

H.F., S.S.B. MANPACK RADIO SYSTEMS

UK/PRC 320 CLANSMAN & PRC 320/1

**Designed to full military user
requirement and specification**

**Extensively evaluated and
proved by British Army**

**In full production to U.K.
Government standards**

**Outstanding ground and
skywave performance**

**Full range of ancillaries
including hand generator
system**



The UK/PRC 320 in operation

Application

UK/PRC 320 is a lightweight h.f. s.s.b. radio station designed as part of the British Army's 'Clansman' range of radio equipments for combat use throughout the world. It represents an advanced concept in military h.f. station radios with a comprehensive range of ancillaries for manpack, ground station and vehicle use.

The PRC 320 is particularly suitable for use by long range patrols or special forces because of its superior skywave range performance and hand generator system.

Description

The equipment is all solid-state and operates in the band 2 to 29.9999MHz with 100Hz channel spacing. This gives a choice of 280 000 frequencies. Communications at night are much improved by using frequencies above 20MHz. Selection is obtained by decade knobs which control a micro-miniature synthesiser locked to a temperature compensated reference oscillator, giving a high order of stability under all environmental conditions. PRC 320 is simple to operate and provides s.s.b. (u.s.b.), a.m., c.w. (wide) and c.w. (narrow) facilities. Speech processing and automatic level control are employed to provide whisper speech facilities and a high mean output power.

An alternative version (PRC 320/1) can be supplied having both upper and lower sideband in the s.s.b. mode, compatible a.m., c.w. (wide) and with 1kHz channel spacing giving 28 000 channels.

A transmitter output power of 30W p.e.p. working into a 2.4m (8ft) whip antenna gives PRC 320 a reliable ground wave communications range in excess of 40km (25 miles) by day under normal conditions.

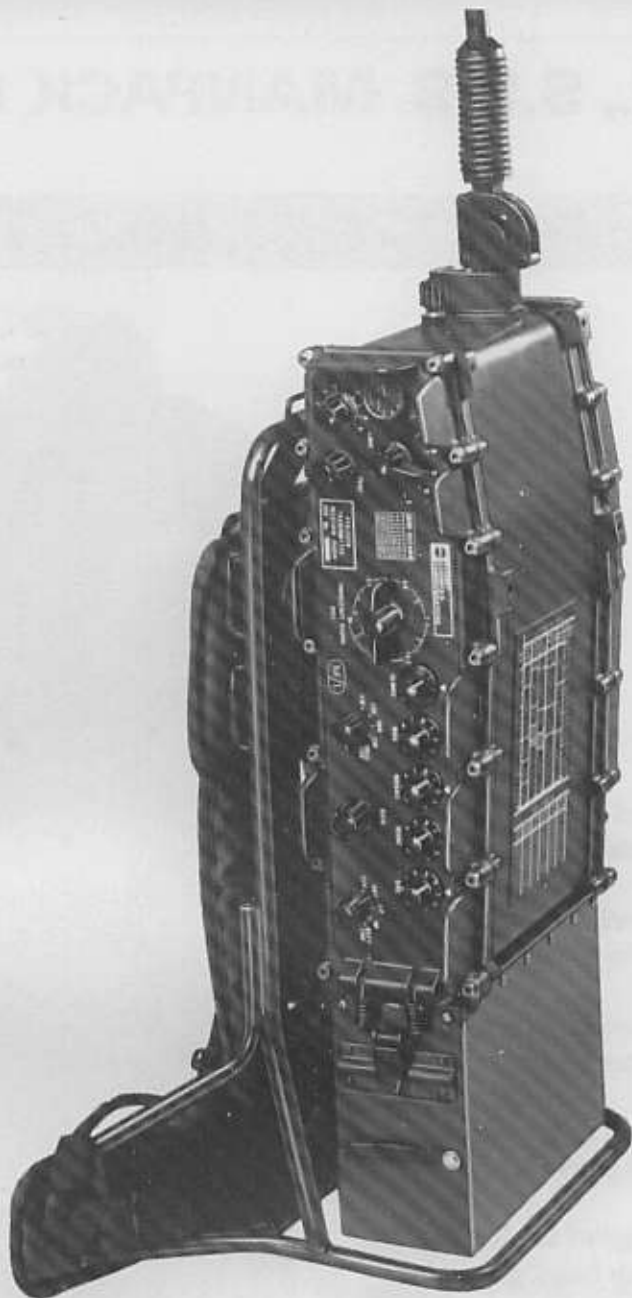
PRC 320 is suitable for use as a ground station, working into static ground or skywave antennas which greatly increase the distance range.

