed and the modulator output valves were 5B/254M (miniature 807). The RF Power Amplifier valve was also a 5B/254M.

The original equipment design also included a crystal control option with a front panel socket for a quartz crystal to be plugged in. The British Army did not officially require this option, and many (but not all) ex-British Army equipments have the MO/Xtal switch blanked out.

When used in an AFV, each crew member had a headset and microphone connected to a junction box in the Larkspur control harness providing intercommunication between the crew and also wireless communication to other Army units. For mounting in a vehicle the C12 used the same series of equipment carriers as WS19 (Carriers Set No. 21 or 25 etc).

A Two-Set Installation of WS C12 and C42 in a 'Fitted For Radio' (FFR) Vehicle



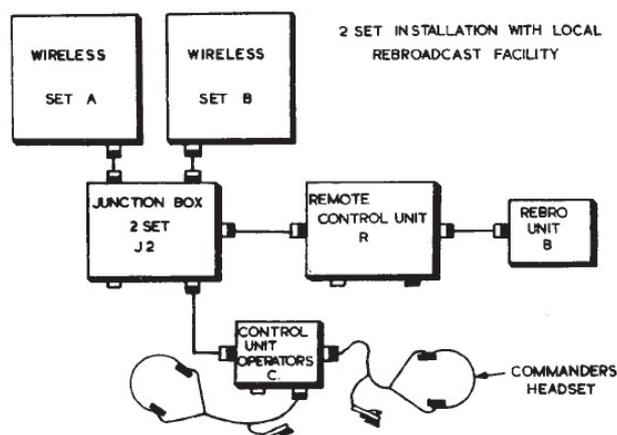
WS C12 mounted on left, C42 mounted on right

Two-Set Larkspur Inter-connection and Control Harness Diagram

TELECOMMUNICATIONS
L 782
Part 2

R E S T R I C T E D

ELECTRICAL AND MECHANICAL
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4 Technical Specifications

- Frequency range: 1.6 - 4 MHz and 4 - 10 MHz in two switched ranges
- Modulation modes: Amplitude Modulation (AM) for speech and Continuous Wave (CW) for Morse code transmission.
- Power output: AM nominally 5-7.5 Watts (W); CW nominally 6-8W
- Active devices 17 thermionic valves (termed tubes in the USA)
- Size/weight: C12 TX/RX:- 17.5 x 8.5 x 12.5 inches, weight 40lbs
Power Supply Unit:- 6.25 x 8.5 x 11.5 inches, weight 23lbs
Aerial Tuning Unit No. 5:- 8.25 x 5 x 11.75 inches, weight 12lbs
- Power Supply: 12 Volt or 24 Volt lead-acid batteries driving an electro-mechanical vibrator providing 250V at 85 milliAmps (mA) for the receiver and a rotary motor-generator which provided 400 Volts at 140mA for the transmitter.
- Antenna System: 8-32ft. vertical or 100 ft. horizontal long-wire according to frequency

5. References & Sources of Further Information

1. C12 Electrical and Mechanical Engineering Regulations Tels H140 to H149, 1956 to 1964
2. Electrical and Mechanical Engineering Regulations Tels H142 Part 1 Technical Description, H142 Part 2 Fault Finding and Repair Data, H143 Unit repairs, H144 field and Base Repairs. Issue 1 1956
3. User Handbook for Wireless Set C12, 1955, W.O Code No. 11562
4. Illustrated Spare Parts List for WS C12, Z1/ZA 43050, W.O Code No. 12569, September 1960
5. Pye Telecommunications Wireless Set C12 Technical Handbook and Parts Lists, Issue 1
6. Pye Telecommunications Crystal Calibrator for WS C12, Instruction Book, Issue 1
7. Duxford Radio Society, <http://www.duxfordradiosociety.org>
8. Pye Telecom Historic Collection, www.pyetelecomhistory.org