

# Racal-Comsec Limited

## Brief technical description



### MA 4470 Audio Encryption Unit

- High degree of speech security
- Excellent voice recognition
- Short transmission delay time
- Advanced continuous synchronisation facilities
- Multiple key storage
- Low residual intelligibility

The MA 4470 Audio Encryption Unit provides a high level of speech security for half-duplex voice circuits. It connects between the handset and the audio input of the associated radio. The unit's small size, light-weight and rugged construction lends itself to numerous tactical roles, being easily man-portable or convenient for fixed or mobile radio system installations.

Racal-Comsec has a great depth of experience in the use of Time Element Scrambling in either Frame or Sliding-Window formats, and methods of Frequency Domain Scrambling. This unit brings together the best features of the available techniques in a new two-dimensional scrambler.

In the time-domain a Disjoint-Frame Sliding-Window method is used which combines the advantages of a high level of security, whilst maintaining a short system delay. The technique also allows the use of continuous synchronisation for system reliability.

In the frequency-domain a combination of frequency translation and inversion techniques are used to ensure effective scrambling, and also to provide a frequency channel for the transmission of synchronisation and message key

information. In this way the input audio bandwidth of 400Hz to 2400Hz is unaffected by synchronisation signals.

The scrambling processes in each of the two domains are constantly and independently varying under the control of a pseudo-random keystream produced by a Racal-Comsec proprietary Sequence Generator device.

The continuous synchronisation system employed provides reliable performance over a variety of channels. It permits "late-entry" and provides simplicity of operation. A new technique of synchronisation-update provides virtually transparent operation at each change of transmission direction of the half-duplex link.

The front panel of the MA 4470 has a 24 button keyboard which is used to control the following functions:

- i. Clear/Secure selection
- ii. Base Key entry from Keyboard
- iii. Base Key entry from Keygun
- iv. Selection of Base Key for use
- v. Erasure of Base Keys

To simplify the keyboard operation of the unit during control and data entry, a four character LED display provides operator prompts and entry feedback.

LED indicators are used to show the power on/off, and clear/secure status of the unit. The indicators can be switched off or dimmed for night-time secure operation.

Key distribution can be achieved by a wide variety of methods. Base keys may be entered into a Master Programmer (MA 4255) for distribution, either directly to a network of MA 4470's, or by transferring via several Slave Keyguns (MA 4459). Alternatively base keys may be entered directly into the MA 4470 using the front panel keyboard. Base key erasure can be actioned on an individual key basis, or total key erasure is possible via an emergency facility which even operates in the absence of external power.

Power for the unit is usually supplied by the host radio but a separate power supply may be used. Power consumption is minimal.

Self test (BITE) is used extensively within the unit. A comprehensive test is performed on the internal circuitry after switching on. Further testing is performed continually to ensure the security of the transmitted audio.

**RACAL**

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## Technical specification

### CRYPTOGRAPHIC PARAMETERS

#### Technique

Time Element scrambling and Frequency processing

#### Keystream generator

Non-linear

#### Total number of key settings

$8 \times 10^{31}$

#### Internal key settings

26 bits

#### Base key settings

80 bits per key entered from keygun or as 20 hex digits from keyboard

#### Stored keys

16 Base keys + 1 guard key selectable from keyboard

#### Keystream cycle length

$10^{24}$  bits

#### Message key length

24 bits

#### Message key transmission

Transmission continuously at 48 Baud. FSK signals sent in frequency processed channel

#### Message key cycle time

In excess of 90 days

#### Key storage battery life

5 years

### INTERFACE PARAMETERS

#### Audio path

Input audio bandwidth – 400Hz to 2400Hz

Required channel bandwidth – 400Hz to 2700Hz

Total audio system delay – 495msec

#### Transmit mode

Input level – Linkable high level (0dBm) or microphone  
Microphone level adjustable over the range 1mV to 50mV rms

Output level – Adjustable to match input level



MA 4470 Audio Encryption Unit



MA 4255 Master Programmer and MA 4459 Slave Keygun



MA 4470 Audio Encryption Unit in use with the BCC 39 HF transceiver

#### Receive mode

Input level – Adjustable over the range 70mV to 3.5V rms

Output level – Adjustable to match input level or up to a maximum of 1.5W into 8 Ohms

#### PTT output ratings

Continuous current – 0.5 Amp

Inrush current – 8 Amp

Maximum voltage – 50V

### Power supply

Voltage – 12 to 32V dc

Current – Secure receive (audio to handset) 120mA  
Secure receive (full audio to 8 Ohm load) 300mA  
Secure transmit 130mA  
Other keyboard operations 170mA

### PHYSICAL PARAMETERS

#### Dimensions

| Height | Width | Depth |
|--------|-------|-------|
| 58mm   | 158mm | 210mm |

#### Weight

1.75kg

#### Temperature range

Operating –  $-20^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$

Storage –  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

#### Environmental

Sealing – MIL.STD.180E to 1m of water

Shock – MIL.STD.810C Method 516.2 Proc.VI 30g.11ms

Vibration – MIL.STD.810C Method 514.2 Proc.VIII curve Y

Transit drop – MIL.STD.810C Method 516.2 Proc.II

Altitude – MIL.STD.810C Method 500.1

Rated operating at 15,000ft ASL

Rated for transportation at 40,000ft ASL

EMI – Case provides screening  
All inputs and outputs filtered

### ANCILLARY EQUIPMENT

**MA4255** Master Programmer

**MA4459** Slave Keygun

**MA4220** Nicad Battery for Master Programmer

**MA4234** Battery Charger (230V) for Master Programmer

**MA4454** Battery Charger (115V) for Master Programmer

Racal reserve the right to vary in detail from the description and specification in this publication.

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