Working into a dipole or end-fed antenna, skywave communications at ranges from 50km (31 miles) to 2000km (1240 miles) or greater can readily be achieved. This superior range performance is due in part to the high grade receiver and high efficiency manual antenna tuning unit which is integral with the transmitter-receiver unit.

The radio is carried on the operator's back and allows him full use of his weapons. It is powered by rechargeable 24V nickel-cadmium batteries of 1.0 or 3.3Ah capacity. These batteries are charged using any of the charging units described below. Alternatively, the radio can be powered by a hand-generator system with 1.0Ah battery.

The radio can be operated remotely if required at distances up to 3km (2 miles)

With its manpack carrier and battery, the PRC 320 can be used as a 'clip-in'



The PRC 320/1

vehicle installation. A vehicle-mounted antenna is used and the battery is float-charged by a d.c. charging unit from the vehicle supply. The advantage of the system is that the transmitter-receiver can be quickly removed from the vehicle and used in its manpack role.

Variants

PRC 320/1 is similar in appearance and build standard to PRC 320 but provides l.s.b. and u.s.b., c.a.m., and c.w. (wide) facilities. Channel spacing is 1kHz. PRC 320-100 or PRC 320/1-100 100W h.f. s.s.b. Vehicle Station uses the manpack station in its 'clip-in' role to drive a 100W amplifier with automatic antenna tuning unit.

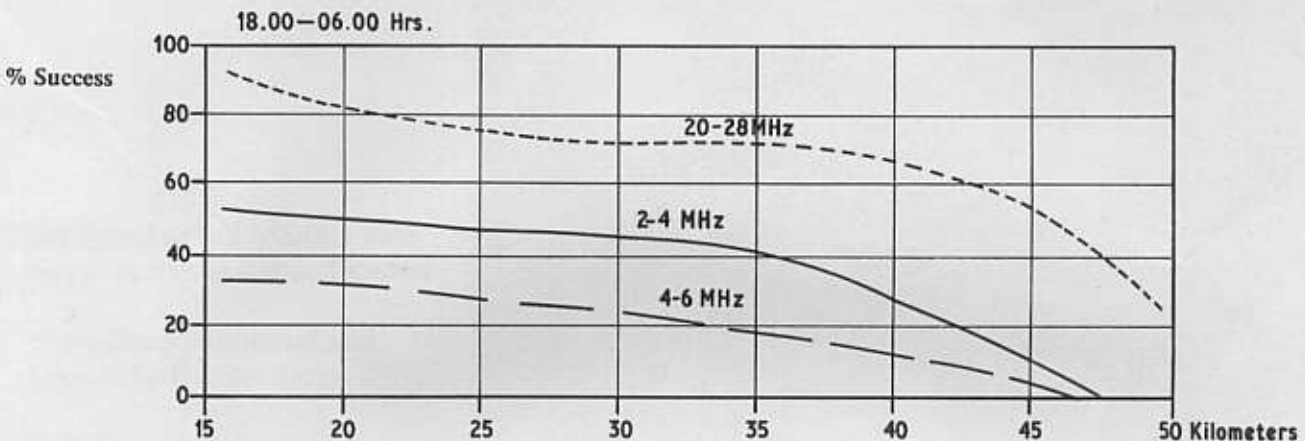
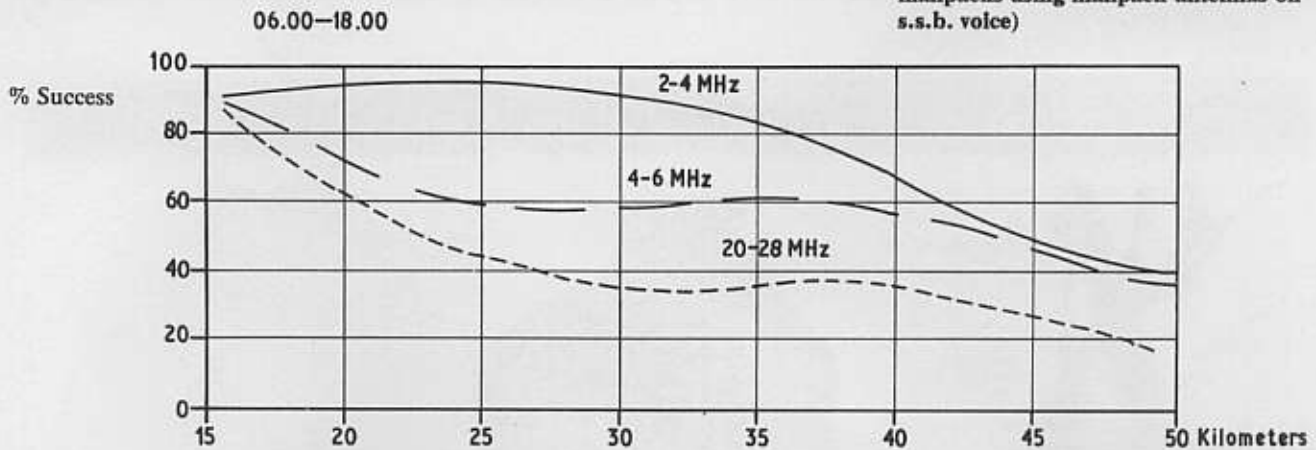
VRC 320/2 30W h.f. s.s.b. Vehicle Station is a vehicle variant in repackaged form which provides the same facilities as the PRC 320/1 and has an

automatic a.t.u. VRC 320/2-100 100W h.f. s.s.b. Vehicle Station utilises RT 320/2 plus 100W amplifier with automatic antenna tuning unit.

UK/PRC 320 GROUND WAVE RANGE PERFORMANCE

BRITISH ARMY USER TRIALS GROUND WAVE RESULTS

(Based on over 7,000 contacts between manpacks using manpack antennas on s.s.b. voice)



Success is defined as a strength 3 readability signal, or better in both directions between random sites in north west Europe.

ANCILLARIES

Audio Equipment

- Clansman or modified Larkspur handsets and headsets with boom microphone
- Knee-strap morse key
- An interface can also be provided with the Clansman or Larkspur vehicle control harness system

Batteries

Clansman sealed rechargeable nickel-cadmium batteries 24V, 3.3Ah and 1.0Ah

Battery charging

Hand-generator system: Comprises a hand-generator and 1.0Ah nickel-cadmium battery. This system can be fitted to the radio in place of the normal 3.3Ah battery. The radio can be operated indefinitely provided the hand-generator is turned while the set is switched on. Ideal for long-distance patrol use and for isolated posts.

A.C. charging unit: Capable of charging up to sixteen Clansman batteries from a.c. mains supply.

D.C. charging unit (28V): Capable of charging a

Clansman battery, or float-charging the battery and radio when powered from a nominal 28V d.c. source such as a vehicle battery supply or petrol charging engine.

D.C. charging unit (14V): As above, but powered from a nominal 14V d.c. source.

For details of the hand-generator a.c. and d.c. battery charging systems, see Publication No. 9313.

Remote control system

For remote operation of voice and pressel over field cable at distances up to 3km. Comprises a local unit and a remote control handset.

Antenna gear

- Lightweight mast 5.4m
- Long-wire, end-fed antenna
- Dipole antenna
- Whip antenna 2.4m and antenna angle adaptor
- Vehicle whip antenna system 3, 4 or 5m (PV 1316)

Data Summary

General

	UK/PRC 320	PRC 320/1
Frequency range:	2 to 29.9999	2 to 29.999
Channel spacing:	100Hz intervals	1kHz intervals
Mode of operation:	s.s.b. (A3J) u.s.b. a.m. (A3) c.w. (wide) A1 c.w. (narrow) A1	s.s.b. (A3J) u.s.b. s.s.b. (A3J) l.s.b. c.a.m. (A3H) c.w. (A1)

Frequency stability: 1 part in 10^6 over 6 months
Power supply: 24V, 3.3Ah rechargeable battery or power supply unit
Battery operating life: 12h at 1:9 transmit/receive ratio
Weight: Transmitter-receiver: 5.3kg (11lb 10oz)
Dimensions: Manpack: 344mm x 248mm x 106mm
(13.6in x 9.7in x 4.2in)
Rechargeable Battery:
184mm x 127mm x 72mm
(7.25in x 5.0in x 2.84in)

Transmitter

Power output: 30W p.e.p.
Spurious output: Harmonics 40dB below wanted output
Modulation sensitivity (whisper speech): 0.4 to 40mV for full modulation

Receiver

	UK/PRC 320	PRC 320/1
Sensitivity (o/c levels)	0.8 μ V s.s.b. for 10dB signal-to-noise 3.3 μ V 30% modulated for 10dB signal-to-noise 0.8 μ V c.w. (narrow) for 17dB signal-to-noise	0.8 μ V s.s.b. and c.w. for 10dB signal-to-noise 3.3 μ V 30% modulated a.m. for 10dB signal-to-noise
Selectivity (nominal 6dB bandwidth)	2.9kHz s.s.b. or c.w. (wide) 6kHz a.m. 300Hz, c.w. (narrow)	2.9kHz s.s.b. and c.w. 2.4kHz c.a.m.
Image rejection:	Greater than 50dB	
I.F. rejection:	Greater than 60dB	

Environmental conditions

Working temperature: -37°C to +55°C plus solar radiation
Storage temperature: -40°C to +65°C
Immersion depth in water: 1m (3ft) for 2 hours
Altitude operation: 2500m (8000ft)
Altitude transport: 7500m (25000ft)

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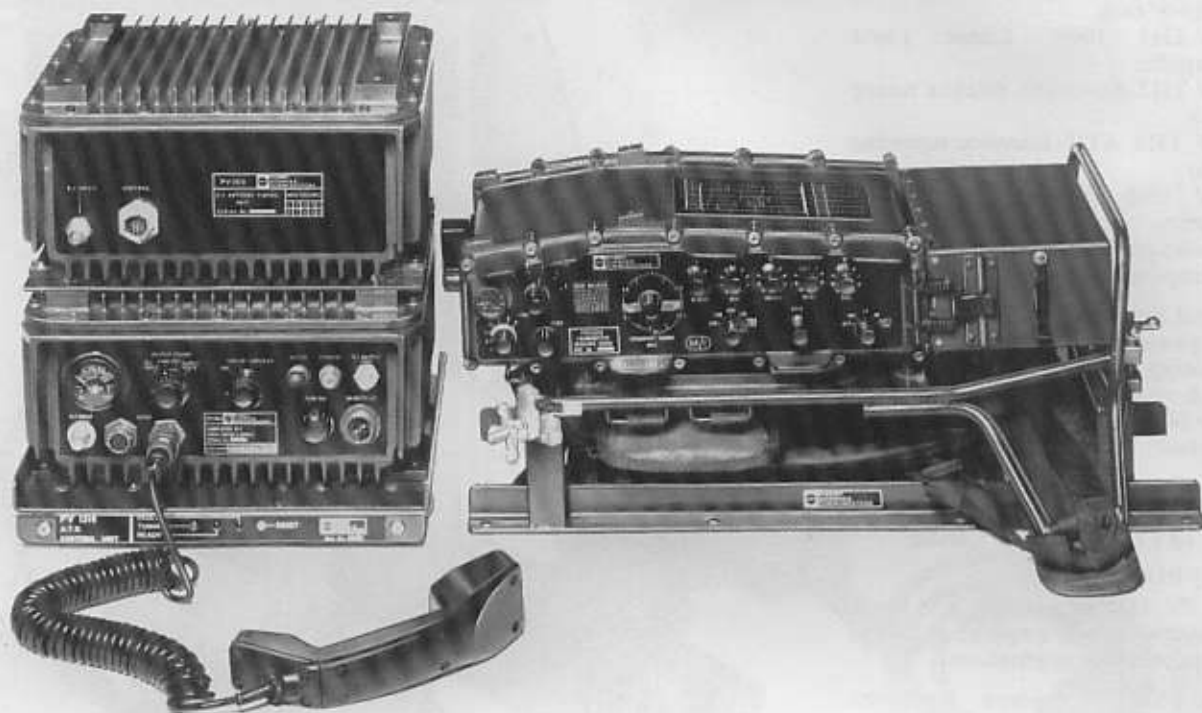
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HF VEHICLE RADIO STATIONS

PRC 320-100W & PRC 320/1-100W



PRC 320/1-100W

Frequency range
2—29.9999MHz
(or 2—29.999MHz)

280 000 synthesised channels
(or 28 000)

100W p.e.p. output

Suitable for installation in soft-skinned or armoured vehicles

Low power consumption

Incorporates British Army CLANSMAN equipment

Transmitter-receiver immediately available for manpack use

Fully automatic antenna tuning

Application

The PRC 320-100W HF SSB Vehicle Station uses the CLANSMAN RT 320 30W manpack in its vehicle 'clip-in' configuration to drive the PV 1311 100W Linear Power Amplifier followed by the PV 1313 automatic antenna tuning unit. The CLANSMAN RT 320 is currently in full scale production for British Army service in the manpack role.

A salient feature of this 100W vehicle station is that the transceiver may be readily removed and used as a manpack.

In all cases the transceiver is installed in the vehicle in its 'clip-in' manpack form complete with manpack carrier. It is removed by means of a 'quick release' mounting and it is then ready for instant use as a manpack with a transmitter power of 30W. This feature is of special value where the vehicle becomes a casualty or when it is desired to establish radio communication in a location inaccessible to the vehicle. Complete logistic commonality between the manpack and vehicle station is also ensured.

Description

The equipment is all-solid state and operates in the band 2—30MHz.

Frequency control is achieved by a microminiature synthesiser locked to a temperature-compensated reference oscillator giving a high order of stability. Speech processing and automatic level control are employed to provide whisper speech facilities and to maintain optimum mean output power.

When operating into a vehicle whip antenna, the system will provide reliable ground-wave communication up to 100km (62 miles) over average rolling terrain. Considerably greater ranges can be obtained using sky-wave propagation.

The system is normally powered from a 24V (nominal) negative-earth vehicle supply. Protection is incorporated against supply spikes and surges and reversed polarity connection. The transceiver can obtain its supply from the PV 1311 Amplifier or from a Clansman 3.3Ah rechargeable nickel-cadmium battery float-charged from the vehicle supply via a Clansman d.c. charging unit.

This latter configuration has the advantage that when the transceiver is removed from the vehicle for use as a manpack, it has a fully-charged battery in position and the manpack radio is available for immediate use.

A typical installation in a vehicle would comprise:

- RT 320 30W manpack transmitter-receiver with carrying frame and 'clip-in' rack
- PV 1311 100W Linear power amplifier
- PV 1313 Automatic antenna tuning unit
- PV 1318 ATU Interface/mounting tray
- PV 1316 Vehicle whip antenna system
- Audio gear and cables
- Manpack ancillaries as required

A fixed mounting frame is provided for the power amplifier and a 'clip-in' mounting frame for the transceiver. A 3.3Ah nickel-cadmium battery and a 12 or 24V d.c. charging unit can also be supplied.

Unit descriptions

PV 1311 HF 100W Linear Amplifier

The PV 1311 is a 100W h.f. linear transmitter power amplifier for fixed station or mobile applications.

The PV 1311 operates over the frequency range 2 to 30MHz and uses solid-state circuitry throughout in a broadband design which obviates the necessity for tuning. Operation is from a 24V (nominal) d.c. vehicle supply. Built-in protection circuits ensure that the amplifier is not damaged by conditions of high load v.s.w.r. (including open circuit or short circuit at the antenna), incorrect supply voltage or polarity, excessive drive or restricted cooling. Built-in test equipment enables the operator to rapidly check the major functions.

The PV 1311 provides a regulated d.c. output of 4A at 26V for supplying a RT 320 transmitter-receiver.

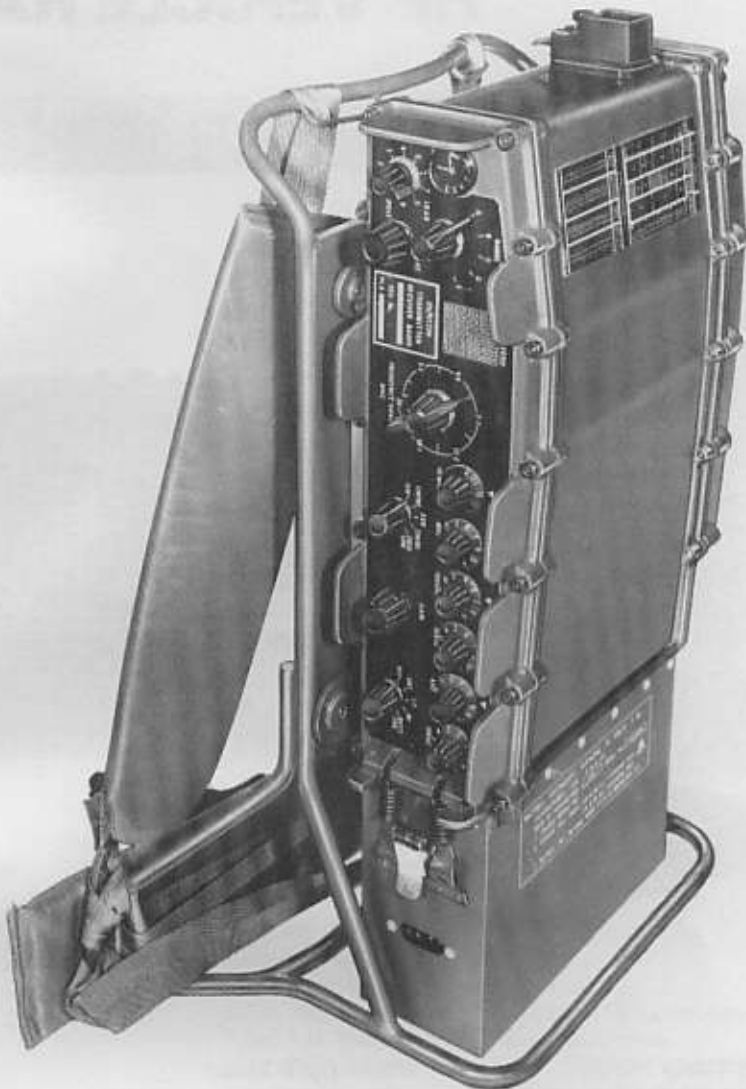
PV 1313 Automatic Antenna Tuning Unit (ATU)

The PV 1313 Antenna tuning unit operates over the frequency range 2 to 30MHz and is capable of tuning a wide range of whip and wire antennas as follows:—

4m vehicle whip	2 to 30MHz
5m vehicle whip	2 to 30MHz
10m whip	2 to 12MHz

Long wire antennas — various lengths 2 to 30MHz.

All tuning adjustments are carried out automatically by means of servo-mechanisms within the unit. When the frequency is to be changed, the antenna tuning unit is reset to minimum inductance by means of a press-button on the interface unit. The antenna tuning unit is then tuned by switching



The RT320 Transceiver with 3.3Ah battery fitted to manpack carrier

the transceiver to 'c.w.' and operating the pressel switch.

Indications of 'tuning in progress', 'tuning complete' or 'antenna fault' are given on the automatic unit interface. A suitable control cable up to 100m in length can be supplied to permit control of the antenna tuning unit.

PV 1318 ATU Interface/mounting tray

The normal method of installation for the PV 1311 and PV 1313 is to mount one on top of the other by means of four fixing screws and to mount the whole on a PV 1318 vehicle shock mounting tray. The PV 1318 also incorporates the ATU interface mentioned above.

Should it be required to mount the PV 1313 separately then a PVS 1317 mounting tray (without ATU interface) is used.

PV 1316 Vehicle Whip Antenna System

This incorporates a rugged mounting base derived from the Clansman system, with an angle adaptor and four

'MS' section elements to make up a vehicle whip antenna of 3, 4 or 5m in length.

Variants

A variant, the PRC 320/1—100W station is available in which the RT320 transmitter-receiver is replaced by the RT 320/1 which has switched upper and lower sideband s.s.b., compatible a.m. and c.w. (wide) facilities at 1kHz channel spacing.

Ancillaries

Audio Equipment

- (a) Clansman or modified Larkspur handsets and headsets with boom microphone
- (b) Knee-strap morse key
- (c) An interface can also be provided with the Clansman or Larkspur vehicle control harness system

Remote control system

For remote operation of voice and pressel over field cable at distances up to 3km. Comprises local unit and remote control handset.

Antenna gear

- Lightweight mast 5.4m
- Long-wire, end-fed antenna
- Dipole antenna
- Whip antenna 2.4m and antenna angle adaptor
- Vehicle whip antenna system 3, 4 and 5m (PV 1316)



Data Summary

General

Frequency range

PRC 320—100W 2—29.9999	PRC 320/1—100W 2—29.999
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Channel spacing

100Hz	1kHz
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Mode of operation

s.s.b. (A3J) u.s.b.	s.s.b. (A3J) u.s.b.
a.m. (A3)	s.s.b. (A3J) l.s.b.
c.w. (wide) A1	c.a.m. (A3H)
c.w. (narrow) A1	c.w. (A1)

Frequency stability

1 part in 10^5 over 6 months

Power supplies

20—32V d.c. (negative-earth)

Current consumption

Average 6A
Peak 15A

Supply protection

Transients up to $\pm 600V$ at 15mJ
Surges up to 80V either polarity

Interface levels

Phone: 10mW into 150 ohms
Mic: 100mV r.m.s. (maximum)

Size(mm):

RT 320 or RT 320/1	PV 1311	PV 1313
280 x 255 x 102	275 x 245 x 140	275 x 245 x 140

Weight(kg):

5.6	4.6	6
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Tuning time for auto a.t.u.

Typical 5s
Maximum 10s

Transmitter

Power output (selectable): 100/30/3W p.e.p.

Spurious outputs: At least 40dB below wanted signal

Receiver

PRC 320—100W

Sensitivity (o/c levels)

0.8 μ V s.s.b. for 10dB signal-to-noise

3.3 μ V 30% modulated a.m. for 10dB signal-to-noise

0.8 μ V c.w. (narrow) for 17dB signal-to-noise

PRC 320/1—100W

0.8 μ V s.s.b. and c.w. for 10dB signal-to-noise

3.3 μ V 30% modulated for 10dB signal-to-noise

Selectivity (nominal 6dB bandwidth)

PRC 320—100W

2.9kHz s.s.b. or c.w. (wide)

6kHz a.m.

300Hz c.w. (narrow)

PRC 320/1—100W

2.9kHz s.s.b. and c.w.

2.4kHz c.a.m.

Image rejection

Greater than 50dB

IF rejection

Greater than 60dB

Environmental

DEF 133 Class L3

Working temperature

-37°C to +55°C plus solar radiation

Storage temperature

-37°C to +85°C

Immersion

1m for 2h

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electronic systems

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100W HF VEHICLE RADIO SYSTEM

VRC 320/2-100W

Frequency Range

2-29.999MHz

28 000 synthesized channels

100W p.e.p. output

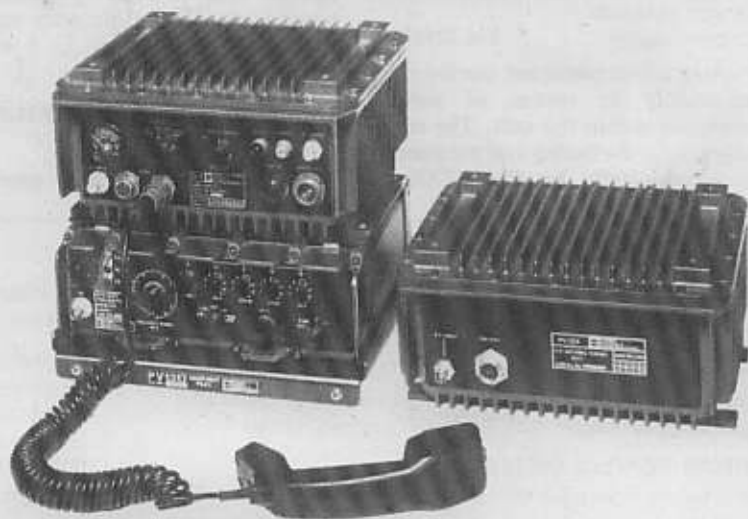
Small, simple installation in soft-skinned or armoured vehicles

Low power consumption

Derived from British Army CLANSMAN equipment

SSB (u.s.b. and l.s.b.) a.m. and c.w. modes.

Fully automatic antenna tuning unit.



General description

The VRC 320/2-100W HF SSB Radio System comprises a transmitter-receiver, r.f. power amplifier and automatic antenna tuning unit. It is built to full military environmental standards and is suitable for use in soft-skinned or armoured vehicles or for static installations. The system is based on the RT320/2 Transmitter-receiver which is a variant of the British Army's CLANSMAN PRC320 Manpack Transmitter-receiver. The 100W amplifier, which is air-cooled, is of modern solid-state design to the same environmental standard as the RT320. A completely automatic antenna tuning unit is supplied which will tune a wide range of whip and wire antennas. The primary mode of operation is single sideband but facilities for a.m. and c.w. operation are also provided.

When operating into a vehicle whip antenna, the system will provide reliable ground-wave communication up to 100km (62 miles) over average rolling terrain. Considerably greater ranges can be obtained using sky-wave propagation. The system is normally powered from a 24V (nominal) negative-earth vehicle battery supply. Protection is incorporated against supply spikes and surges and reversed polarity connection.

The system is very small and compact

and is particularly easy and flexible to install since all three units may be mounted separately or on top of each other. The system also has a low power consumption thus reducing the drain on vehicle batteries which is particularly advantageous for silent watch operations.

Typical Installation

A typical installation in an armoured or soft-skinned vehicle would comprise

- RT320/2 Transmitter-receiver
- PV1311 100W Linear Power Amplifier
- PV1313 Automatic Antenna Tuning Unit (ATU)
- PV1316 Vehicle Antenna System
- PV1317 Vehicle Mounting Frame

Unit Description

The RT320/2 Transmitter-receiver has a high degree of module commonality with the RT320 CLANSMAN Transmitter-receiver and is to the same high standard of design and construction.

The radio operates in the frequency band 2 to 29.999MHz and incorporates a frequency synthesizer. Any one of 28000 channels may be selected in steps of 1kHz by decade controls.

The RT320/2 is extremely simple to operate and provides s.s.b. (u.s.b. and l.s.b.), compatible a.m. and c.w. modes of modulation.

The transmitter output is 30W p.e.p. with automatic level control to

maintain the power output at optimum. Speech processing is incorporated to enable the transmitter to be fully modulated by widely varying voice input levels. An interface unit is incorporated for the automatic control of the PV1313 Antenna Tuning Unit.

PV1311 HF 100W Linear Amplifier

The PV1311 is a 100W h.f. linear transmitter power amplifier for fixed stations or mobile applications. It is intended primarily for use with the RT320/2 vehicle transmitter-receiver or the RT320 or RT320/1 manpack transmitters but may also be used with any other similar transmitter-receiver. The PV1311 operates over the frequency range 2.0 to 30MHz and uses solid-state circuitry throughout in a broadband design which obviates the necessity for tuning. Operation is from a 24V (nominal) d.c. vehicle supply. Built-in protection circuits ensure that the amplifier is not damaged by conditions of high load v.s.w.r. (including open circuit or short circuit at the antenna), incorrect supply voltage or polarity, excessive drive or restricted cooling.

Built-in test equipment enables the operator to check rapidly the major functions.

The PV 1311 provides a regulated d.c. output of 4A at 26V for supplying the RT320/2 transmitter-receiver.



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PV 1313 Automatic Antenna Tuning Unit (A.T.U.)

The PV1313 Antenna Tuning Unit operates over the frequency range 2.0 to 30MHz and is capable of tuning a wide range of vehicle whip and wire antennas as follows:

4m vehicle whip	2 to 30MHz
5m vehicle whip	2 to 30MHz
10m whip	2 to 12MHz
Long wire antennas — various lengths	2 to 30MHz

All tuning adjustments are carried out automatically by means of servo-mechanisms within the unit. The control signals for the tuning unit are generated automatically by the RT320/2

transmitter-receiver whenever the frequency selected is changed by more than 10kHz.

Indications of tuning in progress, tuning complete or antenna fault are provided on the RT320/2.

PV 1316 Antenna System

This incorporates a rugged mounting base derived from the CLANSMAN system, with an angle adaptor and a number of 'MS' section whip antenna elements to make up 3, 4 or 5m antennas.

PV 1317 Vehicle Mounting Frame

This has been designed to provide a

shock-absorbing mount for the transmitter-receiver, power amplifier and automatic a.t.u. when mounted one on top of the other. Another PV1317 may be used to mount the automatic a.t.u. remotely from the transmitter-receiver and amplifier if required.

Variants

Variants are available in which the RT320/2 transmitter-receiver is replaced by either the CLANSMAN RT320 or RT320/1 manpack transmitter-receiver in its "clip-in" role. The manpack may be quickly and readily removed from the vehicle for use in the manpack role.

ANCILLARIES

Audio equipment

- Clansman or modified Larkspur handsets and headsets with boom microphone
- Knee-strap morse key
- An interface can also be provided with the Clansman Larkspur or similar vehicle control harness system

Remote control system

For remote operation of voice and pressel over field cable

at distances up to 3km. Comprising local unit and remote control handset.

Antenna gear

- Lightweight mast 5.4m
- Long-wire, end-fed antenna
- Dipole antenna
- Whip antenna 2.4m and antenna angle adaptor
- Vehicle whip antenna system 3, 4 and 5m (PV 1316)

Data Summary

GENERAL

Frequency range

2—29.999MHz

Channel spacing

1kHz

Mode of operation

- s.s.b. (A3J) u.s.b.
- s.s.b. (A3J) l.s.b.
- c.a.m. (A3H)
- c.w. (A1)

Frequency stability

1 part in 10⁶ for 6 months

Power supplies

20—32V d.c. (negative earth)

Current consumption

Average: 6A peak 15A

Supply protection

Transients: Up to ±600V at 15mJ

Surges

Up to 80V either polarity

Interface levels

- Phone: 10mV into 150 ohms
- Mic.: 100mV r.m.s. (Max)

Size (mm)

RT 320/2	PV 1311	PV 1313
280 x 255 x 102	275 x 245 x 140	275 x 245 x 140

Weight (kg)

5.6	4.6	6
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Tuning time for auto a.t.u.

- Typical: 5s
- Maximum: 10s

Transmitter

- Power output (selectable)
100/30/3W p.e.p.
- Spurious outputs
At least 40dB below wanted signal

Receiver

- Sensitivity (o/c levels)
0.8μV s.s.b. and c.w. for 10dB signal-to-noise
3.3μV 30% modulated a.m. for 10dB signal-to-noise
- Selectivity: (nominal 6dB bandwidth)
2.9kHz s.s.b. and c.w.
2.4kHz c.a.m.

Image rejection

Greater than 50dB

I.F. rejection

Greater than 60dB

Environmental

- DEF 133 Class L3
- Working temperature: -37°C to +55°C plus solar radiation
- Storage temperature: -37°C to 85°C
- Immersion: 1m for 2h

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